THE RISK IS REAL

Mitigation Works

Mitigation Best Practices

Public and Private Sector Best Practice Stories for All Activity/Project Types in All States and Territories relating to All Hazards

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FEMA

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Building Codes Helped Bolivar Peninsula Homes Survive

Galveston County, Texas

Bolivar Peninsula, TX – Hurricane Ike tore across this 33-mile-long arm of land that juts out into Galveston Bay, leaving devastation in its path. Unprotected by a seawall or other barrier, the peninsula suffered arguably the worst of Ike's fury. Winds of up to 110 mph and a 14-foot storm surge hit the peninsula broadside from the gulf, crossed far inland, and then doubled back around.

The full impact of the September 2008 storm on the people of the Bolivar Peninsula may never be known. Officials with the Galveston County Office of Emergency Management said 20 people were either confirmed dead or still missing months after the storm. Some 5,300 buildings, most of them homes, were located on the peninsula before the storm. Afterwards emergency managers in aircraft could count 2,087 rooftops, including those on sheds and skeletons of shattered homes. Only 102 buildings were left unscathed.

The owners of a few surviving homes on Bolivar Peninsula, such as Jimmy and Debbie Bishop, have important stories to tell and lessons to share.

The Bishops came back to check on their vacation house a few days after the storm and had to circle through a field, maneuvering around downed power lines, pieces of buildings and twisted debris. Their subdivision had about 35 houses before the storm and no more than a dozen afterward. Many of their neighbors' houses, including the first two rows along the beachfront, had simply disappeared. The Bishops' had been on the third row back from the beach; now it is open to the sea. When they reached their house, they found the bottom-level breakaway walls gone, as the design had called for. Their stairs were a little askew but still sturdy enough to climb to the second-level living area.

"We opened the door and everything was just fine. Everything was just as it had been before the storm. If I had not been outside, I would not have known there was a storm," Mr. Bishop said. "The only thing out of place inside was one mirror that fell to the floor, and it wasn't even broken."

Why did the Bishops' house survive while neighbors' homes did not? The Bishops' house was the newest occupied home in the subdivision. Their builder has a nearby new house, still for sale, that also held up well in the storm. Both were built under the new coastal building codes and followed specifications provided by a structural engineer. In keeping with the letter and the spirit of the code, the Bishop house is elevated high above the water, located back from the coast, held together with steel connectors, fortified with sturdy materials, and shielded by a storm-resistant roof. Impact-resistant glass on windows also helps protect the interior.

The building elevation may have been the most important safety factor. The required elevation was 16 feet, but the house was raised an additional 7 feet, as a margin of safety. The additional amount of height above the required elevation is called "freeboard." It provides added protection and helps lower flood insurance premiums.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Hazard Mitigation Saves Historic Galveston Home

Galveston County, Texas

Galveston Island, TX − When Hurricane Ike slammed ashore on Galveston Island in September 2008, the storm's 100-mph winds and 11-foot storm surge took aim at one of the most important historic buildings in Texas – Moody Mansion.

The mansion suffered some rainwater intrusion and flooding from Hurricane Ike's surge, but damage was minimal, thanks to hazard mitigation measures that dramatically reduced disaster losses, said Betty Massey, executive director of the Mary Moody Northern Endowment, which owns and operates the mansion. The measures are all part of the endowment's phased, systematic, strategic approach to protecting historic resources through disaster planning, preparation, and hazard mitigation.

The mansion is, by any standard, a priceless treasure. Construction spanned 3 years, from 1892 to 1895. The building is crafted of red brick generously iced with limestone, sporting bold arches, towers, dormers, and a pyramidal red-tile roof. It contains 31 rooms on three floors atop a raised basement. Perhaps the most stunning feature is a 12-foot-tall leaded, stained-glass window overlooking the landing of the finely crafted staircase in the oak-paneled central hall.

During Hurricane Ike, winds hurled debris broadside into the stained-glass window, but the window had been covered with safety glass to protect it in a storm. Mary Hoehne, Moody Mansion facility manager, said, "The covering did its job. There's no question that without the safety glass we would have lost that window."

Broken windows would also have allowed substantial water intrusion and damage throughout the home. That's why most of the other 50-plus windows are covered with clear storm coverings of polycarbonate, a kind of plastic shield that is nearly as clear as glass.

The best of the polycarbonate glazing products are touted for their high-impact strength, flame resistance, insulation, and clarity. This type of shield is often used in bus stop shelters, sky lights, and similar projects that demand both transparency and extreme strength. Placing the polycarbonate on the windows protects the mansion's openings without detracting from the historic building's façade. The window protection system has been a major investment that the mansion is continuing in installments as funds are available.

According to Ms. Massey, Moody Mansion stewards believe their responsibility to safeguard the property requires hazard mitigation measures. Some people think historic properties cannot be protected from hazards because those protective measures could detract from the historic buildings. To the contrary, she feels hazard mitigation is imperative for historic buildings because these structures represent priceless resources that cannot be lost.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Non-profit organization (NPO)

Read All About It: Galveston Newspaper Never Misses a Beat

Galveston County, Texas

Galveston, TX - The Galveston County Daily News has written countless stories about the challenges and heroes of Hurricane Ike (2008). But there is one story they have refused to write: Their own. During the worst of Ike, they didn't miss an edition.

When the eye of the hurricane passed over the newspaper building at 2 AM on September 13, workers who were there overnight rushed out and boarded up cracked windows in preparation for the second half of the storm. The worst was yet to come: The second half of the storm brought 110-mph winds, rain coming in and around the windows, and a 12-foot surge that flooded the carpet. They lost their roof covering, power, generator, satellite phones, and nearly all their technology.

"We were working around the clock," editor Heber Taylor said. "Our reporters were operating out of emergency management centers in Galveston and League City." Dedicated to their readers and their craft, reporters filed stories using whatever technology they could muster, including cell phones, laptops, and wireless air cards. The News would then export copy editing to the mainland and printed through sister newspapers, starting with the Herald Zeitung in New Braunfels, Texas.

Leigh Jones, one of the News reporters, had to resort to text messaging the news from her cell phone when most communications channels were down. She sent short, 140-character (not words, characters) bulletins, called "tweets," through Twitter, a social networking Web site that works over multiple networks and devices:

5:44 p.m. Sept.12 – People are calling for help now but no one can get to them. The water is really coming up fast now. …

7:55 a.m. Sept.13 – Crews pulling people from high water. …

8:30 a.m. Sept.13 – Entire row of houses on fire. Nothing crews can do. …

8:42 a.m. Sept.13 – Structures from the beach are now on the street. …

In another city, a reporter who had traveled with evacuees to cover their story was able to get to the Twitter site and convert the bulletins for The News to post online in real time. Soon other media discovered the bulletins and used the Twitter text for regional and national coverage.

When the newspaper was ready for delivery, finding readers proved nearly impossible. Delivery personnel went where they thought people might be, dropping bundles at emergency centers and hotels. "People would see our trucks and flag them down," Taylor said, "and I don't know how many people told me they hiked to the points of delivery just to find out what was happening. Think about it: There was no cable, no CNN, no local news stations. This was the way they got information, and information is critical.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Private funds

Homes Built With Love -- and Lots of Extra Nails

Brazoria County, Texas

Freeport, TX – Hurricane Ike rudely interrupted Frank Bartolomeo and his team of Habitat for Humanity volunteers just as they were finishing the framing of their latest house in Freeport. Winds through the coastal town reached higher than 90 miles per hour (mph) in the early hours of September 13, 2008 with scattered tornadoes. Nearby on the Gulf Coast, storm surge and hurricane-force winds shattered neighborhoods. It was only a matter of days, however, before they were back at their labor of love: building Habitat homes.

Bartolomeo, 77, a retired chemist, and the volunteers evacuated inland until it was safe to return and begin moving downed trees and repairing ripped roofs throughout southern Brazoria County, west of Galveston.

“We have built 66 homes in southern Brazoria County since 1991,” Bartolomeo said. “We had no more damage to any of them than a few lost shingles here and there and minor water damage in one of the units. We are relieved but not surprised. We have never had structural wind damage or flooding from rising water in any of our Habitat units.”

The secret to their good record is hidden in the details of how and where they choose to build.

“First of all, we go by the city codes on everything,” Bartolomeo said. “The city code officials are a great help to us and keep us updated on all the latest code changes. We are lucky to have a Texas Windstorm Program inspector in our group, and we abide by everything he says, too.”

But they don’t stop with the codes. The volunteers go above and beyond the code so the house will hold together, even in a stiff coastal wind.

“We want to build homes to last,” said Marc Bartolomeo, Frank’s son. “The people who live in these houses are not earning so much, so the homes need to be maintenance-free. They can’t afford damage. They help with the construction, of course, and building to the highest quality gives them a certain sense of pride – and for us, too.”

Ask Bartolomeo and the southern Brazoria Habitat volunteers about the construction and you will get a whirlwind tour of the framed-in house, top to bottom. Here are the steel braces on all connections and the bolts that anchor the frame to the slab, and over there are the extra-strong roofs, the added bracing over the doors and windows, the precise pattern of nails tying the sheathing to the roof.

“We build to combat the wind sheer that could suck up the roof, like an airplane gets lift.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Floodplain Management

Primary Funding:
Non-profit organization (NPO)

1907 Elevation Saved Galveston Church From Flooding

Galveston County, Texas

Galveston Island, TX – In 1907, Galveston was still recovering from one of the nation's worst natural disasters - the hurricane of 1900, which had killed 6,000 people in a terrifying surge of wind, water, and debris. The bell tower of St. Patrick's Catholic Church crashed down into the church, killing 200 members who had sought sanctuary from the storm. It was all ruined – the walls, the roof, the ceiling, the bell tower, the pews, the pipe organ, and the stained glass windows, all tangled together in a massive, sodden heap.

By 1902, parishioners had rebuilt their church. The new structure was even grander than the original, although the bell tower was only half the height of the original.

Shortly after the church's reopening, Galveston County officials made a fateful decision to build a 17-foot-high concrete seawall stretching for miles along the Gulf of Mexico. In an even more audacious move, the town of Galveston decided to raise the land, starting high behind the seawall and sloping down toward the bay for drainage. Overall, officials proposed to raise the ground an average of 8 feet.

To accomplish the goal, townspeople jacked up houses on pilings, erected wooden walkways high in the air, dredged out a ship channel, and piped the slurry sand across the town and beneath the lifted buildings. Then they topped the sand with mainland soil.

Elevating St. Patrick Church, the largest of the 2,156 buildings that were raised, presented an engineering challenge because of its size, its weight, and its many pillars and arches. To prevent cracking, its weight had to be evenly distributed throughout the process. The townsmen accomplished the job, by hand, in scarcely more than a month.

By 1910, the seawall stretched along 5 miles, and much of the grade raising was complete. In 1915, the island was hit by another hurricane, said to be the equivalent of the 1900 storm. Due to the mitigation efforts, Galveston was protected from total devastation.

In 2008, a tidal wave pushed by Hurricane Ike washed ashore over Galveston, damaging at least 75 percent of the island's buildings. In the church complex, buildings that were not elevated — the school and the priests' house — flooded along with many others across the island. Underneath the church, in the crawl space left open by the elevation, floodwaters damaged ductwork as well.

Inside St. Patrick, however, it was as if Ike never happened. "When they elevated this church by 5 feet, they saved it," said the Rev. John Bok, parish priest. "Without their work, we would have had terrible damage inside our church, not only in Hurricane Ike but in other storms, too."

Rev. Bok pointed to the faint debris line left by floodwaters on the church's foundation, about 5 feet above today's street level. Had the church not been elevated, water would have risen 4 to 5 feet high inside the sanctuary.

Also contributing to St. Patrick's survival were the plastic storm windows the congregation had installed in 1991 to protect the ornate windows from wind-driven rain and debris, Rev. Bok said. "One plastic sheet was broken during Hurricane Ike, but the covering did its job, and there was no damage to any of the stained-glass windows," he said.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Private funds

Galveston Neighborhood Gets High Marks in Hurricane Test

Galveston County, Texas

Galveston Island, TX - Hurricane Ike may have devastated most of Galveston, but one of the city's newest neighborhoods – Evia – suffered only minor wind damage and developers say it is thanks to features in the town's design.

Crystal Ruiz, who runs the neighborhood coffee shop, was filled with apprehension when she came back on the island a couple of weeks after the September 2008 storm. "When you drive into Galveston, you are hit by what happened here," she said from the counter of the Sugar Bean Coffee and Cream. She said everything was damaged and described the scene with people dragging their belongings out of ruined homes.

"You drive past that big mountain of trash; you don't know what you will find. You get to Evia, and it is beautiful! A couple of street signs were down. Some siding was missing. But the sun was shining, the grass was green, the lakes were sparkling, and the homes - even the little details like the gardens were spotless. It was fantastic!" said Ms. Ruiz.

It is no accident that the subdivision survived the storm so well. It was carefully planned to offer gracious living and classic design with structural integrity and sustainability.

The first new neighborhood in the city in three decades, Evia is named for Jose Antonio de Evia, an 18th Century Spaniard credited with discovering the island and naming it "Galveston" after his patron, Bernardo de Galvez.

Evia is what planners call a New Urbanist community. It's a traditional, mixed-use neighborhood that echoes the past. Curving streets encourage neighbors to visit and walk or bike around. Pastel houses in Victorian, Craftsman, and classical designs are scattered across the landscape. The 361-lot, 93-acre subdivision is also a green, sustainable community, designed to protect the environment and to minimize disaster losses that are ultimately huge, wasteful burdens for the environment.

What helped the Evia neighborhood survive Hurricane Ike?

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Floodplain Management

Primary Funding:
Private funds

FEMA

FEMA HMGP Funding Provides Security in Port Neches

Jefferson County, Texas

Port Neches,TX – As Hurricane Ike ravaged the coast near the Louisiana-Texas border with wind gusts of more than 110 mph, Emergency Management Coordinator Stephen Curran and Police Chief Paul Lemoine hunkered down in the Port Neches fire house. The two local officials could only hope that mitigation measures funded through the Federal Emergency Management Agency's (FEMA's) Hazard Mitigation Grant Program (HMGP) would spare the town from the degree of damage caused by Hurricane Rita 3 years earlier.

The purpose of HMGP is to reduce the loss of life and property in future disasters by funding mitigation measures during the recovery phase of a disaster. FEMA provides up to 75 percent of the funding, with the remainder coming from the state or applicant or both. The state administers the program and selects the projects with approval by FEMA. Applicants, which must have FEMA-approved hazard mitigation plans, may be states, local governments, Indian tribes, or certain nonprofits. Funds can be used for long-term mitigation measures, including protection of public or private property.

Following Hurricane Rita, Port Neches received funding through the FEMA Public Assistance Grant Program to return damaged public facilities to their pre-disaster conditions. City officials then became aware of the HMGP opportunity to strengthen the facilities. "We went to a seminar and found out what kind of projects would be considered for funding, and we took advantage of the program," Curran said.

In January 2007, Port Neches received eight HMGP grants, totaling $1,512,825, to implement wind retrofit projects. Retrofitting measures were completed on the public works building, library, community center, fire station, city hall, sewer plant, senior citizens center, and police station.

The projects involved re-roofing using FM Global 1-150 rated roofs. This type of roofing meets design and installation criteria mandated by the Factory Mutual Research Corporation, the nonprofit research arm of the Factory Mutual Insurance Company. The 1-150 rating is laboratory tested using an uplift test load of 150 pounds per square foot. The mitigation projects also included replacing existing entry doors with heavy-duty, impact-resistant doors and adding electric roll-down storm shutters to windows.

"During Hurricane Ike, all shutters were in place. It was neat to simply push a button to secure the buildings. This freed up our time to concentrate on getting people to safety," Curran said. "In the past, it took us a couple of days to secure public buildings with plywood."

Some of the HMGP funds were used for the safe room at the Effie and Wilton Hebert Public Library. A safe room is an interior space that is fortified to provide a high level of protection against extreme winds, such as those in hurricanes and tornadoes.

Curran speaks proudly of the advantages of the mitigation measures undertaken and plans to take advantage of future HMGP funding. "We spent every penny that FEMA gave us, wisely. With the high winds from Hurricane Ike, those high impact doors were awesome, the roofs remained intact and the shutters did their job. It was definitely money well spent."

Quick Facts

Year:
2005

Sector:
Public

Cost:
$241,969.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Mayor Steers Tiki Island Turnabout

Galveston County, Texas

Tiki Island, TX – When Hurricane Ike (2008) was bearing down on his town in late summer 2008, Mayor Charlie Everts knew it would be Tiki's toughest test. Townspeople had been working for years to prepare for a Hurricane Ike. "We've worked hard to build above and beyond the standards for coastal construction," said Everts. "Hurricane Ike proved we did the right thing."

Storm winds topping 100 mph blew waters from the Gulf of Mexico across the island, causing surges of 10 to 12 feet. The first blast came from the gulf, across nearby Galveston Island. After the eye passed, a second surge, blown from the opposite direction, soaked the island. The result? "Everything appeared to work as planned," Mayor Everts said. "People evacuated when we asked. Nobody died. Nobody was injured during the storm. Nobody is missing from Tiki Island."

The majority of Tiki's 950 homes are supported on tall concrete pilings. "We lost the downstairs on most of these houses, as we expected – the breakaway walls broke away with the force of the water, just as we planned," Everts said. "The breakaway walls on one house took out the breakaway on the next one. We got a lot of debris from the neighboring communities, too. We had to bring in volunteers with front-end loaders to get through the streets. But, overall we did pretty well. I am really proud of how it turned out here."

Tiki Island, a town of only 1.5 square miles, is largely a manmade island. It was built in the 1960s when developers excavated for a channel and used the fill to elevate the land to between 4 and 10 feet above sea level. At first, Tiki was primarily a small fishing camp, although it evolved into a place for weekend homes, and then into a village that was incorporated in 1983. It is now home to about 1,250 people whose upscale homes sit mainly on the waterfront.

In the town's early years, Tiki Island stayed in hot water with the National Flood Insurance Program (NFIP) over a tangle of floodplain management compliance disputes. "Tiki had a terrible reputation in floodplain management circles then and probably deserved it," said the Federal Emergency Management Agency's (FEMA's) Dale Hoff, who worked with the community for years to try to resolve the compliance issues. He credits Everts with turning the situation around.

When Everts took office in 1992, Tiki was on probation with the NFIP, in danger of losing federal flood insurance for its citizens. "We were concerned that we would have no insurance, no mortgages, no future," recalled Alderman Phil Hopkins. "We were all pulling in different directions then," Everts said. "It took years of building community consensus. Now I think we're all pulling together, everybody has come together."

Now the village is off probation and has progressed so far that the NFIP gives Tiki Island residents a 10 percent break on their flood insurance premiums. "We're very proud of our building standard," said the mayor. "We try to go above and beyond the minimum standard set by FEMA and the standard coastal codes. I think we do it better than a lot of other areas."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

House Built Above Building Codes Stood Strong Against the Wind

Harris County, Texas

Shoreacres, TX – In 2002, when David and Cynthia Garza decided to build their 2,200-square-foot dream home, they had no idea the road to achieving their dream would be paved with building codes. Initially frustrated by the requirements, they later credited the city's "hard-nosed" building inspector for their home's survival during Hurricane Ike (2008).

Their land sits in a low, coastal area less than a mile from Trinity Bay, so the Garzas decided to build on higher ground by adding fill to the construction site. They brought in dirt to create a raised pad, which they assumed was at or above the base flood elevation (BFE), the level that can be reached by a flood that has a 1-percent chance of occurring in any year.

"We had already put our form up when the building inspector walked out here and told us we were a foot too low," David said. "I asked, 'How can you tell? You are just looking.' He was really hard-nosed."

The inspector then asked the Garzas whether they had obtained an elevation certificate, an important tool in floodplain management that documents the elevation of a structure in relation to the BFE. David said, "When I told him I hadn't, he says, 'So you've got two choices: You can go ahead and pour the cement and be told it's too low, or you can stop right now, get your Certificate of Elevation and continue building.'"

Although they were angry and annoyed, the Garzas decided to get the certificate. "Oh boy, I was mad," David said. "The additional elevation would cost more money. I also had to make certain that the land sloped so that I wouldn't flood my neighbors out."

The survey done for the certificate showed that although the house was at the BFE of 11 feet, it was still one foot too low. The City of Shoreacres requires a foot of "freeboard," an additional amount of height above the BFE that provides added protection and can result in lower flood insurance rates. In the end, the Garzas elevated their home approximately nine inches above the city's 12-foot requirement—well above the level needed for flood insurance.

The Garzas also became frustrated with the building inspector during the framing process.

"Although I thank him now, because my house is sturdy, I had some choice words for him," David said. "He comes up and says, 'You have to strap this, you have to tie that down, you have to wrap that.' Oh man, he was tough. He and my builder were always butting heads."

Determined not to have more problems with the inspector, the builder "went overboard," David said. "He tied down, strapped, and wrapped everything. We showed him."

In September 2008, Hurricane Ike brought tremendous winds and a 12-foot storm surge to Shoreacres, dismantling waterfront properties and flooding approximately 575 of the town's 650 homes. Some of the Garzas' neighbors got more than three feet of water, while floodwaters reached within five feet of David and Cynthia's front door.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

FEMA

Storm Shutters Cause for Celebration

Brevard County, Florida

Brevard County, FL – Storm shutters for most people mean protection from damage during severe weather. For Bill Steenson who lives in Vierra, Florida, getting ready for a serious weather event by mounting storm shutters has its rewards.

Steenson and his neighbors have enjoyed a number of “shutter” parties in the last few years as Florida has had more than its share of “wet weather.”

“We [the neighborhood] get together to help everyone get their shutters up, then we have a party when we get done,” Steenson says. One of his neighbors is an 80-year-old widow. Neighbors surround her home to ensure her storm shutters are properly put in place.

Mounting storm shutters is not an easy task. Steenson and his neighbors must work fast to follow the “24-hour rule” – the shutters may not put up more than 24 hours before a hurricane and must be removed within 24 hours after the storm passes.

When severe weather is looming, Steenson gets the galvanized steel shutters out of his garage and divides them accordingly. They are numbered to match the various windows of his house. Steenson must unscrew the bolts next to the windows, hang the shutter on the bolts and tighten them.

“It takes about an hour,” Steenson says.

When Steenson built his house in 2003, he was required by state law to install the shutters. Since then, he has come to realize that storm shutters are one of the most effective ways to protect your home. Shutters are needed for all windows, sliding glass doors, and skylights. Manufactured shutters are available in wood, aluminum, or steel.

Steenson admits to feeling a little claustrophobic when the shutters are up and blocking the natural light, but he knows that his home is safer from wind damage and flying debris. Having storm shutters also increases the value of his house and saved him over $60 on his homeowner’s insurance.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

FEMA

Elevation Saved Family Home from Hurricane Ike

Galveston County, Texas

Kemah, TX - Paul Strizek's home on Galveston Bay is much more than just a house. For more than 50 years, his bayside cottage has been at the center of the most important of his family memories, and it was his mother's house. So it was worth it to Strizek to have the home elevated onto concrete columns in the 1990s. "It cost some money," he said, "but I didn't want to lose that house."

His investment paid off September 13, 2008 when Hurricane Ike stormed ashore over Galveston Island just 20 miles south of Strizek's house. The Category 2 hurricane carried winds up to 125 miles per hour (mph), driving storm surge up the bay. Wind and water assaulted its colorful tourist shops, blue-striped lighthouse water tower, lavish restaurants, festive boardwalk, and 3,200-foot roller coaster.

The storm surge took down Strizek's steps, a dock, and the lower level's breakaway walls. All were carried out to sea. But the house survived, in excellent shape. However, many of his neighbors' houses were shattered. Two homes away, the surge swept an unelevated bay house out to sea.

He thinks the surge reached 12 feet at his house. The piers hold the house up 14 feet. "If I hadn't raised that house, it would be gone," Strizek said. A concrete sea wall that Strizek built after Tropical Storm Frances in 1998 helped curb erosion and dissipate wave energy. In addition, the windows were boarded up before the storm.

Despite the risk of facing the wind and sea on Galveston Bay, his house matters to Strizek in part because of the pervasive charm of the area. The site of Strizek's home, with its sweeping blue-green vistas of the bay and prime access at the Clear Creek outlet, is irresistible.

Strizek knows that Hurricane Ike is not the first or the last storm to hit Kemah, whose name is derived from an Indian word that means "facing the wind" and is home to nearly 2,300 residents. The specific town was founded in 1898 for railroad expansion. Two years later, it was leveled by the 1900 Galveston hurricane, one of the worst disasters in U.S. history. The town was virtually destroyed again by Hurricane Carla in 1961.

Another reason for Strizek's attachment is the house itself. "This house was built around 1919, as far as we have been able to determine," he said. "The materials and workmanship are superb." The inside was finished with old-growth East Texas pine, a wood considered to be of exceptional building quality.

The house is also Strizek's link with his past and his mother, Jane Strizek.

"My mother bought this house in 1963 as our summer home. Then we moved here full time in 1966, and I went to high school here. It was a sleepy little town then, with a drawbridge where the highway bridge is now. The house was low, on the ground, an old bay house on short pilings maybe three feet into the ground. I could crawl under it. She named it 'The Ark.'

"Lots of the bay houses were like that then. And a lot of them washed away in Carla. I have a picture of mother's house from 1961, undermined and heavily damaged. But somehow it has survived, all these years, all these storms," Strizek said.

Quick Facts

Sector:
Private

Cost:
$62,130.00 (Estimated)

Primary Activity/Project:
Flood Insurance

Primary Funding:
Homeowner

Mitigation Measures Keep Hospital Afloat During Storm

Jefferson County, Texas

Beaumont, TX — In September 2005, Hurricane Rita hit the Texas-Louisiana coast as a Category 3 storm, leaving behind catastrophic damage. Damage to Memorial Hermann Baptist Hospital-Beaumont alone reached an astounding $58 million.

“We had water infiltration on the first floor of our buildings and in the towers,” said Jay DeVille, Memorial Hermann Baptist Beaumont Hospital director of facility management. “With wind gusts at 95 miles per hour (mph), the roofs of our fifth floor and Day Surgery Unit were also heavily damaged.”

To minimize the effects of future storms, Memorial Hermann Baptist has successfully initiated mitigation measures.

The hospital received a $2.6 million grant from the Federal Emergency Management Agency (FEMA) through the Hazard Mitigation Grant Program (HMGP) to invest in mitigation measures. HMGP assists states and local communities in implementing long-term mitigation measures following a major disaster declaration. It provides up to 75 percent of a project’s total cost and can be used to fund projects to protect either public or private property.

DeVille said the hospital was able to undertake several mitigation projects thanks to funding from FEMA. “We installed hurricane shutters on entry doors and on all windows on the first and second floors of our buildings. We added a water well and two quick-connect systems, one for each of our buildings,” he said.

DeVille said the hospital also water-proofed all the exterior walls, added through-wall flashing, and replaced roofs with the roofing material recommended by the facility’s insurance company.

All that work paid off. By the time Hurricane Ike drilled in with 100-mph winds on September 13, 2008, the 400,000-square-foot facility was prepared to weather it. In fact, the hospital remained virtually unscathed.

“We escaped the storm with minimal damage to our facility,” said DeVille. “We got a little water resulting from wind-driven rain in a few areas. The water-proof sealant was not as effective as we thought it would be. However, our hurricane shutters protected our entrances and our windows.”

DeVille said Hurricane Rita was a major business interruption for the hospital, forcing it to utilize temporary power for 12 days. “With Hurricane Ike, we were better prepared. We had two large generators and all of our electrical equipment functioned at capacity,” he said.

Quick Facts

Year:
2005

Sector:
Public

Cost:
$3,465,000.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Beaumont Winning Flood Fight With Help from Texas and FEMA

Jefferson County, Texas

Beaumont, TX — Folks in Beaumont used to call their town “Bayou City” because it was under water so often.

“We can get more than 100 inches of rain in a year,” said Richard LeBlanc, Jr., general manager of Jefferson County Drainage District #6. It’s his job to manage all of that rainwater, for Beaumont and nearly the whole county.

It’s challenging work. LeBlanc and his staff can tick off the years — 1998, 2001, 2002, 2003, 2004, and 2005 — that brought 10 to 15 inches or more of water each time it rained. In 2001, Beaumont got a total of 103 inches of rain. Jefferson County has consistently ranked among the top places in the United States for flood losses, including hundreds of properties that experience severe repetitive losses.

As a result of only two storms in 2001 and 2002, the National Flood Insurance Program (NFIP) paid out more than $19 million in claims for widespread residential damage in Beaumont, according to Gilbert Ward, manager of the Flood Mitigation Assistance (FMA) program for the Texas Water Development Board.

To make matters worse, Jefferson County is almost entirely flat, so it doesn’t drain naturally. Moreover, Beaumont is an old town, incorporated in the 1800s, and like many U.S. cities it was built without an adequate drainage system.

But Drainage District #6 is making progress on reducing flooding in Beaumont and the greater Jefferson County area, thanks to the district’s strategic work and its partnerships with the State of Texas, the Federal Emergency Management Agency (FEMA), and many other state and Federal agencies.

That progress became apparent when Hurricane Ike roared ashore on September 13, 2008. Ike delivered a 17.5-foot storm surge on the county’s coastal plain and dropped anywhere from 6 to 20 inches of rain, depending on where it was measured. The surge caused flooding in the county’s sparsely developed coastal areas, though no flooding occurred as a result of rain. “I don’t know of a single house that flooded from the rain in Hurricane Ike,” said Doug Canant, District #6 engineer.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Flood Mitigation Assistance (FMA)

Quick Reopening of Supermarket Served Hurricane Survivors

Galveston County, Texas

Galveston, TX - In the wee hours of Saturday, September 13, 2008, Hurricane Ike barreled ashore as a strong Category 2 storm, bringing wind gusts up to 125 miles per hour (mph) and a storm surge that spilled over the 17-foot high Galveston seawall.

The disaster shut down the island for many long days thereafter. But a bright spot beckoned in the landscape of destruction. Next to the seawall, one grocery store reopened in only three and a half days. For many more days, townspeople could find few other sources of food and essential provisions.

“I have talked to probably 400 of our regular customers, and they say this store was their only ray of normal reality,” said Tom Hearring, manager of the Signature Kroger Grocery Store at 5730 Seawall Blvd., shortly after the storm. “They could come in and enjoy air conditioning, get hot food, get away from their daily trouble for a couple of hours before going back to start cleaning again.”

How did the store do it? Hearring said, “We were able to survive the storm with very minimal damage and to reopen quickly because of many things that we did before, during, and after the storm.”

Hearring explained that the beachfront store, built in 2000, “was designed to have water roll to the left and the right, so the store wouldn’t be impacted so much.” He continued, “When they built this store, they brought in extra fill to raise the lot, built up more on a concrete pad, and raised the store quite a bit. We have a disaster plan, but everything hinges on the physical structure of the building, whether anything survives or not.”

“The sturdy masonry structure complied with all building codes when the structure was built,” said David Ewald, City of Galveston building official. In fact, the structure was built more than two feet above the height required by floodplain regulations, according to Kroger officials.

The building sits on a prized though precarious spot along the Gulf of Mexico behind the seawall. “If that seawall wasn’t there, we wouldn’t be standing here today,” Hearring said. “It did its job of keeping the majority of the water at least off the properties where there is a seawall.” Some of the surge came over the seawall, which is considerably higher than the popular frontage businesses, including Kroger.

Kroger’s staff conducted a blitz of preparedness activities before the storm hit. “We had shutters on all our windows — which were already protected by a masonry-columned promenade — sandbagged the doors and put heavy pallets of merchandise on our bay doors to keep them from blowing in,” Hearring said. “What we did is like the normal precautions you would do at your house before a storm, but on a little larger scale.

“So when we opened the door to check things out on Monday after the storm, there was no water in the store, and very minimal roof damage; a few small leaks, hardly any damage at all to the store,” Hearring said.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Property Owner, Commercial

Hurricane Rita Sparks Need for Mitigation

Orange County, Texas

Orange, TX – Fearing the wrath of Hurricane Rita, staff at Memorial Hermann Baptist Hospital in this southeast Texas city hurriedly evacuated patients a little more than 20 miles away to the hospital's affiliate in Beaumont, Texas. Their actions came just in time. The Category 3 storm rolled in with a vengeance on September 24, 2005, rendering the hospital inoperable for more than two weeks. That hard lesson prompted hospital officials to take mitigation measures for future events.

Hurricane Rita, which made landfall in Texas and Louisiana, was the fourth most intense Atlantic hurricane ever recorded. It also was the most intense tropical cyclone ever observed in the Gulf of Mexico. Rita's storm surge caused extensive damage along the Louisiana and extreme southeastern Texas coasts, completely destroying some coastal communities.

"We were without power for two to three weeks," said Hal Gardenhire, facilities manager for Memorial Hermann Baptist, the primary provider of health care in Orange County. "The 100-mile-per-hour winds forced water under entry doors and through weep holes above windows. We needed to find a way to keep our facility operating and to keep our patient census during a storm or other emergency situation," he said.

Hospital officials turned to the Federal Emergency Management Agency (FEMA) for a solution — and found one. The hospital was awarded a $933,750 grant through FEMA's Hazard Mitigation Grant Program (HMGP) to initiate mitigation measures. HMGP assists states and local communities in implementing long-term mitigation measures following a major disaster declaration. It provides up to 75 percent of a project's total cost and can be used to fund projects to protect either public or private property.

"We moved the power units that house the automatic transfer switches for our older section of the hospital from the basement to the second floor," said Gardenhire. "We also elevated the unit that houses the automatic transfer switches for our newly installed 1,250-kilowatt generator 12 inches above ground level. The generator can power the entire hospital."

Electrical roll-down shutters were placed above all the entry doors and windows on the hospital's first floor, eliminating the need for the lengthy boarding-up process, and deterring wind-borne debris or water intrusion.

Gardenhire said it used to take two men a day and a half to board up all the hospital's windows. The job required drilling holes in the frames, which later had to be patched up. For Hurricane Rita, the hospital was forced to pay a contractor to do the boarding-up work so hospital employees could concentrate on other jobs, such as sandbagging.

The hazard mitigation measures the hospital took after Rita changed all that. "Now all we have to do is push a button and in 15 minutes, with two men, we are all boarded up," Gardenhire said.

Quick Facts

Year:
2005

Sector:
Public

Cost:
$1,245,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Storm Proves Surfside Beach Buyouts Were Good Investments

Brazoria County, Texas

Surfside Beach, TX — It's smart to know when to say, "Enough is enough." That was Mayor Larry Davison's assessment after Hurricane Ike struck Surfside Beach on September 13, 2008. He's glad his town knew when to pull back from its beloved beachfront. The decision wasn't easy at the time — but it saved millions of dollars and countless tears.

In 2006, Surfside Beach bought and cleared nine houses from a beachfront row along the Gulf of Mexico. In 2008, Hurricane Ike proved it was a sound investment. The storm wiped out all of the remaining houses on the front row.

The buyout was made possible in part with funds from the State of Texas and from the Federal Emergency Management Agency (FEMA), whose Hazard Mitigation Grant Program (HMGP) is aimed at reducing risk and chronic losses from flooding and wind damage. The program in Surfside Beach also includes relocation of 11 other beachfront homes and the construction of a new sea barricade.

Surfside Beach, which traces its history to 1821, is the kind of place that people up north dream about on cold winter nights. The Gulf sparkles in the sunlight and white-capped waves lap softly against the shore. Homes are painted in soothing sea-foam green, coral, and lavender. Sand drifts lazily along streets, which bear such idyllic names as Seashell, Saltgrass, and Sandpebble.

The village, however, is in a fight for its future. The cherished beach is eroding dramatically, leaving many homes at severe risk of ruin from storm and sea. After a series of tropical storms and bouts of flooding from Hurricanes Katrina and Rita, Hurricane Ike tore through the town with a storm surge of 7 to 10 feet and winds above 100 miles per hour (mph). Homes along the first row were ripped off their moorings and either given up to the sea or hurled in pieces into the second row of houses.

Davison said he originally paid little attention to letters he received advertising the availability of FEMA's HMGP funds. Now he says he is thrilled he learned of the grant program in time for Ike.

"We didn't understand about hazard mitigation," he said. "Now we understand — it's an investment up front to save money in the long term by reducing disaster losses. Those savings will be multiplied again and again over the years."

Now that the Gulf has claimed the first row of houses, homeowners Peggy and Norman Llewellyn know they made the right decision in 2006. After a lot of soul-searching, they took advantage of the state and Federal funding to relocate their house several blocks from the beach.

"It was very hard to move off the beachfront," said Peggy Llewellyn, an engineer and Surfside Beach city councilor. "We had a lovely house. But we kept getting damages — Katrina, Rita, the tropical storms and the bull tides two years ago. We were constantly making repairs."

Quick Facts

Sector:
Public

Cost:
$628,410.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Technical Assistance Program (HMTAP)

FEMA

Multiple Measures Protected University from Floods

Harris County, Texas

Harris County, TX – As a leading research institution with a distinctive commitment to undergraduate education, Rice University aspires to path-breaking research, unsurpassed teaching, and contributions to the betterment of our world. Unfortunately, it shares a history of flooding with other critical facilities in Houston. To protect its property against floods, the university has invested over $2 million in flood mitigation measures with astounding success. When Hurricane Ike slammed into Texas in September 2008, the university experienced rising water from the deluge of rainfall that accompanied Ike, but did not flood.

“Wwe have a great deal of surface flooding. With a strong summer thunderstorm, we would get surface flooding,” said Doug Tomlinson, assistant vice president in the Project Management and Engineering Department at Rice. “The water would impede traffic flow.”

In 2001, Tropical Storm Allison devastated southeastern Texas. The storm dropped heavy rainfall along its path, peaking at over 40 inches in Texas. The worst flooding occurred in Houston. Downtown Houston was inundated, causing severe damage to hospitals and businesses. Rice was not spared.

“Following Tropical Storm Allison, we had a lot of surface flooding,” continued Tomlinson. “We have a bunch of underground utility systems that provide services to the campus. We got some water in them, which migrated to some of the buildings. We had water come in through some basement level windows also. In some places the water got up as high as five feet. Street flooding was probably around two feet.”

While Tropical Storm Allison may have been a deciding factor in the university’s decision to apply for funding to initiate mitigation measures, poor drainage was a constant woe long before the storm.

A portion of the university’s 285 acres sits on top of what is commonly known as Harris Gulley. Back in the 1950s, two, 11-foot by 11-foot box culverts were installed. Surface water was supposed to drain off the campus into Harris Gulley before finding its way to the Brays Bayou. Over time this feat became less likely. With the amount and rate of rainfall, Harris Gulley would surcharge, and water would simply stand on the surface.

“The [mitigation] projects executed following Tropical Storm Allison were multiple small projects; however, all were initiated as a result of the storm,” said Tomlinson.

The university received a $2,059,747 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP) to fund 11 projects. HMGP pays 75 percent on approved projects that will prevent or reduce damage from storms and other natural hazards. These grants are made available for both public and private projects. With Rice University’s 25 percent portion, the total funding was $2,746,328.

Quick Facts

Year:
2001

Sector:
Public

Cost:
$2,059,747.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Shutters Provide Peace of Mind During Storm

Harris County, Texas

Houston, TX – With wind gusts approaching 100 miles per hour (mph), Hurricane Ike (September 2008) roared into Houston as a Category 2 storm, peeling sheets of steel off skyscrapers, downing power lines and trees, blowing out windows, and dumping mountains of debris. As the storm raged, patients at Houston Hospice were securely tucked away behind hurricane shutters.

“They say ‘Run from the water and hide from the wind.’ That’s what we chose to do,” said Christine Blackmon, vice president of finance for Houston Hospice. “We bunkered in, so to speak, and pulled those shutters down so that the patients would be protected.”

Located in the Texas Medical Center in Houston, the hospice provides inpatient and respite care at its 25-bed inpatient facility. It provides dignified and compassionate care for people in the last phase of a terminal illness so they can live as fully and comfortably as possible. The goal of hospice care is to enable patients to continue an alert, pain-free life and to manage other symptoms so their last days may be spent with dignity.

“We didn’t have any broken windows [due to Ike]. We actually had some wind-driven rain that came in through the windows in some of the patients rooms,” said Blackmon. “It wasn’t anything severe. We were able to put towels down and get the rooms cleaned up.”

Houston Hospice saw the need for hurricane shutters following damage to the Patient Care Unit, estimated at $45,000, incurred from Tropical Storm Allison (June 2001). In January 2003, the hospice received a $131,250 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP) for the placement of storm shutters on the windows and doors of its Patient Care Unit. HMGP pays 75 percent on approved projects that will prevent or reduce damage from storms and other natural hazards. Administered by the state, these grants are made available for both public and private projects.

Hurricane shutters are often used to protect window openings in a storm, although impact-resistant windows are increasingly popular. According to the Hurricane Research Division of the National Oceanic and Atmospheric Administration (NOAA), people who live in coastal areas from Texas to Maine, and in other hurricane-prone areas, will find shutters an excellent investment for protecting against wind and wind-borne debris. These shutters provide protection of not only the windows and doors they cover but also possessions and people inside. Once a window or door has been breached by hurricane-force winds, tremendous pressure is brought to bear on interior walls. Upward pressure on the building's roof can lead to roof failure, which exposes the entire contents of the building to the storm. Shutters are a first line of defense against the hurricane. Much of the damage and building failure in Hurricane Andrew (1992) could have been prevented by well-installed hurricane shutters over windows and doors.

Quick Facts

Year:
2001

Sector:
Public

Cost:
$175,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:

Ruidoso Resident Thankful For Flood Insurance

Lincoln County, New Mexico

Ruidoso, NM - For 15 years, Judy Wilkie, an empty-nester from California, has made her home in the resort town of Ruidoso, New Mexico. She owns the Ruidoso Lodge Cabins, a vacation destination for summer and winter visitors. If not walking her dog, Wilkie can usually be found at the lodge office chatting with guests.

In 2004, she designed a two-bedroom, modern craftsman residence for herself overlooking the Rio Ruidoso. “I specifically designed the house to withstand flooding,” says Wilkie. The new house was elevated one foot above the Village of Ruidoso’s requirement and two feet above the Base Flood Elevation (BFE) noted on the FEMA flood maps. The BFE in a Special Flood Hazard Area (SFHA) is equal to the 1-percent chance of water reaching that level in any given year. This figure translates into a 26 percent chance that a flood insurance claim will be made on a property located within an SFHA within the life of a 30-year mortgage.

Wilkie protected herself against flooding by not only elevating her house but also purchasing flood insurance from the Federal Emergency Management Agency (FEMA) National Flood Insurance Program through her local insurance agent. The annual premium for the flood insurance was about $300 for $250,000 of coverage and included a discount for elevating her home above the initial required elevation.

In July 2008, Wilkie’s initiative paid off when her home was moderately affected by flooding from the Rio Ruidoso. Flooding did not substantially impact her home because it sat well above the floodplain. Since the home is open beneath the piers, floodwater could flow freely.

“It was raining when we went to bed. Around 3 AM Sunday morning, the dogs started barking at the sound of the boulders being moved down river. We noticed water flowing through the yard,” explained Wilkie. She left for the office, and along the drive she noticed damage: bridges were washed out and debris was covering many yards.

“We wanted to get to the lodge to respond to guests who might be afraid,” said Wilkie. Later that same Sunday morning, damage was visible throughout the Village of Ruidoso. Two of Wilkie’s vacation cabins had been damaged. Her home had some mud in the garage, debris in the yard, and damage to the air conditioner compressor. In addition, a pier that supported the deck had pulled away when a tree growing through the deck was washed away.” The house itself was in good shape when Wilkie looked inside.

Elevating homes and purchasing flood insurance in Ruidoso is important to protect against personal property damage and loss as well as helping to start over in the case of a catastrophic lost. “It [elevating] obviously worked,” said J.R. Baumann, Streets Director for the Village of Ruidoso. “They’re calling it a 500-year flood, but theoretically it could happen again next year.”

“Thank heaven for the flood insurance,” she said. Through her agent, Wilkie made a claim and was covered for debris removal, repairs, and replacement of the air conditioning system. Wilkie’s only regret is not having invested in flood insurance on her commercial property. Now she plans to contact her agent about insuring that property as well.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Successful Rebuilding After Previous Ruidoso Flood Proves it Can be Done

Lincoln County, New Mexico

Ruidoso, NM - On Highway 70, as the New Mexico desert landscape ascends into mountains, a yellow road sign warns northbound travelers that the area may close due to flooding. In 2006, the continuous summer rains caused that to happen. The storms created overland flooding throughout Lincoln County, New Mexico. On September 18th at the base of the Gavilan Canyon in the Village of Ruidoso, rapid waters from the Rio Ruidoso washed out a bridge crossing.

The Gavilan Canyon Road, a two-lane bridge built in the early 1980s, serves as a major bypass connecting permanent and secondary residences to the village. Ruidoso has 9,500 permanent residences and thousands of seasonal residents who stay in condos, hotels, campsites, family cabins, large resort homes, and mobile homes. During peak weekends, the population may increase to 30,000.

The Gavilan Canyon Road bridge consists of nine side-by-side, 30-inch round culverts packed with gravel, covered by a concrete decking, and paved with asphalt. In incidents prior to the 2006 floods, water topped over the bridge but did not wash out as it did in the 2006 flooding event.

After the floodwaters subsided, village officials inspecting the bridge crossing discovered heavy debris clogging. A video camera extended into the 30-foot length of each corrugated metal culvert revealed the reasons. “What the camera showed was rusted metal with giant cavities around five of the culverts. The only thing holding the bridge [together] was the concrete on top of it,” said J.R. Baumann, Street Director for the Village of Ruidoso. The Gavilan Canyon bridge was considered extensively damaged.

In response, the Village of Ruidoso selected significantly larger prefabricated, concrete-box culverts to improve the bridge. The new culverts double the capacity to 500 cubic feet per second.

“Foresight on the part of the governing body of the Village of Ruidoso saw this as a mitigation opportunity. Village leaders agreed to provide additional funding to improve the size of the bridge culverts to accommodate additional flow during flooding events,” said Ken Davis, Federal Emergency Management Agency (FEMA) Public Assistance Officer. The Village of Ruidoso’s action would mitigate the crossing against future flooding damage. As an interim solution the existing culverts were cleaned out, which allowed the bridge to be used for the remainder of 2006 and 2007.

In March 2008, the crossing was closed to traffic and the damaged culverts removed. Three new culverts with a 3-foot by 5-foot capacity were installed. The river banks were widened and covered with gravel and the upstream side “straightened” and expanded to allow better flow. A new pedestrian walkway was added to the bridge with exterior handrails installed. However, custom guardrails for the interior that were ordered had not arrived in time for the Memorial Day weekend opening.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

Village of Ruidoso
Wildfire Hazard Mitigation

Lincoln County,
New Mexico

Ruidoso, NM - With funds from the Federal Emergency Management Agency (FEMA), the Village of Ruidoso, New Mexico successfully completed a major mitigation effort to protect its residents from forest fires. This community, with both permanent and seasonal residents, is located by the Lincoln National Forest, adjacent to the Mescalero Apache Reservation. With more than 20 percent of its perimeter adjacent to forests, Ruidoso is a wildland/urban interface community.

In 2000, because of its location, Ruidoso was ranked first within the state by the New Mexico Forestry Division and second in the nation by the United States Forestry Service for significant risk of catastrophic fire. The major concern was that the forests surrounding Ruidoso contained tree densities with more than 10 times that of a healthy Ponderosa pine ecosystem. These extreme densities cause excessive fuel and unhealthy conditions, which contribute to fire dangers. A forest fire near or in urban Ruidoso could be catastrophic to residential property, water supply, economic vitality, and the population.

Emphasizing the concern was the 8,200 acre Cree fire on May 7, 2000, which started from an escaped campfire in the nearby Smokey Bear Ranger District of the Lincoln National Forest. The fire caused no loss of life but did threaten area homes. The fire resulted in local, State, and Federal emergency declarations. The cost to the Village of Ruidoso was $6,000,000. Had the fire burned on the west side of the village, property damage and loss of life would have been catastrophic.

“The Village decided to quit ‘hitting the snooze alarm’ and take action,” said Rick DeIaco, Director of Forestry. DeIaco was hired in 2000 by the Village of Ruidoso as a wildland forester serving an urban community and charged with developing and managing a healthy forest and developing a community forest management plan.

In November 2000, the new Village of Ruidoso Forestry Department began coordinating a multi-jurisdictional land management working group, consisting of nine State, Federal, and local entities, working together to create a wildfire protection plan. “For the Village of Ruidoso, identifying and obtaining the FEMA mitigation grant was a significant contribution to this comprehensive fire management and community protection effort,” commented DeIaco.

In 2002, the Kokopelli fire caused no loss of life but did destroy 29 homes. In 2003, the Village of Ruidoso applied for funds from FEMA to mitigate, or lessen, potential fire sources in public lands near residents by reducing sources of ignition. Crucial to the Wildfire Hazard Mitigation plan submitted is the concept that fire can be beneficial to the forest. “Fire in a forest, which is too dense or contains unhealthy trees due to vegetation or overpopulation, can be dangerous. Ideally forest fire should be low to the ground and be restricted from moving up to the tops of trees where it will burn at the mercy of the wind,” explains DeIaco.

Quick Facts

Year:
2000

Sector:
Public/Private Partnership

Cost:
$389,427.00 (Actual)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Austin Pre-Disaster Mitigation Saves Homes

Mower County, Minnesota

Austin, MN - When the City of Austin, located in southern Minnesota, implemented their most recent mitigation project, no one expected to reap the benefits so soon. In 2007, the city acquired and removed 15 flood-prone homes in the Wildwood Park area, which had flooded six times between 1978 and 2004. The acquisitions couldn't have come sooner. In June of 2008, the Wildwood Park area was flooded again and every acquired, but now vacant, parcel was once again flooded.

The city and its 23,000 residents are no strangers to flood damage. Since 1978 the City of Austin has acquired 240 homes and businesses in order to remove them from the threat of flooding. These acquisitions have saved the city and State and Federal governments millions of dollars in losses avoided as a result of the mitigation efforts.

The City of Austin may be best known as the home of the Spam, the canned meat product. But beyond Spam, the city is proactive and progressive in reducing its flood threat. After experiencing a devastating flood in 1978, local officials began to realize the importance of mitigation in a city prone to floods. With Cedar River, Turtle Creek, and Dobbins Creek converging in the center of the city, hundreds of homes had been flooded in the 1978, 1983, 1993, 2000, and 2004 floods. This degree of damage was unbearable to the residents and frustrating to city leaders trying to protect homes and infrastructure.

In September of 2006, the City received a Pre-Disaster Mitigation Competitive (PDM-C) grant to purchase 15 homes in Wildwood Park along the Cedar River. During 2007, the City of Austin implemented their PDM-C grant and purchased 15 homes in the Wildwood Park neighborhood, which would have been flooded in their basements and to their first floor in 2008 if they had not been acquired.

The PDM-C grant was true mitigation at work: acquiring a flood-prone home before it was flooded again. In 2004, the Wildwood Park area had over $575,000 in flood damages. Add that value to the five previous floods and the area has incurred over $2.6 million in damages since 1978. The city worked with the Minnesota Homeland Security and Emergency Management as well as with the Federal Emergency Management Agency (FEMA) to provide PDM-C funding for the $2.2 million dollar project. The city had already developed a Comprehensive Linear Park System to manage the acquired flood-prone properties so the open space can be enjoyed by all its citizens. The Wildwood Park acquisitions will now make it possible for the city to connect bike trails in parks across the city.

In addition to protecting the 15 homes, the PDM-C project enabled the city to remove the sanitary sewer service to that area, which alleviated sewer backup problems to an additional 36 homes located near the acquisition area but away from the threat of riverine flooding. These 36 homes are no longer prone to sewer backup resulting from the Wildwood Park overland flooding since all sewer connections were removed and the floodwaters are unable to enter the sanitary sewer system.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Pre-Disaster Mitigation (PDM)

FEMA

Moving People Out of Harm's Way

Kenosha County, WI – An excerpt from a May 2000 emergency bulletin announced: “Residents are strongly urged to evacuate until river levels subside…. Rapidly-rising swift currents will provide an extreme danger to residents and responders.” This announcement is a common occurrence for residents of Kenosha County, Wisconsin living along the Fox River between Highway 50 and Highway F. Low-lying land in this region is plagued by frequent, dangerous floods that threaten the safety of the residents and cause severe damage to homes.

The Illinois Fox River rises near Menomonee Falls, Wisconsin and flows through Waukesha, Racine, and Kenosha Counties in southeast Wisconsin for a total of 70 miles before entering Illinois. There are two rivers in Wisconsin called the Fox River. This particular river is designated as the Illinois Fox River by local residents as it flows out of Wisconsin and into Illinois. Flooding is common in Kenosha County, Wisconsin along the river, especially near the Towns of Wheatland and Salem and the Village of Silver Lake.

During the middle of the 20th century, the riverside was valued as a vacation or weekend get-away spot and many people from nearby cities built rustic cabins on the banks of the river. Later, as the area’s population grew, some families built year-round residences and even more constructed weekend cabins. The waterfront properties were occasionally flooded, but the owners kept coming back to clean up and rebuild. The river area provided the scenic beauty and outdoor recreation they treasured.

The private property in this floodplain has created an “urban interface” problem similar to those in the forested lands of America’s western states. Having a population adjacent to or in an area that frequently experiences natural disasters puts stress on local emergency management and law enforcement as well as public works.

When extensive, heavy rains enter the watershed for the Illinois Fox River, Kenosha County emergency management personnel and law enforcement officers keep steady contact with the National Weather Service to receive constant updates about rainfall and river-level predictions. When the river rises to hazardous flood-stage levels, the County Executive issues an emergency declaration to set in motion safety procedures to protect citizens in the path of floodwaters. During emergency declarations, county law enforcement officers personally warn residents of the imminent danger of fast-moving floodwaters and are prepared to provide help to evacuate them to safety if the need arises. The officers patrol the flooding areas in four-wheel drive vehicles carrying personal flotation devices in case people need assistance. During rescue efforts in the 1994 floods, a rescue boat flipped over in a fast-running current. Luckily, no one was killed in the incident.

Kenosha County, Wisconsin

Quick Facts

Year:
1993

Sector:
Public/Private Partnership

Cost:
$7,000,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Multiple Mitigation Measures Give Darlington an Elevating Experience

Lafayette County, Wisconsin

Darlington, WI - Located in the southwestern corner of Wisconsin, this rural city (population of 2,398) was founded beside the Pecatonica River and officially given the name of Darlington in 1869. During the past 172 years, this beautiful community has been at odds with the Pecatonica River, a medium-sized body of water that nearly encircles the city with coils of brownish water during floods. Normally, the river gently flows southward, then bends east until it bends abruptly north, east, south and east again, forming a tight horseshoe. It is at this horseshoe bend where trouble bubbles over and swamps Darlington when the river rises.

Flooding was deteriorating structures and drastically reducing property values all over town. The losses continued to grow with every clean-up and repair. The buildup of mold and mildew in downtown structures was destroying Darlington's business infrastructure. The frequency of flooding in Darlington was approximately once every 20 to 21 years, but since 1950, floods began occurring more often.

During the onslaught of floods, the city's mayor, Bev Anderson, with help and advice from State and Federal officials, and other community leaders began developing a come-back strategy by developing a flood mitigation plan. They used a multi-objective approach to understanding their watershed problems: consider all flooding solutions, identify community concerns, obtain expert advice, and built strong partnerships. Mitigation became the one word that could offer hope for everyone involved.

In the end, Darlington's Flood Hazard Mitigation Plan became the first in the State of Wisconsin to be approved by the Federal Emergency Management Agency (FEMA). The plan called for business property owners to cover the costs of rehabilitation and historic preservation of their buildings; private homeowners encouraged to purchase flood insurance if they did not already have policies; and historic structures brought into conformance with current building codes and the requirements of the Americans with Disabilities Act (ADA). Meeting the ADA requirements called for constructing a shared, concrete, handicap-access ramp constructed in the rear of the downtown buildings. The ramp not only would serve several buildings, it also would act as a flood barrier.

Among the mitigation plan's projects involved mitigating the city's utilities, constructing flood shields, elevating buildings, and relocating buildings. Darlington's wastewater treatment facility was relocated away from the flood zone. All major utilities such as gas and electric in the flood zone were raised as much as eight feet off the ground. Anything that had previously been covered by floods would now be high and dry.

Quick Facts

Year:
1992

Sector:
Public/Private Partnership

Cost:
$2,300,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

NFIP Compliance Coverage Helps Homeowners Stay Dry

State-wide, Missouri

Jefferson City, MO — An often overlooked aspect in National Flood Insurance Program (NFIP) policies has helped many homeowners in the State of Missouri finance required improvements that will save them from significant damage in future flooding events. Many of the Missouri homeowners flooded in 2008 are filing claims under the Increased Cost of Compliance (ICC) coverage to finance improvements that may save them from future damage.

In Missouri, NFIP statistics show 69 closed ICC claims and a total payout of $1,158,339 from the time the program began in 1996 until the end of July 2008. The list shows claims from throughout the State, including Carroll and Holt Counties in the northwest, Stone County in the southwest, Cape Girardeau County in the southeast, Marion and Lincoln counties in the northeast, and Maries County in the middle, among others.

An ICC claim filed with an NFIP policyowner's insurance agent could mean up to $30,000 for a homeowner to pay for bringing a non-compliant substantially flood-damaged home up to floodplain ordinance standards after a flooding event.

One of the counties hardest hit by the floods in 2008 was Lincoln County. According to Kelly Hardcastle, Emergency Manager and Executive Director of Lincoln County Services, the 2008 floods destroyed four homes and caused major damage to 161 others. He said 19 homes, including primary and secondary residences, suffered heavy damage after floods from 2001 and were rebuilt with funds from ICC.

"None of those had damage this year [2008]," he said. The high percentage of flood insurance policies and the obvious benefit of ICC coverage resulted in 45 ICC applications filed in 2008 with insurance agents. Hardcastle said these insurance agents are expecting an equal number still to come in.

Dale S. Schmutzler, floodplain management officer for the Missouri State Emergency Management Agency, keeps officials up- to-date on programs to help disaster-impacted households. Many homes in Lincoln County are insured under NFIP; propertyowners and agents are knowledgeable about the insurance. He said a number of residential elevations are underway since the spring flooding. The ICC is being used to rebuild permanent residences.

Quick Facts

Sector:
Public

Cost:
$1,158,339.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
National Flood Insurance Program (NFIP)

Code Enforcement Plays Major Role in Floodplain Management

Rock Island County, Illinois

Rock Island County, IL - In a county that has a history of flooding and nearly 150,000 residents, enforcing building codes, zoning codes, floodplain ordinances, property maintenance codes, and trying to convince residents to adhere to sound building practices can be a tough job. However, it's a feat that the local Zoning and Building Director and inspectors have managed successfully by being consistent and persistent.

"Rock Island County has 13,000 parcels and 600 miles of road, and approximately 1,400 parcels are located in the floodplain," said Ray Nees, Director of Zoning and Building. "In order for floodplain management to work, the local official has to take a 'hard nose' stance."

With the Mississippi River to the north and west and the Rock River flowing through the center, the county is vulnerable to floods. In June 2008, flooding caused by severe storms resulted in a major disaster declaration for the State of Illinois, which directly impacted 25 counties. Damage in Rock Island County was minimal, partly due to Nees' floodplain management strategies.

Nees assumed the role of Zoning Investigator in 1995. To his dismay, flooding was the contributing factor for more than 85 repetitive loss properties in the county. His goal was to minimize the effects of flooding and save taxpayer dollars. The key: take mitigation measures seriously. By the middle of 2005, the number of repetitive loss properties had been cut in half despite floods reaching all time record depths. Nees estimates that without mitigation, the number of repetitive loss properties would be well over 200 today.

"Mitigation projects are probably the most effective steps somebody at the local level can take to save taxpayer dollars," said Nees. "We've done buyouts, and we've recommended elevations. At one point we had nine houses at once being elevated on Campbell's Island."

There is no preferential treatment when it comes to code enforcement. Everyone is expected to adhere to them. "We have done buyouts for insured flood victims, and we enforce the same regulations on those people who don't have insurance," said Nees.

While empathetic to flood victims' plight, Nees manages to remain steadfast in enforcing regulations. "If I allow a poor family to move back into a home that has not been cleaned and elevated, then not only am I endangering their health, I am allowing their entire family to be placed right back in harm's way. I won't be responsible for that," said Nees.

"The toughest part of a floodplain manager's job is when you've got to tell someone, whose property has been declared substantially damaged, that you [the property owner] must elevate your home or tear it down," said Nees. "Yet, you have to be tough about it and get flood victims to put themselves in a better situation."

Quick Facts

Year:
1993

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigation Project Reunites a Town Divided

Columbia County, Wisconsin

Cambria, WI - Cambria, population 792, is one of many pleasant spots in the middle of Wisconsin corn country, about 33 miles north of Madison. It is quiet, clean, and well managed by experienced and energetic individuals. And, although no sign announces it, it is recognized by many in and around Cambria as the lima bean capital of the world. However, flooding is a common occurrence in Cambria's history, as it is in many Wisconsin towns.

Settled in 1844 by Dutch immigrants, residents built a dam forming what is now Tarrant Lake. They also built a sawmill and gristmill, both powered from the dam's spillway. Cambria experienced its first destructive flood in 1858. Both mills were destroyed. Years later, a roadway was built over the old dam, which the Dutch settlers had constructed of earth, rock, and brick. Culverts at lake level under the roadway provided outlets for the lake water. The roadway subsequently was paved and designated Wisconsin Route 146.

The roadway and dam are about 70 yards from the end of Cambria's main business district. The road is a major throughway for everyone including farmers, school busses, and trucks serving Cambria's three food processors. Any closure of Route 146 requires a five-mile detour around the town.

The 10-acre, man-made Tarrant Lake is fed by two small tributaries and underground springs. Land on either side of Tarrant Lake slopes upward into farmland, contributing runoff to the lake's water levels.

In 1993, the Cambria Dam suffered a major washout. Damage to the old earthen constructed roadway was extensive. Repairs included the installation of two new five-foot culverts under the road and flood gates to control the release of water from the lake to prevent water from overtopping the dam and roadway.

Eleven years later, floodwaters assaulted the Cambria dam again. In late May 2004, heavy rain began soaking the Cambria area and continued for weeks. The heavy rains caused dams elsewhere in the state to burst, forcing people out of their homes. Department of Public Works (DPW) Director Tom Tietz and members of the Cambria Volunteer Fire Department kept close watch on their dam.

Quick Facts

Year:
2004

Sector:
Public

Cost:
$1,500,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
State sources

Pulling the Plug on Monroe's Water Problems

Green County, Wisconsin

Monroe, WI - Monroe is a city with just over 10,800 people. Situated about 12 miles from the Illinois state line, it is in the middle of the southern half of Green County, Wisconsin. Its local claim to fame is cheese, produced by many of the surrounding farms whose earlier pioneering families immigrated from Germany and Switzerland in the early 1900s. Most people nationwide would recognize Monroe's biggest employer as the headquarters for a Nationally famous Wisconsin cheese gift package shipper.

An aerial view of the city shows it to be surrounded by farmland. Thousands of acres of corn reach up into the blue sky in every direction. Numerous large red barns with silos and neat white farm houses are sprinkled amidst miles of corn that stand in long perfect rows and march off into the horizon. Accompanying this are herds of black and white and brown cows, which give Wisconsin its well deserved title of "America's Dairyland." In recent years, however, the blue skies have been changing, darkening rapidly and then dumping great quantities of rain all over the state. Fortunately, Monroe has been planning and building projects to manage the runoff from these seasonal storms.

Normally this is a quiet area, free from the continual siege of serious flooding that has plagued other Wisconsin counties. But as Monroe developed, with new businesses and homes adding to the percentage of paved area, heavy rains became more of a nuisance. Monroe's primary problem was rainwater runoff accumulating in streets and parking lots and causing sewer backups in basements. Although the flooding and backups would come and go quickly, they were causing appreciable damage to roads and property.

Fortunately, the city had this problem in its sights. In December 1987, Monroe joined the National Flood Insurance Program (NFIP), enabling homeowners to purchase flood insurance. When the August 1996 floods triggered a disaster declaration, detention ponds became a major focus in the city's mitigation plans.

In 2003, the city hired a project developer who was a specialist in storm water control. After completion of the runoff study, Monroe's solution for handling it was mapped out. Plans called for the construction of a stormwater management system known as retention and detention basins. Alan Gerber, Engineering Supervisor at the Monroe Department of Public Works, began devising specific plans to handle the runoffs, a major focus of the city's Hazard Mitigation Plan.

Quick Facts

Year:
1996

Sector:
Public

Cost:
$179,529.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

South Padre Island: Living with Mother Nature's Wrath

Cameron County, Texas

South Padre Island, TX - Jay Mitchim has weathered his job in South Padre Island's building department for more than 20 years—longer than many of the buildings in this town known as the "Tropical Tip of Texas." These buildings have survived some of Mother Nature's toughest tests.

Now the town's chief building official, Mitchim speaks of the island's buildings with personal affection, as if he were describing his children. So he watched with interest July 23, 2008 when Hurricane Dolly stormed ashore as a Category 2 storm with winds estimated at between 100 and 140 miles per hour and rain totaling 12 to15 inches.

"I have often wondered how the new buildings, built on my watch, would hold up to a storm," he said. "There's a lot of damage, but there's not a lot of structural damage to the newer buildings. They did pretty well."

A case in point is City Hall, completed just before Hurricane Dolly. It fared very well with just minor water damage from rain that came through and under a door.

City Hall is a shiny new building, colorful and very pleasant, with generous impact-resistant windows that fill the rooms with sun and light. But on closer inspection, it is also a vault. It has a concrete, monolithic-pour roof deck, and its floors and ceilings are poured concrete with concrete blocks filled between the massive columns.

"This building is equipped with an on-site generator and was built to weather a moderate storm, the kind we just had with Dolly," Mitchim said. "The entire two-story City Hall is built 10 feet above sea level. That's two feet higher than the code requirement. Why? To build in an extra measure of safety for this critical public building near the sea."

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Local Sources

FEMA

A Small Village With Big Concerns

Sangamon County, Illinois

Riverton, IL – The Sangamon River forms the west boundary of the Village of Riverton, a quaint community that 2,997 residents refer to as home. But the Village of Riverton has had a long flood history. To lessen the impact of floods on its residents, the village joined forces with other communities in Sangamon County to devise a plan. Acquisition was definitely the mitigation measure of choice, and council members have encouraged the creation of green space in floodplain area.

“This was the second time these homes were hit. The first time was in 1994,” said Linda Viola, Office Manager and Grant Administrator for the Village of Riverton. “We knew that something needed to be done.”

Riverton is 550 feet above sea level. The village has a total area of 2.1-square miles: 2-square miles of land and 0.04-square miles of water (1.93 percent). Heavy rainfall causes the creek, which runs through the middle of the Riverton, to frequently overtop its banks.

The Acquisition Project was initiated in July 2002 and completed in August 2006. Riverton received a grant totaling $272, 867.66 from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP). HMGP pays 75 percent of approved projects that will prevent or reduce damage from storms and other natural hazards. These grants are made available for both public and private projects.

“We filled out all the grant information and we notified the homeowners. They also knew that they had a choice,” said Viola. “They could choose to participate or not. Participation is voluntary. We completed the project without any major problems.”

Continued Viola, “When you buy someone’s home, they always think that it’s worth more. There were some who disagreed with the appraisal. The properties were appraised a second time. The homeowner has a right to request a second appraisal.”

Buyouts of floodprone homes located near the Sangamon River began in July 2004. The average value was $75,000 and total project cost was $376,048.66. The village acquired six homes that were demolished, resulting in open space within the floodplain.

A June 2008 flood event tested the success of the acquisition project as waters from the Sangamon River crept upon the 140,506-acre tract of land, now void of homes. Water rose six feet above flood stage. It was estimated that the water would have reached at least two to three feet inside the six homes had they not been acquired.

A local alderman reportedly contacted the State Hazard Mitigation Officer Ron Davis who acknowledged, “It was great this year when the waters came up, [and we were] able to sit back and relax and not have to mobilize our forces to fight the flood.”

“Those [acquired] homes were in the floodplain. Flooding would continue to occur,” said Viola. “I don’t know how the people could have lived with the flood and continue to re-build in the same area, knowing that it would happen again. We found a way to help them.”

Quick Facts

Year:
2002

Sector:
Public

Cost:
$376,048.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Couple Executes Elevation Project in Combating Flood

Henderson County, Illinois

Henderson County, IL—In June 2008, residents in 21 counties suffered flood-related losses. While some homeowners began tearing down their homes, vowing never to rebuild in a local retirement community, Bill and Karen Opel will continue to enjoy the quiet life, free from the hustle and bustle of the big city, due to mitigation measures employed during the construction process of their home for retirement.

“My wife and I did everything in this house except lay the carpet,” said Bill Opel, a retired carpenter. “We have made it through several floods, following the mitigation measures, without any major flood-related damages.”

Before deciding to make the river town of Shokokon a permanent residence, Bill and Karen Opel had leased several properties in the area as vacation spots, starting in 1975.The town, a retirement community located on the Mississippi River, had a history of flood events. The couple had witnessed the devastation caused by flooding. Following one flooding event, they returned to find their trailer and its contents destroyed. So when the Opels decided to build their 1,064-square-foot, wood-frame home, they knew that it would have to be elevated.

“We were just coming down here on weekends to get away from the city and all the traffic. We lived in Peoria, Illinois,” said Bill Opel. “A guy brought me here [Shokokon] to go duck hunting. That one time—that’s all it took. Karen and I knew the town’s flood history, but we got to liking it so much down here until we decided to move here permanently. We also knew that we had to be prepared.”

The Opels began construction on their new home in April 1995 and moved into it in November of that same year. The home sits on 15, 12-foot steel pilings that are embedded 4 feet into the ground. Each piling has 5-foot lengths of rebar, held together with a wire basket tie, in the center.

Quick Facts

Year:
1993

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

Illinois County Applauds Buyouts

Sangamon County, IL – In May 2002, major flooding occurred in the county when the South Fork of the Sangamon River reached the highest level in a 50-year period and the Sangamon River exceeding the 100-year flood elevation. It was then that the county decided to stand firm in the use of acquisitions (buyouts) as a means of protecting its citizens from the effects of flooding.

Linda Wheeland, Senior Planner with the Springfield Sangamon County Regional Planning Commission, recalls the county's participation in the State of Illinois' Buyout Program.

"At that time [alluding to the Great Flood of 1993], we had an area in the county that had been a fishing camp, probably for about 100 years. Over those years people had built cabins or placed mobile homes on the property," recalled Wheeland. "The property, known as Driftwood Acres, is located at the confluence of the South Fork of the Sangamon River and Sugar Creek. In July 1993 and again in the spring of 1994, it was completely inundated [with water]. People couldn't get in or out."

Driftwood Acres was a 55-acre parcel located entirely in the floodplain and had been used as a river camp since the late 1800s with over 40 structures. The structures and their contents were often damaged by floodwaters, access to the area was cut off, and contamination of the water occurred. The Federal Emergency Management Agency (FEMA) and the Illinois Emergency Management Agency (IEMA) offered a solution to use Hazard Mitigation Grant Program (HMGP) funds to execute a buyout of the floodprone property.

"The property was owned by one individual. We didn't meet with any resistance from him as far as participation in the buyout program. He knew that it was voluntary," said Wheeland. "He lived in Texas. He had inherited the property and just allowed people who were living on it to remain there."

Preliminary approval for the project was granted in March 1996. Closeout of the project was February 1999. The total project cost was $92,485.76. All of the structures were removed, the concrete road was excavated, and the area has returned to a natural state. The county plans to develop a wetlands-banking project on the property to offset the impact of a planned highway-construction project.

Sangamon County, Illinois

Quick Facts

Year:
1993

Sector:
Public

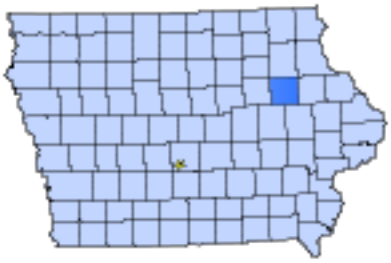
Cost:
$373,362.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Liberating Independence



Buchanan County, Iowa

Buchanan County, IA—The scenic Wapsipinicon (“Wapsi”) River meanders into the City of Independence along low-laying banks that are shouldered by an historic rock mill, grassy parks with walking paths, and a few scattered homes. Independence was once on the receiving end of devastating floods; many had accepted flooding as a bittersweet part of living by the river. While townspeople were frequently scurrying to make decisions about moving to safer ground or staying to fight the floodwaters, city officials were seeking ways to secure the community and its resources. Answers came in the form of Federal grants designed to assist communities in acquiring properties that have been damaged severely or repetitively by floods.

In 1993, the city acquired funding from the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) to start their flood-prone property acquisition initiative. Streets along the Wapsi River that were once lined with flood-prone homes and businesses were being transformed into green spaces. Folks that had tolerated years of repetitive flooding were being moved out of the floodplain to higher ground. As the acquisitions progressed, Independence took additional steps to protect its citizens from future flooding.

On June 7, 1999, the city established a new building code that exceeded the Base Flood Elevation (BFE) requirement. After enduring three disastrous floods in the 1990s, city officials realized the optimal way to protect homes along the river was to raise elevation requirements on new construction to three feet above BFE. Since then, the Wapsi River has flooded several times, proving the additional elevation mitigated further flood damage. Other mitigation measures have contributed significantly to reducing financial drain on the city.

With funding from the HMGP, Independence has acquired 84 homes, relocated two homes, and created three public parks. These projects were funded through five separate disasters over a period of 18 years for a total of $3.4 million. Every dollar funded toward a FEMA project equals $4 in future savings. In addition to saving money, numerous changes have been made that may enhance life for many people living along the river.

The city takes pride in the three parks developed on open green spaces provided by these acquisitions. Independence RV Park at the entrance to town has 42 campsites that are often full during the summer. The grounds of Veterans Memorial Park are located beside the historic rock mill in downtown Independence. This park features an army tank and a Howitzer cannon on display, and a large gazebo overlooking the river. Located on the other side of town is River Walk Park, which offers covered picnic areas, an amphitheater, walking trails, and playgrounds.

Each year on the Fourth of July, the community gathers in the park to enjoy the festivities and to celebrate its “Independence.” As the fireworks light the evening sky and reflect off the river, the community of Independence shares a new sense of liberty on safer, higher ground.

Quick Facts

Year:
1990

Sector:
Public/Private Partnership

Cost:
$3.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Rio Grande Valley Buyout Moves Floodplain Residents Out of Harm's Way

Cameron County, Texas

Cameron County, TX—In the summer of 2008 when Hurricane Dolly swamped the old neighborhood, now largely vacant ground, she unleashed nearly a foot of rain over Antonia Iberra's old home, but nobody was home. In 2006, Antonia and most of her neighbors had moved out as part of a government floodplain acquisition program.

Most of what remains of Del Mar Heights today is only memories, and they are not good ones for Antonia."It flooded there so much—oh, yes, it flooded every time it rained," she said. "I suffered there for 17 years."

When the government bought her house, Iberra recouped enough money to buy a better house, free and clear, in a safe neighborhood.

"We had built our own house there, from whatever we could find," Iberra said from the shaded porch of her family's pink-framed house. The pleasant neighborhood she lives in now is a far cry from the house in Del Mar Heights. Her husband, Moises, looks after a few black chickens in the backyard, and she cultivates flowers.

"It was all we had—that old house. Every time it rained, we could not get out. I had to put plastic bags on the shoes of the children and walk with them for a long, long way through the mud and the dirty water"—she measured up to her thigh to show the depth—"to try to get the bus to school. I had to carry the little ones. My husband is disabled. An ambulance could not get there when people were sick."

Before the buyout, the residents of Del Mar Heights lived with chronic, contaminated flooding that trapped them in their isolated south Texas neighborhood in rural Cameron County, Texas. The unincorporated 300-acre tract is at the southernmost tip of Texas: 20 miles to the south is the Mexican border; 20 miles east is the edge of the Gulf of Mexico.

Quick Facts

Year:
2002

Sector:
Public

Cost:
$1,300,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:

FEMA

When Enough is Really Enough

Douglas County, IL– Located along the Embarras River, Villa Grove, a small town of only 2,553 residents, is prone to flash floods as well as river flooding. The Jordan Slough and the Embarrass River are of significant relevance. In 1994, there was a flood of record, which warranted coverage by CNN. It was during this event that Jackie Athey, City Clerk for Villa Grove, found herself in a quandary as to how to handle the flood.

“I moved to Villa Grove during the fall of 1991. I knew that the town had some flood history,” said Athey. “My grandparents had owned a house there since the early sixties.”

As a child, Athey recalls that her grandmother placed her appliances and cabinetry on the platforms housed in the garage.

“My grandmother had 14 kids. She had an extra refrigerator, freezer, and cabinets stocked. She had to get a step stool to reach them,” said Athey. “As a kid, I never thought about why these things were raised.”

Following the death of her grandparents, Athey talked her husband into purchasing the old homestead for $20,000. They then increased its value by doing major renovations.

“We were first time homeowners. We had flood insurance because the mortgage required it, but we had a big deductible and no content coverage,” said Athey. “The agent talked us into a $5,000 deductible so it would lower our premium and we could make our house payment.”

Douglas County, Illinois

Quick Facts

Year:
1994

Sector:
Public/Private Partnership

Cost:
$296,441.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Doing Something About the Floods

De Witt County, Illinois

DeWitt County, IL – Located in the heart of central Illinois, the town of Clinton is one of the most productive agricultural areas in the nation. While trying to maintain productivity, the town has to contend with floods. The city has a total area of 2.7 square miles, all of it land, with about 2,500 acres draining to the northeast of Clinton. So why is flooding an issue? It is attributed to the Goose and Coon Creeks overflowing into the floodplain.

Goose Creek drains into a reservoir located at an old railroad yard. Years ago, that was a way to collect water for the steam engines. Through the years, the railroad yard filled in part of the reservoir, minimizing its capacity. Through modern improvements, farmers now drain their soils faster and more efficiently, thus, increasing the volume and velocity of water coming into the reservoir and then causing the reservoir to overflow.

Tim Followell, Administrative Assistant to the City Council, knows the town's flood history as far back as 1968 and recalls one particular episode.

"I always use the house that used to sit at the corner of Jefferson Street and Taylor Street as my example. The gentlemen that owned the house had to be picked up by boat," said Followell. "He was sitting on the peak of his roof, holding his TV. The single story house was all but four feet under water."

In 1993 and 1997, Clinton experienced flooding events. In the 1997 event, 54 parcels were affected. This same parcel area has flooded three times before in the past 29 years. It was the 1997 event that persuaded Clinton to consider buyouts as a means of mitigation.

Pointing out the buyouts on the city map, Followell said, "We saw it as a plus to permanently help those people by assisting them in finding better accommodations instead of putting them at risk whenever it [the floodwaters] decided to come back."

Homes in the affected area were valued, on the average, at $55,000. The acquisition project acquired 40 homes, three commercial buildings, and 14 vacant lots. These acquisitions added to community green space.

"The owners knew they would not be allowed to re-build [in the same area] if flooding ever occurred again," said Followell.

There was one business owner who chose not to participate in the buyout. He was confronted with floodwaters again in June 2008. He reportedly received two to three feet of water in his building.

Quick Facts

Year:
1996

Sector:
Public

Cost:
$1,043,100.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Historic Town's Flood Concerns Alleviated With Buyouts

Champaign County, Illinois

Champaign County, IL – Established in 1827, Sidney is a township in the Champaign-Urbana metropolitan area. As far back as residents can recall, the village has been confronted with flooding issues. Boating, a sport that is relished today, was a matter of necessity as far back as 1913 for Sidney residents attempting trips into town as water would simply inundate the city's main street.

"In 1939, water came up to one inch of entering into the town's hall," recalls Eleanor Fear, a former librarian for the town. "Since then, it has repeatedly come very close to that, about three inches."

With more than 50 percent of its landmass located within a floodplain, Sidney's residents continue to ready themselves for flood events.

"The Salt Fork of the Vermillion River empties into the small creek that runs through the village. We still get lots of rain and lots of flooding," said Janet Akers, village clerk.

Akers has been the village clerk for approximately 16 years. In that role, she also serves as grant administrator. Sidney's initial attempt at flood mitigation came in the form of an acquisition project in August 1999 following a July 1993 flood event. The project called for buyouts of 10 homes, which reportedly received the brunt of the flood.

"The water flows all over town but the north end seems worst. These were the houses that sustained the worst damage," acknowledged Akers. "They would always get the brunt of the flooding. The way the water travels, it's close to their property."

Quick Facts

Year:
1993

Sector:
Private

Cost:
$381,363.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
State sources

San Benito's "Safe Box" Shuttered Against the Storm

Cameron County, Texas

San Benito, TX - "We felt very, very safe. It seemed like we were in a safety deposit box." That's how San Benito Mayor Joe Hernandez describes riding out Hurricane Dolly in his City Hall, Emergency Operations Center – protected by storm shutters.

"We were very grateful for those shutters," Mayor Hernandez added.

On calm days, the almond-colored steel shutters roll up neatly into unobtrusive metal casings above doors and windows. They can be unrolled down to clamp securely over the windows during a storm – such as Hurricane Dolly, which brought winds of more than 55 to 70 miles per hour to San Benito.

"I will never forget that wind and the rain—horizontal rain, for hours and hours. It seemed like it was never going to end," said Martha McClain, San Benito's Community Affairs Officer. McClain was one of a dozen people working in the Emergency Operations Center around the clock for two days during the storm. All around them, Dolly was uprooting trees, tearing roofs apart, and turning debris into airborne missiles.

"I was very grateful that those storm shutters were there during the storm," said McClain. "So much debris was blowing around, big trees coming down. We knew the shutters would prevent missiles coming through the windows and doors. I would not have wanted to be there without them. I remember when our former emergency manager got the grant to install those shutters," McClain said. "He was so proud. And now it paid off."

A few blocks away in this pleasant Rio Grande Valley town of 33,000 people, similar shutters protected the San Benito Public Library. "I wasn't worried about the library at all, because of the shutters," said librarian Cindy Hart.

Quick Facts

Sector:
Public

Cost:
$20,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Three Island Homes Pass Hurricane Dolly's Test

Cameron County, Texas

South Padre Island, TX – Richard Ehrlich, a South Padre Island building inspector and builder, knew all too well what Hurricane Dolly could do to the three housing units he had built on this trendy barrier island. He says Dolly was “like blasting your house with a car wash sprayer, for hours and hours.”

Hurricane Dolly came ashore on Padre Island July 23rd in 2008 as a Category 2 hurricane. Winds of 100 to 140 miles per hour lifted roofs, blasted through windows and garage doors, hurled debris, and drove horizontal rain. Most of South Padre Island’s buildings sustained wind and/or water damage, some quite severe.

It was a tough test for the three housing units Ehrlich had built on this island at the bottom of the Texas Gulf Coast. Walking through his houses after the storm, Ehrlich was relieved to find mostly cosmetic damage.

“I was real happy with those houses during Dolly,” Ehrlich said. “We felt quite safe in there. When I build, I’m always thinking, Where are we? On a barrier island, with wind, water, hurricanes....”

Ehrlich built his first island house 12 years ago. “I was a builder in Colorado and had just moved to Padre Island. I was real worried about hurricanes, so I built it as strong as I knew how at the time.” The house was first tested in what he describes as a straight-line wind shear in May of 2000.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Brownsville's “Blue Ribbon” Resacas Reduce Hurricane Dolly Flood Losses

Cameron County, Texas

Brownsville, TX—When Hurricane Dolly came in the summer of 2008, Brownsville was ready with an ingenious disaster defense that kept hundreds of homes from flooding. The Rio Grande Valley leaders capitalized on natural assets, creativity, and teamwork to handle Hurricane Dolly’s 10 to14 inches rainfall across the city.

As Brownsville’s Joe Barrera, who manages the Brownsville Irrigation District, explains, this Texas town is networked with what they call resacas, water-filled, winding “blue ribbons” that aid in flood control and water storage, and add an aesthetic character to the city. Recently, city officials thought to use the resacas for flood control in a management network that stretches across multiple agencies.

“Resacas are the piecemeal remains of old channels of the Rio Grande River that used to meander all through what is now Brownsville. The river now flows along the city’s southern fringe,” said Barrera. “A hundred years ago, farmers in the [Rio Grande] Valley hit on the idea of damming up the dry resaca channels so they could become linear lakes. We use the water to irrigate crops – sunflowers, soybeans, wheat, corn, rice, onions, cabbage.”

Over time, flooding became a chronic problem in this city of 150,000 that dubs itself “On the border by the sea.” Hurricane Beulah, for example, dropped up to 30 inches of rain in 1967, and is the kind of storm that Brownsville leaders know may occur again in any year. In more recent years, Brownsville has experienced serious flooding in 1984, 1993, 1996, 1997, 1998, and 2004.

When Dolly stormed ashore July 23rd in 2008 as a Category 2 hurricane, rain across Brownsville varied from 6 to 14 inches. Some Brownsville residents call Dolly a 100-year storm; others say it was less. Nonetheless, in the old days, they would have been awash.

But not this time. "We did a lot of things differently this time, and it paid off well,” said Brownsville Assistant City Engineer Doro Garcia, Jr. “I don't think in the history of Brownsville we have been able to manage that much water without flooding."

Joe Barrera said, “I didn’t have a single complaint call.” The city reported some flooded streets but virtually no complaints of water in buildings.

Brownsville leaders reduced Dolly’s flooding impact dramatically with a multi-pronged program of prevention, pipes, pumps, planning, and partnerships. The city’s flood-mitigation program requires careful planning, vigilant management, and close cooperation among a patchwork of entities with differing authorities.

“I have to say,” said Barrera, “we’ve worked on it. This is a joint effort among a lot of people who work together well. It could never work without our partners.”

Together, they developed updated plans and procedures, starting with a major flood protection study in 2004. They created flood detention basins in strategic areas, using a combination of local money and other funds such as U.S. Housing and Urban Development (HUD) Community Development Block Grants (CDBG). Three detention ponds reduced flooding directly for more than 35,000 people, according to Ben Medina, Brownsville Planning and Community Development Director.

Quick Facts

Sector:
Public

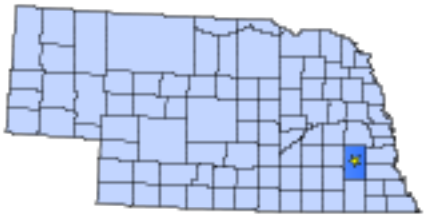
Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

FEMA

Mitigation of Essential Structures Helps to Keep Waste Water Treatment Plant Ope



Lancaster County, Nebraska

Lincoln, NE - In January 2000, the Nebraska Emergency Management Agency (NEMA) approved Hazard Mitigation Grant Program (HMGP) funds for the City of Lincoln's Waste Water Treatment Plant (WWTP), Theresa Street location. The WWTP had requested funds to provide flood protection around an electrical substation and transformers that would be in danger of failing during a potential flood event.

The electrical substation was originally enclosed by a chain-link fence that was open to potential floodwaters from Salt Creek. The HMGP grant helped to pay for the construction of a six foot brick and reinforced concrete wall to enclose the electrical substation. The entrance was engineered for stop logs (removable flood shields) to be inserted during the time of a flood warning, completing the barrier and protecting the substation from floodwaters. The gates are tested on an annual basis to ensure proper fit.

On the west side of the WWTP an electrical transformer was mitigated by raising it three feet over the 100-year flood elevation. The transformer was set up on top of a brick and cement foundation structure effectively raising and protecting it.

The plant's sludge-processing tanks' below-grade stairwells were susceptible to flooding. The stairwell was mitigated by being partially elevated with concrete and enclosed with approximately 12 inches of stainless steel. The stairwell entrance has also been designed using a similar technique used on the electrical substation, incorporating stop logs to prevent floodwaters from filling the stairwells.

The project had a total cost of approximately $298,000.00 of which $178,000.00 was awarded through the HMGP grant. The benefits of the project greatly outweigh the initial cost. These protective measures help to protect vital components of the WWTP from the Salt Creek that runs along the side of the plant.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$298,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

FEMA Mitigation Leaves Bridge Standing Strong Through Repeated Flooding

Reynolds County, Missouri

Reynolds County, MO - Simple design improvements to a one-lane bridge in rural Reynolds County, Missouri have left the span standing while others around it have been damaged or destroyed by repeated flooding. The County Road 324 bridge over Sinkin Creek near Centerville was heavily damaged in a flash flood in Spring 2002. Ongoing storms and tornadoes in late April that year resulted in a presidential disaster declaration that included most of southern Missouri.

In the multi-million recovery effort that followed, the Federal Emergency Management Agency (FEMA) approved funds to rebuild specific public infrastructure to higher standards. The effort is known as mitigation – an effort to break the cycle of damage and repair and to reduce repeated losses and the financial burden of rebuilding again and again.

“We’ve had five or six major floods since,” said Don Warren, Reynolds County District Commissioner. “It’s held through all of them.”

One bridge, just a few hundred yards to the north on County Road 308, was washed out in June 2008, in the severe storms and flooding that resulted in another federal disaster declaration.

The County Road 324 bridge was one of several projects to receive mitigation funding following the 2002 disaster. Working with FEMA’s team of mitigation experts, the bridge replacement project included replacing about 200 feet of road, the bridge footings, and creating a concrete spillway in the streambed.

It also included several other unique features that have enabled it to withstand repeated flooding. Six 2 feet x 8 feet box culverts support the road over the bridge. Each has a specially-designed concrete riser that slopes up and out of the stream at about a 30-degree angle. During flooding, the risers let tree stumps, branches and other materials wash up and over the bridge without damaging the structure. While sand and gravel can migrate and clog the wide culverts during flooding, they are now much more easily cleaned, according to Commissioner Warren.

FEMA mitigation funding is provided as a component of its Public Assistance (PA) program, which reimburses local governments and certain nonprofits for disaster related costs for debris removal, emergency protective measures and repair or restoration of public infrastructure.

Generally, the PA program restores disaster-damaged infrastructure to pre-disaster conditions. However, where it is cost-effective and technically feasible, additional funding can be approved to restore the structure to a higher standard and make it more disaster resistant.

Commissioner Warren said the work was completed by his own road crew in the fall of 2002, and cost about $64,000. FEMA provided 75 percent of the total; the remaining 25 percent – about $16,000 -- was split as 10 percent and 15 percent by the state and county, respectively.

Quick Facts

Year:
2002

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Flood Control Projects Revamp Communities

Jackson County, Missouri

Kansas City, MO – In 1864, Brush Creek flowed through the middle of the Battle of Westport, (the biggest battle of the American Civil War west of the Mississippi River). The site is present-day Kansas City. Today the creek is the focus of a different battle, to keep floodwaters at bay, to protect area citizens and to enrich contiguous communities.

Brush Creek, located 5 miles south of downtown Kansas City, meanders 6.5 miles across Kansas City from the Kansas state line on the west to the Blue River on the east. It lies at the center of residential neighborhoods, commercial areas, educational, cultural and research institutions.

“When the Brush Creek channel was first built in the 1930s, everything on the southern edge of Kansas City was rural and farmland. The water control system was built to handle water under those circumstances. Everything in the area changed as growth and development occurred. Water flow increased dramatically,” said Kent Myers, program manager at U.S. Army Corps of Engineers, Kansas City District.

In 1977, storms and heavy rains caused flash flooding as Brush Creek quickly spilled its bounds into surrounding roadways, residential and commercial districts. The storm caused an estimated $66 million in property damages and 12 people were killed at nearby Country Club Plaza. Shops and restaurants in this upscale outdoor shopping mall were filled with more than five feet of floodwaters.

As a first-line strategy following the catastrophe, Kansas City petitioned the U.S. Army Corps of Engineers to help reduce flood hazard problems. As the Corps implemented environmental assessments and planned construction designs to control flooding, the city’s Parks and Recreation Department developed companion plans to enhance nearby communities and beautify the adjacent linear park which runs parallel to the creek.

Kansas City’s Public Works Department, Water Services Department, city planners, consultants, community leaders and citizens joined the flood control planning team. This collaboration formed Brush Creek Flood Control and Beautification Initiative in the early 1980s.

In 1987, Kansas City passed a $51 million bond issue, the Cleaver Plan, introduced by then Kansas City Councilman Emanuel Cleaver, now Congressman. The plan helped to fund the flood control and beautification projects.

Known as America’s first outdoor shopping mall, the affluent Country Club Plaza and adjoining Plaza Reach, were the first areas revamped following the Cleaver Plan. While the U.S. Corps of Engineers constructed channel improvements, the City undertook the replacement of several bridges along Brush Creek that restricted water flow during heavy rain storms. Flood control works progressed eastward to include nearby Paseo intersection and Lake of Enshriners, which extends up Brush Creek as a result of a city-built dam.

“The Corps identified justification for the project to initiate at Country Club Plaza and nearby districts based on an economic impact analysis,” added Karin Jacoby, division manager, Water Services Department, Kansas City.

Quick Facts

Year:
1998

Sector:
Public

Cost:
$164,000,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Multi-Agency Flood Mitigation Effort Transforms, Beautifies Missouri Community

Wayne County, Missouri

Wayne County, MO - It's a long way from the terror of a flood to a happy park, but that's what's happening in Piedmont, Missouri where a cooperative effort is moving people out of harm's way and saving lives and taxpayer dollars.

Located in southeastern Missouri, Piedmont, is no stranger to flooding. The McKenzie Creek flows south, directly through the center of this small community before emptying into the Black River. In the last two decades, flood damages to residential and commercial properties, structures and contents, averaged $584,000 annually, according to Federal records.

Devastating floods struck in 1982, 1983, 1993, 1995, and as recently as March 2008. Funding from the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), the U.S. Department of Agriculture (USDA), the U.S. Housing and Urban Development (HUD) Community Development Block Grants (CDBG), and other sources has paid for clearing many structures out of the flood zone.

The agencies' voluntary home-buyout programs have enabled the City of Piedmont to transform lower-value, flood-prone properties into parks, ballfields, trails, and other community assets. More than 125 property owners have participated in the buyout program during the last two decades when floods struck again in March 2008.

"Earlier floods [since the buyouts] didn't have the power or force of this year's [flood]," said former Mayor Gaylon Watson after the March 2008 flooding, a long-time proponent of buyouts. "We'd be picking up bodies if the buyouts hadn't taken place."

"People would have died this year," agreed DeWayne Robertson, who moved from the flood zone with his elderly parents after the 1995 high-water event. "The water came up so fast."

Interest in the buyout program remains high, particularly when the McKenzie Creek overflows its banks. City Clerk Tammy Thurman said she had more than 70 inquiries on the program within days of this year's high-water event.

The real impetus for the buyout program began following the 1993 flood, one of the most devastating and significant disasters in the history of the Midwestern U.S. Just two years later, a flood of nearly the same magnitude struck again. A public meeting to initiate the voluntary buyout program was held in March 1995.

Over the years, City officials have became adept at bringing together stakeholders and program sponsors to mitigate flood damages while turning buyout properties into award -winning public space. Additionally, Piedmont officials have found funding, grants, and private donations to accomplish the transformation. The cost to the City's taxpayers has been less than 1 percent of the nearly $4 million project.

FEMA's HMGP provides funding to the State as the program grantee. The State in turn provides funding to qualified local governments to purchase properties in the flood zone. Homeowners must voluntarily agree to sell their properties, and once the local jurisdiction takes title, all structures are razed and turned into limited-use public space.

Quick Facts

Year:
1993

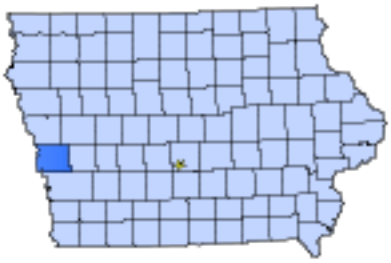
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

One Little Room Provides a Big Sense of Security



Harrison County, Iowa

In 1975, Dan and Dale Hoyt were living in Dale's grandparents' farmhouse in Missouri Valley, Iowa. One day in May, at home with her three-year-old and two-month-old sons, Dale watched a television report as a tornado struck Omaha, Nebraska, some 15 miles from their house. With Dan away at work, Dale chose to be cautious and made her way with her children into the cement basement.

Fortunately for the Hoyts, the tornado remained localized in the Omaha area. The storm was responsible for three deaths and 200 injuries, destroyed 287 homes, and caused approximately $1.1 billion in damage. It is still regarded as one of the costliest natural disasters in American history.

The fear and concern caused by such a devastating force of nature so close to their home and family never left the Hoyts. Years later, when they designed and built their new house, they chose to protect themselves from the eventuality of a similar event happening to them.

"When you live here in Iowa, you need protection from tornadoes," said Dale. "When we were kids, everybody just went out to their cement cellar. Because we live in the floodplain, however, we couldn't put a basement in our new house, so we needed somewhere to go to be safe."

They hired contractor Delbert Bach to lay the foundation, and design and install a safe room at grade level. Mr. Bach has been working with insulated concrete form (ICF) foundations since 1997. Using this construction technique, the basic design of the structure consists of two layers of hardened Styrofoam that enclose another layer of poured concrete, which is available in four degrees of thickness: four, six, eight or ten inches. For the Hoyts' room, they chose to go with the six-inch concrete, which when combined with the Styrofoam outer layers resulted in a wall thickness of almost one foot.

The ICFs are connected by high-impact poly-plastic fasteners. Layers of rebar rods are installed into the concrete both horizontally and vertically every 16 inches. This creates a mesh-like pattern that lends the walls of the safe room much of its strength. The door is one-and-three-quarter-inch-thick steel. It opens inward in the event of debris piling in front of the door opening, and is secured by deadbolts at the top and bottom. A peephole allows the family to see out to make sure that everything is safe.

The safe room measures seven-and-a-half feet by six-and-a-half feet. Along with a filing cabinet that holds the Hoyts' important documents and papers, they also keep the room supplied with bottled water, flashlights, batteries, blankets and other essentials that would be needed following a tornado impact. Even with these items taking space, Dale feels sure that they would still be able to fit as many as eight people in the safe room if the need arose.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Homeowner

Residential Buyout Program Eliminates Repetitive Flood Loss

Jefferson County, Missouri

Arnold, MO - The City of Arnold (pop. 20,082) is a thriving, prosperous community located just 20 miles south of St. Louis where the Meramec River joins the Mississippi. The Meramec, flowing south, forms the eastern border of the city. But in the late spring/summer of 1993, great floods struck hard across the Midwest, inundating northeastern portions of Arnold and damaging more than 225 properties. While the potential for flooding is always a fact of life in Arnold, the 1993 flood was the most significant and devastating flood in the city's history.

Arnold residents William and Kathy Flanigan were better prepared than most. When it became apparent flooding was imminent in mid-July, they picked up their possessions and moved nearly everything they owned to higher elevations – to seven separate locations in all. A 16th birthday party planned for their daughter had to pass without celebration.

"Life happens. Birthdays and funerals go on. Then you have to fit a flood in," said Kathy Flanigan.

But returning home in August after the water subsided, the Flanigans found water had completely filled their basement and reached eight inches above the first floor.

Following the 1993 flood, the Flanigans were one of 528 Arnold households to apply for Federal disaster assistance. Between the disaster housing assistance program, individual and family grants, and low-interest loans from the Small Business Administration (SBA), the recovery costs totaled more than $2 million. The National Flood Insurance Program (NFIP) paid another $2.3 million to the households in the buyout program.

Mayor Mark Powell noted that the combined disaster assistance did not include the human costs, such as lost wages, missed work, and the overall effect on the local economy. He further estimated the city's cost for public services, such as sandbagging, health services, and cleanup, averaged about $10,000 per day over the April through September period that high water threatened the community in the early stages of the flood.

Since the early 1980s, city officials have been actively encouraging property owners in the 100-year flood zone to either relocate or take steps to protect their properties. Of the other methods that protect property owners from and prevent flooding, the buyout program made the most sense to Arnold officials. A proposed levee system studied in a 1976 report by the U.S. Army Corps of Engineers (USACE) would not be cost effective, said city administrators.

For the voluntary buyout program in February 1994, more than $4.3 million in Federal Hazard Mitigation Grant Program (HMGP) funding was approved. The Federal contribution to the program was 67 percent of the cost, while a Community Development Block Grant and State and local funding paid for the rest. Arnold officials aggressively encouraged residents' participation. The Flanigans, and others, received formal written notice that assistance was available to help them relocate out of the flood zone, and word quickly spread.

Quick Facts

Year:
1993

Sector:
Public

Cost:
$4,381,191.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Arkansans Get Ideas on Combating High Winds

Independence County, Arkansas

Independence County, AR – Only six months into the year 2008, the State of Arkansas has had three disaster declarations warranting Federal assistance. In response to the severe storms, tornadoes, and flooding disasters experienced by the State of Arkansas (DR-1744-AR, DR-1751-AR and DR-1758-AR), FEMA Region VI took along an exhibit during its Hardware Tours to demonstrate an aspect of construction critical to the safety and welfare of citizens: using connectors.

In regions of the country prone to high wind events, building codes such as the International Residential Code (IRC) require structures to be capable of transferring the wind's forces through the framework of the building to the foundation. Locally, FEMA Region VI's Hazard Mitigation Community Education and Outreach (CEO) group provided critical information on safe building practices, including demonstrations on building safer structures using connectors. Connectors are steel components designed to connect and strengthen joints within the frame of a home. They are engineered to secure the frame of the house and increase its ability to resist seismic, wind, and other forces. Joints supported with connectors are much stronger than joints secured solely with nails.

"A local company had previously donated some of their connectors to us," said Taran Wilson, Region VI CEO Group Supervisor. "In the wake of the tornado disaster, DR-1744-AR, I contacted the company to secure samples of connectors for our Hazard Mitigation Advisors to display during the Hardware Tours. The company decided to create three models, utilizing various types of connectors, for us to display."

Wilson continued, "The [FEMA] Hazard Mitigation staff, watched and listened attentively, as the company's representative demonstrated the function of each connector. I tried to use advisors who had a construction or engineering background to explain the exhibit during our tours."

The exhibit showed connectors such as hurricane ties, double stud plates, strong-tie nails, floor span connectors, stud plate ties, girder tie-downs, coiled straps, roof truss clips, joist hangers, stud shoes, wall bracing anchor bolts and strap-tie hold downs. These connectors were especially placed in local hardware stores within Arkansas counties affected by recent storms.

Connectors are reportedly user friendly and inexpensive for new construction. They are also recommended for use on existing construction; however, that job is more challenging.

"Whether old or new construction, the use of connectors is advantageous" said Wilson. "The level of difficulty in placing connectors on existing structures depends largely on what you are strapping down. For example, roof to wall connectivity is much easy to accomplish than wall to floor."

Safe building practices can minimize the financial woes caused by disasters. For new construction, citizens and builders are urged to follow guidelines set forth in the International Residential Code (IRC). For areas that experience higher wind speeds (up to 150 mph), the IRC refers builders to the American Forest and Paper Association (AF&PA) Wood Frame Construction Manual (WFCM) for regulatory design guidelines.

Quick Facts

Year:
2008

Sector:
Public

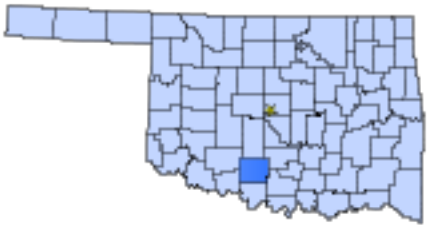
Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

A Bridge Over Powered Water in Duncan, Oklahoma



Stephens County, Oklahoma

Duncan, OK – During 2007, five intense storms, in as many months, tested the resolve of City administrators and residents in Duncan, Oklahoma. Over 100 businesses and homes suffered damage, and numerous pedestrian bridges loosened from their footings. One particular bridge, however, built higher than the Base Flood Elevation (BFE), remained solid and functional. Its fortitude proving the worth of mitigation!

Duncan's Public Works Director R. Scott Vaughn said, "Townspeople had lived with drought for about ten years and forgotten the power of floodwaters, until this year."

By the end of August 2007, Duncan had experienced the sixth wettest year in their history. Roads flooded, creeks eroded banks, and bridges washed away. Home and business owners grew tired of cleaning red mud from their properties after waters receded and the City faced costly repairs on pedestrian bridges used to cross canals.

Vaughn's experience as a public works director taught him the power of water, especially moving water. With that experience in mind, Vaughn built a pedestrian bridge on Main Street in the late 1990s at a height three feet above the BFE.

The elevated bridge project took 30 months to complete and included a concerted effort to educate the City Council regarding the benefits of building above the BFE prior to construction. The bridge now stands about four feet above street level supported by deep footings, and according to Vaughn includes access from both sides of the bridge in compliance with the Americans with Disabilities Act.

The wet summer months of 2007 resulted in four pedestrian bridges being damaged or completely washed away with the exception of the elevated bridge Vaughn had built above the BFE, which sustained no damage.

Costing about $20,000 in materials and using City staff for labor, Vaughn's bridge proved cost effective and served Duncan residents by providing the only safe way to cross the canal by foot. Replacing the bridge entirely would have added an estimated $10,000 to the cost, or $30,000 total.

Vaughn feels that the wise use of local floodplain maps and building above the BFE are effective floodplain management measures that contribute to community safety and sustainability.

Quick Facts

Sector:
Public

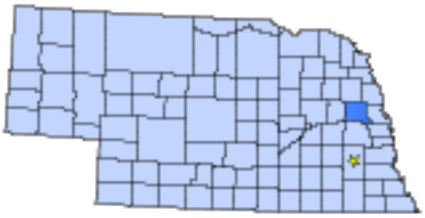
Cost:
$20,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Local Sources

FEMA

Efforts to Mitigate: Elkhorn River Showing Positive Results



Dodge County, Nebraska

Dodge County NE - The county of Dodge, Nebraska has seen its share of flooding in the past. In 1993 alone, the Elkhorn River has overflowed its banks on at least five separate occasions. The repetitive flooding damaged over 5,100 acres of crops and structures per event. So the residents along the Elkhorn River and the Lower Platte North Natural Resources District (LPN/NRD) decided to take action to keep the river from future overflowing.

Using funds that were applied for and were awarded through the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), the local residents and LPN/NRD were able to mitigate and stabilize over 2,670 feet of river bank on the west side of the Elkhorn River.

The river bank was mitigated by embankment stabilization using rip-rap and jetties. Rip-rap is rock or other material placed along the sides of the river to protect against water erosion. Jetties, in contrast, extend into the river at several locations and are constructed of quarry rock at approximately 40 feet in length. Jetties calm the flow and also protect the river banks from erosion. They also aid in forming new land mass along the river, further helping to strengthen and protect the rip-rap banks. But the benefits of this mitigation project go well beyond flood control: the rip-rap and jetties aid in environmental restoration, creating new habitat for wildlife and vegetation.

In addition to the HMGP funds, approximately 100 local residents have agreed to contribute toward funding the construction using a project-maintenance account. The residents contribute to this maintenance account through a tax based upon the assessed property value of land impacted by flooding. The account is maintained at $110,000. When funds are used for maintenance, the tax is implemented to restore the amount; when the account reaches $110,000, the tax is stopped.

By coordinating their efforts with the State and Federal government, local residents have shown how to stabilize the Elkhorn River to protect and prevent future losses from flood events.

Quick Facts

Year:
1991

Sector:
Public/Private Partnership

Cost:
$279,500.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Elevation is Cause for Elation When Damage is Avoided

Owen County, Indiana

Owen County, IN - When Robin Lane moved to Spencer, Indiana in 2003, she had no idea that five years later she would be rescued by boat during a flood.

Lane's residence was located just 300 feet from the West Fork of the White River, which had flooded three times since 1990. On January 7, 2005, four feet of floodwater destroyed Robin's manufactured home.

Lane had lived in the area for almost two years, so she chose to remain and rebuild in the same location. She was eligible for up to $30,000 of Increased Cost of Compliance (ICC) coverage through her policy with FEMA's National Flood Insurance Program (NFIP). In order to meet the Town of Spencer's floodplain ordinances, the house had to be raised at least two feet above the base flood elevation (BFE).

She found plans for a coastal-style house, hired an architect to draft the plans, and an engineer to design the reinforced-cement pillars that would hold the 2,000-square-foot house a total of eight feet above the ground. This would not only keep her safe from flooding but also allow her to plant some trees, a garden, and set aside an area with lawn furniture, which could be quickly moved upstairs. According to ICC regulations, the open area underneath the house has to remain unencumbered to allow floodwater to pass safely through.

Lane went to sleep on the night of June 5, 2008, and woke in the early hours to discover her house surrounded by water. The river had risen 2.8 feet during the night and overflowed the banks.

"At 8:25 pm on June 4th, the river was at flood level [14 feet] and rose to 16.8 feet by 7 am [the next day]," waste water technician and long-time Spencer resident Shelley Edwards said. Shelley is also a Cooperating Weather Observer (CWO) for the National Oceanic and Atmospheric Administration (NOAA) and submits his findings to NOAA at 7 am every day. He explained that the rainfall for May had been unusual. "Three and a half to four inches is normal. In May, we had six and a half," said Edwards.

The water continued to rise to the NOAA category Major Flood Stage of 24 feet and finally crested June 8th at 26.93 feet, coming close to breaking a record set in 1913 of 28.50 feet.

"My car was completely submerged," Lane said.

At first, as Lane watched her neighbors being evacuated from their homes, she felt that she and her dog could just wait things out until the water receded since they were safely out of danger.

Quick Facts

Year:
2005

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

Southern Missouri Tornado Shelter Serves Community in Good Weather and Bad

Howell County, Missouri

Howell County, MO - Should disaster strike, residents of West Plains, Missouri won't have any difficulty finding the City's safe room. Chances are they've already used it for a school event, civic club dinner, bake sale, or other community function.

"It gets tons of use," said Dr. Fred Czerkwonka, assistant superintendent of the West Plains School District. "It's a wonderful asset to the community, the school, and the children."

The tornado-resistant safe room's primary use is as the gymnasium at the district's middle school. Built to the exacting standards set by the Federal Emergency Management Agency (FEMA), it opened on August, 14, 2007. At 15,600 square feet, the West Plains safe room is capable of holding 3,120 people, nearly one-third the city's population.

The safe room was built using special funding incentives from FEMA, which paid for 75 percent (about $2 million) of the $2.8 million project. The school district funded the remaining balance through its capital projects account.

The West Plains safe room was the fourth in the State built specifically for community use. The first was a small, single-purpose sports complex that holds 150 located in Boliviar, Missouri just north of Springfield. There are now 14 safe rooms in the State. Many are in smaller Missouri communities, in schools, and on college campuses.

"FEMA is a hero in these small communities," said Stevens Randy Scrivner, branch chief for Logistics/Mitigation/Floodplain Management with the State Emergency Management Agency (SEMA). "Governor Matt Blunt has been an outstanding supporter of the safe room program to help out Missouri schools, colleges, universities, and communities."

Similar shelters are planned. "We're looking at just about any place interested in having a safe room," said Scrivner. With good reason: According to the National Weather Service, since 2003 Missouri has experienced 341 tornadoes through May 2008, resulting in 43 fatalities.

A State program is currently underway to educate Missourians to the dangers of high-wind events and to promote safe rooms for both community and individual use.

"In cities like West Plains," said Scrivner, "The message is 'Now you have a place to go. Don't wait for the siren.'"

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

A Plan for All Seasons: Hazard Mitigation Planning Helps to Prioritize

Tribal,
FEMA Region VI

Shawnee, OK - The Citizen Potawatomi Nation (CPN) tradition teaches respect for nature and how she refurbishes the earth with winds, floods, and ice storms. Over an 18 month process starting in 2003 the CPN identified disaster risk, prioritized their probability, and documented planned projects to reduce damage. By following the guidance of the Disaster Mitigation Act of 2000, the CPN created the first plan approved by the Federal Emergency Management Agency (FEMA) in the State of Oklahoma.

CPN Safety and Housekeeping Director Tim Zientek said, “As we prepared the plan we discovered flooding posed the most risk and not tornadoes, though more tornadoes form in Oklahoma and Texas than other states. The floods we experienced in 2007 caused over a million dollars in damage.”

Hazard mitigation planning requirements include documenting the history of the land and weather events as well as vulnerabilities to disaster risks. The CPN gathered statistical data and conducted surveys and interviews. Discussing weather history with tribal elders and long-time city residents helped the planners understand how natural forces affected both people and property. Interviews and survey responses explained nature’s impact, the efficacy of actions taken by Nation members, event dates, and severity.

Zientek believes involving members of CPN and the community added to the acceptance of the plan, understanding of the documented risks, and improved support for the projects that would reduce or eliminate damage from those risks. And since plan development requires documented community participation, the interviews and surveys served a dual purpose.

To maintain plan accuracy and currency, the Nation reviews the plan several times a year with annual leadership consideration. As a result of these reviews the leadership reshapes its project priorities based on need and funding. For example, the flooding of Squirrel Creek in 2007 would have had lesser outcomes had CPN been able to fund a High Flow Bypass, a project estimated at $5million but with a projected savings of $12 million.

Zientek said, “Writing and researching the plan enabled the leadership to regain a sense of urgency to support projects that helped us grow a sustainable future, guarding the lives and property of those who live or visit our land.”

Quick Facts

Year:
2007

Sector:
Public/Private Partnership

Cost:
$150,000.00 (Estimated)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Hail, Hail, the Roof's Still Here

Kay County, Oklahoma

Ponca City, OK - The National Weather Service reports an average of four hail storms each year in Ponca City, Oklahoma with at least one producing stones 1 inch or larger. Before the 1990s, homeowners anticipated roof replacements well before their 25-year warranties expired. That changed when manufacturers began offering an extended life, pliable roof system of impact-resistant shingles. Ponca City homeowners Jerry and Bonnie Runyan took a chance and installed the new system, inspecting their roof for damage after each hail storm to find none. After nine years, the shingles still look new.

Runyan said, "Since spending about $4,500 to install the impact-resistant shingles, we've had a lot of hail. Our neighbors, without the special shingles, have replaced their roofs after many storms. We've seen no damage with our roof and even lost less than a cup of the grit that covers it."

The Runyans replaced their roof as part of a 10-year State Farm Insurance Company program to verify the effectiveness of Class 4 impact-resistant shingles. The company chose Oklahoma because of its wide weather patterns – hail, ice, dangerous winds, and extreme temperature. Forty homeowners could participate in the study if they had storm-initiated roof damage severe enough to require roof replacement. Each homeowner chose the shingles, chose a contractor, and agreed to periodic inspections.

Results from the study supported State Farm's decision to offer Nationwide premium reductions for homeowners that installed the Class 4 impact-resistant shingles. Statistically, the company reports fewer claims after hail storms and high wind events. Fewer claims have resulted in offset premium reductions by more than dollar for dollar with homeowners also benefiting financially. State Farm agent Bill Leming said, "Because the impact-resistant roofing has so drastically lowered damage from hail storms, Ponca City policy owners could increase their homeowners' deductibles and decrease their repair and replacement timetables."

Leming also reported improved peace of mind for homeowners of impact-resistant roof systems. Before, the Runyans had lost their roof in 1998 while they vacationed in Alabama. Nine years later, when weather reports show hail in Oklahoma while they are away, the Runyans have no concerns about their 30-year roof that responds to 3-inch hail with no ill effects.

Runyan's neighbors have not been so lucky. Half of the homes in their neighborhood experienced roof damages of $2,500 to $4,000 after the last two severe hail storms. The damaged roofs required replacement and included several new roofs still under warranty.

"Besides the two severe hail storms, the roof survived a 100-year ice storm where ice coated power lines and tree limbs up to 4-inch diameters," said Runyan. "After each storm I checked for breaks, grit-loss, edge damage or wear and found none. With a conventional roof, any one of these storms would have easily broken the shingles. Our roof looks brand new."

Quick Facts

Year:
1998

Sector:
Private

Cost:
$4,500.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Property Owner, Residential

Streams Flow Free for the Citizen Potawatomi Nation

Tribal,
FEMA Region VI

Shawnee, OK - Squirrel Creek creates a property boundary of the Citizen Potawatomi Nation (CPN) in east-central Oklahoma. Historically, the creek causes minimal flooding to Tribal lands twice a year. Despite a history of uneventful flooding, the Tribe maintains an unimpaired channel of the Creek in anticipation of larger flood events. This mitigation measure helped avoid significant losses when floodwaters in July 2007 inundated their lands.

Tribal leadership had developed a creek maintenance plan for several reasons – to reduce risk, preserve natural processes, and preserve Tribal heritage. Work crews maintain waterways by removing dead trees, clearing vegetation, relocating beavers, and securing the banks with grass and sturdy trees to abate erosion.

CPN Safety and Housekeeping Director Tim Zientek said, “Investigating the water and banks that surround us showed vegetation and debris kept the channels from flowing freely. A clogged channel causes flooding and that translates into financial losses and distress for the Nation and our neighbors.”

Had the CPN not taken action to keep waterways free of debris and overgrowth, the July 2007 flood could have resulted in over $40 million in damages had floodwaters entered an elevated casino, the Nation’s grocery store, and Tribal headquarters.

The July 2007 flooding occurred during a scheduled CPN Native American Festival, but prior mitigation actions taken by Tribal leadership in addition to its timely implementation allowed the Festival to proceed without disruption and avoided $10 million in losses to the Nation’s headquarters.

“Understanding the function of nature and working in harmony helps the Tribe function,” said Zientek. “Eliminating or reducing the risk and lessening the impact on those who live and visit here will only enhance their enjoyment of nature.”

Quick Facts

Year:
2007

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Private funds

FEMA

A Place of Refuge in Newcastle

McClain County, Oklahoma

Newcastle, OK - After winds in excess of 250 miles per hour bristled through central Oklahoma on May 3, 1999, citizens and business owners were left to contend with $1.5 billion in damages. Per statistics from the National Weather Service, the destruction included 1,780 homes, 85 businesses, three churches, and two schools. Tragically, 85 people lost their lives after the tornadoes touched down in Oklahoma and two other States. Building Assessment Performance teams from the Federal Emergency Management Agency (FEMA) determined that only specifically designed tornado shelters would have saved lives. One community located in the middle of the destruction, the City of Newcastle, built such a shelter.

After reviewing locations, the city chose a lot next to both the police station and a school. “Placing the shelter near the city’s middle school comforts students, teachers, and parents during severe weather,” said City Manager Nick Nazar. “It’s a great short-term shelter.”

The city contracted an architectural firm to design a facility that conformed to specifications published in FEMA 361, Design and Construction Guidance for Community Shelters. Construction began in Spring 2003 and ended three years later. The first student drill occurred soon after the start of the Fall 2006 school year. Within five minutes of the drill, 850 people exited the elementary and middle schools and settled in the shelter.

Providing secure shelter for 850 people more than justified its construction cost of $601,600. The city partnered with FEMA’s Hazard Mitigation Grant Program (HMGP) and the Oklahoma Department of Emergency Management (OEM) to build the shelter. Through HGMP, FEMA provided $451,200 for the 6,500 square-foot facility, and the City of Newcastle contributed $150,400. The steel-reinforced building temporarily shelters 1,063 people and has a generator to operate all building services, switching on automatically when the facility loses power.

Community members have used the building as a cooling shelter during hot periods and for warmth during winter storms. It also provides temporary protection for Newcastle’s mobile home park residents. Nazar mentioned that during the severe flooding of 2007, one family lived in it as temporary housing. Safe exiting from the shelter is assisted by triple-hinged doors that open inward, facilitating exit despite fallen debris. An entrance sign advises residents how to access the building when severe weather threatens.

“When severe weather threatens, individuals and families need to have a safe place to go and time to get there,” Nazar said. “Residents can easily and quickly reach this facility, and its success has led to including safe room construction in other local schools.”

Quick Facts

Year:
2001

Sector:
Public

Cost:
$601,600.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Leadership Breeds Success

Miami, OK - Ten Native American tribes call land in Oklahoma's Ottawa County home. In 1997, two of those tribes – the Modoc and Miami – created an historic partnership to build The Stables Casino in the City of Miami. Prudent construction plans raised the casino 12 feet above ground level – a height recommended by Federal Emergency Management Agency (FEMA) flood maps. The casino was put to the test on July 3, 2007, when torrential rains severely flooded Ottawa County and, specifically, the City of Miami. The flood resulted in water reaching the threshold of the casino doors, but no higher.

Modoc employee John Ballard said, "United States law restricts casinos to land owned by Tribes. In Oklahoma that means Land Trusts or Tribal Lands. When we partnered with the Miami Tribe to build the casino, the only lots big enough for development were in a floodplain."

The Modoc Tribe came to understand the history of flooding on that land after floodwaters had completely covered it in 1988 and 1995. With that history, the Tribes asked both local floodplain managers and FEMA for guidance. While neither authority encouraged building in a floodplain, Federal regulations provided limits on where and how the Tribes could build. After reviewing the Flood Insurance Rate Maps (FIRMs) that specified a first-floor elevation of at least 12 feet above ground level, the Tribe used landfill and a raised foundation to meet that elevation height.

Following a wet May and June 2007 that logged 181 percent more rain than normal (and becoming the second wettest months on record since 1895), the July 2007 rains tested the casino elevation. With 12 feet of water collecting over three days, aerial photographs documented that The Stables Casino had become an island surrounded by blocks of water. Luckily, no water entered the building. Within three days, the waters receded and people could walk from their cars to the building. The casino then reopened, and the casino's 50 employees lost no wages due to time lost.

In addition to acknowledging the benefits of elevation, Ballard also commended Modoc Chief Bill Follis's leadership before and during the flood. Months before the flood, Chief Follis had put an Emergency Operations Plan into place that was strictly followed by the Modoc Tribe. The plan included actions taken to move casino records and water-sensitive equipment to the second floor. To assist visitors to the casino, the casino workers, and residents of the area, the plan included initiating a boat brigade to conduct rescues, bring critical supplies, and transport Tribal staff to or from the casino. Another part of the plan activated during the flood was a scheduled reporting of flood depths to Tribal leadership to adequately plan securing the casino and its contents.

Tribal,
FEMA Region VI

Quick Facts

Sector:
Private

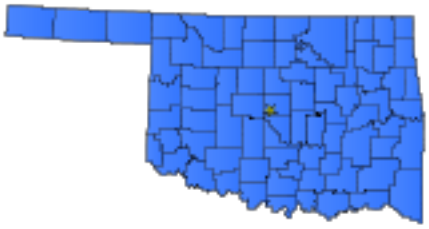
Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Private funds

FEMA

OEM Joins Partners to Increase Disaster Readiness



State-wide, Oklahoma

The State of Oklahoma - In Spring, travelers throughout Oklahoma learn ways to decrease their risks for damage when severe weather comes to their neighborhoods. Each April, the Oklahoma Department of Emergency Management (OEM) partners with private and public entities to spearhead a month-long, public education campaign. During the campaign, people learn readiness tips for weather events like tornadoes, floods, ice storms, and hail.

The OEM Public Information Officer Michelann Ooten said, “A host of partners plan and implement the month-long campaign. A central partner is McDonald’s, where an average of 1,000 customers per day receives readiness information from the 166 restaurants that participate.”

Because of McDonald’s continued involvement, the program is called “McReady.” In addition, the coordination and participation of OEM and other program partners has proved invaluable. Media outlets, non-profit organizations, utility providers, the National Weather Service (NWS), and Citizens Corps provide information and arrange events that bring the messages home. The project has expanded from a single event held in Tulsa in 2003 to a program that stretches throughout the State providing information needed to prepare for the worst weather Oklahoma can bring. In 2007, OEM received recognition for the “McReady” program from the International Association of Emergency Management (IAEM) that recognized the program’s contributions to public awareness and weather preparedness.

In 2007, the public education campaign included funding from OEM and an estmated $170,000 in cash and in-kind donations. Estimates from 2007 show nearly five million citizens were exposed to “McReady”during the 30-day April campaign. The 2007 cost per citizen was less than $12.

Tulsa Partners Director Tim Lovell who helped start the program said, “Keys to the success of the ‘McReady’ program include an organized central message, a growing, involved partnership of private and public entities, and a long-term commitment to delivering the program.”

Quick Facts

Sector:
Public

Cost:
$187,187.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Safe Rooms Add Life to Neighborhoods

Oklahoma County, Oklahoma

Oklahoma City, OK - Residents of the Oklahoma City metropolitan area wonder each year what May weather will bring. In May 1999, multiple tornadoes left 44 dead and more than 8,000 buildings damaged or destroyed. Four years later another May tornado, closely following the 1999 path, imposed far less damage. All because residents as well as City and State officials embraced mitigation measures leading to safe rooms being built in neighborhood schools across the City.

Following the May 1999 outbreak, the State looked to the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP) to provide money for building safe rooms. The HMGP funds were also used as part of a rebate program to encourage the building of safe rooms in schools. Oklahoma City's Program Manager Eric Wenger said, "We participated in the [safe room] project because we had a number of schools facing rebuilding or remodeling, so we seized the opportunity."

Several schools chosen for the safe room project were already part of a City-wide school revitalization program called MAPS for Kids, the second phase of a program for Metropolitan Area Public Schools (MAPS). In 2001, Oklahoma City voters approved for the MAPS program to be funded with a penny sales tax increase and a bond issue for a total funding of $680 million over a 10-year period. The MAPS funds generated would be used to renovate and revitalize neighborhood schools. In addition, the $2,291,250 in HMGP funds allowed the construction of safe rooms for five MAPS for Kids schools: four new facilities and one renovation project.

Safe room construction, which began in April 2004, complied with the Americans with Disabilities Act design specifications as well as FEMA 361, Design and Construction Guidelines for Community Shelters. MAPS for Kids also designed the school safe rooms as multi-use facilities, doubling as locker rooms, classrooms, dance studios, or music rooms.

The combined funding efforts of MAPS for Kids and FEMA's HMGP have helped re-energize not only schools but also surrounding neighborhoods as well.

"The MAPS for Kids program is revitalizing many Oklahoma City neighborhoods and the school projects have helped us add to the overall successes of the community," Wenger said. "Now when we build new schools, patrons ask if the project will include a safe room."

Quick Facts

Year:
2002

Sector:
Public

Cost:
$2,291,250.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Ten Years
Toward a Flooding Solution

Kingfisher County, Oklahoma

Kingfisher, OK – Over the past 10 years, residents in a six-block area cringed whenever authorities forecasted severe rain for their area. And on August 19, 2007, two local creeks ended up spilling from their banks and poured dirty brown floodwater downtown. But thanks to two programs that the City of Kingfisher used to buy frequently flooded lands, the City created places for water to flow and, therefore, mitigate some impacts of flooding.

“The vacant land program offered Kingfisher citizens many benefits. Frequent flooding had displaced residents, but with the acquired open space the community controlled emergency costs and, in dry times, residents used the open space,” said City Clerk and Floodplain Manager William Tucker.

The City’s buyout program, established in 2002, gave citizens owning vacant land that flooded more than once the option of selling the lot to the City for $300. Within five years, the City invested $20,000. The resulting sales relieved these owners of taxes and maintenance costs for the properties sold.

Because flooding in this six-block area of Kingfisher occurs more than annually, the City expanded its acquisition efforts with funds provided by the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP) and managed by Oklahoma’s Department of Emergency Management. The HMGP infused $170,000 to buy houses while the City added the 25 percent match.

A single flooding event typically costs the City of Kingfisher more than $200,000 in this six-block area. But when the August flood struck, the buyout program ended up saving the taxpayer money – as well as reducing the loss of personal items – and peace of mind for those living in the flood-prone area. Without the buyout program, the purchased homes would have suffered an estimated $170,000 in damage to property and contents with this one flood alone.

Tucker said, “These two programs have made a world of difference in the lives of our residents because when it rains they don’t worry, and that means more than money can buy.”

Quick Facts

Year:
2001

Sector:
Public

Cost:
$190,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Local Sources

FEMA

The Gathering on Shipman Drive

Stone County, AR – It took years to build the homes on Shipman Drive and only a matter of seconds to destroy them. Shipman Drive, located in Mountain View, Arkansas, had a total of nine residential properties until February 5, 2008, when a tornado claimed all nine homes. Among the residents were Donnie and Linda Fletcher. Although their home was destroyed, their lives were spared because they, along with members from three other households, took shelter in a storm cellar that had been built just 3 weeks before the tornado struck.

“You could see the blackness in the valley of the mountains,” Linda Fletcher said. “It just got black. I didn’t realize a tornado was coming until I heard timber breaking. I didn’t hear our tornado warning system.”

The Fletchers had lived on Shipman Drive for 15 months in a 3,000-square foot stone house that Donnie Fletcher, a stone mason, built over a 6-month period. He decided to add a detached workshop with a subterranean room underneath, which would serve as a storm shelter. The cost of the shelter was approximately $3,000. Its value was tested when the tornado, ranking an EF4 on the Fujita scale, struck the town of Mountain View just moments after Donnie Fletcher locked the final latch on the door of the 12-foot by 8 -foot cinderblock and concrete storm cellar. “Thirteen of us had gathered in the shelter,” Linda Fletcher recalled. “As soon as Donnie locked that last latch, it hit. We could hear stuff hitting against the door.”

After the storm, it took three men to push away the John Deere lawn tractor that had blocked the entrance to the shelter.

Amidst the darkness, Fletcher’s son-in-law stepped out of the shelter with a flashlight to assess the damages. Referring to his new home, construction of which was nearing completion, “It’s gone!” he reported to his father-in-law. Then he looked back behind the shelter where the Fletchers’ home once stood. “It’s gone, too!” he told Fletcher.

“I didn’t believe Donnie when he told me that our house was gone. I didn’t hear the explosion,” Mrs. Fletcher said. “Later, my neighbor reported hearing it. It was our house. It just exploded and was reduced to rubble. The tornado just wiped out all of the houses on our street. It also destroyed four vehicles.”

Fletcher continued, “This is my first experience with a tornado. I have lived here all my life. The old myth here was “a tornado will hit the top of a mountain and bounce off.” I’m here to tell you that isn’t true. I have pictures to prove it.”

The threat of a tornado needs to be taken seriously. People should be prepared and heed all advisories and warnings. The location of a storm shelter should be reported to the local emergency manager and family members or others outside the immediate area to allow emergency personnel to quickly free the exit should it become blocked by debris.

“Build a storm shelter regardless of how you feel about them,” Linda Fletcher said. “I was not a person that was afraid of storms. I was like my dad. He laid in bed many nights while my mother dragged me to the cellar in anticipation of a storm. Our daughter insisted that we build a storm shelter. I truly believe that the shelter saved our lives.”

Stone County, Arkansas

Quick Facts

Sector:
Private

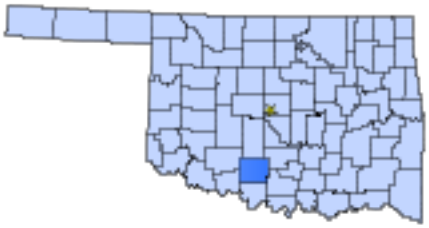
Cost:
$3,000.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Homeowner

FEMA

When It Rains
Plan for Damage



Stephens County, Oklahoma

Duncan, OK - The year 2007 went into the history books as the sixth wettest for Duncan, Oklahoma. Residents saw five major floods with three of them greater than 100-year flood event. The flood on June 28 resulted in a sewer main failure. But quick action and Rip Rap saved the City from unsanitary contaminants, a fate that could have occurred when Tropical Storm Erin dropped 6.2 inches of intense rain on August 19.

Duncan's Public Works Director R. Scott Vaughn said, "Included in our five storms that reached the 100-year event threshold, three exceeded those limits by either rain amounts or intensity."

Following the June flood, Vaughn's inspections on July 2 revealed damage to a 27-inch sewer main line that carried an average of 2 million gallons of raw sewage per day. The inspections further revealed that a wall separating the sewer line from the adjacent creek had eroded. Consequently, health and regulatory concerns dictated immediate emergency repairs. Within 24 hours, Vaughn ordered the sewage field pumped dry, and within the following 48 hours released bid packages for repair work. Less than five days later, the City awarded the bid and construction began.

As an experienced civil engineer, Vaughn knew Rip Rap would slow the creek's flow while protecting the embankment against erosion. Rip Rap consists of stones or rocks placed like a rock wall on a creek bank in ways that resist water conveyance, especially where waterways bend. Without Rip Rap, high velocity water on the outside of a bend increases erosion and can eventually cause a rupture in the shoreline.

On July 23, nearly 20 days after noting the damage, final inspections were completed on the last of the repair work. Less than 30 days later, remnants of Tropical Storm Erin hit the City of Duncan with enough rain to exceed the 100-year flood event criterion, putting the repair project to the test. The 450 feet of 18-inch limestone Rip Rap slowed the water flow and flattened the creek, confining it within its natural shoreline. The creek walls remained stable, and the sewer line secure.

The City of Duncan spent nearly $150,000 on the sewer repair project that included making emergency repairs and constructing the Rip Rap shoreline. The community's 22,000 residents have now gained greater protection from improved creek walls, newly installed manholes, plugged pipe holes, and repairs to the sewer main.

Vaughn summed up the effective actions saying, "Any number of things could have gone wrong in this repair, but our staff took quick, effective action and the contractors knew how to make the final fixes to last well beyond my lifetime."

Quick Facts

Year:
2007

Sector:
Public

Cost:
$147,343.00 (Actual)

Primary Activity/Project:
Floodplain Management

Primary Funding:
Local Sources

FEMA

Where O, Where Does the Water Go? Not in My Home

Ottawa County, Oklahoma

Miami, OK – On July 3, 2007, floodwaters from the Neosha River and Tar Creek inundated homes in six neighborhoods of Miami, Oklahoma. While most homeowners sought temporary housing, 19 former residents of the affected neighborhoods rode out the storm from the security of their newly acquired housing since selling their formerly flood-prone habitats as part of the City of Miami's acquisition projects.

"The water covered so much area that residential properties became uninhabitable and local businesses had to close," said Gary Brooks, Emergency Management Director for the City of Miami, Oklahoma. City emergency management estimated the disaster damage to exceed $6 million.

The City looked to buy flood-prone properties with help from the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) and Repetitive Flood Claims Grant Program (RFC). From 2002 to 2006 both programs provided Miami with a total of $1,149,555. Over all, the City has acquired 34 properties through both programs.

The HMGP assists State and local communities to implement long-term mitigation measures following a major disaster. FEMA can fund up to 75 percent of the eligible cost of each project with the local government funds covering the remaining 25 percent. Funds are administered to the local governments through the State.

The RFC provides mitigation funding for structures insured under the National Flood Insurance Program (NFIP) that had one or more claim payments for flood damage. The funds are available to NFIP participants who are not able to meet the cost share of other FEMA grant programs.

Participation in acquisition projects is strictly voluntary. Those homeowners who have participated in acquisition projects gain peace of mind as future flood loss to their home is eliminated. In addition, homeowners receive fair compensation, a chance for a new start, recovery without loans, and the potential to recoup financial investment of devalued property.

"Acquisitions add another layer of flood deterrents in Miami," said Brooks. "In July, however, when up to 40 inches of water fell in just a few days, acquisition proved the only complete protection against flooding."

Quick Facts

Year:
2001

Sector:
Public

Cost:
$1,149,555.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Cellar of Yesteryear Saves Family of Seven

Van Buren County, Arkansas

Van Buren County, AR – On Feb. 5, 2008, a tornado wreaked havoc on the town of Clinton, Arkansas, leaving area residents in utter dismay. Fearing its wrath, some of the residents sought safety in storm shelters. Danny Pistole, a barber by trade, his wife, Donna, and family members survived to tell their story by seeking shelter in a storm cellar built in 1925. Pistole's daughter, Jennifer, who lives 30 miles away, had been listening to the radio when she heard the severe weather alert. She immediately called her father.

"By the time I spoke with her the cable went out," Pistole said. "I immediately called my son, Jeff. He and his four children, Julia, Zackery, Shelby and Sam, rushed right over and we all headed for the cellar."

Once inside Pistole realized there wasn't any lighting. He kept kerosene lamps inside the cellar. In haste to seek safety, he had forgotten to secure a lighter or matches. He attempted to return to his home.

"I got out of the cellar to go back to the house which was just a few feet away," Pistole recalls. "All of a sudden I saw nothing but blackness. I knew I couldn't make it. So I ran back to the cellar."

As soon as Pistole closed the door of the 10-foot by 12-foot concrete cellar he heard what sounded like a loud explosion. In a matter of seconds his double-wide mobile home was reduced to rubble. Parts from the structure and its contents hurdled over the cellar.

The storm cellar was built by his grandfather who was simply honoring Pistole's great grandmother's wishes. She was afraid of storms. Following their death, Pistole leased the property, which included a house and the cellar. Years later he noted that the home was in disrepair. Its occupants had also used the cellar as a shelter for pigs.

"I tore the house down, bought a double-wide mobile home and moved on the property about ten years ago," Pistole said. "At a cost of approximately $500 I purchased rebar and concrete to re-surface the floor in the cellar and put in a new drain line. I know the cellar is sturdy. It's made of concrete and steel."

Pistole plans to continue working on refurbishing the shelter. A quick view of it leaves the impression that the cellar has, indeed, weathered many storms. Riddled with cracks and its concrete a darkened hue, it proved once again that it exists to serve a purpose – to save lives.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Homeowner

Community Partners Aid Citizens Using the Buyout Program

Cape Girardeau County, Missouri

Cape Girardeau, MO—For a city on the western shore of the Mississippi River, city officials and citizens are determined not to let that the river swallow up their homes as it did during the great Midwest floods of the 1990s.

In the late 1950s, the U.S. Army Corps of Engineers built an impressive concrete floodwall to prevent the river from flooding homes and businesses along the river, which was successful in holding back the swollen river for several years. In 1993 as floodwaters rose, some sections of the city were exposed to the river and resulted in 151 homes being damaged. The city spent $442,000 on sandbagging, extra crews, renting emergency generators, and flood debris removal and cleanup. The 1995 flood cost another $300,000.

Out of these crises, a partnership emerged among the Federal Emergency Management Agency (FEMA), the State Emergency Management Agency (SEMA), the Missouri Department of Economic Development (MDED), the Salvation Army Midland, the Interfaith Ministries, and the City of Cape Girardeau. Together, these organizations combined resources and addressed each family's needs, making it possible for them to participate in a flood buyout program.

Buyouts are based on the premise that using tax funds for buyouts saves taxpayers money in the end from not having to pay for repeated disaster recoveries. Once purchased, damaged structures are demolished and the land converted to deed-restricted permanent open space.

For the City of Cape Girardeau, the buyout program was highly successful. FEMA contributed more than $1.14 million to a $2.6 million program to purchase 109 properties. Residential structures in the 100-year floodplain now number only 17.

During the March 2008 flooding, the city experienced only some closed streets, basement seepage, and limited flood damage.

"The buyout effort demonstrated how communities could take care of their residents in a crisis," said Housing Assistance Coordinator Stephen S. Williams, who worked on the buyout program for the city at the time.

"The key to the program was identifying the needs of the people in the community," added Ken Eftink, director of Development Services for the City of Cape Girardeau's Division of Planning Services.

Quick Facts

Year:
1995

Sector:
Public

Cost:
$2,411,398.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Community Supports Safe Room

Canadian County, Oklahoma

Calumet, OK - Before 2004, when weather threatened Oklahoma skies, students and staff of Maple School in Calumet were bused to nearby country homes with storm cellars. Immediately following the devastating May 3, 1999 tornado that touched down in nearby Moore, the community realized they needed a better plan. Town officials applied through the State Office of Emergency Management (OEM) for a Federal Emergency Management Agency (FEMA) grant to build a school safe room.

FEMA's Hazard Mitigation Grant Program (HMGP) provided 75 percent of construction costs, and the community provided the remaining 25 percent. The community was able to raise money quickly, and the safe room was finished in just 18 months - well ahead of schedule.

With the safe room finished, the school holds timed drills on a regular basis. In just under five minutes, teachers, staff, and 120 students from kindergarten through eighth grade can take their places in the new safe room. The 1,080 square foot reinforced concrete building can hold 216 people.

When severe weather again threatened the area in 2007, parents, teachers, and students felt at ease with the safe room on the school grounds. Eccard said, "It's dangerous busing kids around town in bad weather. This safe room gives us a great alternative."

Quick Facts

Year:
2001

Sector:
Public/Private Partnership

Cost:
$70,200.00 (Estimated)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Innovative Flooding Idea: Elevating the Land Rather Than the Structure

Crawford County, Wisconsin

Gays Mills, WI —In June 2008, when the Kickapoo River in Wisconsin overflowed after a deluge, homes around town were submerged in six feet or more of brownish water. But not Mason Evans' and his wife's, Diane, home. Learning from the floods of 1978 and 2007, the Evans' home was high and dry, because of their choice to elevate the land and prevent history from repeating itself.

During the flood of 1978, the Evans' former home was under two feet of water. The mold infestation rendered it unsafe for habitation, and subsequently, they demolished the flood-damaged structure. The total losses for that flood came to about $50,000, approximately what the property was worth in terms of his initial investment and property values at the time. After the flood of 1978, Evans purchased flood insurance, in order to protect his investment against the next flood.

When another flood in August 2007 inundated the Evans' home again, the damage was far worse than the 1978 flood. Four days of rain pushed the Kickapoo River over its banks, engulfing the entire town of Gays Mills with more than six feet of water. Like everyone else in town, the Evans grabbed everything of value they could think of and left their home for higher ground.

A week later, when the water level went down, Evans re-entered his house along with 36 friends to start the cleanup phase. After they disposed of every square yard of ruined carpeting, gutted the water-soaked drywall and insulation, and threw out all of the ruined furniture and cabinetry, the house was just a reeking, waterlogged shell. Total losses this time came to $150,000.

His combined losses from the 1978 and 2007 flood came to well over $200,000. In addition to his flood insurance payment, which covered a portion of his losses, he also received a Federal Emergency Management Agency (FEMA) grant for roughly $28,000. Evans remarked that it wasn't more than a week later that a check came through the mail. "It was surprising how quickly FEMA reacted," said Evans, "I called in and registered, then inspectors came out and looked over the damage that same week."

Evans then made a proactive decision and decided he was not going to be a flood victim again.

He remembered specialists from FEMA's Mitigation Directorate talking about structural elevation. Although it was too late for his waterlogged house, he owned another piece of land where he could rebuild. Evans decided that rather than elevating the structure, which is the usual method, he would elevate this large piece of land to three feet above the Base Flood Elevation (BFE). The BFE is the minimum standard that many communities use to regulate floodplain development under the National Flood Insurance Program (NFIP). It is assumed that there is a 1-percent chance per year that floodwaters could reach the BFE. In his case, raising the level of his house plot to above the minimum BFE would reduce his chances of floodwaters reaching his new home.

Quick Facts

Year:
2007

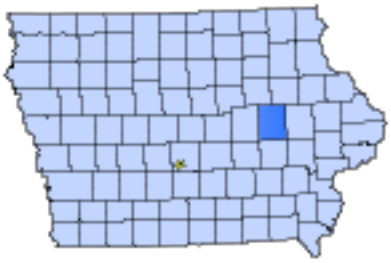
Sector:
Private

Cost:
$54,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

No Fear From Up Here: Iowa Family Elevates Home



Benton County, Iowa

Vinton, IA - Anthony and Jackie Behounek live along the Cedar River outside the City of Vinton, Iowa. When a record flood in May 2008 hit the rural area, the Behouneks left their home to stay with Jackie's mother. After the flood, they returned home, relieved to find that the 7½ feet of water had left their elevated home untouched.

"We had friends who were boating in and out of here," said Jackie. "They were telling us the water was all the way up to our deck and probably in the house. We were so relieved when we came back to find that the water hadn't gotten any higher than the garage/storage space."

Back in 1993, the Behouneks' home sat on a concrete slab and flooding was relatively common. Two years prior, they had to clean up after floodwaters reached as high as the single-story home's foundation. So when they received word in April 1993 that extremely high water levels were expected to occur, they began looking for measures to protect their home. Following some advice they received, they layered the side of the house facing the river with black plastic, and layed down numerous sandbags in hopes of keeping the water out of their home.

"When the water comes up and hits that plastic, it acts as a filter, and keeps out silt and a lot of other stuff," said Jackie. "The sandbags didn't help, though. The water was just too high."

The Behouneks left their home during the 1993 flood and stayed away for several days. When they returned, they found that 28 inches of water had flowed through their house. That's when they decided it was time to do something.

Learning of an elevated house in Independence, Iowa, they visited the site for inspiration and guidance. They also visited the Mississippi River area to see some of the pile elevated homes.

After calling a nearby house-moving company that also specialized in structural elevations, they contracted to have their home elevated. The Behouneks chose not to go with the pile-style design in favor of having an enclosed space under their home to use as a garage and for storage.

The elevation of a home, or other structures, requires the services of a professional engineer. New and substantially improved structures must be designed (or modified) to resist the forces of the floodwaters. This means adequately anchoring the house to prevent flotation, collapse, or shifting from both the weight of the water and the force of the moving water. In order to resist the weight of the water on the foundation flood vents are installed to provide access for water to flow through the lowest part of the structure. By NFIP regulations there must be a minimum of two openings that are no greater than 12 inches above grade and the total net area must equal 1-square inch of unobstructed area to every 1-square foot of floor space.

The Behounek's contractor alternative method was to lift the wood frame off the slab and elevate only that part. A wood floor is then built directly on to the frame, which is then lowered on to the new foundation. The Behouneks elevated their home 9 feet, which costs them approximately $25,000.

Quick Facts

Year:
1993

Sector:
Private

Cost:
$25,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Shelter From Future Storms: The Family is Now Prepared

Newton County, Missouri

Seneca, MO – On May 10, 2008, Randy and Dana Lowe, and nine other members of their family, survived an EF4 tornado unharmed, even though it tore the couple's Seneca home apart. The family barely had time to crowd together after realizing the huge tornado was coming. They sat on the floor of the hallway of the 1,100-square foot, wood-frame house as the tornado raged through the area.

"It was a miracle," Mrs. Lowe said. "No one was hurt."

The tornadoes that struck killed 16 people in Missouri as they ripped through homes and businesses along a more than 70-mile path from west to east. The EF4 tornado that hit the Lowe's area of Newton County left behind a trail of hundreds of damaged and destroyed homes and businesses in three southwest Missouri counties.

The home of the couple, who live south of Joplin, ended up a jumble of rubble and broken lumber. Now, the couple lives in a rented 28-foot-long trailer next to the site of their home. "For 19 years, we lived on this corner," Randy Lowe said.

Less than 25 feet away from the trailer is a new storm shelter, installed within days after the tornado hit the Lowes. "Safety is our main consideration," Lowe explained. He and his wife bought the storm shelter from a distributor in Miami, Oklahoma. The storm shelter was constructed by a precast concrete manufacturer in Drumright, Oklahoma.

It is FEMA-compliant, meaning it meets design and construction guidelines established by the Federal Emergency Management Agency. Tests of the 8-foot by 8-foot by 7-foot shelter "were consistent with FEMA…guidelines requiring the shelter to resist a 15-pound, 2-inch by 4-inch missile propelled by a 250-mile per hour ground speed tornado," FEMA officials said.

"We were thinking about getting a storm shelter three years ago," Randy Lowe said. Reflecting on their thoughts of three years ago, and the trauma of the recent event, they acted without hesitation.

Their new storm shelter – two large pieces of rebarred cast concrete with nearly 6-inch thick walls, with the two pieces bolted and glued together with a steel door frame and steel door – took 2 ½ hours to install, Lowe said. It cost $2,500. And it has space enough for 11 people to hunker down when the next storm strikes.

The Lowes chose to have a shelter installed that is partially underground rather than have it installed as an "in-residence" shelter.

Quick Facts

Year:
2008

Sector:
Private

Cost:
$2,500.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Homeowner

Village Relocates Uphill Above Floodplain

Montgomery County, Missouri

Rhineland, MO - Established in 1853 along the banks of the Missouri River on a backdrop of rolling hills and bluffs, repetitive flooding became a way of life for the nearly 200 residents of the tight-knit community of Rhineland. But between April and July of 1993, four major storms caused the Mississippi River, the Missouri River, and other tributaries to swell and flood communities, including Rhineland. Most of Missouri's 1,500 levees failed or overtopped during the historic floods and damages throughout the State totaled nearly $6 billion.

"We've had past floods and they were nothing compared to 1993," explained Ervin Elsenraat, former mayor of Rhineland.

"Former Governor Mel Carnahan set a priority to get people out of the floodplain and inform communities of the voluntary buyout program," said Sallie Hemenway, director of operations at Missouri's Department of Economic Development Business and Community Services.

The buyout program, which is voluntary, offers homeowners pre-flood, fair market value of property to relocate outside the flood-prone area. Existing structures are cleared from the floodplain and the deed-restricted property remains in perpetuity.

Preserving their community was just as important to Rhineland's citizens as escaping the floodplain to protect their lives and property. "As homes in Rhineland were severely damaged from repetitive flooding and the market value depreciated, people searched alternatives to the buyout plan," said Steve Etcher, executive director of the Boonslick Regional Planning Commission.

The residents decided to relocate homes to the crest of the nearby bluff at a total estimated cost of $4.3 million. Local government, Missouri Housing Development Commission, Missouri Economic Development joined resources with U.S. Housing and Urban Development (HUD) Community Development Block Grants and the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) to accomplish the move. Rhineland resident Sib Elsenraat agreed to sell 49 acres of the family farm, which had been in his family for nearly a century.

"The key to any move is that people have to want to do it. That's what happened here," said Elsenraat. "I wanted the town to stay together for the good of the town. I just happened to have had suitable land available for the relocation," he added.

"We took control of the floodplain by trading a lot on the hill for a lot from the floodplain," stated Etcher. Residents devised a lottery system allowing homeowners to draw numbers for lots of comparable size to the ones in the floodplain. To ensure same neighbors, many exchanged lots among themselves, referred to as the "swap meet."

When it was finally time to move, exhilaration filled the air as the community, government officials, sightseers, and the local and National media converged on the small village. Homes were hoisted by movers and rolled up the hill, one by one.

Quick Facts

Year:
1993

Sector:
Public

Cost:
$4,300,000.00 (Estimated)

Primary Activity/Project:
Relocation

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Helping Children Prepare for Disasters

State-wide, Arkansas

Pulaski County, AR—"When disaster strikes, would your child know what to do?" Children are among the most vulnerable disaster victims, so giving them safety guidelines before a disaster strikes is critical. The Federal Emergency Management Agency (FEMA) has an excellent disaster-specific program just for kids called FEMA for Kids. The program is designed to help children be better prepared in the event of future disasters.

In the first quarter of 2008, Arkansas was one area of the nation pummeled by severe weather and natural disasters. FEMA staff partnered with State and local officials, and organizations such as the American Red Cross to take the FEMA for Kids program to fourth graders in schools. On the two-week tour, over 500 fourth-grade students in counties impacted by the disasters were educated on disaster preparedness.

The outreach was so successful that FEMA targeted the Cub Scouts of Little Rock, Arkansas. Tamara Bellock, who managed a summer camp for approximately 200 scouts ranging from ages eight to ten, joined with FEMA staff and staff at Reservoir Park to accommodate troops throughout the State. The objective in making the Cub Scouts an integral part of safety initiative was to heighten parental awareness of the need to be more proactive in preparing their children who are often home alone.

"We had about 25-30 scouts in each session," reported Community Education and Outreach Specialist, Brianne Charles. "We hosted six 45-minute classes. Students participated in a question and answer session regarding the video, 'Getting Ready for Disaster: One Family's Experience,' and the scouts had an opportunity to view the contents of a disaster supply kit."

Charles continued, "There were lots of questions and students responded rapidly. We asked questions such as: 'What kind of disaster has happened in your area, What can be done to prepare for them in the future, What about contact information, Where would you go, What would you do, What should be placed in your family's disaster supply kit?'"

Students eagerly participated in the five stations set up around the campsite. These stations included Fire Safety; First Aid; Preparing a Family Disaster Kit; Pets in Disasters; and Express Yourself Through Art.

"It's important to educate the kids because they are the ones who are most likely to be home alone," Charles said. "If parents aren't there, these kids need to be prepared on what to do."

Region VI continues to foster the program to school-age children by educating school districts on disaster preparedness.

Quick Facts

Year:
2008

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Partners Provide Statewide Radio Alerts to Save Lives

State-wide, Missouri

Jefferson City, MO - As severe weather hits at 3 a.m. and most people are nestled sound asleep, officials at Missouri's State Emergency Management Agency (SEMA) are confident that the citizens of Missouri are less vulnerable to disaster. Nearly all communities in the State now have access to the National Oceanic and Atmospheric Administration (NOAA) severe weather radio alerts for notification of pending storms.

SEMA, electric cooperatives, private businesses, the National Weather Service (NWS), and the Federal Emergency Management Agency (FEMA) joined forces to provide the State with NOAA weather transmitters and maximize radio alert coverage of every community in Missouri.

"There have been other attempts of similar projects that failed because tower space was unavailable for the transmitters," said Allan Johnston, P.E., an engineering supervisor at Central Electric Power Cooperative, located in Jefferson City.

In 1995, the State had only 10 transmitters, with coverage primarily for densely populated areas but very little coverage for its rural communities. Having the NOAA severe weather radio provides early, life-saving warnings that notify radio users of approaching hazards to the area.

Although acquiring donations for available tower space and securing funds to purchase transmitters were key concerns but not obstacles, SEMA proceeded with a plan to extend radio alert coverage throughout the State. SEMA officials helped to successfully negotiate with various utility partners and private businesses for donated tower space to install the NOAA transmitters. Several electric cooperatives, which provide power to the State's rural communities, also agreed to facilitate purchasing and installing the transmitters and equipment before donating them to NWS. In return, NWS agreed to maintain and program the equipment and provide the communication links that activate tone alert radios when severe warnings are issued for local or adjoining communities.

"We are generally willing to work with the State and Federal agencies where possible. When SEMA came to us and showed us holes in radio alert coverage areas, we worked to close the gap, to protect the public," added Nancy Gibler, director of Business Development at Central Electric Power Cooperative.

A major portion of the estimated $1.4 million project came from the Federal Emergency Management Agency (FEMA) through the Hazard Mitigation Grant Program (HMGP). The HMGP program is designed to reduce the loss of life and property, lessen the impact to local communities due to natural disasters, and enable recovery following disasters. SEMA, the grantee, administered the grants, and the local electric cooperatives managed the funds.

SEMA also secured funds from Emergency Management Performance Grants (EMPG), a program of the U.S. Department of Homeland Security. EMPG has 50 percent, non-Federal cost-share match requirement. States can utilize these funds to strengthen their ability to support emergency management activities while addressing issues of National concern.

Quick Facts

Year:
1993

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Warning Systems

Primary Funding:
Business Owner

FEMA

Safe Building Practice Protects Investment

Baxter County, Arkansas

Baxter County, AR – Entrepreneurs respond differently to the question, “What is success?” The term is not so easily define. Steve and Pam McCumber, an entrepreneurial couple in Norfork, Arkansas defines the term from personal experience. Success for them is the mitigation efforts that continue to keep them afloat amid the perils of bad weather which seem to hover over the State of Arkansas.

“I bought some books and read first because I had never built anything before,” said Steve McCumber, a retired jet engine parts manufacturer. “A FEMA associate, here in Arkansas, sent me some books and I went on FEMA’s website and got some more books and read about flood zones, flood plains and anchoring systems.”

In 1997, the McCumbers purchased an eight acre tract of land on the Norfork River. A project spawned out of boredom, they decided to build a resort, Norfork River Resort. They knew this would mean taking steps to secure their investment.

“Down here we are concerned about high winds and flooding,” said McCumber. Norfork is a small town. Nobody wanted to tackle the project with all of the measures I wanted to employ. So I became the general contractor. I designed everything and supervised the project.”

Research data reported the Base Flood Elevation (BFE) to be 397 feet. The ground level of each cabin is at 401 feet, four feet above the BFE. Each 1,800 square feet cabin rests on 18 concrete pilings. The pilings are 14 inches in diameter. They are embedded seven feet below the surface and eight feet above the ground. Each rests on a two feet by two feet concrete footer. The area beneath the cabins is used for parking.

McCumber fortified the cabins for high wind events. All floor joists have hurricane clips. All trusses have hurricane straps. There is connectivity from the roof to the floor. The hurricane straps are nailed to the 2x4’s which are anchored to the 2x12’s and the 2x12’s are anchored to the concrete pilings. He also secured the outdoor furniture and equipment. Benches and gas grills are anchored with hurricane straps nailed to 2x4’s chains and smaller barbecue pits are anchored in concrete.

In March 2008, flood waters from the Norfork River which feeds into the White River caused extensive damage in Norfork and surrounding towns. The Norfork River Resort remained unscathed.

Continued McCumber, “Because they haven’t been affected by a flood, people get complacent and they think they are going to be okay. So they don’t build above the flood plain and they don’t see the need in purchasing flood insurance. They call this area a floodplain for a reason—it floods! They don’t call something upon a hilltop, a flood zone. Another flood or hurricane might not come in my lifetime or it just might come tomorrow. So you have to prepare for it and you have to buy insurance.”

As of 2008 Norfork River Resort comprises 14 cabins and a 20 room lodge, none of which have been adversely affected by high wind or flooding.

“It costs more money to take mitigation measures up front,” said McCumber. “But it saves in the long run and you are spared the headaches of repairing or rebuilding.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Business Owner

Safe Room Project Proves Beneficial

Stone County, Arkansas

Stone County, AR – The sound of cars rushing, car doors slamming and people hurrying to safety was the scenario at Mountain View's unified school campus as area residents made their way to the schools' safe rooms fearing the wrath of a tornado. As it pummeled the town, more than 200 residents, occupying the schools' safe rooms, remained unscathed.

Robert Ross, principal of Mountain View Middle School located in Mountain View, Arkansas, had an eerie feeling about the weather forecast on February 5, 2008. What he didn't know was that a tornado categorized as an EF4 on the Enhanced Fujita Scale would soon make its appearance and accomplish the feat of demolishing homes, up-rooting trees, zapping power lines and spreading massive loads of debris.

Most of the people that came to the shelter were area residents. "It just seemed to be the people from the eastern part of the town," Ross said. Tornado events are common to the State of Arkansas. According to the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA), the state has experienced more than 1,600 tornadoes since 1950, with 239 tornadoes that were F3 and higher. With respect to tornadoes, Arkansas ranked third in the Nation in related deaths and fifth in injuries.

In an attempt at being pro-active Mountain View School District decided to build safe rooms in the elementary, middle and high school. They took advantage of FEMA's Hazard Mitigation Grant Program (HMGP) following the disaster declaration of December 29, 2000 (FEMA-1354-DR-AR). The safe room project was initiated March, 2002 and completed in April, 2004 at a cost of $1,537,397. Mount View School District received a $1,153,084 grant from FEMA through its HMGP.

The reinforced masonry safe rooms are massive. Total square footage in the elementary school is 4,200 sq. ft, middle school 2,400 sq. ft and high school 2,700 sq ft. Total capacity is approximately 1540 people.

Built according to guidelines outlined in FEMA Publication 361, *Design and Construction Guidance for Community Shelters*, the safe rooms provide a feeling of security.

Precautionary measures were taken to protect the back-up generators should the buildings lose power. The masonry walls surrounding the generators were raised to the height of the equipment to protect the generators from high winds and debris.

Though constructed to protect a student body of 1,300 students, faculty, staff and volunteers during the day, the safe rooms can also be utilized, after school hours, by individuals in the community seeking shelter from the storm.

"We've learned some lessons from the February 5 tornado event. We are going to be better prepared," Ross said. We are going to have water, extra flashlights and medical supplies stocked in the safe rooms. We're also going to share keys with some trusted individuals in the community and orientate them as to where the supplies and power sources are. We have already changed the locks on the doors to make them universal as well as added more emergency lighting.

Quick Facts

Year:
2000

Sector:
Public

Cost:
$1,737,397.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Combating Repetitive Loss

Crawford County, AR – Recovering from continuous flooding was all too familiar to Joey Work and his family. The nightmares began in 2000, re-surfaced in 2002 and again in 2004. Each time, floodwaters from the Mulberry River inundated their home, destroyed their possessions, caused massive clean-up efforts and wreaked havoc in their lives while struggling to recover. Repetitive loss claims totaled an astounding $152,080.20.

On August 17, 2004, Joey Work, a Department of Transportation employee, received a letter from the floodplain administrator of Crawford County. Work's home was declared substantially damaged (damage sustained by a structure whereby the cost of restoring the structure to its pre-disaster condition would equal or exceed 50 percent of the market value of the structure before the damage occurred). The 1380 square foot wood -frame home, valued at $64,383, required a repair cost of $45,758.

"My home was flooded twice in 2004, in April and again in August. I was told that I couldn't live in the house unless it was elevated", Work said. "Before this last event, I had gotten permission from the [U.S. Army] Corps of Engineers to raise the height of the little levee behind my house but that didn't work. Water rose above the levee and got into my house."

As a National Flood Insurance Program (NFIP) policyholder with a substantial damage claim, Work had to adhere to NFIP guidelines, including elevating his home at or above the Base Flood Elevation (BFE). The BFE is the computed elevation to which floodwater is anticipated to rise during the base flood and is also the regulatory requirement for the elevation or floodproofing of structures.

Dennis Gilscrap, the floodplain administrator, provided guidance throughout the elevation project. "I required him to get a surveyor. The BFE in his area is 420 feet. It was determined that his floor level was 418.8 feet," Gilscrap said. A firm advocate of freeboarding, Gilscrap urged Work to elevate the home above the recommended BFE.

"As an extra precautionary measure I always advise folks to raise structures above the BFE. Of course it's left up to the individual," Gilscrap said. "Mr. Work elevated to 421.54 feet, which gave him a free board of about one and a half feet."

The elevation project, which cost approximately $27,090 took a year to complete. Membership in the NFIP proved rewarding. In addition to building coverage, NFIP policyholders with substantially damaged homes are eligible for Increased Cost of Compliance (ICC) benefits. ICC coverage provides up to $30,000 to elevate, demolish, or relocate the home, protecting it from future flood damage. The coverage is included under all NFIP policies issued or renewed after June 1, 1997. ICC funds were used to defray the cost of the project.

In March 2008, the Mulberry River overtopped its banks. Floodwaters made a return visit to Work's property. This time he was prepared.

"I was totally frustrated when I realized we were living in a flood zone. I have lived here for 15 years. The previous owner didn't share that information," Work said. "This time we were ready for the flood. Water got up into the yard only. The elevation project was worth it."

Crawford County, Arkansas

Quick Facts

Year:
2004

Sector:
Private

Cost:
$27,090.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

"Sun" Comes Out in Charlotte Harbor Charley Leaves Town

Charlotte County, Florida

Charlotte Harbor, FL - Hurricane Charley came to Charlotte Harbor one Friday, with winds up to 114 mph, leaving the community stunned. Buildings were destroyed, and streets were filled with debris and downed power lines. While the storm was swirling through town, 30 newspaper employees braved the storm at their office unable to get home. They were dry and secure because the structure was built to resist strong winds and the windows were fitted with storm shutters.

In the mid-1990s, Richard Hackney, Vice President of Operations, lobbied the stockholders for storm shutters to protect the *Sun* newspaper building in Charlotte Harbor. His experience with Hurricane Andrew taught him that an investment in protecting and strengthening the building against intense storms would pay big dividends by reducing future repair costs and wasteful downtime while waiting for repairs. The shareholders agreed, and the shutters were purchased for $15,000. In the previous nine years, the shutters have been put up five times. During 2004, three times. According to Hackney, “Of all the storm events, Hurricane Charley has been the shutters’ most severe test; as yet, the building has not sustained any serious damage.”

When installed, storm shutters maintain building integrity by protecting the windows from direct wind pressure and windborne debris. If flying debris breached large office windows, wind driven rain could enter and cause the loss of valuable computers containing information on news stories, research, subscribers, and other files. Without that information they could not go to press. Intense winds coming in through these windows would cause “uplift” pressure on the roof system. Pressure inside the building along with the speed of the wind above the roof surface, could lift the roof causing catastrophic damage to the building, its contents, and anyone working inside. An adjacent building of similar size and construction, without storm shutters, lost its roof and most of the siding. In fact, it sustained so much damage the business was not operational, and had to be relocated.

According to David Dunn-Rankin, President of the *Sun*, “The shutters helped keep the roof on and kept us operational. If we had lost the roof…I don’t know…it’s frightening. Lost revenue, subscriber credits, computer replacement, press equipment repairs or replacement and production outsourcing all add up. We could have been looking at $3 million to get us back to where we could put out the paper here.”

The entire Charlotte Harbor area was without power, but even that did not stop the *Sun* from publishing. The paper was without power for 14 days. However, because the building integrity had been maintained, they were otherwise operational. Instead of shutting down, they hooked up a rented, 1750KV generator, and published the newspaper. “We didn’t miss a beat,” said Dunn-Rankin.

“It’s not just about the dollars, it’s about publishing.” said Hackney. It’s not even an option not to publish. We have to be able to protect our people, our building, our presses, and maintain our capacity to publish. We met our goal.” The *Sun* came out on the Monday following Charley’s hit on Friday.

Quick Facts

Sector:
Private

Cost:
$15,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Private funds

FEMA

Money Well Spent in Arkansas

Baxter County, Arkansas

Baxter County, AR – On February 5, 2008, when a tornado visited the town of Gassville, Arkansas, Jeanann Quattlebaum felt a certain calmness. Less than ten months prior, she and her husband, Robert, had purchased a storm shelter.

The Quattlebaums have been living in their subdivision for seven years. They purchased their home, which was not equipped with a safe room, from an area builder.

Arkansas is one of several states in “Tornado Alley,” a term used to describe a broad area of relatively high tornado occurrences in central United States. The state ranks fourth, after Texas, Oklahoma, and Kansas, with tornadoes that are F3 and higher.

Arkansas Residential Safe Room Program assists Arkansas homeowners who choose to install a shelter or safe room on their property. The program covers up to 50 percent of the cost and installation, not to exceed $1000.00, for shelters or safe rooms built on or after January 21, 1999.

The Quattlebaum’s storm shelter was purchased at a cost of $2000.00. They received a $1000.00 rebate from the state. The circular concrete structure is 10 feet in diameter and stands five feet tall. It has the capacity to seat six to eight individuals. During the tornado event of February 5, 2008, it housed six as the tornado touched the lives of Gassville residents. The tornado left behind one fatality and damages to homes and property, which ranged from minimal to extensive.

With proper installation, storm shelters and safe rooms serve as protection from injury or death caused by the dangerous forces of extreme winds. They can also relieve some of the anxiety created by the threat of an oncoming tornado or hurricane.

The decision to build or purchase a shelter should include notifying local emergency managers and family members or others outside the immediate area. This will allow emergency personnel to quickly free the exit should it become blocked by debris.

Quick Facts

Sector:
Private

Cost:
$2,000.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
State sources

New Developments' Construction Standards Require Wildfire Mitigation

San Diego County, California

Rancho Santa Fe, CA – More than 2,460 multi-million-dollar houses, built to the highest construction standards possible including expansive defensible space around and within the home development areas, survived extremely well when the Witch Fire stormed through the area in October 2007.

The blaze burned up to plants on defensible spaces and stopped. Embers blown into areas of the estates bounced off tile roofs with boxed-in eaves, stucco walls, patios, and other areas, and died out without leaving more than incidental damage, basically scorched plants. A half-dozen charred embers the size of footballs were found in the Cielo estates, and “nothing was burned,” said Ken Crosby, one of the realtors for the estate areas.

Five Rancho Santa Fe developments, completed just three-plus years before the Witch Fire came, basically set construction standards on the “shelter in place” concept developed in Australia. The standards for construction and mitigation, including mandated interior fire sprinklers, extensive defensible space, and use of fire-resistant vegetation, are the “toughest in the country,” according to Cliff Hunter, fire marshal for the Rancho Santa Fe Fire Protection District, which provides fire protection for the five developments.

The strict development standards make homes in the shelter-in-place communities safer places to stay if residents are not able to evacuate from the areas, according to fire officials. They advise people to evacuate rather than stay to fight fires or simply shelter in place because their homes are considered to be safe refuge.

The estate homes were constructed with materials and techniques intended to make the structures as resistant as possible to effects of wildland fires. Only slow-to-ignite plants may be planted nearer to houses. The standards are strictly maintained by the Rancho Santa Fe Fire Protection District’s fire marshal.

The Sargenti home is on the eastern edge of The Crosby. There is a wide swath of defensible space adjoining the backyard. Smoke and ash came into their house through the drier vent, and there was smoke in the garage, Sargenti said.

The couple said they attended a program staged by the Rancho Santa Fe Fire Department to explain how the shelter-in-place program works. It was there they learned that the concept had not been tested in the United States and that they should “get out early” if they chose to evacuate, and what to do if they stayed.

The fire was coming their way that Monday, so they left. When the reverse 911 call came in at 9 a.m. that Monday morning, “we were long gone,” Sargenti said.

Steve Sargenti said he “knew [the] house was intact,” and when the family returned, they found their house was untouched, other than smoke inside. Embers that landed on the concrete tile roof had burned out, and the courtyard in front of the house “was a repository” for spent embers, he said. Two plants in the backyard were damaged.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

Gloucester County Hazard Mitigation Programs Local Government Continues Commitment to Mitigation

Gloucester County, Virginia

Gloucester, VA - Because of its proximity to the mouth of the Chesapeake Bay, Gloucester County, particularly its Guinea community, is subjected to periodic flooding from coastal storms. Flooding is exacerbated in the coastal areas because of the numerous wetlands, streams, and creeks in the County.

With three flood events over four years, the County realized the need to do something different to protect its citizens and their property. Although many families had obtained a Standard Flood Insurance Policy through the NFIP, most of the homes in the affected areas were located just inches above the ground. The limited elevation of the structures led to severe damage to hundreds of home in the community during these storms.

Shortly after Hurricane Isabel came through the County in September 2003, the County applied for its first grant through the HMGP. In the fall of 2004, Gloucester County hired a planning firm to assist with applying for and managing its storm recovery efforts. The purpose of the application was to help purchase destroyed homes to reduce future losses or to help elevate the homes where the owners wished to rebuild in the community. With the help of the planning firm, the County received its first Hazard Mitigation Grant in the spring of 2005.

In Phase one of the Isabel Hazard Mitigation Grant Program 15 properties were purchased and demolished and six homes were elevated. Phase two was awarded in the summer of 2005 and has resulted in the purchase and demolition of one additional home with work under way on the elevation of 22 additional homes. The County is also working on using its extra funding from the Isabel grants to potentially elevate an additional six homes from its FEMA-approved substitution list.

A subsequent grant provided because of flooding from Tropical Storm Gaston will allow another three homes to be elevated by the middle of 2008. A grant application for the elevation of 18 additional homes was submitted and awarded in the spring of 2007. To comply with Gloucester County's floodplain ordinances, all homes are elevated so that the first floor is at least one foot above the established Base Flood Elevation.

The County has also decided to apply for a 2008 PDM grant with the intention of purchasing five homes for clearance and creating permanent open space in some of its more problematic Zone VE areas. These will not only help reduce the potential loss of life and property in the affected areas, but will also help reduce future pollution of the Chesapeake Bay.

Additionally, the planned acquisitions will be in keeping with the Governor’s initiative to acquire or conserve 400,000 additional acres of open space throughout the Commonwealth.

The acquisition of the dozens of homes that were located in various VE-10 to VE-12 zones located along the coast of Gloucester County has allowed owners to sell their homes at the fair market, pre-storm value and relocate to a safer section of the County.

Quick Facts

Year:
2003

Sector:
Public

Cost:
$5,400,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Moo-ving On Up: Critter Pads Keep Farm Animals Safe From Floods

King County, Washington

The State of Washington - When flood impacts a farm community, there are many challenges and complications. Not only must residents get themselves out of harm's way, but they also must protect their livestock, secure farm equipment and supplies, and deal with many other issues.

Jason Roetcisoender's family has owned their 120-acre farm in Duvall, Washington since the 1920s. Throughout that time, there have been numerous floods that have impacted their home and property. In a flood in 1975, while the farm was run by Jason's father, they lost 32 cows. In Duvall's flood-of-record in 1990, the family lost 120 animals to high water.

"After the flood in 1990, Washington State and King County approved emergency permitting for the installation of critter pads," said Mr. Roetcisoender. "The local farmers, including my father, went to them to try to find a solution to the flooding, and that was one of the remedies they came up with."

A critter pad, or livestock flood sanctuary mound, is an area where approved fill material is used to raise the ground above the Base Flood Elevation (BFE). When flooding occurs, farmers move their livestock onto the pads to keep the animals out of the water's reach. Critter pads require special permitting and must be specifically designed to ensure they have a negligible impact on the floodplain. They also may not be built within the boundaries of a river's floodway.

Since the Roetcisoenders completed their critter pad in 1991, they have had to use it on three occasions, including the November flood of 2006. In that November 2006 incident, Mr. Roetcisoender was able to move over 300 head of cattle onto the pad and keep them safe. They also filled two of the family's trucks with feed and drove them up onto the pad to be safe and easily accessible.

In the nearby Town of Carnation, Michelle Blakely has a 33-acre farm where she grows organic vegetables and fruits, and raises chickens, cows, pigs, and turkeys. When they purchased the farm two years ago, a critter pad was already in place, built by the previous owner. According to Mrs. Blakely, the pad was part of the incentive to acquire the land.

Unfortunately, in 2006, when the waters rose during the November flood, despite being above the BFE, it turned out the pad was not high enough. Upon returning to their home following a mandatory evacuation, the Blakelys found that all their chickens and turkeys were gone.

The Blakelys suffered significant financial damage to their farm from the 2006 flood, a good portion of it in poultry losses. Not wanting to go through this again, they decided to raise the critter pad even higher. They purchased permitted fill, rented a bulldozer, and raised the pad almost three feet.

When the floodwaters came again in December of 2007, the Blakelys felt they were ready. Working fast, the Blakelys managed to relocate their birds from coops on different areas of their property to the elevated pad, even as rising waters surrounded them. If the chickens and turkeys had not been moved to the critter pad, they would have been lost. This time, the Blakelys managed to save almost 1,500 birds from floodwaters.

Quick Facts

Year:
1990

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

Residential Contents Coverage: Protecting Personal Property With Flood Insurance

Lewis County, Washington

Chehalis, WA - Karen McGhee and her husband Terry have rented multiple homes in the City of Chehalis, Washington over the years. In 1990, they sat in their hilltop house and watched as floodwaters rose throughout the town below them.

Years later, in 1996, after having relocated to a new rental property, the McGhees had a much closer look at the water as their home was inundated by record flooding. They were forced to evacuate the property for seven days and suffered significant damage and loss of many of their belongings. Following this event, the McGhees purchased renter's flood insurance to protect the contents of their home.

Only insurance companies within communities participating in the NFIP can provide this federally subsidized coverage. Following the flooding of 1996, the McGhee's landlord chose to elevate all his rental properties to at least one foot above the Base Flood Elevation (BFE), which is defined as flood levels having a one percent chance of being equaled or exceeded in any given year.

With their home damaged in the flood, the McGhees elected to move to another of the landlord's properties, which had a bigger house that had also been elevated and more land for them to grow a garden and raise various animals.

Even after moving to their new home, the McGhees chose to maintain their flood insurance policy, transferring it to the new rental property. Mrs. McGhee reported that establishing the policy and making changes to it was easy and convenient.

One of the advantages of the NFIP is that the financial risk is spread across the country, making insurance policies available to residents of participating communities at extremely reasonable rates, especially for those people living outside the Special Flood Hazard Area (SFHA).

In December 2007, when weather conditions once again resulted in record flooding throughout Lewis County, the McGhee's house came under threat of inundation. With an hour's warning, they were forced to grab what they could and flee their home.

Upon returning once the water had receded, they learned that despite their house having been elevated above the BFE, there had been three feet of water in their house, and that at least three inches of mud was left behind. Sadly, many of their animals were lost to the high water, and their gardens were ruined.

Packing up what they could salvage, the McGhees once again relocated, moving back to the home they had lived in prior to the 1996 flood. They filed their claim with the insurance company and went through the process of filling out paperwork and getting their inspection. Mrs. McGhee stressed the importance of preparation both before and during this period.

Since filing with their insurance company, the McGhees have learned that they are being covered for the depreciated value of their damaged property. For an investment of less than $100 a year, they are receiving over $10,000 in coverage.

Quick Facts

Year:
1996

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood Insurance

Primary Funding:
Homeowner

Fuel Modification Protects Master-Planned Community

Orange County, California

Orange, CA – Devastating wildfires raged across Southern California in October 2007. One of these fires, known as the Santiago Fire, came extremely close to the master-planned community of Serrano Heights, in the city of Orange. Fortunately, no homes were damaged in the community due to carefully designed fuel modification zones and fire-resistant construction of the houses.

The Santiago Fire destroyed 15 residential structures and nine outbuildings and damaged eight residential structures and 12 outbuildings, according to the California Department of Forestry and Fire Protection (CAL FIRE). Strong Santa Ana winds, in conjunction with dry vegetation, spread the fire over thousands of acres, making it extremely difficult for firefighters to contain it.

As a master-planned community, Serrano Heights involved much advance planning and ongoing coordination between private and government entities. Serrano Heights is located on a hillside and is divided into west side (Phase I) and east side (Phase II). The west side fuel modification area falls under the jurisdiction of the city of Orange and the east side falls within the jurisdictions of the cities of Orange and Anaheim.

In order to avoid a potentially difficult problem with power line easements and to comply with fuel modification requirements, the landowner worked closely with the city of Orange fire department, the county of Orange, and the city of Anaheim fire department during the planning process. The result was a creative solution to the power-line problem by creating a park and approximately 200 acres of preserved open space which benefits the residents.

Serrano Heights was built according to the City of Orange Fire Department stringent rules for fuel modification zones, fire officials said. The zones are wide strips of land where combustible vegetation has been removed and/or modified and replaced with drought-tolerant, fire-resistant plants to provide an acceptable level of risk from wildland and vegetation fires.

A company was hired to prepare a fire behavior analysis and preliminary fuel modification plan for Serrano Heights. The plan included detailed studies regarding fire environment, Southern California climate, wildland fire behavior, local fire history, general and individual lot recommendations for fuel modification zones, and additional fire protection measures.

The plan was reviewed and approved by the city of Orange and city of Anaheim fire departments. During implementation and construction, the fire departments of both cities carefully monitored each phase to ensure the requirements were met.

The requirements and guidelines for areas inside homeowners' property lines are specified in the Covenant, Conditions, and Restrictions (CC&Rs) and in the deed for each property. They are enforced by a management company and the Serrano Heights Homeowners Association (HOA). The areas outside of the homeowners' property lines are maintained by the HOA.

All residences in the community were built to meet standards from the Uniform Building Code (UBC) and the Uniform Fire Code. These codes take into consideration multi-hazards including seismic activities.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

High Marks for Accuracy: Tracking Flood Levels in Lewis County

Lewis County, Washington

Lewis County, WA - Lewis County, Washington has a long history of damaging floods originating from three major rivers (the Chehalis, Cowlitz, and Nisqually) as well as numerous tributaries, including the Newaukum and Skookumchuck Rivers.

“Past floods have really taught us a lesson,” said Martin Roy, a senior engineer and surveyor for the Lewis County Department of Public Works.

On December 1st, 2007 Lewis County was again inundated by a flood of record proportions. This time, the Chehalis River overflowed its banks and poured huge amounts of water into the streets and structures of several Lewis County communities. Water levels were recorded as high as nearly ten feet above the Chehalis’ normal flood stage in some areas.

Having learned the lesson from delays in previous floods, Martin Roy and his team did not hesitate to act. “The flood occurred on a Monday,” said Mr. Roy. “On Tuesday afternoon, as the water was still receding, we were out marking peak water elevations.”

The procedure to capture water elevation data is initially simple. A series of points are marked throughout an impacted community. These can take the form of marks made on walls, nails driven into telephone poles, and other similar methods of indicating how high the water actually reached. At each point, a Global Positioning Satellite (GPS) reading is taken and a description of the area and marking is noted.

After durable markings are placed and catalogued, surveyors can return at a later date to determine the elevation of the high water marks using precise instruments.

Previously, high water mark collection in Lewis County was funded by matching grants provided by the Washington Department of Ecology’s Flood Control Assistance Account Program (FCAAP), resulting from a channel migration study. This year the Department of Ecology is assisting directly in the high water marks study with the contribution of equipment and personnel.

“We’re teaming up with the Cities, the State’s Department of Ecology, and the Federal Emergency Management Agency (FEMA) to complete the collection of elevations,” said Matt Hyatt, Lewis County’s Geographic Information System (GIS) Manager. “Our GIS Division is acting as the central location for collecting and distributing the maps and information that will aid in the planning effort. Once all the elevations have been surveyed by the different agencies, we’ll compile them into a single map which will demonstrate the extent and depth of the inundation area, and assist analysis by the flood engineers and specialists to better understand the exact nature of this event.”

Having such data improves the quality and accuracy of flood hazard mapping, flood insurance studies, and flood risk analysis. Greater detail in high water mark tracking assists in the approval and success of grant applications and helps with prioritization of elevation and acquisition projects.

Quick Facts

Year:
2007

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

FEMA

Information from Fire Department Increased Awareness

San Diego County, California

Rancho Bernardo, CA - Bette Blankenship became familiar with defensible space and other ways to mitigate her property from the effects of wildfires through brochures her children brought home from school. The brochures came from San Diego's fire department, which was in the process of providing information about fire prevention and mitigation to students at schools in the Rancho Bernardo area. After she read the materials, Blankenship knew she had to take action, and did.

She is convinced that the type of materials used in upgrading her home, the removal of trees and plants prone to burn and spread fire, and the expansive back yard that serves as defensible space saved her home from the Witch Fire in 2007, while homes directly across the street were lost.

When Blankenship and her family moved to their home in 1998, the lower portion of their .75-acre property was covered with avocado and citrus trees. After learning about fuel modification, Blankenship and her husband, Gregg, started removing the hazardous trees from their back yard. The effort took three years at a cost of $7,000. Bette started planting fire-resistant plants in 2002. Ice plant and other fire-resistant plants of a variety of species now cover their back-yard.

The Witch Fire in October 2007, which devastated much of their neighborhood, started near Santa Ysabel and spread to Ramona, Rancho Bernardo, Poway and Escondido. Burning embers, driven by powerful winds generated by Santa Ana conditions, flew over Interstate 15, spawning fires west of the highway. The Witch Fire continued west, causing significant damage in Lake Hodges, Del Dios, West Rancho Bernardo, and parts of Rancho Santa Fe.

Far and away the biggest of 24 wildland fires that burned in the seven-county disaster area in Southern California, the Witch Fire caused two deaths and injured 40 firefighters, according to Cal Fire, the state's fire agency.

The Blankenship home, constructed in 1978, has concrete roof tiles, stucco walls, enclosed eaves, double pane windows, and the fences and wood on exteriors are treated with heat-resistant materials.

Quick Facts

Sector:
Private

Cost:
$7,000.00 (Estimated)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Homeowner

Laguna Beach Goat Vegetation Management Project

Orange County, California

Laguna Beach, CA – Laguna Beach has been using goats as part of its fuel reduction and vegetation management program since the early 1990s. City Manager Ken Frank got the idea from a similar program in the San Francisco Bay area. The program was expanded after a wildfire burned across 14,000 acres, destroying or damaging 441 homes in the beach community in 1993.

Because of the climate, types of natural vegetation, and expansive wildlands in Southern California, including wildlands that reach into the city, there is an ongoing risk of wildfires. Fully aware of the risk, the Laguna Beach Fire Department is very proactive in vegetation management.

One of the best ways to control wildfires is to control the amount of fuel available to feed the flames. These areas can be difficult to reach by most vegetation management equipment due to the nature of the terrain – rocks, canyons, and steep inclines. The introduction of goat herds in these areas has proven to be an ideal solution to the problem.

In 1995, Laguna Beach applied for and received a grant from the FEMA Hazard Mitigation Grant Program (HMGP), which is administered by the Governor's Office of Emergency Services. FEMA's grant was $396,000 and the city's share of costs for the expanded program was $132,000. The FEMA grant funded the program for two years and the city has continued the effort ever since, at an annual cost of $125,000.

The goats work exclusively on 11 fuel modification zones located on the outside edges of the city. Since California weather allows it, the goats work year-round and are moved from place-to-place as needed. Depending on the amount of rain and vegetation growth each year, as few as 75 and as many as 600 goats are used. A movable goat pen with electric fencing keeps the goats from wandering off and protects them from coyotes and other wild animals, said Lardie.

Fuel reduction by goat grazing is more widely accepted than chemical and mechanical alternatives because of its sustainability. Another added benefit to the program is the cost, which can be considerably lower than other methods available.

Quick Facts

Year:
1993

Sector:
Public

Cost:
$396,000.00 (Actual)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Vegetation Made the Difference

San Diego County, California

San Diego, CA – Herb Peters is convinced that ice plant placed on three sides of his Rancho Bernardo home early in 2007 was a major reason his 1,500-square-foot house did not burn when the Witch Fire roared through his neighborhood during the morning hours of October 21, 2007.

The ice plant and more than 50 feet of wax-leaf ligustrum hedge that lines the north side of his elevated corner lot, facing in the direction from which the Witch Fire came, “had a great deal to do with saving our house,” Peters said.

In April, Peters removed an older type of ice plant that had been growing on the property for well over 20 years and replanted the slopes with 180 flats of the new ice plant. The ice plant is watered three times a week and is “very fire-resistant,” Peters said.

Removing flammable native vegetation and replacing it with low-growing, fire-resistive plants is one of the easiest and most effective ways to create a defensible space, according to the Fire Safe Council. Fire-resistive plants grow close to the ground, grow without accumulating dead branches, needles or leaves, and are easily maintained and pruned, the council said. Some of the more common species of fire-resistive plants include ice plant, periwinkle, rosemary, and African daisy, the council said.

The fire hit the area between 3:30 and 4 a.m. Herb and Jill, got the call to evacuate while they were in Omaha, Nebraska, visiting with family. Peters’ son was taking care of their home. A neighbor across the street called and said burning palm tree fronds “were flying.” Flames and embers blew under tiles of neighboring houses, and the homes “blew up,” the neighbor told Peters.

Houses with asphalt shingles in his neighborhood “are still standing,” Peters said. “Winds were blowing through here at 80 to 100 miles per hour.” He added that “some beautiful multi-million dollar homes” in Rancho Bernardo were destroyed during the conflagration. Houses burned on every side of his home. Peters added that wooden fencing on both sides of West Bernardo Road, a bit more than a block away from his home, acted as a “wick,” or fuel, that fed the fire.

The Witch Fire destroyed 1,125 homes. Another 77 homes were damaged, 499 outbuildings were destroyed, and 26 outbuildings were damaged by the conflagration that blew over Interstate 15 to burn into Mr. and Mrs. Peters’ neighborhood, according to Cal Fire, the state fire agency.

Cinders bounced off the asphalt shingle roof of his home without causing damage to the roof, only burning a piece of outdoor carpeting on the patio, Peters said. Although Peters considers the asphalt shingle roof on his home as “quite fire-resistant,” he will replace it, as soon as he receives his insurance settlement, with new asphalt shingles with a higher fire-resistive rating. He also will install rolls of new R-30 rated insulation in the attic.

Peters said it cost less than $6,000 to landscape his property with fire-resistant vegetation. That is far less than what it would cost for Herb and Jill Peters to rebuild their home. Peters estimates it would cost $250,000 to $275,000 to replace his home.

Quick Facts

Sector:
Private

Cost:
$6,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Higher and Higher: Life Above the W aters

Lewis County, Washington

Lewis County, WA - Over the past three decades, Washington State has experienced numerous record floods resulting in widespread destruction of property and tragic loss of life. These events have demonstrated the necessity of building stronger, safer, and smarter to protect the people, homes, and businesses in flood affected areas.

Retrofitting existing structures or designing new buildings to be disaster resistant can significantly reduce the threat of future damage and lower long-term financial risk. While staying out of the path of potential floodwater is the best choice for avoiding danger, this is not always an option. In such situations, the next best choice is to be above it.

Following the flooding of 1996, Bob and Loyann Munyan, residents of the flood-prone City of Centralia in Lewis County, were approached by a neighbor with information about a home elevation program. The Federal Emergency Management Agency (FEMA) had available funding through the Hazard Mitigation Grant Program (HMGP). The HMGP provides 75 percent funding for approved projects, which frequently include home elevations or relocations, while the State, Local governments, and often homeowners themselves, contribute the balance. Grants are applied for by local communities working in partnership with the State and FEMA.

“We added our name to the list,” said Loyann Munyan, “and we were told we had been approved for a 100 percent grant to raise the house.”

The Munyans elevated their home 5 feet, 10 inches above its previous height, bringing their floor level one foot higher than expected maximum flood levels for their community. Without the grant, they were informed that the elevation would have cost approximately $30,000.

During the December 1st flooding of 2007, record setting storms brought water to within seven inches of their front door.

In the nearby City of Chehalis, schoolteacher Kevin Fields watched the waters rise on December 1st, but felt confident that his house would remain safe, even while the homes of his neighbors began to flood. Like the Munyans, Mr. Fields’ home had been inundated during the 1996 floods. The previous owner, tired of the repeated cycle of flood damage and repair, decided to sell. He bought the home with the intention of elevating it.

“The City wanted me to elevate at least four feet,” said Mr. Fields. “That would have been one foot above the 1996 flood levels. I went four feet higher than that and elevated a full eight feet.”

Given his expertise and easy access to equipment and materials, the cost of the elevation was less than $10,000. According to Mr. Fields, since the elevation, there have been at least a dozen floods in his neighborhood. Though typical water levels in the area only reach ankle to knee deep, this would still be sufficient to flood the first floor of a ground level home.

Quick Facts

Year:
1996

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Poway Home Spared by the Witch Fire

San Diego County, California

Poway, CA - Ken and Bonnie Constable will never forget the terror they experienced the morning of October 23, 2007, when a wind driven wildfire came up to their front yard. Remarkably, their home was spared, and even though they lost a well house, a water tank, and many trees, there were no major damages to the house itself.

The Constables received the reverse 911 call to evacuate the morning of October 22 before the fire had reached their area. By that night, they could see the fire coming over the hills, so Bonnie took the dogs and left to stay with her mother in the southern section of Poway.

Ken decided to stay and was awakened in the middle of the night by one of his neighbors, warning him that the fire had reached the west and south side of his property. Ken, his sons, friends, and some men in the neighborhood helped firefighters combat the fire as much as they could. They were successful in keeping it from all of the homes on their street.

The Constables have lived in their home in Poway for almost 30 years. They bought the home three years after it was built and have done many improvements over the years to make it safer. The 2,800-square-foot home, which is solar-powered, has a stucco exterior and a Class A fire-resistant (clay tile) roof.

Some of the improvements include an asphalt driveway in front of the house, concrete slab on the sides, and a pool area in the back separate the house from fruit trees and grassy areas, creating a defensible space. A defensible space around a home provides firefighters enough space to work, and it also prevents fire from transferring from one fuel source to another.

One of the main reasons why the Constables' home did not burn was due to the fact that they removed weeds from their property, considerably reducing ground fuel. This prevented the fire from propagating too fast. Ice plant at edges of their property also proved to be efficient in stopping the fire, according to Ken Constable.

Additional future mitigation measures include removing flammable trees and installing a pump for the swimming pool enabling them to use the 27,000 gallons of water for firefighting and to enclose the eaves on all sides of the house. They are committed to doing what they can to make their home safer.

Quick Facts

Year:
1993

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Venting Breakaway Walls Saves Homeowner Thousands

Okaloosa County, Florida

Okaloosa County, FL - Dan Sluka and his wife, Dottie, moved from Detroit, Michigan, to the Gulf Coast of Florida in 2001 after building their dream home in a Special Flood Hazard Area a few miles east of Pensacola, with a view of the Santa Rosa Sound and the Gulf of Mexico beyond.

The Sluka's property is located in Zone AE. However, because they are only 1,000 feet from the water, they decided to build to the more rigorous V Zone standards. Their builder used wooden pilings to strengthen the structure of the house against storm surge and to raise the main part of the house several feet higher than the minimum height required by the county.

The code for their county allows areas under elevated homes to be enclosed and used for storage and parking. The Sluka's builder surrounded the area under the home with breakaway walls. To improve wind resistance, the house is built with 2"x 6" studs, hurricane straps, wind-resistant shingles, and hurricane shutters on all doors and windows. The outside air-conditioning unit is installed on a platform several feet above the ground.

In the years before 2004, when Hurricane Ivan hit the Florida Panhandle, Dan stored his tools, sporting equipment, tapes of past music concerts, and filing cabinets with several years of archived work and personal papers in the enclosed area under the home.

The Sluka's home performed as designed during Hurricane Ivan, but not quite the way they'd hoped. The storm surge associated with Ivan delivered floodwaters considerably higher than the "100-year" (1-percent-annual-chance) level, causing widespread damage throughout the area.

Although the Sluka's main living area was undamaged, when the breakaway walls failed as designed, everything inside the storage area—tools, tapes, personal papers—was washed away. In terms of damage to the building, high winds caused minor siding damage. Dan estimates it cost about $24,000 to repair the flood damage. His NFIP flood insurance policy covered some flood damage to the building, but not to the stored belongings, the latter of which Dan estimated were worth about $20,000.

Dan decided he wanted to do something different when repairing so the breakaway walls wouldn't fail so easily in future storms. He researched hydrostatic pressure and discovered a manufacturer making engineered and certified flood vents, which could help limit future damage while still protecting the primary structure from wave and surge forces.

Dan then had his builder install the flood vents when replacing the breakaway walls. Knowing the enclosure will flood during future hurricanes, Dan decided to take another precaution to better protect their stored property. He built a loft space in the garage adjacent to the storage room. Now, when a hurricane moves into the Gulf, he relocates the stored items to the loft until the threat passes.

Dan's idea to install flood vents in the breakaway walls was tested in 2005 when Hurricane Dennis flooded the neighborhood. Although 2.5 feet of water entered the storage area through the flood vents, instead of a large bill to repair the breakaway walls, says Dan, "I just had to power wash the walls. We didn't have any damage."

Quick Facts

Sector:
Private

Cost:
$801.00 (Actual)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Veteran Firefighter Uses Mitigation to Protect His Home

San Diego County, California

Fallbrook, CA - As a veteran firefighter, Gary Bottenfield understands the nature of fires and knows how to be prepared. Bottenfield has lived in Fallbrook for 32 years with his wife, Lana, where they have survived three major fires.

As the Rice Fire made its way toward Interstate 15 and jumped across Pala Mesa Resort Golf Course, the Bottenfields knew their house was in great danger. They received the reverse 911 call on Monday afternoon and took shelter at their daughter's home in Temecula. Even though it was painful to leave their home, as law-abiding citizens they understood the importance of listening to the authorities and following mandatory evacuation orders.

When Bottenfield returned home on Wednesday afternoon, he found the house intact even though his next door neighbor's house and two other homes within view were completely gone. He later learned that once his neighbor realized his home was already a total loss, he worked relentlessly with the firefighters to keep the flames from getting any further.

When asked why he believed his house survived the Rice Fire, Bottenfield replied: "The fact that I mowed my weeds saved my house. One of my neighbors and I share a mower and we tear the blades up every year." Said Bottenfield, "We make sure we always mow everything down to the dirt."

Something as simple as mowing the weeds was a lifesaver for the Bottenfields; but that is not the only mitigation safety measure they have. Their 2,677-square-foot stucco home has a concrete tile roof, boxed stucco eaves, fire sprinklers inside the house and attic, smoke detectors in virtually every room, double-pane glass windows, and a carefully planned defensible space on the 2.7-acre home site.

The cost for using boxed stucco eaves instead of the regular wood ones that were in the original construction plans was approximately $1,500 extra. The cost for having sprinklers installed inside the house was $3,500. Money well-spent, according to Bottenfield. The replacement value of his home has almost doubled from the $350,000 he spent years ago, so Bottenfield was happy to spend a little extra to make his home safer and stronger.

Quick Facts

Sector:
Private

Cost:
$5,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Multiple Mitigation Measures Save Home from Wildfire

San Diego County, California

Jamul, CA – In October 2007, fire surrounded the home of Bob and Suzy Bullock, who live approximately 25 miles east of San Diego near Jamul. They evacuated, and when they came back they found their home intact – protected by all the mitigation measures they took.

On a 10-acre site in the wildland area above Deerhorn Valley, the Bullocks' home sits surrounded by scorched hillsides and gulleys. The Santa Ana winds drove the Harris Fire, one of the biggest fires of the Southern California wildfires in 2007, through the area. The fire destroyed 19 homes within sight of the Bullock property.

A wide swath of defensible space planted with fire-resistant vegetation that is watered regularly with a special irrigation system helped save their home. So did its construction – a tile roof with boxed-in air vents that repel flying embers, stucco walls, concrete aprons around three sides of the structure, and the asphalt driveway at the back of the house. The Bullocks also have a fire hydrant (required by the county as a condition of the building permit) fed by water from a 10,000-gallon water tank.

The Bullocks' advance preparations included coating their house with a fire-repellent gel. The gel is applied as a mist with a garden hose. The "fire-blocking gel" should be rehydrated with a misting every eight hours. Firefighters from Lake Tahoe re-misted the gel while the Bullocks were gone.

The concrete aprons extend 10 to 21 feet from the outer walls of the house. The 16-foot-wide asphalt driveway behind the house serves as an apron there. The Bullocks also have an irrigation system installed for watering plants in the defensible space.

The next thing the Bullocks will do to enhance protection of their property is remove a pine tree that was growing next to the water tank behind and upslope from their house. That decision was made when the Bullocks found out that vegetation by a water tank could ignite, destroying the water tank, as had happened on other properties in other fire areas.

The overall cost of mitigating their house with aprons, defensible space, including the irrigation system, well, fire hydrant, fire pump, and fire hose totals $85,000. The cost of constructing their house in 2003 was $600,000. The Bullocks' insurance company estimated late in 2007 that it would cost approximately $775,000 to replace their home if it had been a total loss. That makes the cost benefit ratio 9 to 1. The house is insured for $800,000, Bullock said.

The Bullocks encourage everyone to consider what they may do to protect their homes and consider that the extra costs are well worth it.

Quick Facts

Sector:
Private

Cost:
$85,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

FEMA

Built to Protect Against Floods, Windstorms and Earthquakes

Columbia County, Oregon

Astoria, OR - In 2000, Randy Stemper, life-long resident of Astoria and owner of Astoria Builders Supply Co., decided to design a new building. The original owner built the first business structure in 1942, and since then the building had been damaged by flood and wind storms and had been repaired several times.

Stemper's family bought the business in 1961, and he purchased the business from his family in 1987. During the 1996 severe flooding/high wind storm, the old building, which had been elevated, again suffered significant damage and loss of inventory. Randy began doing research to see what could be done to reduce or eliminate damages to his business.

Stemper hired engineers to design a building that would protect his investment from damages and his employees from injuries resulting from floods, wind storms, and earthquakes. The storm drainage system was re-engineered, and the entire structure incorporates the best features of continuous load-bearing construction.

The building is anchored on pilings set 60 feet into the bedrock. The all-steel exterior is reinforced from the roof down to the floor and then secured to the pilings, and the roof sections were machined together so that there are no seams to catch the wind.

David Pearson, the curator of the Columbia River Maritime Museum in Astoria, said that "Randy worked very closely with the city planners in developing an exterior design that would enhance the city. This town has a great maritime history and keeping with this theme is very important for the community."

The Astoria Builders Supply Co. building was completed in 2001, and the construction was tested during the extreme high winds that hit Astoria in December 2007. The building withstood the storm with virtually no damage, saving thousands of dollars, and the business kept operating. The community benefited by having the supplies ready when they needed them.

"I have used this type of continuous load-bearing construction on other buildings, including my new home," stated Stemper, "and these techniques will be used on the new Astoria hospital."

According to Wolf Read, meteorological consultant for the Oregon Climate Service, "The Great Coastal Gale brought hurricane-force winds, with peak gusts of 85 miles per hour at the Astoria airport."

The December 2007 windstorm caused major damage to buildings in Astoria as well as in other communities along Oregon's northwest coast. The undamaged Astoria Builders Supply Co. is testament to the rewards of building "stronger and smarter."

Quick Facts

Year:
1996

Sector:
Private

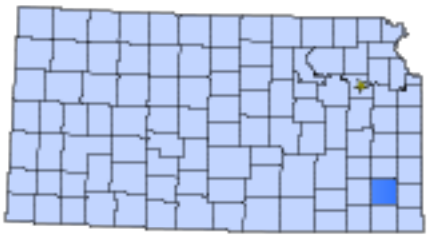
Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Business Owner

FEMA

Mitigation Practices Tested During Flooding



Neosho County, Kansas

Chanute, KS - Hans Harold and his wife, Donna, woke up around 4:30 a.m. on June 30, 2007 to find their house surrounded by water.

Because of the Federal Emergency Management Agency (FEMA) directives from 2002, the Harold family elevated their house and used a method that allowed flood waters to flow under the house. Initially, those instructions upset Harold, but he was grateful to be above water in June when the Neosho River flooded the area.

Harold had to elevate his new house one foot above the 1951 flood line of the nearby Neosho River, which was marked on a fence post in his front yard at 2-feet, 5-inches above the ground. The Harold's home was three feet above water when the Neosho River flooded the Chanute area.

The front of the house was elevated four feet using fill dirt. The back of the yard slopes naturally and was built up by the concrete foundation.

Harold searched the Internet for ways to incorporate freeboard into his plans and discovered that most designs were too costly.

As a result, Harold devised a system of swinging windows that were constructed by a local welder, and his contractor incorporated them into the foundation. This made him eligible for a lower flood insurance rate.

The mitigation practices were put to the test when the Neosho River crested at 3-feet, 5 -inches along with water from the small creek that runs behind the property and the six inches of rain that fell during the night of June 30.

The Harold's house and a nearby business that also elevated their building based on FEMA guidelines endured the flood and rain. Other homes in the neighborhood flooded.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Property Owner, Residential

FEMA

2nd Avenue SEA Street
Seattle, Washington

State-wide,
Washington

Seattle, WA - The 2nd Avenue Street Edge Alternative (SEA) Street project was a pilot project undertaken by Seattle Public Utilities to redesign an entire 660-foot block with a number of Low Impact Development (LID) techniques. The goals were to reduce stormwater runoff and to provide a more “livable” community.

Throughout the design and construction process, Seattle Public Utilities worked collaboratively with street residents to develop the final street design. The design reduced imperviousness, included retrofits of bioswales (landscape elements intended to remove silt and pollution from surface runoff water) to treat and manage stormwater, and added 100 evergreen trees and 1,100 shrubs.

Conventional curbs and gutters were replaced with bioswales in the rights-of-way on both sides of the street, and the street width was reduced from 25 feet to 14 feet. The final constructed design reduced imperviousness, or resistance, by more than 18 percent.

The costs for the LID retrofit were compared with the estimated costs of a conventional street retrofit. Managing stormwater with LID techniques resulted in a cost savings of 29 percent. Also, the reduction in street width and sidewalks reduced paving costs by 49 percent.

For this site, the environmental performance has been even more significant than the cost savings. Hydrologic monitoring of the project indicates a 99 percent reduction in total potential surface runoff, and runoff has not been recorded at the site since December 2002, a period that included the highest-ever 24-hour recorded rainfall at Seattle-Tacoma Airport. The site is retaining more than the original design estimate of .75 inch of rain.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Other Federal Agencies (OFA)

Reducing Stormwater Costs through Low Impact Development (LID)

Regional,
FEMA Region V

Kane County, IL - The Mill Creek subdivision in the town of Geneva, Kane County, Illinois is a 1,500-acre, mixed-use community built as a conservation-design development.

The subdivision was built using cluster development. It uses open swales for stormwater conveyance and treatment, and it has a lower percentage of impervious surface than conventional developments.

When compared with the conventional development, the conservation-site design techniques used at Mill Creek saved approximately $3,411 per lot. Nearly 70 percent of these savings resulted from reduced costs for stormwater management, and 28 percent of the savings were found in reduced costs for site preparation.

LID practices are intended to manage urban stormwater runoff at its source. The goal is to mimic the way water moved through an area before it was developed by using design techniques that infiltrate, evapotranspirate, and reuse runoff close to its source.

Some common LID practices include rain gardens, grassed swales, cisterns, rain barrels, permeable pavements, and green roofs. LID practices increasingly are used by communities across the country to help protect and restore water quality.

While the study focuses on the cost reductions and cost savings that are achievable through the use of LID practices, the EPA says communities can experience many amenities and associated economic benefits that go beyond cost savings.

This study does not monetize and consider these values in performing the cost calculations, but the EPA says these economic benefits are "real and significant."

For that reason, EPA has included a discussion of these economic benefits in the study document and has provided references for further exploration.

Note: This story is part of a case study that involved multiple regions.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Other Federal Agencies (OFA)

FEMA

Above the Flood

Tillamook County, Oregon

Tillamook, OR – The completion of a building elevation project came none too soon for the tenants of Northport Plaza along U.S. Highway101 north of the city center of Tillamook, Oregon. The most recent flooding of the area occurred just six weeks after the Plaza's two buildings had been raised by about 3 feet, which was enough to put the floors about 1 foot above the highest level reached by the floodwaters in early December 2007.

The Western Royal Inn across the highway from Northport Plaza has the distinctive ground-level skirting of an elevated building. In 2004, the inn was raised above the Base Flood Elevation (BFE) for the area, and it has stayed high and dry during subsequent floods.

The city encouraged businesses to move to the 2-mile stretch of U.S.101 when they annexed it 25 years ago. Many of the business owners who accepted the invitation have done well along this busy stretch of coastal highway. But the almost annual flooding of the area by the Wilson River and its associated sloughs, particularly the major, damaging flood of 1996, has caused city officials to re-think that initial pro-development stance. Businesses are now being encouraged to leave the flood zones and move to higher ground.

After the 1996 flood, Tillamook County became proactive in mitigating flood damages, according to Bill Campbell, director of the county's Department of Community Development. The county began to work with property owners in the flood-prone areas to secure funding available through FEMA's Hazard Mitigation Grant Program (HMGP).

Funding to assist communities plan and implement measures to reduce flood losses is also available through FEMA's Flood Mitigation Assistance (FMA) Program. Part of the funds used to elevate the Northport Plaza and to acquire two commercial properties along U.S.101 were provided by the FMA Program.

Quick Facts

Year:
1996

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Flood Mitigation Assistance (FMA)

Defensible Space and Fire-Resistant Building Materials Save Home from Wildfire

San Diego County, California

Ramona, CA - On Sunday, October 21, 2007, Lisa LeFors of Ramona, CA heard the startling news about the Witch Fire advancing toward her home and started making arrangements to evacuate. She monitored the radio all day and night, and finally, at 2:00 a.m., she gathered up her two dogs and one cat and fled her home.

The Santa Ana winds stoked 23 separate Southern California wild fires to a virtual fire storm for four days before subsiding enough to allow fire fighters to contain the flames and ultimately extinguish them.

LeFors's adobe ranch-style house was built in 1990 with protection from wildfire danger considered in its design and construction. Besides the noncombustible adobe brick and concrete tile roof, the fire-resistant exterior doors are metal with dual pane glass. The windows, also dual pane, either have metal clad frames or are of glass block.

Because the house is set in approximately the middle of her 10-acre plot, the land is kept relatively clear around the home's perimeter. Ice plant, which does not burn, grows close to the house, and brick and concrete walkways separate the house from other planted areas. There is evidence of the fire's scorching only up to the edge of the ice plant growth.

When she realized that evacuation was probable, the first thing LeFors did was to clear out the accumulation of leaf debris from under her propane tank that sits about thirty feet from her house. Between the house and propane tank is a four-foot-high adobe patio wall running the depth of the house. This wall also serves as a fire-break.

LeFors keeps vegetation outside of the immediate perimeter of her house mowed very short with a tractor mower to prevent it becoming a fire hazard.

One neighbor who stayed in his home instead of evacuating told LeFors when she returned that the flames burned for about two hours before moving on through the neighborhood. Another neighbor's home burned completely to the ground. LeFors is positive that her house would have burned also if not for the mitigation measures built into her home.

As she was cleaning up after the fire, she found cinders on the exterior window sills, evidence that the fire resistant sills and metal clad window frames prevented the fire from entering the structure.

Having avoided the loss of her property, currently valued at $400,000, during this fire, LeFors is now planning to implement additional mitigation measures. Her first priority will be to enclose the overhanging eaves with non-combustible materials. She also plans to remove more of the foundation plantings and some trees that are too close to the house.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

FEMA

FLHUG
Florida HAZUS-MH Users Group

State-wide, Florida

The State of Florida- The Florida HAZUS User Group (FLHUG) was formally organized in January 2006 when the group met to elect officers, create committees, form regions, and adopt a charter. Rick Burgess, City of Punta Gorda, was elected President.

The overall goal of the FLHUG is to promote the use of HAZUS-MH across the state of Florida to improve risk assessments, mitigation, preparedness and disaster response.

One way of doing this is through a committee structure, including the Outreach Committee, Technical Committee/Data Group, and Training Committee.

With regard to outreach, acknowledging that effective outreach is key to building a strong constituency of HAZUS-MH users, the FLHUG has “taken HAZUS-MH on the road” and demonstrated its use at conferences and workshops across the state. Training sessions have also been provided by the FLHUG, taking advantage of the six HAZUS-MH vendors in the state.

The second main committee is the Technical/Data Committee. Since its inception, a priority of the FLHUG has been to coordinate the statewide collection and processing of high-resolution hazard inventory data, and to integrate the data into HAZUS-MH. A Data Group was formed, headed by Tracy Toutant, Sarasota County, to coordinate the FLHUG’s data management strategy.

At the outset, one of the objectives was to develop a “master state database” that was consistent with the Florida DEM datasets. Richard Butgereit, GIS Administrator, Florida DEM, continues to work very closely with the FLHUG Data Group to coordinate State and local data needs assessment, data collection, and data sharing.

Training may be viewed as the “engine” that moves FLHUG. The goal is to make quality HAZUS-MH training available in all Florida regions in the next two years, in close coordination with Florida DEM and the Florida ESRI Group.

The FLHUG has a core group of experienced HAZUS-MH users who can lead a statewide training initiative in Florida, including four members who are FEMA authorized HAZUS-MH vendors under the Private Sector Initiative.

In 2008, several revised and updated courses will be offered through FEMA that incorporate changes in HAZUS-MH MR3. The FLHUG will be able to capitalize on these courses through field training in the Florida regions.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

FEMA

HAZUS - Comprehensive Data Management System (CDMS)

State-wide, Florida

The State of Florida - The state of Florida has an opportunity to “break new ground” in data management using HAZUS-MH.

Three important pieces are in place: 1) an active network of GIS professionals across the state; 2) leadership that is provided through the Florida DEM and FLHUG; and 3) the Comprehensive Data Management System (CDMS) and a FEMA sponsored pilot project FEMA to develop a web-based HAZUS-MH portal.

The new Comprehensive Data Management System (CDMS) permits HAZUS-MH MR3 users to update and manage state-wide datasets that support analysis in HAZUS-MH.

The CDMS supports a variety of methods for managing data, including: 1) Site Specific Inventory (e.g., essential facilities, high potential loss facilities); 2) Aggregated General Building Stock Data (e.g., building counts, square footage); and 3) Building Specific Data.

In January, 2007, FEMA and the South Carolina Emergency Management Division (SCEMD) launched a pilot project to develop a HAZUS-MH Web-based portal that enables users to easily enter, update and share default/up-to-date data for HAZUS-MH, which will greatly facilitate hazard identification and risk analysis for earthquake, flood and hurricane hazards.

Florida DEM is in discussions with FEMA Region IV to implement a Florida HAZUS-MH Web-Based Project that incorporates many of the features of the SCEMD pilot project. A Florida Web-Based Project can provide several important advantages for Florida.

A Florida HAZUS-MH Web-based portal is a tool that will simplify and streamline data management in Florida, and greatly facilitate FLHUG coordination – working through the Florida regions.

The Web-based portal can become an integral part of a Florida DEM supervised data management strategy that is closely coordinated with existing statewide data inventories, including the Critical Facilities Inventory. These tools can become the underpinning of an expanded data management strategy in Florida.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

FEMA

HAZUS-MH
The SW Florida Pilot Project

State-wide,
Florida

The State of Florida – The state of Florida is a leader in the use of HAZUS-MH. Interest in HAZUS-MH took off after the 2004 hurricane season, with the model was used by FEMA and the Florida Division of Emergency Management (DEM) for hurricanes Charley, Jeanne, Frances and Ivan.

In the months leading up to the 2004 hurricane season, FEMA Region IV worked closely with Florida DEM to develop Standard Operating Procedures for the use of HAZUS-MH for hurricane impact assessment and disaster response operations.

In the aftermath of Hurricane Charley, the City of Punta Gorda – under the leadership of Rick Burgess, GIS Coordinator – embarked on a major effort to collect building damage data. This project was coordinated with the Charlotte County Long-Term Recovery Planning initiative, and HAZUS-MH.

It was during this collaborative effort that FEMA and Florida DEM – in coordination with the City of Punta Gorda – launched the SW Florida HAZUS Pilot Project in January, 2005, which was guided by four objectives.

In addition, the SW Florida HAZUS Pilot Project put the spotlight on HAZUS-MH in Florida, laying the groundwork for the formation of the Florida HAZUS Users Group (FLHUG).

One of the more innovative initiatives under the SW Florida project was a partnership effort with FEMA and Florida DEM to develop the HAZUS-MH Map Series. The idea was simple. Develop a HAZUS-MH template that could be used to depict a range of model outputs and potential applications of those outputs.

The SW Florida HAZUS-MH Pilot Project ultimately brought together representatives from eight SW Florida counties, FEMA, Coastal Services Center (NOAA), Southwest Florida Regional Planning Council, Institute for Business and Home Safety, and several local consulting firms.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

HAZUS-MH - Lessons Learned and Moving Forward in Florida

State-wide, Florida

The State of Florida – During the 2005 hurricane season, the HAZUS-MH outputs were used in State Emergency Response Team (SERT) briefings following each National Hurricane Center advisory. Florida and FEMA are well positioned to build on lessons-learned from the 2005-2006 hurricane season to further develop and test the use of HAZUS-MH to support disaster operations.

A new initiative – led by FEMA, Florida DEM and the Florida HAZUS User Group (FLHUG) – should re-examine HAZUS-MH analysis to identify additional map-based templates that can be used in the 2008 hurricane season – for rapid needs assessment, response and recovery planning, and mitigation operations. The goal is to identify additional HAZUS-MH outputs that can be readily used by FEMA, Florida DEM and local governments to make decisions before, during and after hurricane landfall.

Once Florida DEM and FEMA have identified and prioritized HAZUS-MH templates for use in disaster operations, the next step is to develop the planning and technical capacity to fully integrate HAZUS-MH into disaster operations. Based on lessons learned from previous disaster operations using HAZUS-MH, it is recommended that a new strategy and action plan be based on a number of steps.

For the FLHUG, Collier County has taken the lead in promoting the integration of HAZUS-MH analysis into operations planning. Rick Zyvoloski, Collier County Emergency Management and Chad Bowers, Bold Planning Solutions, have collaborated in the use of HAZUS-MH for local emergency management planning.

In 2007, HAZUS-MH has been used for Florida Catastrophic Hurricane Initiative, a FEMA sponsored project to increase readiness for major or catastrophic hurricanes in the southern part of Florida. As a regional loss estimation tool, HAZUS-MH is well suited for modeling potential impacts of scenario South Florida hurricane events on population, essential facilities, high potential loss (HPL) facilities, and transportation and utility lifelines.

The state of Florida continues to make progress in adapting HAZUS-MH to support disaster preparedness and response operations. This is due to the following: strong support from FEMA Region IV and FEMA Headquarters; leadership and coordination from the Florida DEM; and the active involvement and technical support from the FLHUG. The HAZUS-MH generated products that emerge from the Florida

Catastrophic Planning Initiative will add considerable value to these efforts.

A unique feature of HAZUS-MH is the ability to simulate changes in building practices through mitigation, and then estimate the savings or losses avoided as a result of these mitigation measures.

The FLHUG led initiative to promote the use of HAZUS-MH for mitigation and long-term recovery planning. It is anticipated the state of Florida will continue to make significant progress in 2008 in the use of HAZUS-MH for assessment, mitigation, response and recovery planning, at the state and local level.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

FEMA

2006 King County Flood Hazard Management Plan

King County, Washington

King County, WA - The State of Washington has considerable experience in dealing with disasters. The most frequently occurring and costly natural hazard in Washington is flooding. Like many Washington communities, King County is subject to a wide range of flood hazards.

With six major river systems traversing the region and many other bodies of water all subject to the random acts of nature, the residents of King County face the frequent risk of inundation from rising flood waters. In addition, many of King County's rivers and tributaries are subject to channel migration resulting in the potential for more damaging and dangerous flood events.

Recognizing the ever-present and ever-changing hazards facing their residents, King County officials have taken significant steps to reduce the effects of flooding. In 1993, the County adopted a Flood Hazard Reduction Plan. That document was updated in 2006.

This pro-active planning effort has already helped King County. Looking at examples in the Cedar River, just one of the six major river basins, there are many mitigation projects, both completed and underway, that reduce future vulnerability. This river has sustained many flood events over the years. In response to this flooding, more than 65 flood protection facilities have been constructed in the basin since 1960. Most of these take the form of levees and revetments, yet few if any provide protection to a 100-year flood level.

Many of the proposed projects listed in the Cedar River section of the County's 2006 Plan specifically address the need for greater protection than what is currently provided by the many levees and other flood control structures that have been installed along the course of the river over time. Solutions are wide ranging – some take the form of buyouts, while others involve setting back the levees or removing them entirely.

According to the Plan, their presence causes an impediment to floodwater and natural floodplain processes throughout the reach, affecting both the adjacent public infrastructure and the local natural resources. The Plan calls for the additional acquisition of properties on both banks and moving the levees back from their present locations, consequently opening up the floodplain and allowing the river's natural processes to reestablish themselves.

Flooding in the November 2006 event had widely different effects in the numerous basins throughout King County. While the Snoqualmie River experienced the highest flood of record, Cedar River sustained only moderate flooding.

For King County the outcome was clear: in areas where efforts have been taken to address and reduce flood risks, those actions have worked. Damage in King County during the November 2006 flood was minimized through ongoing implementation of the County's comprehensive flood plans.

Both the 1993 Flood Hazard Reduction Plan and the 2006 Flood Hazard Management Plan were funded, in part, through 50 percent cost share grants from the Washington Department of Ecology's Flood Control Assistance Account Program (FCAAP). In developing the 2006 update, the County utilized its own staff and resources as well as a thorough public participation process.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Floodplain Management

Primary Funding:
State sources

FEMA

Community Rating System in Washington

State-wide, Washington

Washington State - In 1990, the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP) initiated the Community Rating System (CRS) as a means of recognizing and encouraging additional activities that communities can take to surpass the minimum floodplain regulations required by the NFIP. Based on a multi-category point system, the CRS enables communities to reduce their overall flood insurance premium costs by earning more points.

The CRS evaluates communities on the basis of 18 activities, within four categories, in which they can participate to receive points and raise their overall rating. The categories are Public Information, Mapping and Regulation, Flood Damage Reduction, and Flood Preparedness.

Twenty-seven communities in Washington State take part in the Community Rating System, including one of the only two participating Native American Tribes in the Nation, the Lower Elwha Tribe. Of the Washington counties and cities, King and Pierce Counties are among the highest rated in the country.

Washington State has long been forward thinking and proactive in its approach to disaster management. Since the early 1970s, Washington and its various communities have been taking efforts to reduce damages from flooding.

Washington's Department of Ecology (DOE) is tasked with overseeing the NFIP in the State, which helps bring an environmental focus to the management of that program. This is also reflected in how participating communities in Washington receive points for CRS activities.

The DOE has also created the Flood Control Assistance Account Program (FCAAP), Washington's own biannually funded financial program to provide grant assistance to local authorities for flood mitigation activities and planning. There are numerous and varied activities being carried out by the different CRS participating communities in Washington; however, some of the efforts in the different categories stand out.

Public Outreach, one beneficial effort, activities include providing elevation certificates to homeowners and supplying informative publications on flood risks and risk reduction methods. In addition, under the category of Mapping and Regulations, some of the efforts a community can perform to earn CRS points include preserving areas of open space and establishing storm water management regulations.

To reduce flood damages, communities can take such actions as acquiring properties and relocating homes that are within hazardous areas, or maintaining drainage systems to prevent flooding problems from arising.

In the arena of flood preparedness, several communities in Washington are in the process of reevaluating the many levee systems that blanket the State, seeking to ensure they continue to operate as designed.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Insurance

Primary Funding:
Community Rating System (CRS)

Puyallup River Levee Rehabilitation Project

Pierce County, Washington

Pierce County, WA - Since the early 1900s, approximately 90 miles of levees have been built in the Puyallup River system, which includes the Puyallup, Carbon, and White Rivers. Levee construction began in the lower reach of the Puyallup River and progressed sporadically upstream, with the levees on the upper Puyallup and Carbon Rivers completed in the late 1950s.

Although the levees were built primarily to control inundation of agricultural fields, the flood protection afforded by the levees allowed human occupation and development of the floodplain. That protection was compromised over time, however, as maintenance lapsed and sections of the levees were damaged or destroyed by flooding and resulting erosion.

In 1996, a flood on the Puyallup damaged several homes along the river a few miles upstream from the city of Orting, damaged or destroyed several hundred feet of a levee, and threatened Orville Road, an important local roadway. That event triggered efforts by the U.S. Army Corps of Engineers (USACE), in close cooperation with Pierce County, the Washington Department of Fish and Wildlife (WDFW), and the Puyallup Tribe of Indians to develop a plan to address the flood damages and lessen the risk of future damages along the river. The focus was the reach upstream from the city of Orting.

The plan proposed creating a system of new setback levees and bank protection measures. In 1997, 10,000 feet of new setback levee were constructed, 1,000 feet of existing levee were repaired, and 2,600 feet of the riverbank were “hardened” against erosion.

The acquisition of properties, removal or repair of old levees, and the construction of new levees was made possible by a combination of funding from several sources including the State’s Flood Control Assistance Account Program (FCAAP) and FEMA’s Hazard Mitigation Grant Program (HMGP). The work on the levees and floodplain restoration measures were funded by a special appropriation to the Corps’ Seattle District.

The presence of the original levees at the river’s edge resulted in the isolation of the floodplain from the main channel of the river. The erosion of parts of the levee system in the reach of the river upstream from Orting in the floods of 1996, and the removal of the remaining sections and of an old agricultural levee, restored the natural connection between river and floodplain.

The reconnection of the Puyallup River with about 125 acres of its natural floodplain had two positive consequences. First, it allowed the river more room to spread out and dissipate energy during future flood flows. Since completion of the project in 1997, the levees have worked as designed. In fact, during the floods 2003 and 2006, they greatly mitigated the flood impact to the area protected by the project.

The project also restored the access to salmon of approximately 2,000 feet of the channel of a tributary to the Puyallup, and within a few days of completion of the work, chum salmon were seen entering the small stream for the first time in many years.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Snohomish County
Chatham Acres Acquisition

Snohomish County, Washington

Chatham Acres, WA - A flood in December 1999 caused major damage to Chatham Acres, a small community located on the North Fork Stillaguamish River. In a process known as avulsion, the river abandoned its existing path and cut an entirely new 200-foot wide, 800-foot long channel through Chatham Acres before rejoining its original course.

As the river's path changed its course, one home was washed away. Fortunately the house was unoccupied at the time and no one was hurt. Ten other residences in the area, however, were immediately threatened by the avulsion. Something needed to be done to prevent additional damages or destruction of the homes by flooding or further migration of the river.

Most of the homes in Chatham Acres had been constructed in the 1930s, before the implementation of Flood Insurance Rate Maps (FIRMs). Unknowingly, the homes were built within the Stillaguamish River's floodway.

In response to the immediate problem, the Chatham Acres Homeowner's Association (CAHA) applied for and received approval to construct a section of rip-rap along the affected shore.

It became clear early in the project that the rip-rap would suffice only as a temporary solution. Soon after it was in place, three more flood events caused the loss of an additional 50 feet of riverbank. The river had also begun to erode the shoreline behind the rip-rap.

In addition to the ongoing erosion at the site of the 1999 event, an even larger threat was developing 650 feet upstream from the rip-rap location. The Stillaguamish River appeared to be changing course and would likely enter Placid Creek, a parallel stream to the Stillaguamish, which would lead to even greater and more damaging avulsion throughout the area.

In June 2002, an application was filed for the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP) requesting funding for the purchase and demolition of the Chatham Acres homes. The proposed removal of the residences and restoration of the area to its natural state offered life sustaining, ecological, and financial benefits.

The most important advantage to the acquisition approach was safeguarding the lives and property of those in the endangered area. With the residences gone, not only would the immediate threat be resolved, but any potential problems arising from future flooding and avulsion would be removed as well.

The County agreed as part of accepting the grant to never develop anything on the property and put restrictive easements on the property title to ensure this. Another major reason the acquisition strategy was selected was due to its favorable effect on the area's ecology.

During the course of the project, some positive developments occurred. While assessing the properties for the demolitions, the contractor determined that much of the house material could be recycled for future use. When calculating the value of the reclaimed material, in comparison with the originally quoted figure the demolitions would cost, a significant savings resulted. Additionally, two of the homes designated as historic were saved and relocated prior to the scheduled destruction.

Quick Facts

Sector:
Public

Cost:
$1,899,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

All Dressed Up to Brave the Wind

Brazoria County, Texas

Brazoria County, TX – During man-made and natural disasters, the Freeport Fire and EMS Department is designated as the Emergency Operations Center and the Freeport Police Department as the Incident Command Post for the city of Freeport and several surrounding cities.

After years of the tedious task of boarding up the buildings to secure them during impending disasters, the city applied for and received a grant to install hurricane shutters.

The shutter retrofit project began in August 2006 and was completed June 2007 at a cost of $38,394. Freeport received a grant of $28,795 from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP).

HMGP pays 75 percent on approved projects that will prevent or reduce damage from storms and other natural disasters. These grants are made available for both public and private projects.

Hurricane shutters were a logical choice because they save lives and property. The demand continues to grow as more individuals realize their value, and they offer more than just protection from hurricane-force winds and flying debris.

Depending on the type of shutter, they can add security, increase the resale value of property, decrease chances of looting and theft, give protection from outdoor noise, allow for light control, add visual appeal to homes and buildings, and decrease insurance premiums.

In addition, they act as a time-saver. “One of the problems that we’ve run into in the past is that when a storm is imminent a lot of windows have to be boarded up. It’s very labor intensive. Another problem is when you have an EOC such as our building and you keep a crew back for a storm with all the windows boarded up it gets to be a little claustrophobic,” said Stanford.

Electric roll-down shutters were placed on all windows and doors of the police department. A manual override was also installed in the event of power loss. The fire department also has electric roll-downs on the first floor as well as manual roll-downs on the second.

Quick Facts

Sector:
Public

Cost:
$38,394.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Hospital Gear Up to Combat Flood

Harris County, Texas

Harris County, TX – A nightmare, to put it mildly, is how Houstonians refer to the reign of Tropical Storm Allison. In June 2001 she ruled with a vengeance, creating massive flooding.

Among those worst hit by flooding was the Texas Medical Center. Located in the heart of the low-lying downtown area of Houston, Texas, the medical center consists of 42 medical institutions, 19 of which are hospitals, including St. Luke's Episcopal Hospital. Most of the buildings are connected by an underground tunnel system. The rainfall overwhelmed flood protection systems, allowing rushing water to enter through inter-connected basement-level tunnels.

Following the 2001 flood, an engineering firm was retained to perform a study prior to developing a comprehensive flood mitigation plan. Installation of water-tight sub-basement doors was a part of the plan. The submarine-type doors have a seal (bladder) surrounding their perimeter, which is inflated once doors are closed. They can withstand water up to 12 feet deep.

The Dry Flood Proofing Project began in December 2002 and was completed in December 2004, at a cost of $5,013,496. St. Luke's received a $3,866,698 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Program (HMGP). The hospital paid the other 25 percent. The project called for the installation of 20 submarine doors.

St. Luke's Episcopal Hospital, home of the Texas Heart Institute, has been providing primary and tertiary health care to patients in the Houston metropolitan area and around the world for nearly 50 years.

The area that flooded is in the second basement, which houses the majority of the power distribution center. It had been protected by "flood logs" intended to prevent flooding. They were installed in the Texas Medical Center after a 1976 flood.

Manufactured in light weight aluminum, the "logs" provide an economical barrier against water flow through doorways. But it took time and manpower to operate. According to Garcia, it took about one-half hour and two men to bolt and secure the logs in place.

"The water came so fast it was impossible to secure all of the logs," Garcia said. "As soon as we secured the first log, the water began to rise above it. We tried a second, then a third. By the time we got to the fourth log the water was above my thighs. I knew it was time to head for safety."

As Garcia ran for safety, he said he saw water rushing against the giant barriers and spewing through the cracks like a fountain. The logs were no match for what lay ahead. Now that the submarine doors are in place, there is a definite feeling of security.

Quick Facts

Year:
2001

Sector:
Public

Cost:
$5,013,496.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigation Project Gets an 'A' Plus

Harris County, Texas

Harris County, TX – The prediction of rain was not welcomed at Klein High School prior to 2003. Due to the expansion of the campus and the rapid development of the surrounding areas, storm drains were heavily taxed. Heavy rain often flooded some of the school's buildings. After sandbagging for several years, Klein Independent School District (ISD) sought a better solution.

"We used to have these cute little Home Depot type plastic storage units right outside entry doors, and we had a good stock of sandbags," said Donald Blue, Director of Capital Projects for Klein ISD. "Every time we got a good rain, we'd put a little sandbag down around the doors. Students had to step over them, and of course we couldn't put handicap accessible ramps over the sandbags."

Klein ISD retained an engineering firm to perform a study and make recommendations. A stormwater drainage project was proposed.

The Drainage Project was initiated in April 2003 and completed in January 2006 at a cost of $970,113. Klein ISD received a $727,580 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP).

Phase I of the project consisted of three parts. First, the removal and relocation of existing facilities at the practice field and excavating a stormwater detention pond located on the practice field. The detention pond is two feet deep, and the excavated dirt was used to create a berm around the practice field.

The second part was the installation of Tide Flex Check Valves (backflow) to the school's existing storm sewer system to ensure that potential off campus stormwater cannot flow back through the system and flood the campus.

Last came the removal and replacement of approximately 400 square yards of asphalt pavement to install 400 linear feet of 12-inch gravity flow stormwater pipe from the gymnasium to an existing drainage ditch.

Phase II of the storm water drainage improvements was the installation of a 54-inch gravity pipe, buried 15 feet deep. Since the improvements, Klein ISD has not had any problems.

Quick Facts

Sector:
Public

Cost:
$970,113.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Now That You Know
What Are You Going To Do?

Taylor County, Texas

Taylor County, TX – If only the people of Merkel, Texas knew then what they know now. “Then” was before extensive rainfall last August flooded a neighborhood, damaging 60 homes that never had flood damage before.

“Then” was when townspeople couldn’t buy flood insurance because the town did not participate in the National Flood Insurance Program (NFIP).

“Then” was before City Manager Donnie Edwards learned how simple and beneficial it is to join the NFIP and how everyone could benefit, not just those who live in the most flood-prone area, known as a floodplain.

“We had a flood event in an area which doesn’t normally flood,” said Donnie Edwards, who had only been on the job as City Manager for seven months. “I got a call from insurance agents regarding people wanting to purchase flood insurance for their homes. I had no idea that it wasn’t available. That’s kind of how we got to where we are now.”

Edwards continued, “When I first started looking into it [flood insurance], I thought to myself if Merkel had not joined the NFIP, there had to be a good reason. I couldn’t find it. There wasn’t any."

The flood damage in Merkel was one reason that Taylor County was included in a major presidential declaration for severe storms and flooding in Texas this summer, from June 16, 2007 to August 3, 2007. Edwards began to learn about the NFIP.

It was then that Edwards learned of misconceptions about the flood insurance program. One was that flood insurance could only be purchased by persons living in the floodplain. Another was that to file a claim, the flooding had to be a direct result of water rising out of its banks. The third was that flood insurance is too expensive.

A FEMA NFIP specialist, Kathy Graf, explained the program. “A flood is an excess of water on land (two or more acres) that is normally dry,” Graf said. “The NFIP definition includes inland tidal water; unusual and rapid accumulation or runoff of surface waters from any source; mud flow; collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood.”

Once a community joins the NFIP by adopting and agreeing to enforce an approved local floodplain management ordinance (or equivalent county court order), residents can buy flood insurance through local insurance agencies. The insurance generally does not take effect until 30 days after purchase; however, it is effective immediately on a newly purchased home.

Flood insurance is available to homeowners for dwellings and contents, businesses for buildings and contents, and to renters for contents. Rates begin at $112 per year for minimum coverage of a house that is outside the floodplain boundaries or $317 yearly for the maximum coverage of $250,000. Rates are higher in the floodplain.

Quick Facts

Year:
2007

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

Buying Out Time

Lake County, Illinois

Gurnee, IL - As far as natural hazards go, the Village of Gurnee in Lake County, Illinois, is primarily affected by the flooding of the Des Plaines River. In the autumn of 1986, Gurnee suffered from the most devastating flood in its history. Since then, Gurnee has taken extraordinary steps to lessen flood damages to its properties, and the positive results can already be seen.

During the last week of August of 2007, Gurnee was once again threatened with rising floodwaters from the Des Plaines River. However, the effects of the flood were minimized thanks to two main mitigation efforts. The first was a wetlands restoration project that was recently completed by the Lake County Forest Preserve in an area north of Gurnee. The second involved a series of property acquisition projects pursued by Gurnee in the last 20 years.

Wetlands are areas that receive and accumulate floodwaters, thereby slowing and reducing downstream flows. They also serve as natural filters, improve water quality, and provide habitat for many species of fish, wildlife, and plants.

Over the centuries, many modifications to the landscape for agriculture and urban uses have significantly increased flooding from the Des Plaines River. The growing need for solutions to this problem resulted in the Des Plaines River Wetlands Demonstration Project.

Using funding provided by federal, state and local governments, foundation grants, and individual donors, the Wetlands Demonstration Project has transformed abandoned farm fields and gravel quarry pits into a rehabilitated ecosystem along the upper Des Plaines River in Lake County.

Restoration began in 1986, and the results have been very rewarding, especially for the residents of Gurnee, since the restored wetlands played a large role in delaying flood waters and reducing flood heights this last August.

After being selected by the Lake County Stormwater Management Commission (SMC) as a pilot for a community-wide plan in 2000, Gurnee started to aggressively pursue a Flood Mitigation Plan. Having a plan has opened doors for federal and state grants, and it has raised awareness in the community. Gurnee's Flood Mitigation Plan provides carefully considered directions to ensure the best use of public funds.

In 2003, Gurnee received a little over $600,000 from a Pre-Disaster Mitigation Grant from the Federal Emergency Management Agency (FEMA), which was administered by the Illinois Emergency Management Agency (IEMA). They also received approximately $240,000 from the Illinois Department of Natural Resources (IDNR).

These grants helped them purchase five properties and remove them from the floodplain. Since 1986, Gurnee has successfully removed almost half of the 45 structures on the floodplain and returned those properties to open space, often using their own money when grants were not available.

Gurnee's village officials understand that it takes a combined effort, effective planning, and long-range vision to accomplish their goals.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

KnoWhat2Do
A Regional Public Education Program

Multiple Counties, Texas

Tarrant County, TX – When it comes to disaster preparedness, residents in North Central Texas have access to a wealth of information. As a result, citizens in North Central Texas will "KnoWhat2Do" in the event of a wide-scale disaster or crisis situation.

"KnoWhat2Do" is a public education and outreach campaign, which is presently in Phase II of development.

Phase I of the project includes a variety of resources that educate the public on how to think, prepare and act in case of an emergency.

The "KnoWhat2Do" disaster preparedness program was developed through the collaboration of local governments in the North Central Texas area. It arms citizens with the knowledge and skills needed to effectively manage nearly every possible disaster or crisis situation common to North Central Texas, including severe weather and exposure to hazardous materials. Evacuation procedures are also addressed.

Each jurisdiction allocated money from their individual UASI awards.

"The main reason we pooled our funds was because we found out that we were competing against ourselves," added Juan Ortiz, Emergency Management Coordinator. "We decided to join forces and maximize our dollars."

Wilhelm explained the program more in depth. "The three-part program begins with think, which provides detailed information on severe thunderstorms and lightning, tornados, flooding and flash floods, terrorism, extreme heat, drought and wildfire, hail, storm spotting, storm watching and warnings, and chemical hazards," she said.

"Next is prepare, which provides ideas for creating a personal safety plan that includes a home emergency supply kit, a vehicle emergency kit, a communications plan with emergency contact telephone numbers, care plan for individuals with special needs, and planning for pets and livestock welfare," she continued.

"The final part is act, which advocates taking personal responsibility in developing a household preparedness plan and emergency supply kit, staying alert to severe weather and being knowledgeable about hazards. It also encourages becoming involved in volunteer services such as disaster relief groups, community safety organizations, fire departments, emergency medical services, and first responders. Those efforts include training in emergency preparedness, response capabilities, fire suppression, first aid, cardiopulmonary resuscitation (CPR), and search and rescue procedures," finished Wilhelm.

In Phase II of the program, sections of the preparedness guide will be expanded to better serve the public. It will also have an advertising component which will include outdoor billboards, radio, and television commercials.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

The Power of Collaboration in Kirkland, IL

DeKalb County, Illinois

Kirkland, IL - Les Bellah, former Mayor of Kirkland, Illinois, knows the power of water. According to Bellah, in July 1996, a storm dumped eighteen inches of rain on his town in less than twelve hours. The Kishwaukee River jumped its banks and flooded the Congress Lake Estates Trailer Park. Water came up to the windows of many trailers and left a two-foot-high watermark on Kirkland's Village Office.

The 1996 storm ultimately destroyed the Congress Lake Estates Trailer Park and left masses of debris in its wake.

After the waters receded and the debris was all hauled away, the Village faced a serious question: what to do now with the devastated Congress Lake Estates Trailer Park? Local leadership prudently chose to go down the path of mitigation.

Within months of the flood event, Kirkland leaders collaborated with the Federal Emergency Management Agency (FEMA) and the State of Illinois on a hazard mitigation acquisition project aimed at buying out the mobile homes at the Congress Lake Estates Trailer Park.

Once the trailers were all purchased at pre-flood market value, Kirkland residents decided to create a natural park where the trailer park once stood, thereby both beautifying the area and preventing the location from future flood damage.

The former site of the Congress Lake Estates Trailer Park has now been transformed into Pioneer Park, a large green space by the scenic Kishwaukee River.

"We are very proud of our park," said Bellah. "With this last flood of August 2007, we proved one more time that we made the right decision. The area flooded again, and it would have affected homes if they were still here. So the project really paid off."

According to Bellah, Kirkland residents were ecstatic about the results of this project. "We are sad for all the people who lost their homes during the flood of 1996," he said. "But through foresight and some good decisions, we were able to turn the whole experience into a positive thing."

Quick Facts

Year:
1996

Sector:
Public/Private Partnership

Cost:
$1,600,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Rossilli's Restaurant
Saved by an Inch of Prevention

Hancock County, Ohio

Findlay, OH - Two days after the rampaging Blanchard River overflowed its banks last August and submerged downtown Findlay under more than a foot of water, Meg Rossilli stood in front of the restaurant she owns with her brother and her husband.

Located less than two blocks away from the bridge on Main Street that crosses over the river, Rossilli's Restaurant, like many of the stores and offices in the neighborhood, could have sustained major, even bankrupting, damages from the 100-year flood.

In this case, the difference between disaster and setback was a matter of a single inch.

"When we moved to our new location (in 2003), we wanted to raise up the dining room floor by a foot," says Meg's brother and co-owner, Gary. The contractor and the city suggested raising the floor 13 inches instead of 12, in addition to using a more expensive, pressurized water-resistant wood. Being concerned with the additional cost for both modifications, they hesitated.

But ultimately they decided to play it safe and spend the money not only on the extra height, but also on the pressurized water-resistant wood, in both the dining room and the kitchen in the back.

Four years later, a summer storm settled over northwest Ohio, dumping up to 9 inches of rain in a single day on the farms and small towns. Creeks, streams, drainage systems, rivers – they all overflowed in the predominantly flat region.

Down Main Street from the river, the Rossillis and Mike Eynon, Meg's husband and business partner, piled sandbags three feet high in the narrow alcove of their entrance. Flood waters came in anyway, and the bar area in the front got flooded.

Flood water crept up the ramp to the dining room, but stopped less than an inch from the raised floor.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Property Owner, Commercial

Village Locals Reflect Moving Was Best Flood Protection

Crawford County, Wisconsin

Village of Soldiers Grove, WI – In August 2007, the biggest flood in the history of Soldiers Grove came roaring through the village. The Kickapoo River quickly topped the levees, and water didn't recede for about 10 days. Years earlier the center to the town had been moved.

Residents experienced floods in 1907, 1912, 1917, 1935, 1951, and the "big one" in 1978. From 1969 to 2007, the state had 25 nationally declared flood disasters in 38 years. The flood of record in 2007 inflicted the worst damage in the state just 10 miles downstream in Gays Mills.

"The Kickapoo can turn into a wild river. I don't know how we escaped all the floods without loss of life. We had a lot of good people, fire crews, and emergency management crews out there working evacuations and rescues," stated Jerry Moran, Crawford County Sheriff. "Each time there was very little advance warning. People woke up at night with three to four inches of water already in their homes."

Local debate about what to do about the flooding began to swell in the mid-60s when the U.S. Army Corps of Engineers proposed an upstream dam and a new levee for the village. The costs to the village exceeded their ability to pay. The unprecedented move of their downtown, surrounded on three sides by the river, to higher ground began to make financial sense.

Environmentalists were fighting against the Corps over the dam, and the maintenance of the levee was going to cost the village nearly all of their annual tax revenues. By 1975, a small Comprehensive Employment and Training Act grant paid for a relocation coordinator. By 1976 the village took the unprecedented move of passing a resolution that supported relocation to avoid future flood disasters.

The flood of July 1978 made things happen. On July 7, 1978 a federal disaster declaration made federal funds available to flood-proof the village. Local planners convinced state and federal officials moving the town was the best flood-proofing and eventually received their first federal grant of $900,000 from HUD's Community Development Block Grant to get the project moving – acquire flood prone properties, clear the area, demolish old properties, and rebuild the town uphill.

By 1983 the $6 million relocation project was done. According to Hirsch, in 1979 the village wanted to "help the US reduce its dependency on foreign oil" so the village incorporated solar heating in the new buildings, subsequently dubbed Solar Village.

"Since the buildings have solar heating they are insulated a lot better. If I get a good day of sun, I'll get three days of heat. It's clean. I've never had to paint because of dirt from the system," Young noted.

Locals have witnessed a moderate population growth to over 600 with new businesses and the expansion of older ones. "If Soldiers Grove stayed in the floodplain, it would have been a stagnant community; it would have still existed, but stagnant. All the new businesses would have not happened if we were still over there," Moran stated.

"The recent August 2007 flood devastation reinforced that we did the right thing. I don't ever want to go through another flood like 1978," added Young.

Quick Facts

Year:
1978

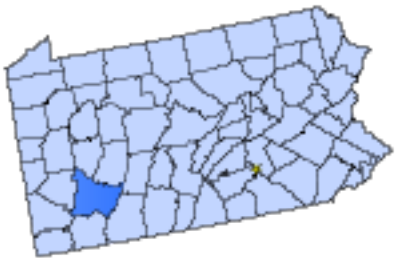
Sector:
Public/Private Partnership

Cost:
$6,000,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Local Sources

Mill Creek Improved Stream-Bank Stabilization



Westmoreland County, Pennsylvania

Westmoreland County, PA - One of Westmoreland County's natural treasures, Mill Creek, recently got even better after some much-needed improvements that stabilized its stream-bank and slowed the amount of sediment entering this exceptional waterway.

Last fall, it was identified by the Westmoreland County Commissioners as one of 21 separate conservation projects to be funded under the state's Growing Greener II County Environmental Initiative.

Mill Creek is one of the last remaining high-quality recreational resources in the Ligonier Valley, according to an extensive report prepared in 2004 by the Forbes Trail Chapter of Trout Unlimited.

The group's 2004 conservation plan for the watershed identified the creek's outstanding qualities: its pristine beginnings in Laurel Mountain and the fact that it is a viable fishery for nearly its entire length.

Trout Unlimited also noted Mill Creek's few but significant trouble spots, including the site where Hannas Run enters the stream just below the community of Oak Grove. Here, the report said, bank erosion is perhaps "the most severe of any area in the entire watershed," and deemed this site the "number one priority" for remediation.

When the flow of Hannas Run struck the eastern side of Mill Creek, there wasn't much to stop it. The lack of streamside trees and vegetation, along with Mill Creek's six-foot-high, almost-vertical banks of soft, loamy soil, meant this site was extremely vulnerable to erosion.

The loose soil polluted the stream and degraded water quality from this point on. The severe erosion from this site was carried downstream and was a major contributor to the high volume of sediment that regularly builds up where Mill Creek crosses Route 30 just west of Ligonier. To solve the problem a number of groups and the local landowners joined forces and took a cue from nature.

"A large log had fallen into the stream against the east bank of Mill Creek and was helping to deflect the force of Hannas Run. So we added eight more like it – configuring these nine logs in groups of three and anchoring them at an angle that would deflect the flow of the water from Hannas Run," explained Rob Cronauer, watershed specialist for the Westmoreland Conservation District. This is one of the first times this "log deflector" approach has been used to improve a stream in Westmoreland County.

The remediation team also added a large mass of tree roots and 100 tons of stone to take the force of the water flowing in from Hannas Run and planted 100 live willow branch cuttings to help stabilize the vulnerable, 200-foot section of Mill Creek's stream-bank, which they also re-graded to reduce the severity of its slope.

The Westmoreland County Board of Commissioners, working with the Westmoreland Conservation District last fall, identified five other water-quality projects to be done for streams in the county located in Allegheny Township, New Kensington, Mount Pleasant Township, Derry Township, and Donegal Township.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$10,000.00 (Estimated)

Primary Activity/Project:
Floodplain Management

Primary Funding:
State sources

FEMA

Technology To The Rescue

Tarrant County, Texas

Tarrant County, TX – Disaster strikes without warning. While first responders do all within their power to handle emergencies efficiently, having additional information regarding the rescue mission can expedite the process. Fort Worth's Emergency Management Department is currently equipped to rapidly supply accurate information about residents with disabilities.

The Special Needs Assistance Program (SNAP), which encourages online enrollment, provides Fort Worth's emergency responders with vital information about residents with permanent disabilities, both adults and children. The elderly population is also targeted. Residents are encouraged to register annually with the Office of Emergency Management.

The program begin in the mid 80s, which allowed residents to fill-out a paper form that was distributed by the city's community partners, and the data was entered into a history file in our computer-aided dispatch system.

Through the years, the program was restructured several times with marginal success because, after a period of time, the data became unreliable and difficult to update in the computer-aided dispatch system. Due to advances in technology and a series of lessons learned from the 2004 power outage, flooding, and Katrina, the office decided to revamp the program again.

The database includes the resident's name, gender, age, weight, address, primary language, emergency contact, and handicapping condition. Other information includes use of aids such as a walker/cane, crutches, a wheelchair, a guide dog, oxygen, or a life support system. Whether equipment requires an intermittent or continuous electrical supply is also noted. Space is provided for additional comments.

"It's important that registrants know that their information is being obtained on a secured site and to know that our office is the only office with administrative rights to the data," Moss said.

The website is in compliance with the Americans with Disabilities Act (ADA), which protects the rights of people with disabilities.

Online registration is preferred, and the program is user friendly; however, the Office of Emergency Management will continue to accept mail-ins from registrants.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Moving Highway Shop Improves Disaster Response

Crawford County, Wisconsin

Crawford County, WI – Before, during, and after flooding, employees of the Crawford County Highway Shop in Gays Mills, Wisconsin, spent hours and days moving vehicles, heavy equipment, and computers, and sandbagging and raising things off the ground, all in an effort to protect their facility from rising waters.

During past floods, the old concrete block building was inaccessible for as long as a week. Phone calls from residents went unanswered and staff was often on the wrong side of the flooding Kickapoo River from the equipment they needed. Then everything had to be dried out, cleaned up, and put back. They always lost vehicle parts.

Some of the duties Crawford County Highway Shop performs during major storms include closing roads, floodwater rescues, erecting safety devices, providing a physical presence, and building temporary dikes. Time spent protecting their equipment and shop took them away from providing these services to residents of the county.

Following two flood events in 2000 when the Kickapoo River overflowed and in 2001 when the Mississippi River flooded the area, Crawford County applied for and secured funds from Wisconsin Emergency Management through Hazard Mitigation Grant Program (HMGP) of the Federal Emergency Management Agency (FEMA). Relocating the facility was underway.

Crawford County spent an estimated $2.7 million from various grants to fund the relocation project, which involved acquisition of the original property, demolishing and clearing the property, and rebuilding out of the floodplain.

With fuel contaminates and chlorinated solvents in the soil underneath the original building, county officials conducted an extensive cleanup project to reduce risk of flood waters transporting contaminants to area water ways.

The county was also required to do a “Farmland Impact Study” for the new property. Because the 42-acre site had been previously subdivided, zoned, and platted for development, no farmland was lost in the move.

By 2003 the county had a newly constructed Crawford County Highway Shop, centrally located near Seneca and at one of the highest points in the county.

“The central location has made it a lot easier to send equipment out to necessary areas and it doesn’t take as long to reach different parts of the county,” added Pelock. “The new facility is larger with bigger sign and mechanic shops and vehicle storage. We have more offices and now a large conference room which is accessible for public meetings. It gets used almost every night.”

In August 2007 Gays Mills received more than 12 inches of rain, and the highest flood waters in the valley’s history did not recede for two weeks. The new shop remained high and dry while Gays Mills was inundated.

Quick Facts

Year:
2000

Sector:
Public

Cost:
$2,700,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

RSDE
Speeds Up Evaluation Process

Wichita County, Texas

Wichita Falls, TX - In July 2007, water from the Wichita River rose out of its banks, hurdled over the Duncan floodgates, and inundated 167 homes in Wichita Falls, Texas. Utilization of the Federal Emergency Management Agency's (FEMA) Residential Substantial Damage Estimator (RSDE) hastened the process for determining damage estimations.

The RSDE software is based on regulatory requirements of the National Flood Insurance Program (NFIP) and is provided free of charge as a tool for those responsible for preparing substantial damage determinations.

Communities participating in the NFIP are required to adopt a local floodplain ordinance that meets the NFIP criteria and to comply with guidelines that require homes located in the FEMA 100 year floodplain or Special Flood Hazard Area (SFHA) be evaluated for substantial damage after a flood event. Substantial damage is damage of any origin sustained by a home whereby the cost of restoring it to its pre-damaged condition equals or exceeds 50 percent of the market value of the home before the damage occurred.

Teague along with six building inspectors from other Texas cities---Hutto (Williamson County), Frisco (Collin County), Irving and Rowlett (Dallas County) began the evaluation process within three days following the flood. The standardized software enabled them to borrow inspectors utilizing inter-community agreements.

Using the RSDE Damage Inspection Worksheet (a checklist), the building inspectors went into the homes and manually recorded the data. The data was entered into the software. The software provided reasonable and defendable building values and damage estimates in a short time frame. The task was completed within a week.

FEMA does not require the use of the software. The homeowner has the right to require the use of alternatives, including professional appraisals, contractors' damage estimates, and community damage estimates for making substantial damage determinations.

The software assists in assessing residential building values. It's a tool for evaluating a home's market value prior to the damage and for determining the amount of damage following a disaster event. It shows how to rapidly, efficiently, and consistently assess substantial damage. It allows communities to compile a data base of inspected houses as well as help to identify areas that have received repetitive damages.

Quick Facts

Year:
2007

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
National Flood Insurance Program (NFIP)

Small Wisconsin Village Leads the Nation Rebuilds Above Floodwaters

Crawford County, Wisconsin

Soldiers Grove, WI – Residents of the Village of Soldiers Grove in southwest Wisconsin created an innovative mitigation plan of their own. Instead of embracing a traditional dam and levee flood-proofing method to protect their community, they raised their town.

Beginning in 1907, repetitive flooding annoyed residents until 1935 when the first disastrous flood engulfed homes and businesses up and down the valley with sludge and mud. Congress directed the U.S. Army Corps of Engineers to study flood options.

Delayed by wars, the study wasn't completed until 1962 when the Corps recommended a dam be built 36 miles upstream in addition to a levee around the village. The fully federally funded dam was attacked by environmentalists, and its future was uncertain.

The $3.5 million village levee system would require Soldiers Grove to pay $220,000 toward construction and an estimated $10,000 in annual maintenance. The village's property was valued at less than $1 million with an annual tax levy of $14,000. These numbers did not add up for the citizens.

For decades the village, with an estimated population of 600, had debated a better plan – instead of spending all the money on trying to control the river, they proposed spending less to move the flood-prone areas of the town. Without significant financial support from higher levels of government, the move could not be accomplished.

The folks at the Village took a huge first step in 1977 and pooled their local and private resources together and with $90,000 in public financing purchased the relocation site. They acquired 100 acres of uphill land away from the Kickapoo River floodplain along the re-routed state highway and hoped for eventual funding to realize their goal – raise the town.

Torrential rains in July 1978 brought damages in excess of a half million dollars. It was declared a natural disaster as the Kickapoo River exceeded its flood stage by over six feet. The local debate was over, and the community began selling their idea to the state and federal government with a united front.

Armed with the research results of feasibility studies and outside consultation paid for with small state grants, local officials convinced state and federal officials that the move would be the best flood-proofing for the Village - to buyout floodplain properties, demolish the structures, clear the land and rebuild the town uphill.

A combination of state and local funds provided over a third of the estimated $6 million total project. The Village applied for and successfully received grants for the remaining cost from federal agencies including HUD's Community Development Block Grant (CDBG). CDBG funds may be used to assist communities recovering from a disaster, especially in low-income areas.

Quick Facts

Year:
1978

Sector:
Public/Private Partnership

Cost:
$6,000,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Local Sources

FEMA

Mitigation Can Be Appealing

Guadalupe County, Texas

Guadalupe County, TX – Gilbert Acuna and his wife, Angie, wanted to live closer to their daughters - three in San Antonio and one in Austin. They chose the small town of Seguin knowing that the town's flood history meant that their dream home would have to be elevated.

"We consulted the city's building official and were told that we needed to elevate eight feet above the floodplain to get a permit. We decided to add three more feet," Acuna said. "My wife designed the home, and we had an architect to draft the plans."

Construction of the 1,805 square foot stucco home began in March 2005 and was completed within six months by a local builder. The first floor is elevated 12 feet above the slab foundation on 32 concrete pilings with embedded anchor plates for added support. The open space below provides parking, storage, and building access. The home backs up to Geronimo Creek, which feeds into the Guadalupe River.

In June 2007, Geronimo Creek flooded. More than three-and-one-half feet of water entered ground-level homes in their neighborhood causing damage. The Acuna's home was unscathed.

The elevation project is one form of hazard mitigation recommended by the Federal Emergency Management Agency (FEMA). Mitigation is any sustained action taken to reduce or eliminate the long-term estimated impact a hazard would have on human life and property.

Quick Facts

Sector:
Private

Cost:
$180,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Property Owner, Residential

Is There Room For The Animals In Your Sheltering Plan

Walker County, Texas

Walker County, TX – In 2005 Hurricane Rita pummeled many cities causing a mass exodus of people and animals. Some found their way to Huntsville, Texas, a designated shelter hub.

Officials were faced with a dilemma: what to do with the animals that tagged along with their owners? Fearing a disaster within a disaster, they hoped for the best, sought help, and vowed never to be caught in that position again. They developed the first animal sheltering plan in Texas called the Animal Issues Plan.

“We were equipped to shelter 1,600 people. We had 360 evacuees following Hurricane Katrina. Here comes Hurricane Rita. We received about half of the population of Galveston. Then the mayor of Houston decided that they were going to evacuate Houston,” said A.L. Davis, Chief Deputy and Emergency Management Coordinator for the Walker County Sheriff Department.

“We received a little over 15,000 [people]. Jack Colley, director of the Governor’s Division of Emergency Management, advised evacuees to bring their animals. We did not know where we were going to place them. We had no cages or leashes, no food, nor means of transporting them. We had no way of associating animal and owner,” continued Davis.

According to regulations, pets are not allowed in a Red Cross approved facility. Service animals are the only exception. Huntsville had to quickly provide shelter for 360 small animals and about 50 cattle and horses.

Later, Davis met with Reggie Leplay, county agent, John Powledge, chairman of Walker County Fair Association, and Dusty Bouillion, director of Texas Animal Health, to develop a comprehensive emergency plan, one that would address animal issues.

Two subcommittees were formed--large animal and small animal. Each had chairpersons, co-chairs, and team leaders. An organizational chart was established. Forms and instructions were developed. Instructions on Intake of Live Animals, Intake and Disposal of Dead Animals, and Procedures for entering Triage Unit were written.

“Following Rita we had a real bad flea infestation problem. We had to get medical help. So we knew that we needed a medical team,” Davis said. “Another problem was identifying pets. Upon deactivation, we went to each shelter and told evacuees to get on a bus if they had an animal. We took them to the fairgrounds and instructed them to walk up and put their hands on their animal. That was the only way we had to identify the owner. Now, the registration group takes a picture of the animal and owner and collects shelter information from the owner. We now tag the animal and the owner. The transportation team accompanies the registration team to the pet owner’s shelter and transports the pet to the animal shelter.”

The arena at Sam Houston University is the designated animal shelter. It’s equipped with radio communication, proper lighting, heating and air, and stalls to accommodate horses. Making certain there’s sufficient supplies and food remains an issue. The county relies upon donations.

“We tested our Animal Issues Plan during our hurricane exercise. We used live animals and some small, stuffed animals. We have a pretty good system. It works,” Davis said.

Quick Facts

Year:
2005

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Local Sources

New Haven
Drainage Project

Addison County, Vermont

New Haven, VT - Heavy rainfall brought flooding and damage to New Haven's River Road and also washed unwanted sediments into the Lake Champlain watershed. The summer of 2006 brought six floods in a row. The town recognized the problem and searched for an affordable solution. Vermont's Better Backroads Program seemed like the perfect answer.

When the town of New Haven, VT applied for a Better Backroads Grant in the fall of 2005, New Haven Road Foreman Philip Busier viewed the area targeted for improvement as a potential time bomb. The roadside between the intersections of East Street and River Road and Sumner Road and River Road was prone to undermining and washouts with every large rainfall.

Each of the two streets connecting with River Road have an eight to ten-percent grade, and the runoff was channeled over River Road and directly into the New Haven River, which flows into Otter Creek and then into Lake Champlain.

Vermont's Better Backroads program works with towns, planning commissions, non-profits, and lake and watershed associations to correct road-related erosion problems to save towns' road maintenance money and to reduce the impact from road-related erosion has on water quality through financial and technical assistance.

More than 80 percent of Vermont's roads are maintained by municipalities. The majority of these roads are gravel. Eroding road surfaces and ditches cost the municipalities money with each storm. Simple, cost-effective maintenance techniques can mitigate the hazards and save scarce town funds. Sediment accumulation is the greatest threat to water quality and fish habitat.

With a $4,000 grant from Better Backroads, Busier began by soliciting community support. In the planning process he marked the town right-of-ways along the streets and held a meeting with the neighbors.

After the planning portion of the project, the next step taken was to provide traffic control and remove excess trees and other vegetation. Since other road workers were tied up in other projects, Busier single-handedly did the construction part of the project. He shaped the ditches to the desired profile to provide positive drainage. He also lined the ditch bottom with non-woven geo-fabric to ensure soil stabilization and covered it with six to eight inches of rip-rap.

The project was approximately 350 feet long by 40 feet at the widest point. Engineers consulted for the project deemed the culvert adequate for flow. Only a four-and-a-half foot section needed to be added to the existing culvert length.

The physical part of the project took only 15 days in October 2006 with Busier as the only worker. Not having to contract out the work provided the necessary local funding match with in-kind labor and saved the town thousands of dollars. The April and July 2007 Vermont flooding events missed the project area.

Photos Provided by the "Vermont Local Roads News."

Quick Facts

Sector:
Public

Cost:
$4,000.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Non-profit organization (NPO)

FEMA

Volunteer Firemen Create Mobile Command Unit

Eastland County, Texas

Eastland County, TX – A 2006 wildfire destroyed nearly 25 percent of Eastland's land mass burning 60 homes within 12 hours. Part of the problem stemmed from a lack of communication and management. Lessons learned prompted the need for a mobile command unit.

"We had fire departments from our county and the surrounding areas scattered out over 20 miles. People were trying to contain the fire at different sections of the community. Logistics was extremely difficult," said Steven Watson, professional firefighter and 911 dispatcher.

A meeting was held to evaluate performance following the incident.

"We had a big critique session. What did we do right? What were our problem areas?" Watson said. "The biggest problem was communication. We didn't have anyone with tools available to them to coordinate efforts."

As a result, a 2003 motor home was donated to Eastland County. Firemen from Eastland's eight volunteer fire departments used their skills, on weekends, to create a mobile command unit.

"We went to a trade show in Dallas hosted by Fire Rescue International to look at the mobile command units on display. We consulted with representatives to determine how each piece of equipment was utilized," Watson said. "Texas Department of Homeland Security gave us $30,000, and we received a donation of $20,000. We used that money to equip the unit, and we furnished the labor." The unit was appraised at $175,000.

In June 2007 Lake Leon flooded, endangering the lives and property of the residents living on the waterfront. Residents had received a warning to evacuate. Only 35 percent heeded it. Boats and military trucks were used to rescue 150 people.

"Instead of someone running a section of the incident with maps spread out on the hood of a truck and a portable radio that you can barely communicate messages back to the town, we had a unit centrally located at the lake and ready to handle the flood event," Watson said.

Having the unit on site resulted in smooth rescue efforts.

Quick Facts

Sector:
Public

Cost:
$175,000.00 (Estimated)

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Private funds

Austwell: A Small Town With Big Plans

Refugio County, Texas

Refugio County, TX – In July 2003, Austwell suffered extensive damage when Hurricane Claudette ravished homes and businesses in the city. Now the unpaid mayor and a building official have joined forces to adopt and enforce strict building codes.

“To protect lives and property from natural disasters, we adopted the International Building Codes as the municipal building code for all construction, alteration, remodeling, enlargement, and repair of any residential and commercial structures within the municipality,” said Earl Bluhm, building official. The codes are recommended by the Texas Department of Insurance.

Individuals seeking to build or renovate a home in Austwell must have their plans reviewed by a wind-storm engineer. “We require that you hire a wind-storm engineer who is approved by the state of Texas,” Bluhm said. “I inspect building for the city of Austwell. I will not issue you a permit to build until your plans are reviewed by the engineer.”

New construction also must be elevated at least a foot above the street. “If you build at least a foot higher than the street you should never have a flooding problem,” said Bluhm.

“There is another hazard that led to flooding in 2007,” Bluhm said. Area farming is creating small dams as well as causing ditches to overflow. The local hazard mitigation plan has been revised, and a request for federal assistance has been made to address this issue.

“We recognized that this was going to be a problem. Rather than take pot shots and waste money, we got an engineer to survey elevations of ditches and culverts and to make recommendations,” said Thomas Bernal, mayor of Austwell. “We know what we need to do. Now it’s a matter of funding to implement the projects.”

Bluhm surveys the condition of existing homes and gives advice on bringing them into voluntary compliance or tearing them down. “Mr. Bluhm means business. He doesn’t show favoritism” Bernal said. “I received a letter requesting that I tear down my mother’s unoccupied residence.”

If owners do not comply, city officials will remove the building and place a lien on the property for costs incurred. “Eight buildings have already been condemned,” Bluhm said.

Overall, Bernal is confident about the outcome. "If a category two or three hurricane comes through, we are going to look golden. We are enforcing these codes. It’s for the benefit of the residents.”

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

FEMA

City of Snoqualmie
Home Elevation Projects

King County, Washington

Snoqualmie, WA - A river constriction at Snoqualmie Falls causes the river to back up into the City. Past floods have exceeded six feet above grade in places. The elevation of several homes made the City of Snoqualmie a positive national model as it demonstrates how to reduce the likelihood and extent of repetitive flood damages.

Snoqualmie has been part of 15 Presidential flood-disaster declarations between 1964 and 2006. Snoqualmie's close-knit community and historic homes have encouraged homeowners to remain in that location, and this made property acquisition costly, so the decision to elevate homes was made.

Several million dollars were committed by Washington Emergency Management Division (EMD), the Federal Emergency Management Agency (FEMA), the Small Business Administration (SBA), King County, City of Snoqualmie, and homeowners to elevate or relocate more than 100 residential structures. Special studies have been done on the effects of home elevations in Snoqualmie. One study evaluated the losses avoided, and another compared sales prices of elevated versus non-evaluated homes.

Under the HMGP, 28 elevated homes at an estimated cost of $1.3 million were studied to see if the mitigation measure worked and to see if the losses could be quantified. Data on these homes was used in equations that account for the fact that the magnitude of flood damage is related to flood depth and the value of the building and its contents. The loss per home was determined in terms of the repair cost or in some cases the replacement cost if the home had been at its pre-mitigation elevation during the November 2006 flood. Unelevated homes would have been inundated with 2 to 8 feet of water.

All elevated homes were above the peak level of November 2006 flooding. Estimated losses avoided ranged from approximately $22,000 to $262,000. Total losses avoided were nearly $1,625,000, which exceeds the $1,316,000 overall elevation project cost. Thus, the cost effectiveness of the mitigation project was demonstrated by the analysis for a single flood. Percentage of cost savings increases with subsequent floods in the future.

Quick Facts

Sector:
Public

Cost:
$1,300,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

Wild Fire
Home Sprinklers

Cook County, Minnesota

Cook County, MN - The Sierakowskis had a dream: to live along the Gunflint Trail in Grand Marais, Minnesota. They honeymooned at Gunflint Lodge, and after a lifetime of work in the St. Paul area, they were able to retire and build their dream log home along the quiet shores of Gull Lake.

On July 4, 1999, the surrounding area was hit with 70-100 mph winds that toppled 40 million trees. They knew that for the next decade, the Gunflint Trail Corridor was at risk for increased wild fire activity.

George Carlson, the Gunflint Trail Volunteer Fire Department Assistant Chief, also realized the implications of the Gunflint Trail Corridor's remote location coupled with the incredible fuel loads and knew some mitigation had to be done to prevent total devastation from the potential wild fire activity. He began researching the use of permanent sprinkler systems on structures and presented his findings to the community.

The Cook County Board of Commissioners applied to the State of Minnesota and Hazard Mitigation Grant Program (HMGP) funding for the sprinkler project. Soon the Sierakowskis received a letter from the County stating that HMGP funds would pay 75 percent of the cost of installation but they were responsible for the remaining 25 percent. Corrine knew they had to protect their dream house and their property.

As part of the approval process for installation, they submitted a plan for the sprinkler system, including the pump location, sprinkler head locations, distance to the house, other building locations, and a diagram of the property. It only took a couple of days to install the system, which they ran afterward to assure proper installation, and it worked great.

During the 2005 Alpine Lake Fire, they saw first hand the importance of maintenance. They ran their system purely as a precautionary measure during that fire, but realized one corner of the house was not getting soaked from the sprinklers. As a result, they added one more sprinkler head to cover that section of the house.

On Saturday, May 5, 2007, the fire started about ten miles away. Once they heard, Joe started running the sprinklers on gas as a precautionary measure.

Sunday afternoon they were notified there would be an evacuation order in effect soon and to begin to get ready to leave. The Sierakowskis were told they would be evacuating later in the afternoon, but a shift in the fire path quickly changed that. They only had time to grab the essentials while the Fire Department fire fighters switched their pump to propane.

They left their house in a four vehicle caravan down the Gunflint Trail. Joe describes the drive by saying "I don't have to wonder what Hell is like; I've been through it." As they were driving in the caravan along the Gunflint Trail, there was fire on both sides of the road.

After waiting anxiously, property owners were finally allowed to visit their home for 20 minutes on Tuesday. When they arrived the sprinklers were still going, although two heads had stopped working. In the end, the sprinkler system provided the protection needed to save their dream home. The Sierakowskis said "This fire is a good testimony that these systems really work!"

Quick Facts

Year:
1999

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

EMERGENCY MANAGER FINDS NEW USE FOR CABLE AND CELL PHONES

Guadalupe County, Texas

Seguin, TX - Fearing that residents along the Guadalupe River were not receiving flood warnings in a timely manner, Seguin County's emergency management coordinator, Dan Kinsey, developed and piloted an emergency callout system.

"Here we could very easily have a situation where we would have a flash flood. If 20-30 percent of your population doesn't have the traditional home phone, you need to find a way to warn them," said Kinsey.

He took advantage of an automated telephone notification system the county has purchased in 2003. It was set to place calls by zones. "We already had everything in place," Kinsey said. "It's a great tool with a lot of possibilities. It was just a matter of creating a database, collecting the information and getting it into the system."

Kinsey continued, "That database could not just rely on traditional land-line telephone numbers, however. There are so many people using cable phones and cell phones nowadays. Your normal land-line database just doesn't cover enough people."

He drafted an Emergency Callout System Voluntary Registration form. Participants are required to list the location of their waterfront property, two phone numbers (designating whether they are land-lines, cell phones or cable/internet phones), and an email address.

Residents are asked to update their numbers in writing, or to notify the Office of Emergency Management if they move out of the flood hazard zone.

However, being able to notify residents is only half of the system. The other half is being able to know when to notify them. Kinsey monitors water flows measured by the Guadalupe River Authority at its hydro-electric dams. Based on those numbers, he can predict when flooding is imminent.

While all emergencies cannot be avoided, Kinsey tries to prevent some and manage others in ways that minimize their impact.

Quick Facts

Sector:
Public

Cost:
$30,000.00 (Estimated)

Primary Activity/Project:
Warning Systems

Primary Funding:
State sources

Homes Removed from Harm's Way Along the Missisquoi River

Orleans County, Vermont

Troy, VT - Just a short drive on River Road southeast of North Troy is an area adjacent to the Missisquoi River that floods every year due to spring thaws and summer's heavy rains. A single-family home on one acre of land and a small farm house with its farm outbuildings on 15 acres were the heaviest hit properties. Each time the cost was about $20,000 for lost farm animals and crops and for cleaning and repair.

In June 2002, Orleans County experienced a flooding event categorized as a 500-year flood. At the peak of the flooding, Mississquoi River waters rose to 18 inches on the first floors of both homes.

The disaster declaration resulting from this flood gave the community the opportunity to apply for funds through the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP). Collaboration between the Town of Troy, Vermont Emergency Management, the Vermont Agency of Natural Resources, the Vermont Land Trust, the Vermont Housing and Conservation Board, and FEMA succeeded in acquiring the grant, a 90 percent federal share for the project. The remaining 10 percent local share was provided by the property owners from the equity when the land was purchased at the local tax assessment appraisal.

The total cost of the project was approximately $150,000.

After all the buildings were cleared from the site, an observation deck for viewing wild birds was constructed on the area where the single-family home had stood. A Troy High School community service project provided workers to clean up litter from the area, plant maple trees along the river bank for erosion control, and prepare signage for a primitive campsite on the remaining land.

In addition, a community garden and leased organic vegetable fields are planned for the site. All of the elements of the project are flood-damage resistant. A custom, hand-painted sign was locally produced and erected on the site at the 2007 completion of the project.

Quick Facts

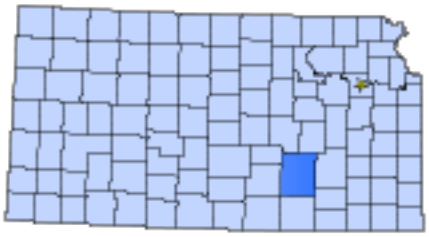
Sector:
Public/Private Partnership

Cost:
$150,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Buyouts Bring Relief to Butler County



Butler County, Kansas

Butler County, KS – Historical Flooding, dating back as far as the 1930s, kept many homes in the City of Augusta and the town of Andover on the repetitive flooding list. Floods resulted from a major river near one community and a creek near the other.

On October 31, 1998, the Whitewater River and the Walnut River, located on both sides of Augusta, converged and flooded the community. The problem was amplified for the county by a watershed that consists of several smaller creeks, including the Four Mile Creek, which is south of the City of Andover.

Using Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP), the city of Augusta received $1.8 million and used it to buy out 32 of 36 houses that flooded on Sunflower Street, leaving two houses on each side of the street. Other options available to homeowners included elevating the existing home, relocating the house to a higher elevation, or simply staying put and hoping for the best.

Under the terms of the HMGP, substantially damaged (more than 50 percent) structures may be purchased and demolished and the land returned to "open space" with no residential or commercial building allowed. The local jurisdiction agrees to own and maintain the land indefinitely. The process took three years to accomplish in Augusta; it was completed in 2001. The city's current plans are to turn most of Sunflower Street into a cul-de-sac park area with scenic walking paths.

David Alfaro, director of economic development and former assistant Augusta city manager, estimated that the city saved $180,000 in 2007 when the open area flooded again.

South of Andover in the Bridlewood Addition along Four Mile Creek, some houses had been sold more than six times with the buyers unaware that they were living in a floodplain. As Wichita became more commercialized, the flooding in Andover worsened.

The FEMA buyout in Andover involved 15 homes out of 20 affected by the disaster. The town received almost $2.5 million from the federal government, and the open land in Andover has become a wildlife preserve, providing food for wild turkeys, deer, and, occasionally, pastureland for horses.

Quick Facts

Sector:
Public

Cost:
$4,300,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Levee Provides Time For Animal Rescue

Cooke County, Texas

Cooke County, TX - Attempting to avoid the rushing waters of the Trinity River, a little elephant clung tightly to a tree during the 1981 flood in Gainesville, Texas. The Frank Buck Zoo lost more than 40 animals in the flood. To ensure the safety of the animals and to minimize the effects of future flooding, an earthen levee was erected. On the morning of June 18, 2007, that levee bought the staff much needed time to evacuate the animals.

Built in a creek bed on 13-acres of land, Frank Buck Zoo is home to approximately 130 animals from four continents. The zoo opened in 1951 with a mission to offer a wholesome, educational environment, one that has been threatened repeatedly by floods.

As a result, the city proposed to construct a flood control levee. The project was initiated April 1991 and completed November 1993. Total project cost was $127,184. Gainesville received a $63,592 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP).

The HMGP paid 50 percent of the cost. On December 3, 1993, the President signed the Hazard Mitigation and Relocation Act of 1993, which significantly increased funding available for hazard mitigation grants under section 404 of the Stafford Act. Presently HMGP pays 75 percent on approved projects that will prevent or reduce damage from natural hazards. The grants are made available for both public and private projects. Funds are administered by the state.

When flood waters rose on June 18, 2007, 112 animals were evacuated to a facility outside the floodplain before the levee was topped. Buildings located on higher grounds remained unscathed. Those same buildings were under water in the flood of 1981.

“The levee definitely protected the animals, and the structures that were on higher grounds and did not compromise the safety of the staff,” Kleven said. “Otherwise, they would have been confronted with flood waters while rescuing the animals. We also were able to re-open the zoo more quickly than we did in 1981.” The zoo opened within three days after the 2007 flood.

Quick Facts

Year:
1981

Sector:
Public

Cost:
$127,184.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

TURN AROUND DON'T DROWN
A PUBLIC AWARENESS CAMPAIGN

State-wide,
Texas

Tom Green County, TX – NOAA'S National Weather Service (NWS) reports that 80 percent of flood-related deaths in South Texas occur as a result of people driving through low-water crossings, walking along the banks of flooded areas, or playing in floodwaters.

Hector Guerrero, a native of Austin, Texas and Warning Coordination Meteorologist for the NWS forecast office in San Angelo, Texas, decided to address the alarming concern. Working in conjunction with his NWS colleagues and partners, he launched the campaign: "TURN AROUND, DON'T DROWN."

People underestimate the force and power of water. Six inches of fast-moving flood water can knock over an adult, and it takes only two feet of rushing water to float most vehicles. More than half of all flood fatalities result from automobiles being swept downstream.

The Turn Around, Don't Drown (TADD) campaign was launched on May 22, 2003, with a news conference at NWS Southern Region Headquarters located in Fort Worth, Texas. The partners included the NWS, Federal Alliance for Safe Homes (FLASH), and the Texas Division of Emergency Management. Informational material, posters, and bumper stickers were provided, along with a demonstration of a new TADD web page. In an effort to reach as many people as possible, Guerrero and his TADD partners held conference calls with representatives from NWS regions across the country to coordinate a nationwide campaign.

In May 2005, through a grant provided by the Allstate Foundation, FLASH, NWS, and Southwestern Insurance Service (SWS), the foundation expanded the Turn Around, Don't Drown campaign in Texas. They targeted the major cities collectively known as flashflood alley – Dallas, Houston, San Antonio and Austin. The cities had alarming flood-related fatalities. Outdoor billboards driving home the flood safety message have been erected in them. The city of San Antonio has placed bumper stickers displaying the slogan on all police, fire, and city vehicles. The message has also been spread through the local media via public service announcements (PSA), distribution of bumper stickers by the Texas Floodplain Management Association, animated presentations, and informative FLASH flood safety flash cards. In 2005 NOAA designated a week in March as Flood Safety Awareness Week.

According to records from the National Climatic Data Center, from January 2007 to July 2007, Texans have experienced more than 900 flooding events, more than doubling the ten-year average of 450 events per year. Over 2,100 flash flood warnings have been issued for the year; again more than double the 10-year average of 903. The number of flooding incidents has increased in the state of Texas, but flood-related fatalities have slightly declined across the U.S.

Quick Facts

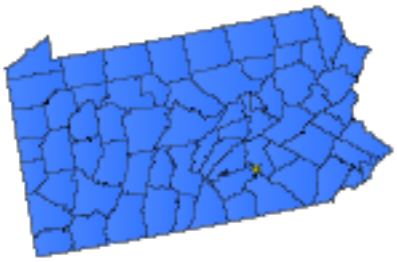
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Cooperating Technical Partners (CTP)

3RiversHUG-CUP Students Begin a New Chapter in HAZUS History



State-wide, Pennsylvania

The State of Pennsylvania - In March 2006, the 3Rivers HAZUS User Group (3RiversHUG) made history—by voting to initiate a student chapter of the HAZUS user group at the California University of Pennsylvania. Interested students from the Department of Earth Science, particularly undergraduates majoring in Geography, with a concentration in Geographic Information Science and emergency management, eagerly accepted the invitation and established the first-ever student chapter of a HAZUS User Group.

One early example of a successful group project was completed during the spring semester of 2006, as part of Dr. Tom Mueller's Advanced GIS course. One of the groups worked with Washington County 911 Coordinator, Chris Barton, a member of 3RiversHUG, to update the school's database for Washington County, Penn.

In addition to these other activities, students also determined that the location data was inaccurate, and Global Positioning Systems (GPS) units were then used to create more accurate location data for the school's database and other databases through internships conducted during the following semester.

During the summer of 2006, another student was given the opportunity to intern at the Washington County Department of Public Safety in order to assist with a Hazardous Materials Commodity Flow Study. This report detailed the moving of hazardous materials via the county's many modes of transportation.

During this internship, a database was developed that displayed all of the SARA reporting facilities within the county linked to a database indicating all the contact and response information about those facilities. The intern also compiled a searchable fire-resources database that showed the locations of all fire-service assets within the county.

The relationships developed through the 3RiversHUG are proving productive for linking local organizations that need assistance with qualified students seeking practical experience. The resulting projects, service-learning activities, and internships are providing real advances—especially in the areas of GPS data creation, GIS analysis, and database-updating and management—that will help create better flood-model results from Level 2 HAZUS runs. These improvements will extend to subjects beyond flooding, including emergency preparedness, mitigation decision-making, and general planning.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
Academic

CHUG - Expanding HAZUS Use in FEMA Region 5

State-wide, Indiana

FEMA Region V - The CHUG (Central HAZUS Users Group) provides a means of collaboration between HAZUS-MH users within FEMA Region 5. This group looks at software challenges, HAZUS-MH projects, and the overall general use of HAZUS-MH software. The main goal of the CHUG is to maximize the potential of HAZUS-MH within the region.

Sharing the successes and challenges between users helps bring the entire region together in planning for natural disasters. HAZUS-MH use is currently growing and maturing within the region. The Polis Center at Indiana University Purdue University Indianapolis, an active CHUG member, has been working with the Indiana Department of Homeland Security to use HAZUS-MH in pre-disaster mitigation planning projects including the development of a statewide 100-year-flood study as well as development of multi-hazard risk assessments using local data in 29 Indiana counties.

In addition, the CHUG has been working to encourage efforts of states like Michigan, Illinois, Minnesota, and Ohio that are just beginning to look into projects that could benefit by using HAZUS-MH.

The CHUG formed a Google Group, which has proven incredibly useful. This group was set up to quickly deliver HAZUS-MH news, upcoming events, and training opportunities. The CHUG felt like this would be a great way to share questions and answers within the user community.

Since the Google Group has a web-based interface all of the conversations can be tracked and searched giving a historical record of the events within the CHUG. In addition, this gives the user group a searchable, low-maintenance way to search for questions and answers similar to a FAQ webpage.

In an effort to communicate with the user community the CHUG also created a webpage.

Quick Facts

Sector:
Public

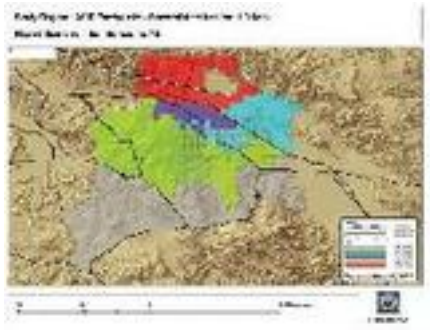
Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
Academic

HAZUS-MH Used
American Indian Reservation Mitigation

Tribal,
FEMA Region I



Region I - Since 2000, Indian tribes, along with State and local governments, have been writing pre-disaster mitigation (PDM) plans in order to achieve compliance with the Disaster Mitigation Act of 2000 (DMA2000).

The FEMA approved PDM plan makes a government entity eligible for FEMA non-emergency public assistance funding that can cover infrastructure improvements. Without an approved plan, FEMA will only fund emergency debris removal programs and emergency protective measures.

Indian reservations are considered “unincorporated areas” and publicly accessible data regarding the infrastructure or buildings on such lands rarely exists. Many of these “sovereign nations” feature tourist attractions, such as casinos. Most reservations contain homes and several businesses. A thorough risk assessment must account for these structures and the reservation’s infrastructure.

The risk-assessment portion of the PDM plan includes identifying potential hazards, researching the background of such hazards as well as their historic frequency, impact and severity. What will happen to the identified study area when each hazard occurs?

Fortunately, FEMA’s multi-hazard loss-estimation tool, HAZUS-MH, has powerful risk-assessment capabilities that can analyze potential losses from earthquakes, floods and hurricane winds. HAZUS-MH Level 2 risk assessments have proved useful during the creation of the PDM plans of numerous Indian reservations.

Some tribes may maintain geographic information system (GIS) data or Global Positioning System (GPS) data that can be input into HAZUS-MH, including building inventories or essential facilities data. Other, more detailed information that will help in the analysis includes a review of hazardous material (HAZMAT) facilities and high-potential-loss facilities. The research may also include soil analysis, ground motion, liquefaction susceptibility, landslide susceptibility, landslide hazards, and dam-inundation maps. If GIS or GPS data is not available, collecting this data is imperative for an accurate risk analysis.

Determining cost-effective mitigation strategies for an Indian reservation always leads to an examination of the relationship between the tribe and the surrounding governments. Reservations exist within the boundaries of a City or County government and within the boundaries of a State government. Some tribes, therefore, maintain a firehouse or firefighting equipment, while others rely on first responder resources within their region.

Most Tribal casinos are open twenty-four hours a day and are ready to survive a power outage or other disaster with powerful generators and stores of food and supplies. Residents of disaster affected communities may flock to a Tribal casino for food and shelter. During the PDM planning process it is useful to discuss these scenarios with all key stakeholders to determine appropriate mitigation strategies.

A responsible PDM plan for an Indian reservation gathers essential data for and about the reservation and examines the relationships and capabilities that exist between the tribal government and its local-government counterpart. These governments have similar missions: to protect their people and assets.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
Pre-Disaster Mitigation (PDM)

FEMA

HIHUG
Hawaii HAZUS Atlas

State-wide,
Hawaii

Hawaii State - To help Hawaii's disaster managers better prepare for and respond to potentially devastating earthquakes, the Pacific Disaster Center (PDC)—in collaboration with Hawaii State Civil Defense and the Hawaii State Earthquake Advisory Committee (HSEAC)—has created the Hawaii HAZUS Atlas (HHA).

The PDC formally unveiled the HHA at the HSEAC-sponsored workshop, Estimated Earthquake Losses for Hawaii County. Over 100 participants attended the event in Hilo, including Hawaii County Mayor Harry Kim. Stakeholders from emergency management and planning communities identified several potential applications of the HHA, ranging from assisting emergency response operations to supporting future exercises.

The HHA is a web-based catalog of 20 "plausible" hypothetical earthquakes based on historical events located in (and around) Maui and Hawaii Counties. The HHA contains loss estimation data and analyses based on HAZUS scenarios. With HHA, communities can use HAZUS results to assist in disaster planning before, during, and after a destructive earthquake.

Prototypes have also been used recently by Hawaii State Civil Defense to support statewide tsunami and earthquake exercises. For the tsunami exercise, the Atlas was used to examine the damage caused by the hypothetical earthquake in Maui and Hawaii Counties.

In case of an actual earthquake in Hawaii or Maui, emergency managers would be able to instantly reference the HHA to assess and visualize a scenario with a similar location and parameters. Simultaneously, HAZUS modelers at the Pacific Disaster Center would run the HAZUS application to produce a near-real time report of the event, including maps and tables.

The HHA application can also assist Hawaii's decision makers by displaying data to support assessment of whether an earthquake's damages are feared destructive enough to merit applying for federal assistance.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

FEMA

Louisiana State University
Using HAZUS to Study a Flood-Prone State

State-wide, Louisiana

The State of Louisiana - In the wake of Hurricanes Katrina and Rita, much HAZUS work was being done in the CADGIS lab, on the campus of Louisiana State University. In particular, a graduate student named Michelle Barnett produced many significant studies that took advantage of HAZUS methodology to create flooding scenarios. Her subject was the flood-prone parishes located all along the Louisiana Gulf Coast.

Three of the studies of the Louisiana Gulf Coast conducted by Michelle Barnett focused on the lower Amite River Valley, the Calcasieu River Basin, and St. Mary Parish, respectively.

• Lower Amite River Valley - The scope of this study was to determine the flooding scenarios for 20-, 50-, and 100-year floods of the Amite River, which runs southeast of Louisiana's State Capital, Baton Rouge. The study also estimated potential losses likely to result from each of the three projected events.

• Calcasieu River Basin - A study similar to the one performed at the lower Amite River Valley was conducted at the Calcasieu River Basin, within Calcasieu Parish (which was struck particularly hard by Hurricane Rita). The study was eventually presented to local municipal authorities.

• St. Mary Parish - St. Mary Parish officials requested that this study be conducted because of the area's considerable coastal vulnerability. Part of the study involved accurately defining the coastline according to the type of land and erosion protection present. The shoreline was divided into transects based on FEMA's Flood Insurance Study (FIS) for St. Mary Parish. These transects differ in still-water elevation levels (SWEs) and studies were developed for both maximum and minimum SWEs.

Michelle Barnett contends that HAZUS-MH methodology can also prove useful for the energy and conservation sectors, as she argued in a paper she co-authored, titled The Economic Value of Coastal Preservation and Restoration on Critical Energy Infrastructure. That paper was presented in Feb. 2007 at the 30th International Conference of the International Association for Energy Economics in Wellington, New Zealand. After that time, HAZUS research was being conducted to consider the coast of St. Mary Parish as if it were hypothetically erosion-protected.

As for Michelle Barnett, in addition to her work at the Center for Energy Studies, she also heads her own enterprise. She realizes that she's an early adopter of HAZUS methodology, but has found opportunities for her company to take advantage of it, nonetheless.

Quick Facts

Sector:
Public

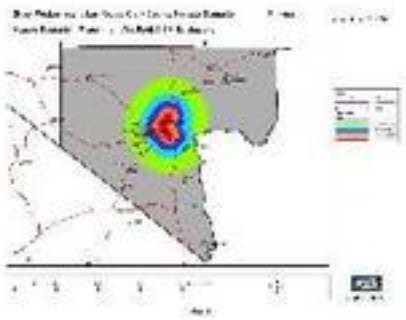
Cost:
Amount Not Available

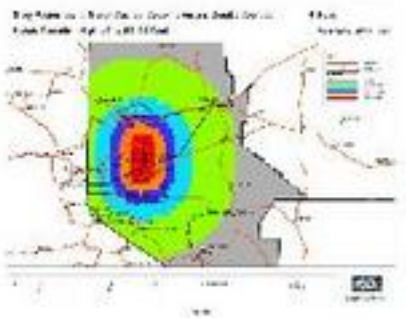
Primary Activity/Project:
HAZUS-MH

Primary Funding:
Academic

NVHUG - Loss-Estimation Modeling of Earthquake Scenarios

State-wide, Nevada





The State of Nevada - With the support of the Nevada Division of Emergency Management the Nevada Bureau of Mines and Geology (NBMG) conducted a project to model the potential earthquake loss in each county in the state of Nevada using HAZUS-MH. Potential earthquake faults that are located near each County seat where selected as the basis for each County HAZUS-MH model.

One of the first pieces of information needed in disaster planning, preparedness, and response is a general estimate of potential damage and costs of an event, such as an earthquake. Nevada has a relatively high level of earthquake hazard, but that hazard is not evenly distributed throughout the state.

Another relevant factor is that the characteristics of the population, infrastructure, and societal resources vary dramatically across the state. The probability of at least one magnitude 6 or greater event in the next fifty years is between 34 and 98%. The probability of at least one magnitude 7 or greater event in the next fifty years is between 4 and 50%.

Earthquake hazards include intense ground shaking, ruptures of the ground, liquefaction, landslides, and ancillary problems, such as fires and hazardous waste spills. Understanding these facts, plus the fact that it is possible to prepare, respond, and mitigate structural and nonstructural risks motivated this project.

A fault that has been determined to be a likely source of an earthquake was selected near each County seat. How often such an earthquake may occur, a parameter that varies from thousands to tens of thousands of years, was not considered in this study. In all cases it is not known when the next earthquake will occur, only that there is a high probability of occurrence. The earthquake scenario provides decision makers with information they need to plan for an earthquake occurrence.

All county scenarios in the report were run using the WUS shallow crustal event-extensional attenuation function, an option within HAZUS-MH that is applicable in Nevada. Earthquakes considered in the study ranged in magnitude from 6.5 to 7.5, the general range of historical damaging earthquakes in Nevada.

Possible economic losses ranged from about $280,000 in Goldfield to $8.8 billion in Las Vegas. These are only crude, order-of-magnitude estimates. That is, any given number may be off by a factor of as much as 10, although HAZUS runs for real earthquakes in recent years have been within a factor of two.

Significant potential economic losses, on the order of tens of millions of dollars, are indicated for most communities in Nevada. Potential major building damage per event ranges from four buildings (in the Goldfield region) to 30,000 buildings (in the Las Vegas area). Unfortunately, an accurate inventory of building stock is not available for the Level 1 analysis and therefore statistical estimates were used.

The different levels of potential earthquake consequences require different levels and types of preparedness across the state. The HAZUS visualization makes these county seat scenarios of immediate value for the local communities and for state contingency planning.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

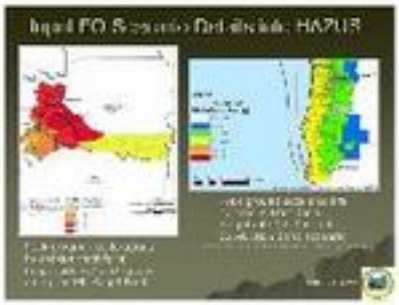
Primary Funding:
State sources

ORHUG - Geologic Hazards
Future Earthquake Damage/Loss Estimates

Multiple Counties, Oregon

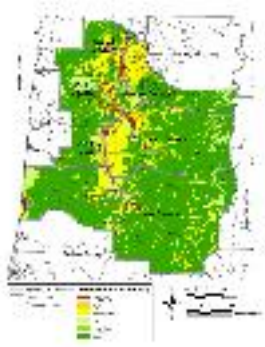
The State of Oregon - In an effort to become more resilient from natural hazards, communities in Oregon have begun a large-scale endeavor aimed at pre-disaster mitigation. Part of the success of this endeavor is due to the Partners for Disaster Resistance & Resilience: Oregon Showcase Initiative (or the Partnership). The Partnership provides a collaborative, cost-effective approach to bring together resources – both human and financial – to enhance disaster mitigation and preparedness statewide.

Oregon Department of Geology and Mineral Studies (DOGAMI) partnered with Oregon Emergency Management (OEM) and the Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon to assist local communities with their Pre-Disaster Mitigation plans. As of April 2006, 18 of Oregon's 36 counties have FEMA-approved natural hazard mitigation plans.



The goal of the DOGAMI-ONHW-OEM partnership is to assist all remaining counties in the state to develop plans utilizing this approach by 2010 . In order to assist these six counties in the development of their natural hazards mitigation plans, DOGAMI identified the primary geologic hazards, developed countywide earthquake and landslide hazard maps for each county, performed future earthquake damage and loss estimates, and performed overall project management.

The 2004-2005 Mid/Southern Willamette Valley project focused on enabling local communities to develop mitigation plans by increasing local capacity through a series of workshops, communication and outreach, and plan development and research support. The project communities included Yamhill, Marion, Polk, Benton, Linn, and



Lane Counties and the City of Albany (herein know as the "Mid/Southern Willamette Valley" communities).

DOGAMI took the lead on developing earthquake risk-assessment components for each of the participating ORHUG Geologic Hazards and Future Earthquake Damage Estimates communities. They utilized FEMA's HAZUS-MH loss-estimation software to model two earthquake scenarios including local Crustal and Cascadia Subduction events.

With an improved HAZUS-MH study region, damage and loss estimates for two earthquake scenarios were modeled—resulting in expected total building damage on the order of $11.7 billion for a Cascadia Subduction Zone event. The outputs of the scenarios were used by the communities to develop action items at reducing the risks posed by earthquakes.

DOGAMI has also spearheaded the development and passing of four new seismic bills in the State Legislature. The laws allow schools and communities to become better prepared for future earthquakes by providing long term, stable state funding to help the highest-risk schools and emergency facilities to conduct seismic rehabilitation.

The hazard maps and damage and loss estimates developed in this study can serve as a starting point for identifying problem areas that should be further evaluated through general highlight of areas of higher and lower concern.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

Wisconsin Emergency Management
HAZUS Used to Evaluate Flood Risk/Losses

State-wide, Wisconsin

The State of Wisconsin - In 2005, the agency charged with helping safeguard the State of Wisconsin against the impacts of all types of disasters initiated a significant undertaking: to conduct a 100-year flood risk-and-loss estimate that could apply to the entire state. While still engaged in that ambitious project, Wisconsin Emergency Management (WEM) has also been preparing for the launch of a second statewide assessment, one that will utilize the powerful processing abilities of HAZUS-MH methodology.

A comprehensive study of flood risks and losses can prove particularly useful in a state such as Wisconsin. Wisconsin features a varied topography that ranges from lowlands to highlands, and is bordered by Lakes Superior and Michigan. When rainfall or snowmelt exceeds normal levels, the State can suddenly find itself facing a flood threat of huge proportions—underscoring the pressing need for analytical research and predictive models.

Under requirements of the Disaster Mitigation Act of 2000 (DMA 2000), states and local jurisdictions must now calculate the amount of risk present and estimate the potential damage that could occur during a flood event, in order to retain eligibility for mitigation funds. However, quantifying the magnitude of flood threat has previously proven difficult, due to the highly subjective nature of calculating risk and loss.

Wisconsin Emergency Management (WEM) first became aware of HAZUS-MH in the mid-90s, back when the program was specifically being used to calculate damage estimates about losses from earthquakes. In 2002, after learning about the HAZUS flood model, the agency sent one of its planners to the Emergency Management Institute (EMI) to receive training about the program. At that time, WEM utilized HAZUS software in order to analyze a limited selection of counties and watersheds.

The possible applications and utility of HAZUS-MH were so varied and intriguing that in 2006, WEM, in conjunction with FEMA Region V, sponsored a training seminar for potential HAZUS-MH users located in the Midwest. The training culminated in the students performing a HAZUS-MH flood run for the jurisdiction of their choice.

After sending another planner to EMI to receive HAZUS-MH Advanced Flood training, WEM began its statewide 100-year flood risk-and-loss estimate. About one-fourth of the state's 72 counties have been analyzed using HAZUS-MH, and planners report successful results, while working with HAZUS software developers to identify ways to bolster the program's functionality.

While continuing to work on the 100-Year Flood-Risk Assessment, WEM has requested funding from FEMA's Pre-Disaster Mitigation (PDM) program so it can contract with the University of Wisconsin and the POLIS Center to complete a Level 1.5 HAZUS-MH flood-risk assessment for the entire state. The goal of this second assessment is to incorporate local data in order to create more accurate estimates. The results from both studies will be compared and used in developing future strategies, including those outlined in the Wisconsin State Hazard Mitigation Plan.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
State sources

FEMA

FLOODPLAIN MANAGEMENT
A JOB TO BE TAKEN SERIOUSLY

Bee County, Texas

Bee County, TX - When Dennis DeWitt assumed the role of floodplain administrator for Bee County, he had no idea what duties were attached to the position. He had not been on the job a year when he faced a rude awakening. There was a flood and his response to local residents affected by it was lacking.

Immediately following a flood in 2000, he received a call from a representative of the Governor's Division of Emergency Management. DeWitt identified himself, as floodplain manager, with much confidence. When questioned regarding the issuance of permits to residents in the process of re-building his response was, "I don't know what you are talking about." At that moment he knew he had to become a fast learner.

DeWitt learned that floodplain management involves both corrective and preventative measures for reducing flood damage. He researched information on zoning requirements, building codes, and special-purpose floodplain ordinances. He familiarized himself with the role of the National Flood Insurance Program (NFIP) and its floodplain management requirements. He could discuss the Increase Cost of Compliance (ICC) and the Community Assistance Program (CAP) relative to the NFIP.

DeWitt revisited his role. He drafted a series of forms, flyers, and letters. "When we started having problems with flooding I went to the newspaper with this form, which is printed on water-resistant paper. It specifically tells residents what they need to do in a flood event and who they need to contact," De Witt said. The form is given to residents or left on their door.

Another form, the Development Permit Application, has to be completed for any structure being repaired, renovated or improved, if the cost equals or exceeds 50 percent or more of the value of the structure. It is also required for new construction. A multi-purpose form, each resident must list an emergency contact number and become familiar with the floodplain management information, which is included in the form. Flood map number, flood zone, and map date are listed.

Following an on-site visit, a Damage Determination letter is issued to residents affected by a flood. In it, Dewitt lists the percent of structural damage, base flood elevation for the location of the property, an estimated level of the present elevation of the home, zoning, map number, and re-building requirements. A statement regarding NFIP and ICC is also included.

Area residents and newcomers are encouraged to visit with DeWitt. He invites them into the map room and educates them on the location of their property, the base flood elevation (BFE), and discusses flood prevention measures. "I want them to know what they are getting themselves into. I don't try to tell them not to build or re-build in that location."

Trying times characterized the first six months of his new program. He was confronted with resistance from some of the local residents who did not welcome change. DeWitt acquainted them with the guidelines and followed up on compliance. As a result of his perseverance, his floodplain management strategy has proven effective.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

FEMA

Doing the Right Thing in Clifton, Texas

Bosque County, Texas

Bosque County, TX – Flood waters repeatedly inundated a small community causing extensive damage. In 1991, a record flood devastated the small town of Clifton, Texas. Some homes were totally destroyed and others required major renovation. The city sought measures to minimize the effects of future flooding by initiating buyouts as a mitigation practice.

In south central Bosque County, the town of Clifton is part of the hill country of Central Texas. With a population of approximately 3,500, the town supports light-industrial and agricultural-based employment. It is also a nesting place for the Bosque River.

“Flooding is no stranger to Clifton. I have seen that annually,” said Jimmy Burch, director of Public Works. “Recent flooding created an island around our old armory.” About the 2007 flood, he added, “Water was 12-18 inches deep. The little bridge was under water. Flood waters got up to the houses. If we had had 4-6 more inches we may have had a repeat of 1991.”

The Acquisition Project was initiated in August 1993 and completed in May 1995 at a cost of $226,252. Clifton received an $113,126 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP). The funds were administered by the Governor’s Division of Emergency Management Agency. The project acquired 18 private real properties (structure and land) and 13 lots.

The HMGP paid 50 percent of the cost. On December 3, 1993, the President signed the Hazard Mitigation and Relocation Act of 1993, which significantly increased funding available for hazard mitigation grants under section 404 of the Stafford Act. Presently, HMGP pays 75 percent on approved projects that will prevent or reduce damage from storms and other natural hazards. These grants are made available for both public and private projects.

Property acquired with HMGP funds must be converted into open space and may not be built on in the future. The purpose is to remove people and their homes from harm’s way. Participation in acquisition projects is voluntary. Some choose not to participate because of sentimental attachment to their homes, while others welcome the opportunity.

The project created green space and a park. “We have tried to create parks in all of the acquired properties.The children are taking advantage of the green space for soccer games,” said Burch.

Quick Facts

Year:
1991

Sector:
Public/Private Partnership

Cost:
$226,252.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Earthquake Loss Estimation Study for the New York City Area

Multiple Counties, New York

Manhattan, NY - A preliminary forecast of the type of losses that the New York City area could suffer after an earthquake is the subject of this study funded by FEMA Region II and coordinated by the Multi-Disciplinary Center for Earthquake Engineering Research. The initial stages of this study involved fact-finding and assessment, with the development of preliminary soil maps and building inventories.

This study describes the scale and extent of damage and disruption that may result from potential earthquakes in Manhattan. In assessing the risks involved, this research has made a significant contribution toward improving our understanding of seismic hazards in Manhattan by forecasting potential losses so that strategies may be formed to reduce their impacts.

The primary objective of this study is to develop and implement a comprehensive risk and loss characterization for Manhattan in the event of an earthquake. This resulted in a complete building inventory of every structure in Manhattan was assembled from a variety of sources. Combined with a detailed geotechnical soil characterization of Manhattan, this building inventory has been used to model scenario earthquakes in HAZUS.

When viewed in context with additional information about regional demographics and seismic hazards, the model serves as a tool to identify the areas, structures and systems with highest risk and to quantify and ultimately reduce those risks.

Deterministic and probabilistic earthquake scenarios were modeled and simulated in Manhattan, which provided intensities of ground shaking, dollar losses associated with capital (the building inventory) and subsequent income losses.

This study is unique, because it is currently one of the most detailed and site-specific applications of HAZUS or any other earthquake loss estimation.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

HAZUS-MH Used for Risk Assessment and Hurricane Preparation

Harris County, Texas

Harris County, TX - Harris County, Texas is the latest in a growing number of urban counties that has used HAZUS-MH for risk assessment and preparedness planning. In 2005, the county enlisted the support of a FEMA-authorized HAZUS vendor for flood and hurricane models to assess the risk to flood and hurricane hazards.

Harris County was in a unique position to initiate a Risk Assessment Program using HAZUS-MH in 2005. The Tropical Storm Alison Recovery Project (TSARP) provided up-to-date hydrologic and hydraulic data and new mapping tools. In addition, the County's unique relationship with the U.S. Army Corps of Engineers provided extensive economic and risk-assessment data from multiple completed and ongoing federal flood-reduction projects.

In Phase I of the Harris County Risk Assessment Project, a basic HAZUS-MH Level-1 analysis using the Hurricane Wind and Flood modules was run for the entire county to familiarize personnel with the program and provide a useful product that could be immediately used. In order to evaluate the program for a Level-2 analysis, a pilot watershed was selected and HAZUS-MH was populated with high-quality data specific to the watershed.

On September 21, 2005, the Harris County Office of Emergency Management (OEM) tasked the FEMA-authorized vendor to provide technical support in estimating potential losses from Hurricane Rita, using HAZUS-MH.

The hurricane approached on an erratic path, first threatening landfall far to the west, then changing course so that its track was closer to Harris County. Local government officials activated emergency preparedness protocols. By Wednesday, September 21, 2005, predictions placed Galveston and Houston directly in the path of the hurricane.

Harris County was spared a direct hit from Hurricane Rita. The storm did, however, give county personnel the opportunity to test their hurricane preparedness protocols and to evaluate planning and implementation of emergency response activities. The FEMA-authorized HAZUS vendor assisted the Harris County Office of Emergency Management (OEM) in applying HAZUS-MH predictive tools to the event.

Several conclusions can be drawn from the analyses performed during the Harris County Risk Assessment Program, including the HAZUS-MH software package can be successfully applied to a large urban county; a Level-2 analysis using local data to supplement the default national data does improve the results of the analysis; near real-time reporting of hurricane events is possible with the HAZUS-MH hurricane module by using NWS advisory bulletins; HAZUS-MH provided much greater detail regarding wind speed distribution throughout the County than was available through the normal news and information services.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

ICC FUNDS AID ELEVATION PROJECT near the Aransas River

Bee County, Texas

Bee County, TX - In 1996, Jason and Alice Dickenson purchased an old, 1,800 square -foot wood-frame home in the unincorporated town of Skidmore, Texas. They were unaware of the zoning, building restrictions, community ordinances, and the need for homeowners insurance.

On Aug. 30, 2001 the Aransas River topped its banks and more than four feet of water poured into their home. “We could tell that the water was rising. We grabbed whatever we could and got out of harm’s way. The water just seem to pick everything up and set it down some place else,” Alice said.

Their home was insured for the amount of the mortgage. The Dickenson’s learned that they lived in a community participating in the National Flood Insurance Program (NFIP). NFIP makes available flood insurance and requires communities adopt a minimum local floodplain management ordinance that regulates new and substantially improved development in identified flood hazard areas.

In addition to building coverage, NFIP policyholders with substantially damaged homes (cost of repair more than 50 percent of its pre-flood value) are eligible for Increased Cost of Compliance (ICC) benefits. ICC coverage provides up to $30,000 to elevate, demolish, or relocate the home, protecting it from future flood damage. The coverage is included under all regular NFIP policies issued or renewed after June 1, 1997. To their surprise, they were covered.

The Dickenson’s decided to rebuild in the same location and vowed they would be ready for the next flood. They met with the county’s floodplain manager, who gave them sound advice: elevate. The base flood elevation in their community is 123.5 feet above sea level. They decided to build a Jim Walter “Lakeside” Home on pilings.

“Building codes specifically said that we had to build above the floodplain if we wanted to stay out here,” stated Mrs. Dickenson. “The pilings are 15 feet tall. Jim Walter normally quotes 6 feet. We used our ICC funds to defray the cost of the elevation. We wanted to stay within the guidelines.”

On June 18, 2007 the Aransas River again crested, spilling on to their property. The Dickenson’s watched as it slowly crept on the lawn, but knew there wasn’t a need to panic. Their new home sitting on pilings gave them a feeling of security.

Quick Facts

Year:
2001

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

Federal Grant Helps Massachusetts Weather Storms

Plymouth County, Massachusetts

Scituate, MA - Jericho Road follows the coastline of Scituate Harbor with several residences and a salt water marsh on the side of the road opposite the harbor-front land. High-storm tides and intense coastal storm surges frequently left yards, driveways, and garages flooded with water.

Completed in 2007, the Jericho Road Drainage Project in Scituate was funded primarily by a grant awarded through the Department of Homeland Security's Federal Emergency Management Agency (FEMA) Hazard Mitigation Grants Program (HMGP).

The work at Jericho Road was a result of the 2001 winter storm season. The Commonwealth of Massachusetts had been awarded $1.5 million for mitigation grants following severe storms in March 2001, and the Jericho Road Drainage Project was a sub-grant. The Massachusetts Emergency Management Agency (MEMA) co-administered the Commonwealth's grant program along with the Massachusetts Department of Conservation and Recreation.

Scott C. MacLeod, MEMA mitigation grants manager, recalled that more than 40 communities submitted project applications following the March 2001 storms. Of the applications, 16 hazard mitigation projects were approved. They included drainage and storm water management improvements, culvert upgrades, and hazard mitigation planning projects.

To improve the drainage system under Jericho Road, a 12-inch pipe was replaced with an upgraded 42-inch pipe. The pipe now drains into two 30-inch concrete pipes before passing through the self-regulating tide gate at the outfall to Scituate Harbor.

Throughout the project's development, the town worked very closely with the Massachusetts Department of Environmental Protection, the Office of Coastal Zone Management, the Environmental Protection Agency, and the Army Corps of Engineers to obtain the permits necessary to carry out the project.

FEMA provides extensive hazard mitigation expertise for every disaster, funding specific public mitigation projects and providing hazard mitigation grants to states following federally-declared disasters. Since 2001, Massachusetts has received two additional hazard mitigation grants as a result of federally declared flooding disasters in October 2005 and May 2006.

From the April 2007 storm, flooding resulted in federal disaster declarations for all six New England states, including Massachusetts. MEMA officials are currently developing HMGP grant briefings in eligible communities in order to give those communities the opportunity to identify and seek funding for appropriate projects.

Quick Facts

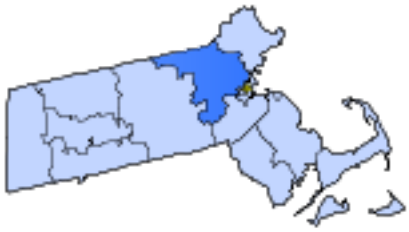
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Winchester Culvert Upgrades Prevent Flooding



Middlesex County, Massachusetts

Winchester, MA - Major storm events repeatedly overwhelmed the culverts at Sylvester Avenue and at Canal Street in Winchester, Massachusetts. Finally, a 2001 storm brought substantial damage, which led to a hazard mitigation project for the Town of Winchester.

A March 2001 storm first brought snow and then rain to Winchester. In this storm, the slush developed into a mass which clogged Horn Pond Brook. A large mass of the slush broke loose and as it moved down stream, it gathered debris, limbs and acted as a massive destructive force.

When the water reached the Sylvester Avenue culvert, the force cracked the sidewalls, washed out the area embankments, and damaged the surrounding pavement. The Canal Street culvert was also negatively affected in similar ways. In addition, the flooding significantly impacted 14 neighborhood homes and a nearby school.

The Town of Winchester took immediate protective measures by installing Jersey Barriers to block the pedestrian walkway across the culverts. Concrete blocks were also placed along the eroded embankments as a short-term action to prevent continued erosion.

The proposed fix long-term was to enlarge the culvert capacity by 20 percent. New headwalls were also to be installed at the entrances and exits of the culverts to prevent erosion and scour. Construction would involve demolition of existing structures, casting new footings and then the installation of new culvert boxes.

With funding from FEMA's Hazard Mitigation Grant Program (HMGP), a $230,018 grant was awarded. This hazard mitigation project for the Town of Winchester was completed in 2005.

A recent storm tested the new structures and the results were good.

Photos by Rebecca Poynter

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

City Uses HMGP to Restore Park

Muskegon County, Michigan

Montague, MI - Thanks to HMGP funds, the site of an old factory in a once neglected part of the small Michigan city of Montague was razed with intentions to create a park in its place. The structure, known as the Chimont building, was built in 1910 and later used for World War II related manufacturing activities.

The property is located next to the Buttermilk Creek just before the creek enters a 48-inch, 800-foot-long culvert that runs beneath the City of Montague's central business district and continues on to enter the White River. The land sits approximately 10 feet lower than the surrounding parcels and during extremely heavy rain, the creek overwhelms the culvert, flooding the site.

This old Chimont building had become undesirable for manufacturing use and in addition to becoming an eyesore in the city's central business district, it was also a safety concern. HMGP has allowed the City of Montague to raze the structure from the flood zone and restore the site to much desired open space, which the city will eventually restore to a public park.

While there had been various previous ideas to redevelop the structure/property, they were adversely affected by the potential for flooding.

In the end, thanks to the HMGP, the land was cleared and the plan to turn the area into a park can be realized. Infrastructure improvements include a small parking area, walking trails, and play ground equipment. The park will also be designed to accommodate a skating rink and sliding hill in the winter.

FEMA and the City of Montague were able to show that restoring the property to a park would be the best use for the land and would eliminate future property loss due to flooding. Thanks to cooperation and the HMGP, the project was completed in a timely, cost-efficient manner that has greatly benefited the city and its residents.

Quick Facts

Sector:
Public

Cost:
$335,109.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

HMGP Provides Safer Roadway and More Reliable Roadway

State-wide, Michigan

The State of Michigan - A 1,320 foot stretch of M-35 was recently restructured using funds from FEMA's Hazard Mitigation Grant Program (HMGP). The roadway had a history of flooding, which caused hassles for drivers and cost the state thousands of dollars.

The project was a two-fold improvement of the stretch of road. First, two 24-foot culverts were replaced with 36-foot and 48-foot culverts. This allowed necessary drainage between the wetlands dissected by the M-35 roadway.

The second phase consisted of an aggregate grade lift that was placed on the existing road surface to allow sufficient drainage to stop the continued erosion during high run-off periods. The roadway was then repaved to allow acceptable traffic conditions for the traveling public. Now the run during peak events no longer saturates the sub-base and degrades the structural integrity of the roadway.

Less flooding, along with faster drainage when flooding does occur, means safer travel conditions for the thousands who traverse the road. The repetitive roadwork that was previously required was also drastically reduced. With an estimated benefit of over $600,000 during the project's 20-year expected use, the Michigan Department of Transportation will save $30,000 annually.

Thanks to the cooperation of FEMA, Marquette County and the Michigan Department of Transportation, the HMGP was used to make M-35 not only more cost-effective, but also, more importantly, a safer road.

Quick Facts

Sector:
Public

Cost:
$205,980.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Homes Saved From Flooding
HMGP Used to Purchase Homes

Livingston County, Michigan

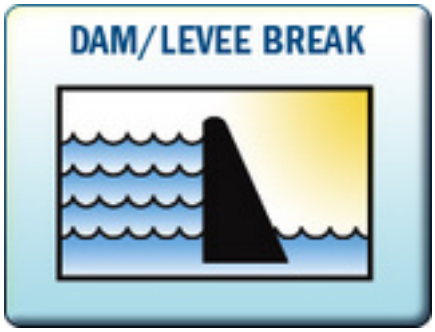
Livingston County, MI - The six Mobile homes that sit on a small peninsula near the Hi-Land Lake and the Portage River were purchased through the Hazard Mitigation Program Grant (HMPG) in order to eliminate the emotional and financial hardships that would afflict the homes' residents following potential floods.

Granted $524,475, the Livingston County Drain Commission acquired six residential structures in the Portage River floodplain. The mobile homes are located in Putnam Township just downstream of the Hi-Land Lake Outlet Dam, which is listed under the National Dam Inventory as a high-hazard dam. The area has a history of Dam flooding, including massive floods in 1982 and again in 2000.

When the floods occurred, most of the damage to the homes would result due to sewer backups caused by short-term power failure at pumping stations and the capacity of the storm water collection system being exceeded. As a result, raw sewage would back up in the homes creating serious public health and safety concerns and causing property loss. Thanks to the HMGP and the purchase of the properties the mobile homes were removed, and the sewer system was secured to prevent future backups of sewage into neighboring homes and waterways.

The effectiveness of the project was realized just months after its completion when the Hi-Land Lake Outlet Dam flooded, and the already-purchased homes were severely damaged.

Thanks to the HMGP, State, County and FEMA cooperation, the potential hardships caused by this recent flood were avoided and will continue to be avoided in years to come.



Quick Facts

Sector:
Public/Private Partnership

Cost:
$584,887.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Overpass Culvert Replacement Results in Safer Road

State-wide, Michigan

Charlevoix County, MI - With over 2,700 vehicles using it daily, Thumb Lake Road is the second busiest road in Charlevoix County. Formerly the road's overpass of the Boyne River was a sight of continual flooding due to inadequate culverts and pour drainage atop the road, but it was restructured to ensure safer travel and eliminate repetitive repairs. Funds were allocated through the Hazard Mitigation Grant Program (HMGP) to rebuild the structure and reduce future risk.

The project consisted of several mitigation techniques on the overpass. The main target was replacing two 48-inch culverts. The culverts had inadequate capacity to accommodate storm-water flow during significant precipitation events. The project replaced the twin pipe culverts with a 22-foot-wide concrete box culvert. Concrete headwalls were also installed and stream bank stabilization measures, such as rip-rap, were taken.

The reduction of water over topping the bridge was a particularly important problem, with damages of $10,000 per event being prevented in the future. Problems with the hydraulics of the water flowing under the roadway, which resulted in debris back-ups, were also resolved with the new, larger culvert.

Thanks to cooperation between FEMA and the Charlevoix County Road Commission, the mitigation of the Thumb Lake Road crossing will result in flood damage prevention ranging between 95 and 100 percent. This means less expense for the county and a safer road for motorists to drive on.

Quick Facts

Sector:
Public

Cost:
$280,000.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

County, Residents Partner with FEMA to Secure Waterway

Oakland County, Michigan

Oakland, MI - Thanks to a two phased grant Bloomfield Township applied for through FEMA's Hazard Mitigation Grant Program (HMGP), the Franklin branch stream bank is a highlight of the community rather than a safety concern.

The Rogue River in Southeast Michigan is responsible for draining over 438 square miles of the most heavily populated areas of the region. When one of its four main river branches, the Franklin branch, began to show signs of serious deterioration and erosion, businesses and residents near the river were threatened. Bloomfield Township applied for the two phased grant to study hydraulics and repair the stream bank.

The Franklin Stream Bank Stabilization Project focused on four areas of stream bank erosion along a one-mile stretch of the Branch. Each site was ranked a priority based on the threat to infrastructure.

This project focused on the use of innovative engineering alternatives that included brush mattresses, live staking, fascines, pools and riffles, and vegetated geocell retaining walls. The 100-year floodplain elevation was not increased at any of the project sites. In addition, this project included an extensive reforestation phase. Among all four sites, a total of 911 new trees were planted.

At the onset of the project, a significant amount of effort was taken to ensure that resident concerns where addressed during the design of the project. The engineering innovation and cooperation of all stakeholders involved in the project is witness to the importance and success of the Franklin and 14 Mile Road Project.

Tthe stream bank was stabilized and the safety of the buildings and residents in Bloomfield County has been insured in a cost-efficient, community-friendly manner.

Quick Facts

Year:
2000

Sector:
Public

Cost:
$2,143,512.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Living on the River and Loving It

Parker County, Texas

Weatherford, TX - Larry and Jenanne Thompson have returned home following several flooding events to find their home virtually unscathed by the creeping waters of the Brazos River. Past experience with flooding guided them in the right direction with regard to the building process.

The 1,670 square foot, wood frame hosue they call home is elevated 12 feet, one inch above the original slab-on-grade foundation and rests on an open wooden column system. The cost of the project was estimated at $70,000. It was secured through homeowner financing.

On June 18, 2007 water from the Brazos River crept upon the land of Horseshoe Bend. According to the local floodplain of their Weatherford home administrator, the flood gauge was documented at 27.5 feet, approximately 2.5 feet over flood stage.

After the water receded, the Thompson's returned home to assess the damage. Debris from the river had once more been swept into the area beneath their home. The living area, on the other hand, was high and dry.

At the house next door, a small wood frame house resting on cinder blocks, more than four feet of water had flooded the home. The neighbor was a newcomer to the community.

Quick Facts

Sector:
Private

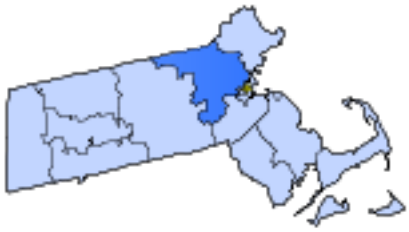
Cost:
$70,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

The Planning Advantage
Flood Mitigation



Middlesex County, Massachusetts

Middlesex, MA – Federal requirements since 2000 have called for local jurisdictions to have multi-hazard mitigation plans in place to be eligible for FEMA project grants. At the local level, developing a hazard mitigation plan can not only meet the requirement, but it can also be advantageous to the community.

In Northern Middlesex County there was an additional interest in planning. Repeated flooding situations along three rivers in the region had driven home the importance of hazard mitigation planning.

The effects of the recent flooding and the desire to engage in solid planning led towns in the area to take advantage of an opportunity provided by the Northern Middlesex Council of Governments (NMCOG). The NMCOG offered to facilitate regional planning.

NMCOG efforts to develop a regional multi-hazard mitigation plan and assist member communities in developing local annexes were funded through the Pre Disaster Mitigation Grant Program (PDM-C). Eight towns and one city agreed to participate.

NMCOG conducted a two-tiered planning process. It first held a series of joint workshops with all the communities and then conducted individual town meetings.

The first joint meeting focused on the risk and impact of natural disasters in the local geographic area. The development of a hazard risk assessment became important to the town representatives. In the next phase, the NMCOG organized individual local teams to discuss specific challenges, suggestions and opportunities. Local teams used their risk assessments to develop customized action items and strategies for specific mitigation projects within each community.

Currently NMCOG is in possession of an approved regional hazard mitigation plan and each member community has a localized plan. The immediate results are several well-planned, fundable hazard mitigation projects. Mitigation projects totaling more than a half-million dollars have been recommended to FEMA for funding in this year's grant cycle.

Quick Facts

Sector:
Public

Cost:
$52,000.00 (Estimated)

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Pre-Disaster Mitigation (PDM)

The Town of East Haven Has Lifted Itself Above the Grade

New Haven County, Connecticut

East Haven, CT - Both in the winter and summer months the town of East Haven experienced flooding and East Haven's firefighters were constantly evacuating and rescuing residents.

East Haven's Cosey Beach is exposed to coastal flooding from hurricanes, nor'easters, and other severe storms. Inland riverine flooding originates from the Farm River.

In 1997, a community group formed an association to see what could be done for both riverine and coastal flooding. Joe Maturo was elected Mayor and began to make changes that would lift East Haven above the grade.

Mayor Maturo's first step was to ask Fire Chief and Emergency Management Director Wayne Sandford to take the lead. Sandford and Mayor Maturo began meeting with residents to turn flooding concern and frustration into action items.

A prior grant of $250,000 from the Connecticut Department of Environmental Protection allowed the enlargement of an area underneath a bridge over the Farm River which had blocked water flow during river flooding. To raise awareness of the NFIP, educational fairs were held for the public. Within two years, East Haven was retuned to good standing in the NFIP.

East Haven was named as a Connecticut 2000 Project Impact community. Project Impact was a Federal Emergency Management Agency (FEMA) initiative to build disaster resistant communities. East Haven developed and implemented several projects with Project Impact dollars.

Coastal measures implemented included evacuation route signs, installation of shutters on residences as well as notification and preparedness information hand-delivered to coastal homes by firefighters within hours of a hurricane warning. However, the most exciting initiative was an effective and efficient notification system. A reverse 911 system was combined with flood-river gauges installed along the Farm River.

East Haven's new rating as a Class 8 in the NFIP Community Rating System (CRS) means property owners receive a 10% discount on their flood insurance premiums with an average savings of $77 per policy for the 1,286 residents with flood insurance. The total community savings for East Haven is nearly $100,000.

This year at FEMA's annual New England mitigation conference, Mayor Joe Maturo accepted an award for East Haven from FEMA Region I and the State of Connecticut recognizing the town's outstanding efforts to improve the floodplain management program. Plans are underway for a major home elevation effort along Cosey Beach in 2008 and a final bridge enlargement will soon be under construction.

Quick Facts

Sector:
Public

Cost:
$1,000,000.00 (Estimated)

Primary Activity/Project:
Warning Systems

Primary Funding:
Pre-Disaster Mitigation (PDM)

FEMA

Recovery Efforts
Retain Historic Gilbertsville

Otsego County, New York

Albany, NY – With additional help from federal and state disaster agencies, the tiny Otsego County Village of Gilbertsville is rebuilding from the June 2006 floods without having to sacrifice one of its most historically significant features.

One of the prominent features of the district is a 200-foot-long manmade channel of laid - up, cut stone that carries the Dunderburg Brook through the center of the community. During the severe storms of June 26 - 28, 2006 the usually placid brook roared through the ravine, cresting several feet above it, flooding homes and businesses.

The historic retaining wall, which varies from 6 to 14 feet in height, held through the flood but was structurally compromised. Temporary bracing has since been put in place to stop the wall from falling further inward, but village officials found that permanent repairs will be much more costly.

When Otsego and 18 other counties in the region were declared eligible for federal disaster assistance last June, it triggered the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) program. The program provides reimbursement to government entities and certain non-profits for repair of damaged public infrastructure.

FEMA provides 75 percent of the funding, and New York State funds the remaining 25 percent. The program is administered by the New York State Emergency Management Office (SEMO). Additional funding is available from FEMA through its hazard mitigation program which encourages, and pays for, preventative measures.

Restoring the wall to its original, historic state will require first removing and then replacing the damaged sections with concrete and then re-facing the wall with laid-up stone. In order to mitigate future damages, riprap is being placed to line the streambed beyond the retaining wall to prevent future erosion.

Mayor Musson worked with FEMA and state officials to secure the funding to return the wall to its original, historic state and to mitigate future damages. In late February, Senator Charles Schumer announced FEMA had approved more than $1 million in public assistance for the project.

Quick Facts

Sector:
Public

Cost:
$1,378,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Simple Fix for Village of Greene Wastewater Treatment System

Chenango County, New York

Albany, NY – The three lift pump stations located in Chenango County's village of Greene have pumps that are about 20 to 25 feet deep in a manhole and are part of the wastewater treatment system that was knocked off line by flooding in June 2006.

Before the flood, the manhole cover was on a metal collar that lifted the entry point about a foot above ground level. During the flood the water rose approximately three to four feet deep at the pump locations, knocking out the motors and threatening to compromise the entire wastewater treatment system.

Extraordinary work by village managers minimized the threats, but the village still needed a long-term solution. In the end, another four feet of manhole collar was welded on top of the existing manhole collars. This lifted the manhole entries roughly a foot above the flood of record for this area.

When President Bush signed a major disaster declaration for New York State because of the 2006 flooding, it triggered the Public Assistance (PA) Program in Chenango County to reimburse government entities and certain non-profits for emergency protective measures and the repair of damaged public infrastructure.

Altogether FEMA and SEMO have provided about $98,000 to repair flood-affected parts of the village's wastewater treatment system. While the elevated collars on the lift pump stations were small in cost, about $2,250 per collar, the dividends are huge.

Quick Facts

Sector:
Public

Cost:
$98,000.00 (Actual)

Primary Activity/Project:
Elevation, Utilities

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Wildfire Mitigation Tested in Orange County, CA

Orange County, California

Orange County, CA - On the morning of Sunday, March 11, 2007, fire erupted at Windy Ridge along the 241 Toll Road in Orange County.

Initial response was units dispatched from the Orange County Fire Authority (OCFA), City of Anaheim Fire Department and City of Orange Fire Department. A Unified Incident Command was immediately established and provided coordination throughout the response. The strong winds continued to stoke the fire and pushed it toward Anaheim Hills and Orange, forcing the evacuation of 1,200 people. One home received moderate roof damage. The fire was fully contained by noon on Tuesday, March 13 after burning 2,036 acres and threatening hundreds of homes.

Mitigation measures paid off handsomely for Dave Blunk and his family. Mr. Blunk built his home three years ago and anticipated a fire “burning right up to my house.” The concrete and steel home was built to withstand wildfire, 100 MPH winds and earthquake.

“There is no wood in the construction of the house other than the fire treated plywood which was used under the roof tiles,” states Mr. Blunk, “the roof tiles are fire resistant and heavy to withstand high winds; eaves are enclosed, the vents covered with 1/8 in mesh; dual pane windows; stamped metal connectors throughout for wind and seismic strengthening and we overbuilt the foundation.”

In addition to all of the mitigation measures to the home, the Blunks installed a water line and connectors compatible with standard fire hoses.

Flames from the Windy Ridge fire roared up the hill and grew to forty feet in height. Flame links touched the house, the fire engulfed the house and moved on beyond. At the height of the inferno, firefighters took refuge in an enclosed courtyard. Firefighters used the Blunk’s fireline and water to augment their resources once the fire passed over the home. There was no damage to the house and the only evidence of the fire was scorched plants and ashes in the swimming pool. Dave Blunk estimates the special materials added 25% to the total cost of construction, however, it was money well spent to protect the multi-million dollar investment.

The Fire Prevention offices of both the City of Anaheim and the City of Orange have very effective fuel modification programs. The programs are designed to control the types, density and moisture content of plants – or fuel – in the wildland urban interface areas. By modifying the fuel around or close to homes, a defensible space is created which serves as a barrier for wildfire and allows space in which firefighters can work.

Training is a major component of effective fire prevention and mitigation. One of the tools used was a reference and resource guide, “Wildland/Residential Interface Pre-attack Information”, a field guide handbook developed specifically for responding fire personnel. “Our ability to quickly brief firefighters responding from as far away as Monterey was greatly enhanced by the use of this pre-attack information,” states Chief Roger Smith, Anaheim Fire Department.

The Windy Ridge fire put the Orange County Fire Prevention programs to the test.

Quick Facts

Year:
2007

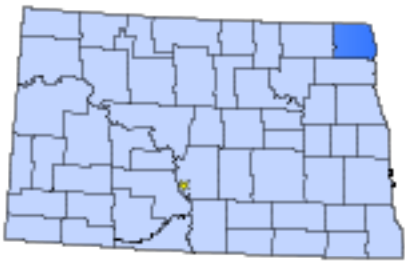
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Drayton Lift Station Relocation



Pembina County, North Dakota

Drayton, ND - Carol Gardner, a long time resident and city auditor of Drayton, ND, fears the day she'll awaken to find that a street or building in her city has, without warning, fallen into the river which hugs its eastern border.

The riverbank, which winds its way along the city's neighborhoods and the downtown main street, is unstable due to poor soil conditions that actually cause the bank to "slump" towards the river.

The viability of a sanitary lift station that sits near the edge of the sloping riverbank has been of particular concern to city officials. For years now, layers of the riverbank have fallen away, causing it to inch closer and closer to the edge of the lift station.

City officials knew their only option was to find a way to move the lift station before the riverbank collapsed or high river levels eroded the soil to its very edge. If either of those scenarios occurred, the city's sanitary capabilities for a portion of the town could be wiped out.

In 1997, when much of the upper Midwest suffered from record flooding spawned by a brutal, blizzard-packed winter that dropped about 100 inches of snow in the Red River Valley alone, river levels at Drayton were more than one foot above the lift station base. City crews were able to protect the lift station that year by building a ring of sandbags around the base. A portable pump was put inside the ring to remove seeping water.

Drayton applied for a grant through the Hazard Mitigation Grant Program (HMGP), and the project was approved in the summer of 2000.

The city found an empty lot, just one block west of the original lift station and close to existing underground sanitary sewer lines. The lot happened to have a high spot right in the center, big enough to site the lift station and to keep it out of surrounding flood-prone areas. Best of all, the property owner was willing to sell the land to the city.

The city also purchased two trailer-mounted diesel generators, which can provide backup power for the master and the south-end lift stations during an electrical outage or other emergency situation, such as a flood.

Quick Facts

Sector:
Public

Cost:
$289,604.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Repair, Improvement of Flood Damaged Road in Stratford

Fulton County, New York

Albany, NY – Repairs to Mallet Hill Road in the Town of Stratford, Fulton County, damaged during the June 2006 flooding were designed to a higher standard. Using the higher standard may have made them less vulnerable to future flooding.

Thanks to a New York State and Federal Emergency Management Agency (FEMA) policy, extra funding is provided to mitigate against future damages to public infrastructure.

June's torrential rains destroyed twin, 42-inch by 42-foot culverts running under the road. This forced flood waters over the road and washed out pavement 20 feet wide, 50 feet long, and four inches deep.

President Bush signed a major disaster declaration for New York State as a result of the 2006 flooding. The disaster declaration triggered the Public Assistance Program in Fulton County to reimburse government entities and certain non-profits for emergency protective measures and the repair of damaged public infrastructure.

FEMA provides 75 percent of the grant funding. The 25 percent non-federal share is funded by the state. The New York State Emergency Management Office (SEMO) administers the program.

A major FEMA and SEMO goal is to mitigate, where it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damages. Extra money spent now can reduce future impacts and costs.

SEMO and FEMA have approved about $63,400 in road-repair costs. They also approved an additional $61,600 to replace the destroyed culverts with a 154-inch-wide by 40-feet-long box culvert with a rise of 100 inches. The bigger culvert will reduce the chance that debris will clog the culvert should another flood occur. The total project costs approximately $125,000, of which the federal share is approximately $94,000.

Quick Facts

Sector:
Public

Cost:
$94,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Elevating on the Myakka - A Tale of Two Elevations

Sarasota County, Florida

Sarasota, FL – In July 2003 summer rains in Sarasota County once again swelled the Myakka River beyond its bank, this time flooding 41 homes for 30 days. While many cleaned up the muddy mess and made repairs as they had in the past, two of the homeowners sought to end the irritations and damages of frequent flooding by raising their houses above possible future floodwaters.

Sarasota County wanted to help the homeowners with the cost of elevating by applying for Flood Mitigation Assistance (FMA) grants on behalf of the homeowner. These grants fund planning or construction projects to reduce or eliminate property damages and flood- insurance claims. The Federal Emergency Management Agency (FEMA) administers the grant through Florida's Department of Community Affairs (DCA).

After extensive review, the state and FEMA hazard mitigation officials approved Sarasota County's application for $55,275 in reimbursable expenses. The homeowners agreed to pay the 25-percent-matching-grant requirement and any costs above those included in the approved application.

The estimated the total project cost is $110,000 and construction took less than six months from start to occupancy.

The two families have drastically cut their chances of flooding since floodplain managers for Sarasota County agree that there is less than a one-percent chance of the Myakka flooding to 2003 levels again.

Quick Facts

Sector:
Public

Cost:
$170,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Following the Leaders with the Community Rating System

State-wide, Florida

Port Charlotte, FL – The Community Rating System (CRS) began in 1990 as a voluntary program administered by the National Flood Insurance Program (NFIP). Its purpose is to promote a decrease in flood risks and an increase in flood insurance participation. Communities enter the CRS as a Class 10 and can improve to a Class 1. Annual flood-insurance premium rates decrease proportionately with the lower class ratings.

To join, a community must adopt a flood control plan describing how it will manage flooding and lessen flood risks by reducing severe repetitive loss properties, constructing flood control measures, and establishing public outreach programs.

Reducing the likelihood that flooding will cause damage in a community translates into tangible savings for its residents. Miami-Dade CRS Coordinator Michael Gambino credits the county's commitment of $1million annually to reduce the number of repetitive-loss properties as helping its residents save $15million in flood insurance premiums over the past ten years.

Florida's Class-5 CRS leaders commonly include drainage among their community's capital-- improvement projects. They also regularly educate the public about how to reduce flood risks.

Like other CRS leaders, gaining political support has helped North Miami maintain their Class-5 status since 2001.

North Miami addresses its many historical, mid-1900 structures within the Special Flood Hazard Areas through regulations and active inspections that pay close attention to construction. Whenever improvements increase a property's value more than 50 percent beyond current market value, the property owner must elevate the lowest floor by three to seven feet, depending on the BFE for the area.

Sanibel Island faces the various challenges of being surrounded by water. City Planner Kenneth Pfalzer said, "As an island, every parcel in the city is zoned as a Special Flood Hazard Area. This means every building here is built to reduce flooding. We also mirrored the restrictions from the Gulf side to the riverside, surrounding the island with a V-zone, and leaving more land between the water and the buildings."

Because of Sanibel's flat topography, the City's public works department also requires intense maintenance of their surface water management system. To better maintain the system and regulate the water levels on the street and in developed areas, the City built a weir, or mini-dam, at the ends of the river that flows through the island.

The Class-5 communities make up three percent of all flood-insurance policies written in the State of Florida. They agree that improving their CRS rating takes a dedicated staff, committed local government, and citizens willing to recognize the tangible benefits of lower flood insurance premiums, and building to reduce flood risks.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
Local Sources

The Unconquered Seminoles: Protecting People and Property

Holywood, FL - In a state rocked by one powerful hurricane season after another, the leadership of the Seminole Tribe of Florida has taken numerous steps to protect its members. Curt Sommerhoff, emergency manager for the tribe, said the efforts have created a security for reservation residents that equals or exceeds measures taken by many cities or counties throughout Florida.

In September 2002, the Seminole Tribe adopted the Florida Building Code as the model for its own construction standards.

The building techniques implemented by the Seminoles are considered “code plus,” or above code. They are most prominently featured in the Fort Pierce reservation community, is comprised of 35 homes, with plans for another 35. Each house has been built to withstand 140 mph winds using concrete and steel construction. Then, each home was fitted with impact-resistant windows and shutters. Finally, a 15,000-watt generator with enough power to run the entire house was installed.

The Seminoles’ mitigation efforts far exceed strong building techniques and several critical services are available to tribe members at no cost. For example, the tribe has secured a number of large fuel tanks with separate containers for diesel and gasoline. The tanks are constantly maintained, keeping fuel for emergency needs accessible —even in times of shortage.

Working closely with the South Florida Water Management District, the Seminoles keep a close eye on Lake Okeechobee and other nearby bodies of water for signs of possible flooding.

The tribe has its own aviation department consisting of several planes and helicopters. The aircraft are used not only to facilitate disaster response throughout the six reservations and to help those Seminoles who live off the reservations in Florida, but also to assist neighboring communities. The Seminoles are actively involved in assisting Native American tribes in other parts of the country, and will send their aircraft to support and deliver supplies and equipment in times of need.

The Seminole Tribe has its own television station and satellite TV reception is provided to all tribal members. Prior to a hurricane or other disaster, the station broadcasts advisories and updates. The broadcasting department has produced a hurricane-preparedness TV program that will air regularly during hurricane season.

Currently, the tribe is working toward completing a number of programs that will help maintain its high level of preparedness. By 2007, the tribe will be compliant with the National Incident Management System, which is a uniform structure that allows all responders to follow the same procedures and ultimately improves communication and overall effectiveness in disaster response. In addition, the Seminoles are establishing Community Emergency Response Teams for each of their reservations, and plan to participate in the National Weather Service’s StormReady program by the end of 2006.

Tribal,
FEMA Region IV

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

FEMA

Couple Fully Braced for Tornado

-

Volusia County, Florida

Orlando, FL - Nestled fast asleep in their beds, a senior-citizen couple was abruptly awakened before dawn on February 2, 2007, by a NOAA weather radio alert. The alert was followed by a call from their son in Orange City warning that a tornado had touched down at nearby Lady Lake. The couple saw the sky light up and heard a rumbling as if a jet was on top of them. Immediately, the tornado swept through their neighborhood. Nearly all the homes that blanketed the community were destroyed, and two of their neighbors were killed. On that Friday morning, tornadoes touched down at Lake, Seminole, Sumter, and Volusia counties in Florida with reported winds exceeding 160 mph. The storms caused extensive damage to homes, businesses, and public infrastructure that resulted in more than 20 fatalities.

Louedna Huber, 81, and her husband, Vern, 87, of DeLand lived to see destruction all around their home and throughout the community. Fortunately, the couple was not harmed and their house had minimal damage in the wake of the storm. Tornado winds uplifted their garage, a detached building next to their house, slamming it into neighboring Bear Lake almost 200 feet away. The open porch suffered little damage as strong winds slightly shifted the support beams. The powerful winds of the rapid moving tornadoes partly sucked out one set of windows in front of the house and flying debris shattered one at the back of the house; all other windows held.

“We were surprised that when the whole thing was over, the house survived,” said Louedna. “It was a terrible wind and this house withstood.”

In 1980 the couple bought a single-level burned-out home of 1960’s era. For several months they worked to attach 2” by 4” studs to the foundation and roofing with hurricane straps; the crew then attached 1” by 8” and 1” by 6” boards horizontally and secured them to the studs with four nails each. The couple added building paper over the board to reduce moisture and followed with an overlay of 5/8” plywood finish to create a rigid structure. The house is located in a retirement community surrounded with rows of mobile homes. The Hubers and friends built their lakeside home to brace against the hurricane-force winds that frequent the area. Vern lightly smirks that his wife named the construction crew, “over-the-hill gang” because they were all retirees. Louedna said she nailed the hurricane straps to the house.

The couple and their friends constructed the home with a continuous load path that connected plywood and 1” board walls, roofing, and the foundation with hurricane ties and straps. When the tornado hit, the anchoring system effectively held, shutting out the roaring winds with no structural compromise to the house.

“All homes here should have a weather radio because we have a lot of storms in the summer,” Louedna said. “I’ve told everyone about how the weather radio sounded the alert.”

Quick Facts

Sector:
Private

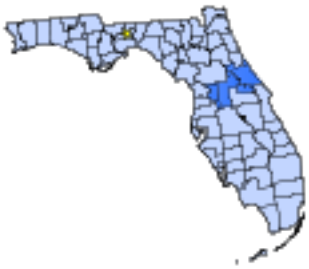
Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Homeowner

FEMA

PARTNERS BUILD MODELS TO ENHANCE COMMUNITIES



Multiple Counties, Florida

Volusia County, FL -Imagine reading, writing, arithmetic, wood, dust, and hammers in the classroom. Picture a home model built to withstand 150 mph winds. Envision DeLand High School students building these model houses. Think of instructors teaching students how to build more secure homes. See communities learning how to rebuild stronger and safer because of the combined efforts of businesses and schools.

Administrators at area high schools eagerly volunteered their vocational students to build Mitigation House Models (formerly known as the Dawg Haus)- a stronger, safer, and complete house structure. The students are members of the DeLand High School chapter of Future Builders of America (FBA). The students earned credit points with monetary value towards college tuition, sponsored by the Volusia Home Builders Association. Their fourth Mitigation House Model is currently under construction.

The Federal Emergency Management Agency (FEMA) collaborated with central Florida building merchants, suppliers, and a vocational high school to donate materials and resources to build Mitigation House Models in the classrooms. Donors such as Grainger Industrial Supply, Home Depot, and Simpson Strong-Tie Company, Inc. had a common motivation for their contributions to the school. They all agreed that it is about helping the community stay safe and that they are glad to be a part of it.

The models were built with 2” by 6” lumbers in lieu of 2” by 4”, to withstand powerful wind uplift. They have metal hurricane ties that connect the roof, walls, and the foundation together, reinforcing the structure. The load is then transferred from the roof, to the wall, to the foundation. A house model structure was located at the Home Depot Store in Port Orange along with brochures and handouts for the public.

Sharon Kircher, a territory manager for Simpson-Strong-Tie Company, Inc., said that her company often works with FEMA. Kircher said that she attended an awards event where the Building Official and Inspector Association recognized students at DeLand High School for their work and gave them code books. The students were very happy.

“Our objective is to educate as many people as we can so that we are all on the same page, knowing that there are products out there to help,” Kircher said. “Even if a house has already been built, there are products people can use to retrofit their house.”

Building stronger and safer houses utilizing the Mitigation House Model will protect communities and will ensure a safer future for families in the wake of severe weather events.

Quick Facts

Year:
2004

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Private funds

Affordable Housing Engineered to 160 mph Winds

Multiple Counties, Florida

Port Charlotte, FL. – The Otero brothers survived the widespread devastation of Hurricane Andrew in 1992 only to see similar damage when Hurricane Charley came through Charlotte County in the summer of 2004. Witnessing the extensive debris from homes destroyed by the hurricane, Osvaldo and Yhovanni Otero decided to put their business and contracting skills to work to build stronger homes – ones the average working family could afford.

The Oteros knew that homes built to the 2004 Florida Building Code for only 130 mph winds averaged in excess of $250,000 in southwest Florida. Since Hurricane Charley made landfall with sustained winds in excess of 145 mph, the Oteros resolved to build homes priced under $200,000 that were able to withstand 160 mph winds. The brothers commissioned plans for the homes. They hired an engineering firm to review and certify the designs to the higher wind loads.

Osvaldo Otero, said, “When my brother and I drove through Port Charlotte after Hurricane Charley, we saw debris from home after home littering the streets. We dedicated our skills and resources to make homes that hurricanes like Charley wouldn’t pull apart and that the average working family could afford to buy.”

Osvaldo’s business background included experience in project management, operation efficiency and commercial marketing. Yhovanni brought general contracting and building experience to the company. These skills allowed them to find ways to reduce construction time and thereby decrease overall building costs. The research into homes that survived Florida’s hurricanes led to specific building designs.

“After Hurricane Andrew in 1992, we noticed concrete homes with the outside masonry intact, but high winds removed roofs and broke windows,” Osvaldo Otero said. “Learning from Andrew, we started with concrete structures, but added stronger windows, doors and roofs.”

The engineer-certified plans specified fiber-reinforced concrete for the house structure and foundation, making the outside shell stronger and better able to resist windborne debris. Reinforced steel rods fortified the walls vertically and reinforced steel grids bolstered the building horizontally.

The designers also engineered an option that converts the bathroom into a safe room based on designs from the Federal Emergency Management Agency. This room has reinforced walls, a poured concrete ceiling, a hurricane-resistant door, and a hurricane shutter that covers a window that can double as an exit even with the shutter in place.

The Oteros have a series of design plans for different living styles: duplexes, condominiums, single family homes, and adjoining duplexes where family members can enjoy their independence but share a common doorway for emergency access. The homes start at $150,000, considered affordable for the average working family.

“Homes like these have survived many hurricanes,” Osvaldo Otero said. “When technology exists to build to Category Five standards…builders should choose to build that way.”

Quick Facts

Sector:
Public

Cost:
$300,000.00 (Estimated)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Private funds

County Action + Citizen Involvement = Savings

Sarasota County, Florida

Sarasota, FL - Since the 19th century, Sarasota County residents have regularly faced flooding caused by tropical storms, hurricanes, and heavy rains.

By joining project planning with public participation, County officials decreased flooding, moderated development, and saved residents millions of dollars in flood insurance premiums. Desiree Companion, the County's Community Rating System (CRS) Coordinator and record keeper for at-risk structures said, "Currently, one in ten Sarasota County structures has a one-percent chance of flooding this year."

Realizing that continued rapid development could elevate flood risk beyond existing control measures, County planners accelerated the implementation of projects such as berms, holding ponds, and levees. In addition, they entered Sarasota County into the CRS, initiated educational outreach programs, highlighted ways for individuals to protect their property, and encouraged non-participating communities to join the National Flood Insurance Program (NFIP).

The County also upgraded its website, making floodplain management topics more accessible to Internet users. Web users can obtain elevation certificate forms, view information on flood-resistant construction, and link to other pertinent websites. They can also download floodplain ordinances and Flood Insurance Rate Maps (FIRMs).

Interaction between County administration officials and the general public also extends to map upgrades that show current flood risks. Drainage Operations Manager Kirk Bagley met with residents to verify the accuracy of flood scenarios created by sophisticated computer models. While talking with residents, he asked them what happens in their neighborhoods during heavy rains.

Citizens also participate in flood prevention by adhering to building codes and floodplain ordinances, according to Code Enforcement Officer Martin Duran.

Together, progressive floodplain management, code compliance, educational outreach, flood insurance participation, and citizen involvement transformed Sarasota County's history of flooding into a testament of accomplishment.

Countywide, the number of homes severely damaged by floods has decreased and flood insurance participation, especially in communities that participate in the CRS, has increased. These actions saved County flood insurance policyholders $4 million in premiums since 1992. Improved citizen awareness and flood-control projects have helped the County move closer to achieving its floodplain-management goals.

Quick Facts

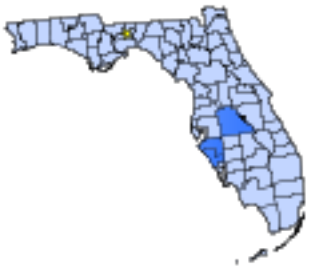
Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Drought Springs a Well of Community Support



Multiple Counties, Florida

Sarasota, FL- In 1992, Sarasota, Manatee and Polk counties entered into their second multi-year drought. For the first time, the Southwest Florida Water Management District imposed mandatory water restrictions as residents reported wells could not supply enough water for drinking and cooking. Drought remediation and water conservation became a priority, and the University of Florida's Sarasota County Extension Office offered a new educational tool with the Florida House Learning Center.

On Earth Day in 1994, the 1,557 square foot learning center opened its doors to visitors who may have seen demonstrations of water-saving techniques for the first time. On display were drought-resistant landscaping, low water use appliances and cisterns that collect and reuse non-potable water for irrigation.

As technologies advanced, the learning center demonstrated dual-flush toilets, high-powered, low-flow showerheads and water-recycling equipment. Based on national consumption figures, the water-saving tools could reduce average daily water usage by one third, to less than 50 gallons a day.

The learning center also advocates the benefits of cistern systems. Some visitors installed the systems to collect rainwater for irrigation purposes or for non-consumptive uses, such as washing clothes or flushing toilets.Along with reusing wastewater, landscaping with water-wise products and plantings can preserve the water table.

The learning center displays numerous native plants and works closely with the University of Florida Extension Office, so people can determine plantings that best fit their care and watering needs. Besides demonstrating drought-resistant landscaping, or xeriscaping, and showing visitors how to transform their lawns with turf replacements, such as fescue grass, the center teaches visitors about decorative touches that increase water flow into the water table rather than into the sewers or streets.

Though drought education was the initial focus of the facility, the center added a number of displays focusing on hurricane resistance and how to react to storm threats. As a result, visitors can examine seven different shutter types, hurricane-resistant windows, windborne debris-resistant screens, safe rooms, Florida Building Code roofing techniques and reinforced garage doors.

Results of public surveys show radio and television drought education efforts of the 1990s failed, but the learning center's surveys conducted over its 12-year history show a 35 percent improvement in drought-resistant behavior among visitors.

Quick Facts

Sector:
Public

Cost:
$125,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Non-profit organization (NPO)

Floating Docks Prevent Damage to Boats During Hurricanes

State-wide, Florida

N. Fort Meyers, FL — Recreational boats moored at traditional docks have a bumpy experience during normal weather conditions, not to mention when a hurricane hits. By design, a traditional wooden or metal dock is stationary while the boat moves back and forth with the water. During severe weather though, the boat can crash into the dock, sustain severe damage, and could even be destroyed. Floating docks may solve this costly problem.

Similar in construction to a raft, floating docks combine lightweight, buoyant materials to create moveable platforms to which boaters can secure their valuable vessels. A floating dock drifts with water currents, but only as allowed by its anchoring system. The waves caused by mooring and launching of boats, for instance, move the dock only slightly—making it very easy to board.

The design of floating docks greatly reduces the problems of traditional ones. Floating docks are tethered in place by a post-tension or whaler cable system. The cables attach to pilings below and allow the dock to ride up or down with the water level. Essentially, a series of pontoons are bounded by long wooden or steel slats on either side, and then anchored to pilings.

The U.S. Coast Guard in Fort Myers, Fla., uses a floating dock during dangerous boating conditions.

“The Coast Guard finds the floating docks a safer bet than the fixed docks at the beach,” said Dave O’Connor, Harbor Master at Legacy Harbour Marina.

Located 17 miles up the Caloosahatchee River, Legacy Harbour Marina has had floating docks since its construction in 2002. There are 131 slips used by recreational boaters. O’Connor attributes the marina’s popularity to the effectiveness of the floating docks. They are able to withstand tidal surges and also serve as a breakwater for the shoreline.

“Hurricanes Charley and Wilma caused only minimal damages to the floating docks, despite the overall serious damage caused by the hurricanes,” he said.

During those storms, damage to the docks was isolated to cracked wooden slats. That allowed the marina to remain open, with no interruption of service.

Pricing is nearly equivalent between floating and fixed docks.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Local Sources

Hazard Planning Successfully Shapes Growing Communities

State-wide, Florida

Belle Glade, FL — Florida recorded four of the top five costliest American hurricanes of the century after Hurricanes Andrew, Charley, Ivan and Wilma struck the peninsula. Over the years the state took action to better protect its residents and establish innovative programs to help communities and businesses reduce their risk of damage during future disasters. The programs included the development of an enhanced, unified, statewide building code and an emphasis on integrating community development and disaster plans on the local level to elevate the priority of disaster resistance measures in the planning and budgeting process.

The state offered statewide workshops to show how effective hazard planning at the local level can reduce a community's vulnerability. Florida's four planning mechanisms address reducing hazard vulnerability: The Comprehensive Plan, The Local Mitigation Strategy (LMS), The Post-Disaster Redevelopment Plan and the Comprehensive Emergency Management Plan. Blending these plans encourages communities to make the right choices as they develop policies, ordinances and plans to create sustainable growth scenarios.

A key part of the effort begins with each government's Local Comprehensive Plan, a guide for land development and capital facilities planning. The plan establishes long-range policy for day-to-day land-use decisions and provides guidance about potential hazards. Using the guidance, communities can direct residential and commercial growth to areas of reduced risk. For example, one Florida community supported locating a development concentrating on water recreation to an area of frequent flooding, thereby reducing residential damage potential.

Federal and state laws require communities to effectively implement a Local Mitigation Strategy (LMS) as another way to reduce their vulnerability to disasters. Florida counties invited representatives from public and private entities within each community to develop a county-wide LMS and to define projects that reduce an area's disaster risks. Florida counties and municipalities must adopt and file a FEMA-approved LMS with the state to be eligible for certain state and federal funding sources.

Two additional disaster plans identify hazard risks and describe how a community responds during and after a disaster. The Comprehensive Emergency Management Plan concentrates on evacuation strategies, sheltering disaster victims and other ways to protect the health and safety of the public. The Post-Disaster Redevelopment Plan identifies what should happen during the process of recovery and reconstruction.

The state-funded pilot project also recognized hazards in potential growth and redevelopment areas. Communities could avoid building homes and businesses in risk-prone areas to reduce future damage to property and public facilities. For example, local leaders could change the land-use designation of a flood-prone area from high-density residential/commercial to recreational and open space.

Quick Facts

Sector:
Public

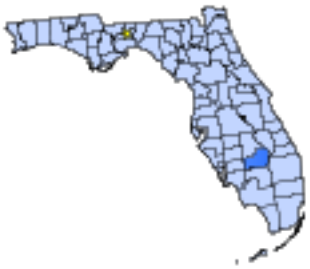
Cost:
$25,000.00 (Estimated)

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
State sources

FEMA

Thrice Hit
Learning From Others' Experience



Glades County, Florida

Moore Haven, FL – When Hurricane Wilma crossed Glades County on Oct. 24, 2005, tropical winds met with cold air masses and intensified the storm. The unusual weather phenomenon caused Wilma to batter the county with winds in excess of 100 mph for a continuous 42 minutes—without the normal calm that occurs when the eye passes. With the damage incurred during previous hurricanes, officials wondered how the facilities would look when they surveyed the grounds.

Fortunately for Glades County families, school district leaders had already implemented damage-reduction measures they learned from nearby schools and county neighbors. Their preemptive actions ultimately allowed students to return to class in one week, even though the roofs of 17 school district buildings sustained damage during the hurricane.

After finishing emergency work, the school district's recovery strategy turned to permanent repairs. School leaders looked at ways to significantly decrease the time needed to complete permanent repairs. They found that having an architect create design documents on all damaged facilities expedited the rebuilding process. Contractors could use building specifications listed in the documents to develop their bids and speed up reconstruction.

Another lesson Glades school administrators learned was the benefit of installing poured concrete portable classrooms instead of traditional ones. The positive feedback came from many South Florida school districts forced to use temporary classrooms after the 2004 hurricanes.

Consequently, Glades school administrators switched from the traditional, manufactured-home-type models to the concrete, portable, stand-alone classrooms. The fortified units have linked, poured concrete walls that are tied to a secured foundation.

One of Glades' concrete portables was installed the week prior to Wilma's landfall. Though subjected to the same winds as the rest of the facilities, the concrete portable unit sustained minor damage to only one corner of the metal roof. The rest of the building was untouched.

Since the school district also suffered a great deal of roof damage during the last two hurricane seasons, Bass sought improvement ideas from members of an insurance consortium. The group agreed that fewer standing-seam roofs suffered damage in Charlotte County after Hurricane Charley's Category 4 winds.

In another improvement effort, the school district designed two new schools in the western part of the county to meet Enhanced Hurricane Protection Area standards, which exceed the sustained wind load requirements for the area by 40 mph.

The many lessons learned by collaborating with neighboring school districts and organizations provided insight into how to respond to the $6.9 million in damage sustained by the Glades County School District after Hurricane Wilma, including how to rebuild.

Quick Facts

Sector:
Public

Cost:
$6,900,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Local Sources

Concrete Portables More Durable, Cost Effective

Palm Beach County, Florida

West Palm Beach, FL - Florida school systems often rely on portable classrooms to ease overcrowded schools. Typically constructed of inexpensive materials that are quickly assembled, traditional portables are easily damaged during severe weather. With concerns from parents and students about the poor design of traditional portables, concrete units are being explored as a safer, cost-effective, and more durable option.

A new method of constructing portable classrooms is being utilized more frequently. Companies are developing more durable forms of construction, while maintaining the advantages of portability.

Some designs incorporate concrete and steel. Wall panels with embedded plates are welded together and a composite beam runs through the middle portion of the building at the seam. This reinforces the roof and supports the center of the classroom. The roof is also made of concrete, which is rated to withstand winds of 187 mph and includes a waterproof membrane. The concrete is composed of a reactive waterproof mixture, which crystallizes and re-seals itself when exposed to water infiltration.

In many cases, the concrete portables are designed and built in a factory setting. This allows for a greater degree of quality control. It takes an average of 30 days to build a unit, and then the portables are delivered to the site. After that, it takes only another day or two to install them.

In the past, due to the temporary nature of portables, more attention was paid to cost-effectiveness rather than sturdiness or longevity. While this reduced the initial cost of portables, the constant need to replace them after each hurricane season caused long-term expenditures to increase dramatically.

“I’ve worked with all the different kinds of portables,” said Dennis McCabe, maintenance supervisor for the School District of Palm Beach County. “I think the concrete portables are the best. There’s very little maintenance and when a storm comes through, the other portable types are destroyed. With these new portables, there’s no damage.”

Several companies have begun exploring expanding portable design into the residential market. The inherent strength of the structure and variety of design options make the portables ideal for use in areas where housing needs are fluid. The expandability and portability allow homes to be moved and configured as necessary to conform to available space.

Quick Facts

Sector:
Public

Cost:
$150,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Private funds

House of Steel Survives Charley

Charlotte County, Florida

Punta Gorda, FL – When Bob and Robin Leonard built their home in 2004 on a canal off Pirate Harbor in Charlotte County they wanted a beautiful, low-maintenance building. They chose a highly engineered, above code steel-panel construction that would endure a major storm.

The structural sandwich panel home was engineered to withstand 150 mph sustained winds, exceeding the current 130 mph required by the Florida Building Codes. When neighbors rebuilt after Hurricane Charley, many asked the Leonards about their house of steel. The Leonards gladly told their story.

“We were in the northeast quadrant of Hurricane Charley. Winds went well beyond 140 mph and this house did what it was supposed to do; it swayed,” Leonard said. “The only damage came after the wind pushed the front door open and we nailed wood braces to the floor to close it.”

The Leonards used a consumer software package to design their home. They brought the drawings to their steel-panel panel manufacturer for engineered plans, permit prints, and manufacturing specifications. After the city’s building department approved the plans, Leonard said, the eight-month project started.

Three-and-a-half feet of compacted fill material served as the base for the steel-reinforced reinforced concrete footings. Six-inch steel I-beam posts anchored to reinforced concrete footings held up the cupola and main frame. Surrounding the ground floor, a grade beam added stability to the building as it swayed when pushed by winds.

The structural sandwich panel assembly consisted of a lightweight foam core securely laminated between two relatively thin metal facings. The manufacturer bonded a pre-formed expanded polystyrene board to the metal skins with adhesive.

Composing the outer structure, the design specified top and bottom channels that anchored six-inch thick structural sandwich panels to create walls. These channels had plates that connected them and supported the roof system's I-beam rafters. The floor system layered nine-inch structural panels supported by I-beams, topped with sub-floor and finished with hardwood flooring.

The Leonard's home boasts its height as an additional strength. Floodplain regulations adopted by the city required building the lowest floor of the house on or above the 11-foot base flood elevation (BFE), but the house exceeds that requirement.

Since they lost power as a result of Hurricane Charley, the Leonards added a propane-fueled generator. To keep intense wind from opening the front door, they bought shuttering to cover the outside and bracing for inside the door.

Quick Facts

Sector:
Private

Cost:
$275,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

Public Library Stands Read All About It

Lee County, Florida

Sanibel, FL - On August 12, 2004, Library Director Pat Allen and her staff readied the 10,000 square- foot expansion of the library for an official opening. That morning, staff guided the delivery crew as they moved equipment and shelving into the new addition. By late afternoon the next day, Hurricane Charley brought fierce winds to Sanibel Island that tested the engineering of both the new expansion and the original building.

Built in 1994, less than three miles from the Gulf of Mexico, Sanibel's Public Library has the distinction of being Florida's first library constructed to withstand 155 mph winds. Knowing the risks of being so close to the hurricane-prone Gulf of Mexico, library administrators hired engineers to calculate the wind loads and document design specifications to withstand those loads. When library officials decided to expand the original structure in 2003, they maintained proactive engineering for the addition and used the same architectural firm to match the Category 5 standards of the original design.

To achieve the high-wind wind rating, the architects designed a poured poured-concrete skeleton fortified with reinforced steel rods that tied the roofing system to the foundation foundation, and secured the metal roof with hurricane straps to counteract uplift.

Concrete pilings not only provided a secure foundation, but also flood control. The pilings raised the building above Base Flood Elevation (BFE), a requirement since Sanibel flood maps show all property on the island to be in a Special Flood Hazard Area (SFHA). Local regulations mandated a height of 10 feet above BFE, but the library added an additional 3 feet of freeboard to better counteract flooding and provide covered parking.

The original building's pilings were driven into bedrock and, because the depths varied with each column, the engineers improved stability with reinforcing metal sleeves around the concrete. They used a different technique when building the expansion. To address differences in rock depth and to avoid structural damage to neighboring buildings from pile driving, they used augers to dig holes allowing pilings to be cast in place.

Library officials also chose to retrofit the original building with the same hurricane-resistant windows they used for the expansion.

As a precautionary measure, the library board added a generator to operate essential services, although electricity service usually returns quickly after the loss of power from a storm event because of the library's proximity to the Sanibel City Hall. The library staff discovered the importance of having working electricity when residents came back to the island after Hurricane Charley. Not only did people use the library as a familiar place to visit, read, or use the Internet, but they drew on its resources to contact relatives, file insurance claims, and register with the Federal Emergency Management Agency (FEMA).

Before residents could return to normal, Hurricane Wilma brought 100 mph winds to Sanibel on October 24, 2005. Again the library suffered no damage and stood ready to welcome residents back to the island.

Quick Facts

Sector:
Public

Cost:
$5,306,680.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Non-profit organization (NPO)

Bay Area Rapid Transit District Mitigation Project

San Francisco County, California

San Francisco, CA - The Bay Area Rapid Transit (BART) Train Operations Center is located in a very high seismic hazard area of Northern California. BART services the entire San Francisco Bay metropolitan area and is a major economic driver impacting the region. In October of 1989 a 7.1 magnitude earthquake struck the region causing widespread damage to buildings and transportation infrastructure.

Damages to the Bay Area transportation infrastructure included the collapse of the double-decker Cypress Freeway in Oakland and failure of a section of the upper deck of the Oakland Bay Bridge; however, all was not lost because commuters had the option of using the still operational BART system to travel from the East Bay to San Francisco.

The BART system is a critical part of the regional transportation infrastructure serving four counties and as such all Bay Area commuters are affected by large scale outages.

The Train Operations Building is the core of the BART system. The lower portion of the building houses the train operations center, which is the critical nerve center of the computerized train system. Additionally, the central office of the Metro Police is located in that sub grade portion of the building.

After being evaluated by engineers, the above grade portion of the Train Operations Building was found to pose a significant collapse hazard and a great risk to life safety and the function of critical train operations. A FEMA Pre-Disaster Mitigation grant provided funds for the disassembly of the above ground portion of the Train Operations Building at Metro Center.

Removing the threat of collapse from the Train Operations Center means that the BART employees can safely carry on their duties throughout a major seismic event which could conceivably include the evacuation of train tunnels and eventually the resumption of normal train service which will be a vital component of the region's overall recovery.

This project is a unique and well reasoned mitigation strategy that promises to assist the region in enduring and recovering from the next major seismic event without some of the devastating effects of lingering loss of transportation infrastructural capacity.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Pre-Disaster Mitigation (PDM)

UCSF Medical Center
Seismic Saw-Cut Mitigation Project

San Francisco County, California

San Francisco, CA– - The University of California San Francisco (UCSF) Medical Center Parnassus serves as the main campus for UCSF's medical program, as well as a Children's Hospital, several research labs, and the center for the Dental and Nursing programs. Located in San Francisco near Golden Gate Park, this fifteen story structure is in a neighborhood that has a high likelihood of significant damage after a major seismic event.

During the last major seismic event, the Loma Prieta earthquake of October 1989, the Medical Center building and the Medical Sciences Building (MSB) experienced significant damage to the expansion joint between them. An engineering analysis revealed that due to the differences in the relative stiffness of the structures, they would perform better independently than tied together.

Project Seismic Saw-Cut will physically sever the structural connection between the two buildings and install a seismic expansion joint in the gap. This improves the chances of both structures surviving a seismic event with minimal significant structural damage. The same change would be implemented on the link between the MSB and Cole Hall (a 408 seat lecture hall adjacent to the MSB).

Currently, UCSF Medical Center is a large teaching and research facility that provides world renowned inpatient care with a total of 575 licensed beds. USCF Medical Center is a critical component of the city's emergency medical response infrastructure and is required by state law to mitigate certain hazards to ensure continuity of operations during local disasters or face decommissioning.

With the completion of this project, the UCSF Medical Center Parnassus will continue to provide quality healthcare and critical emergency medical services up to and throughout a major seismic event. At the time of a future seismic event, there will be few devastating interruptions in healthcare delivery at a time when the community will need to rely on its healthcare system to provide emergency medical services the most.

Quick Facts

Year:
1989

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Academic

Furnace Elevation to Prevent Future Damage

Montgomery County, New York

Starkeville, NY - Beginning in late June 2006, a storm of major proportions crawled across the eastern United States. Rainfalls broke records, creeks and streams climbed their banks and spilled into communities, and rivers crested far above flood stage. The Susquehanna River raged through New York and Pennsylvania, flooding everything in its path. Hundreds of homes were destroyed, roads were washed out, and bridges fell. People were driven from their homes, only to return to the mud and stench of filthy water left behind.

Otsquago Creek meanders through the town of Starkville, New York. Normally it is a quiet, beautiful spot that attracts wildlife and residents alike. The creek flows just behind Leah Cook's house, takes a turn to the east and moves on. All that changed in late June when torrential rains filled the creek to flood stage and sent the raging water over its banks and into Leah's cellar.

When the cellar flooded, the gas furnace Leah had installed in 1985 was ruined and the sump pump (used to pull out the water) was without power. Floodwater sat in the rock-walled room for several days until firemen came to the rescue with their heavy-duty pump and cleared it out.

"This time it flooded my cellar up to four feet," said Leah, who was gone when the flood occurred. "I came home to find a very wet cellar with thick mud caked on everything, including my year's supply of home-canned fruit and vegetables."

The inspector arrived after Leah called FEMA and the State of New York to register for assistance. Before any help could be provided, an inspector checked out the cellar to assess the damage.

"I didn't turn the furnace on when the electricity came back," said Leah, "because I figured the old heater would blow up, and I told the FEMA inspector he couldn't turn it on either."

With the assistance money Leah received to replace her old furnace, she decided to do something unusual with the new one; she had it attached to the cellar ceiling.

Should the creek pour into Leah's cellar again, her furnace should be safely above the floodwaters.

Raising the furnace is highly recommended to avoid damage in future flooding. Furnaces that sit on the basement floor are susceptible to flooding of even a few inches, so raising the furnace or suspending it from the ceiling can save the furnace should flooding reoccur.

"A good guide for raising the furnace is to look at the height of the last flood and install the furnace a foot higher," says David Gillespie of FEMA. "It doesn't take much to get the furnace out of harm's way."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Utilities

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Maryland Assesses its Vulnerability to Flooding

State-wide, Maryland

The State of Maryland - Maryland has had its share of major flood events since the first recorded major flood event in May of 1860. Since 1933, the state has sought to ensure public safety from flooding through the regulation of development projects proposed for the floodplain. As part of its long history of flood mitigation, Maryland has also used its Comprehensive Flood Management Grant Program (CFMGP) to mitigate flood damage through projects such as acquisitions, the installation of flood warning systems, the construction of flood control projects, as well as many other projects over the years.

Previously, determining vulnerability to flood damage was not very exact, involving overlaying Digital Flood Insurance Rate Maps (DFIRMs) with tax parcel assessment information to establish flood vulnerability. Before the flood damage vulnerability assessment, the average age of the Flood Insurance Rate Map (FIRM) used to determine floodplains was 19 years old. Flood studies would be needed to ensure flood safety was more accurate and up-to-date.

To tackle this daunting task, the Eastern Shore Regional GIS Cooperative (ESRGC) at Salisbury University was asked to undertake a vulnerability modeling effort. This would provide a systematic examination of the vulnerability of Maryland's built environment to riverine and coastal flooding.

Using FEMA's HAZUS-MH, a hazard vulnerability analysis modeling software, the ESRGC sought to generate maps and tables of Maryland's potential for loss related to buildings from flooding on a county-by-county basis.

These findings by the HAZUS-MH models were published into a report by the MDE which made several policy recommendations to mitigate the potential impacts of flooding.

This report, "An Assessment of Maryland's Vulnerability to Flood Damage", has been selected by the Maryland Chapter of the American Planning Association (APA) for an award for Public Education or Research.

Quick Facts

Sector:
Public

Cost:
$20,000.00 (Actual)

Primary Activity/Project:
Flood Study Map Rollout/ Map Modernization

Primary Funding:
National Flood Insurance Program (NFIP)

Spicket River Floodplain Acquisition

Essex County, Massachusetts

Arlington, MA - The May 2006 flooding within the Arlington neighborhood of Lawrence impacted two dozen fewer families than in the past, according to Michael Sweeney, Planning Director for the city. This older urban area is located next to the Spicket River, a tributary of the Merrimack River, and close to Malden Mills of textile manufacturing fame. In the previous twenty years, there have been several evacuations due to flooding.

In 2003, the largest New England acquisition by FEMA was completed here with twenty -two owners and tenants relocated out of the river floodplain at a cost of $1,411,430. A FEMA Hazard Mitigation Grant Program (HMGP) award paid for 75%, and a Department of Housing and Urban Development Community Development Block Grant covered the remaining 25% of costs. MEMA (Massachusetts Emergency Management Agency) and DCR (Department of Conservation and Recreation) provided technical assistance.

Two months after the heavy spring flooding in 2006, the grassy fields at the site appeared untouched. Red clover and milkweed bloomed profusely as butterflies fluttered about. Local children frequently explored the broad open space. This is an unusual landscape to find in a congested city of 10,000 people per square mile. Community leaders recognized the unique opportunity this land offered to local families.

Officials plan to make the property part of a larger greenway along the Spicket River. Additional city lots nearby are being held to use in a larger planned, passive recreation area. Now the neighborhood is looking at a future ball field and river walkway. Sweeney says, “None of this would have been possible without FEMA and the state.”

Quick Facts

Year:
1996

Sector:
Public

Cost:
$1,411,430.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mill River Bank Stabilization Project

Franklin County, Massachusetts

Whatley, MA - Modern bio-engineering methods protect the drinking water for half of the quiet rural community of Whately, Massachusetts. This scenic town within the Connecticut River watershed is widely known for its agricultural setting and historic Main Street.

The Mill River meanders around two municipal wells which serve the eastern side of town consisting of 240 private homes, retail stores, and two manufacturing plants. The wells were threatened by bank erosion that could change the course of the channel and damage or destroy the wellhead and water supply infrastructure.

In 2000, the town and the Massachusetts Department of Environmental Protection (DEP) funded the stabilization of 215 linear feet of riverbank along the Mill River in Franklin County. The waterway had become destabilized during construction of Interstate 91.

The project had two phases. The first placed a rock toe and a log revetment at the base of the riverbank slope, followed by brush layers, fascines (bundles of plant cuttings), brush mattress, geotextile material encapsulated fill, and live stakes on the upper slope. This established a self-repairing armor of living vegetation along the stream bank. Finally, sheet piles were added to the embankments closest to the wells.

DEP funded $67,869 of the cost from a Section 319 Nonpoint Source (NPS) Competitive Grant with the Franklin Regional Council of Governments administering the grant. The Town of Whately matched 40% of those dollars, plus additional expenses. Together the local community and state spent $171,144. Technical assistance was provided by the U.S. Department of Agriculture under the Natural Resources Conservation Service (NRCS).

Today the bioengineered slopes are covered with lush plant growth. The Whately Water Commissioner, Paul Fleuriel, is happy to see tree seedlings moving onto the site. He recently noted river water temperatures are being kept cool by the shading of the bank vegetation, which is excellent for local fish and wildlife. In fact, the Mill River is listed by MassWildlife as a “Cold Water Fishery Resource” alive with reproducing native brook trout.

Both residents and wildlife are reaping the benefits of hazard mitigation along the Mill River in Whately, Massachusetts.

Quick Facts

Sector:
Public

Cost:
$171,144.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Local Sources

FEMA

Publix Powers Up When the Power Goes Down

State-wide, Florida

Punta Gorda, FL - When a disaster causes essential businesses such as gas stations, banks and grocery stores to shut down, even for a short time, the resulting problems can be dramatic for hard-hit communities. Publix Super Markets, Inc., resolved to take steps to keep its grocery stores open by installing super-sized generators at nearly half of its stores.

Before the 2004 storms, every store was equipped with a 65-kilowatt backup generator that could power emergency lighting, limited refrigeration and security systems. But during power interruptions, affected stores often lost most, if not all, of their perishable stock.

“We were out of power for nine days after Hurricane Charley,” said Mark Royer, a store manager in Punta Gorda. “Even though we were able to sell non-perishable items, we felt helpless that we couldn’t provide families with produce or necessities, such as milk for the babies or insulin for diabetics.”

Publix decided to install 500-kilowatt generators at 360 store locations. The generators were designed to operate for a minimum of 72 hours, far exceeding the 23-hour average of the current 65-kilowatt backup generators. The supermarket chain’s plan also included an additional 40 portable 500-kilowatt generators to cover the stores that would not receive the permanent equipment.

The two-phase project was conceived following the tumultuous 2004 hurricane season that forced many grocery stores to close. Announced in May 2006, the plan became a reality with the initial installation of 34 super-sized generators. Publix expected all 400 generators to be in place by July 2007.

Publix includes community recovery as part of its corporate mission and has invested more than $100 million in the generator program. “We’re not seeking any financial assistance for this project. We simply want to be there for the communities we serve,” director of media relations Maria Brous said.

Scott Collins, a grocery clerk at the Punta Gorda store, said he knows that the new generators will give the stores the best chance to stay open following a disaster, and understands what that means to the community.

“We opened the doors the day after Charley, and the people started coming in right away,” Collins said. “Two people turned into twenty as soon as they heard we were open. Even though we weren’t able to provide them with everything they needed, it was really great to be there for them … whether it was to give them their groceries or for them to have someone to talk to.”

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Business Owner

Honolulu Harbor Generator Project Pays Off

Honolulu County, Hawaii

Honolulu, HI - When the Kiholo Bay earthquake (measuring Mw6.7) struck early on a Sunday morning in October 2006, the shaking was felt on the islands of Hawaii, Oahu and Maui. Seven minutes later, another powerful earthquake occurred, this one measuring Mw6.0.

Following the earthquakes, the island of Oahu experienced a major power outage which lasted for 13 hours. Fortunately for the residents, visitors and businesses of the State, the large generators that were installed at the Honolulu Harbor performed as planned: providing power to maintain refrigerated containers with perishable goods, operating cranes and avoiding dependency on city power.

The State of Hawaii consists of an island chain situated in the northern Pacific Ocean. Because of the remote location of the Islands, the residents and businesses are dependent on the transport of goods from the mainland to Hawaii and then to the neighboring islands.

The primary providers of this service are Matson Navigation Company and Young Brothers, Limited. Young Brothers, a private company, is the principal inter-island maritime freight company and moves approximately three million tons of goods per month. All containerized shipments are handled through Honolulu Harbor and shipped to the neighboring islands by barge.

Matson Lines receives shipments from the mainland and handles approximately 70 to 80 percent of the cargo in and out of Honolulu Harbor. Perishable goods for the islands are shipped in refrigerated containers (reefers). The proper temperature must be maintained within these reefers throughout the transport to avoid loss of the perishable goods.

“If the facility would shut down,” states Jeffrey Low, Manager, Planning and Facilities for Young Brothers, “the entire inter-island distribution of needed goods is affected.”

The installation of generators at both facilities proved to be a very effective mitigation measure, both operationally and financially. Matson has three which are housed in containers and located centrally to the crane operations. They are protected from truck traffic by bollards and k-rails placed around the perimeter of the generator site.

Maintenance of the generators is a high priority. The maintenance schedule is based on the hours of use, however, they are fired up monthly in coordination with the testing of the State Civil Defense sirens.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$690,000.00 (Estimated)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Oregon's Plan for Mitigating Earthquakes

State-wide, Oregon

The State of Oregon - The Cascadia Subduction Zone Fault is a long sloping fault located off the West coast of the United States which stretches from mid-Vancouver to Northern California. As a result of its enormous size, this fault is capable of producing devastating earthquakes. Geologic evidence suggests eighteen prehistoric earthquakes along this fault. The last earthquake produced by this fault was in 1700, and as a result of pressure build up, it is expected to produce a quake as large as a 9.0 on the Richter scale (the most recent quake of that magnitude caused the devastating tsunami in the Indian Ocean on December 26, 2004). This inevitable future disaster puts thousands of lives at risk, not to mention the critical infrastructure and buildings, many of which were built before today's building codes were put into effect.

In order to mitigate such a disaster, Oregon has recently developed earthquake safety policies to help address this seismic problem on the community level. Nearly three-quarters of the primary and secondary schools in Oregon were built before the first statewide building codes were enacted in 1974 and nearly twenty years before the most modern codes were put into effect in 1993. In order to bring the almost 1,600 at-risk schools up to code, the state Senate passed bills in 2001 requiring public schools to meet life safety standards by 2022, and emergency facilities, such as hospitals and fire stations, meet these standards by 2032. A project of this magnitude would consume many resources and to aid in paying for the renovations, voters passed ballot measures allowing for general obligation (GO) bonds to pay for earthquake mitigation projects.

Though Oregon's policy makers and citizens had set goals for mitigating seismic damage, and even developed ways to fund the project, there was no plan for making sure those set goals were met. In 2004, with the help of funds from the Federal Emergency Management Agency, the GO Bond task force was formed. As its first plan of action, the task force intends to complete a statewide needs assessment by early 2007, which would include schools (K-12), community colleges, fire stations, police stations, emergency operations centers, and acute-care hospitals. Upon completion of the assessments, a temporary committee will be formed to establish a grant program to distribute the earthquake rehabilitation grant funds.

With the help of Senator Peter Courtney, the recommendations of the GO Task Force were developed into Senate bills that were subsequently passed into law. These laws are designed to form a state grant program to distribute nearly $1.2 billion of bond funds as determined by the needs assessment.

While creating new public policies can be an incredibly difficult task, such policies can be very effective in moving towards a statewide goal such as seismic safety. The recent success that Oregon has had with the development of popular public policies can be used as a framework in other states to aid in disaster mitigation.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Local Sources

FEMA

Pre-emptive Pruning: Tree Trimming as a Damage Reduction Measure

State-wide, Florida

Miami, FL - While trimming the tree to display ornaments during the holiday season is a familiar custom to many Americans, tree trimming as a damage reduction measure can protect property during intense rain, winds or hurricanes.

Replacing damaged trees or property damaged by trees can be very costly. High winds or hurricanes can cause tree limbs to break, which can down power lines, or become wind-borne missiles. Sidewalks and gas or water pipes can be fractured when roots tear through the pavement.

Hurricane Andrew in 1992 downed countless trees in its path. In the Miami Lakes area, however, damage from fallen trees was mild due to the community's previously established tree trimming program.

In Miami-Dade County, the Parks and Recreation Department provides tree trimming classes twice a year. Topics include: proper spacing of trees to prevent interference with power lines; selecting healthy, indigenous trees compatible with the local climate; and correct methods of pruning to prevent exposure of tree trunks to rain and mold.

Similarly, the Miami-Dade Local Mitigation Strategy Group sponsors the "Hurricane Tree Pruning" class in collaboration with the University of Florida and the Miami-Dade Cooperative Extension Service. Classes are provided twice a year: one targeting tree service professionals and one for homeowners.

A proactive approach to tree trimming by both private and public sectors contribute to minimizing damage from fallen trees or tree limbs. An interested homeowner or business can check with their local parks and recreation department, roads department or call an arborist to learn about tree trimming education or services available in the area.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Vegetation Management

Primary Funding:
Homeowner

Historic Bisbee Completes Multiple Mitigation Projects for Flood Protection

Cochise County, Arizona

Bisbee, AZ - With the help of several Community Development Block Grants and FEMA's Hazard Mitigation Grant Program (HMGP) Bisbee upgraded its stormwater management infrastructure throughout the city after years of damaging flooding problems. Bisbee's normal annual rainfall is 12 1/2 - 13 1/2 inches per year with most of it falling during the month of September. Rainwater falling on the Bisbee side of the Mule Mountains drains through Mule Gulch, right through downtown Bisbee - through flumes, ditches, culverts and box channels, then out into the old Lavender Pit copper mine south of town.

In 1906 Bisbee suffered from both a catastrophic fire and flood. After that flood, the city constructed a box channel to direct water under streets and buildings, but made the opening at the lower end of the main box channel smaller than the opening at the upper end, causing backups and overflows.

To eliminate this problem, the city applied Hazard Mitigation Grant Program (HMGP) funds to develop the Mule Gulch Drainage project from 2001 to 2003, increasing the size of the box channel as well as the downstream opening.

Bisbee also used HMGP funds to complete the High Road Retaining Wall project. The original wall was rotating away from the road it supported. Rather than use standard soil nails to anchor the concrete wall to the side of the hill, engineers opted for using E-bow anchors.

Not only were the E-bow anchors more effective, they offered a 40% cost savings over soil nails. The engineers attached the anchors to a wire grid, and then sprayed shotcrete (Mortar or concrete conveyed through a hose and projected pneumatically at high velocity onto a surface; shotcrete can be dry-mix (gunite), or wet-mix) onto the grid. This project protected both the road and access for 60 homes above it.

In total, this series of HMGP projects replaced 17 miles of 100-year-old redwood sewer pipe, strengthened retaining walls, and renovated the storm drainage system to carry more runoff. In 2006, the improvements were tested when storms brought rains totaling 22 inches One storm alone dumped five inches of rain on Brewery Gulch in a 24-hour period. The particularly rainy season caused no flooding in the city, due to the improved drainage system.

Quick Facts

Year:
1993

Sector:
Public

Cost:
$787,390.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Environmental/Historical Preservation

Poquoson Home Elevated Just in Time

Poquoson City, Virginia

Poquoson, VA - In June 2006, the Town of Poquoson commenced a new elevation project utilizing funds from the Federal Emergency Management Agency's Hazard Mitigation Grant Program (HMGP). An American Indian word meaning "Great Marsh," Poquoson had a large percentage of its eleven square miles located in the floodplain.

The project slated seventeen homes for elevation in its first phase. On August 18, David Owens's home was the first elevation completed, just before Tropical Depression Ernesto hit in late August and a Nor'easter in October flooded the neighborhood.

"Having my home elevated was a life changing experience. If it weren't for FEMA, I would not be living here now," Owens said, indicating that Ernesto and the Nor'easter that flooded the area twice with over two feet of water would have severely damaged his home.

Since Hurricane Isabel devastated this area in 2003, nearly two hundred homes have been elevated by the homeowners in neighborhoods around the marshlands. The people who lived here realized the only way they could protect their homes from flooding was through elevation.

"The Nor'easter storm came in much faster than expected," Owens said. "The evening the storm started, I was outside getting lumber up off the ground so it wouldn't get damaged. When I started, the water was just up to the tops of my shoes, and in less than thirty minutes it was over my knees," Owens added. He stated the storm was worse than Tropical Depression Ernesto, with higher water levels and wind speeds.

To Owens, this mitigation project was invaluable. He believed that freedom came in many forms, and the HMGP gave him the freedom to live where he wanted and to protect the property he had worked hard to acquire.

Having elevated his home above local floodplain requirements, Owens now protects his home with flood insurance. The future for Owens and the sixteen other families whose homes are being elevated with this grant has changed for the better.

Quick Facts

Year:
2003

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

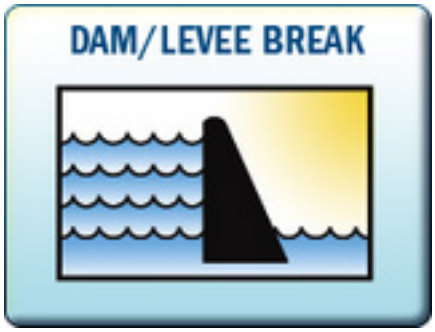
Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Sewage Treatment System Helps Arizona Town

Apache County, Arizona

Eagar, AZ - When the Rodeo-Chediski Fire swept through Arizona, thousands of fleeing residents found a safe haven in the eastern Arizona town of Eagar. Though tiny, Eagar boasted the biggest shelter around-- the 120,000-square-foot Round Valley Ensphere, billed as the only domed high school football stadium in the nation.

Altogether, more than 9,800 evacuees from Show Low and the Lakeside-Pinetop area poured into the “Home of the Dome,” tripling Eagar’s population almost overnight. The sudden population increase took its toll on the town’s infrastructure. Eagar’s three connected sewage ponds nearly overflowed. Had the disaster kept evacuees in Eagar for another week, the ponds could have gone over the banks, Eagar officials believed.



A spill could have caused a nasty chain reaction of contamination, from nearby Nutrioso Creek to the Little Colorado River and Lymon Lake, a popular spot for swimming and recreation.

The near-miss convinced Eager officials they needed to be better prepared to avert any future environmental disaster. They proposed to upgrade their sewage treatment system with an innovative solar-powered aeration system that would increase capacity and continue to operate if a storm knocked out electricity.

This system became a reality when Eagar received funding from the Federal Emergency Management Agency’s Hazard Mitigation Grant Program (HMGP) through the State of Arizona. This grant was made available after the Rodeo-Chediski wildfire of 2002 was declared a major disaster and helps Eagar reduce loss of life and property in future disasters.

The $172,171 grant from FEMA’s HMGP, nearly 75 percent of the $233,444 project, enabled Eagar to install nine solar-powered aerators in the sewage ponds and operational by February 2003.

Besides better protection against spills, the solar-powered sewage treatment system offered other benefits. Improved aeration, for instance, helped increase the capacity of the sewage ponds, increasing the depth of the effluent from 5.5 feet to 6.5 feet. And the use of the solar panels reduced energy costs.

Quick Facts

Sector:
Public

Cost:
$172,171.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Silver Jackets: Bringing Agencies Together for the Benefit of Communities

State-wide, Ohio

The State of Ohio - Many natural disasters of recent times have highlighted the need for government agencies to work together not only in the response and recovery phase of the disaster cycle, but also in the pre-disaster mitigation phase. The Silver Jackets Program aims to accomplish that through providing a more formal and consistent strategy for implementing an interagency approach to planning and applying measures to reduce the risks associated with natural hazards.

Essentially, this program proposes establishing an interagency team for each state, comprised of the Federal Emergency Management Agency (FEMA), the US Army Corps of Engineers (USACE), the State National Flood Insurance Program (NFIP) coordinator, and the State Hazard Mitigation Officer (SHMO) as standing members and lead facilitators. This increased collaboration between federal and state level agencies intends to find more ways to leverage resources between agencies, improve public outreach in risk management, and create a mechanism to collectively solve issues through familiarity with other agencies' procedures and better interagency communication.

Now that it has been active for over a year in the State of Ohio, the Silver Jackets Team has enjoyed some positive results. Though initially hesitant, the State of Ohio now fully endorses the team which has received praise from elected officials. Another important outcome of the project was the discovery of the amount of data available. Several agencies contributed mapping and GIS information, resulting in new sources of information and opportunities becoming available. Finally, the improved communication between agencies has resulted in a better understanding of each agency's programs and resource constraints.

While the Silver Jackets Program will evolve over time, its initial test run in Marietta has proven successful in achieving the goals it set forth of increasing communication between government agencies for the benefit of states and communities.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Training

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Project Slows Flash-Flood Waters, Making Neighborhood Safer

Santa Cruz County, Arizona

Santa Cruz County, AZ - To address these serious flood problems, Santa Cruz County adopted a new floodplain ordinance in 2001 to prevent future development in flood prone areas and restricts certain activities in the designated floodplain.

But the new regulations proved to be inadequate to address the long-term flood storage and drainage problems that plagued the community of Rio Rico. During the first week and a half of the July 2006 monsoon season, Santa Cruz County's Flood Control District used all of their budgeted overtime for the entire year cleaning debris on the streets left by floods - up to 18 inches of mud, rock and woody debris.

The State of Arizona made FEMA hazard mitigation funds available to communities following a 2003 wildfire disaster declaration (1477-DR-AZ - the Aspen Fire on Mount Lemmon). Santa Cruz County applied for and was awarded funding for a two-part hazard mitigation grant to address repetitive damage done by flooding.

The first part of the project consisted of removing the crown from Calle Azulejo and replacing the paving in a V-shape to channel water down the middle of the road instead of propelling the water and flood debris over the crown and into private property on the downhill side of the drainage. In addition, large rip-rap was added at the foot of the hill next to the road to further direct the water and to prevent erosion.

The second part of the project involved the purchase of two land parcels and the construction of a detention basin at the top of the hill above the homes of this subdivision for the purpose of slowing the flow of water during and following heavy rain storms. The detention basin covered seven acres of land where two natural drainages converged and had a maximum capacity of approximately nine feet deep with a spillway designed for a 500-year flood event (a flood that has a .2-percent-chance of being equaled or exceeded in any given year).

When completed, this project will have not only protected lives and homes, but will have also saved Santa Cruz County hundreds of thousands of dollars in cleanup costs. "We use crew and equipment time to clean up the debris every time we get an inch or so of rain," explained John Hays, Floodplain Coordinator of the Santa Cruz County Flood Control District. With this project completed, that cleanup expense will have been dramatically diminished.

Photo 1: Flash flood waters sweep down the hill and across Calle Azulejo in Rio Rico, AZ during a summer monsoon. Photo Courtesy of Santa Cruz County Flood Control District

Photo 2: Calle Azulejo after being repaved into a concave v-shape to help direct flood waters down the middle of the street.

Quick Facts

Year:
2003

Sector:
Public

Cost:
$432,053.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Wildfire Suppression Project to Protect Mountain Community

Pima County, Arizona

Pima County, AZ - In total, approximately 85,000 acres burned in the Aspen Fire. Total damage amounts to public facilities, including electric lines, phone lines, streets and sewers, and water facilities were $4.1 million. In addition, firefighting costs were about $17 million and restoration work by the Burned Area Emergency Recovery (BAER) teams cost $2.7 million.

More than half of the 600 homes in the Summerhaven area were destroyed by the fire. Electrical power to the area was out for six to eight weeks and residents were unable to return to their homes until July 17, a full month after the Aspen Fire evacuation. Those whose homes did not burn still had the monumental task of clean up, including discarding spoiled food from home refrigerators and freezers.

Within the perimeters of these fires in Summerhaven there is an area of unburned trees and homes which were spared by fire-fighting efforts, deviation of the winds driving the flames, or just by luck. One still-green hillside is the target of a Hazard Mitigation Grant Project.

Following the fire, many changes have come to Summerhaven, both for public works and for private property. Summerhaven has connected a new six-inch water line, 2,000 feet long, to the 283,000 gallon Loma Linda water tank on the mountainside high above town, allowing fire hydrants on the line at every street intersection to provide protection to homes and trees in an area that was spared from the Aspen and Bullock Fires.

The community has improved building codes so that new homes in Summerhaven are being built with fire safety in mind, with fire-resistant building and landscaping materials and with landscaping techniques called, “defensible space.”

Besides the fire suppression work, the Summerhaven community has also prepared for erosion and flooding which typically occur following wildfires. It is expected that most of the structural erosion control treatments will remain functional until natural recovery occurs.

As a result of their work on the restoration of the community, the Mount Lemmon Domestic Water Improvement District was selected as a 2006 Common Ground Award finalist by the Metropolitan Pima Alliance, an organization that advocates responsible development in the Tucson area through education, public policy formation and member networking.

Quick Facts

Year:
2003

Sector:
Public

Cost:
$109,688.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Flood-Prone Property Restored to Open Space

Gila County, Arizona

Roosevelt, AZ - In 1911 the Bureau of Reclamation constructed Theodore Roosevelt Lake, the first major structure constructed under the Federal Reclamation Act, formed by the construction of a masonry dam on the Salt River, submerging about 10 miles of the original river bed beneath the waters.

In the 1960's, many homes were constructed along the south shore of the lake and were repeatedly subject to damage from flash flooding. Roosevelt Estates is one of the communities in this area. This area, and these homes, had been damaged repetitively in flooding events because of their location near the confluence of the two major drainages.

During the 2003 monsoon storms, six to twelve inches of rain fell in a 12 hour period, flooding six homes near the corner of Ash Street and Palo Verde Drive, the geographic low point of the Roosevelt Estates where Campaign Creek and Pinto Creek converge. Three of the homes suffered substantial damage, making two of them uninhabitable. Altogether 20 homes lost all utilities for a day and phones were out for one week. The damage zone was eight miles square.

In the summer of 2002, the largest, most severe fire in Arizona history, the Rodeo-Chediski Fire, burned nearly a half-million acres of wilderness and triggered a Presidential Disaster Declaration for Arizona. Gila County applied for and received FEMA hazard mitigation grant funding from the State. Because the hazard mitigation funds were available for any priority risks, Gila County used the grant monies to purchase flood-damaged homes in Roosevelt Estates and to return the lots to a natural state.

Limited funds restricted the purchase to only three homes with the most damage—amounting to over 50% of their fair market value. The costs for purchasing the three homes totaled $298,388.45, including appraisal and escrow fees. The savings from damages prevented to these three properties from floods occurring in 2005 and 2006 equaled more than $500,000.

Gila County placed permanent deed restrictions on the properties, preventing any future development except for public facilities associated with open space or recreational use. In 2006, cottonwoods, eucalyptus trees and native chaparral grow among the rocks and the acquired properties show no sign of ever having been built upon.

Quick Facts

Year:
2002

Sector:
Public

Cost:
$298,388.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Property Acquisitions Reduce Flood Losses

Dauphin County, Pennsylvania

Jednota Flats, PA - Jednota Flats in Lower Swatara Township floods almost every year. The area sits in a flood plain, and the homes endure up to ten feet of flood water during major rainstorms.

After flooding four times within twenty months during 2003 and 2004, the township's Emergency Management Agency (EMA) Coordinator, Alan Knoche, looked for a way to reduce flood losses in Jednota Flats.

With the help of the Pennsylvania Emergency Management Agency (PEMA), the community applied for the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP) for an acquisitions project. Under this grant program, FEMA provides funding to communities enabling them to purchase homes suffering repetitive flood damage. These homes are then purchased from the owner by the community at fair market value and converted into open space. It is also a cost-effective program saving money on future flood insurance claims, cleanup costs, and allows the municipality to conserve valuable resources.

"FEMA and PEMA officials have been cooperative, helpful and responsive throughout the entire buyout process," Knoche continued, "They are always available to answer any questions I have."

After approving PEMA's submission of Lower Swatara's application, FEMA provided $186,166 to buy out the two homes most vulnerable to flooding. "Every time we would have a rain event, these homes would flood, sometimes above the first floor," Knoche explained.

In mid-June, the township closed on the two properties. Just days later, the homes flooded again. This time, however, the grateful families had already moved to new higher, drier homes.

"Not only have we saved families, we no longer have to endanger others, like our firefighters, who rescue those homeowners that are flooded, this program saves lives" Knoche stated.

Their flood damaged homes are scheduled for demolition in late fall or early winter, and the town is planning to allow the neighboring wetlands to expand into the newly acquired open space.

Quick Facts

Year:
2003

Sector:
Public

Cost:
$186,166.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

MODEL HOUSES DEMONSTRATE STRONG BUILDING TECHNIQUES

Multiple Counties, Mississippi

Biloxi, MS - In their efforts to help in the recovery process from Hurricane Katrina, the Community Education Outreach (CEO) Group of the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) designed two scale model houses using the 2003 International Building Codes with input from the Mississippi Emergency Management Agency (MEMA).

The FEMA model houses demonstrate construction techniques that will help buildings withstand Category 3 hurricanes or other severe weather events.

One design, The Waveland, is elevated and illustrates home construction that protects against storm surge and wind. It was named for Waveland, Mississippi, which was almost completely destroyed by Hurricane Katrina's wind and record storm surge.

The second is a slab-on-grade prototype model, The Hattiesburg, designed to mitigate wind damage. It is named for Hattiesburg, Mississippi, located 65 miles inland, which suffered substantial wind damage during Katrina.

Both models were designed by FEMA engineers to provide visible examples of mitigation construction techniques and materials, including hurricane ties for bracing joints and full-sized timbers angled to withstand winds.

Local high school vocational students, home improvement stores, building officials, FEMA and the Federal Alliance for Safe Homes are involved in constructing the scale prototypes. Materials for the project have been donated by building supply companies in Mississippi.

Mississippi coastal high schools with a focus on building construction in their vocational programs have agreed to build more mitigation house models as school projects. Currently, Harrison County Schools including D'Iberville High School are implementing the project in their vocational technical curriculum.

The models are being displayed throughout Mississippi counties hit by Hurricane Katrina. In July, the model was featured at the joint Alabama-Mississippi Hurricane Workshop, in Mobile, Alabama, where FEMA director David Paulison was very positive about the project. The model house was also a popular attraction at the Mississippi 2006 Governor's Conference held mid-August in Biloxi, where delegates to the conference inspected the model and asked questions about its construction. Other display venues have included Edgewater Mall in Biloxi, and Singing River Mall in Gautier, Mississippi.

Quick Facts

Year:
2005

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

FEMA

Clinic's Guests High, Dry During Katrina

Ocean Springs, MS – When Ocean Springs veterinarian Dr. Mabry Allison decided to expand his clinic, he wanted the facility to be a safe haven for pets during extreme weather.

When Hurricane Katrina struck the Mississippi Gulf Coast on August 29, 2005, the expanded facility got a torture test. The clinic's steel building and its guests came through with no fur flying.

The 6,600 square foot heavy steel building is constructed to withstand 133 mph winds. It also is located outside the special flood hazard area in a C-zone in Jackson County. A C-zone is an area considered to be at a low or moderate risk of flooding from overflowing rivers or hard rain

Inside the clinic and boarding facility which housed 112 dogs and 12 cats during Katrina, 55 dog runs are built from steel grates with cinder block walls. The bottoms of the runs are covered with rubber matting and elevated eight inches off the floor of the building. Cats are housed in a separate facility inside the clinic.

In the aftermath of the storm, many pet owners were without shelter themselves. The Allisons admit this was one problem they did not anticipate. "One thing you don't plan for is people not being able to come back and get their animals because they had no homes and nowhere to stay themselves," said co-owner Stephanie Allison.

As Hurricane Katrina approached, desperate pet owners trying to shelter their pets overwhelmed the Allisons. For the 2006 hurricane season, however, the clinic notified the community that space for their pets should be reserved in advance so pets would not be turned away in the face of an approaching storm.

"We give out what we call 'hurricane boarding passes' to pet owners who call in advance," explained Allison. "We set this up on the spring of 2006. Pet owners purchase a pass and are guaranteed a spot. Pets have to be here at least 24 hours before a hurricane is expected to make landfall so we will have everything we need to take care of them."

Jackson County, Mississippi

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Private funds

Desoto Memorial Hospital Recovers from Hurricane Charley

DeSoto County, Florida

Arcadia, FL – Since its construction in 1968, Desoto Memorial Hospital has provided uninterrupted medical care for the surrounding community – even during the 2004 onslaught of Hurricane Charley.

When Charley hit, Desoto County received extensive damage. The hospital was in no way spared. Part of the roof peeled back, exposing patients and critical equipment to wind-driven rain. More than 35 windows shattered from the force of the high winds and the well-manicured grounds were strewn with debris.

With ingenuity and perseverance, however, the staff maintained operations during the hurricane, providing crucial life-preserving services when community need was at its greatest. In response to the sudden and severe nature of the storm, hospital staff moved patients down a stairwell to the safety of the building's interior and utilized the boardroom as an emergency room.

With the benefit of active congressional support, the USDA provided a $20-million loan – the largest such award ever made by the agency. Hurricane Charley caused an estimated $2.3-million in damages to the hospital. The size of the loan permitted not just restoration, but also building expansion and enhancements, with mitigation to strengthen and protect against future storms.

The building project includes expansion of the emergency room and construction of a new patient tower that will increase available services. Improvements to the structure will include strengthened construction and hurricane-resistant laminated glass windows that resist penetration from windborne debris. Hurricane-resistant glass was chosen over shutters for the third floor windows because of limited accessibility. The new windows are graded to resist winds of 150 mph, well above the 120 mph minimum established by current building codes for the area. Supplemental funds for the project were obtained as well.

FEMA awarded a $636,071 grant through the Hazard Mitigation Grant Program (HMGP) to upgrade undamaged windows in the original structure to meet design standards of the new construction. The State of Florida, Department of Community Affairs administers the grant through a contractual arrangement with the hospital.

Quick Facts

Year:
2004

Sector:
Public

Cost:
$20,636,032.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Pumps Keep Morrisville Homes Dry

Bucks County, Pennsylvania

Morrisville, PA - Protecting the safety and property of its residents is the first priority of any emergency manager. Bob Seward, Morrisville Borough EMC, knows this as well as anyone. He has been battling floods in the community for years. In April 2005, more than 25 homes and a large city park were flooded when a spillway channeling the Delaware Canal into the Delaware River overtopped.

Learning from this experience, in coordination with Borough Manager George Mount, Morrisville decided to try a new approach to prevent flooding.

Morrisville is protected from the Delaware River by a series of levees. However during heavy rain, the river rises, and prevents a floodgate from channeling water from the canal into the river. While this poses a challenge, it also guarantees that any flooding will start in the same location.

With this knowledge, Mount and Seward assembled the borough's emergency management committee and developed a plan to set up a series of water pumps in an effort to control the flooding.

Using both borough pumps and several pumps rented from a nearby shop, they pumped water over the levees and into the river. Running the pumps continuously from July 29 to August 1, Mount and Seward were able to contain flooding to the street. Keeping the water level low, they were able to protect all the community's homes as well as the nearby park.

They monitored the water level, and at one point rented additional pumps to ensure water levels would not rise. All told, eight industrial water pumps were used to protect the city.

"By pumping water over the levees, we were able to keep up with the flood water. Except for a few parked cars, this prevented serious flood losses," Mount said.

Seward agreed, "The homeowners were thrilled with how well this worked. The pumps did a terrific job."

Quick Facts

Year:
2006

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

Elevating Service Equipment Reduces Flood Losses for Homeowner

Northampton County, Pennsylvania

Bangor, PA - Mel Stalbird has lived in his Bangor home for 50 years. Built by his grandparents in 1955, his home rests on the banks of the Delaware River in an idyllic setting his family has enjoyed for generations.

In 2004, Tropical Depression Ivan filled the Delaware River. Rising water crept up the banks and into his home. The flooding destroyed his furnace, air conditioning unit and hot water heater, which were stored in the crawlspace under his home.

Months after replacing the appliances, another flood in 2005 destroyed them again. Realizing how flood-prone his home was, Mr. Stalbird decided to take steps to prevent future losses. “I knew the river would rise again, and couldn’t afford to keep replacing these units,” he said.

While repairing his damaged home, Mr. Stalbird realized that by elevating his units just a few feet off the ground, they would likely be spared in the event of future flooding.

Mid-June flooding put the newly elevated equipment to the test, this time they survived the rising waters. He had elevated the air conditioner approximately eight feet, level with the first floor of his home.

The furnace was moved into the garage and elevated about two feet off the ground. A closet was constructed for the hot water heater on the first floor level of his home. Following the flooding, rather than being faced with several thousand dollars in replacement costs, the only items that needed replacement was the ductwork connecting the furnace in the garage to the rest of the home..

“It wasn’t rocket science, what I did,” Mr. Stalbird said. “But putting up my AC unit on the platform, relocating my hot water heater, and raising my furnace in the garage made all the difference.”

Cleaning up from the June flooding, Mr. Stalbird is also taking steps to reduce future losses to flooding throughout his house. He is planning to install detachable kitchen cabinets that can be stored upstairs before a flood. “I can’t stop the water from rising, but I can do my best to protect what I own,” he said.

Quick Facts

Year:
2004

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Utilities

Primary Funding:
Homeowner

Traveling Rake Removes Debris from Filter

Montour County, Pennsylvania

Danville Borough, PA - Sitting on the banks of the Susquehanna River, Danville Borough has seen its share of floods. Following heavy rains, the river surges and rushing waters threaten the town.

Sechler Run, a creek running through Danville, causes problems of its own during severe storms as backflow from the Susquehanna fills the creek. In 1988, a pumping station was installed to protect the town from the rising creek. And while the pumping station has been invaluable, it created problems of its own. A filter protects the pumps from debris, but keeping the filter from clogging presented a unique challenge.

“We used to have about 20 volunteers clearing the screen. It’s really physically demanding work, so after three or four pulls, you’d have to hand your rake off to the next guy,” said Danville Borough Secretary Tom Graham. “One year, we couldn’t keep up with the rising water. In seconds the water overflowed onto the street. Cars across the street flooded up to the windows before we could get the screen cleared again.”

“Clearing debris from the filter was very dangerous work. During an ice storm in 1996, the platform where workers stand to clear the debris was covered in ice. With rushing water below,” Graham said, “it was only a matter of time before a serious injury occurred.”

In 1998, with the help of the Pennsylvania Emergency Management Agency, Danville applied for funding from Federal Emergency Management Agency. Danville received $149,650 from FEMA’s Hazard Mitigation Grants Program to install a traveling rake that pulls debris off the filter and out of the water.

Now during storms, just one man is needed to operate the pumping station, loading collected debris into a truck.

John Hack, who operates the pumping station said, “If it wasn’t for the pumping station and rake during the most recent high water, Danville would have been wiped out. It’s been a godsend.”

Quick Facts

Year:
1996

Sector:
Public

Cost:
$199,533.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Sarasota County Drainage Project Protects Celery Fields

Sarasota County, Florida

Sarasota, FL – Farmers designed the fields to retain water and nourish the celery crops, but development to the south continually flooded as new building subdivisions increased runoff and decreased the ability of the ground to absorb water. The slight southern slope of the land and the loss of natural turf, due to development, caused flooding when heavy rains fell.

The situation became critical in 1992 when 22 inches of rain fell over three days, and the resulting runoff inundated more than 200 homes in the former celery fields.

Engineers analyzed the area's flooding patterns and north-south water flows, and then developed a plan to control the water through a series of canals, ponds and mechanical flow devices. They created computer simulations with various flooding conditions and, upon review of the data, the design appeared to stop the damage without flooding other areas.

The county purchased the remaining former celery fields – more than 300 acres of property cut with ditches and framed by a series of canals. The design incorporated the canal infrastructure and added diversion gates, outflow pipes and controls.

After three years of construction on the first two phases of the project, the test came in November and December 1997 when two 100-year events (a level of flooding that has a 1% chance of occurring in any given year) deluged the flood-prone area. The design worked. Nearby homes were spared from flooding.

The county installed automated monitoring stations that allowed staff to watch the water levels remotely. Because of this remote operation, county officials can track the amount of water in the canals, measure accrued rainfall, graph results and make appropriate decisions about holding and releasing runoff from the facility and control flow into the system.

To pay for the project, Sarasota County put into place a funding plan often used by cities: the county's water division localized assessments. This way only those residents who benefited from the project paid for it, instead of taxing all county residents.

The celery fields project contained a hidden bonus for the county. The grass marsh created on the site lured many birds to nest in its high grasses and weeds. People drove for miles to watch the migrations.

A partnership between the county and the Audubon Society developed to enhance the natural bird habitat. Plans for a third phase will increase walking trails, picnic areas, park amenities and natural landscaping. Visitors will find signs that identify birds and plantings amid the pines, salt myrtles, and wax myrtles.

Quick Facts

Sector:
Private

Cost:
$26,795,388.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Local Sources

Buyouts Bring Relief to a Pennsylvania Community

Montgomery County, Pennsylvania

Lower Moreland Township, PA – Chestnut Street homes located near Pennypack Creek, dating to the early 1900s, and the nearby Garden Condos built in the 1960s shared a history of significant flooding.

Severe flooding in September 1999 devastated the community, leaving residents displaced for two years while repairs were made. “Then, just after finally moving back in, Tropical Storm Allison flooded [residents] again in 2001,” said Lower Moreland Township Manager, Alison Rudolf.

Southeastern Pennsylvania received eight to ten inches of rain from Allison. Residents were weary and concerned about their future. Then a search for a permanent solution to the repetitive flooding began.

Township officials decided that residents could not continue to live in the floodplain. They contacted the Commonwealth and completed an application to participate in FEMA’s Hazard Mitigation Grant Program (HMGP). Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events.

A buyout is a voluntary partnership between willing homeowners and local communities with the goal of permanently removing people and structures from the floodplain. “Property acquisition, or buyouts, is the only flood loss prevention activity that is 100% effective, 100% of the time, and it lasts forever. Additionally, buyouts are environmentally friendly because they result in returning the floodplain to its natural function,” explained State Hazard Mitigation Officer, Ron Killins.

Thanks to the HMGP grant, township officials were able to offer Chestnut Street homeowners fair market value for their properties; most of the homeowners accepted the offer.

The Chestnut Street acquisition project was completed under budget. The Township then requested and received additional funds to include the Garden Condos in the buyout. The project was successfully completed in 2005, at a cost totaling $2,636,060. A total of 35 structures were acquired in the project.

After the buyout and demolition, a new water retention area was built where the residences once stood. “It held an unbelievable amount of water”, Ms. Rudolf said. “This project saved our senior facility, shopping center, businesses, and homes. Everyone was dry! All of these would have been under water [during another major flood event]. This project made all the difference for our community.”

Photo: Lower Moreland Township Manager Alison Rudolf at the new retention area protecting structures outside the floodplain. The retention area is where repetitively flooded residences once stood.

Quick Facts

Year:
1999

Sector:
Public

Cost:
$2,636,060.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

HMGP Buy-Outs Benefit Two Pennsylvania Communities

Luzerne County, Pennsylvania

Luzerne County, PA – Margie Thomas has lived and worked in the Wyoming Valley area all her life. There, she has witnessed many disasters and the hardships they bring to the affected communities.

As a longtime employee of the Luzerne County Redevelopment Authority, Ms. Thomas has first hand knowledge about disasters and disaster recovery. She has witnessed members of the community lose their homes and property, and struggle to get back on their feet.

Plains and Hunlock Townships are located in a low-lying area close to the Susquehanna River. Families there have been residents for generations, or “old stock” as Ms. Thomas affectionately calls them. “Structures consist of mostly single family, moderate income residences,” she said. The river often floods during storms, subjecting residents to personal property loss and a time consuming and extensive cleanup.

Flooding in 1996 mobilized the townships to participate in FEMA’s Hazard Mitigation Grant Program (HMGP). Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events. Administered and funded by the Commonwealth and FEMA, and with the willing participation of homeowners, a buy-out project was undertaken in 1998. The cost of the Plains Township project was $906,823, and the cost of the Hunlock Township project $451,645. The structures located in the floodplain were bought and demolished, leaving empty open spaces in perpetuity. There are plans to turn one area into a recreational field and the other into a riverfront picnic area.

“There is now a general feeling of gratefulness, where before there was only despair,” noted Ms. Thomas. “Plains and Hunlock Township residents have benefited greatly from the buyout… [They now have] peace of mind… Some residents – older ones especially – find it hard to move away from their homes. But now, after making that hard decision, they lead happier, safer lives,” she added.

The HMGP provides long-term solutions to hazards such as flooding. An acquisition removes people and property from harm’s way by either demolishing or relocating flood -prone homes, and returns the area to open space, thereby restoring the natural function of the floodplain. The local government becomes the new owner of the acquired land, and only uses compatible with open space are permitted, such as parks, basketball courts, or walking paths. “The government pays fair market value during purchase of the properties,” Ms. Thomas explained. “If anyone [who as experienced flooding] has the opportunity to participate in a buy out, I strongly recommend they do so,” she asserted.

Quick Facts

Year:
1996

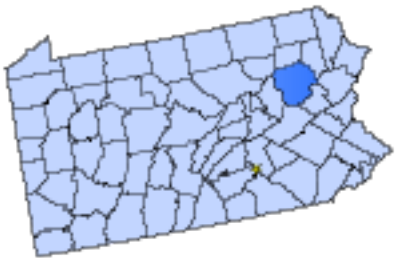
Sector:
Public

Cost:
$1,358,468.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigation Protects Pump Station From Repetitive Flooding



Luzerne County, Pennsylvania

Luzerne County, PA – A wastewater pumping station belonging to the Wyoming Valley Sanitary Authority (WVSA) is often at the mercy of the Susquehanna River. The station, built in 1966, is situated in the historical section of West Pittston, adjacent to the riverbank. It floods every time the river crests above 30 feet.

The repetitive flooding was a serious problem for the WVSA pumping station, resulting in damaged equipment and costly repairs. According to Jim Tomaine, WVSA Deputy Executive Director, “We had to find the manpower to protect the pumping station and to remove the equipment quickly when we received notice of high water levels. Everything that we didn’t remove, prior to any flooding, was damaged. When flooding hit the area, we would keep the non-submergible pumps going for as long as we could, but the floodwaters would always win.”

After the floods of 1996, WVSA took action to reduce damages and losses from future floods. The WVSA applied to FEMA’s Hazard Mitigation Grant Program for a long term solution to the repetitive flooding. “The project was completed in 2002 at a cost of $173,857,” Mr. Tomaine said. “If not for this project, there would have been additional losses and expenses from the periodic flooding, especially during Hurricane Ivan in 2004 and the spring floods of 2005 and 2006. During recent flooding, we had 6 feet of water on the first floor and the submergible pumps were still working,” he noted.

The mitigation project involved the construction of a second story for the pumping station in order to elevate the electrical motor control center and power panels. Submersible pumps that operate underwater were also installed.

Fred DeSanto, Executive Director of WVSA, proclaimed “With the assistance of FEMA, WVSA was able to protect critical equipment while maintaining the historical architectural landscape of the local community.”

“We are so pleased with the results of this project that we are looking into protecting two more pumping stations,” said Mr. Tomaine.

Quick Facts

Year:
1996

Sector:
Public

Cost:
$173,857.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Sliding Flood Walls Help Protect Danville Borough from Flooding

Montour County, Pennsylvania

Danville Borough, PA - This community is no stranger to flooding. Located on the bank of the Susquehanna River, the town floods regularly during major rain events. Two areas, on the east and west edges of town, are particularly susceptible to flooding.

As Danville Borough Secretary Tom Graham explained, “Every time there was a heavy rain, our volunteer firefighters and the kids on the football team would spend hours piling sandbags in vulnerable spots.”

Mr. Graham and other Danville community leaders sought a better way to protect the town. Danville developed a flood mitigation project and submitted an application to the Pennsylvania Emergency Management Agency to apply for funds from FEMA’s Hazard Mitigation Grant Program (HMGP) to construct sliding flood walls at vulnerable points in the town. Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events.

Danville Borough received $350,000 in HMGP funds in 1999, and the flood walls were completed in 2003. Protecting the town from flooding once took dozens of man-hours, but now takes less than 20 minutes. The walls are pulled into place with a battery-powered winch. Water that would have threatened homes is now diverted onto a football field.

According to Mr. Graham, “These flood walls are invaluable. With seven sites that are vulnerable, these walls help our volunteer firefighters protect the town. And they help protect our volunteers from some dangerous and difficult work.”

Danville City Councilman Collins Stump agrees: “FEMA has protected our town. No question.”

Quick Facts

Year:
1994

Sector:
Public

Cost:
$466,667.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Bringing Shutters to Those In Need

Miami-Dade County, Florida

Miami-Dade County, FL - Frank Reddish, the Emergency Management Coordinator for Miami-Dade County, asserts that installing storm shutters is key way to protect a home or business from storm damage.

Mr. Reddish spearheads the County's Local Mitigation Strategy (LMS) Group and has been involved in many successful projects designed to reduce damage from future storms.

For low-income homeowners, the Miami-Dade LMS is making shutters available to qualified applicants at no cost through the In-Need Shuttering Program. This program evolved from the original project as Mr. Reddish and the LMS sought to widen the program's scope and coverage throughout the community.

Community residents can obtain applications for shutters at several locations throughout the county. According to Mr. Reddish, the program has received more than 100,000 applications, and provided shutters for 1,500 homes as of summer 2006.

Currently, Miami-Dade's Community Action Agency Weatherization Program is responsible for the shuttering. The shutters, hardware, and equipment are purchased through local suppliers at reduced rates, with the cost of shuttering a single house totaling between $1,500 and $2,000. Taking into consideration the potential savings in home repair, reduced property losses, and reduced human suffering, the advantages of protecting a house through the relatively simple technique of storm shutters are clear.

Originally, funding for the In-Need Shuttering Program came from the State of Florida's Residential Construction Mitigation Program in the form of a $300,000 grant. An additional $1 million allocation came from the Miami-Dade County Commission. FEMA's Hazard Mitigation Grant Program, administered by Florida's Department of Community Affairs, provided $900,000 in program development funds following tornado events in 2003, and this amount was matched by the County.

"The 2004 and 2005 hurricane seasons were the worst in Florida's history," Mr. Reddish said. "We went out and looked to see how the shuttered houses fared and we found zero damage, not just the houses that we shuttered with this program but any house with shutters suffered no significant damage. Shuttering works, and this is a great program, because we're bringing shutters to those who can't afford them on their own."

Quick Facts

Year:
2003

Sector:
Private

Cost:
$2,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Technical Assistance Program (HMTAP)

Firehouse No. 1 Sets a New Standard in Charlotte County

Charlotte County, Florida

Port Charlotte, FL - On August 13, 2004, Hurricane Charley intensified, veered from its predicted course, and smashed into Charlotte County at the mouth of the Peace River.

Located north of the river on US 41, was Firehouse No.1. Winds in excess of 140 miles per hour (mph), with gusts up to 180 mph, tore bay doors from their rails and ripped the roof from its rafters. Dumpsters were airborne and sheared the air conditioning compressors and generators from their pedestals. There was also a power failure. The building itself suffered more than a 75-percent loss.

Reflecting on the $17.8 million in damages to the County's public facilities and lost equipment, Chief Didio vowed, "We won't let this much devastation happen to us again."

The Board of County Commissioners agreed with the Chief's resolve to rebuild stronger. Encouraged by its team of designers, facility and project managers, and consultants, the Board voted to exceed the 130 mph codes required in Charlotte County when rebuilding all critical facilities.

Before Charley struck, the County budgeted $1.5 million to construct a new facility for Firehouse No. 1. With the new dedication to implement above-code construction, the Board added $449,500 for hardening measures.

The project team, commissioners, and county residents watched excitedly as the new station rose from the rubble. Oversized steel support beams seated eight-feet deep in concrete footings frame the building. Solid concrete blocks form the lower half of the building, with concrete walls poured on top. A seamless metal roof with rafters set 12-inches on center, instead of the standard 16-inches, crowns the structure. The women's locker room was designed to also serve as a saferoom, and features solid concrete block walls and an 8-inch-thick poured concrete ceiling.

To strengthen the building envelope, workers installed high-impact glass in windows and doors and provided Kevlar® screens for the bay doors. The design also called for installing hurricane shutters on the windows. Outside, the compressors and generator were protected with debris fences, and containment walls were built around the generator and dumpster.

The County's building codes require new construction to meet Base Flood Elevation (BFE) requirements; critical areas of the new Firehouse No.1, the living space, the kitchen, and locker and radio rooms were elevated three feet above the BFE. Buildings constructed to this standard are expected to sit above the floodwater and avoid damage during all but the most severe inundations. Outside, the air conditioning compressors and generators were raised on elevated pads.

Quick Facts

Year:
2004

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Local Sources

FEMA

Wildfire Mitigation Teams
Set Florida on Fire – on Purpose

State-wide,
Florida

The State of Florida - In 1998, Florida suffered one of the worst series of wildfire events on record. Heavy plant growth in previous seasons, followed by hard winter freezes, led to an abundance of dead vegetation. Months of serious drought conditions caused the dead vegetative matter to dry up. These were very hazardous conditions – like a tinderbox waiting to be ignited.

Beginning in April 1998, as many as 80 simultaneous wildfires were reported on any given day. By mid-July, more than 2,000 fires had consumed almost half a million acres across the state.

A task force was created to address the growing wildfire threat. Ultimately, the task force formed four regional wildfire mitigation teams whose primary task is to reduce the vegetation that provides fuel for wildfires.

Vegetative fuel sources can catch fire easily, burn intensely, and spread flames rapidly. Embers blowing ahead of the fires can touch down on distant fuel sources possibly creating more fires. The wildfire mitigation teams reduce vegetation through mechanical means and prescribed burns.

Mini-bulldozers reduce small growths of vegetation. Using heavy equipment that includes a grinding head, task force members knock down larger plants which are then ground into mulch.

A technique called prescribed burning is now carried out to minimize the wildfire problem. When weather and geographic conditions are favorable, and with firefighting equipment on hand, mitigation teams safely ignite and manage fires to reduce fuels in wildland areas. Prescribed burns often follow mulching, which gives the teams a greater degree of control over the fires. The prescribed burns can cover small areas of one or two acres, or up to as large as 1,000 acres. This approach has been so successful that prescribed burns are widely accepted as a smart and effective tool for preventing wildfires.

The Florida Division of Forestry provides the majority of the annual budget for the wildfire mitigation teams. Supplemental assistance is also provided by the United States Forestry Service through the National Fire Plan.

One day of prescribed burning costs $4,018. With that one burn, 352 homes, 42 apartment buildings, three businesses, and 15 acres of property are protected. The total value of everything made safe was conservatively estimated at $49 million.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
State sources

Glenville Buy-Outs: Back to Nature

New Castle County, Delaware

Glenville, DE - When Bill Marino and his neighbors saw the flood waters rising around their neighborhood in September 2003, they knew their properties were in serious danger. “I saw the water covering the ground around the house so I headed for the car, but by the time I got outside the flood water had risen waist deep. This flood brought to light a major public health and safety issue for the entire neighborhood because there was no time to escape,” Mr. Marino said.

Mr. Marino, long-time President of the Glenville/Stanton Crest Civic Association, and Tom Gordon, former county executive, unified the neighborhood and endeavored to have the State of Delaware purchase the flood-damaged homes. Mitigation studies conducted by the State concluded that property acquisition and relocation was a sound decision to address the flooding problem in Glenville.

Through the collaborative efforts of the State, New Castle County, the Delaware Department of Transportation (DelDOT) and FEMA, funds were allocated for the buyout project. In January 2004, The Glenville Reinvestment Project began the acquisition of 172 homes located within the 100-year flood plain. A local contracting firm coordinated the demolition and debris removal. This project was unique in the community because of the large number of homes that were purchased and because of DelDOT’s proactive mitigation plan to use the land for a wetland habitat and future flood storage area.

The Glenville area has a long history of flooding; a total of 14 flood events are on record dating back to 1937. The 2003 flood, unlike previous floods, came without warning and flooded the entire neighborhood within fifteen minutes. Fortunately, the event occurred in the morning when most of the residents were at work and children were at school. Had the flood occurred at night, the threat to human safety would have been more severe. However, there were still many residents, including several elderly and handicapped persons in wheelchairs, whose lives were in serious jeopardy and who needed help immediately. The residents stranded in their homes when the flood occurred were thankful that a rescue team was in the area and able to assist them.

Recalling the 2003 flood, Mr. Marino said: “After this flood, everyone knew time was of the essence to relocate. The residents of Glenville were very pleased with the help they received and with how fast the purchase transactions were completed. Things get done when people work together.” Many of the residents whose homes flooded relocated in less than nine months. The community now has one of the nicest wetland reserves in the state and a new flood storage area that will help reduce future flooding. The relocated families are at ease in their new homes, and are saving money on flood insurance premiums. As wildlife roam the open fields of the old neighborhood, the former residents can rest at ease when rain is forecasted.

Quick Facts

Year:
1993

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Community Assistance Program (CAP)

Lessons Learned from Katrina: Retail Store Takes Action

Forrest County, Mississippi

Hattiesburg, MS - When Hurricane Katrina struck the Mississippi Gulf Coast on August 29, 2005, businesses were damaged or destroyed, houses were reduced to debris and concrete slabs, and communities were left stunned. One business hit hard was Hudson's Salvage Stores. Ironically, Hudson's sells merchandise from other companies that have been damaged by some sort of disaster.

Of the 39 Hudson stores in Mississippi, Alabama, and Louisiana, half were destroyed or had significant water or wind damage. Those stores that did survive could not be immediately reopened because their employees had evacuated before the hurricane. More than 350 Hudson employees lived in the area affected by Katrina.

To stay competitive in business, owner Bill Hudson and partner Rob Roberts have learned lessons quickly, and are taking steps to minimize damages and losses from future storms.

"This was my most fearful experience, and I survived," Mr. Hudson said. He had no hurricane plan in place prior to Katrina. "Frankly, I didn't know if there was ever going to be a Hudson's again. By learning from the past, educating ourselves and our employees, we will be better prepared to protect our families and the company in future storms," he added.

Based in Hattiesburg, the retail chain is now committed to providing educational resources to both its employees and residents of the community. Some issues of the company newsletter, "The Hudson Times," are dedicated to hurricane planning and preparedness.

Mr. Hudson has also partnered with FEMA to distribute preparedness publications to customers and employees at 19 stores in south Mississippi, and to host outreach teams at selected stores in the state. "This year, instead of hoping the storm doesn't hit, I am going to expect the storm to hit. The number one answer is education and it's important to have a strategic plan in place for the company," asserted Mr. Hudson. "I had no idea that crisis situations like we experienced would arise after a storm like Katrina. There are preventive measures that will be in place this year. Planning ahead will guarantee that necessary resources are in place."

The company was without electricity for many days after the storm, and there was a fuel shortage. Subsequently, Hudson's now has generators and a fuel station to keep the company running. Mr. Hudson also plans to let his employees off one day earlier than recommended by authorities to give them more time to evacuate before a storm.

A quick recovery of the firm's two divisions, Hudson's Treasure Hunt and Hudson's Dirt Cheap stores, is good for the overall community as well, Mr. Hudson said. The Small Business Administration (SBA) agrees. "The sooner a business can recover from a disaster, the better it is for its employees, customers, vendors, and the community," said Kathy Cook, an SBA government relations specialist. "When we save the small businesses, we save the economic base of the community. We all have a stake in the recovery of small businesses and need to practice preparing for disasters."

Quick Facts

Year:
2005

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Business Owner

FEMA

Gulf View Home Survives Katrina's Wrath

Jackson County, Mississippi

Pascagoula, MS – Susan Lee is fortunate to be the owner of the only home in her coastal neighborhood that remained intact and standing after Hurricane Katrina's devastation on August 29, 2005. "I was shocked when we returned after the storm and saw all the slabs where houses used to be and piles of debris everywhere," Ms. Lee said, recalling the catastrophic damage to her community.

The original home on Ms. Lee's lot had been severely damaged by Hurricane Georges in 1998. During Georges, every home in the neighborhood was flooded with four feet of water. The house was condemned and demolished in 1999. A year later, Ms. Lee purchased the land alongside the Bayou Chico with a view of the Mississippi Sound. She followed the design recommendations of her contractor and builder who constructed the 2,358-square-foot home to withstand threatening weather hazards. "Even the windows have hurricane-proof glass and during Katrina nothing flew through them …they held up."

Ms. Lee lives in a hurricane-prone region. To minimize property damage and economic losses from storms, the City of Pascagoula requires all new construction adjacent to the coast be built five feet higher than the Base Flood Elevation (BFE), which is 11 feet above sea level. The BFE is the average floodwater depth for a flood event that has an estimated one percent chance of occurring during any given year. Buildings constructed to this standard are expected to sit above the floodwater and avoid damage during all but the most severe inundations. Ms. Lee's house exceeds this requirement; it is elevated 19 feet above sea level.

The supporting walls of Ms. Lee's house were constructed with reinforced concrete block and reinforced concrete bond beams. The bond beams connect to the roof with hurricane straps. The house survived Katrina's 19-foot storm surge and 100 mile-per-hour winds, although portions of the roof and the open wooden patio and stairs on the rear of the home were damaged.

Break-away windows and outflow vents were built into the area beneath the elevated lowest floor of the house, which is used primarily for storage and parking. These mitigation techniques allowed the flood waters to freely enter and exit the foundation area, reducing the pressure of the surge and preventing the supporting walls of the home from collapsing.

The only repairs required inside Ms. Lee's home were sheetrock to replace water-damaged walls and ceilings and some new shelving. Nearly all of Ms. Lee's furniture, appliances, and personal possessions were spared.

Seven months after Katrina, Ms. Lee moved back into her house while a few remaining repairs were being finalized. Some homes in her Pascagoula neighborhood have not yet been rebuilt, and many of her neighbors have chosen to permanently relocate elsewhere, but the Lee house is once again a beautiful, modern, Gulf-side home. "Since Katrina, the contractor displays my house as a model for others to see," noted Ms. Lee.

Quick Facts

Year:
1998

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Private funds

Mitigation Efforts Prove Successful In Flood Fight Along the Red River

Clay County, Minnesota

Moorhead, MN – Moorhead has seen its share of flooding over the past two decades. In 1994, 1997, and 2002, the City of Moorhead took part in FEMA's Hazard Mitigation Grant Program (HMGP) to mitigate flooding and reduce future flood losses. A total of eight repetitive loss properties in1994, sixteen homes damaged in the 1997 flood, and two additional repetitive loss homes in 2002 have been acquired through the HMGP.

When Mary and Bill Flickinger bought their home in Moorhead in 1983, it was a great location to raise children. Their backyard abutted the Red River and they felt like they were living in the country yet had the conveniences of the nearby city. Unfortunately, the Flickingers' close proximity to the river became hazardous. From 1983 to 1997, the couple laid sandbags to save their home on three occasions. In the flood of April 1997 (the second highest on record), a sandbag dike rose six feet high just outside the door to the Flickingers' house. From the walkout-level family room, the river rushed by at eye level. With the help of family, friends, and their church, the Flickingers were able to keep water out of the home.

Two months later, more heavy rains fell. The Flickingers' home had made it through the April flood only to have water seep through the foundation in June. Mr. Flickinger asked a friend who was an engineer to inspect house; they discovered that the foundation had moved. The saturated soils from the April flood had caused the house to shift and become structurally unsound. The heavy rain in June then revealed this problem to the homeowners. In response, Mr. Flickinger consulted with City of Moorhead officials and their house was included in a city acquisition project. The City was interested in the property because it abutted the water intake facility for the City's drinking water system. The home was purchased and demolished with the help of FEMA's HMGP acquisition program and the Flickinger family moved to an area known as the Meadows Subdivision.

In 2006, the fifth highest flood on record hit the Moorhead area. This time damage from floodwaters along the Red River was minimal thanks to the buyouts and a sandbag dike. The Flickingers old riverfront home would have been under water during the event.

The City of Moorhead has made many improvements using a variety of Federal and state mitigation funds. For example, dikes have been constructed, storm sewer control gates have been installed, and flood models have been produced. The City also installed sanitary sewer isolation valves on homes remaining in the floodplain and a concrete liner on a ditch to safely move overland floodwater through the city. Sand bagging is necessary in some areas when the river level reaches 35 feet. In 2006, approximately 100 property owners constructed dikes to protect their homes to the 38 foot flood stage.

Quick Facts

Year:
1997

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Napa River Flood Protection Project - A "Living" River Concept

Napa County, California

Napa, CA - In the flood-prone valley of the Napa River lies the world-class traveler's destination of Napa, California. Over the span of 36 years (1961-1997), a total of 19 floods caused more than $542 million in residential property damage alone. That total does not include economic losses in the tourism industry, environmental damage, or the loss of human lives.

During a 1986 flood, 20 inches of rain fell in a 48-hour period, resulting in 3 deaths, the destruction of 250 homes, damage to 2,500 homes, and the evacuation of 5,000 residents. Flood events in March 1995 and January 1997 were similarly destructive. The City of Napa subsequently embarked on an ambitious effort to mitigate flood losses in the community.

The Napa River - Napa Creek Flood Protection Project was voted into reality by the passage of Napa County Measure A in March 1998. This half-cent local sales tax levy passed by the citizens of Napa County provided a funding mechanism for the local share of the project cost and helped solidify the partnership between the Napa County Flood Control and Water Conservation District (NCFCWCD) and the USACE.

Measure A funds flood protection, drainage improvements, dam safety, and watershed management projects for each community in Napa County and in the unincorporated area of the county. The project is still on-going in 2006 and components include the following: the acquisition and removal of more than 50 mobile homes, 16 residences, and 28 commercial buildings from flood-prone areas; the creation of over 400 acres of emergent marsh and 150 acres of seasonal wetlands; the removal, reconstruction, and elevation of several bridges; the elevation of railroad tracks; home and utilities elevations; the creation of structural flood control elements such as widened stream beds, flood walls, levees, and culverts; and the construction of three detention basins with accompanying pump stations. According to NCFCWCD, "When all these project components are in place, the City of Napa will have a system to keep homes and businesses dry in the future."

December 2005 was the first test of Napa County's new flood mitigation efforts when nearly 10 inches fell in a 24-hour period. Local officials were ready for the flood and had already placed sandbags and warned residents. Within four days of the flood the City had placed debris containers around town which greatly facilitated cleanup and repair. At the time of the flood, officials estimated that the project was only 40% completed. Nevertheless, significant economic losses were avoided, and there is a sense of confidence in the city's economic vitality. In addition to mitigating flood losses, the community has placed a revitalized, healthy river as the centerpiece of Napa. Many people now take advantage of the resources the river has to offer, including fishing, boating, walking along river trails, bird watching, and scenic dining.

Quick Facts

Year:
1995

Sector:
Public/Private Partnership

Cost:
$18,940,392.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

Wet Floodproofing Reduces Damage To Popular Beach Restaurant

Monroe County, Florida

Key West, FL - The Duval Beach Club sits on the only natural stretch of beach in Key West. In 2005, it was hit by Hurricanes Rita and Wilma. Thanks to the mitigation efforts initiated by the restaurant's owner, Fred Tillman, worries about flood damage have been reduced.

The building that houses the popular restaurant, as well as the land it occupies, is owned by the City of Key West. When Hurricane Georges made landfall in September 1998, the building sustained so much damage that the previous leaseholders were forced to abandon it. The City of Key West then leased the property to Mr. Tillman and his partners. Mr. Tillman proposed the idea of wet floodproofing the restaurant and completed the retrofit. So far, his efforts have protected the property from hurricane damage.

The concept of wet floodproofing is simple: provide means to allow floodwaters to enter, flow through, and exit a building, thereby preventing more severe damage to the building as a whole. Non-absorbent materials and/or coatings are used to allow easier cleaning and sanitizing of interior surfaces after a flood event.

When designing the Duval Beach Club, Mr. Tillman utilized his experience as a marine surveyor who once inspected damaged buildings in the Caribbean. He recalled, "most of the time, tiki huts, with their basic pole construction, were still standing when everything else around them was gone."

"When hurricanes come, [restaurant personnel] evacuate," said Mr. Jones. "They remove barstools, stoves, and other equipment that would be damaged by flooding. They open the place up, and let it flood. When the storm has passed, they shovel the sand out and put it back into shape."

According to Mr. Tillman, cleanup after a storm does not take long. The Duval Beach Club is usually open for business within 10 to 20 days. The cleanup involves shoveling sand back out onto the beach, cleaning and sanitizing surfaces and fixtures, repainting, and simple repairs. Mr. Tillman keeps his staff on the payroll to assist with the cleanup. Although other businesses in the area are sometimes closed for months, the Duval Beach Club is operational within days, providing a much-needed service to the community and ensuring that the restaurant's staff has continued employment following a storm.

Mr. Tillman asserts that the mitigation efforts were worth it. "The money that we originally invested in the mitigation has been recouped many times over. When storms approach, we no longer have to worry about repairing the building, replacing the equipment, or losing revenue due to being closed."

Quick Facts

Sector:
Public

Cost:
$140,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Property Owner, Commercial

A Dream Comes True: Mitigated Haven in Mississippi

Jackson County, Mississippi

Ocean Springs, MS – When a new beachfront housing development opened in 1995 at Belle Fountaine in Ocean Springs, Charlotte Lamar walked the five waterfront lots until she decided on one for her dream house. Ms. Lamar's home suffered little damage during Hurricane Katrina in August 2005, thanks to mitigation measures she employed during its construction.

"I always dreamed of having a beach house. I grew up around water," Ms. Lamar said. A native of Holland, she moved to New Orleans at the age of 12. "My father was a sailor. We always went sailing. I know my background with water. That has a lot to do with why and how I built this house," she explained. Ms. Lamar also wanted an octagonal-shaped house, which she believed offered improved wind-resistance.

Ms. Lamar learned that her new home would have to be elevated to protect it from flooding. She gathered information from Jackson County on residential elevations and damages incurred during previous hurricanes in her community. She also gave credit to her son, an engineer, for additional suggestions that prompted her to include an additional five feet of elevation (freeboard) into the construction of her home.

Eight pressure-treated wood pilings were positioned at the corners of the octagonal structure, embedded 15 feet in the ground, and connected to the roof. The design of the roof aids in its wind resistance; its pitch equalizes downward pressure from high winds. The entire house is tied together with metal brackets and hurricane straps that help distribute wind loads by providing a continuous load path from the roof to the foundation. The home, built of cedar, stands approximately 22 feet above sea level and is located in Zone C where there is no regulation to elevate above the Base Flood Elevation. Therefore, Ms. Lamar elevated her house by choice, basing her decision on historical events, such as Hurricane Camille. Following fourteen months of construction, she gazed toward the Gulf from the second floor deck of her new home.

Ten years later, Hurricane Katrina threatened Ms. Lamar's house with a tidal surge estimated at 19 feet above sea level at Belle Fountaine. Thanks to hurricane mitigation planning, her home is one of the few houses in her community that did not surrender to the catastrophic storm.

The tidal surge rose two feet on Ms. Lamar's property, but missed her house by three feet because of the additional elevation incorporated into her home's construction. The force of the tidal surge destroyed the air conditioning and heating ductwork beneath the house; saltwater invaded the floor vents and left mud on the floors of the house; and the 102 mile-per-hour winds and rain damaged a window, allowing water into the house. However, compared to other beachfront homes, Ms. Lamar's house sustained minimal damage.

Ms. Lamar's house had successfully weathered several previous storms. "I was overwhelmed by Katrina," she said. "I didn't [expect it to be] as bad as it was…[but] this house did exactly what it was supposed to do."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

Disaster Survival House Brings Message of Preparedness to Community

Broward County, Florida

Deerfield Beach, FL – In 1997, Deerfield Beach became the first community to participate in a FEMA mitigation grant program that encouraged the building of disaster-resistant communities. The City formed a partnership with State Farm Insurance Company to build a fortified house to bring the message of hazard mitigation and disaster safety to local architects, builders, and residents.

State Farm funded construction of the house, and donated it to the community in 2004. Since then, Deerfield Beach has transformed the house into an educational museum devoted to the science of hurricanes and the realities of mitigation and disaster preparedness.

The more than 100 disaster-resistant features built into the house are demonstrated through cutaway displays, where visitors can view the construction and design techniques and materials that comprise the finished house. After the City took ownership, designers incorporated changes that enhanced the educational value by turning the entire house into an exhibit about hurricanes and aspects of disaster preparedness. Erik Salna, Hazard Mitigation Coordinator at the Disaster Survival House, explained that each room of the house addresses a specific topic. Not only has the house been reconfigured to demonstrate and display examples of mitigation and safety techniques, but it also offers a historical and educational overview of hurricanes and other disasters.

Visitors are greeted in the Welcome Room by artwork, photographs, and news articles that tell Florida's hurricane history. An audio/visual presentation featuring surround sound and simulated lightning demonstrates the power and scope of storms that have struck Florida over the years.

The bathroom and laundry room demonstrate different fortification techniques, and display messages from the National Safety Council about in-house safety for families.

The wind demonstration area is located in a screened-in porch, where a wind tunnel provided by Florida International University's Hurricane Research Center demonstrates wind effects on houses using scale models. The models are subjected to simulated hurricane force winds, and visitors can evaluate the effects on different types of construction designs.

The garage area contains a display of various roofing materials designed for strength and damage-resistance, as well as an exhibit on properly reinforced garage doors. Generator safety concerns and precautions are also presented in this area.

Deerfield Beach's Disaster Survival House is a unique and valuable tool for educating the public about hurricanes and other disasters. According to Salna, "It's here for the community, for education. I like to call this place an ambassador. We're bringing the message of preparedness, teaching the history of hurricanes, the science of hurricanes and how to fortify against them. The bottom line is, everybody needs to have a plan. Everybody needs to be prepared."

Quick Facts

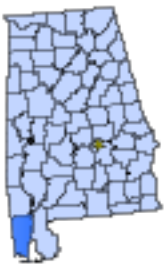
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

Home Buy-Outs Create Green Space on Dauphin Island



Mobile County, Alabama

Dauphin Island, AL – Dauphin Island has created a more hurricane-resistant community. Property acquisitions have taken place as mitigation measures to protect renters, owners, and businesses from frequent flooding caused by hurricanes and storms. Recreational areas, green spaces, and bird habitats occupy land where repetitive loss properties once stood.

Standing guard between Mobile Bay and the vast Gulf of Mexico is Dauphin Island, a true barrier island with dunes, maritime forests, salt marshes, tidal flats, and two freshwater lakes. The island is 14 miles long and 1 ¾ miles wide at the widest point. Less than half of the island is inhabited; 8 miles on the western side are undeveloped. Dauphin Island is vital for providing protection to the mainland from severe weather events. Island officials are very experienced in planning and preparing for hurricanes and floods.

Since Hurricane Katrina (2005), Dauphin Island has begun requiring an additional two feet of freeboard above the Base Flood Elevation for all new construction to help reduce the risk of future flood damages to properties.

Plagued by frequent flooding from heavy rains and hurricanes, Dauphin Island officials were motivated to acquire repetitive loss properties from property owners. The acquisition was funded by FEMA's Hazard Mitigation Grant Program (HMGP) and administered by the Alabama Emergency Management Agency.

When homes and businesses experience heavy flooding (especially multiple flood events), FEMA's buyout program is a cost-effective and long-term solution for community floodplain managers and owners of flood-damaged property. This mitigation activity restores the natural function of the floodplain, eliminates the risk of future damages to those structures removed from the floodplain, and reduces the potential for future property losses by limiting the kinds of future improvements permissible on the land acquired. The resulting open space can be used for flood resistant projects such as parks, picnic areas, walking paths, basketball courts, and wildlife refuges.

A total of three homes were included in an acquisition project that was completed after Hurricane Ivan (2004). "There is no question about what would have happened to these homes during Katrina if they had not been [removed from the floodplain]. They would have flooded," said Mayor Jeff Collier.

One acquired property bordering Salt Creek is now a popular park located near an elementary school. The cost of the HMGP acquisition totaled $218,140. Visitors enjoy modern playground equipment, picnic tables, benches, and shade trees. Pryor Park, a property acquired through the HMGP for a total of $204,262, is located in a quiet residential neighborhood. It is enclosed by a picket fence and has benches for relaxing. The third property was acquired for $101,355, and is now green space for birds to enjoy.

"Dauphin Island is unique because of its location, tourists, secondary homeowners, and specialty shops. Because of its makeup, the effects are far reaching when severe damage occurs from hurricanes and frequent flooding," said Mayor Collier.

Quick Facts

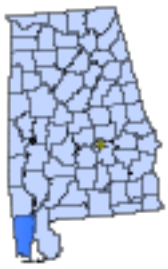
Sector:
Public

Cost:
$523,757.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Island Sea Lab Prepares For Hurricanes



Mobile County, Alabama

Dauphin Island, AL – After being repeatedly assaulted by hurricanes, the Dauphin Island Sea Lab decided to install hurricane shutters. Following Hurricane Ivan in 2004, the shutters were installed as a preventive measure against future hurricane damage. This proved to be a wise decision when three major storms made landfall on Dauphin Island within three months of each other in 2005.

The Sea Lab is located on 36 acres at the eastern end of Dauphin Island, a barrier island approximately three miles from the mainland and 40 miles south of Mobile, Alabama. The Sea Lab spans the island and is therefore surrounded by the Gulf of Mexico, the Mississippi Sound, and Mobile Bay. A bridge connects the island to the mainland.

When Hurricane Katrina made landfall on August 29, 2005, it caused extensive destruction on the island. Nearly 300 homes were destroyed, several businesses were lost, roofs were damaged, bridges were not passable, and power outages lasted for days. However, the sea lab was soon operational, with classes resuming when roads became passable and power was restored after two weeks.

Dauphin Island Sea Lab is a marine science institution with academic and research distinction. Its courses are part of the required curriculum for universities in Alabama that offer a marine science program. A total of 21 schools are members.

The lab installed permanent wind-resistant aluminum shutters on three essential buildings for protection. Although students are evacuated to another campus whenever a hurricane threatens the island, storm shutters are also installed on all dormitories. The shutters protect doors and windows from high winds and flying debris.

The Sea Lab was awarded FEMA Hazard Mitigation Grant Program (HMGP) funds for the hurricane shutters. Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events. The grant, which totaled $169,998, was administered by the Alabama Emergency Management Agency.

Storm shutters are a cost effective way to provide buildings with wind and impact protection. Another hurricane mitigation technique used at the Sea Lab is the installation of ply board in windows that are not equipped with permanent shutters. The ply board is manually installed whenever there is the possibility of a storm. The campus also has backup generators in case of power failure.

“It is essential that the school continues to operate after storms. Therefore we make every effort to protect not only our facility but our faculty and students,” said David England, Director of the Dauphin Island Sea Lab.

Quick Facts

Sector:
Public

Cost:
$226,664.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Storm Shutters Create Feeling of Security for Biloxi Homeowner

Harrison County, Mississippi

Biloxi, MS - Delores Sambuchino's 1,750 square-foot home, purchased in 1994, has several windows and doors. Although they let sunshine and fresh air into the home, they can also be hazardous during inclement weather.

"My first experience with hurricanes, in this home, was with Hurricane Georges [1998]. I was petrified," Ms. Sambuchino said. She wanted to feel safe and know that her home was secure during future storms. Before Hurricane Katrina made landfall on August 29, 2005, Ms. Sambuchino evacuated to Bay County, Florida. She left Biloxi feeling confident that her house would survive the hurricane because she had covered her windows and doors with storm shutters.

Storm shutters are not new to Ms. Sambuchino. The Erie, Pennsylvania, native lived and taught in Germany for eighteen years. "In Germany, they are called roladens. They are built into the houses. I had these on my windows all the time," she recalled. Her fear of a hurricane's destruction prompted Ms. Sambuchino to purchase shutters for her home in Biloxi Her home is located less than a mile away from Biloxi Bay.

When Hurricane Katrina's 115 mile-per-hour winds pounded her home, the shutters did exactly what they were supposed to do – protect windows and doors from damage that could let water, wind, and debris into the house. "I truly believe they saved my house," she said. However, the windows on her sun porch were shattered. They were not protected by hurricane shutters, and broken glass was everywhere.

The force of the wind spread debris throughout her yard. "My yard was a disaster. It was horrible. A huge tree fell on part of my fence…at one point I had five chimneys in my yard [that blew in from neighboring houses]," Ms. Sambuchino added.

Today, roll-down shutters on her front windows and removable aluminum storm panels on other windows provide protection during severe weather events.

Ms. Sambuchino's roll-down shutter systems have a manual crank. Shutter systems are also available that have a fully-synchronized electric motor drive for ease of operation and maintenance. However, electric shutters should be manually operable in case of a power failure. Roll-down shutters are constructed of impact-resistant and durable aluminum. They add value to a home or business in hurricane-prone areas, and provide protection from extreme weather conditions and temperatures and noise.

The removable storm panels are also constructed of aluminum and provide cost-effective protection against hurricanes and tropical storms. The panels are designed to slip into an overhead track and fastened to a lower track with washers and wing nuts. The shutters are extremely durable and easy to set up. They can be easily removed and stored. Ms. Sambuchino purchased her storm panels two weeks prior to Hurricane Katrina at a cost of approximately $3,000. "The [shutters and panels] have paid for themselves," she asserted.

Quick Facts

Sector:
Private

Cost:
$4,500.00 (Estimated)

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Property Owner, Residential

Building Beyond Code Requirements
Charleston, South Carolina

Charleston County, South Carolina

Charleston, SC - In the fall of 2002, a magnitude 4.32 earthquake was measured in the Charleston area. That earthquake pales in comparison to the magnitude 7.7 earthquake that struck Charleston on August 31, 1886. Could a magnitude 7.7 earthquake strike again? If so, many of those in the building industry in Charleston want to be prepared. The Superior Code Home Standards, which are voluntary standards that go beyond the minimum code requirements for new and existing construction, have been adopted by the Home Ownership Program in the Charleston area, Seabrook Island, South Carolina, and the Habitat for Humanity. The City of Charleston also began enforcing the International Residential Code on April 1, 2002, 90 days in advance of any other jurisdiction in South Carolina. “Why would we offer the citizens of Charleston less than the nationally recognized standards for their protection,“ says Doug Smits, Director of Inspections, Chief Building and Fire Officials for the City of Charleston.

There are many other activities being undertaken in Charleston to reduce the risk from earthquakes. In the City of North Charleston, a non-profit organization established in part with NEHRP assistance will break ground in May 2003 on a permanent home for the organization and an educational center for the community. The center, which will include cut-outs so that the public can view earthquake resistant structural systems, will feature a library, hundreds of safety items and displays, and training programs for a variety of audiences, including architects and engineers, building code officials, contractors, and school children.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

FEMA

Businesses Increase Involvement in Earthquake Mitigation

State-wide, Washington

The State of Washington - What do Starbucks Corporation, the Boeing Company, and the Friday Harbor Flower Shop have in common? All are businesses, all are located near Seattle, and all are taking an active role in keeping their employees safe and making their businesses more disaster resistant from earthquakes and other hazards.

The Cascadia Region Earthquake Workgroup (CREW) is a non-profit action group on a mission. In 1996, the scientific community established CREW to promote awareness of seismic risk among businesses and emergency managers. The Nisqually earthquake in February 2001 provided CREW and its partners with an important opportunity to assess lessons learned and to take additional steps to mitigate against damage from future earthquakes. Since the Nisqually earthquake, CREW has sponsored conferences and held forums to showcase both successes and failures during the Nisqually earthquake, and how to apply those lessons learned to a variety of other hazards, including man-made hazards.

In April 2003, CREW will release a 20-minute video directed at small- and medium-sized businesses. Using the lessons learned from Nisqually, the message of the video is “protect your people, your buildings, and your business.” The video, which highlights the work of Starbucks, Boeing, and the Friday Harbor Flower Shop, will be distributed along with a tool kit developed in partnership with the Institute for Business and Home Safety. CREW also plans to meet with the Seattle Chamber of Commerce and other Chambers of Commerce to establish coordinating centers with businesses, and will continue to sponsor its series of business forums.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Training

Primary Funding:
Non-profit organization (NPO)

Measuring Earthquake Potential with GPS

Multiple Counties, California

Southern California - The Chinese philosopher Chang Heng invented the first seismoscope in A.D. 132. The instrument was a large urn, on the outside of which were eight dragonheads facing the eight principal directions of the compass. Below each dragonhead was a toad with its mouth opened toward the dragon. When an earthquake struck, one or more of the eight dragon mouths would release a ball into the open mouth of the toad sitting below. The direction of the shaking determined which of the dragons released its ball. The instrument was reported to have detected an earthquake up to 400 miles away.

Almost 2,000 years later, on July 6, 2001, earthquake scientists unveiled the Southern California Integrated GPS Network (SCIGN), a new type of ground motion monitoring network. Unlike other instrument networks that record shaking, SCIGN tracks the slow motion of the Earth's plates using a Global Positioning System (GPS). With SCIGN, the link between the motions of the plates that make up the Earth's crust and the resulting earthquakes is now being observed by an array of GPS stations operating in southern California and Baja California, one of the world's most seismically active and highly populated areas. On July 2, 2001, the 250th SCIGN station was installed. Using SCIGN data to measure deformation of the Earth's crust, which can occur as movement on a fault or as slow distortion of the ground, scientists can determine how strain builds up slowly over time before being released suddenly during an earthquake. These new GPS measurements contribute to improving the region's earthquake hazards assessments that help motivate people to prepare for earthquakes.

Scientists of the Southern California Earthquake Center (SCEC) designed and manage SCIGN. NASA's Jet Propulsion Laboratory, the Scripps Institution of Oceanography at the University of California at San Diego, and the United States Geological Survey are the principal SCEC partners in SCIGN, and all data from the array are openly available on the Internet.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Warning Systems

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

FEMA

Estimating Earthquake Losses
HAZUS-MH

State-wide,
District of Columbia

Washington, DC - One of the most successful risk assessment tools is HAZUS, or Hazards U.S., a cutting edge software program developed by FEMA with the National Institute of Building Sciences. HAZUS uses an engineering-based approach to estimate physical damage, economic losses, casualties, and other societal impacts from earthquakes.

Although originally conceived as a standardized methodology, HAZUS quickly evolved into an easily transportable software program that could be used by earthquake engineers, universities, private industry, and the public for numerous applications. For example, HAZUS estimates provide decision-makers with evidence of the nature and extent of the earthquake risk in a format useful for garnering public support for public policies and actions to reduce future earthquake damage and losses. State and local governments, the private sector, and communities use HAZUS to estimate physical damage and economic loss to their building stock, critical facilities, and lifelines and utility systems, and to determine how potential losses can be avoided or reduced by preventive actions. HAZUS also estimates debris generated, long- and short-term shelter and alternative housing requirements, and indirect economic losses such as unemployment, losses in tax revenue and production, and reduction in the demand for products and spending. HAZUS also can determine the impact of other hazards that may be triggered by the main event, such as ground failure, fire, and inundation from dam failure.

Today, there are a number of HAZUS user groups across the United States that are supported by FEMA. The user groups provide the disaster management community, industry, government, and the public with the resources and knowledge to effectively use HAZUS. FEMA also supports HAZUS through projects at the community and state level to demonstrate the use of HAZUS in supporting state and local government implementation of the planning requirements of the Disaster Mitigation Act of 2000 and through pilot projects with the Department of Defense to assess the vulnerability of facilities and infrastructure.

Significant enhancements have been made to HAZUS since its release in 1997. FEMA is adding the capability to estimate losses from flood and hurricane wind hazards. This multi-hazard version, which includes revisions to the earthquake loss estimation model, is scheduled for release in 2003.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
HAZUS-MH

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

FEMA

Improving Performance
Steel Moment Frame Connections

State-wide,
District of Columbia

Washington, DC - One of the critical lessons from the 1994 Northridge earthquake was the unacceptable performance of steel moment-resisting frame construction. In response to that performance, FEMA established the FEMA/SAC Steel Moment Resisting Frames Project. When the extent of the problem became known, the earthquake engineering community faced a crisis. The building code for this type of construction had effectively been invalidated, and there was little idea of how safe existing buildings were or how to repair damaged buildings. Since FEMA funds the repair of publicly owned buildings, this was a crisis for FEMA as well as for building owners. It also quickly became clear that this was not just a California problem but also a national problem. FEMA determined that the first need was for guidance on how to repair damaged buildings. With funds from the Congressionally-authorized NEHRP Northridge Research Fund, the work was completed in less than a year and its primary product, the Interim Guidelines for Steel Moment Resisting Frame Construction (FEMA-267), quickly became the de facto standard. To date, FEMA has distributed over 20,000 copies of the Guidelines.

FEMA then began the second phase of the project, an effort to study and develop final design criteria for the design and inspection of new construction and upgrading of existing buildings for use by the nation's model building codes and standards. The final products include technical guidance for new construction (FEMA 350), upgrade guidance for existing buildings (FEMA 351), evaluation and repair guidance for damaged buildings (FEMA 352), and a technical specifications and quality control guidance document (FEMA 353). FEMA also published non-technical guidance for building owners and local officials (FEMA 354) and a CD-ROM with all of the publications and a series of background reports (FEMA 355).

This groundbreaking initiative was the first FEMA, if not federal, effort to effectively combine the academic research world and the earthquake engineering design community on a scale never before attempted. As a result of this effort, the building codes and standards for the entire country have been revised to take into account project findings. The quality of steel moment frame construction has been significantly improved because of the project. Both the model code organizations and the industry standards group are now using the final design guidelines as the basis for the next update of their products. In fact, the American Institute for Steel Construction is now sponsoring training courses across the country using the FEMA publications and has distributed several thousand copies to date.

FEMA has been widely recognized for its role in organizing and leading the solution to a serious problem for the nation's building codes and standards. The steel industry, through the American Institute for Steel Construction, presented an award to the Director of FEMA for its role in resolving this complex problem.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

FEMA

New Era in Earthquake Monitoring
Project TriNet

State-wide,
California

The State of California - Following the Northridge earthquake in 1994, FEMA provided funding to the California Institute of Technology, the California Division of Mines and Geology, and the USGS to upgrade earthquake monitoring in southern California. The result was project TriNet, a cooperative effort to expand and modernize earthquake monitoring in the region and to provide timely and accurate information on earthquake occurrences.

The development of TriNet, which began in 1997, included:

* Installation of 150 broad-band seismometers by 2002

* Installation of 450 strong-motion sensors by 2002

* Development of a data center to manage and process the information

* Development of new products, especially “ShakeMap“

Earthquake shaking is strongly affected by the local geology and soil conditions, and the pattern of the intensity of shaking does not fall in concentric circles about the epicenter. With data from new seismometers available in “real-time,“ TriNet seismologists realized they could produce realistic contour maps showing the severity and distribution of ground shaking within minutes of an earthquake. This product, called “ShakeMap,“ was made available at TriNet web sites and has proven immensely useful to emergency management officials and managers of infrastructure and lifeline systems. Now, whenever an earthquake occurs in southern California, there is a regional map available on the web that shows the shaking pattern.

Project TriNet proved so successful that the USGS used it as the pilot model for the Advanced National Seismic System (ANSS). ANSS is an initiative to expand TriNet capabilities to other urban centers in areas of high to moderate seismic risk. Through ANSS, the USGS and regional partners have begun to develop TriNet-like capabilities in the San Francisco Bay region, the Puget Sound region, Salt Lake City, Reno, Anchorage, and the Memphis and St. Louis areas. In addition to providing ground shaking information for emergency response, the engineering community can apply ANSS data in the design and construction of earthquake resistant buildings and critical facilities.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Warning Systems

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

The Magnitude 9 Earthqauke Solving the Mystery

State-wide, Washington

The State of Washington - Lewis and Clark didn't reach the coast of Washington State until November 1805. So how do we know that a magnitude 9 earthquake occurred in the Seattle area on January 26, 1700? Amazingly, the remains of dead, saltwater-flooded forests along coastal Washington and widespread deposits of sand high in coastal estuaries suggesting tsunami inundation, along with an analysis of records maintained by the Japanese on tsunamis, presented evidence to geologists that great subduction-zone earthquakes (magnitude 8 to 9) had repeatedly struck the Pacific Northwest in the past thousand years, the most recent earthquake occurring in 1700.

Hard detective work by USGS scientists on the Cascadia subduction zone and other previously unstudied crustal faults has helped residents of western Oregon and Washington understand that they live in earthquake country. Particularly in Oregon, where few earthquakes are felt, USGS research helped convince public officials to significantly revise the building codes.

Throughout the heavily urbanized Portland metropolitan region, new buildings are now designed to resist earthquake forces 50 percent larger than they were under the old code, reducing the risk to life and property in future earthquakes.

The impact of earthquake awareness can been seen in Seattle in the effects of the Nisqually earthquake. Although the ground motions were not strong enough to test new design criteria and seismic retrofits, the growing earthquake awareness helped significantly reduce non-structural losses.

For example, at The Little Church on The Prairie Learning Center, this awareness played an important part in keeping people safe. Some months before the earthquake, volunteers worked with FEMA hazard mitigation officials to make sure the daycare center would be safe from shaking effects of an earthquake.

Mitigation measures included bolting cribs to the walls and strapping water heaters, television sets, and computers in place. When the Nisqually earthquake struck, the children and staff at the Center were protected from falling objects.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Training

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

The Trans-Alaska Oil Pipeline Survival

State-wide, Alaska

The State of Alaska - Each day, the Trans-Alaska oil pipeline carries one million barrels of oil, about 17% of the domestic oil supply for the United States, valued at about $25 million. If the pipeline had ruptured during the recent Denali earthquake, the lost revenue and cost of repair and environmental cleanup would have been incalculable.

When the pipeline was proposed in 1968 to transport oil from producing fields near Prudhoe Bay on the Arctic Ocean to the ice-free port of Valdez, USGS geologists realized that earthquakes on faults along the pipeline route presented a potential threat. In the 1970's, seismologists and geologists commissioned by the Alyeska Pipeline Service Company, in concert with the USGS, studied the likely effects of a magnitude 8.0 earthquake, judged to be the maximum credible earthquake for the Denali fault. The resulting technical requirements for the pipeline stipulated it must be designed to withstand intense shaking levels and up to twenty feet of offset, which proved to be right on target for the magnitude 7.9 earthquake that occurred on November 3, 2002.

Shaking during the magnitude November 3 earthquake was violent and damaged a few of the elevated supports south of the fault zone. However, the pipeline design successfully accommodated the damage and remained adequately suspended between undamaged uprights without rupturing. The Alaska oil pipeline had survived intact, with only nominal damage. “Although considered to be excessively conservative at the time, the USGS design guidance proved to be on target, and the resilience of the pipeline to Sunday's fault rupture is a testament to the importance of science in hazard mitigation and decision-making“ says USGS Director, Charles Groat.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Private funds

FEMA

Model Building Codes Impact

State-wide,
District of Columbia

Washington, DC - The nation's model building codes have a greater impact on the quality of construction and how structures will withstand the forces of nature than any other FEMA program. The philosophy of ensuring the quality of construction at the local level before a disaster by making the nation's model building codes adequate for all hazards has made the work of FEMA much easier, both before and after a disaster.

FEMA's experience with the model code organizations began in the early 1980's. The most significant example of FEMA's work with the building codes occurred when the International Code Council, which was formed from the three original model code organizations, attempted to develop a single International Building Code. It quickly became apparent that the existence of two sources of seismic code provisions was a serious issue that threatened to derail the entire effort.

FEMA was one of the first outside organizations to meet with the original International Code Council in 1995 to help resolve this issue. FEMA met with the relevant parties, developed a plan that would respond to most of the concerns that had been raised, and contracted and managed the Code Resource Development Committee Project. The Committee ultimately developed the provisions that were successfully balloted into the International Building Code (IBC).

This was probably one of the most critical issues facing the IBC process, and its resolution significantly improved the quality and applicability of the new IBC. FEMA's work was acknowledged in separate letters from the International Code Council and the International Conference of Building Officials.

Shortly after that process was underway, the National Fire Protection Association (NFPA) decided to offer their own building code to compliment their wide variety of fire and life safety standards. FEMA worked with the various committees, and FEMA's representative was given a seat on the Technical Correlating Committee, which oversees and resolves conflicts from the other developmental committees. With FEMA's involvement, the NFPA 5000 Building Code adopted the latest version of the ASCE-7 Minimum Design Loads Standards by reference and was published recently.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

Getting the Alarm Out: USM's Tornado Warning System

Forrest County, Mississippi

Hattiesburg, MS - Prior to 1998, students at the University of Southern Mississippi (USM) were largely dependent upon “word of mouth” information when tornadoes threatened the campus. According to Bob Hopkins, USM Chief of Security, the university recognized the need for a campus-wide tornado warning system when several alerts failed to reach a considerable portion of the 16,000 students enrolled.

“The critical need is for people outside to go inside,” Mr. Hopkins said. “There is an emergency plan in effect in each building with designated safety areas.” The University Police dispatch office manages the system.

University Officials say the system operates similarly to a radio or wireless system. “If a tornado warning is issued for our area, the University Police dispatcher calls the Emergency Management District to confirm the tornado is a threat to our campus. At that point, we set the alarm off,” Mr. Hopkins explained.

The most noticeable feature of the new system is its prominent position on top of Owings-McQuagge Hall. The radio-controlled warning system has two components: 1) an alarm characterized by Westminster Chimes, and 2) a voice system which announces, “A tornado warning has been issued for the Hattiesburg area. Please seek shelter.”

The Federal Emergency Management Agency contributed $21,902 of the $29,202 cost to install the warning system through its Hazard Mitigation Grant Program (HMGP), which is administered by the Mississippi Emergency Management Agency. Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events.

“Students are acquainted with the system during risk management orientation. Each residence hall gets a copy of the Emergency Response Manual,” Mr. Hopkins noted. He is pleased with the system’s effectiveness.

During Hurricane Katrina (2005), approximately 1,800 students remained sheltered on USM’s campus.

Quick Facts

Sector:
Public

Cost:
$29,202.00 (Estimated)

Primary Activity/Project:
Warning Systems

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Pump Station Workers Seek Refuge in Hurricane-Resistant Rooms

Palm Beach County, Florida

Palm Beach County, FL – When Hurricane Wilma hit Florida in October 2005, mitigation measures and emergency planning were put to the test at two water control pumping stations located at the edge of the Everglades. Workers inside the stations were safe and the pumps remained in operation during the storm.

Operators at two South Florida Water Management District (SFWMD) stations followed their emergency plan and did not panic. Personnel, who must remain at the stations before, during, and after any hurricane event to ensure continuous operation, retreated to fortified hurricane-resistant rooms during Wilma. When the storm passed, workers returned to their priority assignment – making sure that the pumps were running smoothly to keep residents' homes dry.

"Because of South Florida's flat terrain, it is critical to keep [our] 25 major pump stations running during a hurricane event, moving flood waters through miles of canals away from urban and agricultural areas," explained Olivia McLean, Director of Emergency Management at SFWMD. "If these pump stations were not working during a hurricane or excessive rain event, many areas in South Florida could quickly be under water."

After Hurricane Andrew (1992), SFWMD revised and expanded its emergency management operations to address the safety of its workers, while ensuring the continuous operation of the pumping stations. SFWMD embarked on a program to harden all of its facilities against high wind events. Over several years, roofs were upgraded, and hurricane shutters and heavy steel doors were installed. Worker safety inside the buildings was also addressed.

In the spring of 2000, SFWMD engineers designed and constructed hurricane-resistant rooms inside 11 of the District's pumping stations. The rooms were constructed with reinforced concrete to resist a Category 5 hurricane. At four other stations, existing rooms, such as kitchens or bathrooms, were retrofitted to meet the same high standard of fortification. Grants totaling $105,000 from FEMA's Hazard Mitigation Grant Program (HMGP) funded much of the total cost of $117,000 to harden the15 rooms. Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events. The balance was paid for by SFWMD.

"We were in the control room when the bay door started to go out, but we stayed calm," said station G-335 Chief Operator Luis Bianchi, recalling his response when Wilma hit. "We just gave a quick check of the gauges and headed to the [fortified] kitchen." Gary Fisher, Chief Operator at pump station S-5A, noted that "having that [fortified room] takes the fear out of the picture when you're out here in a storm. If you need it, it's there."

Director McLean described the pump station operators as being on the front lines. "We think of them as heroes," she said. "Storm or not, they have to be there. Having the fortified rooms allows us to have those men where we need them most. But most of all, it allows us to have them safe."

Quick Facts

Year:
1998

Sector:
Public

Cost:
$117,856.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Elevated Home Serves as Neighborhood Shelter during Katrina

Jackson County, Mississippi

Moss Point, MS - The Stork family's home is the only elevated building in their community. Although the house was built to mitigate flooding, the family decided to evacuate to avoid being in the path of Hurricane Katrina's reported 90- mile-per-hour winds as it approached the Gulf Coast on August 29, 2005.

In the family's absence, the Storks' house became a refuge for 37 neighbors and their pets trapped by a 15-foot storm surge. Concerned about the powerful winds associated with the storm, Joseph Stork, and his family chose to wait out the storm in the family's church, which sits on a slab-on-grade foundation.

The Storks' small middle-class community borders a canal that flows into a bayou. Before they evacuated, the couple offered their elevated home to a few neighbors as a shelter in case of flooding. Built in 1998, the 1,100-square-foot house is elevated 13.1 feet above sea level and sits on eight-foot-tall wood pilings that are 12-inches by 12-inches square. The 26 pilings are six feet apart and embedded six feet into the ground. The home's double 2-by-10-inch floor joists are securely anchored to the piles.

As Katrina's surge sent waist-deep waters rushing into the church, the family knew they needed to get to higher ground immediately. They decided to return to their elevated home. A family friend who owned a boat transported the family back to their house. When the Storks returned, they found their modest house crammed with residents of the community. Sadly aware that nearly all of the homes in their community were under water, the Storks were relieved that everyone in the area survived Katrina, and were pleased that their elevated home played a major role in that survival. "There were 37 people, three Great Danes, a pit bull, a bull mastiff, two Chihuahuas, a dachshund, two cats and two tropical birds here," Joseph Stork said.

When the Storks began rebuilding their home in 1997 after a fire destroyed the original house, they discovered they had to elevate the house in accordance with the City's recent adoption of building codes compliant with the National Flood Insurance Program. "The house is elevated four feet above the required nine-foot Base Flood Elevation. Having done so certainly paid off for them," noted the City's floodplain administer, Thomas Franklin.

Katrina's rushing waters soaked the insulation beneath the house and caused some damage to the building and staircase. However, the Storks feel the overall damage incurred is minor compared to what their neighbors suffered. "The house held up good," Joseph noted.

The Storks are considering other mitigation strategies that they can apply to their home to help strengthen it against future storms. Elevating the air conditioning unit is important because Katrina's waters ruined the one that was located on the lowest floor. "We have applied for a Small Business Administration loan to help pay for repairs; maybe we'll have enough money to purchase storm shutters," Jane Stork said.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Elevated House Attracts Local Attention

Harrison County, Mississippi

Biloxi, MS – Passers-by often ask Harry and Clarice Shoemake about their elevated house. The couple noticed the new interest in their property after Hurricane Katrina struck on August 29, 2005, destroying large portions of many Gulf Coast communities. The couple's elevated home remained standing during the storm.

When the Shoemakes bought their home in a former fishing camp community, they knew it had been empty for a year and had been plagued more than once by six feet of floodwater. It was the only house built on a slab-on-grade foundation in the neighborhood. All other homes in the community were elevated. "Nobody would buy [the house] because it was on the ground," Harry Shoemake explained.

The Shoemakes' backyard is adjacent to the Tchoutacabouffa River. The river flows into Biloxi Bay, a large inlet of the Gulf of Mexico less than five miles away. The couple decided to elevate and retrofit their home to reduce the risk of damages from flooding and high winds. The elevation, completed in 2004, was funded with a $98,000 grant from FEMA's Hazard Mitigation Grant Program (HMGP), administered by the Mississippi Emergency Management Agency. The Shoemakes supplemented the grant with personal funds and made additional enhancements, such as a wider staircase.

The couple's 2,100 square-foot home is elevated 11 feet 11 inches above the original slab-on-grade foundation and sits on an open concrete column system with embedded anchor plates for added structural support. The open space beneath the house is utilized for parking. Harry Shoemake noted that the elevation includes an additional three feet (freeboard) that is higher than Harrison County's minimum code requirement. "I wanted to be on the safe side, elevate higher, and never have to worry about it again," Harry Shoemake explained.

Another mitigation measure implemented by the Shoemakes was to replace the original shingle roof with a metal roof. They also installed windows with wind-resistant glass rated to withstand gusts of up to 175 mile per hour.

Katrina's 17-foot storm surge brought water into the house after forcing open the French doors in the rear of the structure. Although there was no substantial standing water within the house and no structural damage, salt water from the surge did cause some damage to the drywall and floors. Although the house escaped serious flooding, the powerful winds, in excess of 112 miles per hour, caused some minor damage to the metal roof. "The wind and the storm surge caused the flooding, not the rain," explained Harry Shoemake.

Even though their community did not have power for eight days, the Shoemakes proceeded with the clean-up and repair process. They returned to living in their home in less than four weeks after the storm. "Compared to many people in the city, we came out good after the storm," noted Harry Shoemake.

Quick Facts

Sector:
Private

Cost:
$98,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

View From the Top:
An Elevation Success Story

Harrison County, Mississippi

Biloxi, MS - A Biloxi couple has shown that home elevation not only prevents property loss, but can be pleasing to the eye as well. “We wanted a finished look,” said Judy Steckler of her family’s home. “We wanted our home to look like a home and we worked really hard to make it aesthetically pleasing.”

Judy and her husband Judge Sandy Steckler decided to elevate their house after five feet of water flooded its first floor during Hurricane Georges in 1998. “Georges was the third time that we had water in the house,” Judy Steckler recalled. “The first time we had about 18 inches. The next time water rose about three and a half feet over the counter tops in the kitchen, and then with Georges it came up five and a half feet to the upper kitchen cabinets.”

As they considered rebuilding, the Stecklers were advised by Harrison County officials that they would have to elevate their home in order to qualify for flood insurance. Then they were notified by the Mississippi Emergency Management Agency (MEMA) that they qualified for FEMA’s Hazard Mitigation Grant Program (HMGP). Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events. The Stecklers received $50,000 in HMGP funds and paid the balance of the cost to elevate their home themselves.

Instead of the typical staircase in front and back of the house that usually accompanies an elevation project, the Stecklers decided to use personal funds to build a large wooden porch along the entire backside of the house that faces the river. “We were accustomed to having the outside and living areas inside as one component and we utilized it so much that having stairs in the front and rear would not have worked for us,” she explained. “We chose to spend our own money to supplement grant funds on the porch to make the house [meet our needs]." Builders also added stone work under the house to match the stone on the first floor of the dwelling to give it a more finished and uniform look.

The Stecklers’ elevated house received three feet of water during Hurricane Katrina (2005), but the couple was grateful that they did not get the 11 and a half feet they would have if they had not elevated their property. “We were confident about staying here during Katrina because this is a pole house,” said Judge Steckler. “The poles go all the way from the roof through the house and are tied into steel beams. Our home has a level of strength that rises from the slab all the way to the metal roof.”

The Stecklers were able to clean and dry out the first floor of their home within a couple of days by using a sump pump. Flood-resistant mitigation renovations made in 2002 made the post-storm cleanup easier, such as the installation of hard-surfaced flooring, solid wood doors, and walls made out of a water-resistant material that will not mildew.

In addition to saving their home and reducing damages, the couple discovered another reason to love their elevated home. “We see sunsets better up here,” Sandy proclaimed.

Quick Facts

Year:
1998

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Waterfront High-Rise Survives Katrina

Harrison County, Mississippi

Gulfport, MS - Legacy Towers stands approximately 150 feet tall on the beach facing the Gulf of Mexico. These new luxury condominiums withstood the powerful 30-foot storm surge and winds of more than 140 miles per hour when Hurricane Katrina struck on August 29, 2005.

Penetration of the structure, typically due to compromise of windows and doors, is a major concern during hurricanes, because it can lead to content damage, roof separation, and structural failure. The survival of the condos was primarily attributed to the structure's break-away walls, windows, and doors designed to wash away during high wind and water events. These ground-level-only measures are intended to protect the building from structural loads associated with fast-moving water and water-borne debris. Break-away walls on the first floor allow water and wind to flow freely through the structure and prevent damage to the higher floors.

Property manager Taco Sanchez is proud that the building withstood the storm. "It did what it was supposed to do. The ground level walls blew out and the rest of the building held. The building is a testament to good construction," Mr. Sanchez said. The 14-story building was one of only a few inhabitable buildings standing along the Mississippi Gulf Coast after the storm.

Concrete walls separating each unit and built perpendicular to the wave crest were another vital structural element. The reinforced steel walls were "tied" to concrete-augured pilings embedded 85 feet into the ground. Because the walls carried the load and were continuous from the ground to the top floor, there is nearly as much concrete under the ground as above.

The hardest hit areas were the first and second floors and the southeast corner of the building that was directly in the path of the wind. The first floor received 10 feet of water, which led to mold and mildew. The damaged materials were removed and the walls dried out before renovation began.

Additional damage included the loss of the back-up generator, destroyed by water and debris that also cracked several windows. The roof suffered minor damage but the roof membrane remained intact. Mr. Sanchez suggested that one technique that should be incorporated into the rebuilding is to construct a concrete wall around the generator to protect it from wave action. "If the generator had not failed because of water damage, the Legacy would have remained operational," Mr. Sanchez explained. The towers were without power until they received a backup generator 10 days after the storm.

Legacy Towers' survival has played a key role in the rebuilding process on the Gulf Coast. The Legacy was one of only a few places able to offer housing to construction and emergency workers immediately after Katrina. "You have to build it right," said Casey McGinnis, site superintendent, crediting the survival of Legacy Towers to its excellent design and construction. "Although we had flood insurance, the solution is construction, construction, construction," Mr. Sanchez added.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Business Owner

Elevating a Brick Home: A Mitigation Success Story

Harrison County, Mississippi

Saucier, MS – Retired electrician Schuyler “Skipper” Palmer and his wife, Ivy, used to expect flooding and damage to their home whenever the rainy season began. To mitigate flooding, the Palmers decided to elevate their brick home.

In 1972, the Palmers moved into a house nestled among towering pines in a picturesque and spacious corner of Harrison County on property that had long been in the family. The Palmers’ property is 48 feet above sea level. There is a pond and the backyard borders on Tuxachanie Creek. As development increased in the county, the couple witnessed major rains flooding their community. “Our floods come from rain waters; when it rains above us at Perkinston and Wiggins, it comes down this little creek [in the backyard] and it rises,” Ivy explained.

The Palmers’ house was plagued with floods between 1987 and 1998. Hurricane Georges (1998) flooded their house with 53 inches of water. “Georges was our worst storm. There were three families across the creek who sold out (after the storm), but we weren’t going anywhere,” said Skipper.

Flooding left the couple sifting through sludge to salvage some of their possessions and forced them to evacuate their home for extended periods of time. They have flood insurance, so it was possible for the Palmers to return to their home after each flood and start again. “You can come out pretty good [with flood insurance], but you can’t replace everything,” Skipper explained. “You just get tired of losing everything. You don’t even want to go and pick out furniture,” Ivy added.

After several flood losses, the Palmers were eager to have their home elevated. They received $92,000 from FEMA’s Hazard Mitigation Grant Program (HMGP), administered by the Mississippi Emergency Management Agency (MEMA). Following a major disaster declaration, the HMGP funds up to 75 percent of the eligible costs of a project that will reduce or eliminate damages from future natural hazard events. Because the cumulative cost of damages they incurred from repetitive flooding exceeded $100,000, the Palmers knew they would quickly reap savings by having their home elevated. The project was completed in April 2004.

The first floor of the Palmers’ home is now elevated 10 feet above the original slab-on-grade foundation and sits on an open concrete column system with embedded anchor plates for added structural support. The couple uses the open space below the house for added storage, a parking area, and building access. The couple's house has not suffered any flood damages since the elevation, not even when Hurricane Katrina’s massive storm surges hit the Gulf coast in August 2005. However, the storm’s winds in excess of 119 miles per hour toppled trees, causing damage to the roof and small outbuildings on the property.

Quick Facts

Sector:
Private

Cost:
$92,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

House Built to Code Survives Katrina

Hancock County, Mississippi

Bay St. Louis, MS – John and Allison Anderson moved back into their home 50 days after Hurricane Katrina struck their community on August 29, 2005, with a 29-foot storm surge and reported winds of 130 miles per hour (mph). Their house was standing and soon inhabitable, unlike many others in the community, because the couple had followed building practices and mitigation techniques advocated by the Federal Emergency Management Agency.

When they decided to build their new home on the Mississippi Gulf Coast, the Andersons wanted to build a house that was safe and storm-resistant. They built to the 2003 International Residential Code. Bay St. Louis and Hancock County have since adopted this code. “My house is a testament to the building code,” asserted Mr. Anderson. The Andersons describe the code as tying all structural elements to the earth in a continuous path. Mr. Anderson credits the survival of his house primarily to the 2-by-6-inch exterior wall framing. He also used 2-by-4-inch horizontal timbers, or purlins, to attach the corrugated metal decking to the roof.

The two-story, 3,125 square-foot contemporary home has fiber cement siding, and was built to withstand minimum wind gusts of 130 mph. A grass roof above the carport added weight to the structure, which was another mitigation technique.

The Andersons evacuated as Hurricane Katrina approached the coast. They waited out the storm at a relative’s house in Hattiesburg, Mississippi, where they sat in disbelief as they learned about the destruction that had taken place in their hometown.

The Andersons returned as soon as it was safe to enter their neighborhood. They discovered that seven feet of water had entered their house, but it was still standing. Although mud covered the first floor, they were glad to find everything intact in the upstairs rooms. Four windows were destroyed on the first floor. Other windows survived the high winds and debris impact because Mr. Anderson had boarded them up with exterior half-inch oriented strand boards before evacuating. Kitchen appliances and walls below the water line were damaged, and there was minor damage to the roof, but there was no other structural damage.

The Andersons immediately began cleaning and repairing their house, but could not live in their home for 50 days because there was no electricity, water, or telephone service. Mr. Anderson’s decision to use polished concrete for flooring on the first level proved to be a wise idea, because clean up and repairs were easier and cheaper than if it had been necessary to remove and reinstall carpet. Mr. Anderson noted that the cost of building the new house was $115 per square foot, while repairs to the damaged first floor cost only $55 per square foot.

“It’s really hard on everyone especially the older [people] in the neighborhood who lost their homes,” Mrs. Anderson said. The couple stressed that with proper mitigation techniques, homes in hazard-prone areas can survive.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Mitigation Helps Senior Center Survive Katrina

Hancock County, Mississippi

Bay St. Louis, MS – Storms shutters and other mitigation measures helped the Hancock County Senior Center survive Hurricane Katrina (2005) and serve as a safe haven for the members of the community for 88 days after the storm.

The Center, located only two blocks from the Gulf of Mexico, was retrofitted with storm shutters in 1999 after an assessment determined that high winds could blow out its glass windows and doors. The project was partially funded by FEMA's Hazard Mitigation Grant Program (HMGP). The grant was administered by the Mississippi Emergency Management Agency.

"The reason we got the shutters is because, besides being a senior center, we are a special needs shelter and we would open up whenever there was a storm," said Arlene Johnson, Director of the Center. "We would take 25 patients and 25 care givers. We normally have nurses and supplies from the hospital that would come and set us up to ride out a storm."

The Center was ordered to evacuate on August 29, 2005, as Hurricane Katrina approached. "The shelter coordinator came and told us that the buoys were indicating that the storm was going to be worse than everyone had first thought. I told him that we would evacuate everyone else but I wasn't leaving," Ms. Johnson said. Center staff then worked to ensure that senior citizens who use the center had somewhere safe to go. Ms. Johnson then told the staff to evacuate while she and 12 members of her family took shelter in the building.

"I really felt like the building would be safe for us. The building is new and constructed with all of the hurricane straps it was supposed to have. It was built on the highest point of ground in Bay St. Louis, and it has hurricane shutters and a generator," Ms. Johnson explained. After making preparations and ensuring that hurricane shutters covered all the windows and doors, Ms. Johnson and her family huddled inside the building as Hurricane Katrina hit the area with 135 mile per hour winds. "We cranked the shutters up a little bit to see out and saw things like shingles and insulation and boards from buildings flying by," Ms. Johnson recalled.

Ms. Johnson later discovered that the Center's storm shutters were dented by flying debris, but had passed the test by protecting glass windows and doors of the nine-year-old building. The Center's roof also sustained some damage but remained intact thanks to hurricane straps that secured it to the outer walls. Windows and doors were not breached by wind or flying debris, and consequently there was no uplift on the roof. Nearby houses and apartments were flooded by the 30-foot storm surge that devastated the city, but less than an inch of water came under the doors of the Center.

Ms. Johnson decided to open the Center as a shelter to hurricane victims. "There was no place else for them to go, and this was one of the only places still standing and not under water. We welcomed everyone that came." The Center eventually housed more than 200 people and operated as a shelter for 88 days.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Two Brothers: Home Elevation Protects House

Vermilion Parish, Louisiana

Henry, LA – Five years ago, when Craig Lee began planning the construction of his Vermilion Parish home, he learned he would be required to elevate his new house more than eight feet above grade in order to receive a building permit. He did not understand the parish's requirement to elevate, because his brother's house was on-grade, on the same piece of land, and in 25 years had never flooded. "Why so high?" Craig wondered.

In September 2005, Hurricane Rita provided the unfortunate answer to Craig's question. The vicious storm hit the Lee brothers' property with floodwaters 13 feet above sea level. Craig's elevated home stayed dry. The on-grade home of his brother, Keith Lee, was destroyed. Regarding the Base Flood Elevation requirement, Craig admitted "When they told me I had to go this high, I tried to get around it. Now I'm really glad that I couldn't. [The elevation requirement] saved my house from flooding."

Craig is a carpenter by trade. His wife, Angela, is an administrator at a technical college. They made their home in Henry, Louisiana, because they both grew up in the area and love its peaceful beauty. "It's like a vacation home," said Angela, "except we get to live here year-round…We're really happy here."

Craig elevated his house on reinforced concrete block columns. He anchored the columns two feet below grade, surrounded them with a chain wall, and poured a concrete slab overtop. He reinforced everything with rebar, beginning beneath the slab, continuing up through the columns and wrapping the floor joists. It cost $13,000 to elevate the house.

Although his house did not flood, Craig's property suffered some damage during the hurricane. The vinyl and insulation beneath his house were damaged by the harsh wind and wave action. He has since replaced them. The on-grade barn and storage shed were swept away by the storm surge, and he lost eight head of cattle.

"All in all, we were fortunate," said Angela, "….so many of our neighbors lost everything." "Just about every house around here flooded," Craig added. "A lot of people lost cattle—I know a man who lost over 100 head."

Keith Lee's house was built 25 years ago, prior to the enactment of the current Base Flood Elevation standard. It was flooded with five to six feet of water during Rita. He considers it a total loss, and his family is relocating to the Lafayette area. "We managed to get most of our clothes and some valuables up into the attic before we evacuated, but just about everything else is gone," said Keith, standing in front of the wreckage that used to be his home.

Southwestern Louisiana suffered immense damage during Hurricane Rita. The homes of Craig's father and nephew were also destroyed. Angela's father, brother, and grandmother lost their homes. All of these houses were located within five miles of Craig and Angela's property. The couple encourages everyone in hurricane-prone areas to build as high and strong as possible to protect themselves from future storms.

Quick Facts

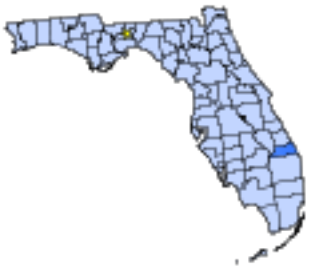
Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Mitigation Helps Jensen Beach Restaurant Weather Another Storm Season



Martin County, Florida

Jensen Beach, FL – In October 2005, Hurricane Wilma's high winds tore through the east end of Jensen Beach, Florida, a quiet coastal town in Martin County. The winds ripped off part of a marina roof, collapsed buildings, and demolished a gas station. One building in the town's historic area was completely destroyed. Then the storm hit the 115-year-old building that housed Jan's Place Restaurant.

"It got very cold and very still," said restaurant co-owner Bob Trudel. "Then all of a sudden the wind came with a roar and ripped the top corner of the building off along with most of the rear portion of the roof." The damage could have been much worse, noted Mr. Trudel, who has operated Jan's Place for the past 14 years with his wife. "All the windows on the second floor were retrofitted in 2003 with hurricane-resistant windows that proved effective in minimizing damage," Mr. Trudel explained.

He and building owner Rodney Fletcher also credit those 29 impact-resistant windows with minimizing building damage in 2004, when Hurricanes Frances and Jeanne caused severe damage to the surrounding buildings and caused power outages that lasted for two weeks. Buildings in the area sustained roof damage, blown-out windows, and extensive damage from wind-driven rain.

"Although we had minor roof damage [during the 2004 storms], the windows kept the wind and rain out and helped keep the roof on, allowing us to open for business just a day or two after each storm," Mr. Trudel recalled. "We were very busy serving lunch to those who were there cleaning up their damaged buildings." The couple could not re-open their restaurant as quickly after Wilma, Mr. Trudel reflected, "but we would have had a lot more building damage without the hurricane windows."

2005 was the second year in a row that mitigation efforts benefited the Trudels and their business. After Wilma, the Trudels and Fletcher sought to rebuild with mitigation in mind.

All remaining windows will be fitted with a hurricane-resistant design. The building's rear wall will be reinforced with five vertical beams running from the foundation to the top plate at the roof, and all the second-floor walls will be reinforced by sheathing them with industrial plywood.

"Making the investment now will save us more [money] down the road when other storms come – and they will come," Mr. Fletcher said. "By strengthening the building I can be assured of the best chance of survival of the building, the restaurant, and other tenants."

Mr. Fletcher also noted that by mitigating against hurricane damage while rebuilding, he is also doing his part to help preserve the historic area in which Jan's Place is located, and the sense of community that it helps foster.

Quick Facts

Sector:
Private

Cost:
$30,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Private funds

Devastation to Sustainability: Flooded Property Returned to Open Space

Multiple Counties, Nevada

Lockwood, NV – Life on the Truckee River can be dangerous during winter rainstorms. Warm currents from the South Pacific Ocean bring rain on top of the winter snow, which can cause severe flooding.

This weather pattern is known as the “Pineapple Express.” It caused the river to overflow its banks into the Truckee River Mobile Home Park in Lockwood on December 31, 1996. The same weather pattern occurred on December 31, 2005, but this time the Washoe County government, residents of the mobile home park, and several neighboring properties were prepared. The community had participated in a $3.6 million project that successfully mitigated the repetitive damage caused by the river’s flooding.

The Washoe County Public Works Department was aware of the flooding problems in Lockwood. The area had flooded five times in 15 years. The mobile homes in the park and 12 nearby single family homes were substantially damaged.

Washoe County applied to the State of Nevada Department of Emergency Management for funding under FEMA's Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) program to buy out the properties located in the floodway.

David T. Price of the Washoe County Department of Public Works was the engineer in charge of the project. He recalled how devastated the area was. “We worked very hard on that project - it was a mess,” he said. Mr. Price was proud of the cooperative effort between the Washoe County Department of Public Works and the Nevada Department of Transportation (NDOT). NDOT contributed 44 mobile homes to the project. The homes had been part of a purchase of land in Carson City for a new freeway. “I enjoyed working with [FEMA] and it was a pleasure to see the joy of the people we helped relocate,” Mr. Price reminisced.

In 1996, a “Pineapple Express” weather pattern increased the river flow to just over 18,000 cubic feet per second in downtown Reno, and there was nothing anyone could do but wait helplessly as properties were damaged. When the sanitation system at the mobile home park failed, the park’s operation permit was placed under suspension by the Washoe County District Health Department. The residents of the mobile home park and the 12 neighboring houses were homeless and had lost all their possessions.

By the end of the acquisition project, all of the families devastated by the Truckee River’s floodwaters were living in new locations. Families in the mobile home park received relocation cost assistance, which enabled them to move to another park of their choice. Some residents purchased mobile homes from NDOT. On New Year’s Eve 2005, the homeowners in Lockwood were safe in their new homes.

The Washoe County Parks Department and the State of Nevada Wildlife Conservancy are working on an open space project addressing flood control, wildlife, and community use. The land is now open space and wetlands that drain water during high water events, and is deed-restricted to that use in perpetuity under the federal grants.

Quick Facts

Year:
1997

Sector:
Public

Cost:
$3,600,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The C-4 Project: Moving Water to Prevent Flooding

Miami-Dade County, Florida

Miami-Dade County, FL - Hurricane Irene (1999) slammed into Miami-Dade County, causing heavy flooding, even in areas that had not been prone to inundation in the past. This was repeated a year later by Tropical Storm Leslie. Local emergency management officials decided that mitigation was necessary to minimize or eliminate the threat of repeated lowland and street flooding.

The Miami-Dade Flood Control Project, or C-4 Basin Project, was created to address the county's extensive flooding problem. The project built on the existing canal system, and its goal was to relocate excess water from one area to another so it could be absorbed into the groundwater or held in reserve. To handle the distribution of water, the entire region is crisscrossed by a 620-mile series of canals and waterways.

Work began on the C-4 Project in 2000. At the heart of the C-4 basin is the Tamiami Canal, which begins in the Everglades National Park and traverses the Miccosukee Indian reservation, the critical Pensuco Wetlands, and several municipalities before flowing into the environmentally-sensitive Biscayne Bay. The driving force of the C-4 Project is the forward pump station at the mouth of the canal, which is designed to push water flow downstream against the tide. A second station, at the mouth of the Miami River Canal in the C-6 basin, was built to offset the flow from the C-4 canal and prevent flooding upriver. There are three pumps in each station that can process approximately 4,500 gallons of water per second. One pump operating at that speed could fill an average swimming pool in three seconds.

For occasions when the canals cannot handle the water volume necessary to prevent flooding, an emergency detention basin, comprised of two reservoirs, was created to receive and store the excess water. In addition, a separate supply canal was built to divert excess water from the C-4 canal to and from the detention basin.

During the C-4 project, the bottom and sides of the Tamiami Canal were smoothed and reshaped, allowing the water to move through at a higher volume and speed.

The cost of the project totaled $70 million. The State of Florida was awarded $52.5 million from FEMA's Hazard Mitigation Grant Program. The Quality Neighborhood Improvement Program, along with the South Florida Water Management District and Miami-Dade County, contributed funds to for the remaining 25 percent.

The C-4 project has reduced serious flooding, leading to fewer insurance claims, reduced repair costs, fewer wages lost to time away from work, and increased public safety.

Frank Reddish, Emergency Management Coordinator for the County, summarized the impact of the flood mitigation project: "The success of a project is realized when you use it, and it works. The first time we turned on the pumps was due to heavy rainfall in the C-4 basin in December of 2001, and it didn't flood...When Hurricane Katrina [struck in August 2005], we had tremendous rainfall, and again we had no flooding."

Quick Facts

Sector:
Public

Cost:
$70,000,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Cloverport Slope Stabilization: A Flood Mitigation Project

Breckinridge County, Kentucky

Cloverport, KY – Cloverport is a small town on the banks of the Ohio River. For the residents of the Creekview Apartment Complex, the benefits of hazard mitigation are evident every time it rains. Clover Creek, a branch of the Ohio River, flows behind the property. Saturation from flooding in March 1997 created severe stream bank erosion that threatened the lives and homes of the 48 elderly and disabled Creekview residents.

Creekview is a Housing and Urban Development-subsidized and privately-owned property. Its small reserve account was intended for small repairs around the complex, not a major construction or flood control project. The City of Cloverport faced its own financial problems because it was economically devastated by flooding, and was therefore not able to provide funding to Creekview for a substantial hazard mitigation project.

Fortunately, stabilization of the slope behind the Creekview Apartment Complex was an eligible activity under FEMA's Hazard Mitigation Grant Program (HMGP). However, HMGP funds would only cover 75 percent of project costs. Creekview, as the local entity applying for HMGP funds, had to find funding for the remaining amount. The City was able to use a Community Development Block Grant made available through the Kentucky Department of Local Government.

The Creekview mitigation project was comprised of two phases. Phase I involved the testing and inspection of the slope in order to determine how to best proceed with Phase II. Phase I also included driving massive interlocking pilings into the side of the bank to ensure its stabilization. The second phase of the project included the construction of a 220-foot sheet pile wall in order to stabilize the slope, and re-grading the earth below the wall in order to create a flatter and more stable stream bank. Seventy-foot-long tiebacks were driven into the bank wall for more stability, and 600 tons of riprap was added to the channel lining between the new wall and the creek.

In 1998, Phase I of the Slope Stabilization Project began, much to the delight of Creekview residents. Four years after Phase I began, the project was completed and the danger to Creekview and its residents was successfully mitigated.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$737,372.74 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Hopkinsville Acquisitions: Protecting Residents from Floods

Christian County, Kentucky

Hopkinsville, KY – Nestled at the base of the Pennyrile Region in southwestern Kentucky, Hopkinsville community officials and residents know first-hand the importance of flood mitigation. Flooding from the Little River has caused 18 major flood events in Christian County in the last 100 years. In March 1997, after major flooding caused over $75 million in damages and devastated 450 homes, officials in “Hop-Town” (as locals refer to their community) knew it was time to pursue ways to lessen the impact flooding was repeatedly having on their town.

Successful and effective mitigation begins at the local level. It requires the desire of local officials to implement mitigation measures for their communities in order to minimize damage from future hazard events.

Beginning in September 1997, the Town participated in a FEMA Hazard Mitigation Grant Program (HMGP) project to acquire properties in the Cherokee Park subdivision, a residential development located near the Little River and at great risk of repetitive flooding. The project acquired 38 properties at a cost of approximately $1.11 million. Subsequent flood mitigation projects continued to concentrate efforts on Cherokee Park.

As of spring 2006, Hopkinsville has been awarded two additional HMGP grants and three Flood Mitigation Assistance (FMA) program grants through the Commonwealth of Kentucky. Additionally, the Town has used money from a Housing and Urban Development grant to acquire and demolish two flood-prone homes, as well as $30,000 from its own budget to acquire a home in Cherokee Park. So far, Hopkinsville has acquired and demolished 66 homes in the subdivision. The Town’s ambitious plans to mitigate flooding do not stop with these home acquisitions.

As these flood-prone homes have been demolished and the property returned to green space in perpetuity, Hopkinsville has been turning the land into a recreational vehicle park to connect with the adjacent Trail of Tears Park.

The Hopkinsville acquisition projects are an excellent example of the goal of mitigation grant programs, whereby a local community, assisted by state and federal agencies, works to reduce or eliminate risk from future hazard events. According to outgoing City Manager Mark Withers, “To achieve success, we must work as hard when it’s dry as we do when it rains.”

Quick Facts

Year:
1997

Sector:
Public

Cost:
$2,035,431.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Middlesboro Storm Sewer System: Upgrades Mitigate Flooding

Bell County, Kentucky

Middlesboro, KY – The residents of Middlesboro in Bell County, Kentucky, are no strangers to flooding. Between 1990 and 1994, the small community was inundated by floodwaters six times.

In February 1994, Middlesboro experienced its worst flood since 1977. Floodwaters from Yellow Creek and Little Yellow Creek flooded East End Elementary School, ruining desks, books, and other items. Major transportation routes in the area became paralyzed with up to six feet of water, and nearly 56 homes and 16 businesses were flooded with up to two and a half feet of water. Rescue squads were called in to evacuate residents from their homes and from stalled vehicles.

Because of its nearly century-old undersized drainage system, the City could not handle flash flooding caused by large amounts of rainfall. Many of the system's drains collapsed and were so full of debris that floodwaters were not able to pass through quickly enough. Although a $29 million U.S. Army Corps of Engineers flood control project was underway, the project did not address flooding in the downtown portion of the city.

Following the 1994 flood, the City removed debris from the drainage system, which controlled the severity of flooding over the next two years. By 1998, however, flooding had once again reached dangerous levels. The estimated damages to businesses and homes over the eight-year period from 1990 to 1998 totaled more than $5 million.

In September 1999, the City of Middlesboro was awarded funds through FEMA's Hazard Mitigation Grant Program to replace a portion of its downtown storm sewer system. New galvanized tile and cast concrete drains and pipelines replaced those that were damaged or undersized so that floodwaters could drain more quickly. The project was completed in the summer of 2000, and its effectiveness inspired the City to expand the storm sewer update. Construction is underway to replace pipelines and install drains in other areas of Middlesboro.

Middlesboro residents and business owners look forward to the project's completion so that they can avoid the devastating effects of yet another flood.

Quick Facts

Year:
1994

Sector:
Public

Cost:
$244,893.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

The Falmouth Flood of 1997: Acquisitions Mitigate Future Losses

Pendleton County, Kentucky

Falmouth, KY – “There is no Falmouth,” lamented Kentucky State Police Trooper Jan Wuchner, following a visit via helicopter to the flood-ravaged town on March 2, 1997. The small town situated at the confluence of the Licking River and its South Fork in Pendleton County had been inundated with floodwaters the previous day. “We lost it all,” said Mike Fields, who lost two properties to the flood, including his grandmother’s house.

On the night of March 1, 1997, heavy rains caused the Licking River to rise to over 24 feet above its flood stage, sending a wall of water into the town. The flood, which reached 50 feet at its height, was the worst in the town’s history, breaking the previous record of 47 feet set in 1964. Five people were killed, and nearly one thousand people lost their homes and had to be evacuated to nearby churches and Pendleton County High School. The damage was estimated at over $50 million.

By April, the City Council had agreed to apply for federal assistance to acquire and demolish some of the homes that had been badly damaged or destroyed by the flood. The City received a $3 million grant through FEMA’s Hazard Mitigation Grant Program (HMGP) to acquire 83 properties. City officials were also able to obtain a Community Development Block Grant to cover the 13 percent local share required for participation in the HMGP. Participants in the acquisition project were given fair market pre-disaster value for their homes. The houses were demolished, and the land will remain open space in perpetuity in order to mitigate future flood losses.

Mr. Fields and his wife, Pam, were one of the families who participated in the buyout program. “This will help a lot,” Mrs. Fields said. “We were making payments on houses that weren’t there.” They planned to use the money they received from the HMGP to rebuild somewhere else. “The only thing to do is revamp and move to another place,” Mr. Fields said.

Ann Howard also participated in the buyout. Her house, which she shared with her mother, Florence McMillian, and granddaughter, Cindy Howard, was completely washed away by the flood. “I lost all of my things and stuff from my ancestors,” said Ms. McMillian. “But I want to go somewhere now where I have peace of mind.” Thanks to the buyout program, the women were able to relocate outside of the floodplain.

Quick Facts

Year:
1997

Sector:
Public

Cost:
$3,070,675.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Warren County
COWS and CALVES Programs

Warren County, Kentucky

Warren County, KY – The 85,000 residents of Warren County, Kentucky, face a variety of natural hazards, such as tornadoes and other severe weather, chemical spills, flash flooding, landslides, earthquakes, and forest fires. A warning system alerts residents of impending danger, enabling them to take the necessary precautions to protect their lives and property.

In 1974, 31 residents of the small city of Brandenburg were killed by tornadoes. The loss of life was attributed to the fact that citizens did not receive warning of the impending storms. Subsequent tornadoes in 1976, 1986, and 1994 also caused death and injury that likely could have been avoided if there had been proper warning.

In July 1997, Warren County was awarded a grant through FEMA's Hazard Mitigation Grant Program (HMGP) to install twelve Community Outdoor Warning Sirens, or C.O.W.S. The sirens had the capacity to warn 100% of the residents of Bowling Green, the county's biggest city, and 80% of residents in the entire county. When the C.O.W.S. are activated during an emergency, residents know they must turn on their televisions or radios for further instruction.

The County recognized, however, that an outdoor warning system was not sufficient. In June 1999, the County received HMGP funds to install 250 indoor Community Activated Lifesaving Voice Emergency Systems, or C.A.L.V.E.S. The system is designed to warn people who are indoors or not close to a siren site, as well as supply disaster information in the event of a power outage. C.A.L.V.E.S. were placed in every school, nursing home, daycare, hospital, church, theater, indoor sporting arena, and emergency responder's office. The system uses a series of beeps followed by a voice message from the activating agency to alert residents of an emergency.

The County also implemented an extensive public awareness campaign to educate residents about the new warning systems. It sent out brochures with instructions such as "When you hear the C.O.W.S. mmoooove indoors. When you hear the C.A.L.V.E.S. protect your herd!"

The warning system is credited with saving lives on April 16, 1998, when a tornado struck the county's biggest outdoor shopping mall. Property damage totaled over $2 million, but no one was killed.

Quick Facts

Year:
1994

Sector:
Public

Cost:
$179,845.00 (Actual)

Primary Activity/Project:
Warning Systems

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Hospital Haven: Facelift Provides Safe Hurricane Refuge for Young Patients

Miami-Dade County, Florida

Miami, FL - The fanciful, brightly colored exterior of the Miami Children's Hospital (MCH) belies the inherent strength of the facility, which can be used as a medical shelter during hurricanes. Beginning in 2001, the building underwent a state-of-the-art retrofit to enable it to withstand a Category 4 hurricane. It is now wrapped in a hurricane -resistant shell.

The hospital serves seven counties in southern Florida, including populous Miami-Dade County, and is the region's only specialty hospital for children. The 268-bed medical facility has expertise in all aspects of pediatric medicine and is an important community resource.

An assessment of the facility's exterior construction, built in the mid-1980s, found that it was unsafe at wind speeds associated with a Category 2 hurricane, which is a common occurrence in southern Florida. Hospital administrators had to solve a two-fold problem: how to fund the renovation project, and how to conduct the retrofit and renovations without disrupting medical services.

MCH received $5 million through FEMA's Hazard Mitigation Grant Program, administered by the Florida Department of Community Affairs, to help pay for the $11.3 million project.

The retrofit involved strengthening the building by encapsulating the three-story structure in pre-molded panels of concrete reinforced with glass fibers. The panel system, anchored into the building's existing support structure, forms a protective cocoon around the hospital and, along with impact-resistant windows and a strengthened roof, enables the building to withstand winds of up to 200 miles per hour. The architect's approach of working from the outside to the inside of the building made it possible for surgeries, diagnoses, and nursing care for the hospital's young patients to continue uninterrupted throughout all phases of the renovation.

The project was completed in the spring of 2004. Young patients and their families did not need to evacuate from the hospital when Hurricanes Frances and Jeanne struck. In addition, MCH welcomed over 60 children who live at home but depend on ventilators or other powered medical equipment.

Not only children in need of medical care found refuge at MCH. Kevin Hammeran, MCH's Senior Vice President and Chief Operating Officer, explained that the safety of the medical staff is also a consideration when a hospital is designated as a hurricane shelter. "The strengthened building has enhanced the hospital administration's ability to recruit staff to serve during hurricanes. Many employees feel safer at the hospital during a storm than in their own homes." He continued, "We also have eliminated barriers by providing on-campus shelter for family members of storm-duty staff. Knowing their spouses and children are within the safe confines of the hospital gives peace of mind to those working through the storm."

During Hurricane Frances, MCH was the refuge for nearly 1,000 staff members and their families. The hospital hosted medical evacuees and families during Hurricanes Katrina and Wilma (2005). MCH has proven to be a safe haven for sheltering sick children and those who care for them.

Quick Facts

Year:
2000

Sector:
Private

Cost:
$11,351,487.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

After Andrew, South Florida Family Keeps Vow to Be Hurricane-Ready

Monroe County, Florida

Monroe County, FL - Barbara Schwartz, who lived for weeks without electricity after Hurricane Andrew ravaged South Florida in 1992, knows how to keep her family hurricane-ready. “We never wait until the last minute once we get the notice of when a storm will hit our area,” noted Schwartz. “Being ready means we will be better able to cope with hardships that can come after the main storm has passed.”

While living in Cutler Ridge, in the southernmost part of mainland Florida, Barbara, her husband Jonathan, and their two young children survived Hurricane Andrew. “I never want to relive the horrible night in 1992 when Hurricane Andrew came ashore,” she said. The Category 5 hurricane destroyed their home.

“We were there almost two weeks without running water and lived in [a shelter we fashioned] from the remains of the house,” Schwartz explained. “We didn’t have power for 42 days. We thought we had prepared for a hurricane, but Andrew educated us about what more we needed. Since then, we have never faced a storm unprepared.”

When the family moved to Pembroke Pines, Barbara and Jonathan purchased a home built in compliance with the improved Florida building codes that were put into effect after Hurricane Andrew. The couple feels safer thanks to the storm-resistant features of the house, such as the doors, garage door, and hurricane shutters for all the windows.

On October 24, 2005, when Hurricane Wilma battered South Florida, the Schwartz family was ready. Their home sustained only minor damage, such as loosened roof tiles. Wilma downed thousands of trees and scores of communities lost power – including Pembroke Pines. “Everyone in our neighborhood was without power,” said Barbara. “But we just started up our generator when the power went out.”

Because the Schwartz family was prepared for the storm, they were able to help others in their community, such as by providing flashlights, batteries, food, hot coffee, water and ice. “Everyone around here knows that we’re prepared and that they can come here and, most of the time, we can provide some kind of help,” she said.

The hardships the Schwartz family experienced after Andrew taught them how to properly stock up in preparation for future storms. Barbara’s emergency preparedness kit contains flashlights, lanterns, bulbs, matches, lighters, and batteries; First Aid supplies; tarps to keep household furnishings dry; cleaning supplies such as bleach, a bucket and mop, and towels; packaged foods; bottled water for drinking and water saved in bath tubs for other uses; plenty of ice; and supplies for the generator.

Barbara conducts an inventory of her kit prior to hurricane season. She replaces any items that are worn out or expired, and checks all items to make sure they are in working condition. The kit contains enough supplies to sustain the family for one month. “I’ve lived in Florida for 29 years,” said Barbara. “Hurricanes are a fact of life here and there’s real peace-of-mind knowing your home and family are prepared. Oh – and don’t forget to buy a weather radio.”

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Homeowner

Diamondhead Home: A Mitigation Blueprint

Hancock County, Mississippi

Diamondhead, MS – Raymond J. Sheehy felt confident that mitigation measures would help keep his home safe when Hurricane Katrina (2005) hammered the Gulf Coast with 135-mile per hour (mph) winds. A retiree from the U.S. Air Force, the Federal Emergency Management Agency (FEMA), and the Hancock County Civil Defense Department, Mr. Sheehy knows firsthand the importance of enacting measures to prepare and protect lives and property before disaster strikes. “I track every storm from force of habit,” he said.

Mr. Sheehy and his wife Pat decided to build a new house and settle into retirement on the Gulf Coast. Aware that the area is highly incorporated mitigation strategies into the construction of their home. This was crucial because their home would be only seven miles from the Gulf.

While deployed by FEMA to American Samoa in the South Pacific, Mr. Sheehy observed that only one of the 750 homes built to mitigation specifications was damaged when a 1991 storm hit the islands with 225 mph winds. Construction of these homes was based on FEMA’s publication, “Home Builder’s Guide to Coastal Construction.“ “So I decided right then I wanted one of those books,” Mr. Sheehy said. Construction of the Sheehys’ mitigated home was completed in the spring of 1995.

There are several risk mitigation strategies incorporated into the couple’s home. The house is firmly anchored to the slab-on-grade foundation, and has reinforced laminated beams along the ceiling to enhance its structural integrity and to increase the roof’s anchoring capability. The roof was built with ¾-inch plywood attached to trusses placed 16-inches apart, rather than the usual 20-inches. Few windows were placed on the southeast side of the house, the direction from which powerful hurricane winds usually blow. Manual wooden shutters were installed on the other windows of the house. There is a pantry-like reinforced safe room in the middle of the house, stocked with emergency supplies. The attached patio area is partially enclosed to help reduce the impact of driving winds. Mr. Sheehy conducts weekly tests of his generator to ensure that it is operating properly. He keeps an ample supply of gasoline and diesel fuel stored outside his garage area.

The couple decided to stay in their mitigated home during the storm. “The wind was blowing, trees were shaking and this house never moved. It never moved an inch,” noted Mr. Sheehy.

While Hurricane Katrina wiped out all power and water to area communities for 21 days, the Sheehys’ generator was up and running and their home was powered for the duration. Once the storm subsided, the couple did a thorough damage assessment of their property and found that their home remained mostly untouched. In contrast, other low-lying communities surrounding the Sheehys were demolished by Hurricane Katrina’s fierce winds and surging waters. The Sheehys’ investment in mitigation planning and construction has created a safe fortress from which they can face future hurricanes.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

Pass Christian House Stands Strong Against Hurricane Katrina

Harrison County, Mississippi

Pass Christian, MS - After suffering damage from Hurricane Lili and Tropical Storm Isidore in 2002, Don Blanchard, a retired aerospace engineer, and his wife Rose were determined to rebuild their house to withstand future hurricanes and floods. The couple's old home was demolished and a new, stronger house rose up higher in its place. Ten months after the couple moved into their “new and improved” house, Hurricane Katrina (2005) hit their community. Don and Rose evacuated before the storm. When they returned to survey the damage, they found that their house was one of the few still standing in their devastated neighborhood.

“When we first came back to see the damage to our house, this area was so hard hit that I was told that our home was completely destroyed,” said Mr. Blanchard. "They didn’t believe me when I told them it would still be standing, but I was very confident, and in fact, it was.”

In 2003, the Mississippi Emergency Management Agency (MEMA) approved the Blanchards’ plans for a Modified Elevation Retrofit, where an old house is demolished and a new mitigated house is built in its place. A standard elevation could not be attempted on their old house because the original foundation was not reinforced and the house was not built on a single slab. The new home was built on eighteen round concrete piles that were spaced 6 to 10 feet apart and elevated the house to 13.1 feet above mean sea level. The foundation alone cost $40,000 to construct. The house was also built to withstand high winds. It has a metal roof with hurricane straps securing it to the support beams on the sides of the house. Six-inch steel “I” beams support the house along the front and back.

“The Blanchards’ home is a model for mitigation along the Gulf Coast,” said Robert Latham, Director of MEMA. “Not only was it built well, but they wisely used the grant funds available to them to reduce their construction costs." The Blanchards used a $70,000 flood insurance claim to pay for some of the costs of the demolition of the old house and construction of the new house. The couple also received FEMA Hazard Mitigation Grant Program funds totaling $76,410, which was administered by MEMA. The remaining cost of more than $241,000 was paid for by a loan from the U.S. Small Business Administration and the Blanchards’ personal funds.

Hurricane Katrina’s 30-foot storm surge caused four feet of water damage to the first story of the Blanchards’ new elevated home. Despite the flooding, the Blanchards’ house stood up against the 135 mile per hour winds and powerful storm surge of the Category 4 hurricane that destroyed most nearby homes. Trees and power lines were forced down, and 14 of the couple’s neighbors lost their lives.

Mr. Blanchard credits his home’s survival to the mitigation techniques incorporated into its construction, especially during construction of the foundation. “I think the strong foundation is one of the main reasons why our house is still standing,” said Mr. Blanchard.

Quick Facts

Year:
2002

Sector:
Private

Cost:
$241,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Rio Linda Residents Rise Above the Floodwaters

Sacramento County, California

Sacramento, CA – The homeowners in a low-lying section of Rio Linda used to worry about flooding whenever the winter storm season arrived. When heavy rains hit the neighborhood, the normally benign Dry Creek overflowed its banks, threatening the row of ranch-style houses on U Street. Over the past few years, Rio Linda residents have participated in FEMA's Hazard Mitigation Grant Program (HMGP) and Flood Mitigation Assistance (FMA) program, which have helped dozens of Sacramento County homeowners protect themselves against flooding.

Federal and county funds were used to elevate houses along U Street above the base flood elevation (BFE), which is the average floodwater depth for a flood event that has an estimated one percent chance of occurring during any given year. Buildings constructed to this standard are expected to sit above the floodwater and avoid damage during all but the most severe inundations. When a series of winter storms battered Northern California from late December through New Year's 2005-2006, none of these elevated homes flooded.

Mr. Brunyansky, a Rio Linda resident, knew when he purchased his house in 1991 that its previous owners had experienced flooding in 1986, but nothing prepared him for the massive flooding that devastated his house during rainstorms in 1995. At the height of the storms, the water rose 39 inches in the single-story ranch house, destroying carpets, drywall, furnishings, cupboards, and personal belongings.

When the Sacramento County Department of Water Resources (DWR) offered Mr. Brunyansky and his neighbors a chance to participate in a home elevation program, he seized the opportunity without hesitation. The project was completed in 2000. While their house was being elevated over a three-month period, the couple lived in a motor home in their yard, where they could observe the progress. Despite the temporary inconvenience, Mr. Brunyansky has no regrets. "I would recommend elevation to anyone who has floodwater, and it's repetitive," he said.

The Brunyanskys' house stands on top of an 81-inch-high cement-block foundation that keeps its living area two feet above the BFE. Specially-designed flood vents near the bottom of the foundation allow floodwaters to pass under the house without damaging it. The house, built in 1961, was among 44 houses in the Sacramento area that was elevated with the help of nearly $2 million in Federal mitigation funds made available in 1997. The cost to elevate their home totaled $66,000. They received $50,000 in FEMA mitigation funds, another $6,000 from the county, and paid for the remaining costs themselves. Now, all but one of the homes on their low-lying block have been elevated.

Mark Rains, the project coordinator and an associate engineer with the DWR, said the County's goal is to either elevate or acquire and demolish older flood-prone homes. As of spring 2006, 72 homes have been elevated. "We have acquired and demolished 22 other houses and returned the property to open space," Mr. Rains said.

Quick Facts

Year:
1997

Sector:
Public/Private Partnership

Cost:
$66,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Flood Mitigation Assistance (FMA)

Flood Mitigation Project Protects Gingerbread Houses

Humboldt County, California

Ferndale, CA – The City of Ferndale is a small dairy community located in Humboldt County's Eel River Valley. Historic Victorian homes line its downtown streets. Francis Creek meanders through the city, attracting ducks and picnickers. This beautiful town has been declared a Federal disaster area seven times since 1980, due to flooding. The peaceful creek has been known to become a raging river in heavy winters, overflowing its banks and damaging homes and businesses.

When it flooded in 1995, Francis Creek caused $1.76 million in building damages and $289,000 in content losses. After the waters receded, it cost an additional $231,800 to clean up the debris. In 1996, the City, through the Governor's Office of Emergency Services (OES), applied to FEMA's Hazard Mitigation Grant Program (HMGP). The City sought a grant for a comprehensive flood mitigation project on a one-mile stretch of Francis Creek. The project called for increasing the creek's size and water flow by cleaning the creek bed of debris, widening the creek in some areas, and restoring its natural path in other areas. It also called for rebuilding 16 bridges where bridge supports unnecessarily restricted water flow.

Not only would the project prevent future flooding, it would also improve roads, water quality, and protected species habitat. The California Department of Transportation (CA DOT) and the California Department of Water Resources (CA DWR) became involved. Funding for the project included contributions from FEMA/OES HMGP, FEMA/OES for disaster assistance from a previously approved Disaster Survey Report, CA DOT as a cost-share for drainage improvements within the state right-of-way, CA DWR Urban Streams Restoration Grant Program, and City Drainage Funds.

Engineers designed the project to carry a flow of 750 cubic feet per second (cfs). To widen the creek, 5,600 cubic yards of soil and concrete were removed, then 7,500 tons of boulders were added to shore up the banks of the creek. Workers also removed a concrete channel in front of Ferndale High School and restored the creek's natural course there. They replaced non-native vegetation with native vegetation and layered culvert floors with three feet of gravel, which improved the mobility of aquatic life.

Upon completion in October 2002, the $3.75 million project provided protection to 73 homes, 56 businesses and commercial structures, five churches, a fire station, and three schools. It also protected part of the city's infrastructure, including roads and bridges. Nature soon put the flood mitigation project to the test. Two severe storms in December 2002 exceeded the 1995 event, but the city stayed dry.

The Mayor praised the mitigation project. "We waited for the banks to overflow, but they didn't. I'm grateful to the State. We couldn't have done it without them." This successful project serves as a model for other communities. The key element was the collaboration of Federal, state, and local governments.

Quick Facts

Year:
1995

Sector:
Public

Cost:
$3,750,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Duplex Avoids Flooding After Elevation

Napa County, California

Napa, CA - In 1987, Jim Hallock bought a flood-damaged duplex and spent nearly $50,000 to remove and replace the downstairs sheetrock and flooring. The property was flooded again in 1998 and 2003, and incurred $100,000 in damages.

The area where Mr. Hallock's property is located is susceptible to flooding. The duplex is immediately downstream from the Behrens Street Bridge that crosses Napa Creek. During high water events, debris can collect under the bridge, causing the creek to overflow its banks. The water then flows across the road into the yard of the duplex. After the 2003 flood, Mr. Hallock was able to elevate the structure through the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP), sponsored by the City of Napa.

In 2004, the work to elevate the structure took approximately four months. The property owner's share of the cost was $30,000; the remainder of the cost was funded through the HMGP. Mr. Hallock estimates that the elevation project will save him about $50,000 each time a flood occurs.

Napa Creek overflowed its banks once again during the New Year's Eve flood of 2005. The house next door to the elevated duplex received major damage, but the tenants in Mr. Hallock's duplex were safe, dry, and able to remain in their homes. The property escaped damage, and Mr. Hallock avoided loss of income.

Mr. Hallock's property is one of a group of residences that benefited from HMGP and Flood Mitigation Assistance (FMA) program funding. The City of Napa combined funds from both grant programs for the elevation project. FEMA funded 75% of the costs, and the 25% local share was paid by the property owners. The primary focus of the project was to elevate homes that would not be protected by the City's larger Napa River Flood Protection Project (NRFPP). The secondary focus was to elevate homes in the Napa Creek floodplain, which flooded in 2002 and floods more frequently than the Napa River. The property owners did not want to wait for flood protection from the NRFPP, because the Napa Creek portion of the NRFPP construction is not planned until 2009. It is estimated that the elevation project prevented about $420,000 in flood losses following the 2005-2006 New Year's Eve storms.

Additionally, the City plans to replace the Behrens Street Bridge with a pedestrian bridge and convert Behrens Street into a dead-end street. This will greatly lessen flooding in the area as well.

Mr. Hallock praised the City of Napa for its mitigation efforts. He proclaimed "Mark Prestwick, Assistant to the City Manager, is a dynamite guy! He was incredibly helpful with the grant process in the two to three months before the elevation started…This is a government project done RIGHT!"

Quick Facts

Year:
1997

Sector:
Private

Cost:
$30,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Floodwall Gives Seniors Peace of Mind

Napa County, California

Yountville, CA – On New Year's weekend, 2005-2006, Northern California suffered a severe winter storm that dropped six to eight inches of rain in 48 hours in Napa County. The storm followed a two week period in which 12 to 14 inches of rain fell overall. Streams and drainage ditches around Yountville flooded, but two mobile home parks surrounded by a new flood wall stayed dry. The new flood wall was completed less than nine months before the winter storms hit.

The Town of Yountville experienced severe and repetitive flooding several years in a row in the early and mid 1990s. One hundred homes were destroyed by three previous floods. Affected most severely in past floods were mobile homes in the Rancho de Napa and Gateway Mobile Home parks located at the town's southeast corner.

These mobile home parks lie within the 100-year floodplain of the Napa River. They are bordered to the west by Hopper Creek and to the east by Beard Ditch. To the north and south are local drainage ditches that carry surface runoff from the adjacent properties and mobile home parks to Beard Ditch.

Frustrated residents of the frequently flooded areas appealed to town officials to explore ways to mitigate the problem.

Initially, the Town of Yountville applied for and was granted funding through FEMA's Hazard Mitigation Grant Program (HMGP) for an elevation project for 88 mobile homes. In the spring of 2001, following several years of preparations and evaluation, the town changed the project to floodwall construction and instituted building codes that required newly installed mobile homes in the two parks to be elevated above the base flood elevation.

The project included several additional components. Engineers built an automatic warning system into the retention pond consisting of a float that rises as the water in the pond approaches flood levels. If the water reaches the 50-year flood level, the system automatically sends warnings to the local emergency response agency dispatchers. The town's lift station generators were moved inside the floodwall. Prior to this move, the generators were subject to frequent flooding, which meant that Yountville's sewerage infrastructure could fail, causing additional damage as effluents backed up into homes.

A combination of Federal, county, and local sources funded the Yountville flood mitigation project, which totalled $6 million. Floodwall design and engineering began in 1995, and construction began in the spring of 2003. The project was completed in March 2005. Eight months later, the winter storms of 2005-2006 hit Yountville. The floodwall spared 314 homes from flooding and prevented the need to evacuate residents, many of whom were senior citizens.

Quick Facts

Year:
1995

Sector:
Public

Cost:
$6,000,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Multi-Hazard Protection for Historic Home

Napa County, California

Napa, CA – In 1998, Paul Faulk purchased a historic home in Napa. It was a slightly elevated house with a four-foot crawl space. When new flood maps were developed for the city, Mr. Faulk's property was included in a Special Flood Hazard Area as designated by the National Flood Insurance Program. The threat to his home from inundation by the 100-year flood prompted Mr. Faulk to take steps to protect it.

Although his house had never flooded, Mr. Faulk decided to hire a contractor in December 2005 to elevate it an additional four feet. The contractor raised the house in 14-inch intervals, installing railroad tie cribs one level at a time until the structure was nine feet above the ground. A new concrete slab replaced the old deteriorated foundation and slab. The contractor engineered the first level framing to allow for open spaces for a new garage, and strengthened the structure to conform to City of Napa building codes for seismic hazard mitigation. All of the structural elements were connected in a continuous load path with ties, hangers, and foundation bolts.

On New Year's Eve 2005, while Mr. Faulk's house was still up on cribs, a sudden storm dropped five inches of rain on Napa County and caused severe flooding. Flood waters came into Mr. Faulk's front yard, and nearby houses were inundated with water and debris. Fortunately for Mr. Faulk, his home elevation project had been completed enough to avoid significant flooding.

Costs for the elevation totaled about $9,900, including elevation of the utilities. Additional expenses for the project included matching historical details such as siding, trim, and windows to the original house.

In less than four months, the newly elevated and seismically strengthened house was partially habitable. The owner was able to move back in before construction was finalized. "It's been an amazing process," exclaimed Mr. Faulk. "The contractor who performed the elevation has done an incredible job."

Quick Facts

Sector:
Private

Cost:
$9,900.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Homeowner

Katrina's Challenge: A Small Elevated House

Jackson County, Mississippi

Pascagoula, MS – Laura Watson's house on Pine Street in Pascagoula, Mississippi, has suffered damage over the years from repetitive flooding caused by heavy rains and hurricanes. Concerned that she would have to leave the home and community she loves, Ms. Watson decided it was necessary to take steps to mitigate her home against storm damage after Hurricanes Elena (1985) and Georges (1998).

Ms. Watson received funds from the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP). The approved project totaled $43,050, and was administered by the Mississippi Emergency Management Agency (MEMA). "The HMGP funds made it possible for Ms. Watson to elevate her home," said Director Robert Latham of MEMA. "The choice to do so prior to Hurricane Katrina certainly saved her home from becoming a total loss."

The house was elevated to 14.1 feet above mean sea level on eighteen 10-inch by 10-inch timber pilings embedded six feet into the ground. The pilings are located on the front, center, and back of the house for support. White lattice, which is designed to break away, conceals a storage space beneath the home. Corner bracings were added for further support, and galvanized hurricane straps were also installed.

Ms. Watson evacuated to Alabama as Hurricane Katrina approached the Gulf Coast. As the storm hammered her community, Ms. Watson's next door neighbor, who lives on higher ground and did not evacuate, kept her informed of conditions in Pascagoula by telephone. Ms. Watson vividly remembers her neighbor saying, "Laura, your yard looks like the Mississippi River." As she listened to her neighbor's descriptions of the storm and its impact on her property, she kept up hope that her house would survive.

Ms. Watson returned to her home two days later, when the water from the Gulf had retreated. She looked at her house and thought, "thank God my house is still standing."

Ms. Watson surveyed her house for damages, and was amazed to find that practically everything was intact. There was one broken window on the back of the house and scattered debris in the yard from surrounding properties. Upon further inspection, she discovered that although the house was elevated, five feet of water had entered the living area. However, Laura noted, "if my house had not been elevated it would have been completely under water.

Ms. Watson immediately began cleaning her house to protect it from further damage and to protect herself from potential health problems that are caused by mold. She knew it was necessary to dry out water-damaged areas of the house and her personal belongings within 24 to 48 hours to help prevent mold from developing.

Unfortunately, a family across the street did not fare as well as Ms. Watson did during Katrina. Their house was completely submerged and is uninhabitable; it sits in the same low-lying area and is not elevated.

Quick Facts

Sector:
Private

Cost:
$43,050.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Mitigation Efforts "Shut Out" Katrina

Harrison County, Mississippi

Gulfport, MS – On August 29, 2005, with Hurricane Katrina's devastating winds blowing outside, emergency personnel at the Harrison County Emergency Operations Center (EOC) were safe and secure thanks to storm shutters protecting the building's windows. More than 200 city, state, and county emergency officials, Mississippi National Guardsmen, Navy Seabees, and rescue workers took shelter and conducted 24-hour operations in the EOC in Gulfport. Located less than half a mile from the Gulf of Mexico, the building lies in an area that took a direct hit from the storm. Wind speeds in the area were reported to have been stronger than 130 miles per hour and the storm surge as high as 24 feet.

"If we hadn't installed the storm shutters, flying debris would have burst through the glass windows and doors on the front of the building," said Richard Faul, operations technician at the EOC. "Trees were down. Power lines were down. Some of the surrounding houses suffered structural damage and we lost a couple of satellite dishes off of the roof." "The fire station right across the street is gone," said General Spraggins, Director of the EOC, as he described the devastation in the area. "I looked out over to the west of the building and the casino there was completely destroyed. It was horrible. We could hardly get from one place to another because the roads were so torn up."

The First Judicial Court House that houses the EOC was built in 1977. Originally constructed as a civil defense facility, concrete was used for the building's frame, roof, and exterior walls, and it was built to withstand high wind events. The facility's first floor sits at an elevation of just over 26 feet.

"The building being elevated saved us as well," noted General Spraggins. "The water from the Gulf came all the way up to the building. If the first floor hadn't been elevated, we would have been under water like everyone else. As it was, we had water blow under the doors, but that was to be expected under the circumstances."

The EOC was retrofitted for metal storm shutters in 2003, after an assessment revealed that high winds could blow out the glass windows and doors of the facility. The total cost of the shutters was $256,303. FEMA mitigation grant funds provided $192,227 of the cost of the project.

The storm shutters were deemed a success. The EOC had the resources to deploy personnel immediately after the disaster, and courthouse documents dating to the 1840s, archived in the building, were saved.

Quick Facts

Sector:
Public

Cost:
$256,303.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Anchoring Code Defends Home From Katrina's Winds

Washington Parish, Louisiana

Franklinton, LA – During the winter of 2002, David and Laquetta Passman moved their manufactured home from Enon to Franklinton, Louisiana. The relocation required the Passmans to come into compliance with new building codes, which mandated stringent anchoring standards intended to protect manufactured homes from high velocity wind forces. When Hurricane Katrina brought sustained winds in excess of 150 miles per hour to the Franklinton area in August 2005, the Passman home remained secure on its foundation. The couple believes their home survived because of their compliance with the current anchoring code.

The Passmans are volunteer firefighters with Washington Parish's Fire District Number One. They moved to Franklinton to be closer to the fire station and to Mr. Passman's parents, who are now their next door neighbors. When the hurricane struck, the family congregated at the elder Passmans' residence to ride it out together. "When the wind started shaking the house my mom called up and said we better get over to her place…. I told her I thought we'd be alright, but [she was worried so] we rode out the storm over there," said David Passman.

Hurricane Katrina caused tremendous wind damage in the Franklinton area. The storm blew apart trailers, tore roofs from houses, and knocked down trees by the acre. The Passmans' residence did sustain exterior damage, but it was minor in comparison with the devastation suffered by many other manufactured homes in the area.

"A man just down the road from here lost his house," noted Mr. Passman. "The way [my house] was anchored before, I don't think it would've made it. I think it would've been blown right over."

In order bring his home into compliance with Washington Parish's current anchoring standards, Mr. Passman followed the recommendations of a structural engineer. The engineer evaluated Mr. Passman's property and advised him to replace several inches of topsoil with dense clay. The engineer then instructed Mr. Passman to secure his home on thicker, heavier concrete foundation pads, and to fasten it with many more steel straps and auger-style ground anchors than he had been required to use in the past.

David and Laquetta Passman are invested in public safety. As firefighters, they assisted in Franklinton's post-storm recovery, witnessing destruction to a degree which they hope never to see again. They want to encourage everyone in hurricane and tornado-prone areas to invest in wind-resistant construction methods and materials to protect themselves and their property from future storms.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Sheriff's Home Defies Katrina

Saint Bernard Parish, Louisiana

Shell Beach, LA – Sheriff Jack Stephens had to use an airboat to return to his home after Hurricane Katrina struck the Gulf Coast of Louisiana in August 2005. His neighborhood in Shell Beach was under water for weeks, and the cars, boats, and houses of his neighbors had been destroyed by the storm. As Sheriff Stephens approached his own property, he was relieved and grateful to see his elevated house still standing strong atop its pilings. The extra time and money he had invested in hurricane-resistant construction had paid off.

Residents between Lake Borgne and the Mississippi River Gulf Outlet are aware of the potentially disastrous weather they face during the Atlantic hurricane season from June 1 through November 30 each year. The sheriff built his home to withstand the flooding and high winds of the fiercest hurricane he could imagine.

Hurricane Katrina hit Shell Beach with 20-foot waves and sustained winds of 145 miles per hour. “It was absolutely roaring here,” the sheriff said. On the evening of August 28, 2005, as Katrina approached, Sheriff Stephens secured his home as well as he could. He then left for his office in Chalmette, Louisiana, where he was on duty for the remainder of the storm.

Considering the vast destruction brought to his subdivision, the sheriff’s home fared exceptionally well. Despite the high winds, the house never budged from its anchored location atop heavy-duty pilings, and the roof remained attached to the frame. The house, elevated to 21 feet, stayed above the floodwaters. Storm shutters successfully defended all of the home’s windows.

However, there was some damage to Sheriff Stephens’ house. One or two panels of siding on the building’s exterior needed to be replaced, and wind-driven rain forced under the roof cap caused some damage to the drywall and flooring. The wooden stairways leading to the front and rear entrances were swept away by the harsh waves, and the on-grade storage shed located beneath the house was also washed away. “The damage was not insignificant, but on the whole the structure will be easily rehabilitated,” the sheriff said. “If I hadn’t taken extra measures to protect it, I don’t think the house would have lasted….I would spend the extra money [I invested in hurricane-resistant construction] again tomorrow—there’s no doubt that it was worth it.”

Sheriff Stephens wants to encourage people to do whatever they can to protect themselves from future storms. There are steps homeowners can take to minimize or avoid a hurricane’s destructive forces. “If you’re starting with a clean slab,” the sheriff advised, “it makes sense to elevate….Look at the high water level for Katrina, and go…higher than that…get it up in the air.”

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Homeowner

Shopping for Knowledge at Local Home Improvement Stores

Multiple Counties, Louisiana

The Gulf Coast of Louisiana – Contractors and homeowners in Southern Louisiana are visiting local home improvement stores with thoughts of rebuilding, following the destruction Hurricanes Katrina and Rita brought to the Gulf Coast in August and September 2005. In response to a burgeoning public demand for mitigation information, the Federal Emergency Management Agency (FEMA) is offering hazard mitigation workshops in home improvement stores, focusing on building techniques proven to make homes hurricane-resistant.

From power tools to kitchen appliances, home improvement super stores have the inventory to put a house back together. However, successful recovery and rebuilding efforts require more than simply constructing a new house. Hurricanes are a fact of life in this part of the country, and the destruction of the 2005 hurricane season has left few residents confident that they will not be affected by another severe storm. Residents want to rebuild safer and stronger so that their homes are able to withstand future hurricanes.

The slogan for these mitigation workshops is "REBUILD Stronger, Safer, and Smarter." They are being held in Stine Lumber, Doug Ashy Building Materials, 84 Lumber, Lowe's, and Home Depot stores throughout Southern Louisiana. The workshops are popularly known as "The FEMA Road Show" by the hazard mitigation teams that conduct them. They are held for three days at each location, and will eventually cover the entire Louisiana Gulf Coast region.

The workshops include a slide presentation, free publications, and the opportunity to meet one-on-one with a FEMA hazard mitigation advisor. Shoppers who attend the Road Show leave with a variety of useful information on topics such as the National Flood Insurance Program (NFIP), wind-resistant roofing techniques, and effective methods of elevating a building and properly anchoring it to suitable footings and foundations. Additionally, each FEMA team possesses not only a thorough knowledge of hazard mitigation policies and procedures, but some particular experience or expertise to address the challenges faced by hurricane victims.

According to the Community Education and Outreach branch at the FEMA Joint Field Office in Baton Rouge, Louisiana, the hazard mitigation workshops are averaging over 80 visitors per day. The word is getting out and public interest is increasing.

Hazard mitigation construction techniques work. Thanks to these workshops, southern Louisiana contractors and homeowners have easy access to the program and policy information that will help them build safer, stronger homes in the hurricane-prone Gulf Coast region.

Quick Facts

Year:
2005

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Memories of Camille: School Survives Katrina

Jackson County, Mississippi

Ocean Springs, MS – Memories of Hurricane Camille's devastating impact on the Mississippi Gulf Coast in the summer of 1969 prompted Ocean Springs Middle School to take preventative measures prior to Hurricane Katrina.

Many long-time residents vividly remember how Camille's fury resulted in numerous deaths and widespread destruction, closing schools for weeks. Learning from experience, the school vowed to develop techniques to reduce the loss of life and property in future disasters.

The school installed permanent wind-resistant shutters on vulnerable classroom windows to help protect against strong winds charging in from the Gulf of Mexico. The Mississippi Emergency Management Agency applied to the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP) on behalf of the Ocean Springs Middle School, and was awarded $49,477 in funding for the hurricane mitigation project. FEMA paid 75 percent of the cost of the project, and the remainder was funded by the City of Ocean Springs.

The shutters performed exceptionally well when Hurricane Katrina made landfall on August 29, 2005, registering winds of up to 104 miles per hour in this Gulf Coast community.

The hurricane shutters shielded windows from wind-borne objects and also protected the contents inside the building. Without shutters, a window may be easily breeched by hurricane winds. This creates tremendous upward pressure which may cause major roof failure, exposing the interior of the building to the storm.

After Hurricane Katrina, Ocean Springs Middle School remained intact and operational, unlike many public buildings in the city which were severely damaged and uninhabitable. In fact, the school served as a disaster command center immediately following the storm and later as a shelter for families who had lost their homes.

According to David Baggett, the current principal of Ocean Springs Middle School, "Getting back to school is so important after a disaster because the students need stability when they have lost their homes. They need a place where they feel safe and secure." Mr. Baggett's own home was completely destroyed by Hurricane Katrina.

Other schools in the district were not as fortunate as Ocean Springs Middle School. Ocean Springs Elementary, located just a mile away, experienced extensive damage because its windows were not protected.

Storm shutters are a cost-effective way to protect schools. They are designed to withstand the impact of hurricane-force winds and prevent window failure that could allow wind, rain, and debris to enter a building. Ocean Springs Middle School demonstrated that taking preventative safety measures not only provides teachers and students with an increased sense of security, but also ensures continuity of vital educational and social resources in the wake of a disaster.

Quick Facts

Sector:
Public

Cost:
$49,477.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigated Homes Remain Standing in New Orleans After Katrina

Orleans Parish, Louisiana

New Orleans, LA - Torrance Green's construction company had nearly completed two homes in New Orleans when Hurricane Katrina struck in August 2005. The hurricane brought 100 mph winds and floodwaters up to 10 feet above grade, demolishing neighboring residences, but both of Green's structures survived the devastation thanks to his strict adherence to sound mitigation techniques.

The first structure is a two-family home built on chain wall footing, and elevated five feet above grade with reinforced concrete block columns. The frame is securely fastened to the foundation with anchor bolts, nuts, and washers. The windows are partially enclosed, the siding is nailed loosely with a quarter of an inch of give, and the roof is fitted to the frame with heavy-duty hurricane straps and connectors. The good condition of this house within a shattered neighborhood demonstrates that Mr. Green's construction techniques should be put to standard use in hurricane-prone areas.

The second house that was under construction when Katrina hit is a single-family, shotgun-style home. Like the first home, it is a lone survivor in a neighborhood that witnessed extensive destruction from high winds and flooding. The house constructed by Mr. Green's company remains standing, however, because it was well-built with hurricane-resistant materials and elevated to the pre-Katrina Base Flood Elevation (BFE).

Mr. Green noted that both of his construction sites were protected with flood insurance, which has lessened the impact of the hurricane on his livelihood.

Following Katrina, Mr. Green also inspected a house he built the previous year in the Lower Ninth Ward, an area notorious for how hard it was hit by the storm. Upon arrival to Delery Street, he found the remnants of what used to be people's homes. The house that Green constructed stood alone among the wreckage. Except for some internal water damage, the house was almost unharmed. In fact, every roof shingle remained in place and even the turbine vent was still spinning.

Torrance Green knows how to build a house to withstand hurricane forces. He has been in the construction business in the New Orleans area for seven years, and has learned how to properly mitigate the natural hazards of the region. Hurricane-resistant construction materials and practices are no secret, Green insists, and in this part of the country they should be routinely utilized. Mitigation measures, along with flood insurance, are likely to help protect homes from flood loss and provide homeowners with peace of mind.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Homeowner

Simple Retrofit Prevents Structural Damage

Saint Tammany Parish, Louisiana

Slidell, LA – Hurricane Katrina (2005) moved four feet of water into Bruce Colby's garage and one foot of water into his home in Slidell, Louisiana. Mr. Colby's garage doors are intact and the overall home is structurally sound. His neighbors, however, will have to replace their entire garages because of structural damage.

The difference between Mr. Colby's and his neighbors' homes is that he installed three International Code Council (ICC)-evaluated flood vents prior to Katrina. Mr. Colby installed the flood vents in order to reduce his flood insurance premium; that financial decision resulted in the physical protection of his property during the hurricane. "My insurance agent told me to get flood vents and so I did an [internet] search," Colby explained. He chose a flood vent certified by the ICC, which ensures that the vent has been rigorously tested for performance under flood conditions, including debris-filled flood waters that could clog ordinary vents.

The National Flood Insurance Program (NFIP) requires flood vents for residential basements, crawl spaces, garages, and other enclosed structures that are below the Base Flood Elevation in Special Flood Hazard Areas (SFHAs). SFHAs are at high-risk of flooding and subject to inundation by the base flood, which is the flood that has a one-percent chance of being equaled or exceeded in any given year. Much different than air vents, flood vents are specifically designed to open during flooding to allow the free flow of water through the structure. Normally these vents are closed so that animals, debris, and moisture are kept out. Some models are sealed, allowing for conditioned space in the interior. Other models are temperature-sensitive, opening during hot weather to allow air circulation.

Flood vents are critical because if water cannot equalize quickly enough, pressure from the flood water can blow out doors and windows, magnifying the damages from the flood. Often, pressure from flood waters that are not properly vented will compromise the entire structure, rendering the home uninhabitable. Proper flood venting may help prevent such substantial loss.

Because he installed flood vents, Mr. Colby saves $700 per year in flood insurance, and he only paid a total of $600 for three flood vents. The fact that his garage survived and his home is structurally sound following Katrina underscores the real value of proper flood venting.

Four feet of floodwater flowed through Mr. Colby's garage without causing structural damage. He is pleased with his decision to install flood vents: "I don't know anyone [else] who has a flood vent. No one around here knew what they were. I guess it will all change now."

Quick Facts

Sector:
Private

Cost:
$600.00 (Actual)

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

FEMA

Community Fire Project Protects Village

Hawaii County, Hawaii

Waikoloa Village, HI - One of the largest fires ever recorded on the Big Island of Hawaii torched 25,000 acres of grassland in August of 2005. The wildfire threatened Waikoloa Village, a community of about 5,000 people located on the slopes of Mauna Kea above the Kohala Coast. Fortunately for the residents and property owners, a 30-foot firebreak cleared weeks before by volunteers and members of the Waikoloa Firewise Committee prevented the fire from engulfing the village.

Since its inception in 2003, the Waikoloa Firewise Committee has had several meetings, workshops, and workdays to develop its wildfire risk reduction plans. The committee wants to take active steps toward the prevention and mitigation of wildfires because they are aware of the high risk in the community. Waikoloa Village is located in a rather remote location, surrounded by brush and grass, with a single road used for both entry and exit. The site was used by the United States Army during World War II, which left unexploded munitions buried on the property.

On July 9, 2005, a team of 22 Firewise Committee volunteers united to create the firebreak that saved Waikoloa Village. Local businesses donated equipment, refreshments were provided throughout the workday, and truckloads of burnable material were hauled away.

During the August 2005 wildfire, village residents evacuated as a precaution. No one panicked and the evacuation proceeded smoothly. Upon returning to their homes, the residents found no structural damage. There was soot and smoke in the homes – clear evidence of their proximity to disaster. “The firebreak did its job,” stated Captain Michael Milare. “It provided time for the firefighters to respond, approach the fire, and let us do our job. Without it, the fire would have entered the subdivision and caused serious damage.”

“Firewise works,” stated Pete Hoffman, member of the Hawaii County Council and chairman of the Waikoloa Firewise Committee. The Waikoloa Village Firewise Committee has continued its work with the assistance of a grant from Firewise Communities/USA, and has scheduled a full agenda of workdays. Among the mitigation projects are a demonstration site which will display fire-resistant landscaping and building materials, the creation of a “buffer” zone at the boundary of the village, and the creation of a secondary road for egress from the village.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$3,000.00 (Estimated)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Property Owner, Residential

Only House Left Standing: Building Code Saves House

Jackson County, Mississippi

Pascagoula, MS - Robert and Sandra Harris safely waited out Hurricane Katrina at their son's home. They were stunned at what they found after the storm when they traveled 20 miles back to their neighborhood in Pascagoula. The couple was met by a local law enforcement officer who said, "Robert, your house is the only one left standing." Except for their intact house, Wiggins Street was lined with slabs where houses once stood.

Robert examined his house as soon as it was safe to enter. He found everything considerably intact, except for windows that were blown out, some missing roof shingles, torn away steps, and other minor damage. "I'm just happy I had a house left to repair, although I am saddened for others," he said.

After experiencing flooding from Hurricanes Frederick, Elena and George, as well as flooding from rain storms, the Harrises decided to demolish and build a new home in 1999. Flood-conscious and determined to protect against the next hurricane or flood, they decided to build an elevated house. The Harrises did not simply comply with the stronger post-Camille coastal building code, they far exceeded it. Their house was built to withstand winds of 160 mph, and elevated on piles and piers 17.2 feet above sea level, which exceeded the current 13.1-foot requirement. Hurricane Katrina slammed into the Gulf Coast on August 29, 2005. This was the first test for the Harris' new elevated, hurricane-resistant home – and it passed.

"The Harris family is a shining example of how citizens can build or rebuild smarter," said Robert Latham, Director of the Mississippi Emergency Management Agency. "We have a tremendous opportunity now for our communities to rebuild stronger than before and reduce future damage costs."

The Harrises took advantage of Increased Cost of Compliance (ICC) funds from a previous flood loss to pay for mitigation measures to build their new house above code. The cost to mitigate was approximately $20,000. "This is the best money we ever spent. During Hurricane Katrina the house did what it was supposed to do. It withstood the storm, " said Robert.

There is connectivity in the Harris' house from the foundation to the roof. The posts that support the house were connected to other structural components using the proper size galvanized bolts and hurricane straps. Hurricane straps can be used to connect the top of the wall to the roof as well as connect the bottom of the wall and flooring to the post. Harris credits the large posts and the connectivity method of construction for saving his house from serious hurricane damage.

Robert said that he is going to take additional measures to strengthen the house. "I have already installed open risers for the steps and I will consider hurricane-resistant windows and shutters." As an extra precaution, the Harrises will add more hurricane straps to the back porch. "The back porch is my favorite place to relax, view the city, and overlook the Gulf of Mexico," he added.

Photo Caption: The Harris' house was the only one in their neighborhood standing after Hurricane Katrina. They used ICC funds to elevate their house, exceeding the 13.1-foot requirement.

Quick Facts

Year:
1998

Sector:
Public/Private Partnership

Cost:
$20,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
National Flood Insurance Program (NFIP)

Elevation is Not Enough: Utilizing Smart Building Practices

Saint Tammany Parish, Louisiana

Slidell, LA – Everett and Carol Brugier's home in Pirates Cove in Slidell suffered only minor damage during Hurricane Katrina, thanks to several special hurricane-resistant features built into it. The Slidell area is at high risk for hurricanes, and the Brugiers knew that they would have to elevate their home to avoid flood damage as well as incorporate wind-resistant features into its construction.

Their home is in a V-Zone within a Special Flood Hazard Area, as designated by the National Flood Insurance Program. V-Zones are coastal areas subject to the additional hazard associated with storm-induced velocity wave action. The design of the Brugier home had to be reviewed and the plans approved by a licensed architect before they could obtain a building permit from St. Tammany Parish.

The local building code requires homes in Pirates Cove to be elevated to 13 feet above sea level, which is four feet above the Base Flood Elevation, the average floodwater depth for a 100-year flood event. The Brugiers chose to elevate their home to 16.4 feet, which provided enough height to park their motor home underneath the house. The additional height prevented several feet of water from reaching into their living level during the 2005 hurricane season.

The Brugiers' house incorporated several hurricane-resistant features, such as a bulkhead of vinyl panels to prevent erosion, reinforced concrete block support columns, hurricane clips, durable windows, and breakaway walls. The Brugiers moved into their new home in November 2004.

The incorporation of hurricane-resistant features (beyond the basic elevation of the structure) into the Brugiers' house increased construction costs by an estimated $12,000, but they consider it a worthwhile investment, especially after the 2005 hurricane season. Although the floodwaters beneath their home rose to 15 feet, within about one and a half feet of the floor joists, the breakaway walls survived intact, no water entered the home, and the roof was not damaged.

"I came out a lot better than my neighbors. There was extensive water damage on either side of me and most of the other houses in my area were badly affected," said Mr. Brugier. He noted that there were 40-foot boats on top of some houses, and other houses were blown two or three miles out into the marsh to the east of the highway.

Mr. Brugier offers the following advice to homeowners who plan to build in areas of high flood risk: "Get it up in the air and build it strong!"

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

FEMA

Home Elevations Work: Rebuilt Higher and Stronger

Terrebonne Parish, Louisiana

Houma, LA – Elevating a structure decreases its vulnerability to damage from floodwaters. This was demonstrated in northern Terrebonne Parish where elevated homes escaped damage from the several feet of water that inundated neighborhoods during Hurricane Rita. A total of 55 residents elevated their homes through an $18 million cost-share Hazard Mitigation Grant Program (HMGP) project administered by the State of Louisiana in the wake of Hurricane Lili (2002).

Terrebonne Parish officials reported that none of these mitigated homes were damaged by Rita's floodwaters. They also estimated that hundreds of other residents in flood-prone areas used insurance claim money or their own savings to elevate their homes after Lili.

Darlene and Wiltz Luke elevated their home along Grand Caillou Road after suffering damage during several storms. Although the local building code required their home to be elevated five feet, the Lukes chose to raise their home by nearly nine feet so they could use the space underneath for a parking and recreational area. Such uses, as well as limited storage and stairs and stairwells for access to the elevated structure, are permitted in spaces below the Base Flood Elevation (BFE). The BFE is the average floodwater depth for a flood event that has an estimated one percent chance of occurring during any given year; buildings constructed to this standard are expected to sit above the floodwater and avoid damage during all but the most severe inundations.

The Lukes elevated their 2,700 square-foot home on a concrete slab with the assistance of HMGP funding. In addition, they were applied for Increased Cost of Compliance (ICC) coverage, which is part of a standard flood insurance policy. When an insured building is declared substantially damaged by flood (meaning that the repair costs would be 50 percent or greater than the pre-damaged market value of the structure), ICC coverage will pay up to $30,000 to bring the building into compliance with State or community floodplain management laws or ordinances by elevating, floodproofing, demolishing, or relocating the building.

"We're really glad we elevated, and even though we had a mess around us, the water didn't get into our home this time," noted Darlene.

About four miles south of the Lukes' home, Rita Verdin's home on Shrimpers Row also escaped damage from Hurricane Rita's floodwaters. She elevated her home on treated wood beams as it was being built in 1986. Although required by the local building code to elevate to three and a half feet, Verdin chose to elevate to a height of eight and a half feet above grade so that the space underneath the home could be used for parking.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigated Roads Endure After Substantial Rainfall

Holmes County, Florida

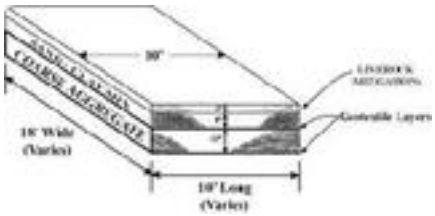
Holmes County, FL – The red clay roads of Holmes County, quietly located between Pensacola and Tallahassee, pass by country homes and farmsteads and through woods and pastures. When Hurricane Earl dumped 20 inches of rain on the Panhandle in 1998, these roads were severely flooded and washed out. Through a State of Florida and Federal Emergency Management Agency (FEMA) initiative, the dirt roads were upgraded to withstand years of use and rainstorms.

After Earl's substantial rainfall, the dirt roads turned into mud, and were rendered impassable by cavernous ditches and flowing water. Holmes County residents became isolated. They were unable to get out of the area, and fire, medical, and police emergency service vehicles could not travel into the neighborhoods. Holmes County Commissioner Jim King surveyed the road conditions in the fall of 1998 after Earl's heavy rainfall. He found that close to 30 gravel roads had considerable washout problems. The majority were impassable at the time.

Because Holmes County was declared a federal disaster area, FEMA and the Florida Department of Community Affairs were able to provide funds through FEMA's Public Assistance program to repair and mitigate damaged roadways in the county.

To repair the roads in Holmes County, affected roadbeds were excavated into trenches measuring two feet deep by 18 feet wide by 10 feet long. A layer of geotextile fabric, or special screen mesh, was laid at the bottom of the trench. Then a coarse crushed stone aggregate base was laid over the fabric mesh. The aggregate, composed of two to four inches of crushed stone, allows water to pass through. Another layer of geotextile fabric was then laid on top of the coarse aggregate. An eight-inch thick sand and clay mixture topped the second layer of fabric as the finishing layer. In addition to the basic road repairs, a final mitigation measure was to stabilize the road surface to prevent erosion by placing a layer of lime-rock over the layer of sand and clay.

The mitigation measure was a success. The repaired roads were not affected by subsequent heavy rain incidents, including Hurricanes Ivan and Dennis. The project was funded under the Public Assistance program, and totaled $91,252.00. Losses avoided from Ivan and Dennis are estimated at $182,504.00.



Quick Facts

Year:
1998

Sector:
Public

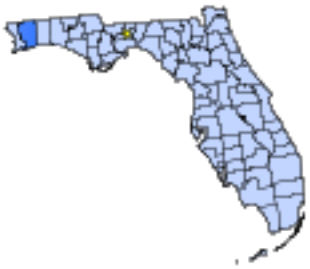
Cost:
$91,252.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Precautionary Measures Save Home from Hurricane Damage



Santa Rosa County, Florida

Pensacola, FL - Tom and Jennie Smith of Gulf Breeze, Florida, do not park their cars in an ordinary garage. The couple has to weave their cars between pilings that support the house above. The tops of the concrete pilings are 5 feet 1 inch above Florida coastal building code requirements. The extra height saved the home from costly damages when Hurricane Ivan struck the Gulf Coast in September 2004. The Smiths built their house overlooking Pensacola Bay.

Because of its proximity to the coast, the house must adhere to building codes enacted to make coastal construction more resistant to the winds and storm surge of hurricanes.

The house is located in a VE-zone, as designated by the National Flood Insurance Program. A VE-zone is one of the Special Flood Hazard Areas with a determined base flood elevation in a V-zone, which are coastal areas that include the additional hazard associated with storm-induced velocity wave action. According to Florida building code for construction in flood hazard areas subject to high-velocity wave action, the elevation of the lowest horizontal structural member must be at or above the Base Flood Elevation (BFE). The BFE is the average floodwater depth for a 100-year flood event. The Smiths chose to elevate their home more than five feet higher than the BFE.

Hurricane Ivan's 12-foot storm surge flowed just below the floor joists, damaging the elevator shaft and stairway, but it did not flood the main floor of the Smiths' home. The surge tore away the Smiths' front steps and breakaway walls surrounding the parking area under the house. Both of these elements were designed to break away from the house in order to lessen the damage to the main structure. Ivan also caused minor damage to the windward roof fascia.

Additional measures helped the Smiths' house withstand the destructive winds and waters of Ivan. Hurricane anchors add extra strength to structural connections from the roof to the wall to the concrete pilings or foundation. Every window on the Gulf-side of the house has roll-down metal shutters. In the event of a hurricane warning, the windows on the front of the house can be covered with aluminum panels and bolted in place. The windows and shutters are rated to meet coastal construction requirements. Elevating their house to more than five feet above the BFE cost the Smiths $10,000, but they estimate the precautionary measures incorporated into the structure prevented a loss of $350,000 from Ivan. The retrofitted house is less than five years old and has already withstood two destructive hurricanes.

Quick Facts

Year:
2004

Sector:
Private

Cost:
$10,000.00 (Actual)

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

Safe and Sound Above the Storm Surge

Santa Rosa County, Florida

Pensacola, FL - When Hurricane Ivan struck Florida's Panhandle in September 2004 with 130-mph winds and storm surge of more than 13 feet, many bayside homes in Milton sustained substantial damage, but the home of Pat and David Rosser was relatively unharmed.

The Rossers' home is located in a V-Zone within a Special Flood Hazard Area, as designated by the National Flood Insurance Program. V-Zones are coastal areas subject to the additional hazard associated with storm-induced velocity wave action. The house was built on wood pilings and installed with hurricane-resistant windows, doors, and shutters. The bottom of the main floor beams were elevated to 12 feet 6 inches above mean sea level, which is 18 inches above the Base Flood Elevation (BFE), the average floodwater depth for a flood event that has an estimated one percent chance of occurring during any given year.

The Rossers evacuated during the storm and returned to find their home high and dry, although their property was littered with debris. Ivan's storm surge had rushed through walls and windows, carrying away household belongings. The area beneath the Rossers' house was crammed with a variety of debris, such as clothing, television sets, and chairs, and two boats had landed in their front yard.

The wooden deck, designed to break away, was gone. Most of the breakaway lattice enclosing the five-foot crawl space below the house was also dismantled by storm surge. Storm surge knocked out the doors of their detached garage. Several beloved oak trees were uprooted and toppled in the front yard, but the house itself remained dry and livable.

The Rossers made a wise decision to build their home to exceed code requirements. Elevating the house to 18 inches above the BFE prevented it from being destroyed by the forceful storm surge. The wave action had pushed through the space under the house, but none of the first-floor contents were touched by the water. "It would have cost us at least $175,000 to make the repairs had our home flooded," said Pat Rosser. The Rossers estimated that the shutters and hurricane-resistant windows and doors added $17,000 to the construction costs, but they feel that the protection against wind, rain, and flying debris was well worth it.

In a neighborhood devastated by Hurricane Ivan, the Rossers' house was one of only a few livable houses left standing, and they offered it as shelter to neighbors who could not stay in their own homes. Pat Rosser spoke of how she and her husband fed volunteers and neighbors during clean-up after the hurricane: "We and another house down the street became the only ones with normalcy. We made sandwiches for everyone, had potluck dinners here and fed 23 people at a time for about two weeks."

When Hurricane Dennis hit in August 2005, the only damage to the house was from wind, which loosened some courses of vinyl siding. This storm proved again that the extra effort put into the construction of the Rossers' house was worth it.

Quick Facts

Sector:
Private

Cost:
$17,000.00 (Actual)

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

FEMA

Shoppers Learn Stronger Building Techniques

State-wide, Florida

Pensacola, FL - Pensacola residents who purchased tools at a home improvement store also had an opportunity to learn how to make their homes stronger. The area was hit by two hurricanes, Ivan and Dennis, in less than a year.

Technical experts visited with shoppers at Lowe's and Home Depot stores in the Florida Panhandle within a month after Hurricane Dennis came ashore. These specialists in hazard mitigation promoted steps people could take to eliminate or reduce damage from future disasters. The Mitigation Assistance Clinics are one of the ways the Florida State Emergency Response Team (SERT) and the Federal Emergency Management Agency (FEMA) responded to assist people affected by the disaster.

Mitigation specialists discussed recovery and rebuilding issues over a table full of literature, which described how to clean up mold and mildew, elevate a home to avoid damages from flooding and storm surge, purchase flood insurance, and build a safe room. The publications also outline construction techniques for strengthening windows, doors, and roofs against wind. Many of these mitigation measures may make homeowners eligible for significant savings when they purchase insurance to protect their homes.

Michael Guin, manager of the Pensacola Lowe's on Airport Boulevard, says offering information on smart rebuilding techniques in a place where people buy building supplies is a win-win situation. "We want to give our community whatever will be helpful to them to build stronger. Having FEMA experts set up here provides a place for an information exchange."

"Since our teams are placed in a friendly atmosphere of a retail store amidst shoppers, people may feel more comfortable about asking what disaster assistance FEMA offers," said Jay Michaud, FEMA mitigation outreach coordinator.

Guin feels that the clinics are an excellent fit for the Pensacola area. "We are going to keep having hurricanes and we're in an area of tourism and military bases with people living here that have not experienced living in a coastal community before. They don't know how to prepare for a hurricane or flooding. And the more preparation people have, the better off they will be."

Before simply distributing brochures on the National Flood Insurance Program (NFIP), the mitigation teams offered some surprising statistics to grab shoppers' attention: "Did you know that buildings located in areas at high risk of flooding have a 26 percent chance of experiencing a flood during the life of a 30-year mortgage, compared to a four percent chance of fire?" and "You don't have to live in a floodplain to experience flooding – 25 to 30 percent of all flood losses occur in low- to moderate-risk zones."

The Mitigation Assistance Clinics are part of a long-term recovery effort that helps people protect their homes and communities. Teams visited Lowe's and Home Depot home improvement stores at 14 locations in the Florida Panhandle over eight weeks. They counseled 5,312 people about disaster assistance and mitigation techniques.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
State sources

Electrical Retrofit Aids in Hurricane Response

Escambia County, Florida

Pensacola, FL - During a major power outage, valuable time is saved through the ability to plug in a generator without having to hotwire it into an electrical panel. This is especially important when quickly connecting power will prevent damage to homes from sewer backup.

Over the course of four years, the Pensacola-based Emerald Coast Utilities Authority (ECUA) has been retrofitting its sanitary sewer lift stations with electrical connections for portable generators. So far, 300 of the 332 lift stations have been retrofitted. ECUA plans to retrofit the remaining lift stations within the next year.

Because the retrofit helps reduce damages during a disaster, a portion of the cost of the project was eligible for a grant provided by the Department of Homeland Security's Federal Emergency Management Agency, under the Hazard Mitigation Grant Program (HMGP) managed by the Florida Department of Community Affairs. The HMGP grant funded the retrofitting of 41 lift stations with a transfer switch and an electrical receptacle connection, along with the flood-proofing of 26 electrical panels located in low-lying areas. The rest was funded by ECUA.

William Ellis, Utility Maintenance Manager for ECUA, estimates that power outages lasting 24 hours at just one lift station can result in a sewer backup costing up to $5,000 in damages.

Lift stations pump waste from lower to higher elevations for eventual delivery into a wastewater treatment plant. When there is a loss of power, these lift stations stop working. The sewer lines intended to carry sewage away from homes to the lift station may instead cause a backup of effluents into homes. Residents returning to hurricane-damaged or flooded homes will then find an additional, and possibly contaminated, mess to cleanup.

In the past, ECUA workers responded to power outages by using portable pumps loaded onto trucks to bypass lift station pumps, or rewired the lift station electric panels to connect portable generators. To streamline the process, ECUA electricians placed power cable connector receptacles (plug-ins for the generators) on the above-ground electrical systems. They installed transfer switches to make it easy to transfer power from the power company line to the portable generator. In the event of a power failure, ECUA workers can now operate a generator without having to rewire the electrical panels. Likewise, they can unplug and transfer a generator to another lift station in need of power.

"If you get the generator in there quick enough, you can do it before the tank fills in the lift station and it's business as usual," said Utility Equipment Supervisor Wayne Lister.

Quick Facts

Year:
2000

Sector:
Public

Cost:
$100,043.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Habitat Houses Stand Against Hurricanes

Multiple Counties, Florida

Pensacola, FL - Approximately 400 homes located in Escambia and Santa Rosa Counties are models for hurricane-resistant construction. These affordable, energy-efficient houses built by Pensacola Habitat for Humanity (PHFH) withstood two hurricanes in less than a year. PHFH is a non-profit Christian organization serving Santa Rosa and Escambia Counties. The organization raises money so that low-income families may own their own home. The homeowners and community volunteers build the houses under trained supervision.

“We heard from many homeowners that they were afraid to come back to their houses to see the damages from Hurricane Ivan,” said PHFH Development Director Don Parmely. “But on their return they found their homes had survived with very little damage while many others nearby were badly damaged." Most mortgages for the Habitat houses average $320 per month. The houses are affordable because the organization depends on many volunteers to build them. More than 5,200 volunteers helped construct 40 houses in the two counties in 2004, under the supervision of volunteer building professionals. The volunteer labor does not diminish the quality or strength of construction, as Hurricanes Ivan and Dennis proved. PHFH builds homes that are in compliance with current building code requirements.

By designing the homes to meet the organization’s goals of energy efficiency and low maintenance, PHFH created structures that are more resistant to hurricane damage, according to Construction Supervisor James Salter. The building plans do not include garages. “There’s no garage door to be blown in, allowing winds to blow out the roof and cause major damage,” explained Salter. Every house is constructed on a concrete slab foundation. The construction uses either “Go-Bolts” or slab tie-downs to firmly anchor the structure to the foundation. Hurricane clips, metal connectors with a minimum of six nails, attach rafters to walls. Double-pane, high-impact windows help reduce energy costs and are rated to withstand 150 mph winds. Every shingle is anchored with six nails per shingle.

When Ivan struck the Gulf Coast, only 50 of 390 houses built by PHFH sustained minor wind damage, such as lost shingles, and only two were substantially damaged. A tree fell on one house, and wind-blown debris from neighboring houses crashed into the second. A housing shortage created by the hurricanes and the publicity surrounding the strength of the Habitat-built houses has generated an increased interest in PHFH housing. More than 150 people attended a Habitat information session held one month after Dennis struck; it was the largest attendance to date. Building techniques that protect houses from hurricane damage do not have to be costly. The majority of Habitat homeowners saved the expense of major repairs that other homeowners in the area suffered. These families were able to remain in their homes after the hurricanes, while their neighbors had to seek housing in shelters, hotels, or with families and friends.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

Acquisition & Relocation Project Protects Riverside Community

Aroostook County, Maine

Fort Fairfield, ME – The spring of 2005 witnessed a massive ice jam and flooding on the Aroostook River in northern Maine. This time, the residents of Fort Fairfield remained high and dry; in the past, they had to flee their homes and wait anxiously for the water to recede. The business district also escaped the recent flood.

“This event (2005) was of longer duration than any in recorded history,” said Tony Levesque, Fort Fairfield’s community development director and code enforcement officer. “We closed some roads and the bridge several times and water in some driveways limited the access to the homes...but there was no property damage to homes or the business district,” Levesque noted.

The community withstood the event thanks to extensive flood mitigation measures adopted by the Town of Fairfield over the past 10 years. The town government led the initiative, with the help of the Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers (USACE), and several local, non-profit, state, and federal agencies.

Funding came from a variety of sources including the FEMA Hazard Mitigation Grant Program (HMGP), Community Development Block Grants from the U.S. Department of Housing and Urban Development, state and local sources, and a grant from the Aroostook Band of the Micmac Tribe.

A flood warning system enhanced the town’s preparedness. It was developed in cooperation with the National Weather Service and local power companies. The system alerted local officials to dangerous situations within minutes and warned the community quickly.

The Aroostook River is near the Canadian border in northern Maine. In a typical winter, the river is blanketed with snow and can be frozen two feet thick or more for months. Periodically, the region experiences a warm spell. When the temperature rises above freezing, the ice begins to break up and jams form. Ice jams, rain, and melting ice and snow create a serious flood hazard. In the past, homes and businesses flooded, residents fled their homes, and there were daring rescues, including one in which people were evacuated in the bucket of a front-end loader. This destructive jam-and-flood scenario occurred six times from 1988 to 1994.

The Aroostook River, clogged by an ice jam and unable to accommodate runoff from unseasonably warm weather and heavy rain, overflowed its banks in 1993. A federal disaster declaration resulted, prompting local officials to seek a solution to stop this destructive cycle. In 1994, an ice jam and flooding event again resulted in a federal disaster declaration. The town responded by developing a two-pronged attack on the problem. First, local officials resolved to develop a project aimed at acquiring or relocating 46 homes near the river that were continually at risk of flooding. The project was awarded funding under the HMGP. The second solution was to build a dike to protect vulnerable sections of the business district.

Quick Facts

Year:
1994

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Concrete House Stands up to Katrina

Harrison County, Mississippi

Pass Christian, MS - The Sundbergs had been building their fully-mitigated home for eight years, and it was 85 percent complete, when Hurricane Katrina slammed into their area on August 29, 2005, with a huge storm surge and reported sustained winds of 125 mph. The water reached an elevation of 28 feet. The winds died down and the water retreated to the Gulf of Mexico, revealing that the Sundbergs' home had survived the storm.

"This is where our heart is," said Scott Sundberg. When building his home, called "Shadowlawn," he utilized his experience with structural physics and design. When they recover from the latest storm, Scott and his wife Caroline will be re-energized in an effort to finish building their home before the next one strikes.

Before breaking ground, Sundberg did his homework. He studied the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs) for his community to locate where his property is in the flood zone. He studied Florida Building Codes and the storm history of the area, and visited abandoned home sites where scars of Hurricane Camille were visible. The information from Sundberg's research motivated them to build their home to withstand severe storms.

The Sundbergs' house has spread footings, with concrete members to distribute the load to the soil, and a 4-foot-high beam- wall and a beam-wall down the center. There is connectivity through the house from the roof down to the third floor, on to the second floor, and then to the carport. The house is also built to 'perform elastically' and to withstand winds of between180 and 200 mph. The bottom of the beam of the first floor living space is 25.4 feet above sea level.

When Hurricane Katrina hit the Gulf Coast of Mississippi, the Sundbergs' home was still under construction. The windows that were installed were vinyl gliders which are not hurricane resistant. The few windows that blew out will be replaced and hurricane shutters installed as planned, adding another safety measure to the home.

Sundberg stated that "as compliance increases, damage is less." He is following the improved codes put into place in the mid-1990s in Florida following Hurricane Andrew's damage to the Homestead area in 1992.

When they visited their new home after Katrina, Sundberg looked for cracking, spawling, and displacement. He was relieved to find no signs that the structural integrity of the home was compromised. "Using concrete adds about 10 to 15 percent above the cost of conventional construction," stated Sundberg. In this case, it proved to be a wise investment since using conventional methods of building may have led to greater losses.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

Hurricane Mitigation Protects Plaquemines Parish Home

Plaquemines Parish, Louisiana

Myrtle Grove, LA - Watching the television coverage of Hurricane Katrina from their son's home in Texas, Gayle and Warren Lawrence expected their home in Louisiana to be destroyed when they returned. The Lawrence home is in Plaquemines Parish. This southernmost Louisiana parish is bounded by the Gulf of Mexico on three sides, and the Mississippi River runs through the middle. Waterways, marine life, and fishing and hunting grounds are plentiful.

There are perils associated with the outdoor lifestyle in Plaquemines Parish. High winds and high water are commonplace, and the area is very prone to hurricane activity. The Lawrences knew that to live safely and securely in this high risk area, they would need a well-built home with wind and flood protection. Hurricanes Katrina and Rita tested their home to its limits.

Myrtle Grove Marina Estates, the subdivision where the Lawrences reside, provides homeowners with bylaws recommending coastal construction principles. By following these recommendations and incorporating a few extra hurricane resistance techniques, Mr. and Mrs. Lawrence afforded themselves added protection. To guard against floodwater and moisture, and in accordance with local requirements, several feet of fill were brought in, thereby raising the ground level. The house was then elevated on concrete walls another 12 feet, putting the home 4 feet above local building requirements. Composite concrete board, a type of wall covering that will not warp or soften when exposed to moisture, was installed in place of the more commonly used drywall.

To provide superior wind and impact resistance, a 7-inch thick concrete wall reinforced with 5/8-inch steel rebar was poured at the ground level. Walls in the living area were upgraded using 6-inch studs, instead of the standard 4-inch, to provide extra strength. Storm shutters were installed to protect the doors and windows throughout most of the home. The points connecting the walls with the roof and foundation are prone to failure during high winds. Mr. Lawrence added metal clip anchors to foundation and roof joints. In this two-story home, the upper story wall framing was firmly connected to the lower framing.

Shortly after Hurricane Katrina, the Lawrences surveyed the damage. Gayle Lawrence's first thought as they approached their home was "at least it's still standing." The couple was pleased to discover as they got closer that there was actually very little damage at all. Building to coastal construction recommendations and exceeding the minimum local building code requirements cost the Lawrences more money than standard construction methods, but they strongly feel that the investment was worth it.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Erosion Control Project Protects Historic West Jonesport Cemetery

Washington County, Maine

Jonesport, ME – The coastal Town of Jonesport, Maine, offers a spectacular water view and maritime activities such as fishing and pleasure boating. The scene is picturesque on a clear summer day, but the shoreline is vulnerable to severe erosion during coastal storms. Waves generated during storms persistently wore away the embankment at the historic West Jonesport Cemetery since a storm destroyed the tamarack-log rip-rap installed in 1976.

Over the past several years, a 350-foot section of shore frontage at the historic cemetery has been steadily eaten away. The erosion threatened the graves, some of which date back to the first half of the 19th century. The erosion also undermined the embankment along a public parking lot on West Main Street, which posed a threat to the safety of travelers along the scenic Route 187 loop. West Jonesport Cemetery is one of four cemeteries maintained by the town. Many residents have relatives buried there. According to David Garcelon, district conservationist with the Natural Resource Conservation Service, “Site inspection found critically eroding slope due to tidal and wave action at the base of the bank…slope is mostly bare soil at the 1:1 or steeper grade, 10 to 12 feet high, and extends approximately 250 to 300 feet along the cemetery and adjacent parking lot.”

The solution seemed relatively simple: stabilize the embankment and install rip-rap that would withstand the punishing wind and waves. However, there were complicating factors, such as how to gain access to the hillside to install the rip-rap and restore the beach and, of course, how to pay for the work. The first problem was solved when the owner of the adjacent property to the west allowed workers to use his land, and even tore down a building to facilitate access to the cemetery site. The town agreed to stabilize the area used for equipment access.

Selectwoman Gloria Feeney began searching for funding sources in 1997. She communicated with at least 10 non-profit and government agencies, including the Maine Emergency Management Agency (MEMA). MEMA applied to the Federal Emergency Management Agency’s (FEMA) Hazard Mitigation Grant Program on behalf of the West Jonesport Cemetery, and was awarded funding for the erosion control project.

Construction began in July 2000 and was finished the following month. The rehabilitation included lining the bank with filter fabric, adding some 2,500 cubic yards of gravel, and installing 5,000 cubic yards of granite rip-rap to stop the erosion and protect the beach. Following a recommendation from the Washington County Soil and Water District, about 100 rugosa roses, about $800 worth, were planted in two parallel rows among the slabs of rip-rap. As they grow, the roses’ root systems will help stabilize the embankment. FEMA contributed $39,203 to the project, which totaled $52,271. The town’s share was $13,067. According to Feeney, nature regularly tests the effectiveness of the erosion control project. “We get several storms each year, mainly in the winter, but the project has stood the test,” she said.

Quick Facts

Year:
1998

Sector:
Public

Cost:
$52,271.00 (Actual)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

New Orleans TV Station Designs for Worst-Case Scenario

Jefferson Parish, Louisiana

Gretna, LA – WWL-TV is a dominant force in the southeast Louisiana area broadcasting industry and is the recipient of several prestigious awards. During Hurricane Katrina, they overcame tremendous challenges and enhanced their reputation by broadcasting continuously and providing communities with ongoing disaster news coverage. No other New Orleans TV station was able to provide non-stop reporting during the hurricane and its aftermath.

The WWL-TV transmitting facility and the adjacent TV tower are located on Cooper Road in Gretna, Louisiana, on the West Bank. Approximately five years ago, Rick Barber, Director of Technology at WWL-TV, owned by Belo Corporation, consulted the Army Corps of Engineers for advice on incorporating protection from potentially catastrophic storm surges into the design of their new transmitter facility and tower. The station took that advice and hired a structural engineering firm known for its ability to design on Louisiana soil, which is 67% water.

Katrina tested the hurricane-resistant building with winds of more than 120 mph. The design proved its worth as the 4,400 square foot, windowless building and tower went unscathed. Ron Rentfrow, the owner of Broadcast Construction Service, the company that built the facility, says the station was built 16 feet above the ground (higher than local code requirements) with an additional 18-inch space to run cables and drain any collection of storm water. The emergency generator and a 10,000 gallon fuel reserve tank also were elevated, and the structure was built with cast-in-place steel reinforced concrete set on 80-foot deep pilings. The pre-cast, eight-inch thick, steel-reinforced concrete walls with metal connectors were trucked in from Mississippi and welded together. Mr. Rentfrow states that “The building was as strong as you could practically build.”

The 1,000-foot tower adjacent to the transmitter site was built to withstand 180 mph winds. Even though the property is actually outside of a Special Flood Hazard Area (SFHA), the parish requires all structures to be engineered as if located within an SFHA. In order to ensure the efficient operation of its emergency equipment, the station runs weekly testing of the generator and its system under emergency conditions.

During the mandatory evacuation preceding Katrina, the studio staff set up a temporary base of operations in Baton Rouge and sent its signal to the transmitter via two satellite links. Mr. Rentfrow described the French Quarter facility as an old building and explained, “We had begun to design a new studio nearby. When Katrina hit, our corporate partners stopped the process and re-evaluated. I won’t be surprised to see elevation and other hurricane resistant measures incorporated into the new studio because this catastrophic event will happen again.”

Photo Caption 1: Transmitter facility and tower for WWL-TV. Photo Caption 2: Transmitter station and TV tower. Photos courtesy of Rick Barber, Director of Technology at WWL-TV.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Business Owner

Brook Road Culvert Replacement Protects Vital Transportation Link

Cumberland County, Maine

Falmouth, ME – Two major storms, Hurricane Bob in 1991 and a severe storm in 1996, damaged significant parts of Brook Road in Falmouth, Maine. The damage totaled approximately $300,000 and $19,297 respectively, and forced officials to close the road to traffic anytime heavy rains caused water to flow over the roadway. Bisecting Falmouth, Brook Road carries an estimated 3,500 vehicles each day between West Falmouth and Westbrook to Route 302 and serves as a vital transportation link connecting the Maine Turnpike to Interstate 295.

“The road was flooded out and closed twice. It is a major traffic connector. A lot of commuter and regular traffic use the road. It was a serious situation and absolutely had to be corrected,” said Public Works Director Tony Hayes. After Hurricane Bob, the town began tracking vulnerable roads within its 88-mile road system.

Meander Brook flowed under Brook Road, following a deep ravine on its way to the Presumpscot River. The brook passed through a 54-inch corrugated metal pipe, down to a four- by six-foot granite stone box, leading finally to a 60-inch metal pipe. Six to seven feet of cover material served as the base for the paved road. Public Works engineers determined that the culvert was undersized and caused a pool of water about 25 feet deep to form on the upstream side of the road during heavy rains. The water often overtopped the roadway and flowed down the road where it undermined a 100-year-old barn. The pond caused by the restricted flow created a real danger: the dam formed by the road could wash out, and motorists attempting to drive through the water would be swept into the ravine. To prevent this from happening, the town had to barricade the road during storms.

Following a severe storm in October 1999, a total of $1,192,193 from the U.S. Department of Housing and Urban Development and administered by FEMA Region I was set aside for five mitigation projects, including Brook Road. These projects were selected from Maine’s Hazard Mitigation Grant Program (HMGP) proposals for which HMGP money was not available. As with FEMA HMGP projects, funding for Brook Road was based on a Federal share of 75 percent, with the Town of Falmouth providing the remaining 25 percent of the project costs.

The project included excavating the ravine on Brook Road and replacing undersized culverts with a 90-inch high-density polyethylene pipe. This pipe was transported to the site in three 40-foot sections. With the new pipes laid end to end, crews joined them on-site with an extrusion weld to form a single unit. A clay base and fill prevents stream infiltration and scouring around the pipe. Concrete headwalls were also installed. Lastly, the fill was added, enabling the road to be widened to allow for a shoulder, guard rails, and a slope.

The spring of 2005 brought another severe storm and flooding, which resulted in a major disaster declaration for the State of Maine. The Brook Road mitigation project performed as designed and the roadway suffered no damage.

Quick Facts

Year:
1999

Sector:
Public

Cost:
$144,627.00 (Actual)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Other Federal Agencies (OFA)

FEMA

Safe & Secure Building Allows Hospital Staff to Do Their Job

Saint Tammany Parish, Louisiana

Lacombe, LA - As Category Five Hurricane Katrina approached the southeast Louisiana coastline, the Louisiana Heart Hospital (LHH) prepared for the worst. During Katrina's approach, the hospital accepted transfer patients from area hospitals located on low-lying ground. Devoted hospital staff cared for more than double its normal patient load. The hospital never lost power or water supply and sustained only minor roof damage. It also provided housing, meals, meeting rooms, and medical care to law enforcement and response teams in the days following Katrina.

Prudent decision making during the design and construction of the facility contributed to the ability of the hospital to withstand Hurricane Katrina. Opened in February 2003, the hospital is a 58-bed, specialty care facility. The non-flood zone property was selected for its convenient location between Covington and Slidell, above the storm surge projection.

A wetland survey revealed the need for extensive site preparation which included the placement of more than $1 million worth of sand to compress the swamp-like soil. Safety measures included installing impact-resistant windows that meet the missile impact test created for hurricane prone areas by Miami Dade County, Florida. These reinforced windows are designed to sustain the force of winds of 130 to 140 mph. According to Wynn Searle of Medcath, Inc., "measures were taken to attach the roof membrane to meet a certain 'wind uplift requirement' (determined by their insurance company and testing lab) to preclude uplift from significant wind storms." Clearly the minimal damage sustained by the hospital demonstrates their cost effectiveness.

The hospital's two large generators engaged when electrical power failed. Additional diesel fuel was ordered as the storm approached, enabling the hospital to run the air-conditioning units and continue dialysis treatments, cardiac catheterization lab procedures, and surgeries. The protocol for back-up diesel fuel now has been addressed and cylinders have been purchased to hold an additional 1,800 gallons of fuel on site.

Problems with the hospital information technology system prevented outside communication during the hurricane. According to Michelle Hays, CFO and Acting CEO of the hospital, "there were no land lines, no cell phones, no email, no form of communication with the outside world." To prevent future interruptions, LHH has purchased additional equipment for better communication.

Clearly, the mitigation measures LHH took to reinforce their building benefited patients, staff, and the surrounding communities. According to Ms. Hays, "No one expected this hospital to play the role that it did during this disaster event."

Photo Caption 1: Four cylinders used for extra diesel fuel located behind the hospital. Photo Caption 2: Louisiana Heart Hospital, Lacombe, LA. Photos courtesy of Michael Schuler.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Private funds

FEMA

Strong Building Code Protects Louisiana Town

Saint Tammany Parish, Louisiana

Mandeville, LA Mr. Berggren is the building inspector and floodplain manager for this small community on the other side of Lake Ponchatrain across from New Orleans. Wayne is happy because his city fared reasonably well during the Hurricane Katrina disaster – partially due to their stringent building regulations that promote proper flood mitigation.

Mandeville has been a member of the National Flood Insurance Program (NFIP) since 1979. Not only does this program provide residents with an opportunity to protect themselves from financial loss during flooding, but it also required that Mandeville raise its building standards to reduce the flood risk in their town. These standards state that all new construction must be built at or above the Base Flood Elevation (BFE) shown on the city's flood maps. The BFE represents the average floodwater elevation for a 100-year flood event, meaning that floors of buildings constructed to this standard will sit above the floodwater and avoid damage during all but the most severe flood events.

Some historical construction in town has also been preserved by these strict building regulations. When a home or business owner located in the regulatory floodplain wishes to make improvements to their building, and the cost of that improvement is more than 50 percent of the current value of the structure, this is called a "substantial improvement." When a substantial improvement is made to a building, the building owner is required to comply with the building code as though constructing a new building. The owner must elevate the structure to the current standard of one foot above BFE. The higher standard does add to the cost of the work, but, in the long-term, it's in the best interest of the community because the effort will protect that building during a future flood event.

Mandeville's mitigation efforts proved their worth during Hurricane Katrina. This storm was the first real test of the city's floodplain building standards. Along Lakeshore Drive, virtually every elevated home suffered little or no flood damage. The homes that were not elevated were substantially damaged. Some are completely gone.

There is help for those who have suffered substantial flood damage and, as a result, are required to elevate their homes. This help comes in the form of the Increased Cost of Compliance (ICC) coverage, part of the Standard Flood Insurance Policy. If community officials determine the home has been substantially damaged by flood, and the home is located within a Special Flood Hazard Area, the owner may qualify to receive up to $30,000 in addition to their regular flood insurance claim to help bring their home into compliance when rebuilding through the ICC coverage option. Since many of the homes in Mandeville that were not elevated suffered substantial damage during Katrina, many residents who had flood insurance will have the chance to take advantage of ICC coverage for the first time. Homes that receive a claim for the maximum statutory limit of $250,000 are not eligible for the ICC benefit.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

Fire Fighter Protects Family By Building Safe Room

Autauga County, Alabama

Autauga County, AL - After seeing the destruction of his parents' home, an Autauga County fire fighter has decided that it is up to him to keep himself and his family safe from storms.

Robert Van Valkenburg, 52, decided to look into building a tornado safe room for his home after his parents' home was destroyed by a tornado spawned by Hurricane Andrew. "I grew up in that house and it was lost during Hurricane Andrew, so I take this stuff very seriously," says Van Valkenburg. He adds, "When it impacts your family, and you see how it affects them, you take it seriously and say 'Well if it could happen to my mom and dad, it could happen to me.'" Van Valkenburg started the process of building his safe room in 2001. He called his local emergency manager and enrolled in the Alabama safe room program sponsored by The Federal Emergency Management Agency (FEMA) and the Alabama Emergency Management Agency. Actual construction of the safe room took place over eight months in 2002. FEMA paid 75% of the cost to build it or $3500 through its Hazard Mitigation Grant Program (HMGP). "My local emergency managers came out to look at the safe room while it was under construction and took pictures. I had to show an itemized break down of everything, and show the cost to substantiate what I paid for it. Then they gave me the money," Van Valkenburg stated. He also spent more of his own money to add a second entry way to the room, in the event the other entry is blocked, a drainage system and a generator in the back of his house that kicks in if there is a loss of power.

The safe room got its first test the following spring. Van Valkenburg, his wife, two children, and three dogs stayed in it when a storm system came through and a tornado touched down in the area. "We heard the sirens and went down there in the middle of the night," says Van Valkenburg "I have my pager from the fire department, and when it goes off I know we have severe weather coming into Autauga County. If they say tornado warning we go there." His family also took shelter in it during Hurricanes Ivan and Dennis.

The safe room is 11-by-12 feet and sits ten feet below the ground under a new wing that Van Valkenburg built onto his house for his elderly father-in-law. It is built to be a natural extension of the house. "I knew because of my wife being claustrophobic, I had to design it where it looked like a room or she wouldn't go into it," he said. The room is made of reinforced concrete and has steel doors that lock from the inside. Van Valkenburg has also equipped it with a big, sturdy bed, battery powered televisions, water, non-perishable foods, a first aid kit, power tools and the negatives to all family photos.

"We can come out of there and we can start life again, said Van Valkenburg. "That's what it is all about, coming out of the safe room and being able to live."

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Schoharie Relocation Project
Flood Damage Avoided

Schoharie County, New York

Gilboa, New York – A major relocation of households, structures and a road in the Town of Gilboa is credited with avoiding subsequent flood damage, even during the early-April storms this year that led to Schoharie County's inclusion in a federal disaster declaration.

Following a disaster in January 1996, the town embarked on a $1.5 million project, aided by federal and state funding, to take people and facilities out of harm's way in a perennial flooding area located in the Schoharie Creek floodplain. Several houses along Stryker Road that had been damaged in the 1996 flooding were purchased and demolished, an historic church and town hall were relocated to higher ground and the road itself was rerouted out of the floodplain.

Judy Cary, the county's Director of Emergency Management, said the Stryker Road project clearly accomplished its purpose. "Even a heavy spring runoff would flood those areas," she said. "We don't have to worry about them any more."

Major funding for the project came from the Federal Emergency Management Agency (FEMA) through programs administered by the State Emergency Management Office (SEMO) - the Public Assistance Program that helps pay to repair disaster-damaged infrastructure. Funding also came from the Hazard Mitigation Grant Program (HMGP), which assists state and local governments to reduce long-term risk to people and property from natural disasters.

Rather than merely repairing Stryker Road and the buildings on it following the 1996 flooding, the Town of Gilboa decided to relocate the road to higher ground. That required agreement by all property owners to accept a buyout, said Shane Nickle, Senior Planner with the Schoharie County Planning and Development Agency. Some 15 homes were purchased and then demolished and buried on site. A church and the old town hall were moved about half a mile to higher ground, and the road was realigned and rebuilt outside the flood plain.

The HMGP funded approximately $900,000 for the purchase of the homes and the relocation of the town hall and church. The $600,000 road reconstruction was funded through the Public Assistance Program. The federal share of the total project was about $1.1 million. The remainder was paid with local resources and state reimbursement through Clean Water/Clean Air Bond Act funds.

"In April 2005, flood waters once again went over old Stryker Road," Nickle said. "There is no doubt that the original Stryker Road and some of the homes would have been damaged had the 1996 project not occurred."

Quick Facts

Sector:
Public/Private Partnership

Cost:
$1,500,000.00 (Actual)

Primary Activity/Project:
Relocation

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Hamlet Protected From Flooding

Delaware County, New York

De Lancey, NY - A perennial problem in a rural hamlet in Delaware County worsened dangerously in 1996 when severe storms and flooding overwhelmed a creek and diverted its flow into the hamlet of DeLancey, damaging nearly every home in the community.

However, taking advantage of the New York State Emergency Management Office and Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), DeLancey has been spared a repetition of the damage those storms brought in spite of severe weather in the intervening years, said Town of Hamden Supervisor Wayne Marshfield.

At the request of Governor George E. Pataki, the President signed a major disaster declaration as a result of the 1996 flooding, triggering federal and state disaster funds for 41 counties in New York State, including Delaware.

“We had a tremendous flood. Part of the embankment of Bagley Brook slid away, forcing the brook into the hamlet and causing damage to nearly everyone there, about 65 homes,” Supervisor Marshfield recalled. “Every time something happens – every time a major flooding event comes along – it isolates that community. Nobody could get to them and they couldn’t get out.”

The HMGP provides assistance to state and local governments to implement long-term measures that reduce the loss of life and property due to natural disasters, and to initiate those measures immediately following an event.

“Mitigation activities such as these are a smart way of doing business by expending monies now to lessen the threat on communities before an event occurs in the future,” said SEMO Director James W. Tuffey.

In the Town of Hamden, a stream stabilization project was undertaken on Bagley Brook. Gravel deposits were removed, the stream channel was restored and straightened and stone riprap was installed to control erosion. The project was completed in 1999 at a total cost of about $48,000, of which the federal share was about $36,000.

The region has seen several disasters since then, including storms that would almost certainly have eroded the stream bank again, but DeLancey has come through them without severe problems, said Supervisor Marshfield.

FEMA prepares the nation for all hazards and manages federal response and recovery efforts following any national incident. FEMA also initiates mitigation activities, trains first responders, works with state and local emergency managers, and manages the National Flood Insurance Program and the U.S. Fire Administration.

Quick Facts

Sector:
Public

Cost:
$48,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Highway Repairs Are Stronger Designed to Avoid Future Damage

Sullivan County, New York

Albany, NY - Repairs to town highways damaged when Tropical Depression Ivan pounded Sullivan County during September 2004, have been designed to make the roads better able to absorb severe weather in the future.

Heavy rains during the storm caused flooding that washed out roads, eroded shoulders and compromised ditches in the Salak subdivision in the Town of Lumberland. The approved repair project looked beyond restoration to avoiding future destruction.

President Bush declared Sullivan County and 13 other New York counties major disaster areas as a result of Tropical Depression Ivan. Among the recovery programs activated by the declaration was the Public Assistance Program. This program reimburses eligible government jurisdictions and certain non profits for costs for debris removal, emergency protective measures and the repair or restoration of damaged public infrastructure.

The Federal Emergency Management Agency (FEMA) provides 75 percent of the grant funding. The 25 percent non-federal share is made up from state and local funding. The New York State Emergency Management Office (SEMO) administers the program.

In most cases, public assistance repair and restoration funding brings the damaged infrastructure back to pre-disaster conditions. However, a major FEMA and SEMO policy goal is to mitigate, where it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damage. A little extra money spent now may save untold funds later.

Part of the reason for the Town of Lumberland road damage was that culverts, designed to channel water under the roads, were too small to handle the flooding. The water flow overwhelmed the culverts, causing water to run over the road and scour out the road surfaces. The mitigation solution was to put in larger culverts – three 15-inch pipes and two 18-inch pipes. The extra mitigation feature work amounted to about $10,000 of the total $135,000 cost, with the federal share at about $101,000.

“Our goal, by spending the funds to mitigate this situation, is to avoid costs of $100,000 and more to repave the roads if another flood of these dimensions occurs,” said FEMA Federal Coordinating Officer Marianne C. Jackson.

In all, more than $14 million was obligated under the PA program for Tropical Depression Ivan reimbursements for the State of New York. Of that, about $1.2 million was mitigation funding associated with $9.4 million in projects.

FEMA prepares the nation for all hazards and manages Federal response and recovery efforts following an incident of national significance. FEMA also initiates mitigation activities, trains first responders, works with state and local emergency managers and manages the National Flood Insurance Program and the U.S. Fire Administration. FEMA became part of the U.S. Department of Homeland Security March 1, 2003.

Quick Facts

Sector:
Public

Cost:
$135,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Stream Bank Repairs More Effective Sewer Line Protected

Broome County, New York

Albany, NY – Repairs of a section of a stream bank in the Town of Vestal, damaged by Tropical Depression Ivan last fall, included special measures that have proven to be successful in protecting an adjacent sewer line.

Heavy rainfall during Tropical Depression Ivan washed out a section of the bank along Choconut Creek near a town sewer main, an area described by County Office of Emergency Services Director Michael Aswad as “a continual flash-flooding problem in that part of the county.”

In addition to restoration of the stream bank, the repair project was expanded to provide protection to the sewer line as part of a state-federal program to support mitigation measures that help prevent damage to infrastructure in future disasters. At the request of Governor George E. Pataki, President Bush declared Broome County part of the major disaster area as a result of the tropical depression.

Among the recovery programs activated by the declaration was the Public Assistance Program. This program reimburses eligible government jurisdictions and certain non profits for costs for debris removal, emergency protective measures and the repair or restoration of damaged public infrastructure.

The Federal Emergency Management Agency (FEMA) provides 75 percent of the grant funding. The 25 percent non-federal share is made up from state and local funding. The New York State Emergency Management Office (SEMO) administers the program.

In most cases, Public Assistance repair and restoration funding brings the damaged infrastructure back to pre-disaster conditions. However, a major FEMA and SEMO policy goal is to mitigate, where it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damages. A little extra money spent now may save untold funds later.

Together with restoring the stream bank to its pre-disaster condition, the Choconut Creek project also involved installation of filter fabric and large stone rip rap to protect the sewer line from erosion. The special mitigation work amounted to about $3,400 of the total $42,000 project cost, with the federal share at about $32,000.

“It’s working well,” Town Engineer Gary Campo said of the project. “The rock’s in great shape. We’ve gone through several storms (including the April storms that prompted the current disaster declaration that covers Broome County) without problems.”

“This is a good example of a modest expense today to avoid potentially significant problems and costs in the future,” said FEMA Federal Coordinating Officer Marianne C. Jackson.

FEMA prepares the nation for all hazards and manages federal response and recovery efforts following any national incident. FEMA also initiates mitigation activities, trains first responders, works with state and local emergency managers, and manages the National Flood Insurance Program and the U.S. Fire Administration.

Quick Facts

Sector:
Public

Cost:
$42,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Hurricane Preparedness Plan Company Helps Its Workers

Charlotte County, Florida

Venice, FL – When Rod Hershberger, president and chief operating officer of PGT Industries, tasked his executive team with establishing a mitigation/business contingency plan, his goal was clear … "We will take care of our PGT family, whatever it takes." When Hurricane Charley, a Category 4 hurricane, threatened Western Florida, the management of PGT Industries stepped up and looked after their workers more than most companies would have.

PGT Industries, a leading manufacturer of custom windows, doors and sunrooms, has had an ever-evolving hurricane preparation plan in place since the early part of 2002. It also has a business continuity plan, and an insurance policy that guarantees employees full pay for one year, in case the company is forced to close its doors because of a disaster. "We did a lot of things in advance," says Dave Olmstead, public affairs and code compliance manager. "Every department has a hurricane plan in place." Periodically, work-time drills are scheduled to assure that everyone learns what to do and where to go in the event of a major storm.

Employees also developed a mitigation plan for interfacing with the corporate plan. They participated in many ways, even funding their own readiness. They raised money by conducting bake sales and raffles and selling special parking permits to support their emergency readiness fund. Employees in each department signed up volunteers and established skill category lists so they could match volunteers to specific needs in an emergency situation.

As Charley approached, the hurricane teams reviewed employee rosters checked addresses and phone numbers and prepared to put their plans into action. On Wednesday, August 11, 48 hours before the hurricane hit, the company went on standby. Departments were issued everything they would need to lock down, including batteries and plastic bags to cover computers.

The storm made landfall south of the PGT plant near Port Charlotte on Friday, Aug. 13. PGT managers mapped out locations where employees were most affected and, utilizing the crisis communication plan, coordinated the rapid delivery of assistance. That plan also included full-page newspaper ads telling employees where to go or whom to contact if they had special needs. PGT even had an airplane fly over the area pulling a banner telling employees to call or come to PGT for relief assistance.

Relief efforts by PGT to its employees were comprehensive. They delivered food, water, diapers and medical supplies. Four-hundred generators were delivered to those who were without power. The company also set up a temporary relief center near the plant that served three hot meals a day, provided laundry and show facilities and had staff working to assist with employee needs. On company time, maintenance department workers were assigned to help repair employee homes and office workers formed a team to find homes for those who were displaced.

Although the plant was not directly impacted by the storm, all the planning worked. Employees were served so well they were able to return to work quickly in numbers sufficient for PGT to continue operations only two days after the hurricane.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Private funds

Control Project Stops Flooding
Rensselaer Residents Relax In the Spring

Rensselaer County, New York

Albany, NY - A flood control project completed three years ago in the City of Rensselaer has spared some residents of their traditional spring flooding, even during the early-April storms this year that led to Rensselaer County's inclusion in a federal disaster declaration.

Working together, local, State and Federal agencies solved the perennial flooding problem by using the Hazard Mitigation Grant Program administered by the State Emergency Management Office (SEMO) and funded by the Federal Emergency Management Agency (FEMA).

The grant program assists state and local governments in efforts to reduce or eliminate long-term risk to people and property from natural disasters.

The Rensselaer project involved construction of a flood retention structure that temporarily impounds water from Quackenderry Creek and allows its gradual release. The creek is the primary drainage feature of a watershed that begins in neighboring East Greenbush and North Greenbush, an area that has seen significant development during the previous three decades.

"There used to be severe flooding in that neighborhood called 'the hollow.' Since the project was completed the flooding has stopped," said City Planner Marybeth Pettit. "I would say it's been very successful."

The project involved installation of concrete anti-scour pads upstream and downstream of an outlet control structure, a steel pad in the creek bed and stone riprap around the control structure.

The total project cost was about $536,000, of which the Federal share was $402,000.

"Mitigation activities such as these are a smart way of doing business by expending monies now to lessen the threat on communities before an event occurs in the future," said SEMO Director and State Coordinating Officer James W. Tuffey.

FEMA prepares the nation for all hazards and manages federal response and recovery efforts following an incident of national significance. FEMA also initiates mitigation activities, trains first responders, works with state and local emergency managers and manages the National Flood Insurance Program and the U.S. Fire Administration. FEMA became part of the U.S. Department of Homeland Security on March 1, 2003.

Quick Facts

Sector:
Public/Private Partnership

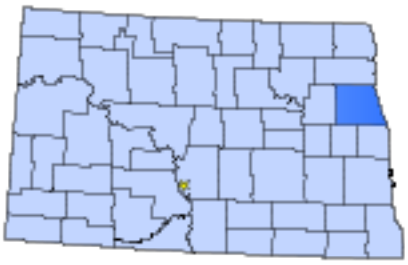
Cost:
$536,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

A New Twist on an Old Tale
Phoenix Building Rises From the Flood



Grand Forks County, North Dakota

Grand Forks, ND - There must be something magical about the name "Pheonix." In mythology, the phoenix bird dies a fiery death every 100 years and a new bird rises from the ashes.

In downtown Grand Forks, North Dakota, a historic structure rebuilt in 1898 after a fire the year before - and renamed Phoenix as a result - is being reborn after nearly being destroyed by the record 1997 Red River Valley flood. This time, the new Phoenix will be better able to withstand another flood, thanks to disaster-resistance measures being put in place. Considered a significant part of Grand Forks' commercial development in the early 1900s, the buildings were deemed important to save when this city began rebuilding after the 1997 flood.

The project includes an empty lot and three buildings: the Phoenix, which originally housed a dry goods store and was the premier commercial structure at the time, a building built in 1931 for the Red River Power Company and the Panovitz Building, custom-built in 1904 as a furniture store. The empty lot housed a fourth building, rebuilt in 1951 for a department store, which was torn down by the city after the flood because of major damage.

To begin the project, the partners purchased the three flood-ravaged buildings and the empty lot for $20,000. With the help of a $1.1 million Community Development Block Grant and another $1.5 million in cash and loans, the partners will spend nearly $3 million to recreate the historic block.

To protect that investment and to reduce the damage potential from flooding, several special features are being installed. In the Phoenix and Panovitz buildings, which anchor each end of the project, new structural supports have been added and the existing basements have been eliminated. Because the buildings are considered historic, local floodplain ordinances do not require they be elevated. Raising the buildings would be cost prohibitive and extremely difficult structurally.

A new building is being constructed on the empty lot to fill the space between the Phoenix and the Red River Power Company buildings. Because the new building has to meet current floodplain requirements, the structure prmarily will house a parking garage with a small commercial area in front and two apartments on the second floor. A waterproof membrane will be installed both under the main floor and 24 inches up the walls to floodproof the building. There will not be a basement.

The flood-resistant measures for the historic renovation project have added only about $130,000 to the overall cost. The majority of that expense is related to eliminating the basements. When the historic renovation project was completed in January 2001, it joined the ever-growing disaster-resistance efforts in a city that was once brought to its knees by a devastating flood and fire.

And the Phoenix rose yet again.

Quick Facts

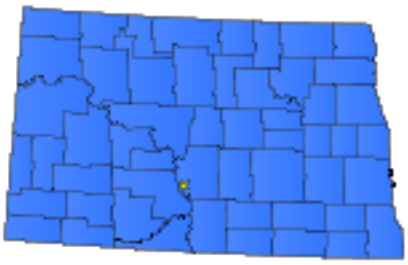
Sector:
Private

Cost:
$3,000,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

Standing Up to Ol' Man Winter
Living Snow Fences Work in North Dakota



State-wide,
North Dakota

The State of North Dakota - Residents in North Dakota expect to see snow every winter. A person cannot live in one of the coldest states and not expect to endure severe wintry conditions year after year.

What residents are wary about is snow combined with wind. That sort of combination can shorten visibility to almost nothing and clog, or even close, roads and major highways.

Residents have found a remedy, or perhaps more accurately, a natural shield for the wind and snow. It is trees ... rows and rows of trees.

These rows of trees, aptly named "living snow fences," are strategically placed and designed to slow down, catch or channel snow. While it may seem difficult to believe a row of trees and bushes can make a difference in a blowing, howling snowstorm, they have proven to be effective in improving visibility and reducing the amount of snow that would otherwise be piled onto roadways, bridges and airports.

A combination of trees and shrubs are planted in rows, typically five deep, to create varying layers in density and height. Shurbs are usually used for the two outside rows, short trees for the two interior rows and large trees for the center row. The combination creates a camel-hump, or mound shape, that provides protection from top to bottom. As snow blows across the snow fence, it acts as a filter. The fence catches and drops the majority of the snow in place before it gets to a road.

Not all snow fences are created equal. They vary in size and species, depending on what they are designed to protect. To protect transportation routes, they generally stand about 200 feet from the side of the road.

Compared to a slatted or picket fence, a snow fence can capture up to 12 times more snow and cost 90% less to install and maintain. Once they are grown, they require little care and can last for decades.

As of 2000, 222 projects were planted in 32 of the State's 53 counties at a cost of about $936,000. Nearly $400,000 of that amount came from the Hazard Mitigation Grant Program. About $112,000 has come from the State Department of Transportation and U.S. Department of Agriculture grant programs.

Some benefits to the snow fences can be seen in three years, but to be effective in severe storms, the fences require 10-20 years of growth.

Quick Facts

Year:
1997

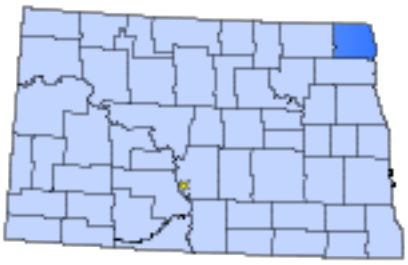
Sector:
Public/Private Partnership

Cost:
$936,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Medical Clinic Moved From Danger Annual Floods Do Not Reach New Clinic



Pembina County, North Dakota

Drayton, ND - North Dakota's historic 1997 Red River Valley flood nearly spelled doom for one small-town medical clinic.

Inside the building, flood waters rose to six inches. A thick layer of mud covered the floor and mold had begun to grow. Despite efforts to clean and disinfect the building, the medical staff thought the health risk for patients was too high to treat them inside the building. Instead, the staff treated patients in their cars.

Floods are a regular occurrence in Drayton, a small city with a population of 900. It faces a flood threat practically every year.

The clinic building, which also housed a local dentist, was at risk to flood again and again, even though it sat 35 feet above the normal river level. The river last reached the clinic's crawl space in the spring of 1999. It was the tenth recorded flood since 1980 alone.

To make matters worse, the riverbank had become increasingly unstable due to erosion from repetitive flooding. Because of this, there was not enough stability behind the clinic to build an emergency dike. Some thought it was only a matter of time before the weight of the building would cause the ground to collapse, sending the clinic tumbling toward the river.

Residents and city officials felt something had to be done. The city's hospital closed in 1975 and the clinic was the only local medical facility available to residents. They knew they needed money to pay for a new building that was better protected from flooding. Through a public-private partnership, they received everything they asked for.

A financial package that included a grant from the U.S. Department of Housing and Urban Development Administration, proceeds from the National Flood Insurance Program and donations from local organizations led to the purchase and remodeling of another building on the edge of town.

Since July 1999, the clinic has been operating from a larger, newly remodeled facility about a half-mile from the structure's original location on Main Street. Due to the recent disaster-resistant measures, the chances of the facility being damaged again are greatly reduced. It is also likely the clinic can remain open for patient care, even if flooding threatens other areas of the city.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

New Alexandria Home High and Dry Elevated Above Hurricane Floodwaters

Fairfax County, Virginia

Alexandria, VA - Christine and Ron Redon had a close encounter with flooding when the Hurricane Isabel storm surge invaded their New Alexandria neighborhood. They heeded the call to evacuate and were not at home to watch as the water rose in their neighborhood during the dead of night.

As daylight returned, all of their neighbors were shocked and dismayed to find two-feet of brackish water in their homes. The Redon home was undamaged.

The difference between the Redon home and their neighbors came about due to a floodplain study done by Fairfax County, Virginia, and the United States Geological Survey (USGS) 45 years ago.

The builder of Christine and Ron's home followed what was then a new set of regulations in 1960 and built the home on a raised foundation.

While other homes in the area were built in the 1940s with their first floor at a lower elevation level, the Redon's first floor level is at least two feet higher. After Isabel, their foundation and crawlspace got wet, but no harm was done to their living space. Dozens of surrounding homes however, suffered severe damage. When the floodwaters receded, Christine and Ron were the only people on their block who didn't need help. They were helping others.

Their first priority was to check on several neighbors who had stayed in their homes during the hurricane.

Ron was amazed at the extent of the flooding. "I paddled my kayak over the tops of the cars," he said.

The job of hauling water-soaked carpeting, beds, furniture, and other possessions out of homes was exhausting. Volunteers throughout the area showed up and, according to Redon, did heroic work. Christine and Ron were part of that army of caring people.

Several other homes in New Alexandria were also spared from the floodwaters resulting from Hurricane Isabel. They were all built after the adoption in 1978, of strict floodplain regulations that are part of the Fairfax County Zoning Ordinance. The observance of this ordinance by the builder and county officials was critical in preventing damage to these homes along with the Redon's home.

The recent flooding from Hurricane Isabel shows the importance of complying with floodplain regulations. Fairfax County's agreement to adopt and enforce floodplain management ordinances is an important element in reducing the loss of property and life when floods occur.

Quick Facts

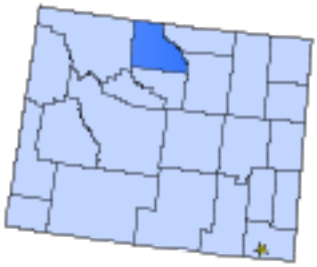
Sector:
Public/Private Partnership

Cost:
Amount Not Available

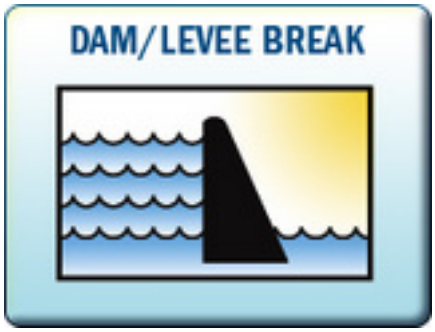
Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Levee Protection Greybull Jetties Reduce High Water



Big Horn County, Wyoming



Greybull, WY - In August 1998, the Wyoming National Guard, 133rd Engineering Company, completed a streambank stablization project adjacent to the Town of Greybull, Wyoming, on the Big Horn River.

The streambank in front of a levee protecting the town was eroding away. The erosion occurred during spring high water. The Big Horn River is regulated by the Boysen Reservoir 85 miles south of Greybull.

During periods of excessive spring runoff, the river level has come within 10 inches of overtopping the levee. The streambank is composed of mostly sand, with the remainder comprised of a silt/clay mix. In preceding years, the river flow had created a gravel bar which was channeling the flow toward the bank in front of the levee. The bank was eroding at the rate of approximately 8 to 10 feet per year.

The U.S. Army Corps of Engineers Omaha District Hydrologic Engineering Division recommended construction of a jetty system to move the river back from the levee. Because the water often reaches or exceeds the bank top elevation, the sides and top of the jetties and still push the current far enough into the main channel to attack the gravel bar. A 20-foot shift in channel flow would match the amount of bank loss documented over recent years.

In addition to increasing the overall stability of the bank, the channel movement might reduce the effect of high water along the bank seeping into a gravel vein which runs under the levee. The water seepage does not pose a structural problem for the levee, but the water floods basements in the area.

Quick Facts

Sector:
Private

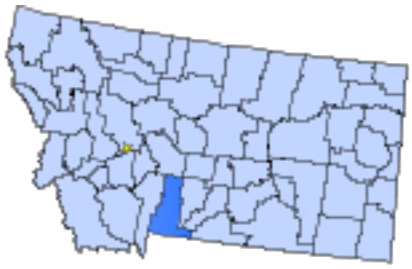
Cost:
$300,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Local Sources

FEMA

Mitigation Project in Yellowstone
Floods in 1996 and 1997 were severe



Park County,
Montana

Park County, MT - Park County experienced a record flood on the Yellowstone River in June 1996. The river maintained a very high flow for over a week, causing massive bank erosion and floods in a number of houses.

In June 1997, the Yellostone River produced another record flood. More bank erosion occured, and the same houses were flooded again. Both floods were on par with the 100-year, one percent frequency flood.

Mitigation obviously was needed for the residential structures, yet relocation was out of the question due to the price of land in the area - known as Paradise Valley.

Many property owners did not have the resources necessary to mitigate the flooding problem. But with help from FEMA and the Flood Mitigation Assistance Program (FMAP), funding was available to assist in mitigating hazards.

One property owner took advantage of this program. He worked with the County, which acted as the applicant, and applied a grant to elevate his house. Park County applied for a FMAP grant to the DNRC Floodplain Management Program. The grant was awarded in February 1998.

The project consisted of simply elevating the house to the standards identified in the Park county Floodplain Management Ordinance. The centers contracted with a house mover to elevate the structure and place a new foundation under the structure. Once the foundation was completed, the house was set back down and the fill material was placed around the structure for foundation protection. The project was completed in less than a month, except for final landscaping.

The benefits are simple. The structure, now elevated two feet about the 100-year flood elevation, will not experience flood damage to the structure, even during a 500-year event. As a result, there should be far fewer flood insurance claims in the future. The Benefit Cost Ratio should prove to be greater than 1:1.

Quick Facts

Sector:
Private

Cost:
$18,304.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Teaching Mitigation to Children Coloring Book is Education in Wildfires

State-wide, Utah

The State of Utah - "The Urwin and Wufi Children's Adventure With Wildfire Coloring Book" was created in 1994 as an interagency effort between the Utah State Hazard Mitigation Program and the Utah Division of Forestry, Fire and State Lands.

The book was created to educate children about wildfires and further their understanding of their role in future fires by learning ways to prevent them.

The story is about a squirrel named Urwin, who lives in the forest and knows about wildfire, and a dog named Wufi, who is new to the forest community.

Urwin teaches Wufi about wildfire and and it is through Urwin's lessons that the children and parents learn to live safely in their communities.

The program has gone to nearly every county in Utah and is being used in South Dakota as well. Several other states have inquired about using it.

The Urwin and Wufi coloring book can be found on the FEMA for Kids Web site with actual online coloring capability using color palettes and brushes. The program is currently available internationally and can be used in classrooms and at home with much less need for hard copies.

This program offers participating third graders a certificate entitled, "Friends of Urwin and Wufi", provided they color some pictures and take the book home to review with their parents.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Changing Course
Buyouts in East St. Peter

Le Sueur County, Minnesota

St. Peter, MN - The Minnesota River covered Highway 99 in Le Sueur County in the spring of 2001. The high water caused the closing of the busy roadway that crosses the river and made the bridge from the unincorporated community of East St. Peter to the city of St. Peter impassable. The rush of waters was a repeat of the flooding in 1997, and before that in 1993.

But for the last two flooding events, damage to residences and businesses along Highway 99 in the East St. Peter area simply did not occur. A buyout program, initiated after devastating flood damage in 1993, helped 16 business owners and two homeowners move out of the floodplain by the time the 1997 flood hit.

"Had the houses and businesses still been located in East St. Peter, they would have had two to six feet of water in them," said Darrell Pettis, Le Sueur County Engineer, describing the 2001 flood.

After floodwaters devastated the area in the 1960s, the Army Corps of Engineers constructed a dike as a temporary solution in 1969. It served its purpose prior to the 1990s, holding high waters back from flooding homes and businesses. Since it was built as a temporary protective measure, no funding was in place for maintenance or upgrading. The community needed a permanent solution.

Le Sueur County stepped up to be the local-share partner for the Hazard Mitigation Grant Program (HMGP) acquisition project, administered through the Division of Emergency Management (DEM) after the presidentially-declared disaster of 1993. The Minnesota Department of Trade and Economic Development (DTED) and the Department of Natural Resources (DNR) helped Le Sueur County with the local share match for the buyout program. DTED also added grant money for conducting environmental studies and cleanup.

Repetitive flooding endangers communities at many levels: loss of life, reduction of property values, significant losses in revenue and stress-related illnesses. These severe consequences push citizens and local officials to action and force difficult decision-making.

The concept of FEMA's acquisition program is simple. When homes and businesses have been involved in heavy flooding (especially multiple flooding events), and local officials and owners of these properties are looking for a solution, FEMA's buyout program can completely eliminate future flooding problems by removal of structures.

The buyout process can take years to complete. In the E. St. Peter project, a number of businesses were involved and various funding agencies participated. Public meetings were held, and subsequently, appraisals and negotiations were conducted on all the properties. Owners were offered a pre-flood fair market price and additional monies for relocation expenses. Environmental testing took place as required by federal law in the purchase of commercial property. By the next major flood, the buyouts were complete.

The flood of 1993 caused business losses of hundreds of thousands of dollars from damage and lost revenue. Even at that, the decision to "get out" was an agonizing one. For some, it was saying good-bye to the livelihoods they had known for 20-30 years and a lifetime of customer-based relationships.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Keeping Floodwaters at Bay Rebuilding Ada

Norman County, Minnesota

Ada, MN - The small town of Ada, population 1657, lies in the flat fertile farmlands of northwest Minnesota. The Wild Rice River meanders its way through the countryside a mile outside of town, traveling fifteen miles to empty into the northward heading Red River.

Entering Ada on a recent hot summer day, the whirr of portable generators powering sewer system lift stations after a severe storm cut power to the community is the only indication that the town has experienced flooding troubles in the past. The generators were purchased with mitigation grant money after the devastating Red River Valley flood of 1997. They now keep the city's sewer system from collapsing in the event of a power outage during a storm or flood.

Despite not having a river view, Ada has suffered flooding often. In the last 35 years, Norman County, for which Ada is the county seat, has been included in 17 declared disasters, almost exclusively for flooding.

The Wild Rice River drainage basin can be characterized by three distinct geological regions. The upland area to the east is gently rolling, giving way to an extensive beach ridge area that drops as much as 200 feet in elevation to the flat glacial lake plain of the Red River Valley, where Ada and much of the Norman County rural farmsteads are located. From Ada, west to the Red River, in the old lake plain the land drops only a couple of feet per mile in comparison to the upper portion of the basin, where the drop in elevation varies from 10 to 30 feet per mile. In the spring, snowmelt and spring rains contribute to the runoff in the upper portion of the watershed above Ada and west to the Red River. Spring and summer runoff events can readily exceed capacity of the river channels in the lake plain, causing overflow onto the land and overland flooding as the water eventually flows into the Red River.

In trying to describe the flooding of 1997, one Ada resident said the images of the devastation and chaos are still too overwhelming for him to want to remember. The floodwaters forced the after-dark evacuation of the town's nursing home, and damaged the high school beyond repair. The area's only medical center for 45 miles endured standing water for days, creating a totally unacceptable environment for a health facility. Many long-time residents worried that the town would not survive the ravages of the flood.

In the months after, FEMA and state disaster assistance contributed to rebuilding the school and the medical facility on the opposite edge of town from where the floodwaters overran the city. State agencies funded the construction of a levee around the community of Ada as a part of the flood mitigation efforts.

"Ada couldn't have done it without the help of federal and state dollars funding the $40 million dollar new school and hospital facilities. It was a tremendous boost to the town," said Dwight Heitman, a school board member at the time of the flooding.

Quick Facts

Year:
1997

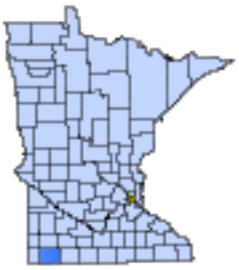
Sector:
Public/Private Partnership

Cost:
$40,000,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Flood Mitigation Assistance (FMA)

Power Up in Nobles County
Underground Lines Save Money



Nobles County, Minnesota

Nobles County, MN - In the span of two weeks, Nobles Cooperative Electric (NCE) experienced two of the worst ice storms ever to hit a Minnesota electric cooperative. In November 1996, line workers saw ice as thick as three inches in diameter coating the co-op's power lines. More than 1,800 poles were broken during the storms. The estimated outage time per consumer on average was 118 hours. Crews from 16 rural electric co-ops in Minnesota and Iowa, plus three contractor firms, helped to restore service. Costs totaled nearly $10 million for restoring power and rebuilding the system after the destructive wintry weather.

At the time of this storm event, Nobles Cooperative Electric serviced 4,900 customers through a system of 1,745 miles of overhead line and 351 miles of underground line. The cooperative's service area covers nearly 1,800 square miles in the counties of Nobles and Murray in southwest Minnesota.

By January 1998, crews replaced a total of 474 miles of power lines. Former NCE General Manager William Motl described recovering from the 1996 ice storm "like raising livestock and farming 1,000 acres in a normal year. The next year the livestock operation remains the same, but you farm 10,000 acres for that year only. It was a big undertaking."

NCE power lines received ice storm damage in four of the six years leading up to the 1996 storm. Ice, tornadoes and winds had knocked down power lines throughout the system but most often in NCE's northwest corner: the Buffalo Ridge area. The glacial ridge is one of the highest elevations in the state and lies within the open terrain of Midwestern farmlands. (It's windy enough to now be the home of 400 power-generating windmills.)

"Whenever a storm came through the area, the Buffalo Ridge area was prone to outages," said Lois Mack, Manager of the Conservation Improvement Program and Special Projects at the Minnesota Department of Commerce.

Hazard Mitigation Grant Program (HMGP) funds gave NCE the opportunity to mitigate against continuing power outages occurring in the Buffalo Ridge area. The co-op implemented a $741,295 hazard mitigation project, converting 36.4 miles to underground line.

"Underground wire has improved so tremendously it has become cost effective. With the advent of technology providing better coating to prevent water from getting in and animals from chewing the line, it was the answer for the Buffalo Ridge area," said Mack. "We had severe storms there last year and there were no problems in electric service."

"Through the Mitigation Program, our system has become stronger and more reliable. Without FEMA's help our members' bills would have significantly increased. Since 1936 NCE has been a vital part of the rural communities in Murray and Nobles counties. With the help of FEMA, volunteers, employees, directors, neighboring cooperatives and contractors, we were able to keep our vision and tradition alive and well," said Line Superintendent Glenn Kluis.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Ring Dikes and Buyouts
Norman County, Minnesota

Norman County, Minnesota

Norman County, MN - The repetitive flooding of the Red River Valley has caused Norman County residents and local government officials to place a high priority on flood protection. Partnerships were formed to provide solutions to keep farmers in business and communities viable. The Wild Rice Watershed District (WRWD) has been working with rural residents, state agencies and FEMA on implementing a mitigation strategy of acquisition and ring dike construction.

Victims of flooding who were seeking solutions had to choose the best option for their circumstances: Sell the farmstead and relocate or build a ring dike encircling the house and farm buildings.

"Farming is a unique situation. We have lots of capitol invested in our buildings and place of business. It's hard to up and move to a different location in the case of a buyout. There's a lot to consider," said Gordon Ramstad of Ada. A ring dike encircles Ramstad's and his brother's homes, and the grain and machine storage, workshops and office that make up their farmstead.

Since 1997, 32 farm homes have been acquired and 36 ring dikes have been built around farmsteads in Norman County. Ring dike costs average $30,000 for construction. Project costs are shared by the landowner, local government and the State of Minnesota. The state legislature has appropriated funding for the ring dike program since 1997. For each ring dike the state provides a cost share of 50%, with the Red River Watershed Management Board (a joint powers board of watershed districts) contributing 25% of the cost and the remaining 25% being evenly split between the landowner and the local watershed district.

"The ring dikes have reduced flooding damages substantially and brought a lot of security to rural residents," said Jerry Bennett, WRWD Administrator.

"When the rain first tested us in 2000, it was such a nice, secure feeling knowing the dike was there," said Gordon Ramstad. "In 2000 and 2001, I'm sure we would have had water in our yard if it hadn't been for the dike."

Dwight Heitman and his family also can sleep easier come the spring thaw. Heitman recalls spending wet spring nights patrolling his property for possible flooding, ready to call in help if rising floodwaters necessitated sandbagging around the house. With the help of the mitigation program, Heitman now has a ring dike fully two feet over the high water mark of 1997.

"It really puts your mind at ease," said Heitman. "In 2001 a lot of farms west of here had more floodwater than in 1997 and I still had three feet to go on my ring dike."

After all is said and done, the ring dikes have offered a feeling of security to these farmers and their families.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Mitigation Planning

Keeping the Lights On In Rural Minnesota

Multiple Counties, Minnesota

The State of Minnesota - Minnesota is known for its inclement weather. But even long-time residents were taken aback by the ferocity of such an early winter storm when it began Halloween night of 1991. First rain drenched southern Minnesota. Then the temperature dropped and it changed to ice and snow. The combination of 50-80 mph winds and precipitation with temperatures ranging from 20 to 30 degrees F, created hazardous and damaging ice conditions.

"The winds were so strong the ice froze perpendicular," said Dave Lundberg, Finance Division Manager for Steele-Waseca Cooperative Electric, Owatonna, Minnesota. "We experienced three million dollars in damages and people were without power for a week. Once temporary repairs were made, a five year replacement plan began."

The loss of power to farmers and rural residents can be disastrous in regards to both economics and safety. Steele-Waseca Cooperative Electric (SWCE) provides electrical power to over 7800 rural customers with 1920 miles of line, covering an area of 900 square miles in nine surrounding counties in Southeast and South-central Minnesota. SWCE, like all Minnesota rural electric co-ops, is owned by its membership: the rural customers the utility serves with electrical power.

"The rural areas are more susceptible to power outages than suburban and urban areas," said Mark Glaess, manager, Minnesota Rural Electric Association (MREA). "Animal husbandry is dependent on electricity, especially for ventilation. Without proper ventilation, the animals can die and a farmer can lose his whole operation. Also, the rural population is more aged than urban and suburban areas and are more dependent on electricity for medical purposes."

Rural cooperatives operate over a much larger distance than municipal power companies, and with far less revenue per mile of line. Because the cooperatives average only six customers per mile of line (SWCE averages four per mile) as compared to an average of forty per mile for municipal utilities, costly repairs can mean much higher rates for rural residents, who statistically earn less than the state's average per capita income.

The 1991 Halloween storm damaged several miles of SWCE power lines. With the cooperation of MREA and its co-ops, 125 line workers drove 60 additional utility trucks to the area from all parts of the state to help repair the lines. Farmers aided line workers by clearing snow to the power lines and towing utility trucks out of snowdrifts. The Minnesota Division of Emergency Management (DEM) coordinated FEMA mitigation funding for the SWCE utility projects. The mitigation projects met one of the core values of the DEM: to create a sustainable community that is resistant to the human and economic cost of disasters. FEMA's Hazard Mitigation Grant Program (HMGP) is a cost share program activated by federally declared disasters.

In ongoing FEMA mitigation funding and repair work since the 1991 storm, $2.2 million has been spent on infrastructure projects and $611,231 spent in HMGP grant funds.

Quick Facts

Year:
1991

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Local Sources

Minnesota City Battles Flooding
Residents Retreat from Cedar River

Mower County, Minnesota

Austin, MN - In the spring of 2000, floodwaters in Austin, Minnesota, crested at 23.4 feet, the highest on record. But far fewer homes received flood damage than in the multiple flood events of the last 30 years. A first-of-its-kind acquisition program was conducted after two major floods in 1978. With additional buyouts occurring after succeeding floods, a total of 163 structures were eventually removed from the flood plain - before the flood of 2000.

In our history of settling this vast continent of North America, rivers continually provided a stopping-off point. The Cedar River meanders across the flat lands of the Minnesota prairie and is joined by Turtle Creek and Dobbins Creek where the City of Austin now lies. Austin grew up around the river, as businesses and neighborhoods developed and people harnessed the river's flow to power the flour and saw mills.

After the second devastating flood hit within 10 days in July 1978, residents and City officials in Austin knew something had to be done.

Concerned citizens formed the Floodway Action Citizens Task Source (FACTS) to investigate ways to solve the flooding problem. The group, with a membership that reached 450, met and dialogued with the Austin City Council, Turtle Creek Watershed Board, the Department of Natural Resources, the Governor's office and state and local agencies to gather as much information as possible.

The City of Austin looked to the U.S. Army Corps of Engineers to develop a solution for the problem of repetitive flooding. The USACE studied the possibilities of dredging the Cedar River or engineering a structural flood control project, but concluded that the various structural and non-structural solutions were not cost effective.

Residents and civic leaders didn't give up. The City's Housing and Redevelopment Authority (HRA) requested and obtained a Community Development Block Grant from the U.S. Department of Housing and Urban Development.

"We had to come up with creative ways to solve the problem," said Kermit Mahan, executive director of HRA. "The key is to be aggressive and creative in putting together the funding."

But first the City and agencies contributing funds for the buyout program had to be assured no more homes would be constructed in the way of floodwaters. Flooding again damaged homes in 1983 and in 1993 when 450 homes were affected. Additional buyouts were conducted on a voluntary basis.

Because of the flood protection work of the city, flood insurance policyholders have lower premiums. Community participation is voluntary. The CRS schedule identified 18 creditable activities, organized under four categories The City of Austin has received credit for 15 out of 18 activities. This has earned the City of Austin a Class 5 rating and a reduction of 25% in flood insurance premiums for policyholders.

Today, Alice Snater still worries about friends who live a few blocks from where her home previously resided in the flood plain. Because Austin has been successful with its buyout program in the past and continues to plan for future mitigation, Kermit Mahan said the city recently received a $2 million grant from the state earmarked for flood relief.

Quick Facts

Sector:
Private

Cost:
$2,000,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Saving an Architectural Landmark
Making it Flood Resistant

Mower County, Minnesota

Austin, MN - The former St. Paul's Evangelical Lutheran church will still be a gathering place. Despite decades of repetitive flooding damaging its interior and a subsequent buyout by FEMA and the city of Austin, the structure will again host celebrations. On a Sunday in July 2001, an audience that included over a 100 veterans stood by when the former church was dedicated as the Veterans Pavilion in the new Community Park along the river.

To stop the cycle of flooding, cleanup, and costly repairs in a neighborhood bordering the Cedar River, an acquisition program was begun after severe flooding in 1978. The project was supported by the citizens group FACTS, the City of Austin, the Minnesorta Division of Emergency Management (MDEM) and FEMA. More structures were designated for buyouts after flooding in 1993.

In the acquisition program, structures sturdy enough to be moved can be relocated out of the flood plain, while others are torn down and removed. The goal is to prevent future flooding damage and protect lives by removing structures from the 100-year flood plain. Based on the many floods of record in past decades, this goal has clearly been met.

The fate of St. Paul's Lutheran Church seemed to be that of demolition. Completed in 1953, the church building suffered costly flood damage in 1965 and 1978. With a $100,000 loan from the U.S. Small Business Administration, the congregation was able to rebuild the church, occupying the building once again in 1980. More damages suffered in the 1993 flood prompted the church leadership to participate in the buyout program. The congregation relocated to temporary facilities and eventually built a new church in another part of Austin -- away from the floodwaters. The original church structure was slated to be torn down.

City leaders and residents considered the church an architectural landmark alongside the river and were disheartened by the idea of demolishing it. A park was planned for the space vacated by the other structures in the buyout program. And parks need sheltered picnic areas. The idea began to take shape that the church could remain in place as an open, public shelter.

"It was a landmark for the city," said Dennis Maschka, parks and recreation director for the City of Austin. "It was too nice of a structure to tear down and it was a nice centerpiece for the whole area."

Mayor Bonnie Besse Rietz and the Housing and Redevelopment Authority (HRA) pursued approval from FEMA to retain the structure in its current location. Because the city used FEMA Hazard Mitigation Grant Program funds to acquire the property, any structure remaining in a floodplain acquisition area had to meet strict criteria. Requirements state the structure could remain as a public facility that is "open on all sides and functionally related to a designated open space or recreational use" and upon completion of the project, "no application for additional disaster assistance will be made for any purpose with respect to the property to any Federal entity or source..." The city hired a design firm to assist in developing a renovation plan that would conform to the requirements, which was approved by FEMA in early 2000.

Quick Facts

Sector:
Private

Cost:
$200,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Steele to Become Disaster-Resistant County Tries Outreach

Steele County, Minnesota

Steele County, MN - The winds blow hard across the farmlands and small towns of Steele County in southern Minnesota. Along with planting season comes tornado and storm season. The mostly rural county has experienced three presidentially declared disasters in the 1990s.

In 1998, funds were made available to Steele County through the FEMA Project Impact pre-disaster mitigation program. This program focuses on helping communities protect themselves from the destructiveness of natural disasters by taking preventive action before a severe storm hits.

Steele County became the first Minnesota recipient awarded funds from this program. The Minnesota Division of Emergency Management (DEM) identified Steele County as a logical choice because of the on-going safety and emergency preparedness activities already promoted in the County. Steele County had established partnerships between industry, the public sector and citizens through a 10-year-old organization concerned with health and safety called Community Awareness & Emergency Response (CAER) and an industry-supported Safety Council.

A planning committee composed of emergency responders, industry partners and committed citizens formed to develop a unifying vision on how to best use the $500,000 grant and to implement a preparedness strategy.

The two-pronged approach of the nine-member committee focused on implementing a community outreach campaign to create awareness about how people can protect themselves against storms, and helping those who were most vulnerable to storms in the area - manufactured home residents.

With the grant money in hand, the Steele County mitigation committee aggressively and creatively marketed its message of preparedness to all residents of the county, young and old, in town and on the farm. Sub-committees met monthly to determine priorities in the following program areas: Communications Systems, Training and Education, Mitigation Strategies for Structures and Hazard Inventory and Infrastructure Mitigation.

Project Impact Coordinator Shirley Woodfill worked with the committee to implement the public outreach and administer the grant money.

Members of the planning committee formed a speaker's bureau and conducted presentations on storm preparedness at community events and for community groups. More than 50 presentations were made throughout the county, reaching a combined total audience of more than 1500.

In the midst of the public awareness campaign, First Alert offered a "50% off" promotion on NOAA Weather Radios for residents of Minnesota. Woodfill and the planning committee felt confident their preparedness message was reaching county residents when they learned that more than 25% of the Minnesotans who ordered the NOAA weather radios were residents of Steele County.

Steele County invented numerous communication pathways to educate both businesses and individuals in regards to storm preparedness and mitigation activities. The county's diverse and creative approach to pre-disaster mitigation planning provided its residents the tools to protect themselves in future storms.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Mitigation Planning

FEMA

Community Outreach Education at the Wisconsin State Fair

Milwaukee County, Wisconsin

Milwaukee County, WI - A grant from the Hazard Mitigation Grant Program provided the Milwaukee County Division of Emergency Management with funds to create an informative, eye-catching Community Outreach Display.

During the Wisconsin State Fair, held in Milwaukee from August 2 through 11, 2001, the Milwaukee Division of Emergency Management made contact with more than 10,000 people and handed out 24,400 pieces of disaster and storm preparedness materials. The take-away material covered a wide-range of topics, including flood-proofing how-tos, children's coloring books and FEMA Disaster Twins booklets, Family Disaster Plans, National Weather Service information packets and Taking Shelter from the Storm booklets.

Pat Fuchs, Project Coordinator for the Community Outreach Display, describes what it takes to create a successful exhibit:

Make it eye-catching. "We incorporated bright orange, yellow and blue colors into the display and used the Sheriff's logo."

Create an adaptable base so display images can be changed, if needed, to represent up-to-date disaster information. "For example, on the pop-up display portion, we created a cloth panel to which we Velcro pictures relating to the most recent weather and disaster events."

Plan for the costs of on-site space rental, hookup and utility costs, as well as salaries of booth staff.

Finally, partner with related agencies, like the Police and Fire Departments, to increase attention from attendees.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Floodways and Wetlands
Trenton Island, Wisconsin

Pierce County, Wisconsin

Pierce County, WI - Wisconsin wetlands are in danger -- only half of the 10 million acres the state once had still exist. Wetlands play a vital role in the environment, storing water to prevent flooding, protecting water quality and providing wildlife habitat. Wetlands restoration is a positive by-product of actions taken to mitigate against flooding. An acquisition program conducted by Pierce County, Wisconsin, has done just that. It has prompted the return of wetlands to an island in the floodway of the Mississippi.

The great Midwest flood of 1993 set the stage for a $6 million buyout program in Pierce County that would involve Trenton Island properties.

Flooding caused roads to close, washed away stabilizing vegetation and threatened lives. Building structures sustained debilitating damage in previous years: major floods occurred in 1952, 1965, 1969, 1993, 1997 and 2001, with minor floods experienced in 1967, 1975 and 1986. The structural damages in the 1993 floods for some were extensive. The losses exceeded 50 percent of the structure's value and thus subjected homeowners to the floodway regulation prohibiting repair or replacement of the structure.

Pierce County applied for mitigation funding because of the continual damage and exposure to environmental hazards. Property owners were provided with the opportunity of a buyout program using combined funding from FEMA's Hazard Mitigation Grant Program, Wisconsin Emergency Management and Wisconsin Department of Administration Community Development Block Grants.

The buyout program had several goals: eliminate loss of lives, minimize property damage and local response costs, bring the island community into compliance with already established zoning ordinances and restore the island to the best possible natural state. Pierce County also developed a Mitigation Plan in 1996.

Within Pierce County, 70 improved parcels were purchased along with three vacant parcels. Salvage materials provided an additional $147,000 toward the acquisition. Participating property owners received the fair market value of their properties. Owners of primary residences were compensated for moving expenses and received a replacement housing cost differential as required under Wisconsin state law. (The housing cost differential payment made up the difference between the acquisition cost and the cost to purchase a comparable replacement). Over 80% of those participating in the buyout program chose to relocate within five miles of Trenton Island.

In 1997 and 2001, floodwaters crested two to three feet higher, respectively, than the 1993 flood, but damage was far less extensive because of the FEMA/state acquisition project. As the books are closed on this project, rough estimates indicate that with losses avoided in the 2001 flood alone, 80 percent of the project cost has been recovered.

The methodology used in projecting potential damage is based on first floor elevations and depth and duration of flooding. In 1993, 1997 and 2001, the depth of flooding got progressively worse. In all cases, the duration of water in structures lasted more than seven days.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

New School Building "Hardened" Should Stand Against the Wind

Fond du Lac County, Wisconsin

Oakfield, WI - A few years back, in Oakfield, Wisconsin, fund-raising T-shirts were printed with the motto: "There's no place like Oakfield," rewording Dorothy's feelings about her tornado experience in The Wizard of Oz. The T-shirts were designed after a tornado roared through the small community in July of 1996, demolishing nearly half the town.

The middle school was one of the 180 structures destroyed or damaged by the tornado. Community residents could also now say, "There's no middle school like the new Oakfield Middle School." With "hardened" interior walls and the roof bolted to wall supports, the school building is now constructed to endure twice the wind force than most other Wisconsin schools. It was designed to withstand 150-mph winds, as compared to the 88-mph wind load required by Wisconsin building code for public buildings.

"From the destruction of that July day, the community of Oakfield built a school to be proud of, and one that provides a greater sense of security for those who experienced the devastation of the tornado," said Joe Heinzelman, Superintendent of Oakfield School District.

Just minutes after sirens signaled its coming, the tornado slammed through the middle of Oakfield, destroying 44 homes, two churches and the middle school. It also razed a majority of the village's mature oak trees, 1800 of them, for which the village was named back in 1847. Authorities estimated Oakfield suffered $50 million in damages.

When a disaster is federally declared, as it was after the Oakfield tornado, mitigation funds are activated through the Hazard Mitigation Grant Program (HMGP). These funds are available to communities for prevention of future disaster damage. In consultation with staff at Wisconsin Emergency Management (WEM), the Oakfield school administration learned that HMGP funds could be used to build a more wind-resistant structure.

"Strengthening the school building was very important to our community," said Heinzelman. "Just to assure people that we have a building that could withstand destructive winds like we experienced and it could become a community shelter in a similar circumstance. It could also become the command center in case other buildings were destroyed. We learned how important that was with the last storm."

The construction technique of "hardening" the walls of the new Middle School included the placement of reinforcing steel in the masonry walls to provide for the additional wind load requirements. The roof structure was changed from steel to a masonry pre-cast concrete roof, and the roof was welded to plates embedded into the walls, placed at double the normal rate, to tie the roof into the structure more securely.

The cost of the improvements to the building totaled $207,260. FEMA contributed $151,662 through HMGP, the state WEM provided $25,277, and the local match was $25,277.

With the funding in place and the building designs completed, an aggressive construction schedule was begun to ensure that no student would miss out on the middle school experience. By January of 1998, after attending classes in temporary classrooms for 18 months, students had a school building they could call their own.

Quick Facts

Sector:
Public

Cost:
$207,260.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Fighting Floods In Kenosha Property is in Safer Place

Kenosha County, Wisconsin

Kenosha County, WI - In the span of 10 years, five emergency declarations have been issued for the Fox River Floodplain in Kenosha County. Following an emergency declaration in May 2004, when the Fox River again overflowed its banks, many fewer homes and residents were at risk, and the costs for response and recovery were substantially reduced. One reason for the remarkable turnaround is that over the 10-year period, 56 property owners have participated in the Fox River Flood Mitigation Program. The Kenosha County Housing Authority administers the program. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) provides staff support.

In 1994, Kenosha County officials initiated a plan to help people move out of the flood-prone area that was mapped as the 100-year floodplain of the Fox River. Since then owners of 56 properties in the communities of Wheatland, Salem and Silver Lake have participated in the voluntary buyout program. Various resources were used to fund the program including Community Development Block Grants - Emergency Assistance Program (CDBG-EAP) from the Wisconsin Department of Commerce, and grant money from the Hazard Mitigation Grant Program and Flood Mitigation Assistance programs administered through Wisconsin Emergency Management (WEM).

During the emergency phase of the 2004 flood, Kenosha County Emergency Management/Homeland Security Director Ben Schliesman noted that as a result of the buyout program, emergency responders had far fewer doors to knock on as they went door-to-door to warn residents of the dangerous flooding situation. Schliesman reported that in addition to fewer enforcement personnel required, no rescue squads needed to be dispatched to help people leave the flooded area.

Following flooding in 2000, the Fox River crested at 2.75 feet over flood stage. Under a federally declared disaster, the communities of Salem and Silver Lake were reimbursed for emergency protective measures under the Public Assistance program for $3,431 in expenses. Kenosha County received reimbursement for $9,253 in expenses for emergency protective measures. Federal reimbursements included the cost of sandbagging and overtime hours incurred by emergency authorities in notifying and evacuating residents.

Under the disaster declaration of 2000, eligible flood victims in the Silver Lake and Salem communities received grants from FEMA that averaged $2,800 for minimal repairs to make the home livable. If the homes had remained in the floodplain, with each successive flood event, like in 2004, an estimated $156,800 in disaster recovery grants for these residents could have been incurred. Property replacement and cleanup costs not covered by grants, and the emotional strain of residents suffering property loss and damage must also be factored into the overall impact if no mitigation measures had been undertaken.

Thus far, the Fox River Flood Mitigation Program removed 56 structures at a cost of $5.5 million dollars, with FEMA contributing $2.5 million in HMGP and FMA grants and CDBG providing approximately $3 million in grants.

Quick Facts

Sector:
Private

Cost:
$5,500,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The Dry Facts
Protecting Homes From Damage

Milwaukee County, Wisconsin

Milwaukee, WI - As basements dried and Milwaukee residents discarded water-soaked belongings, it was evident that flood-proofing needed to be done in regards to these saturated homes and basements.

"Even a rain of two inches over several hours can produce conditions for flooding in Milwaukee County," said Carl Stenbol, Assistant Director for Milwaukee County Division of Emergency Management.

After the June 1997 storm, emergency management staff began developing ideas to better educate homeowners about preventing flooding and sewer backup damages. The disaster declaration the county received in response to the $78 million in damages enabled the department to apply for Hazard Mitigation Grant Program (HMGP) funds through the Federal Emergency Management Agency (FEMA) and Wisconsin Division of Emergency Management (WEM).

"Citizens were asking questions on how they could protect themselves, their property and belongings prior to actual flooding," said Midge Casperson, Milwaukee County Municipal Emergency Service Coordinator and project coordinator/producer for the community outreach video.

Mitigation techniques previously developed and tested could provide the answers to these homeowners' questions. But the challenge was how to get that information to the citizens of Milwaukee County.

"We wanted to put it in a format that was easy to understand and implement, and in a way that was accessible to our citizens," said Casperson.

The staff felt that visual demonstrations provide the best form of teaching. A "mitigation" video production was begun involving script development, actors, and technical expertise. While the county knew it would be a costly undertaking, state emergency management officials helped to determine that the HMGP was a perfect match. The Milwaukee County received a grant of $30,000 from HMGP to produce the video and a corresponding brochure. The final cost of production totaled $40,000. The state and county each matched a $5,000 contribution. Utilizing experts, taking a hands-on approach throughout the entire production schedule, and having a plan for distribution were the successful elements of the project.

"I depended on the production people for what they are best in and researched with mitigation experts, like the Wisconsin mitigation officer and local municipal public works, to get the most up-to-date information and make it a well-rounded video on all aspects of flood-proofing. I worked closely with the production company every step of the way to ensure the accuracy of the content," said Casperson.

County-wide distribution included involving the Milwaukee Federated Library system that encompasses 19 libraries in the City of Milwaukee and the surrounding suburbs. "Librarians told me they had a hard time keeping the video on the shelf," Casperson said.

Timing helped make the video a success in a rather unfortunate way. The video debuted after the county experienced its second 100-year flood event within two years. People were eager to implement protective measures against further flooding damage after basements flooded a second time in two years. The video was able to lay out mitigation suggestions in a very understandable format.

Quick Facts

Sector:
Private

Cost:
$40,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Acquisition in Cambridge Residents Like "View From the Top"

Guernsey County, Ohio

Cambridge, OH - "It was a bad situation turned good," said Ron LePage, a buyout participant, in Cambridge, OH. Cambridge, with a population of 13,000, sits at the foothills of the Appalachian Mountains in Guernsey County. Homes are nestled in the rolling terrain, a dream for those at the peak, but the runoff from heavy rainfall plagues homes at the lower elevations. The acquisition project primarily focused on 60-65 homes suffering from decades of loss due to repetitive flooding. In the past decade Guernsey County has endured three Presidential Declared Disasters. The most severe flooding in recorded history occurred five years ago. Relentless storms pounded the area on June 27, 1998 with the floodwaters cresting on June 30th. The waters didn't recede to below flood stage until July 4th.

In its wake, the flood left more than 100 residents with extensive damage to their homes. "It was devastating," said Michael Coulter, who had two inches of water in the top level of his tri-level home. The lower levels were completely immersed. "I don't know what we would have done without FEMA."

The stress associated with the flood recovery and the fear of impending storms were the deciding factors for many homeowners who elected to participate in the buyout. Ron LePage and Peter Blazvick lived in the low-lying neighborhood, which had the largest number (26) of acquired and (4) retrofitted properties. The source of the flooding was Gordon's Run, a creek near their homes.

The Hazard Mitigation Grant Program (HMGP), activated in a Presidential Disaster Declaration, is designed to relieve communities of future flood losses and give homeowners of flooded properties options. The community of Cambridge chose to apply for these funds and use them for an acquisition/retrofitting project. Participation in the buyout process is voluntary, but homeowners are required to go through a cost benefit analysis to justify their involvement in the project. These funds would be used to purchase the properties and demolish the structures. Then, the property would be left in perpetuity to the community as open space, never to be built upon again. Other homeowners took the option of retrofitting the flooded portions of their home to minimize future damage.

In 1998, City Engineer Jeanette Wierzbicki received notice from the State that mitigation funding was available through the HMGP to purchase homes that sustained repetitive flood damage. She was the initial driving force behind the effort.

On January 3, 2004, severe storms poured five inches of water in 72 hours over large portions of the State. Temperatures plummeted to below zero, warmed and again returned to dangerously cold. Guernsey County was one of the 14 designated counties included in the Presidential Declaration resulting from this severe storm and rain event. The mitigation efforts begun in 1998 proved successful. Several of the acquired properties (now empty lots) had standing water from the rain.

Coulter, Blazvick and LePage expressed concern for those who remain in their former neighborhoods. These three homeowners, pleased with their participation in the project, have relocated in Cambridge to homes on higher ground.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Athens County Retrofit Homeowner Pleased With Result

Athens County, Ohio

Athens County, OH - Kara Edmonds is Community Development Coordinator for the Tri-County Community Action Agency serving Athens, Hocking and Perry counties in southeastern Ohio. Athens County suffered isolated flooding along several streams during the March 1997 disaster, in areas that had been damaged in two previous declared floods since 1990.

Edmonds was designated by county commissioners to work with FEMA and OEMA in pursuing mitigation assistance for repetitively damaged properties, including two homes bordering Sugar Creek within two miles of the Community Action offices on State Route 550. The owner of one of those residences is Ohio University journalism professor Cassandra Reese.

In the aftermath of previous flooding into the "walk-out" lower level of Reese's hillside home, she had invested more than $22,000 to erect a three-foot-high floodwall around the rear and side of the house, replace damaged lower-level drywall, jack up the slab floor, elevate her water heater and washer/dryer and add a brick channel to carry runoff away from the house and down her driveway.

But when the March 1997 downpour created unprecedented runoff, Reese found that three feet of water had found its way around and under her precautions into her lower level, ruining a heat pump and electrical breaker box and causing structural damage to deck supports. Her next step was to seek help through Kara Edmonds and the Hazard Mitigation Grant program. Edmonds prepared and submitted a successful grant application and helped Reese get architectural advice through the Ohio Emergency Management Agency Mitigation Branch.

They determined that during extremely heavy rains, water near the floodwall accumulated so rapidly that it backed up, creating a pond under Reese's deck from which it seeped under a rear doorway and into the lower level.

In 1998, with the help of a $16,000 mitigation grant, Reese was able to retrofit her home by having her deck partially rebuilt, a waterproof rear door installed that would not allow high water to enter the house; a one-way check valve installed in her flood wall that that would allow water to flow only away from the house; her heat pump condenser elevated on a masonry platform to above the peak flood level; and the electrical circuit box and meter moved from the rear to the front wall of her lower level and elevated to six feet above the floor.

While flood waters haven't reached or exceeded the 1997 levels since then, Reese said she is confident her flooding problems are solved and was very pleased with the attitude and performance of Edmonds and the OEMA team. "After everything I had tried, they gave me good advice, and the additional work they paid for was done well. I'm in no hurry to have the water come up high enough to test it all again, but I'm comfortable that I won't be looking at major repair bills if we do have another flood." Edmonds reports that, while neighbors were out sweeping standing water from their driveways and patios after recent heavy rains, she has seen Reese standing on her deck smiling while the new check valve keeps her high and dry.

Quick Facts

Sector:
Private

Cost:
$16,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Community Buy-In Helps City of Jackson Benefits

Jackson County, Ohio

Jackson, OH - Unlike many of the communities which suffered major damage in the March 1997 flood, Jackson, Ohio, (population 6,700) is located more than 30 miles from the Ohio River in the state's hilly and scenic southeastern corner. The sources of its recurring flood problems are Horse Creek and Salt Lick Creek, two usually unthreatening streams that carry runoff from nearby high ground through the town on their way to the Ohio.

When the area around Jackson receives unusually heavy rains, as it did on March 1-2, 1997, both narrow, winding creeks often receive more rapid runoff from miles of surrounding hillsides than their banks can contain. Drainage and stream flows are impacted to some degree by upstream stretches of land formerly used for logging and strip mining, and the creeks also receive heavy runoff from recently widened stretches of U.S. Route 35--now a major four-lane highway.

Homes in several low-lying and poorly drained areas of the town suffered considerable damage in 1963, 1968 and again in 1975 when sustained spring rains took the creeks out of their banks. But according to Jackson city building projects coordinator Story Cool and Mayor Tom Evans, the March 1997 downpour and its aftermath caused "the worst flooding anyone around here can remember." One often-damaged area, roughly a half-mile square along Central Avenue and Freeman Street that suffered street flooding and standing water after even normal rains, was under so much moving water for so long during the '97 event that dozens of homes were destroyed or damaged beyond repair.

"FEMA and OEMA recovery teams arrived while the water was still receding, and set up a Disaster Recovery Center at the local Odd Lots store," said Evans. Once streets were re-opened, utilities were back in operation and debris removal underway, Evans said he and his service director met with OEMA Mitigation Branch staff in Columbus to learn about the HMGP program.

Evans noted that, at an early point in the planning process, several members of the committee strongly advocated that the best mitigation strategy would be to dredge the creek beds at several choke points. "We had experts from the Department of Natural Resources and Army Corps of Engineers come to the next meeting and listen to their suggestions. They explained that dredging wouldn't prevent flooding after heavy rains…just move it downstream another few hundred yards," said Evans. "They told us the real problem was that these creeks are going to overflow periodically no matter what you do, and that our most damaged neighborhood was going to keep on getting flooded because it sits smack in the middle of the natural floodplain."

After they got that information and were able to ask a few questions, Evans said even the strongest advocates of dredging backed away from that alternative and ultimately supported property acquisition as the best course of action.

The City of Jackson received a $288,000 HMGP grant and state and local matching funds that allowed it to acquire 4 vacant lots and permanently remove 31 repetitively damaged structures from the flood-prone area along Central Avenue and Freeman Street.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Miller South Chose Elevation
Lawrence County

Lawrence County, Ohio

Lawrence County, OH - As coordinator of seven different mitigation projects after extensive flooding along the Ohio River in 1997, Doug Cade of Lawrence County Community Action, was primarily involved in acquiring and demolishing severely damaged properties. But in his meetings with residents and review of data from the Miller South flood area, Cade found that elevation of some flood-damaged properties was not only a viable alternative, but also the best one.

The unincorporated area of southeastern Lawrence County designated as Miller South in Cade's grant application is one of the most-often flooded areas in the entire state--with a total of 27 documented flood events since local record-keeping started in 1832. Eight of those floods have occurred since 1950. The small residential area seeking mitigation assistance there consisted of six large, upscale homes that had suffered repeated but not catastrophic damage in several recent high-water events.

"When I talked with the property owners and we looked at the data, there were a couple of good reasons to look at alternatives to acquisition," said Cade. "First, these were large, fairly new homes on big lots that had a high pre-disaster market value--which meant buyouts would be prohibitively expensive. Second, the first floors of most of the properties were only a couple of feet below the Base Flood Elevation; and third, the families really wanted to stay in the area and were committed to following through with the structural work if we would help get government funding."

Cade said the relatively straightforward structural changes that were needed to raise the Miller South homes to a disaster-resistant elevation were a major supporting factor. "After we talked with engineers and got estimates, it seemed pretty clear that--for these types of houses-- adding three feet of elevation was kind of a magic number," he said. "At three feet the expense and complexity of the work were clearly cost-effective. Once you got much over three feet of elevation, the jobs got more complicated and the costs went up fast."

The Miller South proposal submitted and ultimately approved by OEMA and FEMA included funding for six property elevations. By the time applications were reviewed and approved and funds became available, two property owners changed their minds but four stayed and went through with the elevation process.

As of early 2002, all four families were still living in their newly elevated homes, with significantly reduced danger of injury or property damage in extreme weather --and enhanced property values based on the improved disaster resistance of their houses.

Lawrence County kept four upscale properties on the active tax rolls, and greatly reduced the prospect of future public costs for emergency services, temporary housing, debris removal, etc. in one of its most-often flooded areas.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Local Sources

Elevate Above Flooding Disaster
Pomeroy and Rutland Benefit

Meigs County, Ohio

Salisbury, MD - Salisbury Township is home to the river-crossing town of Pomeroy, population 2,200, near the southeastern corner of the state where U.S. Route 33 crosses the Ohio River into West Virginia.

Similar to most river towns, Pomeroy and the surrounding township have dealt with high water many times in their nearly 20-year history. Unfortunately, cycles of drought followed by heavy rain, deforestation of some area hillsides and increased runoff from recently widened state and federal highways contributed to even more frequent local flood damage during the late 1990's.

The village of Rutland is about five miles west of Pomeroy. It also has a history of flood damage, but the culprits there are Little Leading and Beech Grove Creeks, which carry runoff from the steep bluffs above the Ohio Valley through the village of about 500 residents.

When flash flooding occurs along the creeks, it often blocks State Route 124, the main east/west highway, and other emergency routes; and poses a serious safety threat to local residents, nearby property and public infrastructure.

The drenching rains and excessive runoff of March 1-2, 1997, hit Pomeroy and Rutland residents hard…but that disaster also provided an opportunity for some local families to escape the repeating cycle of damage, repair and more damage through funding for post-recovery mitigation projects. Those projects included elevation of 18 homes that had suffered significant damage in several previous floods.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Small But Determined
Village of Rarden, Ohio

Scioto County, Ohio

Rarden, OH - Rarden, population 176, is a classic "wide spot in the road" rural village that straddles an eight-block stretch of State Route 73 in western Scioto County, about 25 miles north of the Ohio River. Other than its proudly up-to-date volunteer fire station, the village's only distinguishing feature used to be its picturesque location in a natural hollow at the convergence of Rarden Creek and Jessie's Run. Now there's also a creek -front village park.

In March 1997, when two days of non-stop downpours and runoff from surrounding hills turned both local streams into raging rivers, many of Rarden' s 60-some households suffered basement flooding or worse. Road closures shut off the village from outside help for two days and loss of water and electric service made life miserable for most residents. But the danger and loss to Copas and her neighbors in a low-lying residential area near the creeks was infinitely worse. They awoke early on the second morning of storms barely in time to escape from a rapidly expanding "lake" of floodwater erupting from the creek bed. By the afternoon of March 2, the water had reached a depth of 10 feet - submerging every structure within 200 yards of the creek beds nearly to the level of first floor ceilings.

Village Mayor Anna Gardner, who was flooded out of her own home and lived for weeks in a second-story room above a garage, worked closely with county and local safety officials over the next several days to help re-open roads, get rescue and recovery aid to those who needed it and provide daily meals for the whole community at the fire house until utility service was restored.

Volunteers, including the Red Cross and a Boy Scout troop from Granville, Ohio, arrived within days of the flood to bring food and drinking water and help with clean up and debris removal. Most village residents who suffered damage, including Gardner, eventually were able to repair and restore their homes to livability with help from FEMA emergency grants and/or loans from the U.S. Small Business Administration. But post-disaster assessments found that certain homes in the creek-front neighborhood were beyond repair.

In late March Gardner received a phone call from the Scioto County Emergency Management Agency, inviting representatives from Rarden to attend a county-wide meeting with FEMA and OEMA staff to help local officials learn about mitigation and the HMGP grant process.

"We knew what a desperate situation the flooded-out families were in, and we also knew we had a chance for the village to avoid future rescue and recovery operations and save thousands of tax dollars that would be wasted to repair or rebuild houses on that land," Gardner said. "We decided on the spot that we'd do everything possible to get a grant. In fact, we sat down and completed a pre-application form right there before we left the meeting."

An HMGP grant of $158,000 and state/local funding totaling $71,000 were approved for the acquisition of four homes, one mobile home and one vacant lot in the flood-prone creek front area.

Quick Facts

Sector:
Private

Cost:
$229,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Illinois' Winning Formula
Buyouts Assist Residents

State-wide,
Illinois

The State of Illinois - After many Illinois river communities experienced the devastation of the Great Midwest Flood of 1993, it became obvious that floodplains are easily reclaimed by rivers following severe weather events. With a combined formula to enforce local floodplain regulations and return the floodplain to its rightful owner, the State of Illinois has succeeded in reducing damage from the most frequent cause of disaster declarations in Illinois.

Flooding has been a constant drain on emergency response and recovery resources. Illinois geography includes 900 rivers and waterways with a combined length of 13,200 miles and the State is bordered by 880 miles of the Mississippi, Wabash and Ohio Rivers. The State's mitigation initiatives have resulted in the purchase of over 3,500 flood-prone structures and some adjacent vacant lots (as of July 2002). Communities benefit when these parcels are returned to their natural functions. Using voluntary acquisition grant programs, the Illinois Emergency Management Agency (IEMA) staff has approved and administered more than $100 million in project activities including flood mitigation, ice storm preparedness and wind-resistant construction.

IEMA and the Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR) are aggressively pursuing the reduction of flooded properties, having proactively completed a detailed analysis of the National Flood Insurance Program repetitive loss structure inventory. More than 30 percent of these properties have already been removed from this list through voluntary buyouts.

The recipe for reducing flood damage can be attributed to a two-fold approach of eliminating existing flood problems and of local officials controlling new development in the floodplain, according to Paul Osman, Floodplain Management Program Coordinator, IDNR/OWR.

The success of the acquisition and floodplain management programs along the Illinois and Sangamon Rivers became evident during a recent flood event in the spring of 2002. The Sangamon River reached 10 feet over flood stage and the Illinois River topped at 15 feet over flood stage. County Emergency Managers and Local Floodplain Administrators reported if the buyouts had not taken place, many more houses would have been inundated with floodwaters. Horton remarked that at the confluence of the Illinois and Mississippi Rivers in the City of Grafton, an estimated 200 additional people would have faced the trauma of cleaning up had not 88 structures been removed from the floodplain by a successful buyout project.

"To be successful, you have to think outside of the box, have a can-do work ethic and avoid getting discouraged," said former State Hazard Mitigation Officer Jan Horton.

After the 1993 floods and subsequent acquisition program, IEMA organized the Interagency Mitigation Advisory Group (IMAG) to facilitate the implementation of various mitigation programs. In addition to IEMA, the group is composed of a variety of agencies, including the IDNR/OWR, Illinois Historic Preservation, Department of Commerce and Community Affairs, FEMA, and the American Red Cross, with staff who can provide expertise in acquisition and elevation projects.

Quick Facts

Year:
1993

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Private funds

FEMA

Two Birds, One Stone
Village of Aberdeen, Ohio

Brown County, Ohio

Aberdeen, OH - Ohio River flooding is nothing new to the village of Aberdeen and its population of 545. Before March 1997, the historic riverfront community about 50 miles east of Cincinnati had lived through five major 20th century flood events (1913, '36, '37, '59 and '96).

While past efforts had been made to reduce the community's exposure to repetitive damage, including adoption of a local floodplain ordinance in 1983, Aberdeen had an obvious "Achilles heel" in terms of repeated property damage, danger to residents and public safety forces and negative impact on the community's appearance and quality of life.

That vulnerable spot was a stretch of downtown river frontage roughly 10 blocks long by three blocks deep which slopes dramatically down from the village's main street (U.S. Route 52) toward the Ohio River. For the last 100-150 yards before the river bank, the hillside flattens into a level plain 8-10 feet below the Base Flood Elevation (100-year flood level). As a practical matter, during periods of heavy rain or when the river begins to escape its banks, this low-lying area functions as a natural drainage basin which can fill very rapidly with several feet of water.

According to current Aberdeen Mayor Billie Eitel, who took office in 2000, local safety forces and volunteers had been called out on numerous occasions prior to 1997 to rescue residents of this area from rising water and tow mobile homes to safer ground.

Because of the unprecedented speed with which runoff accumulated in March 1997, only a handful of mobile homes could be removed from the riverfront area before it became impassable. Virtually all of the three dozen housing units in the low-lying area were destroyed or significantly damaged by rampaging floodwaters as the Ohio surged out of its banks during the next several days.

During FEMA-assisted local recovery efforts, village officials were put in contact with the OEMA Mitigation Branch and briefed on the availability of federal hazard mitigation grants. In discussing the possibilities with area residents and developing a local HMGP proposal, it became clear to community leaders that they had a unique opportunity to "kill two birds with one stone" through a property acquisition project that would: a) eliminate most structures from the riverfront area and b) convert the village's "front yard" along a scenic stretch of the Ohio from an unsightly jumble of substandard housing into a ¾ mile long riverfront park.

While state and federal officials approved Aberdeen's grant proposal in early 1998, the village and its leaders encountered delays and difficulties in implementing the buyout project.

While a few isolated homes still remain in the mitigated area, by early 2002 Mayor Eitel proudly pointed out a new volunteer-constructed (and flood resistant) gazebo that serves as a bandstand for free summer concerts; a string of new merchant-donated riverbank park benches and a grassy expanse of new public parkland that stretches from the eastern edge of the business district to a pre-existing municipal boat dock and children's playground several blocks away.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Acquisition Projects Help Flood-Prone Community Better Off

Henry County, Illinois

Cleveland, IL - It's just a little winding river in northwestern Illinois, but the Rock River drains a large watershed that includes the Upper Rock, the Pecatonica River in Wisconsin and even as far north as Lake Winnebago. When heavy rain or snow melt occurs in that watershed, the Rock River can rise quickly. That's why residents of this small village of 300 near the mouth of the Rock River have endured flooding year after year.

But the recurring devastation of flooding was considerably lessened during the last two flood events: following an ice jam on the river in February of 2001 and a tremendous amount of rainfall in June of 2002. An acquisition program conducted under FEMA's Hazard Mitigation Grant Program removed a total of 31 structures from the floodplain that had received repeated damage over the years, including the home of Nancy Hoskins. Her house had filled with three feet of water, then four and a half feet, then five and half feet in three consecutive floods before she sold her home through the acquisition program in 2001.

After the Great Midwestern Flood of 1993, members of the community began discussing the possibility of an acquisition project with the Illinois Emergency Management Agency (IEMA). A major flood in 1997 created a strong incentive for the program and by February 1998, properties were being purchased. IEMA and the Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR) coordinated the voluntary buyout of 13 homes in Phase I and 18 homes to date in Phase II. An HMGP grant provided $989,742 for the projects, along with a Floodplain Mitigation Assistance grant of $472,920. The IDNR contributed the 25% matching funds, which totaled $487,554.

"The community of Cleveland focused on helping those in harm's way to have an alternative to flooding, especially those who were elderly or ill in Phase I of the project," said Bob Sherman, IEMA Mitigation Planner. He added that Bob Collis, Cleveland's point of contact for the acquisition program, "worked hard to make sure people got out that wanted to."

For Collis, explaining the components of the buyout program to residents was a priority when initiating the program. Collis and local officials met with residents prior to the public meeting just to explain how everything worked.

"Then those people who were participating in Phase I attended the public meeting and representatives from IEMA, IDNR and FEMA helped explain the whole program to them," said Collis.

Although a buyout program can be a lengthy and complex process, Hoskins said that when the river rose in June 2002 she was glad she had participated: "This year there would have been at least five and a half feet in my house if it had still been there."

Community leaders and IEMA hope to bring that same sense of security to those approximately 25 homeowners who were affected by floodwaters in 2002. Initiatives are currently being taken to continue successfully mitigating in the Rock River floodplain with a Phase III buyout.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Floodplain Project Unites Community Playground Replaces Vulnerable Homes

Menard County, Illinois

Petersburg, IL - On a hot day in late June of 2002, there was a flurry of activity in the floodplain of the Sangamon River in Petersburg, Illinois. It wasn't flood fighting this time. About 40 people, from high school freshmen to senior members of the community, gathered to connect brightly colored pieces into play equipment for a new pre-school playground in a shady spot where flood-prone buildings once stood.

That afternoon was a culmination of years of dedicated work. First, 30 flood-damaged structures were acquired and removed from the floodplain. Then the PORTA High School Community Problem Solvers (CmPS) spent four years raising funds and community support for the re-use project. Using the techniques learned from the Problem Solvers organization, the group developed and implemented plans for an approved re-use of City-owned land purchased in the buyout program, obtaining high praise from IEMA and IDNR for the group's creativity, initiative and interaction of the whole community of Petersburg.

Just a few miles from where Abraham Lincoln spent his early adult years, the Sangamon River has repeatedly flooded the City of Petersburg. Homes in the older section of town nearest the river sustained damage and declining property values from flooding in 1979, 1981, 1983, 1990, 1993, and 1994. After the flood of 1994 in which one person died, FEMA and IEMA authorized the use of Hazard Mitigation Grant Program (HMGP) funds for a buyout of floodprone properties in Petersburg. A total of 43 units were acquired and the structures removed at a project cost of $1,124,589, with FEMA HMGP covering $818,252 and the Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR) contributing $305,201 and the city paying $1,135.

The re-use of vacated land from acquisition projects must follow strict guidelines in abiding by deed restriction language. Basically, no new structures can be introduced.

"So many communities who participate in buyouts are locked into the idea that open space means just green grass," said Ron Davis, IEMA Hazard Mitigation Specialist. "In Petersburg, the kids started thinking about other options and took it upon themselves to make it into something else."

Throughout the process of brainstorming for ideas on how to re-use the vacated lots, the group came up with options that would be appropriate for the floodplain. They eventually decided on a flower garden and playground. The group raised $16,000 through numerous fundraising activities, including the "Decorate an Abe" contest and auction that involved businesses in town decorating a cutout of the area's historic figure. They delivered presentations in Springfield, Chicago, and Charlotte, North Carolina, for the annual meeting of the Association of State Floodplain Managers (ASFPM). They received a $50,000 grant from the State of Illinois, and Floodplain Managers from around the nation donated over $1,000 to their project. The $67,000 in grants and fundraising covered the cost of picnic tables, grills, benches, playground equipment, and a fountain and decorative brick path for the garden.

Quick Facts

Sector:
Private

Cost:
$134,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Floodplain Management Assists Community Rebuilds Itself

Jersey County, Illinois

Grafton, IL - Grafton is a river town located at the confluence of the Illinois and the Mississippi rivers. The City grew because of its proximity to the river network and developed its character based on river life. Grafton has also suffered from the devastation of floodwaters and the hard decisions that come when recovering from a disaster. But through mitigation and the enforcement of floodplain regulations, the city has turned around its flood-prone reputation, while maintaining its river heritage.

The Great Midwest Flood of 1993 was the most destructive in recent history because of record crests on the rivers and the extended duration of the high waters that remained above flood stage for 180 days. In one area of town, floodwaters reached a depth of 15 feet, submerging rooftops.

Flooding kept people from returning to their homes for months while others never returned. Once the waters receded, many homes were uninhabitable because of the mud, mold and water damage.

Since 1973, the city has participated in the NFIP and adopted rules regarding development in the floodplain. "One of the hardest jobs for a local official is implementing floodplain ordinances, but enforcement of the rules is what prevents future flood disasters in places like Grafton. They have to keep new buildings and development out of the floodplain. And when there is a flood they have the thankless job of assessing the damage and having to tell some people whose homes are substantially damaged that they can't rebuild in the floodplain," explained Paul Osman, Floodplain Management Program Coordinator, Illinois Department of Natural Resources/Office of Water Resources.

That difficult job was held by Richard Mosby, who was Zoning and Building Inspector during the time of the buyout program in Grafton. "To be able to participate in the flood insurance program and receive the help from the program when you needed it, you had to enforce the floodplain rules," he commented. "A good floodplain manager is one with the ability to say no."

In the aftermath of the disaster, to comply with the local floodplain ordinance, dozens of flood-damaged homes in Grafton were assessed for damage. To ensure the evaluations were non-biased, the city hired a professional appraiser to assess those structures with damages falling between the range of 40 and 60 percent. Structures that sustained damages above 50 percent of the market value of the building were required to be elevated or removed. A total of 70 houses, 24 lots and 17 commercial properties were acquired and removed from the floodplain, at a cost of $2,320,908 in disaster-activated Hazard Mitigation Grant Program (HMGP) funds and $773,636 in matching non-federal funds from the Illinois Department of Commerce & Community Affairs.

"In the floods since '93, the number of people impacted by them is significantly less," said the mayor. "If it had flooded like this before the buyout at least 40 families would have been affected by flood waters. In this last flood, even though we had the inconvenience of road closures, there were probably less than a dozen people whose homes were affected at all."

Quick Facts

Sector:
Private

Cost:
$3,000,000.00 (Estimated)

Primary Activity/Project:
Floodplain Management

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

When It Rains, It Pours
Preventing Sewer Backup

Cook County, Illinois

Chicago, IL - Looking out the window as one flies into O'Hare airport, a sea of rooftops fills the Chicago landscape. And off those rooftops, much rain does run - straight into the city's sewer system.

With an abundance of buildings, streets and parking lots, urban areas have very little green space to absorb or slow down the onslaught of water in a heavy rain. It's especially a problem in the City of Chicago, a city built on a swamp. The high water table contributes to slower absorption rates and more water flowing overland to fill the city's sewers - an interconnected system carrying both storm runoff and sanitary sewer waste.

Chicago's long and colorful history includes troublesome tales of flooded homes filled with five feet of contaminated, bacteria-carrying water from sewer backup. Residents have had to clear muck, throw out possessions and redo their basements - time and time again.

After the flood of 1997 caused hardship and property loss for some 35,000 residents of its close to 3 million population, City officials took action. Officials formulated a two-pronged strategy: install mechanical devices called inlet restrictor valves and promote downspout disconnection by homeowners citywide. Purchase and installation cost $75 million. This was about a quarter of what traditional sewer system improvements would have cost.

A $7.8 million grant from the Federal Emergency Management Agency Hazard Mitigation Grant Program (HMGP) jumpstarted the Chicago project in 1998 by funding a pilot program in three areas of the City that were repetitively hit with basement flooding. John Roberson, Chicago Sewer Department Commissioner, said, "In every subsequent rain that we've had since the pilot program was implemented, the pilot areas have not experienced the type of flooding they normally would have."

The question is this: can any system be designed for a city as large as Chicago to prevent sewer backup when a storm cloud releases tremendous amounts of water on the city within only a few hours? The morning commute on August 2, 2001, was brought to a standstill as a record 3.56 inches of rain fell over portions of the city during rush hour. The deluge, termed by the Illinois State Water Survey as an 80-year-storm event, caused flash flooding in some areas of the city. Ponding water in the streets indicated that the valves were doing their job of slowing the flow of storm water into the main sewer system.

"The system acted the way it was designed to," said John Roberson. "We would have had 14,000 to 16,000 calls on basements without the 'Rainblocker' installed. This time we had five to six thousand calls ... There isn't a sewer system big enough to handle what we faced with the three to four inches of rain in little over an hour."

The city is the first to recognize flooding problems still exist. Flooded streets, a problem deemed preferable to flooded basements, are an acknowledged byproduct of the valve system because of the restricted flow of water into the sewers. The "Rainblocker" program is clearly a work in progress, but if basement backup has been minimized each time it rains, then it appears the city is headed in the right direction.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Stores Are Outreach Centers
FEMA Program Introduced to Shoppers

State-wide,
West Virginia

Charleston, WV - Reaching people affected by the storms and flooding and providing them with disaster-related educational information at home building supply stores is the aim of a Febderal emergency Management Agency (FEMA) outreach program.

"I went into Lowe's and saw the FEMA table and I just had to tell them what a good idea I thought it was," said Nancy Godby, of Chapmanville. "That is exactly where people go after flooding to get supplies and start cleaning up. That's the first place we went." Godby and her husband, Barry, applied for assistance after floods in 2003.

FEMA's Hazard Mitigation and Community Relations specialists visited specified Lowe's, The Home Depot, and 84 Lumber stores in counties hardest hit by the storms. The teams worked in stores within targeted counties and then moved onto other stores in other counties in following weeks.

The program, known as the Building Supply Outreach Partnership, had a total of 1,091 visitors at the Lowe's stores in Logan and Beckley and the 84 Lumber store in Williamson.

"It is a very efective way to reach people who have had damage but haven't registered for assistance, or folks who wanted information on everything from mitigation ideas to mold and mildew cleanup," said Federal Coodinating Officer Lou Botta. "Our specialists were able to refer some to our toll-free number, counsel others and provide information to those who stopped by for various reasons. Some people just want to talk."

Officials found that 231 people who visited the stores during this time had sustained damage but had not yet registered for assistance. Another 577 people stopped by to talk about mitigation techniques and projects. More than 319 people wanted information on mold and mildew.

"It became evident to us that this is a way to reach people communities who may not be aware of the help available to them," Botta said.

Quick Facts

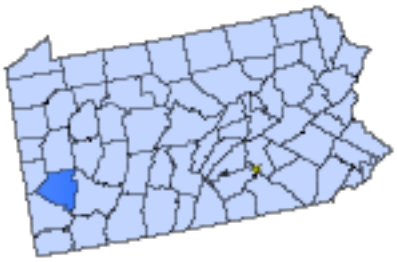
Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Ivan's Wrath Quelled Community Avoids Disaster



Allegheny County, Pennsylvania

Ansonia Place, PA - Prior to 1998, Ansonia Place was a quiet creek-side community close to downtown Pittsburgh. It was home to 22 single-family structures and an apartment building.

After the area was badly flooded in January 1996, the homeowners decided to participate in a Hazard Mitigation Grant Program project that eventually acquired and demolished all the structures, including the apartment building. That decision turned out to be the right one, as the events of September 18, 2004, showed.

Tropical Storm Ivan soaked the Pittsburgh region with at least eight inches of rain. According to Ray DeMichiei, Deputy Director of the Pittsburgh Emergency Management Agency, the entire length of Pennsylvania Route 51 had to be closed from the Liberty Tunel to the City line.

The homes in Ansonia Place, which sits just off Route 51, would probably have suffered first-floor flood damage had they not have been removed. Such flooding would have placed residents and first responders in harm's way and could have resulted in a number of deaths.

The Hazard Mitigation Grant Program (HMGP) administered by the Federal Emergency Management Agency (FEMA) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

NFIP Helps Families Move Houses Out Of Harm's Way

Wyoming County, West Virginia

Wyoming County, WV - Like many locations in West Virginia, floods have hit Wyoming County over and over again. But the latest floods and mudslides that began Memorial Day weekend spared more than 50 homes in the county because of measures taken to move them out of harm's way.

According to Dean Meadows, Wyoming County's Emergency Services Director, one big reason is the National Flood Insurance Program (NFIP). "More than 50 percent of homes in the county flood plain are insured under NFIP," Meadows said.

Because of repeated or substantial flood damage to their homes, some policy holders were approved for up to $30,000 to make their homes more resistant to floods under NFIP's Increased Cost of Compliance (ICC) program.

Mike Wells, a disabled coal miner who lives in Lynko, on Clear Fork Creek, insured his home through NFIP in 1999. After his house was severely damaged by flooding in July, 2001, he elevated it five and one-half feet under his policy's ICC coverage. He received $11,000 dollars from his NFIP policy to pay for it. Well's house had no damage from the flooding that began in West Virginia on Memorial Day weekend. "I do feel safer", he said.

Serena McCracken owns a house in the Lillyhaven section of Lynko. After her home was severely damaged by flooding in 2001, she bought NFIP flood insurance and elevated the structure eight and a half feet under the ICC program. Though Clear Fork Creek flooded again this year, McCracken's house was spared.

Serena McCracken's four children had a frightening experience in the 2001 floods. They had to be rescued from waist-high water inside the home and led to higher ground. After that, she says, they began having nightmares during rainstorms. Now, McCracken says, "The children feel much safer."

Many of her neighbors are now looking into ways they, too, can make their homes safer through the National Flood Insurance Program.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood Insurance

Primary Funding:
National Flood Insurance Program (NFIP)

Ralston Bridge Work Passes Test
Ivan Causes No Damage

Lycoming County, Pennsylvania

Ralston, PA - A bridge damaged by the January 1996 flooding cut the Town of Ralston, Pennsylvania, in half.

Debris had gathered at another bridge further upstream, forcing the creek through the Town and damaging the downstream bridge.

Although FEMA, the Pennsylvania Department of Transportation (PennDot) and Lycoming County had done considerable bridge and creek work in the area, residents were justifiably concerned as the rainfall from Tropical Storm Ivan continued in September 2004.

According to mark Murawski, transporation planner for Lycoming County, the residents "were ecstatic when the floodwaters passed without incident." The bridge and creek work had done their job.

FEMA and PennDOT had completed the work a few years earlier through a combination of hazard mitigation grant funds and state transporation contracts. A raising and widening of the upstream bridge had eliminated the debris/obstruction problem and the creek work facilitated the flow through the town.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Flood Mitigation Assistance (FMA)

Roane County Unites to Relocate Out Of Floodplain

Roane County, West Virginia

Reedy, WV — Today, many residents of Reedy, once a regularly flood-striken community, are at ease thanks to a federal, state and locally-supported program that helped move families out the floodplain and out of harm's way. “I can’t even tell you how many times those people in Reedy got flooded, but I can tell you it was getting worse every time,” said Melissa Bise, director of the Roane County Emergency Services. After years of repetitive flooding, Roane, in 2000 was among six West Virginia counties that qualified to became part of a Federal Emergency Management Agency $3.3 million project funded by the Hazard Mitigation Grant Program and the U.S. Department of Urban Development.

In this once bustling town that served as the county’s main business district, businesses were sold, failed, or abandoned as flooding had become a way of life for those on Main Street and streets behind, a stone’s throw from the right fork of Reedy Creek. “Believe it or not, the hardest part of getting this project started was convincing people that this would be good for them,” Bise said.

Officials said that although most of the repetitively flooded residents were at first reluctant to leave their homes, the desperate situation many found themselves in with nearly uninhabitable homes made the choice to move an easy one.

Connie Wilson is glad that she and her aging parents moved out, but it took some convincing. “No one wanted to leave. We are a community and we didn’t want to give that

up. Wilson said she and her parents did not opt-in to the acquisition opportunity the first time, but when the next flood hit, Wilson quickly changed her mind.

“I knew it was the right thing to do. I’d look out and think it’s so pretty, but it’s not pretty when it’s a river in your backyard,” Wilson said. Both she and her parents subsidized the money they received to build new homes just blocks from where they had lived.

Wilson said she suffered respiratory problems, but never made the connection between the flood damage just below her first floor. “After each flood time I had the duct worked cleaned… but it’s funny, now that I’ve moved I’m no longer coughing,” she added.

Last year, with federal, state and local agencies working together, 35 families and structures including two churches in Reedy moved out of harm's way in one of the largest flood mitigation projects in the State of West Virginia. More than $1.3 million was allocated to the project. All of the residents relocated in Roane County with the exception of one family who moved to neighboring Jackson County. Robert Nichols and wife, Linda, also opted into the acquisition program. “The process wasn’t without it’s problems, but am I glad we did it? I’m tickled,” he said. “It was the best thing that could have happened to us.”

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigation Protects Water Line
Allegany County Benefits

Allegany County, New York

Allegany County, New York – A mitigation project to protect a water supply pipe in Allegany County has likely paid for itself at least three times since it was completed. Severe storms and flooding in the spring of 2000 caused the rupture of a water main that crosses under Houghton Creek in the Town of Caneadea. The main carries water from the town's filtration plant to its water tower, supplying Houghton College and town residents.

The President approved the use of federal disaster funds to help New York recover from the effects of the storms. Among the recovery programs activated by the declaration was the Public Assistance Program. This program reimburses eligible government jurisdictions and certain non profits providing a government-like service for disaster-related damage and costs for debris removal, emergency protective measures and the repair or restoration of damaged public infrastructure.

The Federal Emergency Management Agency (FEMA) provides 75 percent of the grant funding. The 25 percent non-federal share is made up from other sources. The New York State Emergency Management Office (SEMO) administers the program. In most cases, Public Assistance repair and restoration funding brings the damaged infrastructure back to pre-disaster conditions.

However, a major FEMA and SEMO policy goal is to mitigate, where it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damages. A little extra money spent now may save untold funds later.

Section 406 of the Public Assistance Program empowers the FEMA Region II Regional Director to make additional obligations of funding in order to protect the facility from future damages. That was the case with the Town of Caneadea water project.

In addition to repairing the damaged pipe to its pre-disaster condition, the project involved construction of an emergency overflow bypass, upstream from the area where the pipe ruptured, to divert stream flows during high water incidents. As a result, officials said, since the pipe was repaired it has performed without incident on several occasions, including three additional declared disaster events. The special mitigation work amounted to about $42,000 of the total $124,000 cost, with the federal share at about $93,000.

"Mitigation activities such as these are a smart way of doing business by expending monies now to lessen the threat on communities before an event occurs in the future," said James W. Tuffey, Director of the State Emergency Management Office.

"This is an excellent example of an investment in infrastructure improvements that will pay dividends for years to come," said FEMA Federal Coordinating Officer Marianne C. Jackson.

Quick Facts

Sector:
Public

Cost:
$123,603.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Mitigation Improves Road Road Less Likely to Flood

Schenectady County, New York

Albany, NY – Perennial flood damage to a section of Washout Road in the Town of Glenville, located in Schenectady County, has been overcome thanks to a federal-state policy goal that provides extra funding to mitigate against future damages to public infrastructure. Heavy and continuous rainfall in the spring and summer of 2000 scoured, eroded and washed away banks of the Washout Creek, in turn causing damage to the adjacent Washout Road - a common problem over the years.

At the request of Governor George E. Pataki, the President signed a major disaster declaration for New York State as a result of the 2000 flooding. Among the recovery programs activated by the declaration was the Public Assistance Program. This program reimburses eligible government jurisdictions and certain non profits for costs for debris removal, emergency protective measures and the repair or restoration of damaged public infrastructure.

The Federal Emergency Management Agency (FEMA) provides 75 percent of the grant funding. The 25 percent non-federal share is made up from state and local funding. The New York State Emergency Management Office (SEMO) administers the program. In most cases, Public Assistance repair and restoration funding brings the damaged infrastructure back to pre-disaster conditions. However, a major FEMA and SEMO policy goal is to mitigate, where it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damages. A little extra money spent now may save untold funds later. In addition to restoring a retaining wall, embankment, shoulder and roadway along the creek, the Washout Road project also involved installation of a precast concrete T-wall for bank stabilization. That extra measure cost about $38,000 and brought the total project cost to about $134,000, of which the federal share was approximately $100,000.

“This construction technique doesn’t apply everywhere, but at this location it worked pretty well,” according to project engineer Paul Sheldon.

Since the work was completed, officials said, the creek embankment has been stable during severe weather and road damages have been avoided.

Joe Ryan, Director of Public Works for Schenectady County, is happy with the results. “That area had been a chronic problem for years,” he said.

Ryan is also a supporter of spending extra money now if it means preventing problems in the future. “I see a lot of things that get fixed that ought to be upgraded,” he said. “We’re going to pay now or pay later.”

“Mitigation activities such as these are a smart way of doing business by expending monies now to lessen the threat on communities before an event occurs in the future,” said James W. Tuffey, Director of the State Emergency Management Office.

Quick Facts

Sector:
Public

Cost:
$134,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Enhanced Restoration Project Provides Better Protection for Town Road

Ulster County, New York

Hurley, NY – Repairs to a section of highway in the Town of Hurley in Ulster County, which was damaged by severe storms and flooding last fall, were performed to higher standards that should help protect the road against future destruction.

Heavy and continuous rainfall during the storms led to a surge from uphill streams that overwhelmed a culvert carrying water under Eagles Nest Road. With the culvert blocked by debris, a torrent of water undermined the road bed and washed out a section of the highway and its underlying material. At the request of Governor George E. Pataki, President George W. Bush signed a major disaster declaration for New York State as a result of the storms.

Among the recovery programs activated by the declaration was the Public Assistance Program. This program reimburses eligible government jurisdictions and certain non-profits for costs for debris removal, emergency protective measures and the repair or restoration of damaged public infrastructure. The Federal Emergency Management Agency (FEMA) provides 75 percent of the grant funding. The 25 percent non-federal share is made up from state and local funding. The New York State Emergency Management Office (SEMO) administers the program.

In most cases, Public Assistance repair and restoration funding brings the damaged infrastructure back to pre-disaster conditions. However, a major FEMA and SEMO policy goal is to mitigate, where it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damages. A little extra money spent now may save untold funds later.

In addition to cleaning out the 18-inch diameter culvert, repairing the highway and resetting guide rails, the Eagles Nest Road project included the addition of a new 36-inch-diameter culvert adjacent to the existing pipe to channel flows during high water periods. That extra measure cost about $1,700 and brought the total project cost to about $68,000, of which the federal share was approximately $51,000.

“That was a classic example of accumulated natural debris from upstream plugging the culvert and causing the washout,” explained Hurley Highway Superintendent Linda Cook. Keeping ahead of such problems is a perennial issue for small towns with limited resources, she said. “Money is the key thing, and time plays a factor.” Cook is a supporter of FEMA’s policy to identify mitigation efforts that prevent future damage. “It’s much better than it used to be,” she said.

“Mitigation activities such as these are a smart way of doing business by expending monies now to lessen the threat on communities before an event occurs in the future,” said James W. Tuffey, Director of the State Emergency Management Office.

“This is an excellent example of a modest investment in infrastructure improvements that will pay dividends for years to come,” said FEMA Federal Coordinating Officer Marianne C. Jackson.

Quick Facts

Sector:
Public

Cost:
$51,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
State sources

FEMA

Unified Sewerage Agnecy
Washington County, Oregon

Washington County, Oregon

Washington County, OR - On May 12, 2000, the Unified Sewerage Agency of Washington County, Oregon (USA), signed a Partnership Agreement with FEMA under the Cooperating Technical Communities (CTC) initiative (now the Cooperating Technical Partners [CTP] initiative). Under that Agreement, USA and FEMA agreed to work together to ensure flood-hazard information for the incorporated and unincorporated areas of Washington County served by USA is kept up to date and accurate.

The first mapping activity being undertaken by USA and FEMA is a revised study of the 166-square-mile Tualatin River. Under its agreement with FEMA, USA will perform detailed hydrologic and hydraulic analyses and prepare floodplain and floodway mapping for the Tualatin River and its tributaries.

According to USA, the project will result in the development of numerous products that will be of value to the community officials and residents of Washington County.

FEMA will use the digital topographic, hydrologic, and hydraulic data and mapping to produce a new Digital Flood Insurance Rate Map (DFIRM) for all of Washington County. This will mean up-to-date flood hazard information for residents in the Cities of Beaverton, Cornelius, Forest Grove, Hillsboro, King City, Lake Oswego, North Plains, Portland, Rivergrove, Tigard, Tualatin, and Wilson; the Towns of Gaston and Sherwood; and the unincorporated areas of Washington County will be shown on one FEMA flood map.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

FEMA

Complex System Research Center
University of New Hampshire

Multiple Counties,
New Hampshire

Rockingham and Strafford Counties, NH -- On September 29, 1999, the Complex Systems Research Center (CSRC), a branch of the University of New Hampshire, signed a pilot agreement with FEMA under the Cooperating Technical Communities (now Cooperating Technical Partners [CTP]) initiative.

The objective of the agreement was to convert effective Flood Insurance Rate Maps (FIRMs) for three New Hampshire communities into a digital format that conforms to FEMA's new Digital FIRM (DFIRM) specifications. The agreement covered the digitization of 10 FIRM panels for the communities of Salem, Windham and Atkinson - all in Rockingham County. Under the agreement, CSRC also incorporated the results of Letters of Map Change (LOM-C) that had been issued by FEMA since the publication of the effective FIRMs for the three communities.

In 2000, CSRC and FEMA entered into a new DFIRM preparation agreement. This new agreement is for the digitization of 81 FIRM panels for Rockingham County, and 70 FIRM panels for Strafford County.

Overall, the digital format would make the maps easier to obtain and use. For communities with digital mapping capabilities, the DFIRMs will support floodplain management and preparedness programs. In addition, the base maps for the DFIRMs will be U.S. Geological Survey Digital Orthophoto Quarter Quadrangles (DOQQ), which are more accurate and up to date than the base maps used for the effective FIRMs.

The project will enable the CSRC, which is highly respected for its mapping capabilities throughout New England, to expand its expertise into new types of mapping. In addition, the project will help FEMA meet two of the goals of its Map Modernization Program: converting the map inventory to a digital format and increasing local involvement in the mapping process.

According to Steve Colman, Deputy Director of the Mitigation Division at FEMA's Region I office in Boston, MA, "The partnership formed with the University of New Hampshire's Complex Systems Research Center and FEMA under the CTP initiative has clearly demonstrated that by forming partnerships at the local level with qualified organizations we can improve our FIRMs and move forward with FEMA's Map Modernization Program."

Quick Facts

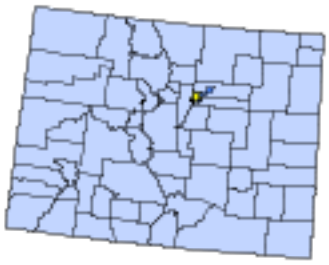
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

Urban Drainage and Flood Control
Denver, CO



Denver County, Colorado

<b>Denver, CO<b> - On May 17, 1999, Denver's Urban Drainage and Flood Control District (UDFCD) became one of the first partners to sign an agreement with FEMA under the Cooperating Technical Partners (CTP) initiative. As Scott Tucker, Executive Director of UDFCD, sees it, "The thrust of the [CTP initiative] is for us to work together to create and maintain accurate up-to-date flood hazard data for the 32 communities participating in the National Flood Insurance Program which are served by [UDFCD]."

The initial Partnership Agreement with FEMA set forth the basic intent of the cooperative effort. UDFCD and FEMA have signed two agreements covering mapping activities to be undertaken under the CTP initiative. The mapping activities undertaken to date are summarized below.

Hydrologic and Hydraulic Data Preparation and Review

UDFCD and FEMA have established the hydrologic and hydraulic (H&H) data parameters that UDFCD would use to conduct flood studies and that FEMA would accept. In addition, the major issue of the use of "future conditions hydrology" was resolved. Because of the continuing growth, local land-use decisions are based on the future urbanization conditions of the watersheds in the 32 communities served by UDFCD. In their first mapping agreement, FEMA and UDFCD established the conditions under which future conditions hydrology can be used for flood hazard mapping. FEMA has started the process to change National Flood Insurance Program (NFIP) regulations to allow future conditions floodplains to be shown on FEMA flood maps.

Survey of Local Digital Mapping Capabilities

UDFCD also has initiated a survey of the digital mapping capabilities of the local governments in an effort to determine which communities are able and willing to provide digital base mapping to FEMA that could be used to produce Digital Flood Insurance Rate Maps (DFIRMs). UDFCD also has taken on the responsibility of coordinating with the communities to ensure the digital mapping provided meets FEMA specifications. The use of local digital products has the advantage of being more easily updated as changes occur and more accurately portraying local field conditions.

Preparation of Sample DFIRM

Using a grant from FEMA, UDFCD prepared a sample DFIRM for a portion of Douglas County in accordance with FEMA specifications for DFIRMs. UDFCD combined flood hazard information from the UDFCD Flood Hazard Area Delineation Study for Willow Creek and digital base map information provided by Douglas County. Based on comments FEMA provided to UDFCD concerning the sample DFIRM, UDFCD has completed the conversion of the map panels for Willow Creek and is working toward digitally converting the map panels for the remaining potion of the county within UDFCD. UDFCD also developed guidelines for its contractors to use to ensure that future flood hazard studies will be compatible with FEMA DFIRM specifications.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

Spartan Child Development Building Safe Room

State-wide, Michigan

East Lansing, MI– Michigan State University received Hazard Mitigation Grant Program (HMGP) funds to include storm shelters in a new Spartan Child Development Center in 2000.

This structure, a one-story wood frame structure of residential character built on a concrete slab, was built to provide care and shelter to over 170 children and staff. Each of the eight classrooms was built with a vestibule between the main corridor and the classroom, thereby assuring close proximity to the shelters at all times. They were reinforced with concrete to provide shelter from the threat of tornadoes and high winds in excess of 250 miles per hour, allowing 20 to 25 children and adults to be protected in each room.

The 15,000-square foot storm room space contains children's lockers with a bench in front of each locker for the child to sit and remove boots or shoes. In addition, storm kits containing battery-powered lights, radios, quiet activities and snacks were placed in each room.

The safe room construction within the building was estimated at a 75 percent Federal share of $123,750, approximately $20,625 for each room and 7.5 percent of the total building cost.

Established in 1971, the Spartan Child Development Center is described on its Web site as a facility "dedicated to meeting the needs of children ages two weeks to seven years in an environment that nurtures and guides their individual growth and development."

With the addition of the safe room, the facility can also say it is dedicated to the safety of their children during a sever tornado event.

Hazard mitigation planning is an important aspect of a successful mitigation program. States and communities use the hazard mitigation planning process to set short and long-range mitigation goals and objectives. Hazard mitigation planning is a collaborative process whereby hazards affecting the community are identified, vulnerability to the hazards are assessed, and consensus reached on how to minimize or eliminate the effects of these hazards. In recognition of the importance of planning, States with an approved enhanced State Mitigation Plan in effect at the time of disaster declaration may receive additional HMGP funding.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$165,000.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Safe Room Provides Relief
Safe For Homeowners And Pets

Oklahoma County, Oklahoma

Oklahoma City, OK– When Karen and her husband built their retirement home in 2002, they were determined to build a protective safe room equipped with the necessary amenities and materials in the event of a devastating tornado. Instead of building the room inside their home like most people, they decided to construct it 20 feet away from the house, and to build it large enough for their extended family.

“I believe my pets are part of my family,” Karen said, referring to her three dogs – two Airedales and a Blue Heller – and bird – a Scarlet Macaw. “I wasn’t going to run three dogs through the house. Because of weather conditions, I couldn’t see running three dogs over the carpet.”

Another reason for building a safe room beyond the confines of their new house was their refusal to alter their floor-plan design. The house was intended to be their last and they wanted it to be a certain way.

“It would have been too much structural change,” Karen said. “I didn’t want to change my basic plans of the house … the floor plan I liked. I didn’t want to modify it to accommodate everyone.”

While the main house is mostly handicapped accessible, it still would have been difficult to construct a safe room inside the house and have someone in a wheelchair enter it without requiring assistance down the stairs. The safe room has a ramp, making it easily accessible for anyone confined to a wheelchair.

“It is a retirement home for my husband and I and one of us could end up in a wheelchair someday, [whether] permanently or temporarily,” Karen said. “Based on Murphy’s Law, that’s when a tornado would hit. We just decided to have everything handicapped accessible.”

Karen and her husband based their safe room model on FEMA regulations and just added a few additional measures of their own. The room is a concrete and steel structure with French drains. The concrete was poured 10 feet thick with reinforced steel throughout. The front of the cellar faces north and wings are extended on the sides and top to hold back the clay. Four feet of Earth also cover the roof of the cellar. Stucco, paint and water sealer was applied to the concrete and a metal porch was built on top of Hickory beams to prevent rain from pouring inside whenever the door was opened. No moisture is likely to leak into the cellar. Karen said she intended to build it that way because she strongly despises a “damp, musty basement.”

The project probably cost more than what it normally would have if they had built it inside their home and without all the added weather protection, but Karen was willing to make the sacrifice. She also wanted the room – measured at 10 by 12 feet – to be large enough for her, her husband and their pets. “I just wanted to take FEMA’s requirements and enhance them,” she said. “I probably have exceeded their requirements … [so] yes, there was an added expense to have it bigger. But it really didn’t add that much. It was worth it to me. That was a personal call. Everybody has to make them.”

Quick Facts

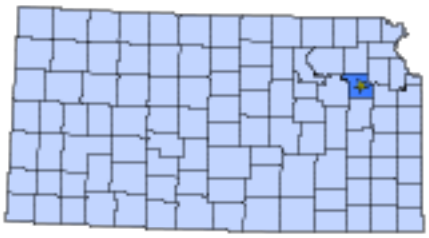
Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Homeowner

Commission Approves Policy Safe Rooms In Shawnee



Shawnee County, Kansas

Shawnee, KS - A tornado with a wind speed of 250 miles per hour could destroy mostly any man-made structure in its path, except for an 8 by 10 foot ground-level room reinforced only with a wood frame and a thin sheet of steel.

A storm safety room has become a requirement for all multiple-family structures being built in Shawnee, Kansas. The County's planning commission approved a policy in June 2005, requiring developers to include such a room in every multiple-family residence.

"If the safe room is designed to the regulations that FEMA has provided, then FEMA describes the level of protection as near absolute," said FEMA Civil Engineer Bob Franke. "Except for the very, very strongest tornado, these rooms are going to withstand pretty much any storm they face."

There are three different publications developers can refer to in order to meet design and reinforcement specifications. The reason the room works so well, according to Franke, is not because of the materials used but the design. If many of the rooms are only reinforced with plywood, then there must be something about the way it is constructed that makes people inside safe from the dramatic dangers of a tornado.

"It doesn't necessarily have to have concrete or a steel door," he said. "It's all about the way it's constructed and put together." Franke said the room, if designed to specifications, would be able to withstand not only a tornado with 250 mph winds, but also a 15-pound missile traveling 100 mph. The foundation would need to be on the ground, so the room would have to be on the ground floor, Franke added.

In Shawnee and other places with high tornado activity, safe rooms have proven to be more effective than basements.

Another reason the commission approved the safe room policy was that it did not raise construction costs as long as it is built simultaneously with the new structure.

If a developer appears before the planning commission and he or she does not abide by the safe room policy, the commission would, in all likelihood, disapprove the building permit. Some county officials are hoping the policy will extend to single-family homes in the near future.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Residential

Del Norte County, California
Studying Flood Hazards

Del Norte County, California

Del Norte County, CA - On Aug. 22, 2000, Del Norte County signed a Partnership Agreement with FEMA under the Cooperating Technical Communities initiative (now the Cooperating Technical Partners [CTP]). Under that agreement, Del Norte County and FEMA agreed to work together to ensure flood hazard information for the county is kept up to date and accurate.

The first mapping activity being undertaken by Del Norte County Community Development staff and FEMA staff is a restudy of flood hazards along a 21-mile length of the scenic Smith River near the City of Crescent City and a three-mile length of Rowdy Creek, a tributary to the Smith River. Under the agreement with FEMA, the Community Development staff will develop digital cross section data, digital topographic data and digital base maps in two phases.

During Phase 1, the County will develop data for a 16-mile long segment of the Smith River extending from the community of Gasquet to a point approximately one mile downstream of the U.S. Highway 101 bridge.

During Phase 2, the County will develop data for the remaining five miles of the Smith River, down to its mouth at the Pacific Ocean and for a three-mile long segment of Rowdy Creek, from its confluence with the Smith River to approximately 1,000 feet upstream of the U.S. Highway 101 bridge.

FEMA will use the digital cross section data, topographic data, and base maps as part of its detailed study of flood hazards along the Smith River and Rowdy Creek. FEMA will develop new hydraulic models and flood mapping and will produce a new Digital Flood Insurance Rate Map (DFIRM) for use by County officials and the county's 27,000 citizens. Officials plan to integrate the digital products with its floodplain management and land-use planning products.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

FEMA

Lower Colorado River Authority
State of Texas

State-wide,
Texas

The State of Texas -- How can communities maintain accurate, up-to-date flood hazard data? That is the quest of FEMA and the Lower Colorado River Authority (LCRA) in their Cooperative Technical Partner (CTP) agreemen. Two pilot projects to produce digital maps in Central Texas have demonstrated how the CTP program can help communities without technical expertise to participate in the digital map conversion process.

Under the CTP agreement, the LCRA is helping to craft a process for maintaining the currency and accuracy of flood hazard data. The LCRA and its partners have used cost -effective GIS technology for FEMA Digital Floodplain Insurance Rate Map (DFIRM) production during pilot projects in two communities, Lago Vista and Meadowlakes, located on lakes formed from the lower Colorado River in central Texas.

In the first year of the CTP, the LCRA assessed the mapping needs for Lago Vista and developed a six-panel draft DFIRM. Paper maps were converted into digital flood data. The digital data were fitted onto a new orthophoto base map. The Special Flood Hazard Area (SFHA) was redelineated with updated topographic data. The resulting data was used to produce new preliminary FIRMs.

During both pilot projects, the LCRA has tested FEMA's DFIRM specifications, developed a production process and defined quality assurance/quality control procedures for DFIRM production. The LCRA was able to provide DFIRM base data for the Colorado River's 500-year floodplain corridor based on a recently completed Contour Mapping Project. However, other DFIRM layers come in a variety of formats, projections, datums and accuracy levels. Additional processing in a Geographic Information System (GIS) is required to incorporate the data into a FEMA DFIRM. With the development of cost-effective production strategies to convert the data, minor challenges encountered during the conversion procedures were overcome. This information will assist FEMA in further refining newly-developed DFIRM production procedures.

The LCRA, in cooperation with the University of Texas Center for Research in Water Resources (CRWR), invented a DFIRM "quilting" process during the pilot project to include more accurate aerial photos into the Digital Orthophoto Quarter Quadrangle (DOQQ) base maps. This quilting process reduces the file size of the base map data by about 42,000 KB per panel. Quilting substantially reduces FEMA storage requirements for base map data.

In an extended project, the automated DOQQ quilting process would be used to produce a seamless base map for each county. Base map panels would be enhanced with the new aerial photography and 2-foot contour information from LCRA's Contour Mapping Project.

Political boundaries also would be included as a base map layer. Developing such community political boundaries has proved to be the most complex and time-consuming activity of base map production. As the DFIRM project progresses, the floodplain coalition will help obtain and update the political boundary GIS data layers. Communities will then have the opportunity to play a proactive role in the digital conversion process and to take charge of floodplain mapping in their area.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

FEMA

State of North Carolina
CTP Agreement

State-wide,
North Carolina

The State of North Carolina --The State of North Carolina, FEMA, and numerous other Federal, State and local agencies entered a Cooperating Technical Partner (CTP) agreement September 15, 2000—the one-year anniversary of Hurricane Floyd. Under the agreement, the state will assume primary ownership of, and responsibility for, the National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRMs) for all North Carolina communities. The project includes conducting flood-hazard analyses and producing updated, digital FIRMs.

North Carolina is the first state to enter into a CTP partnership with FEMA. North Carolina's interest in updating its flood maps is understandable. The state faces extreme hazard and consequence from hurricanes and flooding. Since 1989, there have been 14 Federally declared disasters in North Carolina. The updated digital FIRMs produced through this CTP project will help to protect the lives and property, and contribute to the general well being of North Carolina citizens. In August 2000, the North Carolina General Assembly allocated $23 million to the flood mapping project. FEMA has contributed an additional $5.3 million toward the project, as well as in-kind contributions of engineering, mapping, and program management services through its Map Coordination Contract.

Based on the General Assembly's directive, work has begun on Phase I, which includes the six eastern river basins (Cape Fear, Lumber, Neuse, Pasquotank, Tar-Pamlico, and White Oak). These were the basins most impacted by Hurricane Floyd (1999). They account for approximately one-half of the state, affecting 57 counties (in whole or in part) and approximately 21,200 linear miles of streams, rivers, and coastlines. Studies were completed for the Lumber, White Oak, and Cape Fear River Basins at the end of 2001 and for the other three basins near the end of 2002. Phase II, which includes five basins in central North Carolina, was initiated with data collection in November 2002. The first Mapping Activity Statement (MAS) for FEMA funding of Phase II was fully executed on July 1, 2004. Phase III, which includes the final six basins in western North Carolina, was initiated in December of 2004 with data collection.

Quick Facts

Sector:
Public

Cost:
$119,000,000.00 (Actual)

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

DuPage County, Illinois
CTP Agreement

DuPage County, Illinois

DuPage County, IL - As a large county in Illinois with an active water resources management program, DuPage County has developed its own, highly advanced methodology for modeling the flood hazard. Their principal goal in the Cooperative Technical Partner (CTP) program is to integrate its water resources management efforts with the NFIP program so the FEMA FIRMs will reflect the most up-to-date flood hazard information available for the county.

To achieve this goal, DuPage County has worked through the CTP program to get FEMA approval for its flood hazard modeling methodology. The next step is for DuPage County to create a digital FIRM (DFIRM) for the county with updated floodplain delineations based on new topography. The countywide DFIRM will be the foundation for the future work planned by the county. Building on this foundation, the county is planning a multi-year effort to update the hydrology and hydraulics (H&H) on a countywide basis using its own innovative engineering modeling system. The result will be a state-of-the-art, comprehensive watershed model for the entire county.

The complete countywide DFIRM is expected to be finished in 2001. A pilot area has already been completed, and the County expects to complete work on a 13 square mile drainage basin within the next four months. FEMA has provided a small amount of funding for the project, but DuPage County is performing the majority of this extensive effort on their own.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

Borough of Staten Island, New York DFIRM

Richmond County, New York

Borough of Staten Island, NY - On July 8, 1999, the Borough of Staten Island, signed an agreement with FEMA under the Cooperating Technical Communities (now Cooperating Technical Partners [CTP]) initiative. The objective of the agreement was to refine and/or eliminate floodplains designated Zone A from the effective Flood Insurance Rate Map (FIRM) for Richmond County, Borough of Staten Island. The Zone A boundaries had been delineated from the State of New York Freshwater Wetland Maps. Subsequent to the publication of the effective FIRM for Staten Island, FEMA was notified that the wetland maps were in error and therefore, the Zone A floodplain boundaries were delineated incorrectly.

As part of the CTP agreement, Staten Island provided FEMA with a written summary of the Zone A areas in need of investigation, and provided technical support and assistance as needed. To correctly delineate the floodplain boundaries on work maps prior to preparing a revised FIRM, FEMA conducted onsite investigations to verify the wetlands delineations and performed new analyses for storm sewers within the community that contained flooding discharges. Then FEMA digitized the FIRM and issued a preliminary version of the Digital FIRM (DFIRM) to the community for review on September 7, 2000. The final DFIRM became effective on May 21, 2001.

Feedback from the Borough of Staten Island on the CTP project has been positive. The new DFIRM will provide the Borough with a more accurate floodplain management tool. In addition, with the more accurate delineation of the floodplain boundaries, the floodprone designation has been removed from between 400 and 500 properties. For these properties, the mandatory flood insurance purchase requirements of the National Flood Insurance Program (NFIP) will no longer apply, and the property owners will have the option of purchasing insurance at a significantly reduced rate.

The CTP agreement and related mapping activities has helped FEMA meet three objectives of its Map Modernization Program: to more accurately delineate or remove erroneous A zones, to convert the flood map inventory to a digital format and to increase local involvement in the mapping process.

Quick Facts

Sector:
Public

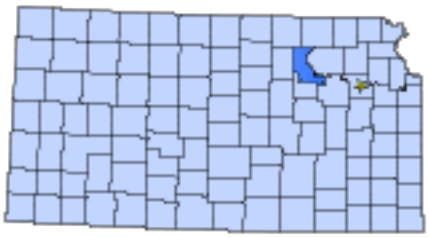
Cost:
$40,000.00 (Estimated)

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

FEMA

Riley County, Kansas
DFIRM



Riley County, Kansas

Riley County, KS - Riley County, which contains the City of Manhattan, is creating a countywide Digital Flood Insurance Rate Map (DFIRM). As part of their participation in the Cooperative Technical Partner (CTP) initiative, the county is taking advantage of several concurrent revisions in the county and incorporated areas within the county to convert from multiple hard-copy single jurisdiction FIRMs to a single countywide DFIRM.

Building on their existing Geographic Information System (GIS) resources, Riley County is integrating the results of three existing preliminary flood studies within the county into a countywide DFIRM. The county has recent high-quality digital orthophoto base maps, road centerlines and jurisdiction boundaries and has already converted their existing FEMA maps to GIS. The county is digitizing the preliminary FIRMs from the flood studies in progress and integrating them with their existing GIS data.

Riley County is one of the first projects to use the DFIRM standards to produce a GIS product instead of a CADD product. This project will update three ongoing studies for several streams within the communities of Odgen, Riley, Manhattan and Riley County to achieve a number of modernization goals for FEMA. Riley County's portion of the project will use effective and revised data to create a countywide DFIRM rather than a separate DFIRM for each jurisdiction. This effort is built on previous efforts completed by the county to obtain and/or create digital flood hazard data.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Cooperative Technical Partner Activity

Primary Funding:
Cooperating Technical Partners (CTP)

Acquisition in Rahway Brings Ecological Renewal

Union County, New Jersey

Rahway, NJ - When Hurricane Floyd brought flooding that exceeded the 100-year flood elevation in Sept. 1999, Rahway residents were already living on higher and safer ground.

The Union and Allen Street areas, which had been ravaged by floods in the past, were flooded again, only this time there were several empty lots where houses had previously stood.

The City of Rahway, using funds from FEMA Flood Mitigation Assistance and New Jersey Green Acres, put together an acquisition program in 1995. The former homeowners who resided in the Union and Allen Street area decided to sell their homes and move elsewhere in the city.

City officials also put conditions on their approval of the Union County Utilities Authority Resources Recovery Facility, which was located on a former landfill. The utility was constructed to repair the environmental damage done by years of dumping along the bank of the Rahway River. The authority agreed to a wetland restoration project that can rise and fall with the level of the river.

Today, a visitor could watch a great blue heron take flight at the public park and nature trail along the river. Phragmites, spartina and other native waterside plants are being used to protect and stablilize the riverbank. A floating boardwalk, a cormorant and a belted kingfisher also occupy the area.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

Elevated Home Barely Affected April Rain on the Delaware River

Bucks County, Pennsylvania

Harrisburg, PA – When the Pennsylvania Emergency Management Agency (PEMA) gave the storm alert one day before April Fool's Day, Don Menke yawned. "This must be a joke," he thought. The sky was slightly gray and, yes, he expected rain, but maybe PEMA was being extra cautious because of the tropical depression iin late 2004.

On April 2, 2005, Don gazed out the window of his Delaware River bungalow as it began raining softly. To his surprise the river started rising immediately—and steadily. He felt safe, however, because his home is elevated eight feet above grade.

Don had minor water damage to his furnace and electric meter, which are at grade. He bought the house five years ago, already elevated. He plans to renovate, moving the furnace and meter above grade and reserving the space under his house for just his car and storage. An architect, Don is still considering how to build partitions between the existing support columns that will allow floodwaters to flow through. Disaster officials suggested Flood Vents in the walls to manage the flow and Don is considering that option. Don's flood insurance covers damage to the house, including the furnace. He registered with FEMA and received rental assistance for lodging until repairs to his electrical system and furnace can be made.

Don Menke's only damage from the April flood was to his furnace and electric meter.

"One of the most effective ways too prevent future flood damage is to elevate your home above the flood level," said Commonwealth Coordinationg Officer Adrian R. King Jr. "Mr. Menke's case is a testament to the effectiveness of home elevation for mitigation."

Federal Coordinating Officer Tom Davies added, "Using mitigation techniques is not only wise in terms of money saved on repairs and other losses, but it decreases stress and displacement. It is an important aspect of disaster preparedness."

As of July 2006, Mr. Menke has not yet reached his goal of elevating the furnace and electric meter, though he did gain the necessary permission from the electric company to raise the meter to a significantly higher elevation. Additionally, the possibility of fuel oil leaking was eliminated by anchoring the fuel tank.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Home Retrofitting Along River Ivan Caused Serious Damage

Bucks County, Pennsylvania

Yardley, Pennsylvania — In April 2005, the Delaware River and the Delaware Canal overflowed their banks. They met at Tessie Reading's house, which is located one block away from both. Tessie is no stranger to floods. When she and her husband began construction of their home in 1955, prior to floodplain management ordinances, they experienced their first flood. Construction was delayed until 1956.

Tessie, 76, has enjoyed morning walks along the River for years. The view was spectacular. She doesn't enjoy it quite the same way now. "It's a beautiful place to live," she said. "I'm not sure I like it so much anymore."

Hurricane Fran caused more flooding in 1996. Having raised six sons, Tessie developed great strength and determination. She still works four hours a day packaging cosmetics for a company that hires senior citizens. Her husband had passed away and making her home habitable was difficult, but she managed. Tessie learned a lesson from the 1996 flood. She could give up her home and move to higher ground or she could take action to reduce future damage to her home and personal property. She chose to stay. Most of the flood water had come in through an outside door in the basement. She sealed the door and turned the outside stairwell into a flower garden. "I never thought [flooding] was going to happen again," said Tessie.

When Hurricane Ivan hit in September 2004, floodwaters filled the basement of Tessie's home, and rose to two feet on the first floor. Her furnace, electrical panel, washer, dryer, water heater, freezer, and some personal items were destroyed. In response, Tessie consulted with a Federal Emergency Management Agency (FEMA) Hazard Mitigation Advisor in a Disaster Recovery Center (DRC). She decided to convert a first floor bedroom into a utility room, and relocated the electrical panel, washer, dryer, and freezer there. She paid for the mitigation project with a disaster loan from the Small Business Administration (SBA).

Tessie also purchased flood insurance for her home and some content coverage, for which she pays $829 a year. Although the Readings had flood insurance for 30 years (dating from when they first constructed their home), as required by their mortgage, she dropped the flood insurance when the mortgage was paid off. Since she hadn't had a flood in all that time she thought she wouldn't need it.

The April 2005 floods proved her wisdom. Although floodwaters entered her basement, the power stayed on and her appliances stayed high and dry. Tessie lost her furnace again, and her water heater. The fuel oil tank shifted, and one of the support legs cracked. Fortunately no spill occurred as it had in 1996. Damages totalled $16,000. Her flood insurance paid $14,000 and FEMA disaster funds covered the other $2,000.

Since the floods in June of 2006 caused damage to her furnace and water heater again, Ms. Reading would like to have them moved upstairs. One thing she did do between last years flood and this years flood was to anchor her Fuel Tank. Previously she had a fuel spill. This year her tank was anchored and did not move or spill any fuel. She really is enthusiastic about any Mitigation measures.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Utilities

Primary Funding:
U.S. Small Business Administration (SBA)

FEMA

Homes are High and Dry
Protection from Verde's Floodwaters

Yavapai County, Arizona

Cottonwood, AZ – Arizona's Verde River showed its dangerous side by flooding four times during the winter of 2004-2005. But for the most part, the Cottonwood homeowners along Comanche Drive with front-row views of the river escaped serious damage. Under a Yavapai County requirement, homes built in the Verde's floodplain must be elevated at least one foot above the base-flood level. Although the rising water entered some of the lower-level crawlspaces, no flooding was reported in the living areas of these homes. The recent flooding – the worst since 1993 – proved to be a lesson for those who wondered whether elevating a home was worth the bother and expense. Before the recent severe winter weather, some homeowners had questioned the need for elevation.

"The hardest part is convincing people that it's going to flood," said Luke Sefton, vice president of Southwestern Environmental Consultants. The owner of an elevated home on Comanche Drive, he has done engineering work on 200 other elevated homes in flood-prone areas. The past season's floods, Sefton added, demonstrated why an elevated house was a wise investment for him as well as others along the Verde River. In the four times the river rose, it did not reach his living space. Sefton, a registered professional engineer and certified floodplain manager, had designed and built his elevated home five years earlier in the Verde Village neighborhood during a dry spell, but he never doubted that floodwaters would one day test his work. "I knew exactly what I was getting into," he said.

Along the Verde River, he said, he helps design homes which, in most cases, can withstand an assault from trees as well as floodwater. Soils in and beneath the house can become saturated, creating enormous pressure. Because of those risks, he prefers to design homes with a solid foundation and thick walls – vented to let the floodwaters flow through the bottom -- rather than constructing houses on stilt-like piers.

Besides elevation, county codes require openings in a new structure's exterior walls no higher than a foot from the ground to equalize water pressure inside and outside the structure. Louvered vents over the openings allow floodwaters to flow through the crawlspace but prevent animals from making homes under the house or debris from accumulating.

Among other requirements, homes must be set back from an erosion-hazard area, and foundations must go at least three or more feet below the scour depth of floodwaters. The county's floodplain rules are under review to see whether they need to be fine-tuned even more. "A new floodplain ordinance is in the works for 2006," said Jeff Low, the county's flood unit manager. He added the county will propose in next year's budget to conduct a topographical aerial study of the VerdeValley, which will be used to create vital new floodplain mapping of the area. The county hopes to form a future partnership with the Federal Emergency Management Agency (FEMA) to undertake the project.

Meanwhile, residents in the elevated homes on Comanche Drive enjoy the beauty of the valley while having the peace of mind of knowing their houses are built to survive the river's occasional rampages.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Community Assistance Program (CAP)

FEMA

Project Reduces Flood Risks
Neighborhood Recreation Enhanced

Santa Cruz County, Arizona

Nogales, AZ - The residents of the Monte Carlo Subdivision have long dreaded the rain. Bordered on three sides by dry washes, the community frequently floods. Residents spent weeks fixing damaged homes and cleaning up mud and debris. Roads, scoured by floodwaters and buried in a layer of sediment, have to be cleared and repaired constantly.

That is changing thanks to a $1.25 million mitigation project designed to divert floodwaters away from the working class neighborhood and, at the same time, creates a regional park a stone's throw from their homes.

"About 1,100 people are far more protected than before," said Barbara Johnson, program manager for the border city of Nogales. "No longer do they have to fear routine rains." The mitigation project began taking shape more than five years ago, when leaders in the border town of Nogales and in Monte Carlo -- a Nogales community of 225 single homes and 10 businesses on 160 acres -- decided to take action.

Nogales officials developed a plan to build storm-water sediment detention basins on the steep upper reaches of the Challenger and Chihuahua washes. Under the system, the basins temporarily store floodwaters and keep sediments from flowing into the subdivision. Channels carry runoff from the Challenger and Chihuahua basins away from the Monte Carlo neighborhood and downhill into a third sediment detention basin in the Monte Carlo Wash.

As it turned out, the winter of 2005 proved to be one of the wettest in recent memory. One storm dumped three inches on Nogales, while another dumped more than two inches. Nevertheless, the partially completed flood control system passed its first test with flying colors. "Not a single Monte Carlo home or business was flooded," Johnson said.

For the community, the final phase of the project brings more than flood control. The 45 acres the city purchased for the Monte Carlo Wash basin is being transformed into the Albert Kramer Park. The basin itself, which releases floodwaters slowly and harmlessly after a storm, will double as a soccer field when dry. Using soils from the basin work and the natural landscape, the city plans to install an amphitheater, a BMX bike track and an interpretive center in the new regional park.

The dual flood-control park concept has drawn praise from local, State and Federal officials. "It's a great idea," said Terri Miller, a member of the team that worked on the project. "That's the only real amenity that the people there will have."

Johnson noted the entire project materialized because of a local, State, and Federal partnership. The Arizona Division of Emergency Management pulled the project together and guided it through its various stages. The Federal Emergency Management Agency (FEMA) provided about $936,500 of federal funding for the project. The local share topped $312,000. The city of Nogales smoothed the path for planning and construction, and the citizens of Monte Carlo pushed for a park to go along with the flood control. The park is being constructed as a cooperative effort between Santa Cruz County and the city of Nogales.

"This success story is due in large part to those people who chose to work together," Johnson concluded.

Quick Facts

Sector:
Public

Cost:
$1,248,712.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Escaping the Water
Frankstown, PA

Blair County, Pennsylvania

Frankstown, PA- Some Linds Crossing residents refer to the Little Juniata River that flows by their houses as "The Gentle Giant." On a normal day, the stream is gentle, shallow and slow moving, though hardly a giant. After a hard rain upstream, however, it quickly becomes gigantic and not at all gentle. Linds Crossing was developed in 1911 as a "Summer Home Farm" in rural Blair County, a modest recreation area of weekend and summer cottages, small frame houses huddled densely along the Little Juniata.

Over the years, the neighborhood in Frankstown Township, near Hollidaysburg, evolved. Today, most residents live there full time. Homeowners praise its beauty, peace and quiet and absence of urban stress. Many have lived there for decades and most wish to stay, but they pay a price for the advantages they extol. The same quiet river that provides boating and fishing, refreshing summer swims and cool breezes can change dramatically with little warning. The Little Juniata floods often. Small, localized bouts of high water also are commonplace.

The price was becoming too high. Jean Jordan had lived in her house more than 20 years. The flooding risk would have made her house difficult to sell. She was certain she could not get enough for it to buy anything similar in a safer spot, but she was experiencing "flooding about three times a year, and it was becoming "too hard to clean up after the floods."

Under the Hazard Mitigation Grant Program (HMGP), Jordan could stay in her home but not run the risk of continual flooding. Raising Jordan's house on a new concrete-block foundation put it above flood level, but left it in its surroundings. "I'm so glad it's up in the air," she said. " I don't know how to act."

Dave and Wendy Reighard took a different approach under the HMGP umbrella. They decided to sell their house and move a short distance away. As much as they liked their old location, the "peace of mind" they enjoy in their new home is "priceless."

The driving force behind the Linds Crossing Project was Richard Furmanchik, executive director, and Beverly Pounds, deputy executive director, of the County of Blair Redevelopment and Housing Authority. They shepherded the project from beginning to end. In the process, they won the gratitude and respect of a good many residents.

Wendy Reighard agreed the "program was a success...The number one goal was to get people out of harm's way, and it definitely did that." She praised the attention Furmanchik and Pounds paid to the concerns of the Linds Crossing population. "They listened to people," she said. "I'm very pleased with the way the people in this office treated us." The fourth time the Reighards were flooded was in 1997, they were negotiating with a realtor for their new house. "We had moved everything downstairs in preparation for the move," David Reighard recalled. "The water came through and trashed (the house) two weeks before we were ready to move."

All told, 38 Linds Crossing residents moved above flood levels, and 37 moved out of the area entirely through the HMGP project.

Quick Facts

Sector:
Public/Private Partnership

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Mitigation in Action
Millennium House

Tulsa County, Oklahoma

Tulsa, OK - Neighbor for Neighbor, Inc. (NfN) has been a very active private, non-profit organization in the City of Tulsa since 1967, with the purpose of serving those in need in the Tulsa community. Advocating assisting low-income families in owning their own homes is one of the agency's primary missions. The concept of the Millennium House is an innovative approach that not only meets the goal of the mission but also has the added benefit of being a storm-resistant house and a safe house for the poor. Additionally, the project location in the city is a high-hazard area at risk for frequent tornados and severe storms.

Millennium House, a storm-resistant house, is a 1,200 square foot home built with Insulating Concrete Forms (ICF) construction. Construction of this home has been very cost effective. The type of form plus concrete construction has a reduced time schedule and volunteers are providing all of the labor. The lot was purchased for $300. Don McCarthy, volunteer builder, states the price of the finished home will be approximately $50,000 to $55,000.

The Millennium House Mission Statement, as written in their newsletter, is as follows: "Neighbor for Neighbor, Inc. (NfN) while acting in concert with its partners is committed to engineer, design and construct a prototype structure that will be the finest house for its clients. At the completion of the testing of the prototype, NfN and other partners hope to replicate this model to significantly impact the neighborhoods and lifestyle of those living in north Tulsa." Millennium House project has established several parameters for the prototype structure to meet this mission statement.

The current house that is under construction is the prototype model for the project. The short-term goal is to build the structure to incorporate all the features outlined in the mission statement and further defined in the operational parameters. Location for this house was chosen specifically to be in the vicinity of the High School of Science & Technology where the students can interact with the project. An advisory board is to be established with membership consisting of city planners, bankers, architects, engineers and builders, among others. Data will be collected during the first six to nine months after the house is operational and will be reviewed by the advisory board to evaluate performance in meeting the parameters. Information from the data will be used to improve on future Millennium Houses.

The list of Millennium House contributors is an example of a successful public/private partnership. The Tulsa Partners contributed seed money in the amount of $15,000, with funds originally obtained through FEMA.

"It's the right thing to do," states Mike Buchert, P.E., Assistant Public Works Director for the City of Tulsa. Buchert lists three basic reasons for his assertion: "this project and type of housing construction helps protect citizens; less money is spent rebuilding and cleaning-up after a disaster; annual operation and maintenance costs are lowered. The City spends half a million dollars annually tearing down old dilapidated homes, this is significantly reduced by the secondary and tertiary benefits of the project."

Quick Facts

Sector:
Public/Private Partnership

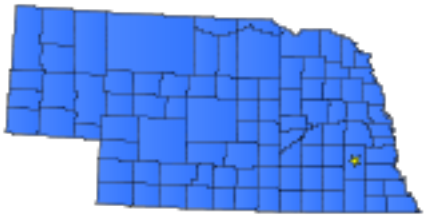
Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Private funds

FEMA

Nebraska Public Power District
Minimizing Damage to Transmission System



State-wide,
Nebraska

The State of Nebraska - High winds and ice storms are common hazards in the plains of Nebraska. Such hazards can cause a transmission system to collapse as one transmission line structure (power pole) fails, “triggering” adjacent structures to topple in succession like a string of dominos. Recognizing this horrifying potential, the Nebraska Emergency Management Agency (NEMA), through Hazard Mitigation Grant Program (HMGP) funding, has assisted various public power districts throughout the state to mitigate the cascading effect of transmission lines from severe wind, ice and snowstorms. To date, NEMA has provided more than $5.9 million in Federal funding to mitigate approximately 1,120 miles of transmission lines.

The recent storms the State of Nebraska experienced in June and July of 2003 caused extensive damage to transmission systems. However, this damage would have been more severe without the mitigation project completed in the fall of 2002. The purpose of the mitigation project was to install the dead-end structures at five- to seven-mile segments, thereby breaking the string of "dominos" into manageable limited failures. By utilizing the HMGP funds through NEMA, the Nebraska Public Power District (NPPD) installed eight, five-pole guyed, dead-end structures along the 230 kV power transmission line from Columbus to Grand Island. The future benefits of this mitigation project were an estimated $4.95 return for each $1 invested over the project’s life.

This project proved to be successful when extreme winds and tornadoes caused failure of five standard two-pole wood structures, setting up a cascading effect from the Columbus to Grand Island transmission line. The cascade ended at the dead-end structure funded through FEMA’s HMGP, demonstrating that these structures performed as designed.

The purpose of these structures was not to prevent the loss of power, but to limit the extent of the damage. Without this mitigation effort, the cascade failures would likely have continued, increasing the damage. With 230 kV line restoration costs estimated at over $200,000 per mile and cascade failures often extending for miles, the potential savings are significant.

Photo Caption 1: Tornados caused the failure of a standard two-pole wood structure, creating a cascade effect. The cascade ended at the dead-end five-pole structure funded by FEMA, demonstrating that these mitigated structures perform as designed. Photo Caption 2: The remains of a sheared off two-pole wood structure. Photos by Scott Walz, Nebraska Public Power District.

Quick Facts

Sector:
Public

Cost:
$6,000,000.00 (Estimated)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Storm Shelter is Life Insurance Couple Proactive with Their Safety

State-wide, Alabama

Gadsden, AL - When Randall and Cheryl Crain saw the death and devastation from the tornado that struck the Coates Bend community in Alabama in Dec. 2000, it did not take them long to decide they needed the protection of a storm shelter.

When the Crains retired, they moved to the city of Gadsden; which is located in Etowah County, in the Spring of 2000 and had been here less than a year when the tornado struck in the County.

The State of Alabama implemented their "Taking Shelter from the Storm" Safe Room Initiative because of the aforementioned tornado event and subsequent Presidential Declared Disaster. Twelve people were killed, over 300 people were injured, and several hundred homes were destroyed or damaged. Using Hazard Mitigation Grant Program (HMGP) funds made available by FEMA, a total of 568 shelters have been constructed as of Dec. 31, 2003.

Of these, 559 are individual shelters with an average reimbursement to the owner of $2,910. An additional nine community shelters have been constructed at an average reimbursement of $20,800.

The Crains now have that protection right in their backyard.

At a cost of $2,700, Randall Crain considers it an inexpensive life insurance policy because it actually saves lives. With his emergency services background, Crain began researching for the best option for a shelter. By March 2001, construction was under way.

Crain hired a local backhoe operator to dig out for the concrete pit, patterned after a concrete septic tank, but reinforced with more steel. The company from which he bought the concrete shelter made the delivery and he finished the steps and entry area. Crain documented the progress and produced a slide presentation on DVD for others who would like to know more or emulate the effort.

The shelter is stocked with a crank-style radio, ham radio, flashlight, bottled water, basic first-aid supplies, an extra cell phone, and other essentials needed for an extended stay. The Crains have made several trips to the shelter, which usually stays about the same temperature because it is underground. The Crains installed a ventilation system for use in warmer months and a sump pump to keep it dry.

Randall Crain built the shelter before information was readily available, but the Federal Emergency Management Agency (FEMA) currently has beneficial information on its Web site about shelters and saferooms.

Quick Facts

Sector:
Public

Cost:
$2,700.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Efforts Build Levee of Hope
Town Flooding Prevented

Barceloneta Municipio,
Puerto Rico

Barceloneta, PR - For years, life in downtown Barceloneta had a serious drawback: repeated flooding from the Rio Grande de Manat. "After Hurricane Hortense (1996), we had carcasses of cattle and other domestic animals, in addition to four feet of mud, filth, and riverbed dirt, all over the town when the floodwaters receded. The smell was the worst. It was a disastrous, terrible experience and we needed to do something about it," explained Esther Rios, a Barceloneta Municipal Officer.

Rios, a municipal employee for nearly 16 years, has been involved in many response and recovery activities. "After Hurricane Georges (1998), we spent weeks cleaning up, and I got such a severe eye infection from the filth, that I've never been able to wear contact lenses again," explained Rios. The frequency of the flooding and its consequences triggered a joint effort led by the United State Army Corps of Engineers (USACE) to build a levee around the town.

Residents in the area had similar problems. "When we knew of the flooding ahead of time, we could elevate some of our belongings, but sometimes we had to evacuate the house or climb up to the roof for safety," explained Elba Fernandez.

With this picture in mind, the USACE, the Puerto Rico Department of Natural and Environmental Resources (DNER) and the Municipality of Barceloneta joined efforts to construct the ring levee to prevent water from entering the town. Seventy-five percent of the funding for the project came from the USACE. It conducted the studies, designed the project, prepared the plans and specifications and supervised construction activities. The Municipality of Barceloneta was instrumental in securing Congressional support for the project. The DNER and the municipality also provided funding and real estate needed to complete the project. The total length of the ring levee is about 5.3 kilometers, with an average height above ground of 5.4 meters. This project is 95 percent complete, and is already fully functional.

Two severe flooding events have already tested the levee--the November 2003 floods and Tropical Storm Jeanne (2004)--and no structure in downtown Barceloneta suffered any flood damages. "The levee performed remarkably during these events," explained Jorge Tous, an engineer with the USACE. It was designed to provide protection in even bigger storms--up to a 100-year flood (a storm with a one-percent chance of occurring every year).

The levee project has saved an estimated 27 million dollars in insurance claims and taxpayers' monies so far. In addition to private residences and businesses, public infrastructure such as roads, utilities and offices are protected. More than 2 million dollars in flood insurance claims were saved in the November 2003 flooding event alone.

The benefits to Barceloneta are clear. Moreover, the levee has not created flooding problems in adjacent areas, but diverts floodwaters into undeveloped lands. In addition, stream flow rates of the Rio Grande de Manata have not changed, the water flows just as quickly as it did prior to construction.

Quick Facts

Sector:
Public

Cost:
$18,000,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Other Federal Agencies (OFA)

FEMA

Flood Insurance Tackles Losses
Caguas, Puerto Rico

Caguas Municipio,
Puerto Rico

Caguas, PR - In the aftermath of Tropical Storm Jeanne (2004), four houses located in the Villas del Rey subdivision of the City of Caguas were designated by the local government as uninhabitable. The backyards of these homes were in the floodway boundary of the Turabo River. Each property lost significant amounts of backyard due to the rise and expansion of the river. One of the homes collapsed into the river; the other three are in imminent danger of collapse.

Fortunately for the owner of the collapsed home, the property was covered by flood insurance under the National Flood Insurance Program (NFIP). Not only will the homeowner receive full payment of the flood insurance claim, but for the first time in Puerto Rico, the Increased Cost of Compliance (ICC) benefit is going to be used.

ICC provides for the payment of a claim to help pay for the cost to comply with state or community floodplain management laws or ordinances from a flood event in which a building has been declared substantially damaged or repetitively damaged. ICC helps pay for the cost to elevate, floodproof, demolish or relocate a building up to $30,000. In this case, the ICC will cover the disaster victim's costs for the demolition and debris removal of the lost home.

Flood insurance is available to any property owner located in a community participating in the NFIP. All areas are susceptible to flooding, although to varying degrees, in fact, 25 percent of all flood claims occur in the low-to-moderate risk areas. In the case of Villas del Rey, flooding can occur anytime due to heavy rains, inadequate drainage systems, failures in levees and dams, as well as tropical storms and hurricanes. Having flood insurance is both wise and prudent, even for residents of low flooding risk areas.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Insurance

Primary Funding:
National Flood Insurance Program (NFIP)

Grand Blanc Family High and Dry Old Home Under Nine Feet of Water

Genesee County, Michigan

Grand Blanc, MI - When the severe storms, tornadoes, and flooding struck the lower part of the State of Michigan in late May 2004, few had any idea that it would affect tens of thousands of Michigan families and cost more than $51 million in grants and low-interest loans for disaster assistance. For one Grand Blanc family, the storms and flooding had the opposite affect. What use to be their home was flooded again, but this time the Minard family was sitting high and dry and didn't need any disaster assistance. When Karen Minard returned to her old neighborhood near Thread Creek, she couldn't believe her eyes after discovering nine feet of water in the area she had once called "home."

It was in 2000 when a flood inundated the city of Grand Blanc, located a short 10 miles south of Flint, severely damaging many homes and leaving roads impassible. Flooding from Thread Creek plus poor drainage caused major flooding that left homeowners helpless and city officials unable to control the rising creek. Together, they took a proactive approach to deal with the repeated problem. A Federal disaster declaration made grant money available for mitigation projects throughout the State. Hence, Grand Blanc decided to pursue a Hazard Mitigation Grant Program (HMGP) project for the acquisition of homes damaged repeatedly from flooding.

The double threat of flooding from Thread Creek and sewage backup led the Minards to participate in the buyout project. The Minards were one of five families who participated in the voluntary buyout program just seven months before the May 2004 flooding. Four of the acquired homes were still awaiting demolition when flooding struck again.

According to Randy Byrne, City Manager of Grand Blanc, City Officials were getting tired of repairing the same damage after every flood and thought a proposal to acquire these homes at a cost share of 75 percent Federal and 25 percent non-Federal match could help to solve the problem. The Community submitted its proposal, and the project was selected by the Michigan State Police/Emergency Management Division (MSP/EMD). When FEMA approved funding, City Officials provided homeowners specific criteria for participation that included an appraisal and offer to buy out the property at pre-flood fair market value. Five homeowners decided to be a part of the voluntary project, and the Federal share of the project was $626,322.

In addition to the families who occupied the acquired homes, the Community also benefited from the buyout. A major component of HMGP is that ownership of the acquired land reverts to the City with a deed restriction stating it must remain open space. The City used the land, demonstrating a conscientious approach to floodplain management, by incorporating it into Rusk Park. Now when Thread Creek floods, there is no maintenance required for the Park.

The key, according to Byrne, "is having a casual meeting and getting everyone on the same page." Informing the residents about the available options is imperative.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Homemade Floodgates Succeed
Octogenarian and Blacksmith Collaborate

Guayama Municipio,
Puerto Rico

Guayama, PR - Born and raised in Barrio Puerto Jobos in Guayama, Miguel Flores and his wife Evangelia Diaz have seen floodwaters rise into their home so many times they barely can number them. This octogenarian and his wife have had two to four feet of water rush into their house in a matter of minutes.

“Our community gets flooded very easily. We live in an area lower than the sea level. Behind our house, runs the river canal; and the street gutter in front is higher than our property. Too many times, we woke up in the middle of the night surrounded by floodwater; it happened very quickly,” said Flores. However, two years ago he came up with an idea that keeps the water out.

“I thought of two metal slots, one on each side of the door, to slide a wood panel through them. Then, foam sealant is sprayed all the way around the panel, between the metal slot and the floor,” explained Flores. A friend of his, who is a blacksmith, created and attached custom-made metal slots to every outside doorway. The wood panels are three and a half feet tall, and the couple tries to keep them at hand. “We are two aging persons . . . we need the floodgates to be comfortably low: high enough to remain safe, but low enough to step over them. And it’s easier to move if they are lighter instead of heavier,” Flores explained.

Recurrent flood damages are part of life for residents of Barrio Puerto Jobos. These families suffer heavy losses from repeated flooding events, not only during major storm events but during isolated heavy rainfall throughout the year as well. However, since Flores started using his floodgates, his home hasn’t suffered significant damage. He clarifies that his system only works if, at an early stage, he notices that flooding is imminent and he has time to install and seal the floodgates.

Last year, one of his neighbors started using a similar method to avoid flood damages and so far it has been successful also. The need for mitigation measures in this area is evident and the community has already taken the initiative. Since Flores started using his floodgates, two severe flooding events have affected Puerto Rico, the November 2003 floods and Tropical Storm Jeanne (2004), but his property did not suffer any damages.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood-proofing

Primary Funding:
Homeowner

FEMA

Improved Channel Bringing Security and Tranquility

Jayuya Municipio, Puerto Rico

Jayuya, PR - When Hurricane Georges hit Puerto Rico in September 1998, residents of San Felipe's Interior Street in Jayuya saw the La Zanja Creek turn into a river that ran over the existing protective wall and headed for the road and their properties. The storm caused over $22,000 in damages due to the overflow of the La Zanja Creek. Portions of the road were washed out and debris was left behind.

"I used to get very nervous, during heavy rain events, because the creek would pass just a few inches from our house," said Jaime Roman. The creek runs alongside Roman's property. And, even though his residence never got flooded, the water used to get so close that they had to evacuate every time. But the situation soon changed for the better.

In 2000, FEMA through its Hazard Mitigation Grant Program (HMGP) awarded funds for the improvement of the existing canalization of the creek. The project included the addition of 164 feet to an existing 656-foot long channel and the construction and/or reconstruction of a concrete wall. This protective wall was designed to prevent water from overflowing the natural creek and running into the street and homes in La Zanja ward. Overall, the channel was extended to 19 feet wide, six feet high and 820 feet long.

The canalization was completed in March 2003 and has performed successfully during two heavy rain events: the November 2003 floods and Tropical Storm Jeanne (2004). The channel allowed storm water to move downstream without overflows, preventing damages to residential properties as well as to the adjacent road.

"Now, that the canalization is complete, we stay home during a heavy rain event because we do not need to worry about the creek anymore. Now we feel much safer," said Roman.

David Torres, Municipal Officer in charge of the project, shares Roman's perception on the results of this improvement. "Communities in Jayuya feel more secure and safer now that some of the canalization projects have been completed, and many others are underway," said Torres. "Both the community and the municipality benefit from mitigation projects like this."

Quick Facts

Sector:
Public

Cost:
$86,500.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Improved Drainage Improves Lives
Bayamon, Puerto Rico

Bayamon Municipio, Puerto Rico

Bayamón, PR - Flood-related experiences left an indelible impression on Nelson Irizarry and his family in Los Dominicos, Bayamon, Puerto Rico. Once, while taking a dinner break during the clean up of their flood damaged home, the water started rising again and they had to start all over. Because they only had a few minutes to evacuate their homes during floods, his family and neighbors created a “Neighborhood Flood Watch,” establishing shifts to keep an eye on rising waters. However, during Tropical Storm Jeanne (2004) the families in Los Dominicos were able to finally go to sleep feeling safe and secure.

“Four years ago, as soon as it started raining during any heavy rain event, we tried to put all our important and beloved things in higher places, since we normally got two to four feet of floodwater inside the house,” explained Irizarry. “However, as soon as the retention tank and the drainage system were completed, we didn’t need to worry about water coming into our house.”

Recurrent flood damages were routine for some residents of San Rafael Street in Los Dominicos. These families suffered heavy losses from repeated flooding events, not only during major storm events but during isolated heavy rainfall throughout the year as well.

The existing storm water drainage system capacities were insufficient to handle storm water runoff from heavy rains. Rapid residential development in surrounding areas considerably increased water runoff and, consequently, any significant amount of rain would exacerbate the problem.

While many of the residents of the affected area were flood insurance policy owners under the National Flood Insurance Program, most of their flood-related losses were covered by the insurance. However, because of the number of flooding events, repetitive claims were made to the flood insurance fund, highlighting the need for a mitigation measure in the area.

In 2002, the Flood Mitigation Assistance program awarded funds for the improvement of the existing storm sewer. This program is funded through flood insurance premiums to carryout projects that will reduce flood insurance claims. The Municipality of Bayamon upgraded 1,003 feet of the existing storm water system, including the installation of two additional storm water drains. In addition, a water-retention tank was constructed to control rapid water build-up in the area and provide subsequent slow discharge to a nearby creek.

Since completion of this project, two severe flooding events have affected Puerto Rico, the November 2003 floods and Tropical Storm Jeanne, and no family on the San Rafael Street in Los Dominicos suffered any damages. “The system performed excellently during these events,” explained a neighbor.

Quick Facts

Sector:
Public

Cost:
$453,567.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Improved Pumping Stations Keeping a Community Safe and Dry

San Juan Municipio, Puerto Rico

San Juan, PR - Family heirlooms, furniture and appliances under floodwaters for a week is an experience Arlyn Alcaraz and her family would rather forget. As residents of the floodprone Ocean Park for 50 years, the Alcaraz family was recurrently affected by flood events. On every occasion, her family had to replace their belongings, clean up, and try to save what little was left behind.

“To see my mother’s favorite antique furniture standing in a pool of dirty water, to have little water snakes lurking around my ankles and being unable to do anything to avoid the situation, was overbearing and frustrating,” explained Alcaraz. “In addition to enduring frequent storm sewer flooding, we had to deal with ocean water brought by the storm surge. The floodwater also had oily patches drifting around our furniture, appliances, messing everything it touched.”

More than 30 years ago, the Puerto Rico Department of Natural and Environmental Resources (DNER) installed a water pump station in the Baldorioty Avenue to direct storm water away from the floodprone area of Ocean Park (an area below sea level), the Luis Llorens Torres housing project and nearby areas of Santurce. But the equipment became obsolete when business and residential development outgrew its capability.

In September 1996, Hurricane Hortense hit the Island causing flooding damages islandwide. Later that year, DNER proposed improvements to the pumping system and was awarded Hazard Mitigation Grant Program (HMGP) funds for mitigation measures to upgrade the mechanical and electrical equipment and install new storm sewer pumps. In addition, an upgrading of the emergency generators was included to operate the storm sewer pumps in case of electrical failures.

The project was completed in December 2002. Since then, three significant flooding events have occurred in the area and none have affected these families and their communities. Four other storm sewer-pumping stations within the municipalities of San Juan, Guaynabo and Catano were included in the upgrading project.

Furthermore, the upgrading improved the working conditions for the employees at the station. Station manager Angel M. Constantino explained the operational differences between the latest and previous events: “Two years ago, we had to keep an eye on the water levels, even under hurricane conditions. This meant an unprotected run from the building to the water pumps and the retention system to personally inspect the situation. Now, we just need to check on the pump control panels without taking unnecessary risks.”

The upgrade has simplified the operations at the station. The new pump control panels allow DNER to connect all the station’s storm water pumps to the backup system, thus making the response period shorter. The replacement of old storm sewer pumps and the installation of additional pumps have doubled the pumping station’s operational capacity. In addition, the backup generators would allow the pump station to work independently if necessary.

Quick Facts

Sector:
Public

Cost:
$9,078,551.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Preventing Community Isolation Mitigation in Yabucoa, Puerto Rico

Yabucoa Municipio, Puerto Rico

Yabucoa, PR - During any heavy rain event, almost 10,000 residents of Barrio Guayabota and Barrio Quebradilla in Yabucoa faced the possibility of losing the road at Coquí Bridge, which is their connection with downtown Yabucoa and other communities. If this road got damaged or destroyed, it meant a 30-kilometer detour to get assistance or provisions.

Natividad Ruiz was born and raised in Barrio Guayabota and has endured this situation many times. “Just last year, as soon as it started raining heavily, we would worry about how much time we had left before our community would be isolated,” said Ruiz. The floodwaters would scour the creek bank and cause washout of the road.

The FEMA Public Assistance Program normally funds repair of public infrastructure to pre-existing conditions. However, in this case, it was clear that future rains would again damage the road and bridge approach. Thus, after the November 2003 flooding event, a mitigation measure was undertaken, which involved the installation of gabions (rock filled wired baskets) in areas eroded by floodwaters. The gabions were later covered with earth.

“With the completion of this project, even with all the rain brought by Tropical Storm Jeanne (2004), the road never collapsed, and that benefited both communities,” Ruiz explained.

Quick Facts

Sector:
Public

Cost:
$5,772.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Secured Fire Stations
Faster Response in Yabucoa, Puerto Rico

Yabucoa Municipio,
Puerto Rico

Yabucoa, PR - To achieve a rapid response during emergency events, first responders should remain in safe and secure facilities, ensuring a speedy deployment when they're needed. Firefighters in the Yabucoa Fire Station have first-hand knowledge of the value of taking preventive measures in the workplace and remaining protected until they're needed.

In 1998, when Hurricane Georges struck the island, Sergeant José de León helplessly watched as rain gusted through windows and wood shutters, damaging equipment and supplies in the fire station. "We didn't feel safe inside the building, even our equipment, including the vehicles, were at serious risk while the winds were blowing. We were only able to protect some of the windows, in the first floor, with heavy wood panels," said Sergeant Leon.

It was 2001 when the Yabucoa Fire Station became part of a joint effort to protect public facilities from natural hazards. The FEMA Hazard Mitigation Grant Program (HMGP) funded the installation of storm shutters at 45 fire stations. These storm shutters prevent wind and water damages related to heavy rain and wind events. Other independent mitigation measures taken in the Yabucoa Fire Station were the acquisition of water tanks and electrical generators to guarantee service continuity.

During Tropical Storm Jeanne (2004), the situation was completely different. "Even with all the rain and wind brought by Jeanne, we were safe and we even sheltered additional staff from the Fire Academy in Gurabo," explained Sergeant Leon.

Quick Facts

Sector:
Public

Cost:
$237,878.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Shutters Ensure Medical Services Continuity for Bella Vista Hospital

Mayaguez Municipio, Puerto Rico

Mayaguez, PR - Gusting storm winds and heavy rain have always been a factor for the Bella Vista Hospital, which was built on top of a mountain in Mayaguez. Having to rush emergency medical services and expediting patient and personnel releases to avoid additional emergencies during severe storm events became crucial in the hospital's operational emergency plan. But that hectic situation changed four years ago.

During Hurricane Georges (1998), the normal operation of this private facility was significantly affected. Patients and hospital personnel were forced to evacuate to guarantee their safety. "We had rain water pouring into patient rooms, and that was unacceptable," said Olga Babilonia, the hospital's Assistant to the Executive Director.

After Hurricane Georges, the hospital's administration requested assistance from the FEMA Hazard Mitigation Grant Program (HMGP) to fund the installation of storm shutters. These shutters would prevent wind and water damages related to heavy rain and wind events.

The project included the installation of electric roll-down shutters in higher or hard-to-reach areas, manual accordion shutters for high but more accessible windows and regular aluminum panel shutters. "In previous disasters, the installation of any protective device, wood or metal, was a hassle and dangerous in some of the higher sections of the building. Now with the new system, we can close up during any rain event, without jeopardizing the operations. We combined different shutters, adjusting them to our specific needs, in a cost-effective way. And we are very satisfied with the results." explained Babilonia.

Another privately funded mitigation measure taken alongside this project was the acquisition of electrical generators to guarantee service continuity. "During Tropical Storm Jeanne (2004), we even received patients and people from other facilities, because with this project we ensured that during that kind of emergency, the operation of this hospital wouldn't be disrupted," said Babilonia.

The completion of this task was a joint effort between the public and private sectors to improve the preparedness, response and recovery of essential services and facilities. The hospital provided 25 percent of the cost of the project and FEMA provided the remaining 75 percent.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$339,320.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Simple Actions, Significant Results
Homeowner prevents flooding

Yabucoa Municipio,
Puerto Rico

Yabucoa, PR - In Puerto Rico, almost any significant rain event can pose a threat to homes in floodprone areas. Hurricanes and tropical storms are even more dangerous due to the heavy rainfall they bring. The Jaime C. Rodriguez neighborhood in Yabucoa is susceptible to flooding from a small creek that runs next to the district. Rain events have caused water levels to reach up to three or four feet inside some homes. On numerous occasions, the residents experienced the loss of personal property, and the houses suffered structural damages.

Jesus Rosado Vazquez has been a resident of the neighborhood for many years and repeatedly confronted that situation. Each time the Rosado residence flooded, the damages ranged from $8,000 to $10,000, with a total loss of contents when Hurricane Hugo struck the island in 1989. In the past, FEMA granted funds to the family to make repairs and “get back on its feet.” However, Rosado decided to take action and implement measures that would prevent future damages. Those measures were simple, yet effective mechanisms that have protected his home since 1996.

First, Rosado constructed a floodgate for each doorway. The floodgates consist of a wooden board cut to cover the bottom half of all doorways, thereby blocking water from coming into the home. Once in place, a sealant is applied around the borders to prevent water from seeping through. The boards are mounted with screws, allowing for their removal once the floodwaters have receded. Rosado also decided to reduce the size of his windows, making sure that all openings were well above flood levels.

Furthermore, Rosado mitigated the home’s electrical system. “Every time our house flooded, all the electrical wiring had to be replaced because water would get into the outlets,” said Rosado. “I eliminated the risk by elevating all the wiring and outlets high above the ground so that the water would not damage them.”

Rosado’s actions are a good example of how individuals and families can take steps to mitigate their homes against flood damages. Since 1996, the Rosado residence has not sustained any damage due to rain events, while other homes in the same neighborhood continue to be impacted. During Tropical Storm Jeanne (2004) many of his neighbors sustained flood damages while his home remained safe and dry.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Homeowner

Future Disaster Damage Abated
Morgan County

Morgan County, Ohio

Morgan County, OH - When it comes to repairing or replacing disaster-damaged infrastructure, federal and state recovery officials look for cost effective opportunities to reduce damages during future events. Such was the case when the Morgan County Highway Department applied for funding to replace a twin culvert system. The culvert system became overwhelmed by Hurricane Ivan floodwaters in September 2004, which washed out the roadbed of Compressor Road north of Marion Township, Morgan County.

Extra funds were dedicated to build one large, arched culvert and repair the roadbed to prevent flooding in the future. The work was done just in time. When floods hit in January 2005, many roads in the area were heavily damaged but the new culvert performed up to expectations and Compressor Road at this site came away unscathed.

This was all made possible by Morgan County becoming eligible for the FEMA and Ohio Emergency Management Agency (Ohio EMA) Public Assistance (PA) program under a Presidential declaration of a major disaster for that flood. The PA program, administered by the state, provides reimbursements to state agencies, local jurisdictions and certain non-profit organizations that provide a government-like service for eligible disaster-related costs and damages. Services include debris removal, emergency protective measures, and repair and restoration of disaster-damaged public infrastructures. FEMA provides 75 percent reimbursement of the eligible costs.

Under one section of the PA program, administrators are empowered to make additional obligations of funding for a project that meets the program mitigation funding criteria if those mitigation measures are cost effective. The Marion Township Compressor Road culvert replacement met these criteria. In most cases, PA repair and restoration funding brings damaged infrastructure back to pre-disaster conditions.

One major FEMA and Ohio EMA Public Assistance program goal is to mitigate, wherever it is cost effective, when restoring damaged infrastructure so the repaired facility is better able to withstand future disaster damages. A little extra money spent now may save untold funds later. Such was the case with the Compressor Road repairs.

Altogether, it would cost about $3,200 to replace the culverts and roadbed to pre-disaster conditions. For a little more than $6,000, an arched 85-inch by 54-inch culvert replaced the twin culverts.

"By adding extra funds to provide a larger culvert, we believe that the culvert and roadway will have a much better chance of not being damaged in a similar flooding event," said FEMA's Region V Acting Regional Director Janet Odeshoo.

Quick Facts

Sector:
Public

Cost:
$6,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Home Elevation in Ohio
Once is More Than Enough

Muskingum County, Ohio

Muskingum County, OH - Once was more than enough for the McDonoughs. Jim and Carol McDonough bought a summer/weekend, getaway modular home about 100 feet from the Muskingum River in Blue Rock, Ohio because of its sweeping river view and it seemed to sit above most of the river flooding that occurs in this area, Ms. McDonough said. "The structure is a 26 by 50 foot, wood frame house", James McDonough said. It's about 10 years old.

"Then came the January 2005 flooding, the highest in 50 years according to the locals" said Ms. McDonough. The McDonoughs ended up with four inches of water on their first floor. "We had to tear out our carpet and insulation. It was a mess", said Jim McDonough. " I estimate we had about $5,000 in damage. In addition to the monetary cost, there also was the loss of use and time spent cleaning up." They decided they did not want to go through that again. "We chose to elevate", Ms. McDonough said. "Since this was the highest water in 50 years, and we had four inches on our first floor, we decided to go up 28 inches higher than the four courses of concrete blocks."

James McDonough also went on to the Internet and visited the Ohio Department of Natural Resources. "I found they had the base flood elevation for this area on their site. It is 25 feet. I elevated so I would be a couple of feet above that" McDonough said. The base flood elevation determines the extent a 100-year flood (a flood that has a one percent chance of occurring in a given year) will rise to in a given area. Contractors were hired to lift the home by installing piers four concrete courses high under the home and then set the home back on the piers.

"I was fortunate with my contractor" McDonough said. "He had done other work for me. When I broached the elevation project to him, he said he could do it." The McDonoughs are well satisfied with the finished project.

The McDonoughs think the elevation will prove a good investment. "It cost us $8,000 for the elevation work" McDonough said. But when the Muskingham River rises again, as it does every year says Carol McDonough, "those 32 added inches should keep us high and dry." Based on their costs and losses from this event, they believe the work will pay for itself if water from the next two floods like the January 2005 flood does not reach the structure's first floor. This is what is known as mitigation; taking steps now to reduce the chances of sustaining future disaster damages.

"We commend the McDonoughs for elevating their structure. They took responsibility for themselves and used their own resources to protect themselves from future flooding" said Acting Regional Director Janet M. Odeshoo for FEMA Region V.

The State of Ohio Emergency Management Agency (Ohio EMA) administers the hazard mitigation program. Ohio EMA Executive Director Nancy Dragani said all too often folks in harm's way wait for the government to solve their problems, but many times the solution is in their own hands. "The McDonoughs are a tremendous role model for what can be done with a little money and lots of gumption and will."

Quick Facts

Sector:
Private

Cost:
$8,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

New Richmond, Ohio, Acquisitions
HMGP Acquisitions

Clermont County, Ohio

New Richmond, OH - New Richmond, a small, historic Ohio village about 20 miles upriver from Cincinnati on the Ohio River, is no stranger to flooding. Its flooding history is most eloquently told in pictures.

New Richmond is also a town of resilient Ohioans who want to keep their history alive and thriving. So they looked for ways to learn from the past and stop the cycle of destruction and reconstruction.

During the 1996 and 1997 floods, a new way of dealing with the aftermath of flooding and other disasters had come into being – the Hazard Mitigation Grant Program (HMGP). Initiated by the Department of Homeland Security's Federal Emergency Management Agency (FEMA) and administered by state partners such as the Ohio Emergency Management Agency (Ohio EMA), HMGP provides funding for projects that will reduce damages from future disasters.

FEMA provides 75 percent of HMGP funding and provides technical assistance to the states in implementing an HMGP project. The states administer HMGP and determine what type of projects (i.e., acquisitions or elevations) will be funded. In acquisition and relocation projects, the properties acquired are turned into green space in perpetuity.

New Richmond applied and became a participant in HMGP acquisitions projects based on January and June floods in 1996 and a March flood in 1997. Altogether, the projects acquired 43 structures, the lots they were located on and five bare lots for about $1.9 million. These repetitively damaged structures permanently were removed from harm's way and the village now has a green space along the river that has become a village gathering point.

While the HMGP projects were a boon to New Richmond, it also came - as any new government program would - with its own issues to meet and overcome.

The experiences of New Richmond Village Administrator David Kennedy, who was new to the village at the time of the1997 flood, is illustrative of the challenges an administrator would face with the HMGP program. These challenges also were met by constructive solutions that may help other HMGP project coordinators deal with issues that crop up.

New Richmonders know the Ohio River will rise again and that parts of New Richmond will flood when it does. But because of HMGP and other local initiatives, New Richmond is much better prepared to deal with flooding than ever before. Mitigation works.

Quick Facts

Sector:
Private

Cost:
$2,300,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

High and Dry in Chickamauga
Elevated Homes Prove Value

Walker County, Georgia

Chickamauga, GA– In mid-September 2004, Hurricane Ivan brought some of the heaviest rainfall ever recorded to the City of Chickamauga, a small town in northwest Georgia close to Chattanooga, Tennessee. This caused the West Chickamauga Creek to rise, as heavy rains have done for years. The rising waters inundated properties in the creek's floodplain. This time, one of the affected properties was Charles and Tina Hill's detached garage.

"The water was knee-high in the garage," Charles Hill said, "but the house came through just fine. If the house had not been elevated, the water would have been in our living room!"

Many of the homes in the Hill's neighborhood were built in the early 1900s. Although the city has experienced occasional high water over the years, it was not until the 1990s, especially after the flooding caused by Hurricane Opal in 1995, that the Chickamauga was able to justify a flood mitigation project.

The project got underway in earnest in 2000 with funds from the Federal Emergency Management Agency's Hazard Mitigation Grant Program and the Georgia Emergency Management Agency. The City of Chickamauga offered residents along West Chickamauga Creek three choices: have their property bought out by the city, have their homes elevated, or do nothing. Most residents chose to elevate their homes.

"Approximately 50 elevations were completed in two neighborhoods near the creek," said John Culpepper, utilities manager for the City of Chickamauga. "We also bought out several homes and created a small park."

"The one-percent-chance flood level in the area of the project is 728 feet above sea level," Culpepper said. "The homes were elevated to 731 feet, as were all the utilities." "Only two residents chose not to participate in the program," Culpepper said. "Everyone else was [very pleased] to participate."

The project has been beneficial to the residents. "It has improved their quality of life, no doubt about it. For anyone with a disability, we even put the little 'ol chair on the rail that you sit on and ride on up to the door rather than having to, say, roll a wheelchair up a long ramp," Culpepper said. He added, "there was even money in the program we could use in case a resident with a disability needed a new switchbox or a wheelchair-accessible bathroom or something. So it was a good project for all the people in these neighborhoods. A very good project."

Charles and Tina Hill agree. Although they did not live in their home before it was elevated, they did experience high water in the neighborhood once before. "That time, the water just barely reached the garage door," Charles said. "This time it actually got in there and you can still see where it came up to about the forth row of blocks in the space under the house."

"The creek went back down and the water under the house and in the garage all drained out in about 12 hours," Charles said. "We have some plastic sheeting we need to get out from under the house so that the dirt will dry faster." "It's good, though," Tina said, "that the wet is all down there and in the garage. I'm really glad our house stayed dry."

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Buyouts in Kokomo, Indiana
Mitigation is Everyones Responsibility

Howard County, Indiana

Kokomo, IN - You can almost tell by its name a creek called Wildcat is going to be hard to tame. Every few years, an area in Kokomo, Indiana gets inundated when the creek jumps its banks. In 2003, the flood was said to be the worst in 90 years. In 2005, predictions were even more dire. This time, however folks were prepared.

People learned from what happened in 2003 and took steps to protect themselves, said Debra Cook, City of Kokomo Community Specialist. Many bought sump pumps and raised appliances, like furnaces and hot water heaters, above previous flood marks. A few even thought to buy generators so that when the power was cut off to the neighborhood as a safety precaution, they had a back-up.

The community as a whole also decided to take preventative measures into their own hands. After the 2003 floods, a town meeting was held to determine the best course of action. They called upon the local media, as well as volunteer flood recovery teams from local churches and civic groups.

It was determined that elevating homes would be cost prohibitive. City and county ordinances designate a home substantially damaged if it has sustained more than a 40-percent loss. This requires homeowners to adhere to newer, stricter codes when rebuilding and that can really add to the cost, said Cook. So, it was agreed that buying the properties, removing the structures and converting the area into green space was the best option.

In deciding which homes to buy out, the town followed guidelines recommended by Housing and Urban Development (HUD). A top priority were homes that were owner-occupied and that had sustained substantial damage from flooding again, in this community that was more than a 40-percent loss. Next were homes not occupied by the owner, but that had suffered substantial damage. Following this came owner-occupied homes with less than substantial damage, and finally unoccupied homes with less than 40-percent damage. Homes owned by the elderly, handicapped and those with low income were also targeted.

To keep potential participants and the community at large engaged while the city applied through the state for Hazard Mitigation Grant Program (HMGP) funds from the Department of Homeland Security's Federal Emergency Management Agency (FEMA), Cook sent out special mailings and made herself available by phone to answer any specific questions. Because the process takes time, I wanted to let people know about some alternative assistance programs both public and private that might be able to help out in the interim, said Cook.

The city also looked into additional sources to fund the project. Money from HUD Block Grants, as well as from the Urban Enterprise Association of Kokomo, whose enterprise zone programs are designed to stimulate local community and business redevelopment in distressed areas, were particularly significant. By broadening their vision and pooling resources, Kokomo was able to include more properties in the project and further limit the financial and emotional toll of repetitive flooding on the community.

Quick Facts

Sector:
Private

Cost:
$430,688.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Home Buyout is the Best Option
Flood-Prone Home Buyout Thrills Owners

Mower County, Minnesota

Austin, MN - After Richard and Helen Johnson were flooded the first time, they knew the prospect to participate in the City's buyout project was the best option for them. They waited patiently. When they were offered a buyout of their flood prone home, they were thrilled.

Following the 2000 flood, funding became available for the purchase of their home. After being flooded in 1978, 1993, 1997 and 2000, Richard said the buyout was a wonderful opportunity to better our situation.

The City of Austin has completed over 200 property buyouts since 1978 with funds from FEMA, the State of Minnesota and the City of Austin. These buyouts have saved millions of dollars in flood damage. After the 2000 flood, the City utilized Flood Mitigation Assistance (FMA) Program funds, providing 100 percent of funding for the project, to acquire 39 residential properties in the Cedar River floodplain, including the Johnsons' home. The Housing and Redevelopment Authority of Austin administered the FMA project on behalf of the City.

FEMA and State of Minnesota Division of Homeland Security and Emergency Management (HSEM) returned to the area in September of 2004 when the Cedar River flooded again. This time Richard and Helen felt fortunate to be high and dry. "If we had still been in the floodplain, this last flood would have come in through the first floor windows and substantially damaged our home," said Richard.

Buyout projects have become a well-received mitigation measure to permanently remove people out of harm's way. In the case of the Johnsons, they felt very satisfied with their $72,000 buyout offer and were able to purchase another home out of the floodplain in the same community. Helen said, "because we lived in a floodplain, we would not have been able to sell our home at a reasonable price." Richard added, "I feel that people should take advantage of the buyout program when it is offered to them."

Now a park is being created in their former neighborhood. When they visit the area, they feel very lucky to have participated in the buyout. This time when the floodwaters were rising, the Johnsons could count their blessings and return to their safe, dry home. Helen sighed and said, "we would not have the strength to go through another flood."

Quick Facts

Sector:
Public

Cost:
$72,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Guinea Residents Elevate Isabel is Catalyst for Mitigation

Gloucester County, VA – Guinea is a tight-knit community in southeastern Gloucester County. Bounded by the Chesapeake Bay to the east, the York River to the south, and the Severn River to the north, the economic history of the area is a "waterman's" life comprised of fishing, crabbing, and oyster harvesting. With numerous wetlands, streams and creeks in the area, floodplains are prevalent.

On September 18, 2003, Hurricane Isabel created a tidal surge of 6.4 feet at Gloucester Point and wind gusts up to 85 miles per hour throughout the County.

"Guinea area residents not only suffered from Hurricane Isabel flood and wind damage, but had a tornado and a separate hail storm pass through within an 18 month period," said Dana Lyon, local Project Rebound Outreach Services worker for the Middle Peninsula-Northern Neck Community Services Board.

In early 2002, Ed and Bain Schultz bought a house in the low-lying Browns Bay area of Guinea. Following local floodplain ordinances, they purchased flood insurance and settled in with their two children, seven chickens and two cows, and made their new house a home.

Hurricane Isabel caused substantial damage to their home. They lost all their chickens, but the two cows survived. The Schultz family had obtained a Standard Flood Insurance Policy through a local insurance agent with the National Flood Insurance Program (NFIP), and was able to take advantage of the Increased Cost of Compliance (ICC) portion of the policy to cover the costs of elevating their home.

The Schultzs packaged the ICC benefits with a low interest loan from the Small Business Administration to repair and elevate their home. Under specific circumstances during the retrofitting process, FEMA may provide temporary rental assistance or travel trailers until families can move back into their homes.

"Having a travel trailer is a blessing," said Bain Schultz. "To be on our property, to feed our animals, and to keep an eye on our home and its reconstruction gets us back to normal quicker."

To comply with Gloucester County's floodplain ordinances, the Schultz home was elevated over a crawl space with the first floor above the established Base Flood Elevation. "It would have been irresponsible if we didn't elevate," said Bain Schultz.

A new concrete block foundation wall includes the required flood vents. The vents allow for the free passage of water automatically in both directions without human intervention. The bottom of the openings are no higher than one foot above grade underneath the flood vents.

The September 2003 flooding from Hurricane Isabel revealed the importance of complying with floodplain regulations. Gloucester County's agreement to adopt and enforce floodplain management ordinances is an important measure to reduce the loss of property and life when flooding occurs.

Gloucester County, Virginia

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

Planning is Key to Mitigation Success Achieved by Community

Wells County, Indiana

Bluffton, Indiana – Bluffton, an historic town set along the Wabash River, regularly pays a price for its bucolic setting. The Wabash has overflowed its banks many times since the Great Flood of 1913. The floods in 2003 and 2005 forced residents to evacuate and encouraged them to consider steps they could take to protect themselves and their property in the future. "As the waters were rising in 2003, we brought in surveyors and engineers to mark levels," said Mayor Ted Ellis. "They let us know we were right on target with our established floodplain management guidelines and our Base Flood Elevation figures, as shown on the FEMA maps."

Early in 2005, threatening floodwaters came again. This time, however, the Town was better prepared to concentrate response efforts in areas with the greatest potential for significant damage. "Through the FEMA Hazard Mitigation Grant Program, we were able to purchase properties and turn them into green space," said Jerri Lehman, Wells County Emergency Management Director. "The area is no longer a drain on resources or emotions."

Buying homes and properties, some held by families for generations, can be a challenge even when they have sustained repetitive flood damage. Regular town meetings were held to discuss mitigation options and explain how various programs would work. Once everyone agreed that a buyout was their best option, the community readily approved funding to meet the cost-share obligation of the FEMA grant.

The Town's next task was to decide which homes they would offer to purchase and remove as part of the initiative. Properties were targeted based on their position in the floodplain and grouped into four categories: owner-occupied with greater than 50 percent flood damage, not occupied by owner with greater than 50 percent flood damage, owner-occupied with less than 50 percent flood damage, and not occupied by owner with less than 50 percent flood damage. All properties in the first three categories were included in the project. A total of 25 residential structures were approved for acquisition and demolition.

To remove the structures on the selected properties, the town chose licensed contractors through their standard bidding process. "When the time came to level the homes, we gave the owners the option to attend" said Ellis. Some decided to watch, while others said, "'Don't even tell me when it's going to happen. I don't want to know.' It's a hard thing, the family's losing part of it's history, and the community part of its flavor."

"The buyout program worked for us on several levels," noted Ellis. "First, we didn't have to waste valuable time trying to protect an area that was going to get hit...More importantly, folks in Bluffton don't get stressed every time the rain comes. They know things are being done to ensure their safety and protect their property, and they are an important part of the process."

Quick Facts

Sector:
Private

Cost:
$929,623.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Turning Water into Wine
Flood Mitigation in Napa Valley

Napa County, California

Napa Valley, CA – Napa Valley produces some of the best American wines, but until flood mitigation techniques were implemented in 1997, there was great risk involved. In 1986 and 1995, major floods threatened the valley's 200 wineries. In 1997 however, the Citizens for Napa River Flood Management (CNRFM) decided to take a different approach to the flooding problem, breaking with the tradition of flood control, instead favoring flood management. Whereas in the past, engineers tried to halt flooding, the new approach aims to work with the natural floodplain to better absorb excess flooding. As Karen Rippey of the Friends of the Napa River said, "This plan is designed to manage the river, not control it."

Napa Valley is a well-known tourist destination, drawing more than 5 million visitors annually, but the area is prone to flooding. Between 1862 and 1997, the valley saw 27 major floods. The largest occurred in 1986, with 20 inches of rain falling in 48 hours, causing over $140 million in damage, three fatalities, and requiring the evacuation of 7,000 people. A flood of similar size occurred in 1995, damaging businesses and residences and causing over $100 million in damage.

Napa County has the third-highest amount of flood-damage claims in the State, owing to the flooding common to the area. In 1996, the CNRFM was formed, enabling residents to take a more active role in preventing flood damage. The group approved the Napa Project, a plan designed to work with the natural environment to help prevent further losses from flood damage.

The plan, leveraging seed money from a $7 million grant from FEMA's Hazard Grant Mitigation Program, is expected to take five years at a cost of $220 million, money that will be made back in an estimated 11 years by avoiding property damage. In addition, the people of Napa City approved a 0.5 percent increase in the sales tax to help pay for the project. Napa City has applied for a $20 million grant from the Federal Highway Administration to replace three bridges. The US Army Corps of Engineers will also be responsible for building 13 new bridges in the area.

Now that Napa has taken an active role in protecting itself from flood damage, citizens and business owners like Herb Schmidt, VP for Public Affairs at Robert Mondavi Winery, feel much more at ease: "We believe that the success of this project will allow visitors to focus their attention on the beauty of all our wines and our valley rather than the worry of potential flooding."

Quick Facts

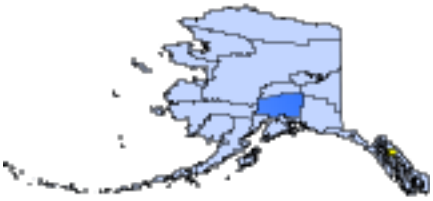
Sector:
Public

Cost:
$220,000,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Wildfire Mitigation
Matanuska-Susitna Borough, Alaska



Matanuska-Susitna Borough, Alaska

Matanuska-Susitna, AK - The Miller's Reach Wildland Fire destroyed or damaged nearly 450 structures, and caused extensive damage to public infrastructure in June 1996. In cooperation with local businesses, several local, state, and federal entities created a Wildfire Mitigation Plan to implement aggressive fire prevention programs rather than continue to rely upon fire fighting and suppression.

The Wildfire Mitigation Plan proposed programs such as preventative land treatments that reduce fuels and break up large contiguous urbanizing fire-prone zones, the creation of defensible space around buildings, and improvements to existing buildings. Equally important, the plan emphasized the need to change people's perception of the wildland fire threat and how they see their place in a border between wilderness and urban spaces.

The Borough's Fire Mitigation Officer developed a wildfire prevention program, which incorporated significant involvement from local area businesses. One national company distributed cups, banners and placemats with fire prevention methods and sponsored promotional slides shown in theatres before movies. A local insurance company provided volunteers and extensive fire prevention education materials for area home shows, and several local greenhouses and nurseries participated in a program to promote the concept of "defensible space" by encouraging the purchase of fire-resistant landscaping plants.

In support of fire damage reduction goals, programs were introduced that created firebreaks and evacuation routes, retro-fitted public buildings to increase fire-resistance, defensible space demonstration projects and exhibits, development of alternative water supplies and installation of dry hydrants and installation of an automated weather data collection system for the Borough.

The Matanuska-Susitna Borough's wildland fire mitigation efforts underline both the need for and the enormous benefits of forging partnerships. Due to the successful cooperation of numerous public and private partners, future wildland fires will result in significantly less damage.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Acquisition Project, Clinton County New York

Clinton County, New York

Schuyler Falls, NY - Severe flooding in the winter of 1996 motivated residents in the Town of Schuyler Falls to move out of flood impacted areas. When the Town refused to be the applicant in the buyout, residents prevailed upon Clinton County to be the buyout applicant. The match was obtained and the buyout proceeded, with savings realized in under a year and two additional properties acquired.

When the Town refused to be the applicant for the buyout, citing a possible loss of tax-base, the County agreed to be the applicant on the condition that matching funds were received from the State.

The state senator from the area was successful in attaining the match from the State Legislature, a key reason the buyout project was successful. The County donated in-kind services, and additional funds were received from private sources.

In all, the acquisition under the Hazard Mitigation Grant Program (HMGP) involved purchasing 19 residential structures and three empty lots along the Saranac River. Based on the damage to these residences during the January 1996 flood and the history of flooding in Schuyler Falls, it was estimated that full benefit payback would occur within 20 years.

Flooding struck again in November 1996, and although they were impacted, most of the acquired properties were vacant. Substantial savings from this project were realized in less than a year. The project was completed under budget with two additional properties acquired.

A follow-up analysis confirmed that the acquisition project had a minimal impact on the tax base in Schuyler Falls. The total assessed value of the acquired neighborhood was approximately $1.5 million. Currently, there are $150 million assessments in the Town. The acquisition of the properties affected one cent per thousand, and therefore, did not have a detrimental effect on the tax base in the community.

Quick Facts

Sector:
Public

Cost:
$692,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Acquisition, Evaluation & Analysis: Acquisition Successes in Birmingham

Jefferson County, Alabama

Birmingham, AL - The City of Birmingham faces its greatest hazard from flooding associated with severe weather. Birmingham's high population density and development render the City particularly vulnerable to the effects of flooding. In an effort to end this damage cycle, FEMA and the U.S. Army Corps of Engineers (USACE) provided funding for one of the largest flood acquisition project ever implemented. The buyouts under this project have avoided losses of over $60 million on an investment of $36 million.

Village Creek's floodplain comprises 53 percent of Birmingham's Special Flood Hazard Area. In some locations, floodwaters can rise as quickly as 3 feet per hour. Village Creek has flooded nearby neighborhoods over 20 times in the past 20 years. Since 1977, federally declared flooding events have occurred 11 times. This history of repetitive flooding and associated damages prompted the City and the USACE to seek congressional funding to accomplish both structural and non-structural solutions to resolve the cycle of repetitive flooding.

The acquisition project was a cooperative effort by the City, the State, and the Federal government that spanned 20 years and removed 735 structures from the floodplain. Additionally, the project returned the floodplain to its natural state as a retention basin for floodwaters; breaking the cycle of flood damage in the floodplain of Village Creek. The report "Losses Avoided in Birmingham Alabama" documents the direct losses avoided resulting from the federally cost-shared Village Creek Acquisition Projects.

When severe storms hit Birmingham with four inches of rain on March 10 and 11, 2000, in the residential areas surrounding Village Creek, there was little residential property damage, no displacement of residents, and no need for assistance even though floods elsewhere in the City were serious enough to result in a Presidential disaster declaration. The financial savings realized by the community as the direct result of implementing the acquisition project can be put toward other civic improvements/projects.

Quick Facts

Sector:
Public

Cost:
$37,500,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Breaking the Cycle of Devastation Reducing Damages in Southern Ohio

Multiple Counties, Ohio

Meigs County, OH - Since 1964, Ohio has received 28 Presidential disaster declarations—22 of which were for flooding. To address the issue of flood risk, the State of Ohio has taken aggressive measures to assess areas of vulnerability and reduce the impact of flooding to those areas.

In 1990, Ohio implemented a state-wide hazard mitigation plan. The state has developed numerous mitigation programs and projects in conjunction with the federal government, under the supervision of the Ohio Emergency Management Agency. The acquisition project in Meigs County demonstrates that an investment in mitigation can be fully returned within only one or two subsequent floods.

The Village of Rutland sits five miles from the Ohio River's edge in south central Meigs County. Most of the village properties were over 50 years old, and most were susceptible to flash flooding from nearby creeks. The January floods of 1996 prompted the village to apply for FEMA's Hazard Mitigation Grant Program (HMGP) to fund an acquisition project.

The project involved the acquisition and demolition of 22 structures, elevating nine structures, relocating four structures, and retrofitting two structures. The estimated cost was just over $1 million. Although the project was approved in 1997, the area was subjected to heavy flooding prior to the start of the project, which was completed in 1999.

Thanks to the mitigation project, Lilly Kennedy's home, flooded every year since 1995, was eight feet higher than in 1997, when first floor flooding reached a depth of four feet. When flooding occurred again in February of 2000, floodwater came up to nearly three feet around the foundation of Lilly's house, but never threatened the interior of her home or her belongings. "This last time," exclaims Lilly, "I just stood and watched as the water came up, knowing all the time that my son and I were safe."

Quick Facts

Sector:
Public

Cost:
$1,048,870.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Building Better: New Building Code & Power Upgrade, US Virgin Islands

State-wide,
US Virgin Islands

US Virgin Islands - After Hurricane Hugo, a Category 4 storm, swept through the islands in 1989 leaving near total devastation in its wake, FEMA and the Government of the Virgin Islands worked together to identify measures to mitigate damage from storms. Mitigation programs included upgrading building codes and building practices, hardening the power grid, and instituting public education programs about the value of mitigation measures.

With FEMA support, a new building code was written and implemented. The new code requires anchoring systems, hurricane clips, shutters, and other hurricane resistant measures. Other mitigation projects enacted in the wake of Hurricane Hugo was the strengthening of infrastructure facilities and a massive public education outreach to inspectors, contractors and owners about proper construction practices and other mitigation strategies.

Following Hurricane Marilyn in 1995, the Governor's office initiated the Home Protection Roofing Program: a comprehensive program to repair damaged roofs. The program provided nearly 350 homeowners with roofs designed to withstand a Category 2 storm. Additional funding was made available to expand this program after Hurricane Bertha struck the islands in 1996.

The high winds accompanying Hugo and Marilyn caused a total disruption of the power system. Using Public Assistance and Hazard Grant Mitigation Program funding, the Government of the Virgin Islands began a series of major projects designed to keep the power system intact and functional in the wake of a storm, among them was the decentralization of the power generation system and the diversification of fuel sources.

When Hurricane Georges struck in 1998, damage to private homes on the island was less than two percent and all of the power substations and other projects constructed since Hurricane Hugo survived undamaged. These successes can be directly attributed to the mitigation efforts undertaken and completed after Hurricanes Hugo and Marilyn.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The Community Rating System Saving Lives and Dollars

Placer County, California

Roseville, CA - With the realization that implementing the Community Rating System (CRS) program was not much more than the cost of implementing good floodplain management, the City of Roseville joined the CRS and is currently rated at Class 5, giving residents outside the Special Flood Hazard Area (SFHA) a 10 percent reduction on their flood insurance premium, and a 25 percent reduction to residents within the SFHA.

One of the biggest advantages of the CRS is that it creates partnerships. In joining the CRS, the City of Roseville was able to bring together different mitigation stakeholders and garner support within the city government for supporting hazard mitigation planning. Key components of Roseville's mitigation program are floodplain mapping, stringent building codes/regulations, a flood early warning system and public outreach in the form of annual mailings describing what to do before, during and after a flood and providing information on flood insurance.

Floodplain mapping is used in conjunction with other hazard mitigation activities. When mapping the floodplains, it is assumed that there is full build out of the contributing drainage sheds. Regulations stipulate that newly developed areas must drain completely and not cause any flood damage to homes even if the stormwater drainage system is completely blocked. Additionally, any development outside, but adjacent to the floodplain must be built two feet above the base flood elevation.

The development of a flood early warning system is an integral part of the mitigation program. When a 100-year flood event occurred in 1995, over 300 water rescues were performed. After the development of the system, in 1997 when another 100-year storm event occurred, no water rescues were needed.

Since joining the CRS, the City of Roseville has implemented a successful mitigation program that has returned 80 to 90 percent of the floodplain to open space, reduced repetitive loss properties from 24 to two, implemented a flood early warning system and raised public awareness about flood insurance and hazard mitigation.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
Community Rating System (CRS)

Community Rating System Helps Resulted From Hurricane Andrew

Miami-Dade County, Florida

Key Biscayne, FL - In 1992, Hurricane Andrew swept through southern Florida. The resulting storm surge and flooding destroyed a large portion of the Village of Key Biscayne and demonstrated the need for a plan to cope with flood hazards. Since entering the Community Rating System (CRS), the Village has implemented flood mitigation programs that reduce the impact of flooding, making it a safer community, while residents enjoy discounted flood insurance due to participation in the CRS.

The CRS has helped Key Biscayne to focus on systematic mitigation and has established an administrative link between the Village's and Dade County's mitigation activities. Three key activities promote hazard mitigation and inform the public about hazards and the benefits of flood insurance: the stormwater drainage maintenance program, an open space program, and the public outreach program. These three programs also helped the Village achieve a CRS rating of 6, giving residents outside the Special Flood Hazard Area (SFHA) a ten percent reduction on their flood insurance premium, and a 20-percent reduction to residents within the SFHA.

Participation in the CRS has made Key Biscayne more vigilant in maintaining and improving the stormwater system. The Village is a co-permittee with Dade County and both have implemented a stormwater management program that reduces flooding and ensures that clean water is discharged into the waters of Dade County and the Village's deep well system.

The Village conducts public outreach to inform citizens about on-going hazard mitigation strategies, provide information on what to do in the event of a hazard and educate the public about why mitigation is important.

By participating in the CRS, Key Biscayne has reduced their flood losses, saving lives and property, and increased awareness of hazards and hazard mitigation, while providing its citizens with discounted flood insurance.

Quick Facts

Sector:
Public

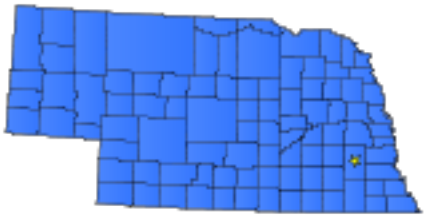
Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
Community Rating System (CRS)

FEMA

Large Area Mapping Initiative In the State of Nebraska



State-wide, Nebraska

The State of Nebraska - Through the Cooperating Technical Partnership program, the Nebraska Department of Natural Resources (NDNR) developed the Large Area Mapping Initiative to map unstudied areas in the state as a means of providing flood hazard data to all users. Coordinated with FEMA, the results of the initiative provide a complete set of data to floodplain managers for use in the administration of the National Flood Insurance Program (NFIP).

Until five years ago, not all Special Flood Hazard Areas (areas subject to inundation by the base, or 100-year flood) within the State of Nebraska had been identified. The NDNR requires that flood hazard data be provided to its citizens. This requirement, coupled with the need to assist communities in the NFIP, provided the incentive to enter into a partnership with FEMA to provide flood hazard data to all users in the state.

Using a geographic information system (GIS), the State developed software to delineate flood hazard areas. The method is largely automated, making the process more efficient, and less expensive than traditional study methods. In the last three years, 19 counties have been mapped using this method. The delineations are approximate, but a user can input flood stage data to calculate a Base Flood Elevation (BFE) for use in floodplain development.

FEMA and the State are working together to produce official FEMA flood maps from these studies. In the meantime, many communities in the NFIP have adopted the working maps as best available data, and use the BFE information for floodplain management.

The State will continue to work with the communities to help them adopt the working maps for use in floodplain management. Even after the maps are published as the official, effective FEMA flood hazard, the additional flood elevation data generated by Nebraska's automated processes will continue to benefit communities.

"This mapping effort would have been impossible without the strong partnership between the State of Nebraska and the Federal Emergency Management Agency, through the Cooperating Technical Partners program." --Roger Patterson, P.E., Director, NDNR.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Insurance

Primary Funding:
Map Modernization

Moving Homes From a Floodplain Initiatives in Allegany County

Allegany County, Maryland

Allegany County, MD - Allegany County's mitigation initiative contributed to the long-term endeavors by earmarking funds to relocate units for an acquisition project. Despite numerous setbacks, the project reached a successful conclusion due to the County and its contractors.

In the spring of 1998, the review and approval process began with the accumulation of supporting cost/benefit data. The project called for the relocation of units within a manufactured home park and then returning the area to a natural habitat/open space. The units were all located within the 100-year flood boundary of Evitts Creek and had experience flooding numerous times in the past.

As the units were being evaluated for relocation, owners sought alternate pad sites. Only four found available pads, the remainder were unable to find vacant pads in other area manufactured home parks. Furthermore, the units did not meet the new zoning regulations due to their age and construction and an evaluation of the homes indicated that most were too fragile to move safely. By April 1999, the project had to be restructured to acquire the units.

What seemed to be a straightforward purchase and relocation took over two years at a final cost of $390,000, double the amount of funding set aside by the county. FEMA expressed concern for the continued viability of the project, but the County was willing to continue because the staff strongly believed in relocating the units outside the 100-year floodplain.

The County's relentless outreach to the residents and the use of contract personnel well-versed in the Uniform Relocation Assistance and Real Property Acquisition Policies Act, were the key reasons the process moved forward with the support of the tenants.

By the winter of 1999, the last manufactured home was removed from the site and by June 2000, every family was relocated to affordable housing and the manufactured home park was in the process of being returned to a natural state.

Quick Facts

Sector:
Public

Cost:
$390,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
State sources

New Bridge Prevents Flood Damage Backwater Has Been Reduced

Cattaraugus County, New York

Ellicotville, NY - The configuration of the Martha Street Bridge abutments and channel caused floodwaters to spill into Ellicottville during repeated flood events. By replacing the one-lane bridge with a two-lane bridge and altering the abutments and channel to allow for greater water flow, the amount of backwater was reduced and flooding was alleviated.

Funded under FEMA's Housing Mitigation Grant Program with matching funds from Cattaraugus County, the replacement of the Martha Street Bridge reduced future flood potential throughout the Village of Ellicottville. Prior to this mitigation action, requests for FEMA and Small Business Association (SBA) assistance were received on a regular basis. Damage to 51 residential and 20 commercial properties at over $125,000 were reported annually.

The new two-lane bridge accommodates greater traffic flow and provides pedestrian access. Removing the channel restrictions south of the confluence caused by the bridge reduces the potential for backwater overflow and widened bridge abutments allow more flood water to pass under the bridge, ensuring emergency access throughout the Village during floods.

The new Martha Street Bridge has been in place during two floods that previously would have resulted in residential and commercial flooding. To date, the Village has not experienced flood damages due to a back up of water at this structure.

The reduction in the amount of backwater may have a beneficial impact to the adjacent floodplain, and as a result new flood maps are now being processed. Estimates indicate that the project cost will be completely recouped following the next disaster.

Quick Facts

Sector:
Public

Cost:
$421,399.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The Community Rating System
Saving Lives, Property, and Money

King County, Washington

King County, WA - On October 1, 2002, King County, Washington became the nation's first Class 4 county in the Community Rating System (CRS). The CRS provides an opportunity to promote flood insurance, and due to the County's rating, residents in the Special Flood Hazard Area (SFHA) enjoy a 30-percent discount on their flood insurance premium and a 10-percent reduction for residents outside the SFHA.

FEMA Region 10 introduced King County policymakers to the CRS when the CRS was first implemented, because of the County's progressive floodplain management program. King County's comprehensive floodplain management program includes: planning policies, flood hazard regulations, programs - such as floodplain mapping and channel migration hazard mapping, an extensive open space management plan, capital improvement projects that address reducing flood hazard conditions and public outreach.

Using an innovative approach to open space management, the County combined the creation of open space with that of creating habitat for salmon and wildlife. These extensive open space areas along the county's river systems cannot be developed and provide a habitat for wildlife while providing significant flood storage and conveyance. As part of the open space program, the County acquired 25 homes in the floodplain and completely removed the structures, creating additional open space and allowing for future land restoration.

Another innovation is the inclusion of a certified floodplain manager among County staff. Not only does this count towards the County's CRS rating, but it expedites the permit review and approval process and allows the County to work more closely with FEMA on mitigation activities.

Participation in the CRS has been beneficial to King County in many respects. It has positively affected the County's ability to obtain funding/grants for mitigation activities, its policy makers are more knowledgeable about floodplain management and its residents are more knowledgeable about mitigation and flood insurance, making the County a safer place to live and reducing the economic impact of flood hazards.

Quick Facts

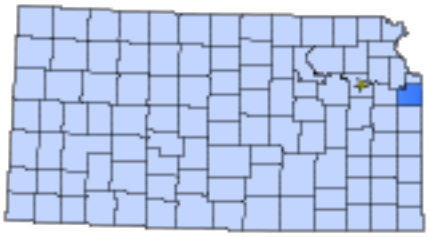
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
Community Rating System (CRS)

The Rains Came Down and the City & County Came Together



Johnson County, Kansas

Merriam, KS - On October 4, 1998, a storm dumped 5.6 inches of rain on the City of Merriam in Johnson County, Kansas. Flash flooding damaged structures throughout Merriam and the surrounding county. After the flood, the City and County investigated engineering solutions for the flood area. A buyout was selected as the most economic solution, with the greatest return on investment.

The County and City quickly moved forward with the buyout option, purchasing 33 homes for a total cost of $5.3 million. The buyout was accomplished with no federal funding: the county provided 75 percent of the funding and the city 25 percent. Involved early in the process, all of the homeowners willingly signed purchase contracts, and the homes were purchased at their appraised values, with a relocation allowance of $2,000 issued to each property owner.

All 33 flooded structures were under contract for purchase within ten months of the flood event. Demolition of the structures began in September 1999 and was completed in November 1999. With direct involvement from the adjoining neighborhoods, the City developed plans for a park on the purchased property. The park may include recreation amenities, such as a playground and walking path, while the remainder will either be mowed or allowed to return to its natural state. The repeated flooding has spurred other mitigation risk reduction projects.

In 1998, the County initiated a comprehensive county-wide watershed study. The scope of the study included re-mapping all of the floodplain areas in drainage areas of 160 acres or greater. The required the County to purchase new planimetric and contour data, and new aerial photography. The County data collection and mapping project will provide one-foot contour intervals 1200 feet on either side of the FEMA identified floodplains. The total estimated cost to complete the data collection, aerial photography, and all seven major watershed studies will be $9.8 million. The project is scheduled for completion by 2002.

Quick Facts

Sector:
Public

Cost:
$9,800,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The "Renaissance Zone"
The Future of Map Modernization

Jefferson County, Kentucky

Louisville, KY - With the largest population in the state of Kentucky, the City of Louisville is the economic engine for Jefferson County. Located along the Ohio River, the city has a long history of flooding. After severe flooding in 1997, the Jefferson County Metropolitan Sewer District (MSD) initiated partnerships among private businesses, residents, and local, state, and federal governments to develop a business plan for identifying mapping needs and priorities and to create an approach for flood prevention.

One area of concentration for the new mapping efforts was in Louisville's "Renaissance Zone," a redevelopment project area supported by the local, state, and federal governments. Approximately 60 percent of the Renaissance Zone is located in the floodplain. For the region to sustain economic vibrancy, MSD addressed existing and anticipated flooding from new developments. To protect their investments, businesses invested in addressing the area's flood hazards. The Renaissance Zone showcases map modernization: leveraging funds, partnership, and the use of technology to provide an ideal platform for change.

As funding became available, the Flood Rate Insurance Maps (FIRMs) were updated. The revised topography yielded better definition of the floodplain, allowing MSD to conduct more effective floodplain management and to implement an aggressive floodplain management ordinance. Through the use of Geographic Information Systems technology, the FIRMs were digitized, allowing for integrated hydrology modeling and flood analyses.

Updated modeling and modernized maps position MSD to better facilitate bringing local businesses and industries together to construct cost effective flood control projects and implement the necessary watershed management activities.

The Renaissance Zone is a microcosm that offers a vision for the future of map modernization. MSD has built a reputation as a national leader in stormwater management through its balanced approach to mitigation and its commitment to protecting its citizens through innovation and partnership.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Study Map Rollout/ Map Modernization

Primary Funding:
Local Sources

Tropical Storm Allison Recovery Project: Map Modernization Outreach

State-wide,
Texas

The State of Texas - In June 2001, Tropical Storm Allison ravaged 31 counties in Texas, including Harris County. The storm caused $5 billion in damage in the City of Houston, the county seat of Harris County. Working under a Cooperating Technical Partner agreement, FEMA and the Harris County Flood Control District (HCFCD) conducted a flood studies leading to the remapping of 1,200 stream miles in 22 watersheds encompassing all 35 of the flooded communities. Because the individual community must adopt the new flood maps, a coordinated outreach plan involving all the affected communities was key the project's success.

The Tropical Storm Allison Recovery Project (TSARP) was created through the partnership of FEMA and the HCFCD. To generate community involvement in the project, the team invited all 35 communities to participate in the mapping process. The TSARP held frequent meetings. Communities also participated via advisory committees and stakeholder groups. In this way, effective two-way communication was achieved.

Outreach tools utilized by the Team included a TSARP web site for posting presentations, reports, educational resources and guidance documents; publications such as the "Off the Charts" report, which was distributed by the Houston Chronicle; community visits by the HCFCD Communication Department; the use of a public outreach consultant to lead media and public relations; clear, concise messages customized for specific audiences; the development of training courses for flood insurance agents; and presentations to civic organizations, real estate groups, homeowner associations, business and environmental groups throughout Harris County.

A TSARP poll of 500 citizens found that 82 percent supported the map update efforts, while only four percent opposed. Through a coordinated, integrated public outreach program, the TSARP Team was able to make people understand and support the idea that updated, more accurate maps will help the HCFCD reduce the risk and impact of future flooding.

Quick Facts

Sector:
Public

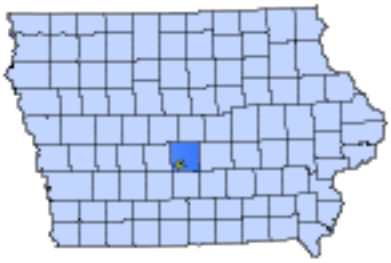
Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Cooperating Technical Partners (CTP)

FEMA

A Safe Haven For Campers
Iowa State Fair Campground Shelter



Polk County, Iowa

Des Moines, IA - In June 1998, a storm with winds in excess of 100 miles per hour (mph) caused over $465,000 in damage to the Iowa State Fair complex and the 160-acre campground. Fortunately, no one was hurt, but the potential for disaster and loss of human life was obvious. According to the National Climatic Data Center, the State of Iowa ranked sixth in the number of tornadoes across the nation with 1,974 events between 1950 and February 2004. As a result, the State Fair Board decided to construct a shelter at the campground, which is used from April to October.

The project began in the fall of 2002, when Linda Roose, Iowa Homeland Security and Emergency Management Division (HLSEM) Safe Room Project Coordinator, contacted the College of Design at Iowa State University in Ames, Iowa, requesting assistance with the design for a storm shelter. Professor Bruce Bassler and two of his students worked on the project and submitted their designs to the State Fair Board. The Board selected their unique preliminary shelter design, which resembles a football when viewed from above. Tom Hurd, of Spatial Designs Architects and Consultants, developed the final design, completing the plans as prescribed by FEMA 361, Design and Construction Guidance for Community Shelters.

The Iowa State Fair and HLSEM collaborated on the shelter construction project. The funding source was the Hazard Mitigation Grant Program (HMGP); funds for the project were split between Federal (75 percent) and local (25 percent) monies.

The unique design offers excellent wind resistance. The curved surfaces force the wind around the shelter on all sides, thus, alleviating wind pressure at specific points. The roof and the unique curved walls are constructed of 12-inch thick, pre-cast concrete panels. The interior partition walls are constructed of fully reinforced concrete masonry units (CMUs) and many of the interior walls are 8 inches thick.

On the east side of the structure, a concrete canopy mounted on concrete piers provides weather protection and has been designed to withstand 250-mph winds. The canopy provides cover for gatherings at the campground, such as small musical groups and social events. Descending steps radiating from beneath the canopy promote its use as a stage.

The shelter encompasses 5,200 square feet in area and is 100 feet long by 71 feet wide; it was constructed to hold approximately 400 people. When not in use as an emergency shelter, the large multi-purpose building is used by both the fairground staff and campers.

Whether to design and construct shelters that can provide protection for all attendees at a state fair or, as in the approach taken by the Iowa State Fair, for a selected group with the greatest need, is a decision that will need to be based on a state's priorities and resources. Constructing the shelter is a big step toward providing for the safety of campers who would otherwise have nowhere to turn.

Quick Facts

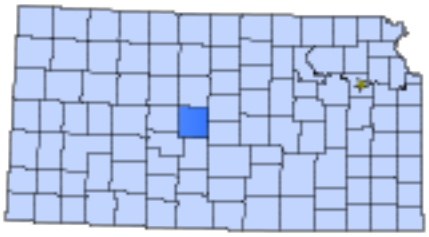
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Clara Barton Hospital Shelter
A Safe Place to Be



Barton County, Kansas

Hoisington, KS - On April 21, 2001, an F4 tornado struck Hoisington, Kansas (population 2,975), severely damaging 230 homes and businesses and leaving one person dead. The sirens in town did not sound that night because the poles they were mounted on snapped during the first few moments of the storm. The Clara Barton Hospital sustained extensive damage estimated at nearly 1.5 million dollars. The destruction was an alarming wake-up call for the region.

Soon after, Kansas State and Hospital administrators decided to build a shelter at the hospital to ensure the safety of the patients and staff in the event of another tornado. It would be the first hospital shelter in the State to meet the criteria presented in FEMA 361, Design and Construction Guidance for Community Shelters.

Funds for the shelter were obtained through the FEMA Public Assistance Program. Following a Federally Declared Disaster, this program provides supplemental grant assistance for the repair, replacement, or restoration of disaster-damaged facilities that either are publicly owned or are certain Private Non-Profit (PNP) organizations. FEMA modified the Public Assistance Program in August 1998 to provide more flexibility in funding mitigation measures under Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Clara Barton Hospital qualified for the funds because it is a PNP organization and provides a critical service to the community. The Public Assistance Program funded 75 percent of the shelter cost, the State of Kansas provided 15 percent, and the hospital covered the remaining 10 percent.

The new shelter is located between the main hospital building and the clinic building to facilitate easy access from both areas through interior doors, and it has one exterior door (meets the FEMA 361 criteria) and no windows. The layout includes one large open area, two restrooms, a mechanical room, and a storage room. With 1,026 square feet of finished area, the shelter can accommodate 14 patients (6 seated, 6 in wheelchairs, and 2 bedridden) and 30 standing staff members, with space for an additional 67 evacuees. The design allows a maximum of 111 occupants.

Although the shelter adjoins the hospital and clinic, it is designed as a stand-alone structure; therefore, it does not rely on the walls of the hospital building or clinic building to resist the extreme wind loads. This design helps ensure the safety of the occupants in case the hospital or clinic buildings are damaged extensively or destroyed.

The shelter is available for community use by the town government, schools, clubs, and other non-profit groups. Because the shelter space is used by a number of groups, it is an ideal location for providing information, educating the public on safety issues related to tornadoes, and promoting shelter and safe room construction. The famous Kansas “Can Do” attitude is well represented by Hoisington’s recovery, resulting in securing a safe place for the patients and staff of Clara Barton Hospital as well as an additional peace of mind for the community.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Non-profit organization (NPO)

FEMA

School-Based Safe Rooms
Arkansas Protects 100,000 Children

State-wide,
Arkansas

The State of Arkansas - From 1950 through 2003, Arkansas has been affected by 1497 tornadoes. More recent tornado data through 2003 indicates an average of 27.7 tornadoes occur annually in Arkansas. In 1999, Arkansas was slammed with 107 tornados, which is the most for a single year in the State's history.

More than 100,000 children, teachers, and local residents in 60 school districts across Arkansas are safer because of safe rooms built to protect them through mitigation grants from the Arkansas Department of Emergency Management (ADEM) and the Federal Emergency Management Agency (FEMA), which is now part of the Department of Homeland Security. The “Arkansas School Safe Room Program” began during Disaster 1266 in 1999 and has continued through Disaster 1516 in 2004.

At least 350,000 square feet of shelter space has been constructed during this period totaling 66 safe rooms across the State. These rooms are being used on a daily basis by the schools as libraries, computer rooms or physical education areas. Parents and friends can rest assured their children are safe from tornados during school hours. At a cost of only $395 per child, this is one of the most proactive mitigation actions in the nation.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$39,510,253.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

GIS an Innovative Program
Floodplain Management in Kinston

Lenoir County,
North Carolina

Kinston, NC - In 1999, Hurricane Floyd had decreased in strength to a Category 2 hurricane before reaching North Carolina's coast; but the City of Kinston was still devastated by severe flooding. More than 75 percent of the homes located in floodplains in Lenoir County were substantially damaged and /or repeatedly flooded following the remaining storms that year: Hurricanes Fran and Dennis.

The City then made a commitment to consciously reduce their risks and proactively incorporate floodplain management planning into their community. Using Geographic Information Systems (GIS) as the technical foundation for their floodplain management planning, local officials developed and utilized relevant databases and tracking functions to produce graphical images to aid in planning, implementing, and tracking a comprehensive floodplain management program.

The City of Kinston Fire Department is an example of GIS use for emergency response. Each fire emergency response vehicle is equipped with a laptop computer containing the most recent GIS data for properties in the community, including homes and businesses located in the floodplain. If a unit is called to a flooded home to rescue the residents, the emergency responder can access critical pieces of information, such as how many people reside at the house or if any of the residents are handicapped and will require special assistance.

Hazard Mitigation Grant Program (HMGP) Acquisition and Management Local officials used GIS to graphically illustrate the 100- and 500-year floodplains and the HMGP acquired lots to help local officials illustrate the benefits of proactive floodplain management and to plan for future acquisitions.

Because HMGP acquisitions are voluntary, residents must be interested in participating and must also understand the implications of their decisions. By using GIS as an educational and marketing tool to illustrate the acquisition plans and benefits, local officials were able to generate community support. Ninety-seven percent of the homeowners in acquired homes relocated to housing in the City of Kinston, resulting in minimal impact to the tax base.

A requirement of FEMA's HMGP is that the purchased property must be maintained as open space. Viewing this requirement as an opportunity, the City of Kinston, in partnership with the Conservation Fund and the University of North Carolina at Chapel Hill Graduate Student Workshop, developed a green infrastructure plan that redevelops areas as open spaces that create amenities and services to benefit the overall community.

When planning mitigation strategies, communities must address a number of political, emotional, economical, and logistical issues. The City of Kinston took a holistic and inclusive approach to making and implementing decisions. GIS technology provides integral documentation, planning, and educational and marketing tools to produce, implement, and track a comprehensive floodplain mitigation plan that addresses both the community's needs and mitigation goals.

Quick Facts

Sector:
Public

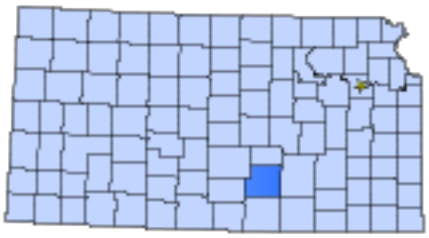
Cost:
$40,000,000.00 (Estimated)

Primary Activity/Project:
Floodplain Management

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Protecting School Children
State of Kansas Shelter Initiative



Sedgwick County, Kansas

The State of Kansas - On May 3, 1999, a series of strong fronts moved through Oklahoma and Kansas, producing numerous tornadoes that tore through areas of both states considered parts of “Tornado Alley.” Two schools in Wichita were severely damaged. Luckily, the storms occurred after school hours and children were not present. But what if there had been children in the schools?

But even before the May 3 tornado event, the Sedgwick County Emergency Management Office looked at schools in the Wichita Public School District and asked this exact question.

The two schools had few interior areas for refuge, therefore the hallways in these schools were designated as the best place to seek refuge. But during the last tornado event, the hallways in both schools suffered extensive damage. At one, a tall boiler chimney collapsed into a hallway. If children had been present, injuries or deaths could have occurred. The information gathered by Federal, state, and local agencies from the damaged schools has led to a re-examination of the criteria used to determine places of safety.

As a result of the tornado, the damaged counties received a Presidential disaster declaration and financial assistance from FEMA. Work then began to find a way to construct tornado shelters in Kansas schools. FEMA’s Hazard Mitigation Grant Program (HMGP), as well as supplemental appropriations from Congress, provided funding for damage-prevention projects after the tornadoes.

To encourage shelter construction in schools, Sedgwick County Emergency Management works closely with the Wichita Public School District to evaluate areas of refuge in the schools. Each evaluation identifies the safest areas within a school and leads to recommendations for increasing occupant safety. The school district then determines the most appropriate and feasible means of creating the shelter—constructing a new school, constructing a new addition, or retrofitting an existing area. All new approved shelter construction carried out in the Wichita program meets the criteria presented in FEMA publication 361, *Design and Construction Guidance for Community Shelters*. In addition, all shelter construction projects are inspected by a trained team that assists in determining the best location for shelter areas, identifying areas that need improvement, and determining how to resolve any structural concerns.

The success of this school shelter program is based largely on the foresight of the Wichita Public School District and the cooperative efforts of school district officials, the State of Kansas, the private sector, and the Federal government—efforts that have enabled the design and construction of economical, attractive shelters that make efficient use of valuable school space while providing for the safety and comfort of students. By following the guidance presented in FEMA 361, the participating schools have ensured that school children are afforded an unparalleled level of protection from the hazards associated with severe winds and windborne debris.

Quick Facts

Sector:
Public

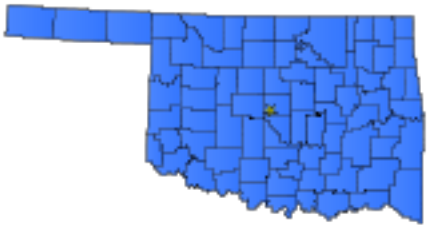
Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Safe Rooms Save Lives
State of Oklahoma Safe Room Initiative



State-wide, Oklahoma

The State of Oklahoma - On May 3, 1999, more than 70 tornadoes tore through Kansas and Oklahoma in the worst tornado outbreak in a generation. As a result, in Oklahoma alone more than 44 people died and almost 800 were injured. Approximately 90 percent of the buildings damaged were single-family dwellings. How could Oklahomans feel safe in future tornadoes?

To help answer this question, the State of Oklahoma launched an initiative to promote and support the construction of storm shelters in homes. The initiative was the first large-scale effort to build thousands of safe rooms through a rebate program.

An extensive public education campaign was launched by FEMA's Office of Public Affairs and supported by the State of Oklahoma. Teams of FEMA mitigation advisors fanned out across the state to show people how to build disaster-resistant residential structures, with an emphasis on safe rooms. Four thousand people were reached in a one-week period.

With the goal of saving lives in future tornadoes and severe storms, Federal and state agencies developed a first-in-the-nation safe room rebate program to help Oklahomans cover the cost of constructing safe rooms. The program offered a $2,000 rebate. The state provided rebates to local jurisdictions on a worst-first basis from $12 million dollars in Hazard Mitigation Grant Program (HMGP) funds. The safe room rebate program resulted in the construction of 6,016 shelters throughout the State of Oklahoma. Additional safe room financial assistance was provided by the U.S. Small Business Administration (SBA), the Department of Housing and Urban Development (HUD), and Fannie Mae.

To ensure that safe rooms were constructed and installed to resist appropriate wind and debris impact forces, technical support and information had to be provided to the public and to builders and contractors who would be designing and constructing. To meet this need, FEMA and the State of Oklahoma required that safe room and shelter performance standards be met (according to the design plans depicted in FEMA 320, *Taking Shelter From the Storm*, or other FEMA-defined performance criteria), retained a technical representative, and conducted technical seminars.

As an effort to continue promoting safe rooms throughout the state, several builders have constructed safe rooms with their newly built communities. The Millennium House, a project of Neighbor for Neighbor, a nonprofit, privately funded agency that serves the disadvantaged, serves as a model home for low- to moderate- income families in North Tulsa. Habitat for Humanity of Altus defined a tornado safe room as a standard feature. Therefore, every home they build will have a safe room. The Community Action Project (CAP) of Tulsa County helps individuals and families in economic need achieve self-sufficiency. CAP teamed with Tulsa's Pre-Disaster Mitigation Program to provide safe rooms for low-income, first-time home-buyers.

The State of Oklahoma's safe room initiative was the first statewide safe room mitigation program in the Nation. Their efforts have resulted in the construction of over 6,000 residential safe rooms, through the rebate program alone, throughout the State of Oklahoma.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The Missouri Buyout Program Success Stories

State-wide, Missouri

The State of Missouri - Anyone who lived through the 1993 Midwest floods will never forget them. Of the nine states affected by flooding during the spring and summer of 1993, Missouri was the hardest hit, with damages totaling $3 billion. The stench of waterlogged trash and rotting food lingered in towns for weeks and even months.

The Missouri floods of 1993 ruined more cropland, destroyed more residences and businesses, and cost taxpayers more money than any other flood in the state's long history of flooding. For the thousands of Missourians who lost their homes, businesses, and everything they cherished, the floods were a living nightmare. But thankfully for many, it has not been a recurring nightmare.

Since 1993, FEMA and Missouri State Emergency Management Agency (SEMA) have partnered with local governments to help thousands of willing homeowners move out of the floodplain. The people profiled in this report are just a few of the countless success stories from the Missouri Buyout Program. Devastated by the floods of 1993 and 1995, these people and communities took seriously the opportunity to move out of harm's way.

People across the state of Missouri took pride in taking responsibility for the safety of their families, homes, and businesses. In the process, they spared taxpayers the expense of additional federal disaster assistance, which they no longer need to weather the storms.

Since 1993, FEMA has provided $54.9 million to the State of Missouri in Hazard Mitigation Grant Program (HMGP) funding. Missouri has used the majority of these funds to acquire, relocate, or elevate more than 4,800 properties.

When floodwaters returned to Missouri in May of 2002, these Missourians - and thousands like them - were spared the heartache of watching their homes and lives devastated by another disaster.

Quick Facts

Sector:
Public

Cost:
$54,900,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Hardened First Responder Facility Serves Smith County, Texas

Smith County, Texas

Tyler, TX - Smith County is located in east Texas, approximately 100 miles east of Dallas. It is largely rural, with only one metropolitan area, the City of Tyler. The Sheriff of Smith County and the Police Chief of the City of Tyler saw a need for a consolidated emergency operations and communications center that would serve the entire county. They believed this consolidation would reduce fragmentation and duplication of emergency services, and allow services to be provided in a more efficient and cost-effective manner.

In January 2003, the County begun construction of a state-of-the-art facility to serve as the centralized 911 communications dispatch and emergency operations center (EOC) for approximately 30 agencies (serving a population of approximately 175,000). Administrative staff moved into the new facility in November 2003. Dispatching from the facility began in January 2004.

Notable features of this 15,000-square-foot facility include a roof and exterior walls hardened to resist tornadic forces, a lobby designed to minimize blast effects, multiple security access levels, and an area specifically planned for press conferences, interviews, and other interaction with members of the media. The project architects consulted FEMA 361, "Design and Construction Guidance for Community Shelters," to determine the specific design loads that the new communications and emergency operations center would have to be able to withstand.

There are four key concepts that should be considered in the design of building systems for a critical facility. Backup systems should be provided, all points of access to the systems – including entry points, control panels, and maintenance access – should be located in secured areas, all systems should be protected from potential hazards, and all systems should be physically separated.

Smith County's EOC has an on-site emergency generator with the capacity to operate the entire facility and function independently from the normal electric service. The emergency generator is housed in a secured, reinforced concrete masonry mechanical yard covered with a steel screen designed to protect the generator from windborne debris impacts.

The facility was designed to be self-contained for two weeks at a time. It is equipped with enough cots and mattresses for 25 people, and is stocked with enough food to feed up to 50 people for two weeks. Washers and dryers are also available on site, as well as showers and separate dressing rooms.

The extended EOC stays often required of emergency workers, the urgency of emergency response, and the need to deal with injuries, loss of life, damage, and destruction, all place extreme pressure and stress on emergency managers and staff. Recognizing the effects of this difficult working environment, the Research and Planning Committee put high priority on keeping the staff as comfortable as possible during their stay at the EOC.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Local Sources

FEMA

Promoting Mitigation
FEMA and the State of Louisiana

State-wide,
Louisiana

The State of Louisiana - Tropical Storm Allison flooded nearly all of south Louisiana with three months of rain in three days. The storm provided a new opportunity to evaluate the effectiveness of recent mitigation investments by Federal, State and local government. This report explores 11 projects where mitigation proved particularly effective. By reviewing the basis on which Federally funded mitigation activities were approved, the performance analysis details the damages avoided or financial savings that resulted from these activities.

In a sense, Louisiana is the floodplain of the nation. Louisiana waterways drain two-thirds of the continental United States. Precipitation in New York, the Dakotas, even Idaho and the Province of Alberta, finds its way to Louisiana's coastline. Pre-existing high land is often the result of natural levees developing along the banks of historical or present-day waterways.

Despite massive improvements to reduce the impacts of severe weather in the last 100 years, flooding is a constant threat. The State of Louisiana has more flood insurance claims than any other state in the country. Leading the nation, Louisiana has more than 18,000 repetitively flooded structures. Repetitive loss structures are the largest drain on the National Flood Insurance Program (NFIP).

As part of the National Repetitive Loss Strategy, FEMA has ranked all repetitive loss structures. The top 10,000 repetitive loss structures nationwide have received repetitive flooding to the extent that flood claims equal or exceed the value of these structures or, as is the case for most of Louisiana's structures, have experienced four or more losses in the last 10 years.

Of these top 10,000 structures nationwide, over 3,000 are in Louisiana, more than any other state. Furthermore, the top two parishes (or counties) in terms of repetitive loss structures are in Louisiana: Jefferson Parish and Orleans Parish, both part of the New Orleans Metropolitan area. Over the last 5 years, Louisiana has made excellent progress in addressing repetitive loss issues.

In addition to mitigation, flood prevention is enhanced through regulatory programs such as the Community Rating System (CRS). To date, 38 Louisiana communities have joined CRS, an

insurance rating system similar to that of the national fire rating system. From June 6 to June 8, 2001, mitigation measures and flood damage prevention regulations were tested when Tropical Storm Allison brought torrential rains through southern portions of the States of Texas and Louisiana. The storm lingered and moved slowly, dumping up to 20 inches of rain in many of the low-lying parishes of Louisiana. A Major Presidential Disaster Declaration was signed for the State of Louisiana on June 11, 2001, for 28 parishes.

In the report, there are examples of successful hazard mitigation. For selected stories, the cost of damages avoided during Tropical Storm Allison as a result of these mitigation projects has been estimated. These examples show that actions taken to permanently reduce or eliminate long-term risks in the state have been effective and demonstrate the long-term sustainability for communities throughout the state.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
Community Rating System (CRS)

FEMA

Couple Moves Out of Flood Path
Brooke County

Brooke County, West Virginia

Bethany, WV - The Dixon family has struggled against nature's awesome power twice. Hurricane Frances (2004) caused Buffalo Creek to overflow and reach their porch. Two weeks later, Hurricane Ivan caused floodwater to lift their mobile home off its foundation, overturn it and leave it in shambles a quarter mile downstream.

Initially when the floodwaters began to approach, the Dixons started moving their valuables to a higher level in their home or onto high shelves in their storage shed. But the water rose too quickly, and they had to flee to higher ground. They lost everything.

Fortunately, the Dixons were registered with FEMA and received a housing assistance grant under FEMA's Individual and Household Program. The Dixons used this money to purchase a used mobile home and relocated it on higher ground across the road.

In their new, higher location, the Dixons feel much safer. The floodwaters do not reach the new site, which is out of the flood hazard area. Relocating their home was a win-win situation for the Dixons. They get to stay in an area they love, and they have reduced the chances they will be flooded again.

The local Federal Coordinating Officer of FEMA said, "Relocation is one way to mitigate a structure against damages from future events, and we commend the Dixons for taking this rational step to protect themselves from future flooding."

Mitigation is taking steps now to reduce damages from future events. It is also an essential part of the FEMA and State of West Virginia disaster response and recovery programs.

The Dixons are grateful for the FEMA assistance and have a lot more peace of mind when the rains come and raise Buffalo Creek. They now know they are not as vulnerable to floodwaters as they were before.

Quick Facts

Year:
2004

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Relocation

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Taking Initiative to Lessen Losses Flooding of Community Complex

Pleasants County, West Virginia

St. Mary's, WV - Hurricane Ivan (2004) raised the Ohio River up to the rafters at St. Mary's community hall this past September. But thanks to a progressive local government with some creative ideas for providing manpower and financing, the community is on its way to dramatically reducing future flood damage at their community complex.

The flood damage caused by the winter storm of 1996 had compromised an already questionable electrical installation, and by 2004 it was no longer compliant with recent codes for electrical systems. This problem initiated City Council meetings that led to a three-phase program. The first phase included digging up and replacing all outdoor underground electrical wire and conduit, as well as installing and raising five new electrical boxes out of reach of future floodwaters. Mark Jackson, St. Mary's City Manager, stated, “This mitigation project was long overdue. With the help of a legislative Budget Digest grant and surplus tax revenues provided by the city of St. Mary's, the first phase of our mitigation project was completed.”

An initial $25,000 was provided through the efforts of State Senator Donna Boley via the Budget Digest. The remaining two-thirds of the $70,000 budget were met through surplus city tax revenues. It could have cost a lot more, but creative foresight cut the projects’ labor costs dramatically by using inmates from the local North Regional Jail as well as city employees.

Phase two began after Hurricane Ivan’s dramatic flooding, which inundated the St. Mary's community hall up to the rafters. The good news was that the previous work was not in vain: the outdoor, main 800 amp panel and meter were not flooded. The bad news was that their community hall was heavily damaged. This time, they opted to use flood damage resistant materials and fixtures.

The hot water tank was fitted with a Quick Disconnect and all wall outlets were raised 4 feet above the finished floor. The gypsum wallboard and fiber ceiling tiles were replaced with water and mold resistant paneling. The pine trim was removed, the mold cleaned up, the walls disinfected, and the nails replaced with screws. The next time it floods there will be no need for the trim to be ruined; they can be unscrewed, cleaned, disinfected, and then replaced. The old wooden cupboards will be replaced with new stainless steel ones.

The third phase plans are to replace the remaining fixtures. The wet, ruined fiberglass and insulated doors will be replaced with foam core insulated ones. This prevents mold build up and the loss of insulating properties when the insulation gets wet. The plans also include replacement of all the double pane glass windows with Quick Remove ones to prevent floodwaters from seeping in and filling the air space. The furnace will also get a Quick Disconnect for easy removal prior to a flood. Finally, they will be adding roofs to all the outdoor electric panels.

Quick Facts

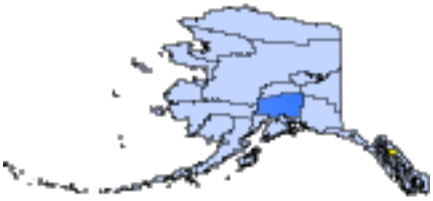
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Utilities

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Miller's Reach Develops Plan For Mitigating Wildfires



Matanuska-Susitna Borough, Alaska

Matanuska-Sitna, AK - The Miller's Reach Wildland Fire destroyed or damaged nearly 450 structures, and caused extensive damage to public infrastructure in June 1996. In cooperation with local businesses, several local, state, and federal entities created a Wildfire Mitigation Plan to implement aggressive fire prevention programs rather than continue to rely upon fire fighting and suppression.

The Wildfire Mitigation Plan proposed programs such as preventative land treatments that reduce fuels and break up large contiguous urbanizing fire-prone zones, the creation of defensible space around buildings, and improvements to existing buildings. Equally important, the plan emphasized the need to change people's perception of the wildland fire threat and how they see their place in a border between wilderness and urban spaces.

The Borough's Fire Mitigation Officer developed a wildfire prevention program the incorporated significant involvement from local area businesses. One national company distributed cups, banners and placemats with fire prevention methods and sponsored promotional slides shown in theaters before movies. A local insurance company provided volunteers and extensive fire prevention education materials for area home shows, and several local greenhouses and nurseries participated in a program to promote the concept of "defensible space" by encouraging the purchase of fire-resistant landscaping plants.

In support of fire damage reduction goals, programs were introduced that created firebreaks and evacuation routes; retro-fitted public buildings to increase fire-resistance; defensible space demonstration projects and exhibits; development of alternative water supplies and installation of dry hydrants, and installation of an automated weather data collection system for the Borough.

The Matanuska-Susitna Borough's wildland fire mitigation efforts underline both the need for and the enormous benefits of forging partnerships. Due to the successful cooperation of numerous public and private partners, future wildland fires will result in significantly less damage.

Quick Facts

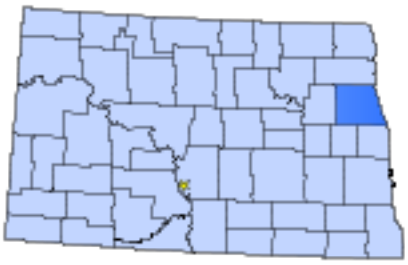
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

The New Grand Forks Committed to Reducing Future Losses



Grand Forks County, North Dakota

Grand Forks, ND - In April 1997 the Red River overflowed its banks, flooding 8,600 homes in Grand Forks, North Dakota. While the floodwaters rose, a fire broke out in the downtown business district. Between the flood and the fire, all 315 businesses were affected. The successful rebuilding of the city resulted from partnerships among residents, local businesses and local, state and federal governments. The city also established a commitment to reducing future losses through mitigation projects.

City leaders set the tone for rebuilding almost immediately. After the water receded, they enforced local regulations requiring rebuilding with special flood protection measures and by implementing several other mitigation projects.

The city's water treatment plant was rebuilt with measures to elevate sensitive equipment, creating a flood emergency management plan, prohibiting further construction along the Red River and with the addition of hollow core metal shields to protect windows and doors. These measures will ensure continued operation of the plant through floods, blizzards and severe storms.

A new elementary school was constructed above the base-flood elevation, replacing two substantially damaged schools.

A buyout program was funded through FEMA's hazard mitigation grants, by the state, city and under HUD's Community Development Block Program. Nearly 600 residential and 40 commercial properties in the floodplain were voluntarily sold to the city through a buyout program. Because of the buyout, home and business owners have moved out of harm's way to safer areas. The flood-ravaged buildings also have been demolished and the resulting green space will remain open and undeveloped forever.

Through the first three years of recovery, the new disaster-resistance philosophy has taken hold.

"Rebuilding with disaster-resistance measures is the best advice we've ever been given and I have the greatest trust that they will work," said Pat Owens, former Mayor of Grand Forks during the 1997 flooding and recovery.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Preparing For Floods Along the Shores of Westport, CT

Fairfield County, Connecticut

Westport, CT - Located along the shores of Western Long Island Sound, 26 percent of the residents of the Town of Westport live within the 100-year floodplain. Taking an integrated approach to mitigation, Westport implemented several concurrent mitigation strategies.

In 1993, the Town applied for a grant from the Connecticut Department of Environmental Protection to elevate seven residential properties under the Housing Grant Mitigation Program (HMGP). Other mitigation measures included the installation of 16 combination staff gauges/evacuation signs, and the printing of a disaster preparedness brochure (privately funded by one of the elevated homeowners) for Town residents.

In 1996, flooding struck again. However, damage to the seven elevated homes was completely prevented. Unfortunately, flooding damaged several dozen other homes in Compo Beach that were not elevated. The success of the elevation project spurred other homeowners to seek elevation as a mitigation solution. As a result, 15 homeowners have received grants under HMGP and the Flood Mitigation Assistance Program to elevate their homes.

Westport has also amended its National Flood Insurance Program regulations such that any homeowners or businesses that construct additions or renovation to their buildings which exceed 50 percent of the fair market value of the building must elevate the structure to one foot above the Base Flood Elevation.

The combined mitigation efforts of the Town of Westport are estimated at a benefit to cost ratio of three to one. As the first community in Connecticut to have an approved Hazard Mitigation Plan, Westport has served as a model for the communities of Milford and East Haven.

Quick Facts

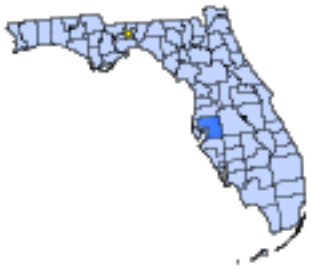
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Flood Mitigation Assistance (FMA)

Horses Find Safe Haven State Fairgrounds



Hillsborough County, Florida

Tampa, FL - Tampa entrepreneur Bob Thomas, with the help of his friend Olin Mott, was determined to create the world's greatest horse show facility. His vision, persistence, and dedication helped create what would become the Bob Thomas Equestrian Center, a world-class venue for horse shows.

The Center, operated by the Florida State Fair Authority under the Department of Agriculture and Consumer Services, occupies a large portion of the 317-acre State Fairgrounds in Tampa. Well known by those who are equestrian smart, it is one of the world's leading horse show grounds. The weeklong Winter Equestrian Festival held there offers more than $3 million in prize money. Events of 4 days provide as much as a $2 million boost to the local and State economies.

A study conducted by the University of South Florida in fiscal year 2000, estimates annual spending by Fair Authority, employees, event sponsors, and fairground visitors generates more than $76 million for Hillsborough County.

With the approach of Hurricane Charley, the Center received many inquires from people searching for a place to shelter their horses. As a result the Center found a new role: safe haven for horses under threat of severe weather.

Previously, the county humane society used the horse barns to shelter trucks and other equipment when storms threatened. The manager, Butch Carse, had equipment moved to the show arena, and opened the Center's 471 reinforced concrete, 10 feet by 10 feet stalls, as a safe haven for horses. Valuable equines and family "pet horses" soon began to arrive with their grateful owners. Days before Hurricane Charley (2004) struck, the Center was filled to capacity.

Except for a $15 clean-up fee, there were no charges for the stalls. One horse, known to be skittish, was permitted to share his stall with a favorite companion, a goat. That chemistry didn't work in the 2003 movie *Seabiscuit*, but, in this case, the goat's presence was a tranquilizing influence as storm winds swept across the fairgrounds.

Money cannot measure the affection existing between an owner and a horse. It is unique. An immeasurable loss had been avoided because the shelter was "hardened" to protect the horses. They all came through the storm without a scratch. Only an unsecured, roll-up barn door received damage.

The Equestrian Center at the Florida State Fairgrounds was financed by donations to the Florida State Fair Horse Show Association. In 1977, the Association constructed the barns, rings, tower and pavilion at a cost of approximately $1,750,000. The Association donated the buildings to the Florida State Fair Authority in 1989 to operate as the Bob Thomas Equestrian Center. No public money was used in the construction or operation of the Center.

As business grows, plans are to construct an additional 300 hurricane-proof stalls for show activity and to protect a larger number of horses from natural disasters.

Quick Facts

Sector:
Private

Cost:
$1,750,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Private funds

FEMA

Mitigation Meant Peace of Mind
Perdido Key

Escambia County, Florida

Pensacola, FL - Harry and Sheila Palmer live on Perdido Key, Escambia County's wispy-thin barrier island in Florida's panhandle. They were awestruck as they watched on television two powerful hurricanes, Charley and Frances in 2004, cut destructive paths coast-to-coast through south central Florida. Eight days later, their awe became incredulity as yet another hurricane mere weeks later—Ivan with 137 mile per hour (mph) winds—took dead aim on their new 4,000 square feet island home overlooking the Gulf of Mexico.

Growing up in the Florida panhandle, Harry spent his entire life on or near the water. As a young man in his 20s and early 30s he worked in Mobile, AL, with the emergency management office as a civil defense manager. He saw firsthand the destructive powers of Hurricane Camille in 1969 and Frederick in 1979. "I would live nowhere else," he said, "but I know what hurricanes can do, especially to barrier islands."

Unlike most worried islanders, the Palmers knew that their house was built to code when it was completed in August 2003. If any structure on the 8-mile barrier strip could survive the fierce winds of a Category 3 hurricane, that structure they believed would be their home. Like many of their neighbors, the Palmers, along with Sheila's 83-year-old dad, evacuated to Birmingham, AL. Those who dared to "ride it out" risked arrest because of mandatory evacuation orders.

Built in 2003 to comply with Florida building code requirements, the Palmer's two-story home was built using energy-efficient insulated concrete forms. The steel-reinforced concrete walls are 6-inches thick. Windows are high-impact glass that will resist winds up to 150 mph. Roofing is 24-guage metal. The lowest floor of the two-story house was built 8 feet and 4 inches above the mean sea level, 2 feet, 4 inches above the required base flood elevation. Dunes on the beachside of Perdido Bay's State Park serve to blunt storm surge.

"We returned two days after the storm. Our home was dry and intact, and the generator was still on. Needless to say I was relieved, but I never did really worry," said Palmer. "Although my wife and I had taken precautions to mitigate against major damage, windborne debris from neighboring houses caused minor damage to the front porch and two roof panels on the main roof."

Neighboring houses sustained major roof damage, with ceilings collapsed because of water breaking through. Flooring, carpets and furniture were inundated. The house across from them was totally destroyed, and the now homeless residents sought alternative housing off the island.

"Neither my house nor my family would be placed in peril. I knew what to do to prevent that from happening, and we succeeded as a family. The extra dollars spent to make our dwelling strong and safe will continue to afford peace of mind," Palmer said.

Quick Facts

Sector:
Private

Cost:
$20,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

FEMA

Screen Barriers Protect Firehouses
Defense Against Charley in Orange County

Orange County, Florida

Orlando, FL - During Hurricane Charley in 2004, Fire Station No. 66 in Orlando survived sustained winds of 55 miles per hour (mph) and gusts of 97 mph without damage to the stationhouse or equipment. Emergency readiness was never compromised thanks to the installation of a wind abatement system that protected the large, bay doors from high wind and windborne debris.

Some stations had no shielding screens. At Fire Station No. 76, winds from Hurricane Charley ripped away two bay doors, allowing wind and rain to enter the building. If the building envelope is breached, sudden pressurization of the interior can cause major structural damage (e.g., roof loss) and significant interior and content damage from wind-driven rain.

In 1992, many Miami-Dade fire stations lost roofs, equipment, files and furniture to Hurricane Andrew's fierce winds. Debris-laden winds penetrated aluminum-framed glass doors, lifting roofs away. "Everything inside -- equipment, computers, files and furniture was blown away," said Lt. R.W. "Bob" Saunders. "Firehouses were rendered useless in a time of public crisis."

Orange County did not want to face the same circumstance. They needed an easy-to-assemble and operate, flexible barrier that could withstand hurricane force winds and windborne debris. According to Lt. Saunders, lessons learned from Hurricane Andrew influenced the decision to install polypropylene screen barriers on Orange County fire stations and Emergency Operations Center. The screens and shutters were funded by a grant from FEMA under the Hazard Mitigation Grant Program (HMGP). Total cost of barrier screens for six, 12 feet by 14 feet fire station bay doors was $13,260.

The barrier screens are polypropylene, woven monofilament, geotextile fabric, customized for an exact fit at each opening. They are engineered to reduce wind speed and water penetration by 90 percent, and prevent windborne debris from impacting the doors. "Other great advantages of the screen barriers are that they allow us to see outside, have fresh air and a cooling breeze," said firefighter/paramedic, Dan Bracewell. Screens, at Fire Station No. 66, slope away 2 feet from the base of the bay doors. This helps to channel wind and rain away from the building. The flexibility of the material absorbs the impact of windborne debris and keeps it from hitting the doors. Bolted top and bottom, to rustproof metal anchors, the screens flex, but stay secured. When not in use, the screens are rolled up and secured above the door.

Daryl McCarthy, Orange County Project Officer involved in the grant application 5 years ago, said no failures of the hurricane-proof screens had been recorded. Of the County's 33 fire stations, 12 now have protective screen barriers. "We are, today, in the process of preparing another mitigation grant application to safeguard the remaining 21 firehouses."

"Our stations were built in the 1960s and 1970s when building codes did not require hurricane resistant structures. Once barrier screens are installed, we are assured of maintaining operational readiness during and following severe weather. Barrier screens are our most cost-effective way of achieving this goal," McCarthy said.

Quick Facts

Sector:
Public

Cost:
$4,420.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

“Show Goes On” at Kravis Center
Window Laminate Exceeds Expectations

Palm Beach County, Florida

West Palm Beach, FL - Vaulting walls of glass surround the entire lobby of the Alexander W. Dreyfoos Jr. Concert Hall at the Kravis Center for the Performing Arts. When Hurricane Frances (2004) came through, it severely damaged the roof membrane allowing rain to enter the building. This, in turn, resulted in severe damage to the interior of the structure. While work was underway to repair the roof and restore the interior, Hurricane Jeanne arrived. “Water coming in through the previously damaged roof, cascaded over the balconies from one level to the next and flowed down the grand staircase like a waterfall,” said James Mitchell, Sr., director of Building and Production Services at the center. But in spite of that, Mitchell managed a smile.

The Kravis Center for the Performing Arts features a unique and grand facade. Its round front soars almost five stories with over 15,000 square feet of glass. Since its 1992 opening, the building has sustained only minor damage to the glass panels from windborne debris during moderate storm events and, on occasion, from vandalism. Over the years, the management and board of directors discussed installing some type of protective laminate film on the windows.

After an act of vandalism almost 5 years ago, the board of directors decided to strengthen the glass panels in the front of the lobby against high winds, windborne debris and acts of vandalism. In October of 2001, they purchased and installed the anchored film glass laminate system for the lobby windows, considered one of the products best suited for retrofitting existing fixed commercial tempered or plate glass windows. Installation was completed in the spring of 2002.

“Yes, we bought the system [anchored film glass laminate system] for $170,000,” said Mitchell. “Quite frankly, however, we didn’t think it would work. But then another incident occurred. Although a high window panel shattered when hit by a bullet, the broken glass, held by the anchored laminated film, stayed in the frame. The bullet was trapped between the broken glass and the film laminate.” In fact, the damaged window remained in place until the replacement panel could be installed.

Then came the back-to-back hurricanes in 2004. The windows remained in place, without damage. They kept the wind out of the building, and that, according to Mitchell, helped keep the roof system intact. “If the roof system had been structurally damaged, we [Kravis Center] could have been shut down for our entire season.”

“Culturally, the cost of closing the center would be immeasurable,” said Brian Bixler, publicist for the Kravis Center. The estimated economic loss to the community, based on governmental surveys of money spent by those attending theater events, would exceed $20 million if the season was lost, and that does not include the cost of repairs.” Had the windows been breached, allowing wind into the building, repairs to a damaged roof system could have exceeded $1.5 million.

“There is not one member of the board of directors who is wondering, at this point, if they made the right decision by purchasing the anchored film glass laminate window system,” said Bixler. “It worked.”

Quick Facts

Sector:
Private

Cost:
$170,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Private funds

Boone Couple Heads Uphill Avoids Flooding

Boone County, West Virginia

Madison, WV - Jack and Elvonna Bowyer had flood insurance, but when severe flooding of the Spruce and Pond Fork rivers dumped seven inches of water in their first floor and 12 inches of water in their garage, they were at wits end.

The Bowyers had gotten used to living in their home at the bottom of the hill, but they never got used to the high water and flooding they experienced on a regular basis.

“When I purchased the home in Madison in 1994, there were other nice homes on the street and I just never thought that it would be flooded all the time the way it was,” Elvonna Bowyer said. It didn’t take long for the Boone County couple to realize they were “smack in the middle of the floodplain."

“I believe it was in May of 2001, and we just didn’t know what we were going to do,” Elvonna Bowyer said.

The Bowyer’s said when the offer came to be part of FEMA’s Hazard Mitigation Grant Program (HMGP), which would help them relocate, they jumped at the chance.

“They talked to us during the day and it didn’t take us long… by that evening we decided we were going,” Elvonna Bowyer said. In all, four homes qualified for HMGP in the Old River Road area, and in December of 2002, the couple moved into an existing home up the hill. They borrowed additional money to complete renovations. “We were just tickled to death to get out of that damp, dank, bottom (of the hill),” Elvonna Bowyer said.

“I can’t tell you the number of times we had to grab the dogs, get the cars and go,” Jack Bowyer explained. At night, the couple spoke of one of them getting up to keep watch while the other tried to get some sleep. “You just never knew if it was going to reach us or not,” he added.

Now when it rains, the Bowyer’s just go back to sleep. “It was well worth it and we don’t regret it at all. We are so happy, we call this our ‘sleep easy’ home,” Elvonna Bowyer laughed.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigation Prevents Bridge Damage West Virginia Homeowners Relieved

Multiple Counties, West Virginia

Charleston, WV – Many West Virginia homeowners and businesses took steps after previous floods to make their property more secure from flood damage. Some of those efforts were tested in the latest floods and landslides that began Memorial Day weekend. It isn't only individuals and businesses that can make property more resistant to floods. Local and State governments also can take mitigation action.

Public assistance or "infrastructure" mitigation takes many forms, but one of the most successful has been upgrading flood-damaged bridges when they are being replaced because of flood damage.

In Cabell County, a bridge on Route 9 over Trace Fork had to be replaced after a flood heavily damaged it in June, 2003. The new bridge, constructed at a cost of $92,450, is made of concrete and steel. Flood debris, including tree trunks, is still clinging to the sides of the bridge from the Memorial Day floods, but the bridge itself was undamaged.

After a flood in November 2003, FEMA and West Virginia officials began a $30,000 project to improve a bridge on Route 5 over Manila Creek in Putnam County.

Thick concrete wings were added to the bridge abutments protecting the approaches from floodwaters, which in the past had washed away the approach road. The storms and floods that began Memorial Day weekend in West Virginia did not damage the Manila Creek Bridge.

There have been more than 60 bridge improvement projects in 32 West Virginia counties since the floods of 2001. In the majority of those projects, damaged or destroyed wooden bridges were replaced with concrete and steel structures. The total cost for those improvements was $8.6 million. FEMA provided 75 percent and the state 25 percent of the cost of the projects. Officials said all the improved bridges survived the recent floods with little or no damage.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

91st Avenue Wastewater Plant
Salt River North Bank Mitigation

Maricopa County, Arizona

Tolleson, AZ - The Wastewater Treatment Plant located along the bank of the Salt River had been at risk of severe erosion. Flooding greater than a 10-year event would undermine the bank and the resulting damage would effect the channels, chlorine contact chambers and holding ponds. This would create serious health threats to the community.

Maricopa County recieved funds from FEMA's HMGP to mitigate the potential problem. Thus, the stabilization, strengthening, and extension of the bank was done.

The estimated losses avoided are expected to exceed the cost of the project.

Quick Facts

Sector:
Public

Cost:
$2,550,462.00 (Actual)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

A Safe Place To Go
Safe Room & Community Shelter Program

State-wide, Alabama

The State of Alabama - In Dec. 2000, strong storms that moved through the State of Alabama resulted in 12 deaths and more than 300 homes being damaged in the six most severely damaged counties - all due to tornadoes.

During the recovery phase of this disaster, Federal and State mitigation staff counseled more than 900 individuals and distributed 2,800 publications on Safe Rooms and wind-resistant construction.

In a two-week period, mitigation staff traveled 780 miles throughout the state and set up booths in home improvement stores, shopping malls, county courthouses, and even at outdoor temporary shelters in rural damaged areas. The Alabama Emergency Management Agency (AEMA), through the Hazard Mitigation Grant Program (HMGP), implemented phase one of a Safe Room grant program. The grant program was administered by county emergency managers, providing grants to 340 individuals to retrofit homes with safe rooms or storm shelters. Phase two of this grant program was approved by FEMA on November 27, 2002.

From Nov. 5-11, 2002, strong thunderstorms and tornadoes triggered widespread damage throughout the State. As a result of this recent event, AEMA's Mitigation staff undertook a telephone interview of a sampling of the 140 grant recipients within the 10 counties that experienced the most damages from the Nov. 2002 tornadoes. Contact was made with 68 individuals. All shelters were completed except for one. Fifty-eight families actually used their safe room during this most recent event, and all 67 families have used their safe room at least once since being built or installed.

When asked if they used the shelter, representative comments were as follows: "Yes, [we] sure did. These things are life savers! Everyone is asking us about ours." "Yes, very pleased with our safe room and how it worked. [I] got my 90 year old parents in there." "Yes, got 14 people in the shelter. It has a handicap ramp for my mother. We are very pleased with the shelter!" "Yes, tornado came up both sides of the house and blew a tree into it. We are very appreciative of the safe room shelter." "Yes, entire family and daughter and grandkids were in the shelter. Sure felt much safer and can't say enough good things about it. You're welcome to come and see it anytime. Safe room is in the basement of our home."

Quick Facts

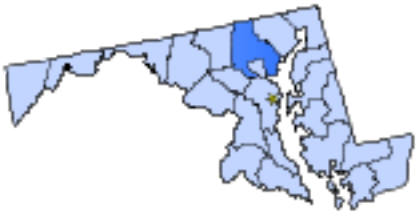
Sector:
Public

Cost:
$1,750,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

A Tall Order After Isabel
Homes Rebuilt Required To Be Elevated



Baltimore County, Maryland

Bowleys Quarters, MD - Standing in her front yard, her back to the Chesapeake Bay, Brenda Tucker gazed at the collapsed roof marking the spot where Hurricane Isabel's waves crashed through her house, carrying away her 40-year-old cottage' Florida room and a 30-foot deck. "I don't know if there will be enough money to fix it. I don't know if it will be condemned," said Tucker.

Her more immediate concern was whether her flood insurance or homeowner's insurance - or both - would cover the costs. Because of building codes adopted in the 1970s, anyone rebuilding within the State's official flood plains - or making "substantial" repairs or renovations - must elevate their first floor above the 100-year flood level.

The storm story ended far more happily for Steve Moody. His bay-side house was built in 1992 under current flood insurance rules. The first floor stands just above the 100-year flood level, and it stayed dry. "We didn't have any damage, really," he said. His circuit breakers, central vacuum controls, some ductwork, and belongings he had stored in the crawl space beneath the first floor got wet. Compared with the devastation visited on most of his neighbors, he got off easy.

"All the new construction we saw that met the requirements of the county did not have damage," said Roger Benson, a natural hazards specialist with FEMA.

The Maryland Department of the Environment said 78,000 improved properties are within Maryland's 100-year flood plains. Of those, more than 51,000 (about two-thirds) have flood insurance policies. John M. Joyce, the department's flood insurance coordinator, said insured homeowners whose houses were destroyed or "substantially damaged" (more than 50 percent of fair market value), may receive up to $30,000 to cover the costs of raising their homes above the flood line.

Those without flood insurance may be eligible for other grants under Federal, State and local programs. Many homeowners will simply lift their homes onto new pilings. "You just jack it up; the technology to do that is out here, and it's well known," Benson said. Others will raze their damaged homes and build from scratch.

These new or rebuilt homes will have no basements. Owners also sign "nonconversion" agreements promising not to convert the ground floor space to a living area. The agreements become part of their deeds. Homeowners can use ground floor storage as a garage, but it must include "flood venting." These are ports that pop open in a flood and allow the water to flow through without causing structural damage. Any outbuildings larger than 100 square feet must meet the same flood codes as the house.

New construction in floodplains has had to meet these codes for decades, FEMA officials said. Their effect is most noticeable along Maryland's Atlantic beaches, where every new "cottage" has been built on tall pilings.

Benson said people who once objected to elevating their homes had changed their tunes. Benson said, "I don't think you're going to have a lot of people say, 'I don't want to elevate it; it will never flood.' You've sold the entire building community [on the reality] that this can happen."

Quick Facts

Sector:
Private

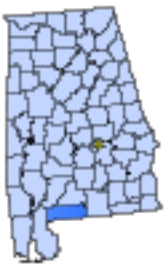
Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

A Tribe's Path to Mitigation
Study, Prioritize, and Implement



Escambia County, Alabama

Poarch Creek Indian Reservation, AL - The Poarch Creek Indian Reservation, located northwest of the City of Atmore, had a challenging storm-water drainage problem. Rain runoff placed property and tribal members at risk to flood damages. Through a thorough approach, the Poarch Creek Indian Reservation took steps to reduce the risk and associated vulnerability to the safety and economic condition of its community.

In 2000, the Poarch Creek Indian Reservation obtained funding from Alabama Emergency Management Agency to conduct a comprehensive study of their 23 drainage basins covering 460 acres. The Storm Drainage Study, completed in January 2001, provided the Reservation with a sound assessment of the nature of their storm water drainage problem, solutions for each of the 23 drainage basins, and a recommended prioritization for the improvements. The projects were prioritized as high, medium and low and the project costs totaled $447,000. With accurate risk and mitigation option information, the Reservation moved forward to work on the highest priority efforts.

Based on the study, the Reservation applied for funding for a drainage system associated with the Willow Creek Housing Subdivision, the study's identified top priority. This drainage basin, identified as Basin 4 in the study, consists of 11.5 acres of residential land located in the southern portion of the Reservation. During heavy rainstorms, water would back up at the mouth of the flume and flood the nearby residences. Hurricane Erin in 1985, for example, resulted in almost $200,000 in damages to buildings.

An additional compelling reason for this priority was the 30 senior citizens and disabled person housing units in the Willow Creek Subdivision. The project also protected six private homes and the Poarch Creek Indians Utilities Building.

Over 600 feet of culvert and 190 feet associated flume were completed rebuilt for a total cost of $60,000. The culvert was expanded to a 42-inch drainage pipe and the concrete flume was 4 feet in diameter. The previous system had inadequate capacity and the extremely low slope of the flume caused the backwater condition. The new drainage system provides protection against high-frequency surface water flooding (20-year flood level).

Since the completion of the drainage system in 2002, the area has not suffered from surface water flooding. The drainage system successfully managed the over eight inches of rain brought by Hurricane Ivan in Sept. 2004.

Quick Facts

Sector:
Public

Cost:
$60,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
State sources

FEMA

Above Ground Safe Room
New Home and Safe Room for Homeowners

Cleveland County, Oklahoma

Moore, OK - Don Staley and his family are no strangers to storms and tornados. Their first home was hit by a tornado in October 1998 and suffered minor damage but was destroyed by another tornado on May 3, 1999. They rode out both storms inside the house. "It was such a frightening sound," he said. "We decided we weren't going to ride out another one inside the house."

In December 2000, the Staley's new home was ready. Shortly after moving in, they had an above ground safe room constructed on the back patio. The concrete room has 8 inch thick walls, an 18 inch thick ceiling, a 10 inch foundation and a sliding entry door made of 12 gauge steel with three-quarter inch plywood on each side. The safe room is equipped with battery-powered lights and a battery-powered television.

When the warning sirens sounded on May 8, 2003, Don took shelter in the safe room along with his dog and two cats to ride out the storm feeling very protected and safe. "I was watching it on TV in there," he recalled. "I could see it was coming my way and I could hear it coming. I could hear the roar. That's a sound you never forget."

When he emerged from the shelter, he found his house in shambles with the roof ripped off. Other houses on the street were also heavily damaged or destroyed. The Staleys used their safe room following the tornado to store and protect belongings they had salvaged.

The Stayley's home was among the more than 300 homes destroyed in the city that day. Whereas a severe tornado hit the city in May of 1999 claiming 44 lives, there were no deaths in the 2003 tornado. The absence of fatalities is being attributed to community preparedness, improved early warning systems and the many safe rooms and shelters that have been built.

Staley sums it all up, "The safe room saved my life, it came through with flying colors. It's worth a million bucks to me."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Homeowner

Acquisition, Relocation of Schools Multiple Hazards in California

Los Angeles County, California

Los Angeles County, CA - After the 1994 Northridge Earthquake, the Castaic Union School District conducted a study of the earthquake-related risks. The District had 63 buildings that was a mix of permanent and portable structures with construction dating as far back as 1917, serving approximately 1,200 students and 115 staff. Two of the most active faults pass through the District's area. The assessment revealed that earthquake-related damage was not the only risk.

Besides seismic damage, the study revealed two additional threats: flooding from the Castaic Dam (located only 1.7 miles upstream) and fire or explosion from a rupture in nearby oil pipelines (a 1925 gas-welded pipeline, and a 1964 modern arc-welded steel pipeline).

The potential economic cost from either a dam failure or oil pipeline break following an earthquake was enormous. The first potential cost would be incurred from both building and content damage. Replacement of the school buildings would cost an estimated $7.7 million in direct construction costs (1995 dollars). Second, if such an earthquake occurred, alternative school facilities would have to be located and rented at an estimated cost of over $500,000 per year. Third, the community would have to absorb the costs of losing the educational services provided by the District in the time period between the actual loss of the facilities and the relocation to temporary facilities. The School District calculated the cost of the lost public services based on the operating expenses required to provide the services. The daily cost of lost educational services was estimated at $28,601.

The District determined that the most feasible method to reduce their risks would be to condemn the structures on the old, high-risk site and relocate to a low-risk area. The location selected was completely out of the dam inundation area and far removed from the high-pressure oil pipelines. Thus, eliminating the risk posed by the dam and oil pipelines hazards. While the campus would still be within an active earthquake fault area, the new campus building would be constructed to fully conform to 1995 building code provisions.

The District then agreed to turn the land over to the Newhall County Water District. The old school property is located above two active wells, which the water district can use to supply their customers in Castaic. In doing so, they changed the property deed to restrict human habitation and development, and to return the site to natural open space.

The Castaic School District financed the relocation effort through a combination of the $20 million generated by the sale of school bonds and a $7.2 million grant through FEMA's Hazard Mitigation Grant Program for the market value of the property, including the existing structures and infrastructure. The district used this funding to rebuild the elementary and middle school, and district office, and to relocate the elementary school students into temporary buildings during the construction. The new middle school opened in the fall of 1996, and the new elementary school opened in Aug. 1997.

Quick Facts

Sector:
Public

Cost:
$27,200,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Floodprone Structures Acquisitions Becomes Park Area

Tulsa County, Oklahoma

Tulsa, OK - Floods have devastated the City of Tulsa many times, an average of about once every 5 years. Through the Hazard Mitigation Grant Program (HMGP) and the Flood Mitigation Assistance (FMA) Program, the City has taken measures to mitigate against these costly floods. The City has also taken measures to increase public awareness and support of flood mitigation via the production of videos and publications.

Through HMGP funding, the City of Tulsa acquired 17 repetitive loss structures. An additional five structures were acquired under the FMA program. These structures were among the 100 repetitive loss structures addressed in the City's Master Drainage Plan. As a result of the acquisition, all acquired homes were demolished and the land was reverted to a park area and water detention site.

The City also received a public awareness grant to educate and improve flood awareness throughout the City and county. Through the FMA program, the community received a planning grant to produce a Flood Mitigation Plan aimed at further reducing repetitive loss within the City of Tulsa.

Quick Facts

Sector:
Public

Cost:
$467,429.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Alenaio Flood Control Project
Flood Control Keeps Community Dry

Hawaii County, Hawaii

Hilo, HI - It was November 2000 when more than 27 inches of rain fell on the city of Hilo in a 24-hour period. The banks of the Alenaio Stream overflowed, and the water marks reached 10 feet high. Fortunately for the community of Hilo, the floodwall was 12 feet high.

Between 1920 and 1994, the 10 reported major flooding events in the city often took with it lives and devastated residential and commercial structures. The Alenaio Stream had flowed through residential areas to the business district of Hilo, a principal urban center and the county seat for the County of Hawaii.

It was in 1994 when the Water Resources Development Act of 1990 authorized the Secretary of the Army to construct a watershed to control and direct floodwaters. This project was designed to contain the 100-year flood, removing the flood designation for eight properties. One of these is the Hilo Central Fire Station, which was then eligible for a Hazard Mitigation (404) Grant to seismically retrofit the Drying Tower. The floodwall guides the water into the channel and terminates in a catch basin, which also serves as a soccer field. The soccer field was constructed in an area where commercial structures had previously been flooded and destroyed by Tsunamis. The excess water from the channel captured in the soccer field ultimately flows to the Pacific Ocean.

As expected, the water from the record-breaking rains of November 2000 flowed successfully through the channel and into the soccer field. This rainstorm was the first real test of the flood control project. More than 27 inches of rain fell on Hilo in a 24-hour period.

The uprooted trees, large boulders and twisted bleachers where businesses once resided, were visual reminders of what could have happened had the project not been accomplished.

The US Army Corps of Engineers estimated that the project helped the community avoid in excess of $20million in damages. The watershed more than paid for itself in this single event.

Quick Facts

Sector:
Public

Cost:
$14,200,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Community Park Prevents Damage
Acquisitions Prevent Future Flood Damage

Skagit County, Washington

Skagit County, WA - After 34 homes on the west side of the Skagit River, opposite downtown Mount Vernon, were severely damaged in the 1996 floods, city officials concluded it was time to take aggressive steps to prevent this kind of damage in the future.

In partnership with the Washington State Division of Emergency Management and FEMA, the City of Mount Vernon acquired 34 flood-prone properties. The designated houses were then demolished (or moved), and the entire site was combined to form an enlarged community park.

The acquisition totaled approximately $2,375,000, financed from the post-disaster Federal Hazard Mitigation Grant Program (HMGP). Substantial though the grant was, its total amount pales in comparison to the cost of replacing and repairing the homes that stood there.

During the 2003 flooding, the entire park was under water again. But this time there were no homes to repair or replace, and no people to evacuate or rescue. After the water receded, all that needed doing was some minor cleanup.

The City of Mount Vernon saved itself from serious flooding, thanks to thousands of citizens who filled and stacked sandbags to protect the downtown area, and to city planners who took steps to minimize future damage after the 1995-96 floods.

Quick Facts

Sector:
Public

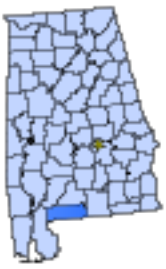
Cost:
$2,375,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Atmore Plaza on Dry Ground
Businesses Dry After Hurricane Ivan



Escambia County, Alabama

Atmore, AL - Atmore Plaza was known for its chronic flooding, along with the other structures located in the 142-acre Owen Street drainage area. The existing 1940's drainage system could not handle the volume of surface water that accumulated during heavy rains. To the pleasant surprise of many residents, Atmore Plaza did not flood during Hurricane Ivan. The success was due to a recently expanded drainage system.

The old drainage system under Owen Street, starting at Carney Street and extending over 2000 feet to Jackson Street, could not handle the surface water volumes from heavy rain events, which occurred during Hurricane Georges in 1998. The drainage system was a concrete covered dirt ditch, prone to collapse and sink holes. The City of Atmore estimates their costs associated with frequent repairs to the existing culvert, erecting barricades and assisting stranded motorists at $15,000 per year. After Hurricane Georges in 1998, the losses associated with the under capacity drainage system exceeded $1.4 million - $180,000 in damages to Atmore Plaza and $1.2 million in lost revenue. Additionally, the tenants at the Atmore Plaza were not renewing their leases, turning the Plaza into an increasingly vacant eye sore.

Through the Alabama Emergency Management Agency, the City of Atmore received over a million dollars in federal and state assistance to modernize and expand the drainage system. It was updated to a reinforced concrete culvert ranging in size from 84 inches to 96 inches in diameter. As a result of the project, the eleven houses, ten commercial properties, and one public facility previously at risk to 50-year flooding events now have a greatly reduced risk of flooding.

Mayor Howard Shell said, "This project provided a much needed system to remove flood waters from a shopping district which had suffered severe flooding and a loss of revenue to both the business owners and the tax base of the city. These improvements to the drainage system have enabled the shopping center to attract new tenants and rebuild the tax base in this area."

Quick Facts

Year:
1998

Sector:
Public

Cost:
$1,000,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
State sources

Backwater Valves Protecting Basements

Cumberland County, Maine

South Portland, ME - The City of South Portland has an old combined sewer system. When it rains, all of the runoff goes into the system. When heavy rain and flooding occurs, the sewer system is overwhelmed and the cellars of houses are swamped. This has resulted in health hazards and repeated damage to items in the basements.

Homeowners with backflow problems called David Thomas, Collection Systems Manager for the City of South Portland, who got the idea to have backflow preventers installed in homes with such problems. Thomas then applied for a Hazard Mitigation Grant made available from an October 1996 disaster declaration.

In February 1998, the City began its Backwater Valve Program and installed valves in 89 participating houses within 5 months. Each valve cost $397, including installation. The city council approved expenditure of $35,000. Of that, the Federal share was $26,250 and the City paid the rest.

The program is considered a success. Despite a June 1998 rainfall of more than 10 inches that caused flooding across central and southern Maine, none of the participating homeowners reported flooding. Since the valves were installed, the City has not received any calls from distressed homeowners. Savings in avoided damages from the 1998 flood and future floods is expected to be at least $75,000.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$35,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Bader Home Recovery Project
Protecting It From Future Landslides

Madison County, VA - During June of 1995, four major, record rainfalls caused flooding and landslides with such velocities that structures in the valley were knocked off their foundations. This 500-year flood event served to change permanently the mountain, the course of the stream below it, and the lives of the Baders.

The Baders, a family with young children, had all of their financial resources tied up in the property. Their 11 acre property is located on an alluvial fan created from a mountain watershed. A survey of the area revealed that only six of these acres are susceptible to continued flooding and erosion. Although a stand of sturdy trees located uphill from the Bader's blocked the brunt of debris from impacting the main structure, the outbuildings were destroyed during the 1995 landslides. The house received some damages, and inspection of the intermittent streams on two sides of the house and the debris above it revealed that it still faced serious perils.

As a mitigation measure, the Baders had a low-profile berm system constructed. Unfortunately, a year after the project was completed, two short-term storm events compromised the berm and nearly destroyed it.

Bcause the berm did not provide a long-term solution, other options were considered. The Baders sought assistance from their local government who in turn joined with the State and Federal teams in developing and evaluating alternatives. The most cost effective alternative was to relocate the house to higher ground (already owned by them), where it will be at a much lower risk of flood or landslide. Relocating the structure allowed the Baders to remain in the community while acquiring the property would have been more expensive.

Madison County, Virginia

Quick Facts

Sector:
Public

Cost:
$36,625.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Baldwin County's Fish River Retrofit & Acquisition Project

Baldwin County, Alabama

Baldwin County, AL - Several homes bordering the Fish River have flooded during periods of heavy rainfall, which resulted in a rise in the river levels. These homes were especially affected by Hurricanes Erin (1995), Opal (1995) and Danny (1997).

Baldwin County is a participating community in the National Flood Insurance Program (NFIP). In compliance with the NFIP floodplain management requirements, all new residential construction along the Fish River have been elevated above the base flood elevation (BFE). Additionally, a comprehensive retrofit effort is ongoing using a combination of Hazard Mitigation Grant Program (HMGP) and private funds. As part of the retrofit project, 10 homes have been elevated two feet above the BFE in an effort to protect them from flooding.

This area flooded again from Hurricane Georges (1996) to a depth of approximately four feet. For the homes already elevated, flood damage was significantly reduced. This further justifies the need to continue to undertake mitigation measures. Total cost for this elevation project was $477,605. FEMA's HMGP program has calculated total benefits in avoided future damages due to flooding from Hurricane Georges and future events over a 50-year project life to be $936,409.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$455,506.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Baptist Bottoms Acquisition Project

Geneva County, Alabama

Geneva, AL - At the end of a week of rain and flooding in March 1990, about 6,000 people in Alabama had lost their homes or had seen their property damaged. Hundreds more had to seek shelter in neighboring Georgia and the Florida panhandle. Estimated damages throughout the State were at more than $100 million. The hardship was summed up at the time by Alabama Governor Guy Hunt, who said, "A lifetime of hard work for some disappeared into the raging floodwaters. A lot of our people have never witnessed such devastation from floods before."

Four years later, in early June 1994, Tropical Storm Alberto moved slowly inland, leaving a trail of flooding and destruction along the Pea and Choctawhatchee Rivers. Small towns along these waterways were hit particularly hard.

In the aftermath of the 1994 flood, the Town of Geneva officials developed a model hazard mitigation project. They began an aggressive campaign to convince homeowners in the flood-prone Baptist Bottoms area to sell their homes and relocate out of the floodplain. Eventually, they submitted a grant application to FEMA for the acquisition of 54 homes. FEMA agreed to fund the buyout of dozens of buildings within the floodway of Double Bridges Creek in Baptist Bottoms.

In the first week of March 1998, a heavy storm system from the Gulf of Mexico moved inland across the southeastern United States. Torrential rains swept through the region and caused serious flooding in several Alabama counties. The flooding not only damaged hundreds of homes and businesses, it also took a serious toll on infrastructure. Several bridges and culverts were overwhelmed, roads were washed out, emergency services were delayed, and water treatment facilities were damaged.

The buyout of 30 homes (the actual number acquired prior to the spring of 1998 floods) after the 1994 flood proved to be an effective investment in Geneva. FEMA's benefit-cost analysis determined that for an upfront cost of approximately $672,000 to acquire flood-prone properties, over $1.4 million in damages and losses were avoided. All of the acquired properties lay deep in the floodplain, and would have been flooded had they remained. If these buildings had merely been repaired after the 1994 flood, many would have been severely damaged or destroyed in 1998.

This illustration of avoided damages emphasizes a very important point for hazard mitigation planning: the biggest benefits come from acquiring structures at highest risk--that is, buildings which are deepest in the floodplain.

Quick Facts

Sector:
Public

Cost:
$672,558.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Rising Above the Flood
Belhaven, North Carolina

Beaufort County,
North Carolina

Belhaven, NC - The first thing that usually strikes visitors who enter the small harbor town of Belhaven (population 1,900) is that many of the homes, whether trailer or mansion, are elevated high enough to protect them from floodwaters. The town did not always look like this.

As a coastal town in North Carolina, Belhaven has often been battered by severe storms and hurricanes. In the last eight years alone, it has been flooded by seven named storms and hurricanes, and absorbed tens of millions of dollars worth of damages. The public buildings that were regularly hit included the town's elementary school, and the beloved, but low-lying, town library.

As far back as 1933, when children would be read to in the window of O'Neal's Drug Store, it was clear Belhaven needed a library. Still, it took almost two decades before a permanent library found a home on Main Street, just blocks from the picturesque Pantego Creek, which flows into the Pungo River. Since the town is located in the 100-year floodplain, the bungalow library remained in a vulnerable position for major flooding. "From 1996 to 1998 our former library flooded six times," said branch librarian Joan Bogun. "Since we had outgrown it anyway, it only made sense to rebuild to survive future floods."

After the devastation of Hurricane Fran in 1996, Belhaven city officials were determined to take action. They started an aggressive mitigation campaign to elevate structures. They would use Federal and State grant money where they could, and private money when the grant money ran out. "Our plan was to keep everybody out of harm's way," said Town Manager Tim M. Johnson.

Federal, State and city officials worked together on two projects in the Hazard Mitigation Grant Program (HMGP), which is administered by the North Carolina Division of Emergency Management (NC DEM) and funded by FEMA. The first project elevated 232 eligible residences, and the second purchased Belhaven's old elementary school with the money going towards a new school out of the 100-year flood plain. The residential elevations accelerated after Hurricane Floyd in 1999. Both projects were completed before landfall of Hurricane Isabel in September 2003.

Not everyone waited for Federal money, however. For instance, the often-flooded Belhaven public library was rebuilt and elevated through a substantial donation from a local patron, community fundraising, and a State disaster relief grant. Completed in November 2001, the new structure is large enough to hold community meetings, events and local projects.

After Hurricane Isabel passed through North Carolina, media and disaster officials flocked to Belhaven as word spread of the success of its mitigation efforts. The story in Belhaven was that the damage that did not happen.

Property owners who had elevated homes through HMGP funds experienced minimal or no flood damage from Isabel. The new library was also among the survivors. At the height of the storm, Belhaven's Main Street was under 3 feet of water, but the library's artwork and books remained above the surging waters.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Berkeley Hazard Mitigation Program
Bond Program Addresses Multiple Hazards

Alameda County, California

Berkeley, CA - Like most California communities, the City of Berkeley is susceptible to multiple hazards, such as earthquakes, wildland-urban interface fires, landslides, and urban creek flooding. The community has seen significant earthquake damage in recent years and is in continual preparation for the forecasted Hayward fault event and other major regional earthquakes. The Hayward fault runs through the eastern portion of Berkeley.

The City of Berkeley launched its first mitigation bond program in 1992 with passage of two general obligation bond measures and establishment of a variety of municipal residential upgrade incentive programs. The main purpose of the City's program is to reduce potential life and property losses in the event of a major natural disaster.

An Un-reinforced Masonry Upgrade Program was developed to provide legislative mandates for the upgrade of hazardous buildings and a seismic technical Advisory Group established to advise the city manager on all seismic safety projects. A thorough study is planned to define the community's risk exposure including loss estimates using FEMA's HAZUS software. The study will be used to adopt improved building codes and standards for upgrades and to secure funding sources for private sector risk reduction.

The City also constructed a new Emergency Operation Center(EOC), a separate public safety building to house police and fire operations, and installed a contingency disaster water supply system. A special fire assessment district was instituted in the Berkeley hills areas most vulnerable to wildland-urban interface fires. These districts levied an annual fee of $50 per parcel to fund vegetation management activities and provide fire prevention assistance for property owners.

In Dec. 1998, the Disaster Resistant Community Project was launched. This project will combine the efforts of the University of California, Berkeley, and City officials along with many community stakeholders to continue hazard assessment and mitigation efforts. The public sector work has been very successful. By the year 2002, every major municipal and school building in Berkeley will be seismically upgraded.

The City will concentrate on private sector mitigation for the next 5-10 years to reduce hazards in seismically weak commercial and residential structures. About 1,200 homes are upgraded annually (approx. 6,300 homes in the last five years) via the transfer tax rebate program. Another 1,250 residences have been upgraded in the last 18 months using the permit fee waiver program.

The tremendous local investment in risk reduction has generated $262 million in three local mitigation bond measures. City officials say that the post disaster costs saved would be at least $520 million with this pre-disaster mitigation investment.

By leveraging funds and seeking technical assistance from a variety of sources, this city has made significant progress in reducing hazards and making its residents more aware of the necessity to mitigate and prepare. These efforts will protect the infrastructure, economic stability and sustainability of the community and in doing so the residents will benefit from their investments in mitigation.

Quick Facts

Sector:
Public

Cost:
$262,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Homeowner

Bethany Beach
Removable Access Ramp

Sussex County, Delaware

Bethany Beach, DE - Major coastal storms, with an approximate six-year frequency, severely damaged the old permanently installed handicapped beach access ramp. This presented danger from flying debris to the adjacent fixed structures as well as any passersby. It also entailed responses by emergency services personnel. Additionally, loss of the ramp resulted in the loss of beach privileges to many handicapped people.

The local governing body of the Town of Bethany Beach applied to the State of Delaware for Hazard Mitigation Grant Program (HMGP) funds to construct a new removable ramp to allow for wheelchair access over the sand. Bethany Beach agreed to provide all of the non-Federal matching funds for the project.

Previously, replacement costs for the ramp averaged $11,000 per storm event. Savings to Bethany Beach came in avoided damages to surrounding buildings and from not using emergency services. Dollar values saved are attached to the need to defend suits from handicapped persons denied access to the beach.

The new ramp consists of stationary 12-inch pilings and eight 12-foot removable ramp sections. Today, when severe storms are predicted, town personnel remove the ramp sections, preventing damage to nearby structures as well as visitors to the beach.

Quick Facts

Sector:
Public

Cost:
$25,672.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Biotechnology Company Uses Safety Genentech Seismic Upgrades

San Francisco County, California

San Francisco, CA - Genentech, Inc., is a leading biotechnology company that discovers, develops, manufactures and markets human pharmaceuticals for significant unmet medical needs.

To protect their employees and reduce business interruptions in the event of a natural disaster, Genentech has developed a comprehensive disaster preparedness program, which includes the establishment of a fully trained and supplied emergency response team and the evaluation of the structural integrity of their facilities.

A risk assessment was done to determine the level of risk for natural hazards and to devise an appropriate response plan. One of the primary goals was to minimize the amount of damage to their facilities and to prevent the possibility of a "red tag" or condemnation situation, with the ultimate goal of minimizing business interruption. Upon completing the evaluation, mitigation projects were identified along with associated costs, which in turn were compared to the cost of insurance. It was determined the value of the facilities and production time was such that the real value of insurance was questionable.

Genentech officials decided to invest in the retrofitting of their facilities. One plan included the development of corporate-design guidelines for new facilities. The second included a seismic upgrade plan for existing facilities. The decision to pursue upgrades of existing buildings was made with consideration for the practical aspects of insuring for business risk, and the real need to assure business continuity. The structural retrofit work exceeded the current minimum building code requirements. Non-structural retrofit for seismic preparedness included bolting and bracing shelves, as well as adding shelf lips or edges to stabilize items placed on them. Emergency power generation was also deemed necessary for many of the critical facilities with adequate fuel available for at least 72 hours of operation.

Genentech estimates that facility-loss values could be from zero to $30 million per building, while business interruption could potentially be somewhat in excess of those values. Loss of production time that could result from the effects of a natural disaster, primarily earthquake, was determined to be an unacceptable risk. Business continuity is of vital concern to Genentech to support the advancement of science and to meet the unmet needs of their customers. Mitigating the buildings and establishing a comprehensive employee preparedness plan will reduce significant risk to the organization in the event of future disasters.

Quick Facts

Sector:
Private

Cost:
$4,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Business Owner

Black Pond Slough
Detention Facility For Floodwaters

Desha County, Arkansas

McGehee, AR - The City of McGehee has experienced flooding in the residential area east of and adjacent to Black Pond Slough many times over the previous 10 years. Up to 25 houses in this area have received repetitive damages of more than $1.1 million during this period. Due to the recurring nature of the floods, the City could expect annual damage in the amount of $150,000.

The proposed mitigation alternative was the construction of a detention basin on the west side of the affected subdivision. It was conceived for the storm water to flow and to be held in the 17-acre basin for a period of time instead of overflowing into the subdivision. When the slough returns to normal levels, the water in the basin would be slowly pumped back into the ditch. The Army Corps of Engineers provided information about previous flooding events. The East Arkansas Planning and Development District assisted the City in preparing the application for this project.

This project has greatly reduced the flooding risk in the project area. In early Jan. of 1999, over eight inches of rain fell in McGehee, an equivalent to the 75-year storm. As noted from a local newspaper, "Many residents breathed a sigh of relief as they realized the onslaught of water was draining away from their homes instead of steadily rising toward them, as had been the case in the past."

The Mayor of McGehee sent a letter of thanks to the Arkansas Office of Emergency Services for working with them to decrease the potential for flooding in McGehee. He stated in the letter that "had the detention facility not been in place, some 15 to 20 homes would have received damage. I was pleased that this flood control project was in place." In addition to the above benefits, infiltration into the City's sewer system during flooding has been significantly reduced and damage to city streets will be minimal.

Quick Facts

Sector:
Public

Cost:
$582,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Blackstone Tree Trimming Measures Minimizing Utility Damages

Nottoway County, Virginia

Blackstone, VA - After a 1998 ice storm wreaked havoc on power lines, cables, trees, and cut power to Blackstone residents for hours, town manager Larry Palmore decided it was enough. "Then last year [2002] we had another ice storm and a couple of small twisters. That was enough. There was no question we had to do something to keep from losing power and having downed (power) lines all over the place," Palmore said.

Palmore and his work crew began a tree-trimming campaign in this community of nearly 15,000 residents to reduce the risk of losing power due to downed trees and branches during severe storms, thereby increasing the safety of the people of Blackstone. "We have a nursing home and a medical facility here. We also have a lot of people in this town who for health and other reasons and situations have to have power," Palmore explained.

Palmore said people started fussing when we started cutting back (trees). But months later when they found out the hurricane was coming, "They were more than happy to have us out there." When Hurricane Isabel hit, Blackstone lost power at about 2:30 p.m. September 18th, and the town's lines were operational and ready to power by 5:30 p.m. the same day. "We lost our source, so we didn't totally restore power until [the next day], but we were ready," he said.

"We definitely helped residents save their properties from falling trees and limbs, and we definitely saved a lot (of money) not having to replace downed lines and poles," Palmore said. "Everywhere around us was torn up." The efforts to clear branches from power lines paid off.

Although Palmore had no dollar figures, he estimated the cost of the pre-hurricane "pruning" was about 10 percent of what the cost of rebuilding new power lines would have been. A preparedness proposal to expand the power transmission line right-of-way to further protect it from storm and tree damage is under consideration.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Local Sources

Boeing Retrofits Hardware Systems Safeguarding Against Earthquakes

King County, Washington

Seattle, WA - Deep inside the earth's crust, pressures are building that eventually will result in an earthquake of epic proportions. Deep inside Boeing, a few good people are busily tying everything down. One of them, Doug Marsh, became a believer after the Kobe, Japan, earthquake in 1995. He vividly remembers seeing film footage of workers freezing at the onset of the tremors-only reacting as equipment started falling all around them.

Having been in the Northwest during the 1965 Seattle earthquake, Marsh knew that 30 years was long enough for most people to get pretty relaxed about a potentially large-scale earthquake. "When I started talking about seismic mitigation in 1999, most people treated the subject without any particular sense of urgency," he said. "To the company's credit, a disaster preparedness audit had just been completed that showed the need for more earthquake preparation."

Steve Guzek, senior manager of Computing Disaster Preparedness in SSG Information Technology Services, saw the connection to his then-new organization immediately. "After that audit, I became convinced that seismic mitigation was going to be a critical part of any serious company-wide disaster preparedness program," Guzek said. Guzek drew Marsh into his group. Marsh immediately began working with Boeing organizations to develop seismic mitigation plans for their computing assets.

Fortunately, by the time Seattle got its rolling wake-up call in February 2001, Marsh and Davis had completed the installation of nearly 1,200 seismic isolation platforms and had made almost 1,000 machines virtually quakeproof. As a testament to their work, none of the machines that they retrofitted failed in the Nisqually shaker. Working with the vendors who make the server isolation hardware, Marsh helped develop a number of new methods for installation and upgrade that operators can perform while the server is online. In fact, the step-by-step processes that the Computing Disaster Preparedness group wrote to accompany them have become the industry standard for seismic mitigation procedures. "Boeing has become something of an industry bellwether in terms of seismic preparation," Guzek said. "But as we move further and further from the last significant quake, it is human nature to focus on other things. Organizations are less likely to put seismic preparation at the top of their 'to-do' list... "Until the ground moves again."

Quick Facts

Sector:
Private

Cost:
$1,500,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Business Owner

FEMA

Brewery Adjusts After Earthquake
Seismic Retrofitting to Avoid Disruption

Los Angeles County, California

Los Angeles, CA - Anheuser-Busch operates a large brewery just a few miles from the epicenter of the Jan. 17, 1994, Northridge Earthquake. The facility serves the company's markets throughout the Southwest and Pacific regions. Because it is in a high earthquake-hazard area, Anheuser-Busch initiated a risk reduction program at the brewery in the early 1980s.

A risk assessment of critical buildings and equipment was performed. Those with unacceptable levels of risk were seismically upgraded, without impacting daily operations.

Seismic reinforcements were designed for a number of buildings and the critical equipment contained within, including buildings housing beverage production and vats where the beer is stored and aged.

The Northridge Earthquake produced very strong ground motion, causing extensive damage in the immediate vicinity of the brewery. However, post-earthquake surveys conducted by the company's engineering consultants, indicated that none of the retrofitted structures sustained damage. On-site facilities of lesser importance to the business had not been strengthened and consequently sustained damage, requiring repairs. None of the vats which are essential to the brewery's operations, was damaged. The brewery was quickly returned to nearly full operations following minor cleanup, repairs, and restoration of the off-site water supply.

Anheuser-Busch conservatively estimates that had seismic strengthening not been performed, direct and business interruption losses at the brewery could have exceeded $300 million. According to Anheuser-Busch, this is more than 15 times the actual cost of the loss control program.

Clearly, this loss control program paid for itself in the Northridge Earthquake event.

While this is but one example, the Anheuser-Busch case study indicates mitigation measures can strengthen corporate balance sheets.

Quick Facts

Sector:
Private

Cost:
$20,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Business Owner

Brigham Hill Road Preventing Washouts

Chittenden County, Vermont

Towns of Essex, Colchester and Milton, VT - The Vermont highway system can be vulnerable to flooding if proper mitigation techniques are not employed. Vermont has a high proportion of major roads that are gravel. Typically these roads follow watercourses between steep rocky hills. The bedrock slopes are impervious to water, so runoff flows quickly downhill. Soil saturation further aggravates the potential for flash flooding.

In recent years, development has been stimulated in vulnerable areas from tourism and the construction of seasonal and retirement homes. Federal agencies, state and local highway engineers have developed numerous mitigation techniques to reduce damage to those gravel roads.

The towns of Colchester, Milton and Essex joined together following the damage to tackle persistent flood damage on a shared thoroughfare, the Brigham Hill and Mars Hollow Roads. Today residents are seeing significant benefits from this mitigation. A grant from FEMA's Hazard Mitigation Grant Program (HMGP) covered 75 percent of the $95,245 cost.

For the mitigation project, Essex supplied the engineering work and submitted the Federal grant application on behalf of all three communities. Each town paid a share of the mitigation activities including the addition of stone lined ditches and larger culverts that included several high-density polyethylene pipes.

Testing the project in the fall of 2004 was a series of severe storms and flooding, which struck the area and resulted in the declaration of yet another Federal disaster. The town highway departments reported only minor damage to the Brigham Hill and Mars Hollow Roads. In previous years, annual municipal repair costs on the two roads exceeded $18,000.

Essex Public Works Director Dennis Lutz commented that FEMA funded work on Brigham Hill Road demonstrated how to include effective mitigation during construction. Essex has since adopted local Codes and Standards for all roadwork. When extensive water damage occurred in August on Pettingill Road in Essex, their department quickly made repairs and installed stone ditching before federal staff had arrived. FEMA Public Assistance personnel inspected the Pettingill Road work and the town will be reimbursed for the mitigation ditching and other work currently underway.

The adoption of the Codes and Standard, developed for local communities in an initiative by the Vermont Agency of Transportation (AOT), has been a great benefit to many cities and towns. Communities that have adopted and enforced these Codes and Standards have secured over $500,000 additional dollars in federal assistance that otherwise would not have been available.

With driveway runoff a source of limited damage in Essex, the Public Works department is initiating a public education program to inform homeowners how residents can prevent washouts on their private property and reduce damages to connecting town roads.

Vermont Emergency Management is distributing a flyer "Things to Consider When Constructing or Repairing Your Driveway" to communities. The literature was developed using information provided by the Vermont AOT and FEMA.

Quick Facts

Sector:
Public

Cost:
$95,245.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Building Codes Protect Homes Wildfires Warded Off

Los Angeles County, California

Los Angeles County, CA - For Karen Stevens, her family, and neighbors in the Southern Oaks section of Stevenson Ranch, it was a blessing that the planned development where they live has a 200-foot-wide greenbelt around it designed to ward off wildfires. "There were plenty of embers flying around," said Stevens, whose home in Santa Clarita backs up to the Santa Susana Mountains.

These same mountains were set ablaze by the Simi Fire, one of 12 wildfires that burned more than 739,000 acres in five Southern California counties in Oct. 2003. Airdrops were made on the wildfire as it came toward the Stevens' home, and firefighters surrounded the area. Firefighters were bolstered in their fight by the mitigation measures taken.

Homes in the Stevenson Ranch planned development were all built to conform to Los Angeles County building and fire codes. All developers must comply with before building permits are issued. There is a multi-hazard approach to disaster-resistant construction. Wildfire mitigation measures include double-pane heat-resistant windows, concrete-slate tile roofing materials and enclosed eaves as primary protective measures standard. There are 100-foot greenbelts planted with fire-resistant plant materials, and they have sprinkler systems. The maintenance of greenbelts is managed through the homeowners association.

To mitigate against earthquakes, homes are built on high-tension slabs and bolted onto the slabs. "Earthquake safety was important to us when we were considering buying a home here," said Todd Stevens. "Since the experience of the wildfires, we're very grateful for the wildfire protective measures that are required."

Clearly, pre-fire mitigation, which cost less money than the value of the home, has protected this family's investment.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

FEMA

Built to Code
Port Charlotte Home Still Stands

Charlotte County, Florida

Port Charlotte, FL - After the whipping winds and rain of Hurricane Charley subsided, residents of Port Charlotte ventured out to inspect the damage. The extent of damage to older homes in the neighborhood ranged from moderate window and roof damage, to homes that were substantially damaged or totally destroyed. In the midst of all this, the Fodor home, remained almost without damage. A window was broken in the front of the house, when a piece of tile from a nearby house came through it and several of the roof tiles were knocked off from debris hits as well.

A local builder constructed the home three years ago. It was important to the Fodor's to have the house constructed by someone who would pay attention to details. They selected a builder who had an established record for quality construction. "We needed a strong house," said Mrs. Fodor. "This is more than just our home. I'm in the antique business and the house serves as a storehouse and gallery for many of my unique pieces. We expected our house to protect us and our antique collection because we trusted our builder," Mrs. Fodor said.

The Fodor's house is not unique. Construction is wood framed with stucco exterior. It also has cement and a barrel-tile roof. The house was built to comply with the local floodplain ordinance and building code in force in 2001. A basic, safe, strong, and storm resistant home is affordable to people building a new home.

Most of the older homes in the neighborhoods were substantially damaged. When homeowners there start to rebuild using the current Florida building code, the entire community will become more storm resistant. Then, if another hurricane like Charley comes to Port Charlotte, the homes will sustain less damage from wind, rain, and windborne debris. There will be fewer, less extensive repairs, and less cleanup. Best of all, people would be able to return to their homes and daily routines more quickly.

To learn more about pre-storm mitigation projects, rebuilding, and information on making your home safer, stronger and more storm resistant, go to the FEMA website, Mitigation Division, at http://www.fema.gov/fima. There is also information on "safe room" construction, which are rooms resistant to the effects of intense hurricane and tornadic winds.

In addition you can download a copy of Florida's "Handbook of Hazard Mitigation Projects" from http://www.floridadisaster.org/BRM by clicking "BRM Publications" under "Resources" in the sidebar.

Contact the Federal Alliance for Safe Homes (FLASH). for tips on making repairs after a storm. Call 1-877-221-7233(SAFE) to get your free copy of "Seven Things You Need to Know Before Rebuilding Your Hurricane-Damaged Home."

Although the Fodor home did a great job of "weathering the storm," the owners are now going to add storm shutters to all windows. They are also replacing the entrance doors with a stronger door system that has barrel bolts at the top and bottom of the jam to hold the doors closed against high wind events. "We understand that you have to take action and prepare yourself and your property to protect yourself from storms," said Mrs. Fodor.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Buyouts Cancel Complaints
Cobb County, Georgia

Cobb County, Georgia

Cobb County, GA - Every time it rained more than 2 inches, Bill Higgins' phone would ring. "My basement's flooding again! Can't you do something to help?" Unfortunately, as a water engineer for Cobb County, there wasn't much Higgins could do to help anguished residents of Leasa Court and Cynthia Court, whose homes were built in the floodplains. "All we could do was explain to them that their house was built before 1988, before our current floodplain ordinance," Higgins said.

This year, when Hurricane Ivan dumped more than 5 inches of rain on Cobb County, Higgins' phone remained quiet. "It was a relief not to get called by those folks again," he said. What made Hurricane Ivan's heavy rain different? "Last year, we bought out 19 houses on Leasa Court and four houses on Cynthia Court, eliminating residential damage in the most severe of the chronic flooding areas in this part of the county," Higgins said. Buying out these homes proved to be the most cost-effective solution to Cobb County's continual flooding problems. Two FEMA programs helped make it possible for the County to buy the properties on Leasa Court - the Flood Mitigation Assistance (FMA) program and the Hazard Mitigation Grant Program (HMGP). Staff from the Georgia Emergency Management Agency (GEMA) worked closely with Cobb County on grant application development, review, and in recommending them for FEMA funding.

"People who had lived on those properties for a long time were very glad to have the opportunity to get out," Higgins said. "They knew they weren't going to get anything out of the house. Many of them had sustained a lot of damage, and they would have to disclose it when they sold."

From the county's perspective, buying the properties was more cost effective than other measures. For the properties on Leasa and Cynthia Courts, Higgins said, "we could have carried out a capital improvement project in that area, but the cost of such a project would have been at least twice the cost of buying the homes outright."

In addition to the cost savings," he added, "It's nice to be able to regain the storage capacity of the floodplain again. There's also the benefit of re-establishing the natural vegetation and the filtering abilities of the vegetation."

Cobb County is known for being one of the more progressive counties in metro Atlanta in regard to floodplain management, and Bill Higgins is part of the reason. Higgins spearheaded several flood mitigation initiatives - and has been enthusiastically backed by the director of the Cobb County Water System, Cobb County Manager and Cobb County Board of Commissioners.

"Floodplain buyout, I think, makes a lot of sense," Higgins said. "It restores the floodplain's storage capacity, the natural flood-mitigation quality that the floodplain has."

Higgins' long-term goal is to mitigate all the major floodplains in Cobb County, thus eliminating or reducing property damage due to floods and flood-related litigation.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

Cape Mendocino Seismic Retrofit
Retrofit Program for Lower-Income Homes

Humboldt County, California

Humboldt County, CA - On April 25 and 26, 1992, three powerful earthquakes rocked the Cape Mendocino area of Northern California. Three major faults meet at this point forming one of the most seismically active areas in the United States.

Effects of the series of earthquakes were greatest in Humboldt County, with significant damage reported throughout. Hundreds of homes slid off foundations. Some buildings experienced separation of roofs and exterior walls. Over 1,000 homes were damaged and 200 were demolished due to structural inadequacies.

The Redwood Community Action Agency (RCAA), based in Eureka, CA, is a non-profit organization for Humboldt County. The Agency received $324,000 through the FEMA Hazard Mitigation Grant Program (HMGP) to retrofit homes of low income owner-occupants. This grant, combined with funds from local sources, provides funding for what has become the Seismic Safety & Retrofit for Residential Structures Program.

The program has specific target areas throughout Humboldt County and combines seismic retrofitting with housing rehabilitation. The goal is to assist individual low/moderate income homeowners directly in financing appropriate, cost-effective seismic retrofit activities. A unique aspect of this program is the integration of the HMGP money into the RCAA's ongoing housing program. All funding sources combined provide approximately $1 million.

To date, the projected number of low-income family homes benefiting from this program is 100-125 at an estimated $3,000 per house.

American Red Cross and California Office of Emergency Services data show a total of $37.2 million in estimated damages to 1,194 residences resulted from the Cape Mendocino event. The ongoing vulnerability of Humboldt County for future earthquakes is well documented. Historically, risk is clearly demonstrated. While a non-structural benefit/cost model has not yet been developed for use to verify this projects cost effectiveness, experiences of the Northridge earthquake demonstrate that non-structural retrofit projects are cost-effective mitigation. Potential savings from the reduction of repetitive property damages, relocation/displacement expenses as well as the human toll clearly outweighs the cost of the RCAA Seismic Safety & Retrofit for Residential Structures program.

Quick Facts

Sector:
Public

Cost:
$1,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Carl Crisler's Elevated Home Proves Successful Against Flood

Sonoma County, California

Forestville, CA - Wheelchair-bound Carl Crisler, a decorated World War II veteran and retired deputy sheriff, was 75 when his River Road home in Forestville, Calif., was flooded. Crisler's home is 100 yards from the banks of the Russian River.

In Jan. 1995, seven feet of mud and water flooded his home causing serious damage. When the structure was flooded again, in March 1995, the home was condemned.

The National Flood Insurance Program (NFIP) paid the Crislers a $65,000 settlement for damage and loss of contents. Use of the funds was limited to restoration of the property to its previous condition and could not be applied to elevation of the home. In 1995, because the loss from damage to the property exceeded 50 percent of its value, Sonoma County required the building be elevated if it was to be rebuilt and inhabited again. If the property could have been sold, the Crislers would have sold the residence and moved.

With the help of Deluge Response Interfaith (DRI), a Guerneville-based community assistance program for elderly and financially needy persons, the Crislers elevated their home. Their project began in the summer of 1995. DRI coordinated their applications for grants and federal assistance and arranged for volunteer laborers to do a portion of the elevation work.

The total cost of elevating the house nine feet and repairing it was $83,000.The Crislers returned to their home after living 16 months in an apartment. They moved into a like-new triple-wide, three-bedroom, two-bath mobile home set two feet above the 100-year flood plain.

The first year they were in their new home (1997), five feet of water covered nearby River Road and the Crisler's property. The water rose to just below the 100-year flood level. After the water receded, the Crislers returned to find their home unscathed. When flooding occurred in 1998, there was no damage to the elevated structure. The test of elevation of the Crisler home shows that money that would have been spent for repairs, plus costs of rental assistance from FEMA and reimbursement for damage claims from NFIP were saved.

Quick Facts

Sector:
Private

Cost:
$83,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Cassandro Wash Dam Mitigation Project Successful

Maricopa County, Arizona

Wickenberg, AZ - North Wickenburg is home to close to 100 families who are in the middle to low-income group. These residences were in the floodway, Cassandro Wash, the oldest part of the city. The community experienced severe flooding many times. At one time, water was so deep in the streets emergency vehicles could not pass through.

The City of Wickenburg resolved to eliminate risk to these families and worked with partners for the building of the Cassandro Wash Dam.

Shortly after its completion, Wickenburg experienced a major storm event. The dam impound area filled to 20 percent capacity with minimal overflow to the street. The dam proved effective again during Hurricane Nora in 1997 and the severe storms of October 2000. No flooding problems occurred to North Wickenburg.

Quick Facts

Sector:
Public

Cost:
$5,000,000.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

FEMA

City of Centralia
Home Elevation Project

Lewis County, Washington

Centralia, WA - Approximately every five years, heavy winter rains flood as many as 600 homes and businesses. With six Federally declared flood disasters since 1975, City officials and residents knew that something had to be done.

Since the City joined the National Flood Insurance Program (NFIP) in the early 1980s, it has been able to minimize flood losses to structures constructed after the adoption of a local Flood Insurance Rate Map (FIRM) and Flood Damage Prevention Ordinance. However, pre-FIRM structures were still vulnerable to flooding, as evidenced by the repetitive nature of losses in the area. The vast majority of flood related damages, almost 98 percent, have occurred to structures that were built prior to the identification of floodplains on a FIRM.

During the most recent flood event in 1996 alone, the cost to repair properties along the Chehalis River was approximately $633,000. Properties along the Skookumchuck River, the second principal source of flooding in the City, incurred $437,000 in damages in 1996.

In a series of public meetings held in 1996, City officials met with residents to determine the best course of action to reduce the threat of flooding in the area. Acquisition of flood -prone structures was considered, but this alternative was rejected due to its high cost. Elevation in place was chosen as the preferred alternative.

In February 1997, the City was granted approval to expend $1.5 million in HMGP funds to elevate 48 homes that have experienced repetitive flood losses. This grant has been supplemented twice, so that the City of Centralia would be able to fund the elevation of at least 80, or approximately 17 percent, of at-risk homes.

To ensure that properties most at risk were first in line to benefit from mitigation funds, Centralia officials devised a scoring system to prioritize properties for HMGP funding. Each structure was assigned points based on several key factors, including its current elevation relative to the base flood elevation, the depth of flooding during the 1996 flood, the number of times the property has flooded, and whether the property owner carried flood insurance. The City requires that all structures be elevated to the base flood elevation plus one foot of freeboard, or to one foot above the 1996 flood level, whichever is higher.

One such resident, Karen Meuchel, wrote to the local newspaper to thank FEMA, Centralia officials, and even the construction team for helping her gain some peace of mind whenever a hard rain falls. Meuchel wrote about the experience of elevating her home: "My home never had floodwater in it until 1990. By 1996, the water level in my yard was over my head and I had no way out except by boat. Thank you so much to all of the above. What could have been a very stressful period actually turned out to be an enjoyable experience. I will still have a certain amount of frustration when we do flood again. However, I will now be able to assist other flood victims."

Considering the history of repetitive flooding in Centralia, officials have little doubt that the project will pay for itself in avoided losses in coming years.

Quick Facts

Sector:
Public

Cost:
$3,131,140.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

City of Belleville Acquisition

Saint Clair County, Illinois

Belleville, IL - The City of Belleville is located across the Mississippi River from St. Louis, Missouri. The City experiences repetitive flooding along Richland Creek in various locations identified as 100-year floodplain. Most recently, the 1996 flood was the worst the City has encountered in 15 years and prompted the implementation of the acquisition program.

The City received funding to acquire 36 properties, including 19 residences, two commercial properties, and 15 vacant lots. The acquisition project involved demolishing the acquired structures and clearing the land to open space. The properties acquired will be retained by the City for open space and to be included in the Richland Creek Greenway Project.

Prior to the 1996 flood, the City had been working on a Greenway Project to mitigate damages in the flood-prone area. The Richland Creek Greenway Master Plan called for the City to acquire various properties along the entire length of Richland Creek within the City. The Greenway would eliminate properties from the threat of flooding and provide the City with a link to several public parks developed along Richland Creek in the recent past. The Greenway Project was initiated through a public/private effort and was recognized in 1995 as a model public/private partnership project by the East-West Gateway Coordination Council.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$1,177,220.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

City of Chicago
Inlet Control Valve

Cook County,
Illinois

Chicago, IL - In August of 1997, the City of Chicago experienced flooding and sewer back-up damage during a torrential rainstorm. The flood caused hardship and property loss for over 35,000 City residents. Because of the City's population density, many basements are utilized as garden apartments, and many of the affected residences have experienced damages on a recurring basis. In addition to property loss, four fatalities occurred as a result of the flood disaster.

The City was awarded Hazard Mitigation Grant Program (HMGP) funds to install valves that attach to the inlets of the combined storm water and sewer system; these valves restrict the flow of rainwater into the combined system at the peak of a storm. Engineering studies determined that the inlet valves were the most cost effective mitigation measure. The inlet control valves are located throughout the area based on topography and other engineering criteria.

The result was that the combined system functioned at no more than full capacity. The sewers function as they are intended, and the inlet valves prevented back up of sewage into the residential basements. During peak periods of full capacity, the excess storm water was temporarily stored in the streets and not contaminated with sewage.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$14,300,000.00 (Estimated)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

City of Darlington Honored Acquisition and Floodproofing

Lafayette County, Wisconsin

Darlington, WI - The City of Darlington is a small community located in southwestern Wisconsin along the Pecatonica River. When the City was flooded in the Great Flood of 1993, community leaders decided enough was enough. After experiencing flooding in 1950, 1959, 1969, and 1990, City officials, residents, and business owners decided they could no longer sit by and let nature decide the future of their community. As the Mayor stated, "The preservation of the past is an investment in our future."

The City developed a comprehensive flood-hazard mitigation plan that detailed a downtown rehabilitation and flood mitigation project. The ongoing multi-year project combines historic rehabilitation with innovative floodproofing techniques. Instead of moving the downtown district, the project included in-place floodproofing and rehabilitation of buildings listed on the National Register of Historic Places, as well as acquisition and relocation of some non-historic buildings and business revitalization.

The project included floodproofing 35 buildings in the downtown area, many of which were classified as historic structures. The plan also called for relocating 15 businesses from the downtown area and developing an alternative site for business operation on a 35-acre parcel south of Darlington. The business owners covered the costs for rehabilitation and historic preservation of the buildings. The local banks had a $600,000 fund to provide low-interest loans to the business owners for the costs they incurred. Federal funding covered the flood mitigation aspect of the project.

As of Nov. 1, 1998, 11 buildings have been acquired and demolished, and 16 buildings have been floodproofed. The acquired properties have been converted into open, recreational space.

The Darlington project is a prime example of what can be achieved by long-term planning and the cooperation of City officials, local business owners, and concerned residents. The project was a cooperative effort among many agencies including FEMA; Wisconsin Emergency Management; State Historical Society; Wisconsin Departments of Natural Resources, Administration, and Commerce; Economic Development Administration; and Southeast Wisconsin Regional Planning Commission.

The City was honored with a State Historical Society of Wisconsin Historic Preservation Achievement Award on May 9, 1998. The architectural and engineering firm hired for the project received a State award for special categories through the Association of Building Contractors.

Quick Facts

Sector:
Public

Cost:
$4,706,531.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

City of Deer Park
Drainage System

Harris County, Texas

Deer Park, TX - Located in southeast Texas, the City of Deer Park is in close proximity to Galveston Bay and the Gulf of Mexico. The City's population is approximately 28,000 within 15 square miles of land comprised of residential, commercial, and industrial zones properties. Deer Park is subject to intense local thunderstorms, storms extending over periods of several days, as well as torrential rainfall associated with hurricanes and other tropical disturbances. Numerous episodes of flooding have severely impacted the city's drainage systems.

Since 1979, the City spent approximately $13 million on a variety of measures to alleviate flooding, such as concrete-lined channels; reworking of earth-lined channels; and overall improvements to the existing storm-sewer systems. Building restrictions are also stringently enforced to ensure flood protection measures are adhered to.

The City of Dear Park's flood management program provides its citizens with a future that promises minimum flood damage and losses.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$13,000,000.00 (Estimated)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Local Sources

City of Eau Claire Acquisition

Eau Claire County, Wisconsin

Eau Claire, WI - Historically flooding from the Chippewa River took its toll on residents of the Forest Street neighborhood in the City of Eau Claire, Wisconsin. Starting in 1993, the city began to turn the tide on damages created by repetitive flooding when it implemented an acquisition program supported by FEMA's Hazard Mitigation Grant Program.

From the devastation of flooding has grown a planned revitalization of downtown Eau Claire. The west central Wisconsin city is changing its vulnerability to flooding into a recreational and aesthetic amenity that is spurring downtown economic growth.

History is repeating itself in Eau Claire. The Eau Claire and Chippewa rivers first brought settlers to the area. Here, loggers capitalized on the bounty of the woods. The growing city on the river served as an economic center during the logging decades of the 1850s to 1880s. When that 'boom era' passed, the city rebuilt as an industrial and medical center for the surrounding agricultural industry. The city is in another phase of rebuilding its downtown, this time after the shopping malls and freeway corridors influenced the development of retail centers on the outskirts of town. The Chippewa River, now bordered with newly opened up green space, is once again bringing commerce to downtown Eau Claire.

Nearly every spring, houses in the Forest Street neighborhood on the northern edge of downtown and near the Chippewa River filled with floodwaters. The 100-year-old houses were deteriorating from successive flooding and age.

The third highest flood of record hit the city in 1993. People nicknamed it the 'Great Flood'. Homes in the Forest Street neighborhood were among the 75 structures in the city that had river water in the basements. The estimated cost to the city in damages and flood fighting was $750,000.

The federal disaster declaration of 1993 triggered FEMA's Hazard Mitigation Grant Program (HMGP). Armed with HMGP funds, city officials acquired 50 properties in the five-block Forest Street neighborhood. "Although other areas of the city also incurred flooding, the city chose these homes to acquire because of the 100-percent participation by property owners in a concentrated area," said Donna Meier, Project and Acquisitions Coordinator for the city's Department of Finance. "Every year these homes were flooded. It was very destructive. People saw that they were much better off getting out of there and everyone agreed to sell."

In the summer of 2001, the City of Eau Claire approved ambitious plans for the space left vacant by the demolition of flood-prone homes and rental units. The 13.5-acre green space would be linked to another nearby redevelopment area along the river to form a riverfront park. The Redevelopment Plan introduction states, "The open space is readily accessible to downtown businesses, the government center, the University of Wisconsin campus and surrounding neighborhoods. The riverside edges of the site offer excellent views, water access, and an attractive urban destination in the heart of the city."

The buy-out of homes and resulting vacant acreage prompted the development of the park plan.

Quick Facts

Sector:
Public

Cost:
$2,557,143.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Technical Assistance Program (HMTAP)

FEMA

City of Keyser
Curb and Ditch Project

Mineral County,
West Virginia

Keyser, WV - Continued heavy rains in left the residents of the City of Keyser with frequent damages from excess ground water. The undersized and aged drain system was unable to process the runoff from heavy rains and flooded homes, property, and streets in the area. This resulted in repeated flooding and drain backups, which contributed to the premature deterioration of the system.

This project consists of two components that jointly solved the problem of the undersized storm drain system. The drop inlet and storm drain that empty directly into New Creek were replaced. This action increased the capacity at this location from the normal storm flow, one-year, to a minimum of 25-year flow eliminating most backups and flooding in the immediate area.

The other component of the project called for the replacement of 1,650 feet of storm drain plus the addition of five drop inlets in the area. Completion of this phase will eliminate the frequent system backups and the flooding to houses in the adjacent area.

Quick Facts

Sector:
Public

Cost:
$57,003.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

City of Moorhead Acquisition

Clay County, Minnesota

Moorhead, MN - Located in northwestern Minnesota, the City of Moorhead lies along the Red River of the North and experiences repetitive flooding. In 1993, the City experienced its fifth damaging flood in the past 20 years, damaging several homes. Four years later, the City experienced record flooding in April of 1997 that substantially damaged 16 homes. The majority of these homes were located in the River Oaks subdivision on an inside bend of the river, making the homes especially flood prone.

In the 1993 flood, there were 15 homes damaged significantly, and the City acquired eight of them in the following year. The remaining homeowners chose to stay and fight future floods on their own. In 1997 those remaining homeowners fought the unrelenting flood and received substantial damage to their homes. At that time, 16 homeowners—a combination of newly and previously flooded homes—voluntarily agreed to have their homes acquired by the City.

The 1993 acquisition project had only a partial local match, which meant that the homeowners had to provide 10 percent of the local match. The homes acquired were relatively high in value, and yet the homeowners realized the importance of flood mitigation to protect their homes. When the properties flooded again in 1997, the record flood would have caused extensive damage, as had occurred to the 16 homes acquired after the 1997 flood.

The 1993 acquisition saved thousands of flood insurance claim dollars and taxpayer's disaster assistance funding in 1997. The City of Moorhead has since acquired several more properties. The properties are now cleared, and the land remains as open space within the City's park system.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$1,120,719.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

City of Ottawa Acquisition Project

La Salle County, Illinois

Ottawa, IL - Located 80 miles southwest of Chicago along the Illinois and Fox Rivers, the biannual flooding of one particular floodplain area of Ottawa typically lasts three days with outside water depths anywhere from 1 to 6 feet. Although many of the occurrences may have been considered "nuisance" flooding, people living in this "flats" neighborhood had faced evacuation of their homes every few years.

But following unusually heavy mid-July rains in 1996, the City of Ottawa was among those included in a Federal disaster declaration covering 11 counties in northeast Illinois. Coordinated by the Illinois Emergency Management Agency (IEMA) and FEMA, this declaration brought relief to families through FEMA's Individual Assistance program and U.S. Small Business Administration loans. Through FEMA's Public Assistance program, the declaration helped Ottawa and other municipalities recoup response, cleanup and repair costs. The City estimated that its direct costs exceeded $105,000 for a single flood and did not account for commercial and personal losses.

Over the years, the owners of 33 properties with National Flood Insurance Program (NFIP) coverage each filed multiple claims. Many of these properties were located in the Flats, and their multiple claim distinction identified them as repetitive loss properties in this community of 18,000. With a high number of repetitive loss properties and substantial damage resulting from the 1996 flooding, Ottawa had the attention of FEMA's NFIP staff and the State NFIP Coordinator within the Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR). Under the City's floodplain ordinance, owners of substantially damaged buildings were already being required to elevate their homes or businesses, but many of these owners could not afford to meet the ordinance requirement.

When the City learned that the Hazard Mitigation Grant Program (HMGP) acquisition, or "buyout" funding, would be available as a result of the disaster declaration, Ottawa officials jumped at the chance to become part of an ongoing effort of FEMA and IEMA to acquire flood prone properties at pre-disaster, fair market value, from willing sellers, with FEMA paying up to 75 percent of the project cost. As the City had committed to providing 5 percent of the funding, the final 20 percent would need to be absorbed by qualifying property owners. Factoring in basic transfer costs, the participants would be getting less than 80 cents on the dollar for their properties.

In total, the City acquired parcels from 36 different property owners and demolished over 65 structures including single-family homes, duplexes, garages, out-buildings, and commercial buildings.

The Flats area is now the pride of Ottawa. The newly established "Fox River Park" has open play areas and public space for picnicking and fishing, not to mention boat docks and a river walk.

Thinking of it as a "recycling opportunity," the City used some of the buildings as training sites for fire, arson, and drug enforcement investigations before demolition. These training events served multiple local communities, as well as State police and fire agencies.

Quick Facts

Sector:
Public

Cost:
$3,300,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Local Sources

City of Peoria and Peoria County Acquisitions and Relocations

Peoria County, Illinois

City of Peoria and Peoria County, IL - Acquisition and relocation of frequently flood-damaged buildings have been taking place in the City of Peoria and unincorporated Peoria County for nearly 15 years. Beginning with FEMA's Section 1362 floodprone property acquisition program in 1982 and continuing through today's Hazard Mitigation Grant Program (HMGP), the City, County, and Park District have acquired, relocated, and demolished dozens of structures and restored an open floodplain along a 25 mile reach of the Illinois River.

The City and County have obtained Illinois Department of Natural Resources (DNR) funding to continue to acquire floodprone properties. All the properties have since been cleared into open space, and residents have relocated to flood-free locations. The County also participates in the Community Rating System (CRS) and has used the acquisition projects to reduce their CRS rating, which lowers flood insurance premiums for County residents.

Record floods occurred in 1979, 1982, 1985, and 1995. The success of the program is obvious when the damages for the 1985 and 1995 floods are compared. Although the 1995 flood crested 1.4 feet higher than the 1985 flood, very little damage occurred, and flood insurance claims were reduced by almost 90 percent. Taxpayers saved millions of dollars in relief costs, and the benefits are continuing. Removing the exposure to flood damage pays real benefits. The jurisdictions have continued these ongoing efforts by applying for $1.3 million in HMGP funding and $383,000 in Flood Mitigation Assistance Program funding, which will be matched by State agencies.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

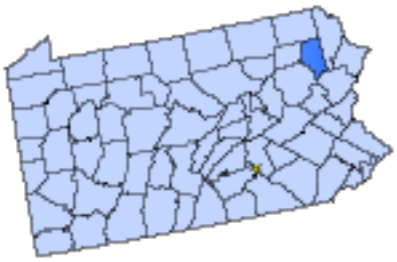
Cost:
$4,700,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

City of Scranton
Nay Aug Avenue Acquisition



Lackawanna County, Pennsylvania

Scranton, PA - In January 1996, Nay Aug Avenue experienced its second major flood in 11 years. The 13 homes along the avenue were built prior to 1940 with no footers for the foundation to rest on. Additionally, the foundation walls were of stone and crumbling mortar. Through the years of flooding, the banks of the Lackawanna River washed away to the point that the houses are sitting in the floodway.

The project consisted of the acquisition and demolition of the 13 properties. Various city agencies assisted in the implementation of the project.

This project did highlight cooperation of a City working to help its citizens. For example, a shortfall in funding was identified as the project progressed. So the City held an auction at the properties. Everything from the kitchen sink to the mailboxes in the front yard was sold. Citizens from around the community (including several that opposed the acquisition) came to help. The auction raised $40,000 to aid the project. This auction and other creative means of dealing with the project lead to the project having an $11,000 excess when it was completed. This money was returned to the Hazard Mitigation Grant Program (HMGP) fund.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Since the completion of this project, the area has been flooded four times, and subsequently the Army Corp is constructing a levee to further reduce the area of flooding. Future flooding may also be avoided by increasing the currently inadequate capacity of the storm water pipes in the area.

Quick Facts

Sector:
Public

Cost:
$907,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

City of Urbana
Wind Mitigation

Champaign County, Illinois

Urbana, IL - Mitigation doesn't always take the form of actual construction projects or acquisitions. Federal and State funding mechanisms like the Hazard Mitigation Grant Program (HMGP) can sometimes be used in creative ways to meet local needs. Private citizens and the business community are the players that make the mitigation happen. But what may be needed to jumpstart local interest is a combination of educational tools that provide technical information and marketing efforts to spread the word.

In 1996 a tornado ripped through City of Urbana, located in central Illinois. More than 100 structures experienced wind damage and Champaign County received a Presidential disaster declaration. The occurrence of that tornado was not an isolated event, as the city lies within an area of the Midwest commonly called "tornado alley."

With the disaster declaration, came the availability of HMGP grant money for mitigation projects. According to Jan Horton, Hazard Mitigation Officer for the Illinois Emergency Management Agency (IEMA), when her staff and the State's Interagency Mitigation Advisory Group discussed mitigation needs, they realized that the mechanical strategies for more wind-resistant construction had been developed, but no one had been implementing them. A task force was formed composed of knowledgeable members with a vested interest who worked as partners in the development of an educational piece: "The Windstorm Mitigation Manual for Light Frame Construction."

The collaborative effort used FEMA HMGP funding, administered by IEMA, with matching funds contributed by State Farm Fire and Casualty Company. David Wickershiemer, a faculty member in the School of Architecture, University of Illinois at Urbana/Champaign (UIUC), compiled the manual with research assistance from the UIUC Building Research Council.

The City of Urbana received an additional HMGP grant to expand on the mitigation message of the manuals. They created two videos and marketed them to prospective homebuilders and building contractors. The Institute of Business and Home Safety (IBHS), an insurance industry organization, and the Illinois Department of Commerce and Community Affairs (DCCA) provided non-federal matching funds.

The grant also allowed the city to provide funds for brackets and garage door upgrades, using the concepts described in the manual, on six model homes under construction at the time. Craig Grant, manager of the Building Safety Division of Urbana at the time of the mitigation and coordinator of the video production, explained why the videos created more interest than the tax rebate: "The videos are effective in alerting people before they actually get into the building process about things they can do in home construction. We realized you had to reach the right people - the owners that would be paying the bill, as well as building contractors and building code officials."

The video entitled "Inland Wind-Resistant Construction, Upgrading the Wood Frame Home" introduces the concept of increasing a home's wind resistance with the implementation of simple framing techniques. It's intended for individuals attending home remodeling shows and representatives of local jurisdictions.

Quick Facts

Sector:
Public

Cost:
$28,852.00 (Actual)

Primary Activity/Project:
Building Codes

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

City of Vassar
Planning Grant

Tuscola County, Michigan

Vassar, MI - Located in east central Michigan, the City of Vassar is 40 miles northeast of Flint. The City of Vassar is a small community that experiences repetitive flooding from the Cass River. For years, this strong-minded community had shrugged its shoulders at the flood situation. However, after repetitive flooding, the City realized that mitigation was the best solution to maintain the City's population and create a flood-resistant community.

As an initial mitigation measure, the City received Flood Mitigation Assistance (FMA) funding to develop a Flood Mitigation Plan. The City hired a consultant, and the plan was written in six months. The City Council adopted the plan by resolution on September 21, 1998.

The plan identified structures subject to repetitive flooding, and the City has now applied for additional FMA funding to acquire the identified structures. The new project will include the acquisition of about 10 properties in the floodplain. The City also plans to apply for Hazard Mitigation Grant Program (HMGP) funding to acquire four additional properties, totaling approximately $100,000. The additional benefit of the planning document is that it showed the City residents that teamwork and cooperation can result in desirable and effective mitigation measures.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$175,100.00 (Actual)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

City of Washington Voluntary Buy-Outs

Franklin County, Missouri

Washington, MO- Flooding in the summer of 1993 uprooted thousands of people and destroyed or damaged their property. People and animals were caught in raging waters, causing many deaths. The high water damaged millions of acres of agricultural land, devastated towns and businesses, cut off water supplies, and knocked out roads, bridges and railways. Since then, the State of Missouri has taken steps to remove people from harm's way. The State has currently acquired nearly 5,000 homes through voluntary buy-outs administered by the State and FEMA's Hazard Mitigation Grant Program (HMGP).

Since the 1993 floods, the State of Missouri continued to experience flooding in several different parts of the State. On May 7, 2000, in Jefferson and Franklin Counties, over a foot of rain fell in the early morning hours, suddenly transforming normally quiet little creeks into walls of raging torrents of water, carrying off cars and mobile homes, killing two people and swamping many homes in several communities and rural areas. The part of the Missouri River that caused most of the damage in 1993 had lower than normal levels for the most part. This time it was the small creeks and rivers that caused so many problems for the sleeping residents of these two Counties.

In 1993, among the numerous buy-outs that were funded and administered by FEMA and the State of Missouri, funding was approved for a buy-out project in the City of Washington. The City of Washington considered elevation and the construction of a protective levee, but the final decision, made by a consensuses of the local residents and the community leaders, was to buy-out the property owners and deed restrict the land so that no further development would occur. The project was forwarded to the State and FEMA and consisted of the voluntary acquisition of five residential structures.

This project has been a great success for the City of Washington. When flooding began again in May of 2000, none of the homes that once stood in the buy-out area were affected. Costs of warning, rescue, and evacuation were avoided. Building repairs and personal property losses were far less costly. Homeowners, once terrified by the rising waters, may not have even heard about the problems until they listened to the news broadcast the next morning. The area is now a neighborhood park with basketball, tennis courts, and a playground for children.

The total cost for this project was $508,503. According to the City, all of the homes involved in the buy-out would have received a substantial amount of flooding had they remained. After only 7 years, the project benefited tax payers by saving more than $1.1 million in disaster assistance, warning, rescue and evacuation. The most important benefit, however, is the removal of people from harm's way.

Quick Facts

Sector:
Public

Cost:
$505,503.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

CCRFCD Projects Prove Successful Clark County Regional Flood Control

Clark County, Nevada

Las Vegas, NV - On July 8,1999, the City of Las Vegas experienced the worst flash flood in its history. The storm damaged 360 structures: 85% owner occupied and 80% low income. Among those most heavily impacted was a large mobile home park.

The Clark County Regional Flood Control District responsibilities are: (a) to develop a coordinated and comprehensive master plan to solve flooding problems, (b) to regulate land use in flood hazard areas, (c) to fund and coordinate the construction of flood control facilities, and (d) to develop and contribute to the funding of a maintenance program for master plan flood control facilities. At the time of the flash flooding, one third of the master plan had been implemented."What's in place worked!" stated Kevin Eubanks, P.E., Assistant General Manager for the district. The projects were tested by the flash flooding of July 8.

The mitigation projects include both the Flood Threat Recognition System (FTRS) and the Capital Improvement Program. The FTRS was one of the first major components implemented as part of the master plan. It was in place throughout the Las Vegas Valley, measuring rainfall and activating a warning that is immediately communicated to the flood control district staff. Staff can assess the potential for flooding and begin alerting public works and other emergency response personnel. The District maintains modems to provide local governmental agencies with access to the FTRS.

The Capital Improvement Program, includes the construction projects, which are prioritized according to the potential of providing the greatest protection against threat to life and property. Two of the completed detention basins, Oakey and Gowan, clearly demonstrated successful mitigation during the flash flood. The basins, both located in high-density urban areas within the Las Vegas, filled to near capacity and protected adjacent residential communities from inundation.

Additionally, there is a plan for the media to be alerted to begin broadcasting watch and or warning information to the public, giving critical real-time attention to the flood event that aided in minimizing loss of life and property. The July 8th flash flood fully tested the completed portions of this project.

Quick Facts

Sector:
Public

Cost:
$1,200,000,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
State sources

College Brook Drainage Structure Relieving Overwhelmed Culverts

Strafford County, New Hampshire

Durham, NH - The College Brook flows through property owned by the University of New Hampshire and down through residential and commercial neighborhoods in the Town of Durham, ultimately emptying into Mill Pond. High water resulting from heavy rains or snow melt inundates the College Brook area approximately twice a year. The culverts under Mill Road and Mill Pond Road are overwhelmed, causing backup and flooding to 37 properties. There is recurring damage to homes, improved property, and infrastructure.

In 1997 and 1998, FEMA Region I partnered with the State of New Hampshire, the Town of Durham, and local residents to improve the drainage capacity of the two culverts. The project consisted of upgrading two culverts along the College Brook in order to maintain the flow of water during a storm event. The existing culvert was upgraded with a bottomless multi-plate pipe arch set on pre-cast footings. This pipe arch will be sized to allow the flow due to a 25-year storm event. The project removed the granite slabs that roof the exiting box culvert and widened the box culvert from 8 foot to 10 foot at the base; and then stabilized the slope with granite slabs and constructed a timber pedestrian bridge on top. Engineering studies have shown that these upgrades will carry the flow of a 25-year storm event.

The project has been tested during heavy rain events and there has been no damage due to flooding. The real test will be during the Spring snow melt. As of December 1998, benefits in avoided damages are $170,000.

Quick Facts

Year:
1998

Sector:
Public

Cost:
$225,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

Colton Schools Seismic Mitigation School Retrofit Program

San Bernardino County, California

San Bernardino County, CA - The Colton Unified School District, in San Bernardino County, Calif., combines traditional and year-round schedules, thereby having a high level of occupancy and use of facilities. Year-round life safety is a major focus of the school district's preparedness and mitigation program.

The county was seriously affected by the Landers and Big Bear earthquakes, which struck the area one hour apart in 1992. Both earthquakes caused damage to building and interrupted school schedules.

These events -- plus the realization that there is ongoing potential for hazards and damage to facilities in the seismically active area (near the San Andreas fault) -- prompted the county's Office of Education to apply for a hazard mitigation grant from FEMA. Funds are for non-structural mitigation for all school districts in the county.

The Colton Unified School District's consultant recommended mitigation solutions that would exceed life-safety standards. The first non-structural mitigation projects were done in kitchens of three schools where stoves, freezers and refrigerators were secured to prevent tipping during earthquakes. Mitigation plans also called for installation of computer hold-downs, and securing mobile carts and filing cabinets.

Funds for this project were made available from FEMA's Hazard Mitigation Grant Program, and were obtained by the San Bernardino County Office of Education for the Colton school district's non-structural mitigation effort. Non-structural retrofit projects have been demonstrated to be cost-effective mitigation. For the District's project, the benefit/cost analysis shows a ratio of savings from future events to the cost of mitigation of at least one-to-one.

The position of the county schools office and Colton school district is that hazards can and do repeat themselves, that non-structural mitigation done to lessen effects of these hazards can greatly reduce damage and life-threatening affects of hazards, and that non-structural mitigation can last for the life of facilities.

Quick Facts

Sector:
Public

Cost:
$200,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Educating about Volcanic Hazards Community Outreach Program

State-wide, Hawaii

Hilo, HI - The program is very popular with students and teachers, with yearly return invitations issued to the presenters. As time progressed, the Center for the Study of Active Volcanoes (CSAV) became a regular part of the presentations at the Keakealani Outdoor Education Center (KOEC) in Volcano, Hawaii, with approximately six visits per month.

The programs are Public Seminars; Student Education Series visits; Teacher Training sessions; Community Associations; and Islands Reached (Hawaii, Kauai, Maui, Molokai, Oahu). Each teacher presented ten lessons incorporating the hazards/preparedness message to their respective classes during the year that the training sessions were held in their county. It's intended that once the class is in their syllabus, it would be offered every year thereafter. Teacher training presentations are structured with members of the community attending.

Established in 1989, CSAV is a training and outreach program located on the Big Island and operates under the auspices of the University of Hawaii (UH), Hilo. The professional staff includes UH faculty and US Geological Survey scientists assigned to the Hawaiian Volcano Observatory. The Center's mission is to provide training and information on natural hazards that occur in Hawaii and worldwide. Program delivery is through public outreach, including visits to schools and the presentation of public lectures and symposia, various program specific presentations on volcanic hazards monitoring and response, programs to train educators and production of public information programs relating to natural hazards preparedness, response, and mitigation.

The program was initiated on the Big Island and subsequently exported to the other islands through their respective UH Campuses. Dr. Donald Thomas, CSAV Director, conceived the process, identified the target audiences and through his leadership is responsible for the programs successes to date.

The process is designed to reach a broad cross-section of Hawaii's population base. This is accomplished through public seminars, by taking the program to community associations, and by educating students in the grades 4, 6 and 8, thereby instilling an awareness of the multiple natural hazards and the resulting transfer of the knowledge to other family members. This has a beneficial by-product in that the information is disseminated to residents from broad socio-economic and geographic backgrounds.

In addition to presenting information at Big Island schools, CSAV also makes regular presentations at KOEC. These are multi-day presentations on earth sciences and ecology to 6th graders from schools throughout the State. The presentation focuses on volcanic and lava flow hazards. School presentations center on earthquake and tsunami hazards for fourth grade students, and eighth grade students are exposed to information relating to hurricanes and flash floods. In order to appeal to the intellectual capacities of the fourth graders the instructional medium is through hands-on participation and videos. The older student curriculum consists of lectures and video presentations.

Quick Facts

Sector:
Public

Cost:
$341,166.00 (Actual)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Contra Costa Food Bank Relocation
New Building for Contra Costa Food Bank

Contra Costa County, California

San Francisco, CA - On Oct. 17, 1989, the Loma Prieta earthquake measuring 7.0 on the Richter Scale rocked the San Francisco Bay area. It was felt by millions of people in a 400,000-square-mile area. Sixty-three people died because of the earthquake, and 13,757 persons were injured.

Shelters accommodated thousands of people who needed food, lodging and other necessities, but responding agencies and local resources were quickly overwhelmed. The Contra Costa Food Bank, a Bay Area organization, was called upon to assist in the massive response to the widespread emergency. Following the Loma Prieta earthquake, officials realized they had to either relocate or retrofit the building they had used, which is located close to a major Bay Area fault. A community-wide campaign generated $3 million in donations from private and public sources to pay for a new location in a seismically safe structure.

Constructed in 1997, the building that now houses the food bank met selection criteria and all other needs. It was built to meet the latest codes for construction to earthquake-safe standards, including reinforcement of floors. Another $55,000 was invested in non-structural mitigation. This included installation of storage racks, donated by a local business. Manually controlled skylights were installed to act as vents to release smoke in the event of a fire.

The cost of purchase of the building was $2.5 million. It offers protection to inventory, which totals an average of $6 million in value annually. The building offers a safer place to work thus reducing risk of loss of life and injury to food bank employees and workers. It also provides potentially uninterrupted service to the community in the event of emergencies and disasters.

Quick Facts

Year:
1989

Sector:
Public

Cost:
$2,550,000.00 (Estimated)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Private funds

FEMA

Critical Facility Mitigation
Olive View Medical Center in California

Los Angeles County, California

The State of California - Many States and communities over the years have decided that it is in their best interest to begin mitigating the natural hazard risks posed to critical facilities, such as hospitals. A prominent example of such mitigation can be found in the case of the Los Angeles Olive View Medical Center, in California. The 850-bed Los Angeles Olive View Medical Center, which cost approximately $23.5 million to build, was dedicated in November 1970. The Center was built according to the 1965 Los Angeles Building Code, which did not contain many of the seismic protection provisions found in the 1973 building code.

In 1971, the San Fernando Earthquake destroyed most of the building, caused three deaths on site and forced the evacuation of the structure. When the hospital was replaced in 1988, it was designed and constructed to new statewide performance standards and enforcement procedures for hospitals intended to maintain functionality following earthquakes. The cost of replacement was $48 million (1988 dollars).

The new seismic provisions proved worthwhile when the Northridge Earthquake struck the Los Angeles area in 1994. In that event, the Olive View Medical Center sustained only minor damage totaling $6.6 million, or 11 percent of the total replacement cost ($60 million in 1996 dollars). Furthermore, the building damage sustained in 1994 was repairable and the facility was fully operational within four weeks, which was not the case with the 1971 earthquake. The valuable medical services provided by Olive View continued to benefit the community.

This case illustrates the value of seismic mitigation for hospitals in areas of high earthquake risk. Because of successes such as Olive View, FEMA has established a program to encourage such mitigation. After the Northridge Earthquake, the Seismic Hazard Mitigation Program for Hospitals (SHMPH) created an optional alternative to the Damage Survey Report (DSR) process that FEMA traditionally uses to calculate the amounts of disaster assistance to be given to public facilities after disasters. The program is designed to accommodate hospital facilities that were structurally damaged in the Northridge Earthquake and constructed prior to 1973 when California established special seismic safety regulations for hospital construction. The SHMPH provides funding specifically for mitigation measures that are likely to significantly improve a building's seismic performance. These funds are provided on a Federal/non-Federal cost-share basis.

Approximately 22 hospital complexes in the three-county Northridge Earthquake disaster zone are eligible for participation in the SHMPH. It is expected that more than $2 billion in Federal, State, local, and private funds will be expended in this mitigation program over a period of up to 15 years, and that more than 50 percent of these funds will be used to construct new, updated hospital buildings, which will serve to improve health care delivery in times of disaster.

Quick Facts

Sector:
Public

Cost:
$48,000,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Critical Waterline Seismic Retrofit Success

Thurston County, Washington

Lacey, WA - Holmes Island lies within the waters of beautiful Long Lake in western Washington State. Less than 30 homes are on the island, with only one road and bridge for access and one pipeline for its water source. That waterline follows along Holmes Island Road and across the bridge.

In the summer of 1995, a project was undertaken by the City of Lacey, Public Works Department. Approximately 200 feet of pipeline were replaced on each side of the bridge and across totaling 450 foot. Flexible joints were designed to rotate, extend, retract and twist. Connections were high density 8-inch sleeved polyethylene water main pipes that were run through 10 inch steel pipes for extra protection. The total cost for this project, funded through the Water Utility Funds for Capital Improvement, was $162,000.

In the event of an earthquake, these pipes move along with the bridge and avoid rupturing, which would cause loss of water to the island and thousands of dollars in repair. "It would cost $4,000 for one coupling alone," states Mark Russell, Design and Construction Manager for the City of Lacey, Public Works Department. "A temporary system would cost $15,000 to $20,000."

The Holmes Island Bridge and waterline were tested on February 28, 2001, when a strong 6.8 earthquake struck the Puget Sound Region of Western Washington.

Approaches to the bridge slumped 6 to12 inches, and bridge supports were pulled away from the banks. The ground all along the road moved at least that much. The water main pipes dropped 8 inches. Because of the flexible expansion capability of the waterline under the road, no pipes were broken and water supply was never compromised.

The City of Lacey is currently seeking $50,000 in Federal funds to replace a portion of the waterline that is out of alignment from the earthquake. Had the city not planned ahead, they could have spent up to $20,000 for a temporary "fix" and still would have to spend the $162,000 or more dollars for a new pipeline. More importantly, the residents of Holmes Island did not lose their water source, and now have reassured confidence that their lives will not be compromised from loss of water.

Quick Facts

Sector:
Public

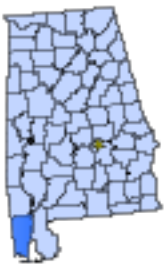
Cost:
$162,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Local Sources

FEMA

Dauphin Island
Hurricane Resistant Roofing



Mobile County, Alabama

Dauphin Island, AL - Alabama's Dauphin Island has repeatedly experienced roofing failures during previous hurricanes. Roof failures usually lead to further interior damage from subsequent rainfall.

After Dauphin Island was incorporated in 1989, the town adopted recommendations for hurricane-resistant roof construction. For the installation of asphalt/composite roofs, six nails per shingle are required, and the first two courses of shingles must be cemented to the roof underlayment. Ridges and valleys must also be cemented to the underlayment. The use of metal roofs is encouraged where fasteners are covered by the seam and therefore not exposed to the environment.

According to the local building officials, Hurricane Georges (1998) caused only minimal damage to asphalt/composite shingle roofing as a result of the implementation of these measures. This is a substantial benefit, because the cost of replacing a roof is approximately $3,000 to $4,000. Metal roofs appeared to have sustained little damage. However, since they are relatively new, the success of metal roofs must be further evaluated and based on longer exposure to corrosive conditions.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

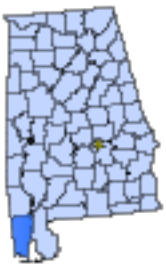
Sector:
Public

Cost:
$0.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Local Sources

Dauphin Island NFIP Compliance



Mobile County, Alabama

Dauphin Island, AL - Dauphin Island is threatened by periodic flooding and has suffered substantial damage and losses from previous floods. As a result, the town has implemented a flood damage prevention ordinance to reduce the risk to lives and property.

The ordinance is in compliance with the National Flood Insurance Program (NFIP). The NFIP makes Federally backed flood insurance available to communities that agree to adopt and enforce floodplain management programs that meet minimum federal criteria. These floodplain management programs are intended to regulate future floodplain development, and reduce future flood losses.

In 1989, after Dauphin Island was incorporated, the Town implemented an ordinance for flood damage prevention. The Town's building inspector administers and enforces the provisions of the flood ordinance. Implementing the ordinance ensures that structures are built in accordance with NFIP construction requirements. Flood data are provided from maps prepared by FEMA depicting areas of special flood hazard as well as the base flood elevations (BFE). In the high hazard areas, structures must be elevated so that the lowest level is 1 foot above the BFE. Other provisions include anchoring requirements; utilization of materials resistant to flood damage; and the use of breakaway walls, designed to break away without causing structural damage. In addition, utilities, HVAC, and plumbing systems must be located such that water does not enter or accumulate within their components.

In September 1998, Hurricane Georges caused extensive damage along the Gulf Coast and Dauphin Island sustained damages from coastal surge and flooding. Structures built in accordance with NFIP construction requirements performed well. It was observed that elevated buildings setback from the shoreline were constructed with adequate connections and anchoring, withstood hurricane forces in most cases. The enforcement of 10-foot minimum pile depths contributed to these successes. Utilities that were elevated on adequately supported platforms also performed well.

Since the implementation of NFIP requirements in Dauphin Island, there have been three major hurricanes events. During this time period, the average insurance claim payout for structures built according to NFIP minimum standards is approximately $3,000. In contrast, structures built prior to the implementation of these standards averaged nearly $12,000 per claim.

Although this is an example of the program's effectiveness over a short period of time, national cumulative data demonstrate that NFIP standards result in a 25-percent reduction in the severity of losses among those buildings that are damaged by floods and a 69-percent reduction in the frequency of those damages.

Quick Facts

Sector:
Private

Cost:
$0.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Local Sources

FEMA

Deaconess Hospital
Earthquake-Resistant Supply Well

Vanderburgh County, Indiana

Evansville, IN - Evansville is considered earthquake country. The Deaconess Hospital in Evansville has implemented an earthquake mitigation program for the facility, which opened in 1892. The program included installing an emergency fresh water well, water treatment facilities, and necessary piping. The hospital is one of the three in the City, with 358 beds, a family practice center and a family practice residency program.

The hospital is being pro-active in earthquake mitigation and building to higher standards. The water well was built to exceed local seismic codes and supplied by an emergency generation system. Specifically, the well was built to meet United Building Code Seismic Zone 3, although the area of the hospital is rated as a seismic zone 2A. The well is part of the ongoing effort to upgrade the hospital's existing emergency operation system and supplements the hospital's heating and cooling system.

The hospital itself was not altered since the well is in the middle of an asphalt parking lot adjacent to the hospital's energy center. In addition, no land use or infrastructure system capacity is altered. As of November 1, 1998, the well has been installed, all the emergency water lines have been installed throughout the hospital, and piping into the energy center is progressing. Construction was completed by the end of January 1999.

With the help of generators, the seismic-resistant well enables the hospital to operate independently of the City of Evansville utility system, which could be disabled in the event of an earthquake. This pro-active mitigation measure contributes to community recovery after an earthquake by assuring that the City has an operational emergency care facility.

Quick Facts

Sector:
Public

Cost:
$200,000.00 (Estimated)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Defensible Space Saves Home
Wildfire Mitigation Success

Navajo County, Arizona

Novajo County, AZ - The home of Lois Trimble is located in the Pinedale area, Navajo County, Arizona, just 10 miles northwest of Show Low. They built their house over the years and it became their primary residence in 1981. The entire area around this home was burned by the Rodeo-Chediski Fire that swept through the community in late June 2002. However, the Trimble home was unscathed.

Mrs. Trimble explained, "The fire started on Monday. On Tuesday we were told that the fire was out. Wednesday morning, ash was raining down all around us. My son called and told us that the fire had exploded, we looked and saw it coming over the ridge. We were told to evacuate. We had one hour. Because we had experienced this before five years ago, we knew exactly what to grab - important papers, some food, clothes and photo albums. My husband is an invalid so my daughter and I had to do it all." They were evacuated to the town of Eager and sheltered there until it was safe to return. The only building which survived the fire was their home.

Their home, while not damaged by fire, had smoke and soot inside and was not immediately habitable. During the previous few years, Mr. Trimble spread decomposed granite approximately 30 to 50 feet around his home. He keeps the pine needles clear because of the fire hazard they pose to their home. The decomposed granite also helps to keep the area clean after rain and absorbs any runoff. The Trimbles, in effect, created a defensible space. Trees, shrubs and a garden area close to the house and within the cleared area did not burn. The fire leveled all of the neighbors homes and out buildings as well as burning the trees in the forest.

The current market value of the Trimble property is approximately $200,000. The cost of one dump truck load of decomposed granite is $120.00. Mr. Trimble has used four truck loads of material at a cost of less than $500.00. Clearly, the low investment of time and materials has proven very effective to protect their home from this devastating wildfire.

Quick Facts

Sector:
Private

Cost:
$500.00 (Estimated)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Homeowner

Delta Dental Plan of California
Business Exercise Results in Action

Sacramento County, California

Sacramento County, CA - On Nov. 20, 1997, Delta Dental Plan of California and Deltanet, Delta's data processing and consulting subsidiary, conducted a business continuity exercise in partnership with Region IX of the Federal Emergency Management Agency (FEMA) for its Sacramento facilities. The objective of the "El Nino" Exercise, was to test Delta's business and Information Technology (IT) contingency plans in anticipation of unusually stormy weather and severe flooding at the business locations.

The scenario, developed by the Sacramento County Office of Emergency Services, described the flooding of the Delta facility due to a break in the nearby American River levee. There were three primary exercise objectives: 1) to familiarize Delta personnel with their business recovery plan, 2) test how well the plan was supported by the Deltanet plan, and 3) assess any additional steps that might be needed to prepare for an emergency.

Participants included several key internal departments for Delta Dental. Observers were from the Roseville Fire Department, National Weather Service, California State Office of Emergency Services, FEMA and J&H/Marsh McLennan. As a result of the El Nino exercise, senior staff addressed the need to secure their facilities from potentially severe flooding. Planning began in July 1998 for the relocation of the $2.3 billion company to mitigate threatening impacts to the business. In April 1999, Delta began relocating its Sacramento operations center from a 100-year flood plain to a 500-year flood plain.

The action taken by Delta Dental demonstrates clearly the value of disaster exercises conducted with trained professionals from both the public and private sectors. The partnership illustrates how proactive and cost-effective mitigation can be when problems identified in an exercise setting are acted upon.

A clear indication of financial risk reduction for this business is shown by the risk analysis report submitted annually by Delta Dental to the State of California. The report shows the risk of loss due to flooding at the previous location was in excess of $25 million with an annual loss expectation of $367,551. Additional benefits are employee job stability and decreased insurance premiums to the customers of Delta Dental.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Training

Primary Funding:
Business Owner

FEMA

Rain-Damaged Home Gets New Life
Community Help Allows Homeowners to Stay

Culpeper County, VA - When the Rapidan River in northern Virginia crested 30.5 feet above flood stage in June of 1995, devastating the Furloughs' historic 145-year-old house, they knew what they would do: rebuild on their home site by the river, elevate it, and get flood insurance.

And they did just that. They built their new home two feet above the 500-year floodplain, the river's record flood level. It cost the Furloughs about one-third more than it would have if they had been allowed to build a conventional house. The local Mennonites put up the shell of the house and shingled the roof in one day. To help pay for the construction, the Virginia Housing Development Authority provided a no-interest $27,000 loan, and the Culpepper County's planning department forgave the fees normally charged for building permits.

FEMA provided a grant to pay for the concrete pad and 8-inch by 8-inch beams placed in concrete 4 feet into the ground in 15 places to support the elevated house. FEMA also provided the Furlough family with rental assistance for 3 months.

They said it was all worth it. When the Rapidan River crested 28 feet above flood stage in September 1996, flood water poured into 10 neighboring structures in historic Rapidan but left the Furlough's living space untouched. When the river was rising, the Furloughs moved their eight vehicles, two camper trailers and garden tools to higher ground.

It's what you do if you live by the river, and "if you love where you live," said the Furloughs.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Culpeper County, Virginia

Quick Facts

Sector:
Private

Cost:
$0.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

East Bay Seismic Program
Utility District Seismic Program

Multiple Counties, California

East Bay, CA - The East Bay Municipal Utility District (EBMUD) provides water service to 1.2 million people along the east side of San Francisco Bay. Three major active faults create a high seismic risk to EBMUD's water-supply facilities. Following the Loma Prieta Earthquake in 1989, EBMUD performed an in-depth evaluation of the seismic vulnerability of its water-treatment plants, reservoirs, buildings, pipelines, tunnels, pumping plants and communication facilities. The results showed that in the event of a magnitude 7 earthquake on the Hayward Fault, it would take approximately six months to restore partial service, and the costs to repair damage to facilities were estimated at $245 million dollars.

The EBMUD Board of Directors decided to take action in 1994 by approving a 10-year, $189 million capital improvement program to minimize damage to the water system, improve firefighting capabilities, and protect customers from long, disruptive water outages following a catastrophic seismic event. The Seismic Improvement Program (SIP) reduces long-term risks to EBMUD facilities, people, property owners and the local economy. The four goals of the SIP are: (1) Life Safety -- to minimize the loss of life due to failure of any EBMUD structure; (2) Water Quality and Public Health -- to ensure that all water introduced into the treatment system is fully treated; (3) Fire Service -- to enable water availability in all areas, especially high fire danger zones; and (4) Customer Service -- restore minimum water service to 70 percent of customers within 10 days.

To date, the District has completed seismic upgrades for 21 reservoirs. EBMUD has installed shut-off valves and emergency hose connections at nine locations where water mains that cross earthquake faults are particularly vulnerable. These upgrades will either prevent pipe rupture or provide a bypass system to reroute water around broken pipes to protect life safety and property and to preserve the water supply for post-earthquake uses, including fighting fires. Upgrades to five of six water treatment plants are complete to ensure they will be available and functioning after a seismic event.

The District also educates the public about seismic risks in the Bay area, and maintains public support for the SIP with an extensive community outreach program. EBMUD has reached out to the community to solicit input prior to program implementation. It routinely conducts outreach during project implementation for the SIP, which has resulted in the strong support of the public and local elected officials. Additionally, the SIP Team has partnered with other agencies and state and local offices of emergency services to develop a single message on how to store emergency water supplies.

Quick Facts

Sector:
Public

Cost:
$189,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Local Sources

East Grand Forks
Accelerated Acquisition Program

Polk County, Minnesota

East Grand Forks, MN - The City of East Grand Forks is located in northwestern Minnesota along the Red River of the North. As a result of heavy snowfall during the winter and quick snowmelt in the spring, the Red River valley experienced a record flood in April of 1997. The City of East Grand Forks was flooded almost in its entirety, with only 1 percent of the buildings being spared any damage. The northern location of the town, in northwestern Minnesota, allows only a short building season. Therefore, an accelerated acquisition program was needed to enable flood survivors an opportunity to rebuild before the next winter.

With cooperation among FEMA, the State Division of Emergency Management, and the Governor's appointed "Minnesota Recovers" Task Force, the City of East Grand Forks received project approval to acquire 407 properties within 75 days after the disaster declaration. This allowed the City to make its first buyout offer on August 4, 1997.

All properties acquired under the accelerated program were substantially damaged residences in the 100-year floodplain. The acquired properties will become open space and eliminate the risk of flooding for more than 400 families. In addition to the 407 initial properties acquired, the City has received additional FEMA and State funding to acquire 100 rental properties for an additional $5 million. By the end of 1998, the additional 100 properties were acquired.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$15,000,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Education Program for Flood Control Teaching Youths About Risks

Los Angeles County, California

Los Angeles, CA - The dangers associated with the flood control system in the County of Los Angeles, especially during periods of heavy rain, produces a substantial threat to the health and safety of our young people. The LA County Drainage Area system consists of over 470 miles of mainstream and tributary channels designed, built and maintained by the LA County Department of Public Works and the US Army Corp of Engineers. The flood-channel system conveys, stores, or manages the storm runoff from the mountains, through and including the urban community, to the ocean. On an annual average, six individuals drown in the flood channel system, the majority of these involve young people from 5 to 18 years old.

LA County and the LA County Office of Education embarked on a public education program directed to grades 4-12 and required parent participation. Their goal was to educate young children and the public about the extreme danger and substantial threat to life that the flood channel system presents. Educational materials include: 1) Booklet describing flood channel safety information, 2) science lesson explaining forces of water and dangers around flood channels, and 3) videos depicting flood channel dangers and safety precautions.

The materials will be incorporated within the safety section of the health education and science education curriculum. It is important to tie the specific flood control system safety information to these broader curricular areas, because they address the personal and social skills of decision-making needed to avoid all types of risks in daily living.

These collaborative efforts will contribute to a long-term solution to the historically repetitive problem of rescues and deaths related to flood control channels. If these measures are not implemented, the rate of deaths and rescues may increase due to the increase in population in the Los Angeles County area.

Quick Facts

Sector:
Public

Cost:
$77,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Elba Stormwater Drainage System Ending Recurring Flooding

Coffee County, Alabama

Elba, AL - Originally named "Bridgeville," after the ferry that ran across the Pea River, Elba was founded around 1840. It is also the county seat of Coffee County, located in the fork between Beaver Dam Creek and the confluence of Whitewater Creek and the Pea River. Today, Elba remains a small community of 4,000 residents and is home to several manufacturers and industries.

Elba has a long history of flooding stemming from (1) failure of the town's protective ring levee, which caused major flooding throughout the downtown area, and (2) stormwater accumulation within the levee, affecting the low-lying southcentral and southwestern areas of town (as happened in 1994).

In the 1930s, the Works Progress Administration constructed a three-mile long levee enclosing three sides of the town. At the time it was an effective measure, but today the aging levee is vulnerable in the event of a major flood. In fact, the levee failed during the March 1990 storm when Whitewater Creek overtopped its banks and caused the worst flooding the town has seen. Hundreds of buildings were flooded, and damages ranged upwards of $10 million. It took weeks of around-the-clock pumping to remove floodwaters.

With a Hazard Mitigation Grant, Elba installed a stormwater drainage system in 1997. The system was built by widening an existing drainage channel and installing two pumps at low-lying points in the town's southeast quarter. The pumps, designed to remove water quickly from flooded areas, are each capable of moving 17,500 gallons per minute.

In March 1998, a heavy storm system swept through the Southeast, causing serious flooding in several Alabama counties. The small community of Elba was devastated again in the third disastrous flood in 10 years. Eight inches of rain caused nearby Beaver Dam Creek to overtop its banks, and the levee surrounding the town failed. Flood depths in the downtown area were as high as five feet, and half the town's residents were evacuated. Water levels inside the levee were over two feet throughout most of the area.

The new pumps were able to drain the area of water in approximately four and a half days. Had the pumps not been available, it would have taken natural drainage and smaller pumps as long as eight or nine days to completely drain the area.

Elba's pump system reduced by half the time it took to drain the water from inside the levee and saved $130,000 in avoided damages from the March 1998 flood. Over the 30 -year life of the project the system will likely generate savings well beyond the cost of the project.

Quick Facts

Sector:
Public

Cost:
$391,114.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Electric Utility & the Community Partnerships Reduce Damage From Trees

State-wide, Massachusetts

New England Region - Since 1990, New England has experienced more than 30 storms including one hurricane, four nor'easters, one downburst and three major winter storms. The total cost of these storms to electric utilities in the region is estimated to be more than $100 million.

Nationwide, trees are the leading cause of electrical outages. Tree damage from storms has a devastating effect on electric utility infrastructure and is a mutual hazard to public roadways. Public safety is threatened when critical facilities, such as those for fire and police, hospitals and nursing homes; as well as water pumping stations and sewerage treatment facilities, have extended power outages.

In 1995, 32 communities in Massachusetts and Rhode Island formed Tree Stewardship partnerships with Eastern Utilities to reduce tree damage from storms. A risk assessment was conducted to determine the characteristics of trees that pose an above average threat to arterial power lines and roadways. In addition, analysis was conducted to evaluate system performance of the electric utility infrastructure.

The tree population assessment revealed less than 20 percent of trees caused more than 70 percent of damage in storms. These trees have characteristics that indicate structural weakness. The system performance analysis indicated 25 percent of the electrical circuits were causing 65 percent of outages in storms.

Since the Tree Stewardship partnerships began, damage from trees to arterial power lines was reduced by 35 percent per storm. Storm costs were reduced by 30 percent per storm, and these results were achieved with no incremental increase in budgets. Over $1 million in storm costs have been avoided.

Quick Facts

Sector:
Public

Cost:
$0.00 (Estimated)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Local Sources

FEMA

Elevated Buildings Stay Dry
Keeping the Home Safe

Skagit County, Washington

Skagit County, WA - If Mike and Velda Thrams' home in Hamilton, Washington, was not elevated, they would not have moved into it last June. And if it had not been elevated by its previous owner following the 1995 flood, it would be as flooded and unlivable as the house next door. Because on the following October, the Puget Sound area suffered the worst single-day rainfall the state had seen in more than 100 years.

"I'm very happy about our home," said Mrs. Thrams. "We wouldn't have bought this house if it wasn't [elevated] this high. We may have lost a motorcycle and the back deck was dislodged, but our belongings and our house are fine." The Thrams had closed on the house only a few weeks before the flood.

According to Mrs. Thrams, the elevated town museum (formally the city hall) across the street also "looks good." The museum had been part of a FEMA elevation project. Owing to the elevation of the museum and the Thrams' house, both structures stayed dry.

In addition, the land now used for the city park across the street from the museum used to be occupied by several flood-prone homes. Another FEMA mitigation project allowed for the purchase and destruction of these homes and the formation of the existing park. This too avoided a great deal of damage from the recent flooding that would have occurred to those homes had they not been removed.

The rental house next door to the Thrams was flooded and unoccupied, said Mrs. Thrams. That was the fate of many other homes in the Thrams' neighborhood – a view from their elevated home that makes its point.

Quick Facts

Sector:
Public

Cost:
$2,375,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Elevated Family Home Pays Off High and Dry, Safe and Secure

Indian River County, Florida

Vero Beach, FL - In 1998, Scott and Susan Deal decided to add a bedroom to their existing home for their growing family. Much to their dismay, their building permit was denied. The local floodplain ordinance, adopted by the City, required existing structures with the lowest floor built below the required base flood elevation (BFE) be elevated to or above the required BFE when substantial additions or alterations are to be done or if the structure has been substantially damaged. The Deal home was one foot below the required BFE. “When I first found out about the requirements, I was exasperated,” Scott related. “The house had been here 48 years without flooding. Why should I have to go through all this when all I wanted to do was add one bedroom?”

To comply with the local ordinance, the Deals had three choices: keep their existing home without substantial addition or alteration; demolish their home, clear and fill the lot, and build a completely new house; or elevate the existing house and fill in the area below the structure to meet the requirement. Working with a local contractor, the Deals secured plans and estimates and realized to demolish the house, clearing and fillingl the lot would cost $25,000, plus the cost of building the new house. For approximately $40,000, they could elevate the existing structure 16 feet above the BFE. This elevated level would far exceed the requirement and allow a space underneath to build a first floor.

The Deals chose to elevate their existing house, funding the project themselves. While preserving the 2,800 square feet of space, they built a first floor underneath that is one foot above the required BFE. “For an additional $15,000, we gained 2,800 square feet, protected against flooding, and even kept the roof in place. We built a new whole roof over it,” the Deals explained. Incorporating covered porches, steps, and architectural details created a well-integrated appearance. According to Scott, “From start to move-in date took 10 months, a lot of patience, and an excellent contractor.”

Before we started this project, stated Scott, “We weren’t flood conscious, flooding wasn’t a problem. But now, with [Hurricane] Frances,” he continued, shaking his head. “The others, who didn’t [elevate their houses], it’s sad, terrible, what happened. I’m talking flooding you have to clear out with a shovel. There’s river mud a foot deep in some houses. Our house is the only one on the street with no flood damage. We’re glad the floodplain [regulation] made us elevate the house, and avoided a loss or damage to our property and contents of at least $45,000 from Hurricane Frances due to flooding. It was definitely worth it to raise the elevation.”

Quick Facts

Sector:
Private

Cost:
$40,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Elevated Lighthouse Resort Shines A Beacon of Success in Fort Meyers, FL

Lee County, Florida

Fort Meyers, FL -- When Hurricane Charley hit Fort Myers Beach in Aug. 2004, four buildings at Tom Kolar's Lighthouse Resort Inn and Suites, which sits 200 feet from the beach at San Carlos Bay, remained dry, undamaged, and full of customers. Other hotels and motels on the island were damaged or flooded, and closed. In the past, the Lighthouse Resort would have been closed too. In two decades there have been seven hurricane events causing flood and wind-related damage to the Resort, leaving the third-generation owner to deal with nearly $l00,000 in repair costs per event. When "Charley" hit, the four undamaged buildings remained high and dry, having been elevated as part of a joint State, Federal, and local mitigation project. In one year they have saved nearly $200,000 in repair costs alone, almost 50 percent of their investment.

"Everybody else was out of business but Kolar was renting rooms," said Bob Rockwell, a local contractor who worked on the recent project. He had worked on many of the previous repairs, and spurred the project after he spotted a television program in 2001, about the Federal Emergency Management Agency (FEMA) Flood Mitigation Assistance (FMA) program.

Working with Fort Myers Beach Deputy Town Manager, John Gucciardo, Kolar and Rockwell worked to gain the necessary approvals for the jointly funded mitigation project to elevate six of the Resort's buildings. Hoping to prevent future repetitive losses and the subsequent effects not only for the owner but also on the community, work began March 2003, and two more buildings are scheduled to be elevated by year's end. The project's aim is to elevate the six repetitive loss structures two ft. above the 100-year floodplain ("A" zone 12ft. National Geodetic Vertical Datum (NGVD) to 14 ft. NGVD. The owner far exceeded the requirement and elevated the building to elevation 18.7 and 19.1 ft NGVD.

If there was a "silver lining" in the clouds of hurricanes Charley and Frances, it is that they have now demonstrated the value of the Lighthouse Resort Inn and Suites mitigation project. For the owner, the repetitive losses, ever-higher repair costs, and lost income will be avoided. Employees will avoid the anxiety of losing their income due to time lost for lengthy repairs. The town and state will recognize tax benefits from the increased value and extended life of the mitigated property. For the National Flood Insurance Program, it means reduced or eliminated repetitive payments for damage claims.

"Adjacent property owners benefit," said Gucciardo, "because the project is located in a Community Redevelopment Area and the additional tax revenue must be invested back into the local area." According to Gucciardo, the town is even seeing benefits such as no expenditure for debris removal, a staggering post-hurricane task for the area. "Other properties did not fare as well (as the Resort)," he stated, "and we expect to be dealing with debris removal for weeks to come."

As a result of undertaking the joint investment in the mitigation, the Lighthouse Resort is "open for business," a welcome oasis in the midst of so much destruction.

Quick Facts

Sector:
Private

Cost:
$1,651,603.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Flood Mitigation Assistance (FMA)

Elevated Private Residence
Elevation Protects Homeowner

Placer County, California

Roseville, CA - The City of Roseville and surrounding areas have experienced repetitive flooding in 1986, 1995 and 1997. These floods have caused significant damage to both public and private properties. Our homeowner was a victim of two of these events.

In 1986, floodwaters inundated his home with 3 feet of water and again in 1995, with 2.5 feet of water. Both floods required his family to evacuate as well as lose appliances, furniture, and irreplaceable personal items.

Additionally, he also is a small business owner. Because of the time necessary to stay with his family and home, he suffered several thousand dollars of business loss and was unable to respond to customer requests. His employees also lost salary due to business closure.

Following the flood of 1995, this homeowner made the decision to elevate his home. He followed recommendations of FEMA's National Flood Insurance Program (NFIP) and received a portion of funds that were available to Placer County from FEMA's Hazard Mitigation Grant Program (HMGP).

Flooding occurred again in Jan. 1997. This time there was no damage to the living areas. The cost of elevating and the inconvenience to the family during the construction was recovered in many ways. His home has increased beyond market values.

As a small business owner, with his family and home protected, the need to spend time away from the business was eliminated. Additionally, his employees benefited because their jobs were protected.

Quick Facts

Sector:
Private

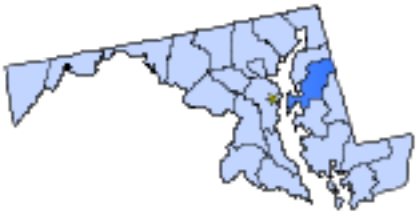
Cost:
$0.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Elevation, Modular Home
A Flood Mitigation Success



Queen Anne's County, Maryland

Chester, MD -- Christine Behr describes herself as playing General Contractor, managing the steps necessary to make her new modular home ready for occupancy. She visited the Queen Anne's County Department of Public Works to obtain a Certificate of Occupancy (CO), which would allow her family to move into their new home. She met with Sharon Cook, Office Coordinator I, who discussed with her the flood plain regulations and the requirements to be compliant. Mrs. Cook provided the package for compliance, and Christine learned that their home was 1.5ft. below the Base Flood Elevation (BFE) therefore it was non-compliant and a CO could not be issued. The building must be above the BFE and an additional 2ft of elevation was recommended. Mrs. Behr and her husband had used their own funds to purchase the home and the property was a gift from her Grandparents. Because they had no mortgage, there was no flood insurance requirement, however, their intent was to purchase the insurance independently.

The homeowners researched the pros and cons of additional elevation and determined that they needed to protect their biggest investment, their home, however they could. They made the decision to elevate the 1456sq. foot structure. Their home was already placed on the foundation so it had to be raised while the new foundation was built underneath. The project took ten days for a total cost of $8040.00 ($6300 for the elevation; $1740 for the foundation). Final elevation is 8.56 feet, exceeding the recommendation. Additional mitigation measures are the flood control vents incorporated into the foundation and the elevated utility box. The vents are temperature controlled and adjust between open and closed positions automatically. During flood conditions water flows through the vents, in and out, avoiding build-up of water under the house.

This home is located approximately 125 feet in front of Cox Creek, a lovely waterway branching off from Eastern Bay, which is fed by Chesapeake Bay. The day before Hurricane Isabel struck Maryland, the home was lowered and secured to the new foundation. As a result of the hurricane, Cox Creek reached flood stage and spilled its banks. Floodwater rose to a peak level of seven feet around the Behr home. Nothing inside our house got wet, exclaimed Mrs. Behr. If it had not been for the caring and advice of Sharon Cook, we would have lost everything. Christine Behr talks about the benefits that have resulted from elevating her home. Her daughter has asthma and exposing her to the health hazards of mold and mildew were avoided. They protected their investment and increased the re-sale value. Future mitigation measures include elevating their air conditioning unit and purchasing flood insurance.

Standard Homeowners insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Private

Cost:
$8,040.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

Elevation of New Hotel Protecting an Investment

Calvert County, Maryland

Chesapeake Beach, MD -- The merciless winds and rains of Hurricane Isabel created a 28 feet tidal surge up Chesapeake Bay, flooding many communities along the Eastern Shore of Maryland. The town of Chesapeake Beach recorded wind speeds over 60 miles per hour and an estimated 80 miles per hour peak.

Chesapeake Beach Mayor Gerald Donavan said that his community emerged unscathed other than flooding at a local restaurant. Water came within 2 inches of flooding another popular restaurant in town but a new hotel, the Chesapeake Beach Hotel and Spa, under construction was undamaged.

Mayor Donavan attributes this success to following FEMA's "directive" to construct the hotel four feet off the ground. "People get upset with the Federal government," stated Mayor Donovan, "but hats off to FEMA. The hotel barely got a scratch."

The Chesapeake Beach Hotel and Spa opened in April 2004. The hotel has 72 rooms, retail and restaurant facilities. Protecting this $6 million property from damages resulting from hurricanes and floods makes good business sense. Mayor Donavan said, "We went through a 100-year storm and didn't get wet. We're really thrilled."

Quick Facts

Sector:
Private

Cost:
$6,000,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Business Owner

FEMA

Escambia County
Protecting Critical Facilities

Escambia County, Florida

Escambia County, FL - In 1995, Hurricane Erin caused extensive damage to Escambia County. So the City of Pensacola fire stations and police headquarters worked to find solutions to protecting their buildings from the future damage of hurricane-force winds. Escambia County's Emergency Medical Services (EMS) also wanted to protect its buildings from hurricane flooding and winds so they could provide a safe facility for the primary healthcare providers during and after a major disaster—when it is most crucial that emergency services be maintained.

Three separate projects in Escambia County were funded as a result of Hurricane Erin: 1) The fire stations visited by the Building Performance Assessment Team (BPAT) had installed storm shutters over the glass window openings; 2) The City Police Headquarters had installed accordion shutters over 141 glass window openings and twin aluminum roll-ups over the front entry. Window shutters were installed with bolts every 6 inches; and 3) the Escambia County EMS Administration Building was an elevated structure and had installed storm shutters over the glass window openings.

In 1998, none of the fire stations sustained damage from Hurricane Georges. The City Police Headquarters accordion shutters over the glass window openings and twin aluminum roll-ups over the front entry performed well. Escambia County EMS Administration Building storm shutters were also reported to have performed well, thereby creating a secure shelter facility.

Without these window and door shutter projects, it is possible that wind forces and air-borne debris could have caused damage to these critical facilities. Protective measures such as these will help to avoid damages from future disasters.

A benefit-cost analysis for the projects resulted in expected savings of $293,785 in avoided future damages. (FEMA's HMGP Interim Guidance Manual defines the benefits that accrue from a hazard mitigation measure as the avoided damages.) Costs: City Fire Departments: $69,706; City Police Headquarters: $32,011; County EMS Department: $30,000. Net benefits: City Fire Departments: $38,406; City Police Headquarters: $64,022; County EMS Department: $60,000.

Quick Facts

Sector:
Public

Cost:
$131,717.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Evansville Acquisition Village Implements Mitigation Measures

Randolph County, Illinois

Evansville, IL - The village is a small community in southwestern Illinois along the Kaskaskia River, about 10 miles from its confluence with the Mississippi River. In the Great Flood of 1993, the village experienced record flooding as the Mississippi River floodwaters backed up the Kaskaskia River. Homes and businesses were inundated with more than ten feet of water, causing severe damage to over 20 structures.

The Village of Evansville utilized the Hazard Mitigation Grant Program (HMGP) to acquire the substantially damaged structures. Funds from the Illinois Department of Commerce and Community Affairs and U.S. Economic Development Administration were used to relocate the Water Treatment Plant away from the threat of flooding. The village acquired 12 properties, including residences and businesses. The properties are now all dedicated to open space and are planned to be used for recreation purposes to promote tourism in the village.

The village also developed a Hazard Mitigation Plan to address all hazards within the village, including earthquake since the village is within the New Madrid seismic zone. An ordinance implementing BOCA building codes was adopted to encourage earthquake-resistant construction.

The village has successfully removed many of its residences away from the threat of flooding. Evansville has received recognition across the Nation for its successful implementation of mitigation measures in a small community.

Quick Facts

Sector:
Public

Cost:
$296,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Excelsior Springs Acquisition
Green Space Brings Wildlife

Clark County,
Missouri

Excelsior Springs, MO - The charming, late Victorian-era Town is renowned for its remarkable varieties of mineral waters. The Town is located in the northeast portion of Missouri along the Fishing River, about 30 miles northeast of Kansas City. Floods and flash floods have devastated Excelsior Springs many times. In 1993 severe flash floods devastated the town causing extensive damage. Residents were evacuated. Streets were closed. Homes were destroyed. Cars, furniture, appliances all were swept away. Every public building was flooded.

With financial support from FEMA's Hazard Mitigation Grant Program (HMGP) and the Housing and Urban Development (HUD) Community Development Block Grants program, Excelsior Springs has taken measures to mitigate against future costly floods. The Town applied for and received $1.3 million to buy homes from those who wanted to move out of harm's way. Using these mitigation funds from FEMA and HUD, the Town purchased 61 residential properties. Structures were cleared from the floodplain and green space remains. Wildlife has been sighted in places where it didn't reside before.

This project has been a great success for the Town of Excelsior Springs. In 1998, the Town experienced three floods, but they did not impact the community as they had in the past. Very little damage occurred. Costs of warning, rescue, and evacuation were avoided. Building repairs and personal property losses were far less costly. Cleanup is easier and faster when it's just mud and not automobiles or furniture.

All 61 structures that were removed from the floodplain would have been flooded and extensively damaged during the most recent flooding in October 1998. Above all else, the residents of Excelsior Springs are safer now.

Quick Facts

Sector:
Public

Cost:
$1,300,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Fenway Community Development Corporation Develops Flood Mitigation

Suffolk County, Massachusetts

Boston, MA - The Fenway Community Development Corporation owns and manages a building on Peterborough Street. This building is an affordable residence for the sick, elderly, and disabled. In 1996 the building was flooded twice. Most notably in October of 1996 flood waters and sewage entered the building via the main waste line, the garage area, and the elevator sump. Flooding caused damage to five living units, the fire alarm, fire suppression system, the elevator (a vital evacuation tool for the disabled), and the basement area which was used for an after-school program.

During repairs to the building, the Fenway Community Development Corporation worked with FEMA Region I and Massachusetts Emergency Management Agency to develop a flood mitigation project. This project included the following building retrofits: (1) The elevator sump depth was increased and equipped with a larger pump and debris screen; and (2) A check valve was installed on the main waste line to prevent sewage backup.

In June of 1998, the area flooded again. There was no damage to the building. These mitigation steps have saved over $60,000 in avoided damages from this event alone. The protection has given the residents of the building an increased sense of security.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$19,396.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Fire Weather Monitoring Stations
Delaware Proactively Battles Wildfires

State-wide,
Delaware

The State of Delaware - Severe snow and ice storms in Delaware often cause numerous downed trees. The dried trees create extreme forest-fuel loading which contributes to major fires in Delaware pine forests on an annual basis. These conditions lead to extra budget demands for personnel overtime, aircraft rentals for suppression, and reimbursement of volunteer equipment damage and losses.

A reduction in loss to State forest lands is obtainable through an elevation in readiness, public warnings, fire bans and restrictions, and budgeting for manpower before fire occurs. The Fire Weather Monitoring Stations project was submitted with the support of the State of Delaware, FEMA, and the Delaware Department of Agriculture. Contact with the U.S. Forest Service and other state forestry groups provided data for justification of the project.

The estimated value of one acre of good timber is approximately $1,500. Between 1989 and 1992, Delaware lost about 40 acres to fire. Installation of the system would cut response time by 10 percent and acreage loss to approximately four acres. Since the installation of the project, Delaware has not experienced a fire season that would exercise the system.

Quick Facts

Sector:
Public

Cost:
$28,000.00 (Actual)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Flood Mitigation
Keeping Historic Key West Alive

Monroe County, Florida

Key West, FL - The southernmost city of the United States, Key West has a population of 25,700, and the economy revolves around tourism (averages of 9,500 each day), commercial fishing, a vibrant art community, and US Navy and US Coast Guard operations. But flooding has been a fact of life in the City of Key West ever since it was founded.

Large sections of the historic Old Town District have historically flooded frequently. Most buildings were constructed in the mid-19th century. The tourist economy and cultural vitality of Key West depends on protection of these irreplaceable historic resources.

The island city is flat with the highest elevation being about seven feet above mean sea level connected to the mainland by the Overseas Highway. Hurricanes and tropical storm systems are obvious threats. A category 5 hurricane could produce storm surge that would completely cover the city. However, less dramatic events, such as heavy rainfalls and seasonally high tides, regularly produce flooding on a much smaller scale, disrupting business and daily life.

In 1997, the city began a project to alleviate the flooding from coastal storms and seasonal high tides. City engineers installed tidal control valves and stormwater quality treatment structures for outfall pipes on the city's western seawall. They also raised the height of the seawall. The duckbill type tidal control valves prevent the intrusion of seawater and allow stormwater runoff and tidal surge to flow out to the ocean. Hydrostatic pressure from the seaward side of the seawall holds the valves closed, while a couple of inches of run-off can open the valves to allow conveyance of stormwater into the ocean. On the landward side of the seawall, a pollution-reduction skimmer was installed to prevent debris from entering the check valve assembly and to reduce pollution discharge into surrounding waters.

The project has been a huge success. It has practically eliminated the tidal flooding that plagued many of the city’s most important intersections. The city has not flooded since the completion of the project. The city has received compliments from local businesses and commendations from local newspapers and citizens about the project.

Previously, seventeen businesses were affected by the flooding with losses estimated at up to $68,000 total per year due to closings. Flooding events had averaged 10 times per year with cleanup and damage estimated at $7,500 per event or $75,000 for the year. Now with the elimination of flooding in this area, the city and local businesses has $143,000 in savings per year. At a total cost of $356,183, the project will pay for itself 2.5 years after the completion date.

Quick Facts

Sector:
Public

Cost:
$356,183.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

Flooded Homes To Farmers Market
A Bluefield Success Story

Tazewell County, Virginia

Bluefield, VA - Bluefield wasn't always known by that name. Eighty years after its third change, Bluefield is undergoing more changes. "Two creeks collide in the middle of town," according to Todd Day, Public Works Director for the City of Bluefield, Virginia. "Beaver Pond and Whitney Branch meet under the IGA store. When torrential downpours happen, the whole town floods." From 2001 to 2003 the area has experienced four floods that impacted Walnut Street, home to seven longtime residents of this town of just over 5,000.

As a result of a flood that hit in 2001, Bluefield was awarded funds from the Hazard Mitigation Grant Program (HMGP) to buyout and subsequently relocate the seven families on Walnut Street. "Removing the buildings won't stop the flooding," Day said. But the trauma associated with frequent flooding and the damage it caused has come to an end. "The residents of those homes were concerned about finding suitable housing," Day stated. A valid concern considering many of the residents were senior citizens. "The residents of Walnut Street have been relocated inside the city limits, and I believe they are reasonably happy with their homes," Day added.

Road repairs and maintenance were a costly factor for the city, too. "We were patching and paving and building back that road over and over again. We figured out that had we not become involved with the HMGP, it would have cost the city more than $65,000 for repairs and maintenance over the next five years. That will be a huge savings for Bluefield," said Day. "When Walnut Street flooded, we were going down there in power boats, with the rescue squad and fire department and all other types of emergency services regularly."

Bluefield Mayor Bill King said the Walnut Street flooding occurred even when there was only a moderate amount of rain. Consideration was given to elevating the homes, but in the final analysis the houses were considered too old to elevate successfully.

Day said that a group of citizens has formed a committee to consider possible uses for the "green space" created after the homes were vacated and demolished. The committee is considering using that space for an unpaved parking lot or a cordoned-off park area with benches. "The committee is still forming, but so far, favor seems to be on the side of forming a farmers market there," Day said. "That would be good for Bluefield."

Quick Facts

Sector:
Public

Cost:
$409,522.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

From Floodway to Greenway
Warner Robins, Georgia

Houston County, Georgia

Warner Robins, GA - Originally named Wellston, Warner Robins changed its name to match that of the military base that was founded near the town in the early 1940s, becoming Warner Robins Air Force Base.

In 1994, Tropical Storm Alberto caused the usually dry Bay Gall Creek to overflow and flood numerous properties in central Georgia. Today, the formerly flooded property is the beginning of Wellston Trail, a multi-use greenway through a wooded region in what otherwise is a busy part of town known more for its strip malls and traffic jams than for tranquil parkland. This change, however, didn't happen overnight. As Walter Gray, Warner Robins city engineer puts it, "Within a week of that flood, we had people starting to repair their houses, and we had to go out and ask them to stop."

"As a participating community in the National Flood Insurance Program, Gray said, "the city was required to have property owners elevate their homes that were flooded and declared substantially damaged before any other repairs could be made. So during that first week, we were busy posting notices on all the damaged buildings we could find to let their owners know about the requirement to elevate before beginning any repairs."

At that time, Gray explained, a predecessor of FEMA current Flood Mitigation Assistance (FMA) program was a program known as the "1362 program." It involved Federal funding through the National Flood Insurance Act's Section 1362; this pro¬gram made it possible for the city to buyout the properties of people who had flood insurance.

"The city bought about 13 houses with the 1362 money," Gray said. "But the 1362 program didn't help the people who didn't have flood insurance. So the city got back with FEMA and found out it would soon have the Hazard Mitigation Grant Program (HMGP) that would fund 75 percent of the cost of buying out the remaining proper¬ties. The city also applied to the U.S. Department of Housing and Urban Development for funds to cover the remaining 25 percent. With these Fed¬eral funds, we were able to buy out the remaining 25 properties, 22 of which were occupied houses."

It took approximately 8 years to buy out all of the properties, Gray said, "Some of them went real quick. But we didn't finish buying the last one until about two years ago because of a disagreement regarding the price. Since then, we've owned all of the properties and have used State of Georgia green space monies to create park areas and trails on it.

"So, in addition to having green space here in the middle of town, we no longer have to come down here in boats to rescue people stranded in their houses. To me, it's the most effective thing we can invest our dollars in. I would buy out the houses in a heart¬beat before I'd make major improve¬ments to this channel. Let Mother Nature do what she does best."

The greenway that begins where flooded houses once stood is a new reality made possible by funds from FEMA's Flood Mitigation Assistance program and the foresight and persis¬tence of Mayor Donald S. Walker, the council members, other city officials, and volunteers engaged in both the buyout program and the design and implementation of the Wellston Trail.

Quick Facts

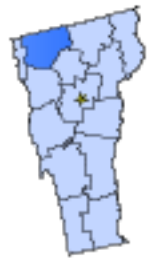
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Fuller Covered Bridge
A Vermont Historic Treasure Preserved



Franklin County, Vermont

Montgomery, VT - In the northern tier of Vermont close to the Canadian border, the rural town of Montgomery is home to one of Vermont's treasures. The Fuller Covered Bridge, listed on the National Register of Historic Places, is one of the town's six remaining covered bridges out of an original thirteen. Brothers Savannah and Sheldon Jewett built the covered bridge in the later half of the 1800s.

These covered bridges are an important part of Vermont culture and history. Tourists attracted to the bridges help support many local businesses in the Montgomery community, with a population just shy of 1,000.

In early July 1998, heavy rains deluged the town of Montgomery. Water levels in the town's rivers and tributaries rose at a rapid rate. Debris from fallen trees and other objects accumulated in the rising waters exacerbating the problem. Riverbanks swelled to capacity and began to overflow. Water carrying mud and debris swept down Main Street causing damage along its path. Homes along the river were washed away; a motel along the riverbank was lost; and the town hall and local church sustained significant damage. The fast moving floodwaters and debris caused significant damage to the Fuller Covered Bridge. Access to town was restricted to a single road due to damage to several bridges.

President Clinton declared a Disaster, making Federal Individual and Public Assistance monies available. Public Assistance covers the repair of damaged public facilities such as roads and bridges.

The town was faced with a decision - whether to rebuild, restore, dismantle and/or install a modern replacement bridge. The town chose to rebuild.

A preservation specialist was brought in to help. Soon after, the bridge was removed and hauled to another location for restoration and repairs and a temporary bridge was installed at the site. During the repair phase the stone abutments were refaced with concrete, reducing their future vulnerability to debris such as trees, wood, and other floating objects carried by floodwaters. In August 2000, following completion of the restoration work, the Fuller Covered Bridge was returned to the repaired abutments.

This past August and September, residents of Montgomery watched as a series of severe storms deluged their town once again. The results of Montgomery's mitigation efforts were a success. The Fuller Covered Bridge remained intact, as did the other repaired structures from the 1998 storm.

Quick Facts

Year:
1998

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

GIS Mapping
Accurately Recording Floodplain Areas

Allegany County, Maryland

Allegany County, MD Allegany County lies in the western panhandle of Maryland and has a high proportion of development along the floodplain because most of the land lies on steep slopes. In January 1996, following a heavy snowfall and subsequent rapid thaw and heavy rains, severe flooding along the Georges-Wills Creek basin occurred. Eight months later, Hurricane Fran further damaged the area with the resultant flooding in the same locations. In the aftermath of these two Presidential Declared Disasters, a Hazard Mitigation Plan was developed that highlighted the need for basic floodplain boundary information and other government and emergency services related data.

Geographic Information System (GIS) capabilities were determined to be the most cost effective and comprehensive data storage medium available for use by a wide variety of data end-users. Because of the wide range of data required, decisions were made to concentrate on a reference base upon which all other data "layers" would relate: street boundaries.

The most accurate presentation was to digitize aerial photographs provided by the Maryland Department of Planning and then extract data layers readable by ARCVIEW, a GIS software. This was the first step in a comprehensive Hazard Identification and Risk Assessment process initiated by Allegany County. Project Impact funds ($100,000) were joined with Allegany County funding ($100,000) to complete one-half of the entire county.

The data are being used by the State Highway Administration to provide baseline road references for the re-issuance of Flood Hazard Insurance Rate Maps presently being completed in the Georges Creek area. This information will be the basis for decision making on a wide range of planning issues being addressed by not only the Project Impact sub-committees but also the State, regional and county planning bodies. The digitized data are presently being formatted by the Allegany County Planning Commission for presentation to Project Impact sub-committees.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

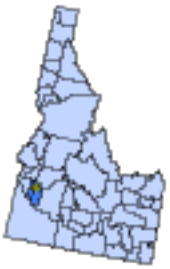
Sector:
Public

Cost:
$500,000.00 (Estimated)

Primary Activity/Project:
Floodplain Management

Primary Funding:
Local Sources

Garden City Gets Cheaper Insurance Community Earns CRS 8 Rating



Ada County, Idaho

Garden City, ID - Garden City residents already enjoy reduced flood insurance premiums as a result of their city's active participation in the National Flood Insurance Program (NFIP) Community Rating System (CRS). And they're about to pay even less.

"We recently rezoned 89 acres to open space use and have worked hard on a flood warning system," explained Garden City floodplain administrator Marsha Lamascus.

Garden City's new Class 8 rating has earned policyholders a 10-percent reduction on flood insurance premiums. Policyholders collectively will save $4,535. The average annual policy in Garden City is approximately $367.

"The CRS rewards communities for implementing programs and policies which protect their citizens from flooding," said FEMA Regional Director John Pennington. "Such activities can range from mapping, regulations, and flood damage reduction to flood preparedness and public awareness programs. Garden City's new standards for protecting critical facilities and regulating water runoff generated by new development earned a CRS Class 8 rating."

Flood insurance premium reductions resulting from "above and beyond the minimum" initiatives run in 5-percent increments, from 5-percent to 45 percent. Class ratings range from 10 to 1. The higher the flood protection activity, the lower the Class rating. "We can't stop the rain," Lamascus said. "But we can help protect our citizens from the worst effects of flooding, and that's what the CRS is all about."

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Community Rating System Activity

Primary Funding:
Community Rating System (CRS)

Geneva: Buy Outs and Acquisitions Keeping Residents Dry

Geneva County, Alabama

Geneva, AL - Geneva has a long history of flooding. In 1861, the town was destroyed by a flood and relocated to higher ground. Since the start of the 20th century, Geneva has been flooded four times. Three of those events occurred during the 1990s. Although not all residents of Geneva were hit hard by each flood, the small residential area of Baptist Bottoms has always received the brunt of the damage. According to the Geneva City Clerk, "With the exception of what they could carry out during the evacuation, they [Baptist Bottoms residents] lost everything in the [1990 and 1994] floods."

To stem the cycle of disasters, Geneva applied for hazard mitigation grant funds to acquire structures most at risk. FEMA agreed to fund the buyout of dozens of buildings within the floodway of Double Bridges Creek in Baptist Bottoms. Local officials began an aggressive campaign to convince homeowners in the flood-prone Baptist Bottoms area to sell their homes and relocate out of the floodplain. Eventually, they submitted a grant application to FEMA for the acquisition of 54 homes. An initial benefit-cost analysis determined that the project would be cost-effective. All of the structures are located deep in the floodplain, and it was clear that damages from repeated flooding in the future would take a heavy toll on the community.

Of the original 54 structures included in the application, 30 were actually acquired and removed before the March 1998 flood. A revised and updated benefit-cost analysis for this group found that the acquisition was even more cost-effective than initially projected.

Quick Facts

Sector:
Public

Cost:
$672,555.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

George's Creek Acquisition Project
Lessening Hazards to Life and Property

Allegany County, Maryland

Allegany County, MD - Allegany County lies within the Potomac River Basin; historically it has experienced devastation of property and loss of life due to swift flowing high water. The total land area of Allegany County that is located in the 100-year floodplain roughly equals the National average (about 10%). Unfortunately the population is concentrated in the narrow river valleys where the flood hazard is greatest.

Flooding as a result of flash flood events come from intense regional summer thunderstorms or long spring rains on the melting snow pack, causing extended periods of high water. The flooding from the aftermath of the January 1996 blizzard, and subsequent damage from Tropical Storm Fran (1996) left substantial damaged to eight residences.

This project represents the first stage of a three-part project aimed at lessening the hazard to life and property in the George's Creek Basin. The project will acquire and demolish the substantially damaged structures and the grade the land. The property will then be dedicated to open space in perpetuity and access for recreational use provided. Stages II and III of the project will involve elevations and retrofitting.

This project permanently removes these families' homes from the floodplain and prevents future construction in this area. Damages related to these properties from the two major events in 1996 (including property repairs, loss of services, and loss of rental income) are estimated at $160,000. This acquisition removes these repetitive loss properties from the National Flood Insurance Program (NFIP) rolls and the need for future Federal disaster aid.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$201,750.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

University Hall to be Made Stronger
Seismic Safety Corections Needed

Alameda County, California

Berkeley, CA -- Giannini Hall received a "poor" seismic rating in the 1997 review of campus buildings and a project to correct structural deficiences was scheduled to begin July 2005. The schematic design is scheduled to take up to two years, whith construction scheduled to begin in 2007.

Giannini Hall is a four-story concrete buildling totaling 69,564 gross square feet. It houses programs in the College of Natural Resources, including the Dean's Office, classrooms and faculty offices, as well as administrative offices for the Department of Molecular and Cell Biology and the Giannini Foundation of Agricultural Economics. The building was designed by William C. Hays in 1930. It is listed in the National Register of Historic Places and is one of the Berkeley campus' most historically significant buildings.

The primary goal of the project is to correct the building's seismic deficiencies, but it will also address mandatory fire and life-safety requirements, accessibility improvements and essential deferred maintenance.

The project is expected to provide new shear walls and collector beams to improve the building's resistance to seismic forces. It will also add new concrete footings, soil anchors and other reinforcements designed to minimize the risk of falling objects. The proposed scheme, developed during the feasibility phase, maintains the histroic interior and exterior of the building while providing the needed seismic corrections.

Some of the required upgrades to the building will include altering an entrance to improve wheelchair accessibility, installing a new elevator and shaft, installation of a fire sprinkler system, installation of a complete fire alarm system and eliminating dead-end corridors.

The university seeks to avoid major relocation or reconfigurations of space, but the project will need to address program impacts caused by the seismic project. In order to avoid substantial interior modifications to the building to meet fire codes, the Electron Microscope Lab will be relocated to another campus buidling. This will make space available in the basement level of the building, providing flexibility to address program impacts elsewhere.

In order to carry out the seismic work while continuing academic activities, all of the occupants of Giannini Hall will need to be relocated during construction.

Quick Facts

Sector:
Public

Cost:
$22,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Giving the Creek A Little More Room
Lexington, KY, Acquisition

Fayette County, Kentucky

Lexington, KY - Residents of the Valley subdivision in Lexington are no strangers to flooding. Behind their homes meanders the quiet Wild Cat Creek, offering a pleasant view from the backyards of the homes on either side. However, every few years the creek lives up to its name, dumping 1 to 5 feet of swirling water in homes and basements.

In 1989, Wild Cat Creek roared over its banks damaging 16 homes, evacuating 58 people and causing $195,000 in damage. Flooding in 1992 caused $346,000 in damages, and for four houses, structural costs reached mostly $80,000. In 1997, the flooding came so fast evacuations were not possible. It caused about $93,000 in damages and several residents were treated for hepatitis after clean-up efforts. In 1998, the flooding struck again, damaging 16 homes.

Flooding damage was often severe because the houses were built in a mapped floodway. Each structure contained a basement that faced the creek, housing a utility room with a washer, dryer, hot water heater and furnace. As floodwaters entered, appliances and utility connections were damaged or ruined entirely. Sometimes homes lost retaining walls.

The rising creek flooded neighborhood streets and run-off from higher elevations across the street would add to the mess. The city of Lexington's costs skyrocketed as they paid numerous times for debris clean up, garbage pick up, repaired drains, and evacuations.

Working in cooperation, the Commonwealth of Kentucky and the Lexington-Fayette Urban County Government (LFUCG) requested Hazard Mitigation Grant Program (HMGP) funding, and were approved for 16 homes to be acquired and demolished through the voluntary acquisition program. On the other side of the Wild Cat Creek, approximately 12 to 14 homes were bought out through LFUCG funding alone. The land was cleared and converted into a greenway corridor, providing linkage to a dedicated park system as well as stormwater management. The land remains as open space and provide a natural drainage area for future high water.

With the changes in place, Wild Cat Creek now flows along its natural course. If it floods, the severity of damages or losses is greatly reduced. The open area, where the houses once stood, now allows the creek space to naturally pool past its banks and flood mostly open space. When the creek waters reach any of the remaining houses near the creek, the runoff intensity is greatly reduced.

Now the City of Lexington is saving money and manpower. The Wild Cat Creek is tamed and the community has a lovely open space park to enjoy. "Cooperation of the Federal, State and local officials made this vital project happen." said Kentucky Governor Ernie Fletcher. "This important funding will allow families to escape the flooding fears that come with every spring and summer thunderstorm."

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

The Town of Glasgow
Housing Relocation and Floodproofing

Rockbridge County, Virginia

Glasgow, VA - The Town of Glasgow is located at the confluence of Virginia's Maury and James Rivers and at the base of steep mountain slopes. Flash flooding and river flooding occurs when hurricanes and storm systems stall against the mountains. In the past thirty years, the Town has been hit by six major flood events. More than 50 percent of the Town lies in the floodplain.

The Town will relocate, elevate, and acquire approximately 56 houses. By April 1999, the project had relocated three houses, elevated two and acquired eight. As of June, 2000, the project has elevated 11 houses, relocated eight houses, and acquired 16 houses. During the summer of 1999, two more houses were be elevated.

Through the use of these three mitigation options, the Town intends to move people out of harm's way and prevent property damage. Land acquired by the Town will be held as open space.

Quick Facts

Sector:
Public

Cost:
$1,930,968.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Glen Campbell Borough
Stream Crossing Replacement Project

Indiana County, Pennsylvania

Indiana County, PA - There are only two roads leading into Indiana County. One of them frequently experiences washouts from flooding. Unfortunately, this roadway is a primary access route for residents and emergency personnel.

The original project called for the replacement of the existing damaged 30-inch terra cotta pipe with a 4-by-8 foot box culvert. This action would increase the hydraulic capacity of the culvert and reduce the amount of water backup experienced at this location during severe storms. But during the 18 months it took from conceptualization to start of construction, the price of some materials became cost prohibitive. The local community, State and Federal officials worked together to come up with a rescoped project that had a longer life and cost the same as the original project.

Instead of the 4-by-8 foot culvert that would have cost twice the estimated amount, the crossing was reconstructed with the original available funds. The local government added road surfacing and guardrails to their contribution to the project. The engineering firm that worked on the project agreed to forgo $750 of their original engineering budget to assist in finalizing the completion.

This was truly a project that reflects the intention to be a joint effort between various levels of government and the community to solve a problem that affects everyone. The 30 residents who live in the area served by the road no longer face near certain isolation when heavy rains cause high water in the area.

By using the combined technical resources of the Borough, State Mitigation Office, FEMA and the managing engineering firm, the project was rescoped to fit the budget and solve the problem. This joint effort resulted in a project with a more useful life and therefore, a greater benefit than the original.

Quick Facts

Sector:
Public

Cost:
$8,110.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Nottoway County Man Helps Others Volunteering in Times of Need

Gloucester County, Virginia

Gloucester County, VA - Forest Myers has a soft heart for those in trouble, but as a professional engineer for 54 years, he is also a realist. When helping the dispossessed West brothers of Maryus, Virginia, with a new home, Mr. Myers made certain that their new house was in compliance with Gloucester County building codes and regulations.

Several years ago, the West brothers' home was destroyed by fire. Having nowhere to go, they lived in a camper on their property. This arrangement conflicted with county zoning regulations, and the brothers were facing a bleak future when Forest Myers offered to help.

Mr. Myers suggested that William and Gail Kellum, who were building a new house in the Jenkins Neck area, donate their old house to the West brothers. The Kellums had planned to demolish the house to dispose of it, and were delighted to make it available to the brothers.

Mr. Myers worked with the County to ensure that he obtained all required building permits and complied with all codes when moving the Kellums' old house onto the West property in Maryus. The 10-mile area around Maryus is swampland, and county codes required all new home construction in this area be built with the first floor (including basement) elevated above the Base Flood Elevation, the average floodwater depth for a flood event that has an estimated one percent chance of occurring during any given year. Buildings constructed to this standard are expected to sit above the floodwater and avoid damage during all but the most severe inundations.

With volunteer materials and labor, Mr. Myers built a five-foot-high foundation on the Wests' home site. He then had the donated house moved to the property, where it was lifted onto its new foundation by two cranes.

Shortly after construction, Mr. Myers' mitigation efforts paid off when Hurricane Isabel struck in September 2003, and the York River flooded the Maryus area. The West home, located about a half-mile from the river, was the only house that was not flooded during the storm. The Maryus Post Office, located across the street from the West home, was damaged by two and a half feet of floodwater.

The West home demonstrates that when constructing in a floodplain, home elevation is a wise mitigation technique.

Quick Facts

Sector:
Private

Cost:
$60,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Business Owner

Grafton Acquisition
Benefiting Residents and Tourists

Jersey County, Illinois

Grafton, IL - The City of Grafton, a small tourist-based community in west central Illinois, is located at the confluence of the Illinois and Mississippi Rivers and just north of the Mississippi and Missouri Rivers' confluence. The location of the City makes it extremely flood-prone. Prior to the Great Flood of 1993, the City had experienced repetitive flooding but not to the same degree. The 1993 flood inundated almost the entire City for months. It caused substantial damage to over 100 homes.

The City opted to utilize the Hazard Mitigation Grant Program (HMGP) to acquire substantially damaged structures and end the cycle of flood-rebuild-flood. With matching funds provided by the Illinois Department of Commerce and Community Affairs (DCCA), the City implemented an acquisition project to acquire 100 properties, many of them located in the floodway of the rivers. The acquisition project moved relatively quickly, and within 2 years the City had acquired and demolished most of the properties. The properties are all dedicated to open space, which provides an unobstructed, scenic view of the rivers.

The success of the program was obvious in 1995 when the City experienced flooding at the 100-year level. In previous years, that degree of flooding would have caused extensive damage; but after the 1995 flood, the City continued to function as if the flood was non-existent. There was almost no damage to homes, and flood insurance claims were drastically reduced. The benefits of an open floodplain are clearly evident in a City that has flooding on an almost annual basis.

Since 1993, the City has experienced flooding in 1995, 1996, and 1998 with no significant damage in any of those events. The reuse of the acquired land is beneficial to the City. With its strong tourism base, the City is using some of the acquired property to connect a bicycle trail that begins at Pere Marquette State Park, just to the north of the City, and ends at the City of Alton, to the south.

Quick Facts

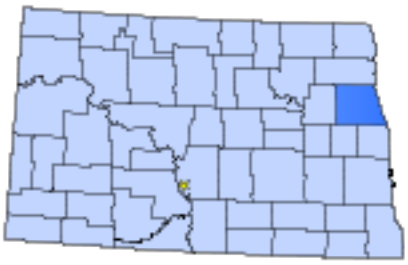
Sector:
Public

Cost:
$4,735,832.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Grand Forks Water Treatment Plant
Water Kept Available With Modifications



Grand Forks County, North Dakota

Grand Forks, ND - The City of Grand Forks experienced a devastating flood in 1997. Structures, personal property, and infrastructure, including the Grand Forks Water Treatment Plant (GFWTP), sustained extensive damage. Once the City's water reserve was depleted, the distribution system depressurized and became contaminated.

The only viable solution was to get the GFWTP back on line to provide water and fire protection to 50,000 residents, various industries, and the U.S. Air Force Base. The GFWTP was producing water 13 days after being inundated, using only emergency repairs. Extensive flushing and testing of the distribution system was necessary to ensure that potable water was in the system.

To limit the effects of future flooding events of similar or greater magnitude, city officials embraced the concept of mitigation and protection planning. With 406 Mitigation funds, the City developed two flood protection plans to provide two levels of protection. The large, flat drainage basin of the Red River Valley, results in a relatively slow, stable rise of the Red River during the spring snow melt, which makes a two-level, flood protection plan feasible.

The first-level plan uses a series of strategically positioned slide gates, valves, and flood shields to protect the plant to the 100-year flood elevation with one foot of freeboard. The second-level plan assumes an extreme 250-year event and provides a ring dike and additional gates to protect the plant.

With Hazard Mitigation Grant Program (HMGP) funds, mitigation of electrical equipment consisted of elevating components or changing to submersible components. The transformers and a primary feed structure were relocated, elevated, and altered. The alterations will allow an inundated transformer to be bypassed, which will prevent the shorting out of the rest of the electrical system.

The equipment mitigation and the two flood protection plans are incorporated into an overall Flood Protection Plan, which will also guide City staff in flood preparedness and response. The GFWTP Flood Protection Plan is an excellent example of flood emergency response, mitigation, and protection planning that will minimize future potential flood impacts.

Quick Facts

Sector:
Public

Cost:
$1,596,725.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Guam Memorial Hospital Mitigation
Hospital Mitigates Against Typhoons

State-wide,
Guam

Guam - The U.S. Territory of Guam is the largest and southern-most island in the Mariana Islands archipelago. Many typhoons form in the western Pacific Ocean and in the past 50 years, more than 25 typhoons have struck the island.

On Dec. 16-17, 1997, Typhoon Paka, noted as one of the most powerful storms of the 20th Century, directly struck the island with sustained winds of 150 miles per hour and gusts to 185 mph. Paka's winds impacted the island for a 12 hours, creating a much-longer-than-usual timeframe for wind, rain, and storm surges to cause damage. The northern and central sections of the island sustained widespread damage to homes, the island's power grid and public utilities, privately owned buildings, and many other structures.

Guam Memorial Hospital (GMH) is the only civilian inpatient facility on the island and the only healthcare facility that remains open during and immediately after typhoons. The hospital becomes the only dialysis unit, lab and source of oxygen. It also provides temporary lodging for expectant mothers.

Typhoon Paka impacted GMH's main building and its service delivery. The exterior oxygen storage facility sustained structural damage. Upper levels of the hospital are accessible by an open stairwell and exterior corridors. Heavy rains and high winds created an extremely dangerous situation making the ability to care for the patients on the upper levels difficult.

Following Typhoon Paka, GMH was awarded HMGP funds to harden the oxygen storage facility and enclose the exterior corridors and stairwells. By replacing the facility's tin roof with concrete and by building concrete walls around the structure, the hospital eliminated the possibility of storm and debris exposure to the facility. The funds were also provided to enclose the exterior corridors on the ground floor and the exterior stairwell in order to provide a safe, protected means of access. The one-time cost of replacing the roof of the oxygen storage facility, replacing the liquid oxygen tank and using portable cylinders until the new tank was put in place was $988,560. The cost of hardening the oxygen storage facility was $51,550. The benefit/cost ratio for this project is 20 to 1.

The expectation is that there will be little or no damage from the next typhoon and thus no further repair or replacement costs. Risk analysis shows the benefit of this work is valued at $4,768,188, a benefit to cost ratio of 2 to 6.

Quick Facts

Sector:
Public

Cost:
$1,919,612.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Gulf Shores NFIP Compliance
Managing Floodplains

Baldwin County, Alabama

Gulf Shores, AL - Alabama's Gulf Shores is a coastal city bordering the Gulf of Mexico. This region is susceptible to the effects of hurricane destruction and periodic flooding. Over the years, population growth and the appeal of coastline dwelling resulted in the development of areas threatened by chronic flood hazards.

In order to help prevent the loss of life and minimize property losses, the City of Gulf Shores implements a flood hazard ordinance. The City actively participates in the National Flood Insurance Program (NFIP). The NFIP makes Federally backed flood insurance available to communities that agree to adopt and enforce floodplain management programs that meet minimum Federal criteria.

The flood ordinance is administered and enforced by the building official of Gulf Shores. Under the ordinance, floodplains are managed and land-use practices are regulated. Flood Insurance Rate Maps (FIRMs) show anticipated flood characteristics and are used to guide construction in flood-hazard areas. New buildings must be elevated according to flood depths specified on these maps. Other provisions specify minimal below base flood elevation enclosures, pile embedments, and breakaway walls. Concrete slabs-on-grade constructed below elevated buildings should be designed as free-standing structural elements. This allows the slab to break up without damaging the building foundation. Slab connections to piles are of particular concern because of the frequent use of at-grade concrete slabs.

The adoption of NFIP building requirements and the practice of elevating flood-prone buildings have reduced the amount of damage incurred during recent hurricanes. Since the implementation of NFIP regulations in 1978, over 1,700 structures in Gulf Shores have been built in compliance with NFIP criteria.

Historical claims Nationwide, comparing buildings constructed according to NFIP standards to those built prior to the adoption of NFIP requirements, show that compliant structures result in fewer claims and the losses experienced tend to be less severe. The average insurance claim pay-out since 1978 in Gulf Shores is approximately $15,000 for structures built to NFIP standards. Structures built prior to the implementation of these standards average $19,000 per claim.

Quick Facts

Sector:
Public

Cost:
$0.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
National Flood Insurance Program (NFIP)

Gulf Shores Public Beach Acquisitions Prevents Further Losses

Baldwin County, Alabama

Baldwin County, AL - Gulf Shores is a coastal area that has experienced flood inundation, erosion, and hurricane hazards. Hurricanes pose a great risk to development along the coast and endanger lives and property with high winds, wave action, and flooding. In 1980, following Hurricane Frederick, several large prime oceanfront lots in the City of Gulf Shores were purchased with Federal funds under the National Flood Insurance Program (NFIP) former Section 1362 Property Acquisition Program.

Under the Property Acquisition Program, FEMA could purchase flood-damaged properties and provide owners with the opportunity to relocate. The community had to accept title to the property and manage it for open space purposes. The property acquired under Section 1362 was previously occupied by commercial establishments. It is currently being used as open space for a public beach.

In 1998, Gulf Shores was subjected to coastal surge and flooding during Hurricane Georges. The absence of businesses along the immediate shoreline in this area resulted in a significant avoidance of damages and the resulting economic losses. The relocation of properties out of this area not only will prevent further suffering and personal losses, but will also reduce future costs for responding to and recovering from flood disasters.

Quick Facts

Sector:
Public

Cost:
$1,068,400.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
National Flood Insurance Program (NFIP)

Hawaii Hurricane Relief Project
Incentive Program Results in Mitigation

State-wide,
Hawaii

Kauai, HI - On September 11, 1992, Hurricane Iniki hit the island of Kauai, Hawaii, with wind speeds exceeding those of Hurricane Iwa (1982) and Dot (1959). Iniki (a category 4 hurricane) was the strongest and most destructive hurricane to hit the Hawaiian Islands in recorded history. The total economic impact to Kauai and the state exceeded $2 billion. About 80% of Kauai operated without electricity for two weeks after the event.

Approximately one fifth of the 20,000 homes on Kauai sustained major damage or were destroyed. Most hotels, government and commercial buildings sustained damage. Insured losses reached $1.6 billion. As a result of the catastrophic losses from Iniki, many insurance companies did not have financial reserves to adequately cover their policyholders. This resulted in a decision by insurers to stop offering homeowners policies and forced 40,000 policyholders statewide to purchase expensive insurance policies.

In response to this crisis, the Hawaii Hurricane Relief Fund (HHRF) was created by the state legislature in 1993 as a temporary measure to provide hurricane insurance for homeowners in Hawaii. In 1996, the HHRF created and implemented a hazard mitigation program that encourages homeowners to strengthen their homes against hurricanes by offering incentives in the form of reduced premiums. The program also recognizes superior construction that meets or exceeds wind speed requirements of current building codes. A comparison study of government operated property insurance providers indicated that the HHRF rated second behind the National Flood Insurance Program for coverage and mitigation activities.

Other programs, such as the State Hazard Mitigation Forum and Project Blue Sky, were developed in Hawaii for hazard mitigation. Project Blue Sky, an awareness program, is a coalition of businesses that sell mitigation products at a discount and offer workshops to teach people how to strengthen their buildings. Due to increasing awareness, new building codes have been adopted for wind resistance. New businesses have been created to develop and install mitigation products such as storm shutters, anchoring/cable systems, and other hardware designed to strengthen structural extensions.

The increased cost of construction and the additional costs of retrofitting are a small payment if, after an event, the losses are substantially reduced. Insurance company projections indicate that installing storm shutters alone would reduce insured losses by 50%. Following Iniki, the HHRF hazard program has been instrumental in motivating policyholders to strengthen their homes.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Historic Home Retrofit
Preventing Earthquake Damage

Kitsap County, Washington

Poulsbo, WA - In late 1998, Doris Chapot purchased a two-story Cape Cod-style home built in 1902. For years it served as the First Lutheran Church parsonage. In 1940, the parsonage was moved to its present location. It was set on posts and concrete pier blocks, but nothing more was done to ensure its safety from earthquake damage.

At the time of purchase, a building inspector suggested that Chapot have an earthquake retrofit done to ensure positive connections among beams, posts, and pier blocks. Forty piers were braced with a gusset system that included a two-foot, triangle-shaped plywood tying the posts to the concrete pier. All of the posts around the perimeter were tied together in the front and the back with 2-foot by 6-foot posts, and nails were strategically placed. Because pier blocks were different shapes, bendable metal connections were used for attaching the posts.

The retrofit project was completed on February 26, 2001. On February 28, a large 6.8 magnitude earthquake, with the epicenter located in the Nisqually Basin in western Washington State, caused an estimated $2 billion in damages. Movement was felt as far north as Vancouver, British Columbia, and as far west as Salt Lake City, Utah. Chapot was on the second floor during the earthquake. "I've been through many earthquakes during my lifetime and the house rode beautifully." After a careful inspection under the house, no damage was detected. "Not one thing in the house fell or broke! It feels so good to be safe!"

Quick Facts

Sector:
Private

Cost:
$3,312.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Private funds

FEMA

Historic Island Mitigation
Finding Up Is the Best Way

Dare County,
North Carolina

Dare County, NC - All along the North Carolina coast, individual homeowners and whole communities have increasingly realized the persistent threat to life and property posed by major storms and hurricanes. North Carolina's Outer Banks, a thin line of barrier islands 25 miles or more from the mainland in places, began to be built up as never before. Then as major storms began to roll in, they saw the forces of both the ocean on one side and Pamlico and Albemarle sounds on the other.

Mickey and Linda Daniels have lived in their Wanchese home for 32 years on Roanoke Island, was flooded in the "Storm of the Century" in March 1993. Every year after that, the arrival of hurricane season would make Mickey acutely aware of the weather reports.

Not far away, Boyd and June Basnight had 13 inches of floodwater surge through their house during the 1993 storm, damaging or destroying all in its path. In the following years, an approaching storm would send the couple into a frantic scramble to raise furniture onto blocks and boxes.

Some 15 miles north in Kitty Hawk, Lou and Helen Hoppe lived in a large and stately historic home built in the 1890s. But after the "Storm of the Century," and then Hurricane Fran in 1996, they were ready to move out of the area. "I don't care if you get two inches or three feet, it's a mess," Lou says. "If you've ever been flooded once, it's something you never want to go through again."

After Hurricane Bonnie hit in 1998, Dare County was ready to participate in a mitigation project for the first time. Jenny Gray Jones, a seventh-generation resident of the Outer Banks and project manager for the county's hurricane recovery mitigation projects, recalls that 400 families showed up for a town meeting on an elevation project and 300 applied for the project. The process eventually winnowed the 10 that would get the $719,000 in funding, which was split between FEMA (75 percent) and the state of North Carolina (25 percent). The project took some time to get the required engineering drawings and hire contractors that were often booked up to two years in advance. But the homes were elevated before Hurricane Isabel struck in September 2003.

During the elevation of Mickey and Linda Daniels' home, they lived in a church trailer for more than 3 months. The temporary inconvenience proved worthwhile. When Isabel roared through the town, the storm surge covered their yard, and the garage took five inches of floodwater. But the house stayed high and dry. "I'm not under pressure as I was before," Mickey says. "I don't have that sense of dread that the water will come in."

The Basnights also found Hurricane Isabel less threatening to their property. Floodwaters entered their yard-but not their home. "I didn't have to find someone to move my furniture up in the air," recalls Boyd Basnight.

The Hoppes, too, found their home was indeed above the reach of Isabel's floodwaters. "We don't have to worry any more about being flooded," Lou Hoppes says.

Quick Facts

Sector:
Public

Cost:
$719,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Risk Reduction Measures Pay Off Upgrading Historic Railroad

New Castle County, Delaware

Wilmington, DE – After 1999's Hurricane Floyd destroyed two trestles and damaged several others, the Wilmington and Western Railroad (W&WRR) decided to upgrade the lost trestles with steel instead of going back to wood. "Dollar for dollar, it made no sense to go back to wood," says David Ludlow, Executive Director of the 130-year old W&WRR.

Later that same year, On Sept. 15th, catastrophic flooding along Red Clay Creek swept over the rebuilt section nicknamed "Ludlow Bridge." Although water eventually completely covered the new trestle, it survived and sustained virtually no damage," said Ludlow.

But six of the railroad's original wood trestles were destroyed. The W&WRR sustained nearly $6 million in damage from the mid-Sept. 2003 flash flooding, more than twice the cost of damage from Hurricane Floyd.

Based on the success of the newer steel design, the lost trestles will be rebuilt to allow a higher floodwater capacity. Because of the increased strength of steel compared to wood, fewer supports, or "bents," are needed under each trestle to permit more water to pass and fewer debris jams. To retain the historical character of the original wooden trestles, CORTEN steel is used for the substructure and girders, and finished with a protective rust patina.

Besides structural repairs, the W&WRR is strengthening its track embankments along the stream channels, too, to minimize the erosive effects of floodwaters. After Hurricane Floyd, there were several areas where quarry rock was placed for bank protection; those areas resisted scouring during the recent floods. Based on the success of these sites, further bank protection measures are underway.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Environmental/Historical Preservation

History Not Repeated at State Park
Elevation Protects Cabins From Damage

Baldwin County, Alabama

Gulf Shores, AL - Park Superintendent Hugh Branyon remembers the horrible aftermath Hurricane Frederic had on the Gulf State Park lakeside cabins in 1979. All the cabins were destroyed leaving only their chimneys behind. During Hurricane Ivan on Sept. 16, 2004, however, the rebuilt cabins did not repeat history. Only one of the 17 cabins was destroyed. The drastic difference was the result of the cabins being elevated above tidal surge and flood levels.

After Hurricane Frederic, the cabins were rebuilt to the same size along Lake Shelby with Federal assistance. However, this time they were elevated over 12 feet instead of the previous 3 feet.

Hurricane Ivan struck the Gulf State Park on Sept. 15, 2004, with winds over 120 miles per hour and a tidal surge over nine feet. Beyond minor roof damage and one damaged AC unit, 16 of the 17 cabins escaped significant damages. High water marks at Cabin 6 indicated the water had reached 10.5 feet. If the cabins had not been elevated over 12 feet, they would have been catastrophically damaged by the floodwaters. The estimated replacement cost for each cabin is over $150,000.

The survival of the cabins is significant beyond the reduced damage costs to the park and State of Alabama. The cabins are a popular park attraction, which generate year-round revenue from the cabin rentals to support the park and provide employment for eight staff members. Because the cabins had only limited damage, rental operations are expected to resume approximately eight weeks after Hurricane Ivan. A remarkable reduction compared to the three years the cabins were not available for rental while being rebuilt after Hurricane Frederic.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Home Earthquake Retrofit Program
Keeping Homes and Neighborhoods Secure

King County, Washington

Seattle, WA – The Phinney Neighborhood Association (PNA) is a very proactive community group located in the City of Seattle. For many years the organization has sponsored programs and activities that have built a strong sense of community.

Following the Loma Prieta earthquake of 1989, program director Roger Faris and members of the PNA realized that the earthquake hazard they faced in Seattle was as great as that in California. They decided to incorporate an earthquake safety program into the existing Well Home Program. In 1998, the City of Seattle was selected as one of the sites to receive disaster mitigation funds under the Project Impact initiative. The funding was used to develop the "Home Retrofit Program," a comprehensive program to reinforce a typical Pacific Northwest home's ability to withstand earthquake movement.

Home Retrofit Program is a partnership between Seattle's Department of Design, Construction and Land Use, the University of Washington, PNA, Washington Mutual, Bank of America, and the Office of Housing. Each partner has contributed critical elements which make the program successful for the average homeowner. Specific items include plans for home retrofit projects; streamlined processes for obtaining building permits; professional training for builders and contractors; special retrofit loan products; grants for low-to moderate-income homeowners; and a tool lending library. The program is offered as a training workshop and scheduled through PNA.

A unique feature of the program is the tool lending library. "Half of doing any job well is having the right tool," states Faris. PNA members can borrow tools for a modest weekly tool maintenance fee, and in some cases, at no cost. Having the right tools readily available for homeowners' use provides additional incentive for retrofitting homes.

When the Nisqually Earthquake struck the Seattle area in February of 2001, the Phinney neighborhood experienced severe shaking. Following the quake, Faris received many phone calls from “graduates” stating how secure they felt because they had retrofitted their homes.

Previous earthquake damages have resulted in an average cost for home repair of $30,000, plus the cost of a licensed contractor at about $3,000. Homeowners' cost to do the work themselves averages $1,000.

The Home Earthquake Retrofit Program offers the following benefits: safer homes to protect lives and property; lower repair costs; less damage to utility connections, which reduces fire hazard; availability of home retrofit loans; and an greater opportunity to obtain earthquake insurance.

Quick Facts

Sector:
Private

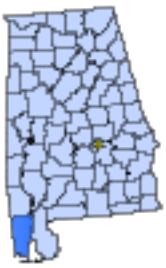
Cost:
$1,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Homeowner

FEMA

Home Elevation Pays Off
Dauphin Island, AL



Mobile County, Alabama

Dauphin Island, AL - By going beyond the required elevation for their home, Beth and Stan Houston were spared flood damages from Hurricane Ivan. Their home is located on Dauphin Island, a narrow barrier island south of Mobile. Hurricane Ivan, a Category 3 hurricane with 130 mph winds, made landfall on Sept. 15, 2004, and battered areas like Dauphin Island with five to 12 feet of tidal surge and up to 15 inches of rain.

Dauphin Island's floodplain management ordinance requires homes to be elevated one foot above the Base Flood Elevation, as identified in the community's National Flood Insurance Program (NFIP) Flood Insurance Rate Map. Rather than building their home to the minimum required elevation, the Houston Family chose to elevate their home 12 feet. It was a good decision. Floodwaters reached approximately five feet in their neighborhood yet no water reached their home. Since flood insurance premiums are based upon risk and the elevation of the structure, their flood insurance rates are lower than the rates of less elevated or non-elevated homes in their neighborhood.

The Houston Family also receives a 10-percent discount on their flood insurance premium through the Town of Dauphin Island's participation in the NFIP's Community Rating System (CRS). The discounted premium is based on floodplain management activities administered by Dauphin Island that exceed the minimum NFIP requirements. Those communities may receive discounts of five to 45 percent on flood insurance premiums throughout their jurisdiction based on their CRS Class Rating.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Floodplain Management

Primary Funding:
Community Rating System (CRS)

FEMA

Home Elevation Proved Successful After Tropical Storm Isabel

Dorchester County, Maryland

Hoopers Island, MD - Ray and Caroline Warehime bought their waterfront property in the early 1990s with the plan of building a home for relaxation and future retirement. As they spent more time on the property and began to develop their building plans, they became acquainted with Nick Lyons, the Building Codes Administrator for Dorchester County. Through Lyons, they learned about the hazards that the location was at high risk for, notably hurricanes and flood. As a result, they made the informed decision to build to FEMA hurricane standards.

Building of the house began in 1993 and was completed in 1998. Ray Warehime designed the building, and together with Lyons monitored the building process step by step to insure that recommended codes and standards were incorporated correctly. The footer was sunk into the ground and the building was elevated 4 feet up (six cinderblocks above ground) above the base flood elevation (BFE). The foundation is bolted to the footer, threaded rods are through each block, fastened to steel plates, fastened to studs and the roof trusses secured with hurricane ties and clips. Warehime chose to use plywood for the siding rather than particleboard. The siding is nailed every twelve inches, which creates a stronger resistance to wind and pressure. Additionally, the roof is strapped to the foundation at all corners.

When the hurricane watch and warnings were issued, the Warehimes, whose primary residence is in Taneytown, Maryland, came down to the island only to tape the windows and secure exterior items. They returned to Taneytown with the peace of mind that their home was structurally prepared to withstand the upcoming hurricane.

When they returned to Hoopers Island after the storm, their home was high and dry. The ground-level garage sustained minor damage with the low panels on the garage doors ruptured, allowing some floodwater to enter. The Warehime's neighbors were not as lucky as they describe, "The home next door had water above the radiators and 8 to 12 inches of water in the living quarters, on the other side, they had little to no water; the fourth house down flooded; half a mile away, a house is off the foundation. Hurricane Isabel (2003) deposited 12 inches of new sand out there, and moved about a ton of gravel from the driveway to the end of the garage. We built up, so we didn't have any damage. The flowerbed and walk washed out, we lost the food after the power went out. But we didn't have any damage."

The cost of building was approximately $150,000 in 1993. In 2003, their home is valued at approximately $300,000. Although the cost of incorporating mitigation measures into the cost of building materials was not documented separately, Warehime is convinced that damages, which would have been incurred as a result of Hurricane Isabel, would have exceeded the initial expense. "Isabel taught me a good lesson," states Warehime. "The glass in the windows is tested to withstand 110 miles per hour winds but will not withstand projectiles. I am now having custom built plywood covers made for the windows. We will have them readily available to install during a hurricane watch."

Quick Facts

Sector:
Private

Cost:
$150,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

FEMA

Home Elevation Works
Property Owner Takes No Chances

Skagit County, WA - When Mischke built his rental home a year ago he elevated it a little higher than County regulations demanded. So when the October 20 and 21 flooding came to Skagit County, the home was a safe 5 feet above the floodwaters.

Acting as a general contractor, Mischke elevated his house as County regulations instructed. The 100-year flood level is gauged at 43 feet, and the County insists that new homes be elevated to 44 feet, one foot above flood stage.

Mischke took no chances; he elevated his house 45 feet. And it was a good investment. “My renter has a dry home, and my rental income is uninterrupted,” he said. “Elevation worked as advertised.”

His renter was displaced for a couple of days, but there were no property losses associated with the flood. “Just a little washing after the water receded,” Mischke said. “I’m delighted, and so is my renter.” By going an extra foot, Mischke saved his investment and his renter’s roof.

Skagit County, Washington

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Home Retrofits in Allegany
Volunteers Assist the Less Fortunate

Allegany County, Maryland

Allegany County, MD - NAILS is a program to repair and improve the homes of needy homeowners. Hazard mitigation projects for victims of disaster receive priority consideration. Given the restricted amount of alternative housing available to potentially displaced homeowners, a concept of repairing, floodproofing, and improving local homes was initiated by the First Presbyterian Church of Cumberland, Md., in the aftermath of the 1996 floods. The First Presbyterian Church founded NAILS to directly serve the community as an affirmation of their faith and as a way for the entire community to work together for the greatest good.

NAILS volunteers are from local churches, synagogues, non-profit organizations and from outside work camps and are supplemented by skilled contractors for jobs too dangerous for volunteer labor or when mandated by local building codes.

A separate Memorandum of Agreement was initiated between Allegany County and NAILS to define the breath and scope of the contemplated work with dollar ceilings established unless pre-approved by the entire committee. In addition to the program's public notification campaign, various data bases (County Housing Authority, Public Welfare Office, Emergency Management Agency's 911 information) and information from the Flood Repair Advice Team were consolidated to obtain potential clients.

To date, 18 properties have been identified to participate. Eight homes have been retrofitted with the limited floodproofing endeavors. Inasmuch as the majority of efforts entail furnace elevations and relocating electrical panels, the work has been suspended during the winter months to avoid disrupting or inconveniencing the household.

Allegany County believes the projects completed to date and those pending will aid significantly to the protection of homes and their contents in future flooding events.

Although initially concentrating on flood-prone homes, the project will also consider high -wind damage caused by localized tornadoes (1997 in Frostburg, Maryland, for example) as a viable retrofit endeavor. Countless volunteer hours have already been expended and that will increase this spring when the program continues.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$100,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Hood House Floodproofing Project
Upgrading an Historic Building

Strafford County,
New Hampshire

Durham, NH - In October of 1996 the Hood House on the campus of the University of New Hampshire (UNH) at Durham flooded, causing $11,848 in damages. Damages were held to a minimum because of the swift action of the University Building and Grounds personnel. If the event occurred during off hours potential for damage would have exceeded $118,000. In addition, there have been numerous minor flooding incidents at the facility.

The floodproofing project consisted of upgrading a perimeter footing and rain leader drainage system around the building. Previously, a clay tile drainage system in place did not have the proper capacity to carry ground water due to a storm event away from the perimeter of the foundation and basement areas. FEMA Region I partnered with the State of New Hampshire, Local Contractors, UNH Building and Grounds personnel, professors and students to complete the project. The Hood House (which is listed the National Register of Historic Places) is now floodproofed and re-landscaped.

The project was complete in September 1998 and has survived rains and storm events which in the past would have caused flooding. The appurtenant landscaping that was designed by University professors and completed by University students has enhanced the features of this historic structure.

Quick Facts

Sector:
Public

Cost:
$87,600.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Local Sources

Hurricane House Passes the Test
Withstood Hurricane Frances

Saint Lucie County, Florida

Fort Pierce, FL - Hurricane Frances struck Florida's east coast September 5, 2004, with winds up to 115 mph. Many homes in the Fort Pierce area sustained moderate to severe damage, but the "Hurricane House" training center was hardly scratched.

The Fort Pierce "Hurricane House" is officially known as the St. Lucie Windstorm Education Center. The 3,000 square foot facility is one of four Regional Windstorm Damage Mitigation Centers established by Florida's Department of Community Affairs and Department of Insurance as part of a $2.3 million Residential Construction Mitigation Program launched in 1997.

The demonstration and training facility had been built to meet or exceed building codes enacted 2 years ago. As a result, only a segment of fascia was bent by windborne debris. From anywhere in Florida, at least one of the centers is within a two-hour drive. In addition to the Ft. Pierce location, centers are found in Pensacola, St Augustine, and Ft. Lauderdale (under construction).

The Hurricane House contains publications, exhibits, displays and a classroom for training and seminars. Class topics include mitigation, environmental issues, energy conservation, wind resistant construction, new building materials, and high-tech construction techniques.

For illustration purposes, portions of the walls and ceiling have been cut away and shielded by plastic, so components can be examined. When new products are brought in for evaluation, they are sometimes incorporated into the building, replacing older components. So whether a visitor is a professional builder, an inspector or a homeowner wanting to learn about latest innovations, he or she can do an examination of up-to-date high-wind construction materials and techniques.

The structures are also models for energy efficient building materials. For example, a homeowner, building with the exhibited Insulated Concrete Form System (ICF) filled with concrete, creates a structure with high insulation value walls that produce a more energy-efficient structure. Windows are also double pane, gas filled, and wind rated to 130 miles per hour. These and other materials can be used in new construction or for retrofitting existing homes. Compared to homes built using conventional materials and methods, savings of 30 to 50 percent on energy consumption have been reported.

Quick Facts

Sector:
Public

Cost:
$2,300,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
State sources

FEMA

Kinston-Lenoir Floodplain
Repetitive Flooding Leads to Planning

Lenoir County,
North Carolina

Kinston, NC - Approximately 75 percent of the homes in Kinston-Lenoir County's floodplain have experienced repeated flooding following Hurricanes Fran (1996), Dennis (1999), and Floyd (1999). Many of these homes sustained substantial damage. The community was devastated, both physically and economically.

The City of Kinston and Lenoir County made a commitment to proactively reduce flood risks by integrating floodplain management planning into their community development efforts. Using Geographical Information Systems (GIS), local officials developed databases and tracking functions to more effectively coordinate floodplain management and community development. Officials use the GIS tools to predict the impacts of various disaster scenarios, identify vulnerable structures, and track the progress of property acquisitions.

The project also provides useful information to facilitate disaster response and recovery. Through the Hazard Mitigation Grant Program (HMGP) and State support, more than 1,000 properties in the floodplain have already been acquired by the City and County. There are still plans to purchase approximately 225 more. The residents who were relocated were allowed to move as neighborhoods in order to preserve their social networks, school districts, and overall community spirit.

Ninety-seven percent of the homeowners whose properties have been purchased have elected to stay in Kinston. This effort resulted in a minimal disruption to the community's tax base. In addition, new partnerships have been built. A Green Infrastructure plan has been developed in the floodplain to minimize future damage and improve the quality of life. The Greenway will include historical tourist attractions, educational areas, and recreation facilities.

Quick Facts

Sector:
Public

Cost:
$40,000,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Automated Controls in Coral Gables Installation Leads to Effectiveness

Miami-Dade County, Florida

Coral Gables, FL - The metropolitan areas of Southeast Florida were carved almost entirely out of the Everglades. During the early stages of development, the land was frequently inundated with water for long periods of time due to the flat topography, low land elevations, and the high groundwater table in the Biscayne Aquifer. To make the land suitable for habitation, government and private entities constructed a canal system. However, the excavation of the canal system exposed the Biscayne Aquifer, the area's primary source of drinking water, to saltwater intrusion. In order to stem the flow of salt water into the Biscayne Aquifer, salinity control and flood control gates were constructed at the mouths of both secondary and primary canals throughout.

Today, the canal system in Miami-Dade County is a network of approximately 620 miles laid out in an approximate 1- to 2-mile wide grid. The gravity-driven canal system is divided into 360 miles of primary canals and 260 miles of smaller secondary canals. The ability to move water in the secondary system depends on the available capacity in the primary system, which, in turn, is depends on the proper operation of the salinity control and flood control gates.

In the past, one of the Coral Gables Canal's gates had to be opened manually. An operator from the city would be sent to physically open and close the gate as conditions warranted. The gate was difficult and unsafe to operate during hazardous weather conditions; operators were exposed to high winds, lightning, and dangerous road conditions. Furthermore, proper operation of the gate depended on knowing water levels upstream of the gate. Improper operation resulted in frequent flooding in downtown Coral Gables during high rainfall events. Therefore, the city decided to install an automated system that would monitor upstream water levels and open and close the gate safely and more effectively.

The effectiveness of the project was demonstrated by comparing the gate's performance with manual operation in the previous rainfall events before the automated system was in place. The result was significant flooding in downtown Coral Gables in 1977, 1985, 1991, 1995, and 1999—five times in a 25 year period. All of the five flooding events were caused by less than 12 inches of rain in a 24-hour period. In 1977 and 1991, downtown Coral Gables was forced to pump standing water for two weeks after the flood, directly attributable to the difficulty in opening the gates.

During the October 2000 floods there was no flooding in downtown Coral Gables even though the city received 16 inches of rain in 15 hours, about twice as much as previous events that caused widespread flooding downtown. Local officials attributed the success to the performance of the new automated gate control system. To date, 11,638 residents of the basin have benefited from the project.

Quick Facts

Sector:
Public

Cost:
$83,444.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Pancake Restaurant Elevates
Restaurant Elevates out of FloodPlain

Placer County, California

Roseville, CA –The City of Roseville experienced repetitive flooding in 1986, 1995, and 1997 from several small creeks. Damage from the 1986 floods was extensive and severe. After witnessing the effects of this flood event, one of the local business owners embarked on a significant mitigation project to protect his business property and to meet the National Flood Insurance Program (NFIP) requirements to raise the finished floor above the base flood elevation in a floodplain.

A new construction project, the International House of Pancakes (IHOP), was planned for a piece of property situated between two creeks in the City of Roseville. The owner had the property for 20 years and knew it was in the floodplain. A market analysis indicated that property values in the area for business were high and rather than convert the site to a park or unoccupied space, the owner decided to build 4 feet above the base flood elevation level. The restaurant was constructed over parking garage space and the generators were elevated 6 feet.

Elevation of the IHOP restaurant has resulted in several benefits to the daily business. The business is more visible and therefore attracts customers. The parking garage is valuable and will become more so over time. The elevation gives the building owner peace of mind. In his words, "There is an initial price to pay but in the long term, when the potential catastrophic effects are looked at, it is a sound investment. The most important consideration is safety, then economics."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Business Owner

Isabella Stewart Gardner Museum Flood Mitigation Keeps Building Dry

Suffolk County, Massachusetts

Boston, MA - The Isabella Stewart Gardner Museum was inundated by flood waters and sewage in October of 1996 causing damage to their basement areas; in particular, the ventilation/air-handling system. In addition to heating and cooling the building, the system keeps the museum and its permanent collection of art works at constant humidity levels. This system preserves the collection worth hundreds of million if not billions of dollars. The building itself is on the National Registry of Historic Places and is considered a National treasure.

As repairs were made to the building the museum staff worked with FEMA Region I, the Massachusetts Emergency Management Agency, members of the US senate, engineers, archeologist, and historic architects to develop a flood mitigation project. The museum installed four sumps and pumps in strategic areas in the basement of the building. During a flooding event the sumps fill and the pumps eject floodwaters into the city's storm drains or directly on the street in the event the storm drains have surcharged. The system is equipped with an emergency generator in the event of a power failure.

In June 1998 the area flooded again. The museum was dry. This project has saved at least $200,000 in avoided damages from the June 1998 flood alone. In addition, the project has demonstrated to the museum's neighbors the benefits of mitigation. One neighbor, The Museum of Fine Arts, which was flooded in the October 1996 and June 1998 events, has now taken on an aggressive mitigation strategy to prevent future damage.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$135,898.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Jefferson Parish Elevation Pilot Project Involves Demolition

Jefferson Parish, Louisiana

Jefferson Parish, LA - Within Jefferson Parish, flooding may occur during any season of the year. Jefferson Parish is bordered by Lake Pontchatrain to the north and the Gulf of Mexico to the south. The principle sources of flooding are rainfall ponding and levee overtopping and hurricane or tropical storm surges originating in the Gulf of Mexico from Lake Pontchatrain on the east bank and Lake Salvador and Cataouatche on the west bank. A total of 5,509 structures in Jefferson Parish are on the National Flood Insurance Program repetitive loss list.

Floodwaters drain into a system of structures and canals, which outflow to pumping stations. But these pumping stations have been inadequate in capacity to handle the volume of floodwaters reaching the stations and have operated at less than full capacity during floods.

The pilot project involves the demolition, rebuilding, or "alternative elevation" of six structures on the target repetitive loss list. The structures will be demolished and rebuilt above the base flood elevation. Benefit/Cost analyses were conducted on the structures so the project cost does not exceed the cost of an elevation project. The process began by identifying repetitive loss structures, which met certain criteria provided by FEMA. Homeowners identified were provided with a letter from the Parish president requesting that the parish be allowed to complete a fair market appraisal on their repetitive loss structure. This appraisal would be provided to FEMA for evaluation of an alternative mitigation program pilot project. Portfolios were established which included specific structure information, flood loss history, flood insurance information, and a picture of the property to complete the process. Some of the criteria associated with this grant include that the homes will be built with a two foot freeboard, and that the current homeowner retains the title throughout the life of the project implementation.

Damages to all six structures since 1978 are documented to be more than $400,000. At this rate the total damages over the next 50 years would be estimated at greater than $820,000. The total cost of this project is estimated to be $400,000.

Quick Facts

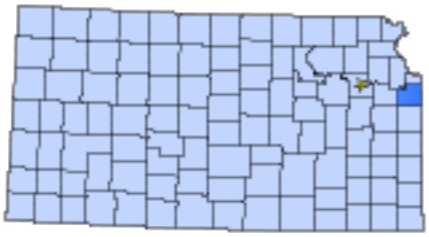
Sector:
Public

Cost:
$400,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Local Sources

Johnson County Acquisition Removing Families From Harm



Johnson County, Kansas

Merriam, KS - Located in Eastern Kansas, just south of Kansas City, Johnson County is one of the more populated counties in the State and has flooding and flash flooding problems from Turkey Creek, Indian Creek, Rock Creek, and Brush Creek. The county has been actively working to alleviate the dangers associated with flooding and to provide protection for their citizens and reduce property losses. Johnson County applied for grant funds to assist the City of Merriam in removing families from the 100-year floodplain.

The City of Merriam has experienced serious flooding from Turkey Creek in 1914, 1935, 1958, 1961, 1977, 1983, and 1993. In 1977 the damages that occurred along Turkey Creek totaled $8.3 million. During the July 10, 1993, flooding event up to 10 inches of rain fell over the Metropolitan area. Overall damages to residences and businesses in the Merriam area was $3.3 million.

Johnson County received funding from FEMA's Hazard Mitigation Grant Program (HMGP) and the Housing and Urban Development's (HUD) Community Development Block Grant (CDBG) program to acquire four residential structures and one vacant lot. The county transferred the acquired properties along Turkey Creek to the City of Merriam. All of the structures were demolished and cleared; the land was returned to open space.

This project has been quite an achievement for Johnson County and the City of Merriam by removing families from harm's way. During the most recent flooding event in 1998, the acquired structures would have been inundated by an average of 4 to 6 feet of water and sustained an estimated $110,500 in structural damages. This does not include the financial costs of warning, rescue, evacuation, temporary housing, or loss of personal property.

Quick Facts

Sector:
Public

Cost:
$352,153.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Kaiser Permanente Health Care Seismic Retrofit

State-wide, California

Oakland, CA - When the Loma Prieta earthquake struck the San Francisco Bay area in 1989, Kaiser Permanente, a health-care organization founded in 1948, experienced damage to its administrative building in Oakland, which was evacuated and closed, and to its Santa Clara Medical Center, where the chiller and cooling towers were moved off their supports.

Following that event, in 1990, the Kaiser Permanente system began an aggressive seismic mitigation program. The first phase was to upgrade the structural status of its medical and administrative buildings. Kaiser hired two structural engineering firms to conduct thorough reviews of its 28 major medical centers and approximately 300 medical and administrative buildings in California. Building performance standards for operations were then developed for all the buildings. The standards established were 1) all acute care hospital buildings would remain in service following a major earthquake and 2) all other buildings would protect occupants from serious injury or death but might not be operational immediately following a major earthquake.

Next, Kaiser began funding work to either seismically retrofit its existing hospitals and buildings to these standards, to replace buildings that are too expensive or outdated to repair and to vacate buildings that are no longer useful.

Non-structural mitigation including anchoring all major furniture, building and medical equipment has been mostly completed in Kaiser's buildings. Kaiser has also established an aggressive employee emergency preparedness program including funding for an amateur radio network that would link the company's facilities in northern and southern California.

Kaiser has started seismic mitigation work on many of its hospitals. Seismic improvements for this hospital include excavating under hospital buildings to reinforce foundations and joints, adding steel reinforced weight bearing walls to the hospital's exterior to function as shear walls and transfer drag stress, thus keeping stress off floor members of old hospital wings. Mitigation also includes strapping air dampers and ceiling light fixtures.

Kaiser’s goal is to have all of its hospitals to be able to continue in service after earthquakes by 2008 and meet the functionality standard 22 years in advance of requirements set by California Senate Bill 1953. Extensive seismic retrofitting or replacement of hospitals by 2030 will be required.

Quick Facts

Sector:
Private

Cost:
$2,000,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Business Owner

Kampsville Acquisition
A Solution that Benefits Community

Calhoun County, Illinois

Kampsville, IL - As a small tourist-based community in west central Illinois, the Village of Kampsville is located about 15 miles north of the confluence of the Illinois and Mississippi rivers and is along the Meeting of the Great Rivers National Scenic Byway designated in 1999. The location of the Village, confined between the Illinois River and its forested bluffs, makes it extremely flood-prone. Prior to the Great Flood of 1993, the Village had experienced repetitive flooding, with severe damage in 1973. The 1993 flood inundated almost the entire Village for months, causing substantial damage to over a dozen buildings.

Following the 1973 flood, which was then the worst on record, the Village received a grant from FEMA and the Illinois Department of Natural Resources (then IDOT now IDNR) to acquire flood damaged structures. The Village acquired 34 structures using FEMA, IDNR, and Illinois Department of Commerce and Community Affairs funds. This initial acquisition cleared much of the repetitive flood areas in the Village by acquiring structures located in the lowest portion of the floodplain.

Following the 1993 flood, the Village utilized FEMA's Hazard Mitigation Grant Program (HMGP) to acquire damaged structures that were not acquired in the 1973 buyout. With matching funds provided by the Illinois Department of Commerce and Community Affairs, the Village acquired an additional 13 properties, now all dedicated to open space. The Village also received funding to develop a Hazard Mitigation Plan to address all hazards in the area. This plan was updated following the 1993 buyout.

The success of the buyout program was obvious during the 1993 flood: a significant reduction in damage to homes. Although several structures had flooded, the severity of the damage seen in 1973 would have been repeated and greatly intensified had there not been a buyout project implemented.

The benefits of an open floodplain were clearly evident in this Village which experiences repetitive flooding. The benefits influenced other communities and organizations as well. The mayor encouraged nearby communities to implement a buyout, saying that although it was the hardest thing, it was the best thing the Village had done. The American Red Cross was also able to direct its private contributions to other needy sources instead of the flooding damages. The reuse of the land has also been beneficial to the Village serving tourists with a campground in one area of the buyout with gravel pads and an unobstructed view of the Illinois River.

Quick Facts

Sector:
Public

Cost:
$269,325.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Kramer Motors
Rebuilding After an Earthquake

Los Angeles County, California

Santa Monica, CA - Kramer Motors has been in business in Santa Monica for 40 years. The business originally had six facilities in the Santa Monica area. The Northridge earthquake that shook southern California early on the morning of Jan. 17, 1994, damaged all six facilities. The roof of the auto agency's showroom on Santa Monica Boulevard caved in on a dozen sports cars. One building was destroyed and was not replaced. That site was turned into a parking lot. Three of the other buildings sustained major damage and the other two received minor damage, according to the owner, Robert Kramer.

Repair and reinforcement to all five buildings was required to bring them up to current code. There was also the loss of business for six months at one location. Other locations were reopened more quickly, with work done around damage until it was repaired and mitigated. In retrospect, Kramer said he might have torn down one of the buildings that sustained major damage but didn't do so because he was caught up in the emotion of the moment immediately following the earthquake.

Following the earthquake, the company initiated a mitigation program. The five remaining buildings of Kramer Motors needed repair, one requiring substantial work to bring it up to code. Structural reinforcement and retrofitting of all of the buildings consisted of tie-downs, columns and steel reinforcements. Consideration is being given to applying protective film to the auto show room windows.

Cost of repairs and mitigation was $1.5 million. Repairs were financed by a 20-year, 4 percent low-interest, $1.4 million loan from the U. S. Small Business Administration.

Kramer said the current value of the five buildings is $20 million. Thus the value of protecting fixed assets of Kramer Motors and the potential for reducing business loss in the event of another earthquake exceeds the cost of the repair/renovation/mitigation project by at least 4 to 1.

Quick Facts

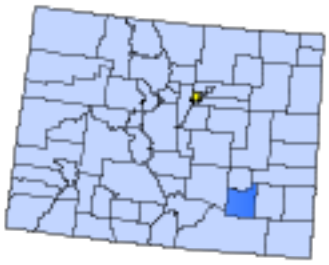
Sector:
Private

Cost:
$1,500,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Local Sources

La Junta Salvage Yard
Acquisition to Clear the Floodplain



Otero County, Colorado

La Junta, CO - The City of La Junta's salvage yard had been in operation since the late 1960s and had become a blight within the community. The property was under water whenever there was high water in the Arkansas River. The owner felt that the problem was going to get worse in the future.

The City's objective for the acquisition project was to clear the floodplain of structures and/or flood proof the existing commercial structures to minimize the flood damages. The fear was that the next flood would wash debris into the properties and then into the Arkansas River Bridge downstream.

Five months after the salvage yard was cleared, a 50-year flood event occurred. The project prevented approximately $500,000 in damages to the Arkansas River Bridge and downstream properties.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$106,591.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

Lazybrook Acres Development
A Community Decides on Acquisition

Wyoming County, Pennsylvania

Wyoming County, PA - The Lazy Brook development was constructed in the late 1960s and early 1970s on farm land along the Tunkhannock Creek. The 89 homes in the development had experienced flooding seven times since 1976. In 1996, 69 of the 89 homes had water levels in their lowest floors ranging from 1 to 8 feet. These homes also experienced failure of the septic systems; contamination from fuel oil; and 8 homes were isolated by a drainage channel after losing their access bridge. Three months after the disaster, only 10 families were able to live in their homes.

On January 24, 1996, a town meeting was held to review options for the community. With a long history of flooding and the latest flooding still fresh on their minds, the residents of the community expressed a strong desire to have their homes acquired. Hazard Mitigation Grant Program (HMGP) funds, along with State and local government funds, enabled the community to relocate one home and acquire 75 homes.

The National Park Service played a key role in the coordination and development of the land-use plan for the area. The land-use plan, when implemented, returned the area to open space as a recreation area for the whole community.

Savings in avoided future damage from this project is expected to be at least $6 million.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$4,757,708.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Clark County Flood Control Law Creates Regional Flood Control

Clark County, Nevada

Las Vegas, NV - With an estimated 5,000 new residents arriving each month, Las Vegas and its surrounding area is the fastest growing community in the western United States. More than 1.2 million people live in the area, which lies at the center of a desert valley bounded by mountain ranges. Creeks and riverbeds connect in the center of the valley near the heart of the city. The arid desert soil absorbs little water. As development spreads, there are fewer areas where water may naturally flow or gather.

Because of the terrain, the Las Vegas area is prone to flash floods. The area experiences several minor floods each year. Half an inch of rain in a day is enough to flood downtown streets. Water flows downhill from west to east. Regular flooding results in structural damage to businesses and residences, and serves as the catalyst for car accidents.

In 1984, El Nino-generated storms ravaged the Las Vegas area. Seven persons died in storms that year. More than $27 million in property damage occurred. Twenty-four persons died in nine flash floods since 1990, and eight other floods have resulted in more than $1 million in damage.

The Nevada Legislature responded in 1986 by creating the Clark County Regional Flood Control District. It embarked on one of the most progressive self-funded flood control programs in the country. The district is funded by a .25 percent sales tax. It raises revenue of more than $45 million annually.

Since its program began more than a decade ago, it has spent nearly $350 million on structural mitigation projects throughout the Las Vegas area. Current master plans call for further mitigation expenditures of $1.2 billion over the next 30 years. Thus far, the Clark County Regional Flood Control District has constructed more than 60 miles of flood control channels plus 20 retention basins that manage up to 80 million gallons of water. In addition, the flood control district has contributed more than $8 million toward the county's purchase of easements and rights-of-way.

The region also receives Federal funding. It is initiating several other mitigation projects throughout the southern half of the state. According to the Las Vegas Sun, Congress contributed $10 million to related flood control projects in 1996. Congress will contribute another $23 million in 1999 for work on the Tropicana and Flamingo washes (seasonal watercourses in arid areas), and $300,000 to help protect the Las Vegas wash.

The exact cost benefit ratio of these projects is currently being independently studied and will be released later this year to the state legislature, according to Kevin Eubanks, a Clark County engineer. However, Eubanks and residents say tangible benefits have already been demonstrated. A number of buildings and other structures that would have been flooded before mitigation was done were not damaged in the recent flooding. Eubanks said this flooding could have been much worse and much more costly if it were not for the massive mitigation effort already done. Also, costs of flood insurance for property owners were reduced substantially. [See "Las Vegas Flood Control - Part 2" for an update following the devastating flash flood of July 1999.]

Quick Facts

Sector:
Public

Cost:
$1,200,000,000.00 (Estimated)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
State sources

Lessons Learned in Hampton
Keeping Home Safe with Modifications

Hampton City, Virginia

Hampton, VA - Matina Howarth always thought hurricanes needed to be taken seriously, having lived in New England as a child when Hurricane Bob (1991) hit. After she and her husband bought a waterfront home built already in compliance with the city's floodplain regulations to the National Flood Insurance Program (NFIP), they had a large rock bulkhead installed on their waterfront embankment.

"I talked with the neighbors in this area and asked a lot of questions about measures we could take. I especially spoke with residents who didn't have major damage during Hurricane Floyd. Most of the area residents had these huge rocks," she said. They were told not to use the smaller riprap rock because they were told it would move too easily and end up inside their home during strong storms. The Howarth's specified that very large rock should be used as part of the bulkhead protection system in front of their home. They spent $30,000 on the large rock. She goes on to say, "I then negotiated the expense of the rock into the purchase price of the house."

In addition to the large rocks, Howarth had hurricane shutters installed on their home's 33 windows. "My husband didn't want to get the shutters but I made sure we had them. He now swears by them."

Upon Hurricane Isabel's approach as a category five storm, the Howarths followed the evacuation order for the area. Upon return, they found their home, for the most part, unscathed. The only damage outside was to a fence and an aboveground pool. The garage had no water in it, and the first floor living room carpet was wet. The structure of the home was intact.

In the Grand View area overlooking the Chesapeake Bay, many homes built in the 1940s were severely damaged or destroyed by Hurricane Isabel. Yet, some adjacent homes built within the last eight years sustained less damage. The difference? Building code requirements adopted in the early 1980s in compliance with the NFIP.

These newer homes were built above the 100-year flood plain with pilings and breakaway walls," David Langille, chief inspector with the Hampton Codes Compliance Department explains. "The homes built during the 1940s were mostly cottages, and that area received at least $4 million in damages." The typical 1940s cottage style home was one story with the floor and outside grade levels practically the same.

The installation of hurricane shutters and the large rock bulkhead reduced the damage of Hurricane Isabel. "I consider this no damage, when I think of what could have happened. It was great to come home and find the measures we took had paid off and our home was safe," said Howarth.

Quick Facts

Sector:
Private

Cost:
$50,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

Light Fixtures and Earthquakes Protecting School Children

Los Angeles County, California

Los Angeles, CA - The Los Angeles Unified School District (LAUSD) is second in size only to the New York City School District. At present, the District is composed of over 900 schools, serving over 800,000 students, and employing 57,000 full-time and 24,000 part-time staff. The LAUSD provides public education services to a 708 square mile area including the cities of Los Angeles, Bell, Carson, Cudahay, Gardenia, Huntington Park, Lomita, Maywood, San Fernando, South Gate, Vernon, and West Hollywood; portions of 18 other cities; and the unincorporated areas of Los Angeles County.

At the time of the 1994 Northridge Earthquake, the LAUSD facilities were illuminated with suspended ceilings and imbedded pendant lighting systems. These lights tend to fall from the ceiling when impacted by strong seismic motion. Hundreds of lighting units fell onto desks in the classrooms when the earthquake hit.

Fortunately, the earthquake occurred early in the morning when the schools were closed. As a result of this experience the LAUSD, with the support of FEMA, decided to undertake the seismic retrofitting or replacement of pendant lights to increase life safety, reduce the earthquake injury risk, and to meet current building code standards.

In the Northridge Earthquake, 5,500 buildings owned by LAUSD were damaged with total damages currently estimated at $134 million. Under Section 406 of the Stafford Act, FEMA funded $3.1 million for damaged, unbraced pendant ceiling and lights. In addition, $45 million were obligated to mitigate unbraced pendant ceiling and light systems of the same design that were not damaged.

The reinforcement and/or replacement of the unbraced pendant lights in the Los Angeles Unified School District will reduce the high risk of injury to the more than 800,000 school children during the next earthquake event.

Quick Facts

Sector:
Public

Cost:
$48,100,000.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Living Snow Fences in Minnesota
Making Winter Driving Safer

State-wide,
Minnesota

The State of Minnesota - The State has taken a pro-active role in providing some relief to communities that encounter blowing and drifting snow, resulting in hazardous travel, economic losses, and extremely high plowing costs in the winter.

The State has developed a Living Snow Fence Task Force to address the issue of unsafe winter driving conditions and provide the State with an active group to mitigate the dangerous blowing and drifting snow. The living snow fences consist of indigenous vegetation, including trees and shrubs, planted along main roads and highways to buffer the damaging effects of wind and blowing snow.

The Task Force members include State agencies such as the Division of Emergency Management, the Department of Transportation, the Board of Water and Soil Resources (BWSR), Department of Natural Resources, Department of Agriculture, and the University of Minnesota Center for Integrated Natural Resources and Agricultural Management. In addition to the Task Force being developed, the State Legislature has approved $100,000 for BWSR to fund more living snow fence projects. Other State agencies are providing funds in the way of local matches. The Department of Transportation is providing the 25 percent local match on all their projects.

Funding has been approved to address approximately 150 living snow fence sites, equating to approximately 36 miles, to reduce the threat of dangerous snowdrifts across roads and highways. Twenty counties have snow fence projects underway, including the following: Blue Earth, Brown, Clay, Kittson, Lincoln, Lyon, Marshall, Murray, Nicollet, Olmsted, Pipestone, Polk, Redwood, Renville, Roseau, Sibley, Steele, Traverse, Wilkin, and Wright. In addition to the above counties, there have been 15 new applications totaling $850,000 being reviewed by the Task Force for future funding. The subgrantees vary in each project but usually involve the Department of Transportation or the local Soil and Water Conservation District.

Living snow fences are an extremely economical, effective, and environmentally sound alternative for controlling snow. Properly placed living snow fences can significantly reduce the costs to taxpayers for snow removal and improve the driving conditions for motorists.

Quick Facts

Sector:
Public

Cost:
$2,067,402.00 (Estimated)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Low Interest Loans From Citizens National Bank

Multiple Counties, West Virginia

Tucker and Randolph Counties, WV - Tucker and Randolph Counties stretch for more than 75 miles along the northern fringe of the Allegheny Mountains in eastern West Virginia. In 1990, they had a combined population of just over 35,000 in this predominantly rural area with most settlements restricted to narrow river valleys. Thus, the primary concern in this area is flooding. Since 1967, both counties have received Presidential disaster declarations as a consequence of flooding five times.

In 1996, several events resulted in a total of $65 million in disaster aid to the communities. Tucker and Randolph counties are pilot Project Impact communities. Citizens National Bank, with offices in Tucker and Randolph Counties, West Virginia, became a project partner in 1997. The bank president became familiar with the complexity of State, County and local regulations in the Hazard Mitigation Grant Program (HMGP) through Project Impact Steering Committee meetings.

Realizing that an inordinate amount of time was necessary to coordinate all the home buyout activities, further placing the homeowners at risk, the bank took the initiative to offer low interest bridge loans to individuals participating in the acquisition project under HMGP. The loans enabled local residents to move out of the flood area before the HMGP- and State-funded acquisition projects could be completed. Additionally, Citizens National Bank set aside $1 million in low interest loans for flood prevention and mitigation. The bank also teamed with the Elkins Builders Supply and the Randolph County Vocational Technical Center to provide building supplies and education on retrofitting flood prone structures.

As of February 1999, the low-interest loans, totaling $248,296, enabled six homeowners to move out of harm's way while awaiting the final deed transaction from the State to the City. In neighborhoods that have been repeatedly damaged by floods, loan officers are going door-to-door to explain their loan program. As a part of their presentation, they discuss some retrofit techniques promoted by Elkins Builders Supply. The Randolph County Vocational Technical Center has incorporated these retrofit methods into the curriculum and developed 3-D models for display in the Elkins Builders Supply.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$1,000,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Main Street Drainage Modification
Improving Culverts, Basins and Drains

Grafton County,
New Hampshire

Plymouth, NH - The Town of Plymouth faced with repeated flooding in the downtown area. This was caused by an undersized stormwater collection system. Existing culverts, catch basins and stormwater drains were inadequate to handle even low to moderate runoff. High velocity water moves down the streets causing stormwater backup through the drains and spouts as high as 2 feet. As much as 2 feet of water accumulates during a heavy rainfall, flooding businesses and some homes, and flooding streets and walkways, making the business district inaccessible to traffic.

The mitigation project was planned in two phases to improve serious drainage problems in the downtown business district. The plan was to lay 1,500 feet of 24-inch subsurface drainage pipe along with three drainage manholes and six catch basins. The new drainage system outlet was directed into a stabilized portion of the Pemigewasset River. The system was designed to handle a 25-year flood event. An agreement between the Town and New Hampshire Electric Cooperative allowed the new stormwater system outlet to be constructed on land owned by the utility company. Plymouth State College was also willing to match the Town cost share of the project.

The Plymouth Highway Department had calculated that the annual damage to public access roads and walkways was $50,000 to $100,000 per year over a 10-year period. The Town of Plymouth definitely considers this a success story. With the improvements in place, the severe June 1998 rains did not repeat the flooding of the past, and likely saved the Town thousands of dollars and avoided business disruption. The main road access to the community remained open. Businesses were spared 1 to 2 feet of water by the improved drain system.

Quick Facts

Sector:
Public

Cost:
$50,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

FEMA

Making Worship Center Stronger Providing Haven in Time of Disaster

Charlotte County, Florida

Punta Gorda, FL - A church pastor and his congregation are thankful for hurricane-resistant features of the Worship Center at the First Baptist Church of Punta Gorda. Eight church staff members hunkered down safely in the worship center while Hurricane Charley, packing winds strong enough to rip the steeple off the church roof, swept through the quiet city, leaving widespread destruction behind. The church, established in 1887, built the new sanctuary in 2001 utilizing the new building codes and other storm-resistant methods and materials.

“We’re thankful for the strength and integrity of the structure,” said Paul Russell, pastor of the 815 member church. The Worship Center blocked the wind from hitting directly on the Fellowship Hall and Religious Education Center. “We may have lost more from those other buildings had the Worship Center not been here to protect them.”

James Murray, the church’s chairman of property and space, said, “When planning began for building the $1.3 million Worship Center, discussion centered on how it could be constructed to exceed the building code and what types of mitigation might be employed.” Serving as construction manager for a Punta Gorda-based commercial contractor, Murray has worked in construction since 1961 and is well aware of elements of the building code and mitigation measures that can be taken. Without taking the proper preventative measures, the estimated loss could have exceeded $250,000, he said.

When this project was started, “We weighed facade - how it looks - versus construction," and spent extra dollars on the masonry, concrete and structural aspects of the building. Laminated arches and beams were used rather than steel construction at an additional cost of $40,000. And that, said Murray, combined with reinforced concrete block walls and “tie-beams” made the building much stronger and conformed to the Florida Building Code in designing the structure.

There was some cosmetic damage from Hurricane Charley. Flying shingles from another building left tar marks on the worship center. Although the prefabricated steeple was ripped from the sanctuary roof by the high wind, there was no damage to the main structure. “It’s just a great structure,” Murray said. Construction costs were paid through church membership donations and fundraising projects.

It was obvious that the mitigation measures used in the construction of the Worship Center saved the structure from incurring further damage from Hurricane Charley. Recognizing the benefits of these measures, church leaders of the First Baptist Church in Punta Gorda are initiating two additional mitigation measures to strengthen the Worship Center. They are installing storm shutters for the bigger windows and high-impact glass on the structure’s smaller windows. High impact glass is able to withstand winds up to 150 miles per hour. With these measures in place, their goal is to have a structure that will serve as a safe, storm resistant community shelter as well as a church.

Having spent the additional money building to a higher standard, Murray stated, “We have absolutely no regrets.”

Quick Facts

Sector:
Private

Cost:
$1,200,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

Acquisition and Elevation Project in Mandeville, Louisiana

Saint Tammany Parish, Louisiana

Mandeville, LA - In the City of Mandeville, approximately 80 percent of the incorporated area is within a Special Flood Hazard Area, Zone A and Zone V. In May 1995, the southeastern portion of Louisiana experienced a flood so significant that the National Flood Insurance Program estimated it to be the most expensive flood disaster for Louisiana, costing approximately $534 million in claims paid.

The City of Mandeville itself experienced low level to deep water flooding in over 200 residential structures. One subdivision in particular, Golden Glen, had many homes substantially damaged by flood waters, several of them in Zone C. Mayor Eddie Price made a commitment to his citizens to do something about the flooding problem.

Mayor Price organized a local hazard mitigation team and developed a local hazard mitigation plan for the City, incorporating all aspects of Multi-Objective Management. Hazard mitigation alternatives were discussed among the City staff; a determination to pursue acquisition, elevation, and dry floodproofing of residential structures was then agreed upon.

The City sponsored a series of projects, using new technology to elevate concrete slab structures with the slab attached, achieving benefit cost ratios of 5:1 and greater. Local demolition contractors tore down several structures to open drainage pathways, and a local floodproofing contractor was hired to protect those structures with a history of low-level flooding.

The City has now eliminated the costs of flood damage in the subdivision of Golden Glen, as demonstrated by two subsequent floods that occurred in 1998. Structures that would have flooded are well above the base flood elevation, completely removed, or are watertight. It is estimated that this project has saved almost $500,000 in 1998 alone!

The new elevation technology used by local contractors, the development of an effective dry floodproofing technique, and the technical expertise of local mitigation consultants have all been an excellent combination to solve many of these problems.

Quick Facts

Sector:
Public

Cost:
$1,800,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Flood Mitigation Assistance (FMA)

FEMA

Mapleton Elevations
Mitigating Damage Caused By Heavy Rains

Lane County, Oregon

Mapleton, OR - Located in the unincorporated coastal region of Lane County along the Siuslaw River, Mapleron has experienced flooding most recently in December 1997. This logging town has been subject to recurring floods throughout its history. The Siuslaw River valley is narrow, with steep mountains that rise up directly from the floodplain. The coastal range mountains are famous for their high rainfall and unstable soils, both factors that contribute to recurring flood events. The State climatologist has indicated that the area is entering into a cycle of wet years, which will ensure the continued impacts to the community if no action is taken. In February 1996, the rapid rise in the Siuslaw River and heavy rain caused numerous problems in Lane County, including landslides and heavy flooding.

In August 1997, Lane County decided to mitigate the recurring damages caused by the heavy rains and flooding in Mapleton. The objective of this project was to mitigate damage to structures in future flood events by elevating 20 structures above the base flood elevation.

On December 28, 1998, after the first phase of elevations was complete, the river came knocking at their doors, but it never found its way in for the residents who participated in the elevation projects. The Siuslaw at Mapleton was more than 9 feet above flood stage. This time, the residents who raised their homes escaped with minimal damage. The December 1998 flood was a 25-year flood. Thus far, the project saved over $900,000 in avoided damages for the residents in Lane County.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$1,000,000.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Acquisitions and Elevations
Letting the River Flow Freely in WA

Mason County, Washington

Mason County, WA - The Skokomish River valley experiences widespread flooding several times each year as heavy rains and mountain snow runoff swell the river outside of its banks.

"The Skoke," as it is commonly called, drains nearly 250 square miles of the mountainous Olympic Peninsula into the Hood Canal region of South Puget Sound. County officials were aware of several areas in particular that suffered frequent and severe flooding, but 12 homes along East Bourgault Road incurred the most significant flood losses. Damages to homes along East Bourgault Road alone had exceeded $300,000 in recent years.

Residents whose homes flooded at least once a year, and who often were forced to evacuate their homes 3 to 4 times each flood season, desired relief. Ten of the 12 homeowners had expressed an interest in participating in an acquisition project. So in 1991, the County applied for and was awarded Hazard Mitigation Grant Program (HMGP) funding to begin buying out some of the homes.

In December 1996, the County adopted a Comprehensive Flood Hazard Management Plan that outlined several recommendations for mitigating flood losses in the Skokomish River Valley. The success of the initial round of acquisitions along East Bourgault Road, which included six homes, created public support for more buyouts. The County applied for additional HMGP funds, and was twice awarded additional funds to acquire, and perhaps elevate where appropriate, more homes along East Bourgault Road as well as Skokomish Valley Road, the second priority area for mitigation.

Mason County was awarded a total of $1,510,077 in HMGP (Federal share) for its non-structural mitigation effort. The remaining $754,772 was funded by the State of Washington and through local government and private resources.

To date, the County has completed the purchase of 13 homes and approximately 75 acres of floodplain. Officials expect to fund the acquisition or elevation of at least seven more properties in 1999.

Site visits since the project was implemented have proven that it has been hugely successful. The Skoke now flows across East Bourgault Road without causing damage where homes once stood. The project as a whole is expected to save approximately $1.50 in avoided damages for each $1 spent.

Quick Facts

Sector:
Public

Cost:
$2,264,849.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Michigan Executive Order
Taking Active Role in Hazard Mitigation

State-wide, Michigan

The State of Michigan - The State has been taking an active role in hazard mitigation for several years, and has increased its coordination by developing an interagency group to review and prioritize projects for the Hazard Mitigation Grant Program (HMGP) funding available after a Presidential disaster declaration.

On July 29, 1998, Governor Engler signed an executive order creating the Michigan Hazard Mitigation Coordinating Council (MHMCC). The Executive Order 1998-5 designates several agencies as members, including the Department of State Police, Department of Environmental Quality, Department of Natural Resources, Department of Agriculture, Department of Consumer and Industry Services, Department of Transportation, Department of Management and Budget, in addition to members from the insurance and planning industry, and local emergency managers.

The MHMCC assists in implementing the Michigan Hazard Mitigation Plan and supports and promotes mitigation concepts, principles, strategies, and practices within governmental agencies and private sector organizations in Michigan. This council is a driving force for mitigation and promotes activities for creating disaster-resistant communities.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

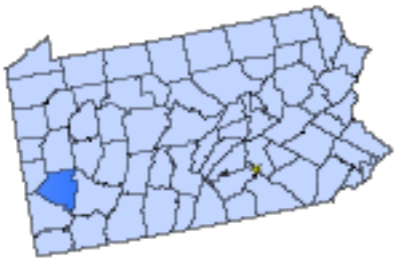
Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Land Use/Planning

Primary Funding:
State sources

Millvale Borough Property Buyouts Erosion Prompts Acquisitions



Allegheny County, Pennsylvania

Millvale Borough, PA - During a period of extremely heavy snowfall and rains in March of 1994, occupants of Millvale Borough complained of feeling movement in their homes.

Inspection showed evidence that earth movement had occurred over many years. Signs of recent earth movement in a grassy area behind one of the homes resulted in an evacuation order. Eventually, this earth movement resulted in a broken sanitary sewer line that polluted the groundwater.

The following month, additional earth movement occurred again, causing severe undermining of tree root systems in the area. It was obvious that the condition was worsening. Residents of three more properties were advised to evacuate.

The Borough of Millvale decided to acquire 12 properties, three of which had been demolished during the disaster. After purchase, the remaining nine building were demolished; all fill and failure materials were then removed from the site. Finally the slope was stabilized, and ground cover added to prevent a reoccurrence.

The stabilization of the slope will protect residents of the surrounding area from further erosion damage. Capping the sanitary sewer line prevents sewerage from seeping into the ground water. The cost of utilizing emergency personnel for evacuation and rescue is avoided, as well as the disruption to the lives of residents in this community.

Quick Facts

Sector:
Public

Cost:
$924,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Mitigation Education and Outreach
North Carolina State Fair

State-wide,
North Carolina

The State of North Carolina - A problem with mitigating natural disasters is knowing what threats are most likely and what can be done to protect against them. Another problem is thinking, "Disasters only happen to other people. It won't happen to me."

Throughout the 1990s, US taxpayers spent $25 billion fighting disasters. Insurance companies spent $106 billion over and above that in 1990s catastrophes, plus another $6.6 billion were paid through the National Flood Insurance Program (NFIP), private companies uncounted billions above that figure, and private individuals even more beyond that.

After Hurricane Isabel went through North Carolina, mitigation specialists reached out to the public with information on making their homes and businesses safer. They found many people hungry for information. Specialists set up information booths and passed out literature at the North Carolina State Fair, and at Lowe's Home Improvement Centers in the communities of Washington and Elizabeth City.

More than 3,000 people received about 5,000 pieces of mitigation literature. Children got more than 2,000 coloring books about mitigating disaster damage, available in English or in Spanish. Teachers and principals asked spokespeople to come and make presentations at schools.

Many came specifically seeking out the FEMA booth. Whether they had been damaged by Hurricane Isabel or not, they wanted to know what steps to take now to protect their families and property. Many were interested in a booklet called Reducing Future Damages: A Guide for Rebuilding Safer and Stronger that discusses techniques ranging from building safe rooms against wind damage, construction techniques to reduce hurricane damage, weather radios, and flood insurance. Others asked about cleaning up mold and mildew.

One church leader from Wallace, North Carolina, stopped by the booth at the state fair. He described how his church "adopted" and helped a disaster family recover from Hurricane Floyd. They helped them build a "disaster kit" of items to have ready in case of another disaster. And they also helped the family mitigate their property against future damage, improving their drainage, installing hurricane shutters, and buying a weather radio. The church understood that just repairing past damage is not enough. It is critical to prepare for and protect against damage from future disasters.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
State sources

Flood Mitigation Project Protects Bidwell Paiute Tribal Reservation

Modoc County, California

Modoc County, CA - Annually, the Bidwell Paiute Tribe experienced damage to their reservation from heavy storms. Their outdated dam and gutters were ill-equipped to handle the heavy amounts of rain. As a result, heavy runoffs caused serious erosion damage, especially to the earthen dam upstream from the community. The dam holds a water volume of 450,000 cubic feet and houses a hydroelectric system and generator. Damage often occurs to these systems from the rainfall. The effects of the erosion disrupt supply lines and access roads.

The leadership of the Tribal Council applied for and received a grant from FEMA's Hazard Mitigation Grant Program to mitigate the problem areas. Phase I of the project was to place a concrete gutter along the southern portion of the Dam Road and eastern portion of Penstock Road (downstream) to carry storm runoff down a 24-inch culvert to Soldier Creek. In Phase II, the hydroelectric water supply pipe, which had collapsed into Soldier Creek, was buried further downstream. In addition, a timber-retaining wall was built with compacted stone behind it. The earthen ditches on the east and west sides of Dam Road were renovated with either concrete lining or corrugated metal pipes.

As a result of this mitigation, the Bidwell Paiute Tribe and their community are no longer in immediate risk of extensive damage or loss of life caused by the collapse of their dam upstream. Their community is better equipped to handle the annual heavy rains. The risk of their community being devastated by the loss of electricity, supply lines and access roads has been significantly reduced.

Savings over the life of the project due to avoided damages is expected to be at least $104,308.

Quick Facts

Sector:
Public

Cost:
$13,635.00 (Actual)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Mitigation Saves House From Fire
Homeowner Initiates Project

Los Alamos County, New Mexico

Los Alamos, NM - When John and Cindia Hogan bought their home in 1994, they did so knowing that a major fire might occur in the Santa Fe National Forest that backs up to their property. John Hogan, a physical scientist with the U.S. Geological Survey, and a trained, experienced firefighter, began taking steps to mitigate their home in 1996.

In 1996, John Hogan contracted to have a metal roof put on their two-story, wood frame 2,600-square foot home located on two-thirds of an acre. He also cleared some 100 trees from the rear portion of the property, and removed flammable materials from the backyard. The cost of mitigation is estimated at about $50,000. All costs were borne by the Hogan family.

On May 10, 2000, the Hogan family evacuated from their home, and on May 11 the Cerro Grande fire—largest wild fire in New Mexico history to date—burned through their neighborhood and other areas of the community of Los Alamos. For two days, the Hogans believed their home was consumed by the blaze, which burned and destroyed well over 200 homes, leaving more than 400 families and individuals homeless.

But when John and Cindia Hogan returned to their home, they found it and one other adjacent house intact. Homes to the west and south of them had been destroyed. "We're very conscious of fire danger," Hogan said. "We consciously chose fire mitigation as a proper move." Hogan plans on more mitigation, including removal of more trees in his yard, and put fire retardant on cedar shake paneling on the east and west walls of his home.

The most valuable information that Hogan had was his knowledge of landscape ecology, based on his work with the US Geological Survey. He works with vegetation studies and fire history as well as changes in landscape.

The Cerro Grande fire caused one tree in the Hogans' front yard to catch fire, and burned a shed and its contents at the far rear of his backyard. The only other damage from the fire was soot that entered into the dryer vent.

The home is insured for $270,000 for its structure and another $200,000 for contents. The savings, even though his property is insured, is figured at more than $450,000—the value of the structure and its contents—nine times the cost of mitigating the structure and grounds.

Of the expense of mitigating his home, Hogan said, "It was certainly worth it."

Quick Facts

Sector:
Private

Cost:
$50,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Homeowner

FEMA

Mitigation in Action: Huntsville
No More Flooding for One Small Business

Madison County, Alabama

Huntsville, AL - John's Photo Mart, a small camera and photo processing shop, had been beset by flooding problems for years. Located in a 100-year floodplain and surrounded by the waters of Brogan Branch, Pinhook Creek and Fagan Creek, the small brick building with the slanted roof had been flooded three times since 1979. Each time, floodwaters breached its interior one to two feet, and each time, the National Flood Insurance Program (NFIP) paid out damages to the owner/policyholder. Over the years, insurance settlements for flood damage amounted to $24,167 or $59,860 in inflation-adjusted 2004 dollars. It was a cycle destined to go on forever.

Seeing the devastation on this small property year after year, Huntsville city officials agreed it was a problem that needed a solution. One day in 2003, opportunity stared them in the face.

A City employee who drove by the site each day on the way to work saw a "for sale" sign and mentioned it to colleagues. The possibility of purchasing the building was then presented to the head of the planning department who instructed staff to begin the process.

Without any financial assistance from the Federal or State government, Huntsville officials did a property appraisal and offered $125,000 in local funds for the property. On April 17, 2003, the offer was accepted and the little building belonged to the City. Less than a month later, the former photo mart flooded again, but this time it didn't matter. The proprietors had moved out, the inventory was gone, and the building was scheduled for demolition. In Oct. 2003, the building was razed.

The NFIP is no longer paying insurance settlements year after year for a property whose future was clouded with the prospect of more flood damage. The property's owner, Fuji Photo Film Ltd., was compensated at full market value. The final silver lining is this - the small 5,400 square feet patch of land where John's Photo Mart once sat is now a well-manicured green space maintained by the City of Huntsville, lending a touch of serenity to a busy commercial intersection.

Quick Facts

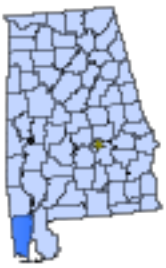
Sector:
Private

Cost:
$125,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Local Sources

Mobile Convention Center
Building a Hurricane Resistant Structure



Mobile County, Alabama

Mobile, AL - Over the years, Mobile has experienced a number of major hurricanes. For this reason, a major undertaking was employed to build a hurricane-resistant structure when building the Mobile Convention Center. Located in the Upper Mobile Bay, the Convention Center, owned by the City of Mobile and operated by SMG, Inc., represents the centerpiece of the revitalization of the City's downtown area.

The Mobile Convention Center was constructed in 1993 and cost $52 million. Elevated above the 100-year flood elevation, it was designed to withstand hurricane-force winds and rising water. Prior to designing the Mobile Convention Center, architects met with over 30 facility planners across the country and solicited their input for functionality. This input was incorporated into plans for a structure that would be aesthetically pleasing without compromising its structural integrity.

The Mobile Convention Center received only minor damage in 1998 from Hurricane Georges. There was approximately four feet of water on the lower level of the building used primarily for parking. Total damage to this structure (including flood fighting and clean-up costs) has been $156,000 to date with approximately $350,000 estimated for additional costs to complete repairs. The initial expenses included some miscellaneous electrical work on the lower level; fire control panel, electronic parking equipment and elevator repair, dry wall repair, and general removal of mud and water.

The Center was operational within three days after Hurricane Georges hit. Many of the remaining repairs are cosmetic with carpet and tile replacement being the most costly. Because damage was minor, the Center was able to remain in operation. In addition, the Center received additional bookings from other facilities that were damaged from Hurricane Georges. If the building had not been elevated, possible repairs could have included the main HVAC, located on the second floor, which would have cost several million dollars. Business interruption costs would have included the cancellation of the Southeast U.S./Japan Trade Commission Conference, costing more than $1 million to the Center.

The design and elevation of the Center represented a major economic success exceeding $5 million in both damage avoided and lack of business interruption costs.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Local Sources

Morgan County Acquisitions Flood Buyout Project

Morgan County, West Virginia

Morgan County, WV - Residents in various Morgan County locations along the Potomac River and its tributaries have suffered repeated flood damage. These rural locations experienced major floods in November 1985 and again in January and September 1996. Most property owners had their life savings invested in these properties. They faced financial ruin since no one would buy the floodprone properties and it seemed that just when they finished re-building, a new flood would occur.

This buyout project was a joint Federal, State and local undertaking. It involved acquiring the properties and demolishing the structures. Once this is completed, the county will grade the vacant lots and then maintain them as open space in perpetuity.

Records indicate that major flood events occurred in this area in 1936, 1985, and twice in 1996. The repeated severe flooding problems experienced by these properties will be solved after completion of this project.

Combined payments by FEMA and the National Flood Insurance Program (NFIP) for the 1996 losses totaled $764,000. The cost of this project was $340,000 less than those losses, and it was a one-time payment. The Hazard Mitigation Grant Program (HMGP) property acquisition project gave residents the necessary capital to relocate out of the flood zone.

Quick Facts

Sector:
Public

Cost:
$422,480.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Moving from Harm's Way Pays Off
Elevation Keeps Family Business Dry

Franklin City, Virginia

Southampton, VA - For 30 years, Robert and Gale Stradley's home escaped the intermittent threat of flooding. However, when Hurricane Floyd struck in September 1999, the couple was not so lucky. "Floyd was a very, very different storm. It dumped an unbelievable amount of water on us and then the wind just held the water in," remembered Gale Stradley.

Gail Stradley and her husband stayed with friends while they waited for Floyd's floodwaters to recede. "The water came up above our windows and our house sat in water for seven long days," she said. "It was a scary picture. We lost every single thing, and my husband's business was [run] out of our house."

With the help of FEMA grants for temporary housing and a low-interest loan from the U.S. Small Business Administration through their own bank, the Stradleys were able to rebuild and elevate their home, moving it out of harm's way.

"We never wanted to go through that again," Stradley said. She added that the mitigation measure to elevate their home resulted in a reduction of the retired couple's flood insurance premiums. "Thanks to the government's help, we're still independent and living in our own home."

"I can't say enough about what the people at FEMA did for us," she continued. "There was a woman from New York State named Rosa and she was so wonderful, she walked us through every last thing we had to do [to receive FEMA assistance]. I can't say enough about the help we received," Stradley declared.

Unfortunately, not all the residents and businesses in the Stradleys' community were protected from Hurricane Isabel when it hit the area in September 2003. "I feel so badly for those folks. If you don't think they were sweating this one…" her voice trailed. "It was bad."

How did the couple fare during Hurricane Isabel? "Just fine," said Gale Stradley. "We had debris in our yard but our house and possessions stayed safe and dry."

Quick Facts

Sector:
Private

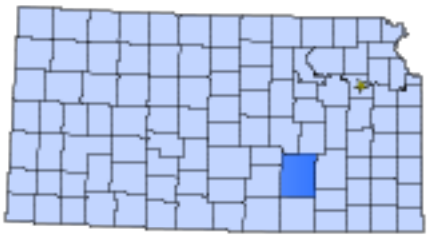
Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

NOAA Weather Radio Giveaway
Communicating During Disasters



Butler County, Kansas

Butler County, KS - Butler County's Hazard Mitigation plan identified tornadoes as its highest rated hazard. Close behind were flooding and hazardous materials. Also identified in the plan was the need to effectively and efficiently communicate with special populations before a crisis strikes.

Butler County's Mitigation Team designed an entry form for a weather radio giveaway for the elderly, disabled, and lower income families with children under the age of 10. The county partnered with Interstate Battery to provide the 9-volt battery backups and with the Department on Aging, Health Department, Red Cross, SRS, cities, senior citizen clubs and schools to distribute the entry forms. The "contest" ran for 2 months. At the end of that time, there were 109 entries. All of these entries received a weather radio. In addition, radios will be providing to every senior center, school, nursing home, and day care center not covered by weather radio for a total of 210 radios.

210 families, individuals and gathering places for special populations will now have first-hand information on disaster and emergency issues. These radios will enable these groups to take the necessary actions to protect their lives and/or property in a much timelier fashion.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$10,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Nehalem-Tillamook County Elevations Savings in Avoided Damages

Tillamook County, Oregon

Tillamook County, OR - The February 1996 floods devastated areas of Oregon's Tillamook County bordering the Pacific Ocean. The Nehalem River reached 1.6 feet above base flood elevation. This area of the county is a watershed to the sea for three major rivers. In all the flood zones of these rivers, people have repetitive losses in the hundreds of thousands of dollars. In the two blocks, which comprise downtown Nehalem, every business flooded, many had 3 feet of water. There was 4 feet of water over the only highway through town, and the town was isolated for 2 days.

In addition to the flooding of commercial and agricultural land, the most dramatic effect from the flooding was on residential property. Whole neighborhoods were inundated with water. Property owners were forced to leave their homes as the water reached their living spaces. The flooding was so serious that emergency evacuation of trapped residents by helicopter was required since the water rose so fast and the current was too swift for boat evacuation.

FEMA's hazard mitigation funds were used on two separate projects: one managed by the county to elevate 28 residences in the floodplain; and the other, managed by the City of Nehalem to elevate 11 commercial and 4 residential structures.

In December 1998, floods again impacted Tillamook County; yet, there was no damage to the elevated homes. Expected annual savings in avoided damages and emergency response costs are estimated at $40,000 per year per residence. A county ordinance now requires that houses be elevated 3 feet above base flood elevation.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

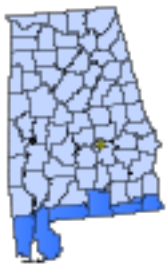
Cost:
$1,000,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

New Building Codes
Reducing the Risk Along Gulf Coast



Multiple Counties, Alabama

Orange Beach, AL - Following Hurricane Ivan's landfall Sept. 15, 2004, Alabama homeowners with houses built to a higher-building standard were rewarded with significantly less damage. The higher-building standard, contained in the International Building Code (IBC), requires far better construction materials and sturdier framing for winds up to 140 mph.

Understanding the risk of hurricanes, Al Bradley decided to build his home in Orange Beach to minimize potential damages from hurricane winds and tidal surges. Though Bradley had received his building permits before Orange Beach adopted the new IBC in June 2004, he decided to incorporate the new code into his construction. As a result, he had virtually no damage. Wade Nofziger, of FEMA's Hazard Mitigation Team in Alabama, said, "Compared to all the damage around the home, its survival was quite a visual contrast to the devastation in the area - even the back deck steps survived."

The Town of Dauphin Island adopted the new IBC in March 2004. Most of the 91 homes constructed over the previous 18 months were built to IBC in anticipation of the new requirement. According to Jim Reaves, the Town's Building Official, these houses fared far better than older homes standing nearby. None of the newer homes was significantly damaged, even though some were built on the exposed south side of the island and were near homes that had been badly damaged. An initial estimate of Hurricane Ivan's destruction on Dauphin Island's older homes was 44 destroyed houses and 100 homes with damages which may result in demolition.

The City of Gulf Shores, recognizing the need to rebuild homes to be stronger and less vulnerable to high winds and tidal surges, adopted the IBC on Sept. 27, 2004. The adoption was unanimously approved by the Council members and the Mayor. Therefore, homes rebuilt during the recovery from Hurricane Ivan will be better able to withstand future hurricanes.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Local Sources

FEMA

New Orleans Elevations Project for Pre-FIRM Structures

Orleans Parish, Louisiana

New Orleans, LA - An extensive drainage system and new drainage projects within the city for the past 80 years have caused subsidence and turned the city's overall topography into a saucer configuration. The city is bounded by Lake Pontchartrain on the north and the Mississippi River on the south. New Orleans is, thus, susceptible to flooding from heavy rainfall, or surrounding water that breaches or overflows its levees.

The City of New Orleans and Orleans Parish currently has a total of 4,279 structures on the National Flood Insurance Program's (NFIP) repetitive loss list.

Structure elevation has been considered an effective alternative in many situations to eliminate the flood damages to a flood prone structure. Recent technology has substantially reduced the cost to elevate the complete concrete slab structure with the slab attached. Typically the elevation process is less disruptive than experiencing another flood and is cost effective for repetitive loss structures. The process does not adversely affect the environment because construction remains within the existing footprint of the structure.

The project consists of the elevation of 11 pre-FIRM (pre Flood Insurance Rate Map) structures on the NFIP target repetitive loss list. Damages to all 11 structures since 1978 are documented to be nearly $1.5 million. At this rate, the total damages over the next 50 years would be estimated at more than $7 million.

The total cost of the elevation project is estimated to be more than $1.6 million.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$1,668,218.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Local Sources

Newton - Acquisition Project
Buyout as an Effective Investment

Baker County, Georgia

Baker County, GA - In 1994, Tropical Storm Alberto devastated central and southwestern Georgia. The river communities of Newton and Albany were among the hardest hit by floods from the storm. Alberto, which meandered over the state for several days before dying out, dumped up to 28 inches of water in some areas. One-third of Georgia's counties were declared federal disaster areas.

Located in Baker County, Newton is a small rural town with a population of less than one thousand. The town lies about 20 miles southwest of Albany and is located next to the Flint River. Alberto left the downtown area under 12 feet of water; flood depths were as high as 20 feet; 150 homes and businesses flooded; and several historic structures were damaged. Newton suffered $4.5 million in damages.

In the Newton mitigation project, FEMA funded the acquisition and demolition of 20 residential and 19 commercial structures. The total cost of the project was $754,464. All but one business moved out of the floodplain.

For five of the first nine days of March 1998, a storm system inundated Georgia with torrential rain. More than 40 percent of Georgia's counties had some level of flooding. The buyout of 39 residential and business properties after the 1994 flood proved to be an effective investment in Newton. Nearly $2 million in damages and losses were avoided. If these buildings had merely been repaired after the 1994 flood, many would have been completely destroyed in 1998.

Quick Facts

Sector:
Public

Cost:
$754,464.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

“Noah's Ark”
A First Person Account

Cowlitz County, Washington

Woodland, WA - “On February 8, 1996, my family and I faced the most difficult challenge of our lives. We were forced to leave our home because of water rising from the Columbia and Lewis Rivers. Water was entering through our front door. What followed was five days of 5 feet of water in our home. Almost everything was destroyed. This was a bit of a shock as we do not live on either river. However, we do live in the floodplain, which by the way never floods (or so we were told). We carried structure but not content insurance so as we sat in our tiny, 20 foot borrowed trailer, and I tried to figure out what to do.

“We were given a lot of literature from government agencies and I, through my tears, read and highlighted everything. I went to meetings and asked questions of city officials, who were no help at all. Finally, someone shoved a video tape in my hands just to shut me up and make me go away. The video tape was “Mitigation Success Stories in the State of Washington,” a video jointly developed by FEMA Region X and Washington State agencies, including the State Emergency Management Division and Department of Ecology.

“For the first time in weeks, I felt there was hope. You see, everyone just said rebuild the house, don't worry; it [flooding] will never happen again. But no one could assure me it wouldn't happen again. So, armed with my video and moving on very shaky ground, I insisted we explore the possibility of raising the house on its foundation. My husband thought I was crazy, and so did every other lending institution in the area.

“I started with the insurance settlement and used it to raise the house on its foundation. After that, things got a little scary as I had no idea how we were going to complete the project. We purchased a 5th-wheel travel trailer and moved it onto the site just to keep our sanity. If it hadn't been for the Small Business Administration and the generosity of my husband's Credit Union we might still be in that travel trailer. However, we had help from a lot of other people. The Christmas of 1998 marks our second year in this home that is 8 feet on the foundation and 4 feet above the flood plain. I must also mention how grateful I am to the wonderful contractor whom I hired to complete the work, Darryl Manue of Woodland Homeworks. When the rest said that's impossible, stupid, and why would you want to spend that much money, Darryl said yes, it can be done. Our home went from a simple 3 bedroom, 2 bath, 2,000 square foot home to a 4 bedroom, 3 bath, 2,400 square foot home with many features required to meet flood code and a few tricks of our own.

“There is so much more to this story. We are one of two families in this town to raise our house on the foundation. There is so much denial in this area. We have not faced major flooding since 1996, however the Lewis River jumped to flood stage today and the weather box we have lets us know about flood warnings and watches on a regular basis. I don't ever remember having to worry about flooding and now it seems to be with us all the time. Our flood insurance has been reduced to $300 for three years.”

Quick Facts

Sector:
Private

Cost:
$140,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

FEMA

Non-Structural Mitigation
Cost Effective Way of Preventing Damage

Thurston County, Washington

Olympia, WA - On February 28, 2001, Mrs. Mallinger was at home when she felt shaking and realized that there was an earthquake. During the two phases of the earthquake, books, glassware, CDs, pottery and some pictures fell. The power and water to her home did not shut down but the telephone was out of service. When Mrs. Mallinger was able to check her home more thoroughly, she found that the shaking had been severe enough to cause a ceiling light fixture in the garage to fall, and new cracks in the foundation.

The Mallingers water heater was several years old and needed to be replaced. During installation, earthquake strapping was recommended by the installer. The Mallingers agreed, and flexible gas lines were installed and metal strapping was used to secure the water heater to the wall studs.

Four years after the securing of the water heater, the Olympia area was shaken by a 6.8 magnitude earthquake. The shaking was severe enough at this house to cause items to fall from shelves, a ceiling light fixture to fall, and the foundation to crack. The simple preventative action taken to secure the water heater, at a cost of about $10, protected a home valued at $250,000 from fire. The Mallingers also have earthquake insurance.

Knowing that the water heater strapping prevented the chance of fire gave the Mallingers great peace of mind. As a result, they recommended to their neighborhood homeowners' association that all homes in the neighborhood secure their water heaters. This initiative will further protect the community and create a greater level of survivability in the event of future earthquakes.

Quick Facts

Sector:
Public

Cost:
$10.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Private funds

Delaware Seismic Exploration
Getting a Picture of the Subsurface

State-wide,
Delaware

The State of Delaware - There have been more than 550 documented earthquakes within 150 miles of Delaware since 1677. The largest registered earthquake occurred in the New Castle County area in 1871. The second-largest was in 1983 near the Delaware River in northern Delaware. In this area, there are no known fault traces on the surface of the Earth. In order to identify the faults responsible for the earthquakes, their detection in the subsurface is required.

The Delaware Geologic Survey (DGS) developed a joint cooperative agreement with the U.S. Geological Survey (USGS) to artificially produce seismograms in order to get a picture of the subsurface. Using a geophysical data processing technique developed by the USGS Geological Division in Menlo Park, Calif., and with staff from that center, the faults were explored.

Seismic waves were produced by firing 8-gauge shotgun shells into the ground at a depth of approximately 12 to18 inches below the surface. Simultaneously 1-pound explosive charges, at a depth of approximately 10 to 15 feet below the surface, were detonated. The results from both sets of explosions were recorded on an array of five seismographs with 300 active channels.

This project provided the first opportunity to study and map the possible subterranean fault line in Delaware. It presented scientists with a relatively non-invasive method of imaging the subsurface. The high-resolution seismic reflection and refraction survey identified possible faults that may be associated with earthquakes in the northern Delaware area.

The information garnered from this study will be useful to planners and local governments when considering development in the local area. It will be especially useful when selecting sites for critical facilities. The dollar values saved are not measurable since the objective is to prevent development on the fault or at least make sure it meets earthquake-building standards.

Quick Facts

Sector:
Public

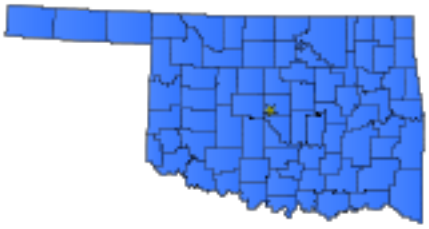
Cost:
$280,000.00 (Estimated)

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
National Earthquake Hazards Reduction Program (NEHRP)

FEMA

Residents Survive May 2003 Tornado
Surviving the Tornado in Oklahoma City



State-wide, Oklahoma

Oklahoma City, OK - On May 9, 2003, tornados swooped across Oklahoma City's "Tornado Alley." The tornados path was virtually the same as the one that struck 4 years prior. Oklahoma has historically been subject to destructive and deadly tornados and high winds. After the 1999 tornado, 44 persons died, 800 were injured and over 6,000 homes were damaged or destroyed.

In order to make Oklahoma a safer place to live, the State launched a Safe Room Initiative Program. Oklahoma was the first State to promote and implement a Statewide residential safe room initiative to build safer communities. The safe room initiative was implemented by the State of Oklahoma with mitigation funds made available by FEMA through the Hazard Mitigation Grant Program (HMGP). This program funded the building of 6,016 safe rooms across the State.

The three basic objectives to help ensure a successful program were public education, financial assistance, and quality control. First, the State of Oklahoma and FEMA kicked off an extensive Public Education Campaign that encompassed a wide range of outreach projects using public service announcements through radio, television and print. The publication of books, resources and educational materials were distributed to the residents and communities, while speakers and meetings were used to reach the general public.

Next, the safe room had to be financially affordable to the people. Federal and State agencies developed a first-in-the-Nation safe room rebate program called "Oklahoma Can Survive" to help cover the cost of constructing safe rooms. A $2,000 rebate was offered to property owners for the building of a safe room. The rebates were given in three phases. Phase 1 provided rebates to those people whose homes were destroyed or substantially damaged in the designated disaster area. Phase 2 provided rebates to people with damaged homes in the designated disaster area, and Phase 3 rebates were provided to anyone in the state who wanted a safe room.

Finally, minimal performance criteria guidelines were enforced for proper safe room construction. The FEMA publication 320, *Taking Shelter from the Storm*, was developed as a construction guideline to provide all the information a contractor needed to build a safe room including connection details, specifications, and material list for concrete, concrete masonry unit, wood-frame, and insulating concrete form designs. FEMA then defined performance criteria was developed and implemented. An engineer was retained to assist the State in technical support and help contractors and educating the general public about choosing a safe room construction contractor and helping homeowners with complaints against contractor performances.

The Safe Room Initiative and rebate program built 6,016 safe rooms after the 1999 tornado. There were no deaths in the 2003 tornado; the success directly attributable to the availability and utilization of the safe rooms. The Oklahomans in "Tornado Alley" felt safe and protected knowing that their families had a safe place to go.

Quick Facts

Sector:
Public

Cost:
$12,032,000.00 (Actual)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

On Safer Ground
New Secure Housing Program

Toa Baja Municipio,
Puerto Rico

Toa Baja, PR - When Hurricane Georges hit Puerto Rico in Sept. 1998, residents of low-lying areas of the municipality of Toa Baja, including Fernando Flores, had already endured yearly seasonal flooding. To relocate families whose homes were destroyed or damaged by flooding, especially those affected by Hurricane Georges, the Commonwealth of Puerto Rico created the New Secure Housing Program (NSHP). Many Toa Baja residents were included in this program, using funds provided by the FEMA Hazard Mitigation Grant Program.

Fernando Flores and his family lived in a low-lying area of Toa Baja. La Plata River and a nearby creek would flood the area and its main roads, isolating the community for several days. The families had to wait for the floodwaters to recede in order to receive any assistance.

"When we lived next to the creek, between 1973 and 2002," said Mr. Flores, "water would rise as much as 3 to 4 feet into our home. This would happen as often as once or twice a year. The cost of replacing appliances, furniture, clothes and other personal items was over $5,000 each time. Every time we flooded, we lost a part of ourselves."

The residents of this sector were pleased to discover the Office of the Governor of Puerto Rico had proposed the implementation of the NSHP and that they would be included among the families to be relocated to a safer area. The voluntary NSHP Toa Baja project, now called Urbanizacion Campanillas (Campanillas Subdivision), relocated 223 families out of harm's way. After the project was completed in 2002, the Municipality of Toa Baja demolished the acquired structures and cleaned up the surrounding area. Only 20-25 families decided to stay in the few structures remaining in Villa del Sol.

During the previous two years, Toa Baja residents endured two significant rainstorm events, major flooding in Nov. 2003 and Tropical Storm Jeanne in 2004. Both times families in Campanillas lived a different experience.

"We are now living in a concrete house, at a higher elevation," added Mr. Flores, "During Tropical Storm Jeanne, no water reached our house, and the water that did come down the streets, quickly flowed out of the subdivision. I know the streets and homes are higher and have better drainage, so we feel much safer."

Viable voluntary programs, initiated on a local level and funded by FEMA, can work wonders to assist individuals and families to move out of harm's way and relocate to a safer area. Now that they feel safer from the threat of rising floodwaters, the 223 families residing in Urbanizacion Campanillas are working on neighborhood programs to reflect ownership pride in their new homes, including efforts to maintain the subdivision as clean, attractive and in good working order.

Quick Facts

Year:
1996

Sector:
Public

Cost:
$16,667,917.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Operation Smoke Alarm
Preventing Future Fire Fatalities

Monterey County, California

Pacific Grove, CA - In 1991, the Pacific Grove Fire Department experienced a fire-related death of an elderly resident who did not have an operable smoke detector in her residence. As a result of this tragedy, the Pacific Grove Fire Department initiated Operation Smoke Alarm. Their goal is to prevent future fire fatalities and property loss associated with fires by ensuring every household has an operating smoke detector.

Local service clubs joined fire personnel and canvassed the entire City to identify those households without smoke detectors. The project surveyed over 5,000 single-family homes within the City, making sure there was at least one working smoke detector per household. Survey results revealed 34 percent of the homes did not have a smoke detector while 9 percent of the homes had inoperable smoke detectors.

The local Rotary Club donated smoke detectors and batteries that were given out during this first campaign. The project continues and smoke detectors and batteries are supplied free of charge to those in need. The project is funded through public donations and the fire prevention budget.

Pacific Grove has a large elderly population and they have become faithful “return customers.” Residents who have benefited from the program either visit the Fire Department or call twice a year to have their smoke detector batteries changed.

Since the project began and operable smoke detectors have been successfully placed in homes, small fires have been detected and extinguished early, thus, preventing loss of life and significant property damage.

Quick Facts

Sector:
Private

Cost:
$15,000.00 (Estimated)

Primary Activity/Project:
Warning Systems

Primary Funding:
Local Sources

Ottawa County, OK
Acquisition Project

Ottawa County, Oklahoma

Ottawa County, OK - The Ottawa County flood mitigation project is located in the extreme northeast corner of Oklahoma. Flooding occurs in this region from the Neosho River, Tar Creek, and Spring River, which flow north to south into the Grand Lake of the Cherokees. Twenty-two of the homes within the two subdivisions have suffered substantial damages and are listed on the repetitive loss list.

The project consisted of the acquisition of six homes on the repetitive loss list. The homes were demolished and the land returned to open space or park area.

The benefits included the reducing the amount of repetitive losses and associated claims filed against the NFIP, preserving and restoring the project area as a natural open space, improving the water quality in the area, and providing wildlife habitats.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$419,867.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Pacific Tsunami Museum
Museum Educates New Generations

State-wide,
Hawaii

Hilo, HI – Tsunamis are as much a part of the Hawaiian history as the islands themselves and the deadliest of all Hawaiian natural disasters. The State is identified by the scientific community as the “tsunami capital of the world.” But with the population of Hilo grown to almost 40,000 people, there are now two generations of children with no experience of tsunamis.

In the last 74 years, 230 lives have been lost due to tsunamis, with property damage exceeding 60 million dollars in the last 30 years. The most devastating occurred on April 1, 1946. Dubbed the “April Fools’ Day” tsunami, it claimed 159 Hawaiians’ lives with 96 of those in Hilo alone. Property damage was in excess of 26 million dollars.

During a 1993 festival held in Hilo, a group of local residents were sharing stories of tsunami experiences. Jeanne Branch Johnston who had survived the 1946 event thought “we should have a tsunami museum.” With the influx of residents and the propensity for people to gravitate to the coastlines, it was extremely important to have an educational means available.

Johnston, with assistance from Dr. Walter Dudley, professor of oceanography at the University of Hawaii at Hilo, and co-author of the book, "TSUNAMI", and the provost of the University of Hawaii at Hilo, formed a non-profit organization. The First Hawaiian Bank donated their building worth over 1 million dollars to the organization. Renovations of the building began after a grant from the Federal Emergency Management Agency’s Hazard Mitigation Grant Program (HMGP) was approved. The interior of the building was completely restored by volunteers and prisoners.

Grant monies provided exhibit and outreach education support for adults and children in many categories. A computer system with desktop publishing capabilities, a CD-FOM writer, and audio/video editing was installed. A library of videos contains educational materials. Large exhibits have been developed. Books, articles, displays, and other items are now in place. The website developed, www.tsunami.org, benefits virtual visitors unable to come in person.

After opening in June of 1998, the museum has had over 17,000 visitors. School groups from across the State and mainland come to the museum to study and learn the need for awareness and preparedness. Many of the programs at the museum are now being used as part of the permanent academic curriculum.

Volunteer Director Donna Saiki said, “People come here to re-connect with their history.” The entire museum staff is composed of volunteer docents who spend hours educating visitors. Many of the island’s elders come and share their tsunami stories. Saiki stated, “No one in Hawaii should die because of a tsunami.”

Quick Facts

Sector:
Public

Cost:
$1,224,200.00 (Actual)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Partnership, Program, Persistence Watershed Buyout Plan

Newton County, Missouri

Neosho, MO - Although far removed from both the Mississippi and Missouri Rivers, the City of Neosho, had a long history of flooding. In the 1960s, the Hickory Creek Watershed (and especially the High School Branch which runs directly through the City) was not sufficient enough to carry runoff water in severe storms. Average annual flood damages to homes, businesses, public facilities, roads, and bridges totaled $855,500.

Armed with documented statistics, the City developed a watershed agreement in cooperation with the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). The agreement was designed to eliminate the flood-rebuild-flood cycle within the City via a buyout of several residential and commercial properties and the construction of 11 floodwater retention dams. During Missouri's Great Flood of 1993, the City experienced unprecedented flood damage. The Watershed Plan, already developed, was in desperate need of execution.

Following the 1993 flood, FEMA's Hazard Mitigation Grant Program (HMGP) funds became available and the City of Neosho was able to acquire 52 residential properties. The buy-out program received overwhelming community support. An additional 26 property owners wanted to participate in the buyout program, but unfortunately the HMGP funds were not sufficient enough to meet all known needs.

In Aug. 1997, the citizens of Neosho decided to take control of their own destiny and passed a 3/8 cent sales tax for park, recreation, and storm drainage projects. Nations Bank agreed to finance up to $1.5 million in bonds to complete the flood-buyout program. The City obtained a 4.51 percent interest rate and recently approved the first issue of nearly $1.4 million. Nineteen properties have been targeted for the first issue. The $203,000 generated through the tax and approximately $120,000 of an already existing transportation tax will be used to pay off the bank note.

City officials have mentioned over and over again that the flood buyout program proved to the community that hazard mitigation makes sense. The HMGP was the "jump start" the City needed. Since the buyout program the NRCS has now committed the needed funds to complete the floodwater-retention dams. A partnership, a program, and persistence by City officials have forever changed the way the City deals with its flood risk.

Quick Facts

Sector:
Public

Cost:
$1,800,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Petersburg Area Acquisition
Returning Area to Natural Contours

Grant County,
West Virginia

Cabins, WV - Rapid snow melts and heavy rains caused this area of West Virginia to suffer flood damages in 1949, 1985, and three times in 1996. Each subsequent event caused damages of increasing measures to residential properties. The September 1996 flood caused a great amount of damage in this area, and one family's home was completely washed away.

The Grant County Commission acquired and demolished two, flood-prone residential structures: a two-story brick residence and a one-story wood frame home, plus the vacant land between them.

After the man-made structures were removed, the vacant land was landscaped to meet the adjacent contours, and seeds and straw were applied to retard erosion. Deed restrictions require that the land remains as open space in perpetuity to block future development in this area of the floodplain. The State Department of Natural Resources is planning to use this area for stream access, which is well within the guidelines for land use in the Hazard Mitigation Grant Program (HMGP) Acquisition Program.

Losses from the November 1996 event totaled $101,000 for these two residences. Additionally, one entire residence was washed away during this event, representing another $50,000. Cost saving from not having to deploy emergency services personnel in the future, while not measured in exact dollars, is significant.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$196,393.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Philippi Acquisition
Preventing Flooding In a Rugged Terrain

Barbour County,
West Virginia

Philippi, WV - The terrain of West Virginia is very rugged, consisting of forested hills and mountains with narrow valleys. Due to the extremely narrow river valleys throughout most of the State, flooding is the most common cause of widespread disaster.

The flood stage is 17 feet. Since 1985, the Tygart River has flooded 8 times with flooding over 20 feet. In 1996, the area experienced, again, heavy rains and flooding. This repetitive flooding has caused more than $2 million in damage.

The community received Hazard Mitigation Grant Program (HMGP) funds to acquire three residential and three vacant commercial warehouses. Philippi will retain this area as open space.

Based on previous damage assessments, a savings of $270,931 will be avoided in future damage. Plus, savings in disaster response costs are expected as a result of this project.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$165,493.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Placer County Elevation Project
Miner's Ravine

Placer County, California

Placer County, CA - The Dry Creek Watershed has experienced several significant flood events over the past several years. Homes and properties repeatedly flooded, resulting in millions of dollars of property and personal losses.

Authorities of Placer County and the State of California established the Dry Creek Regional Project, a multi-jurisdictional effort to reduce repetitive flooding in the Dry Creek Watershed. The goals of the project are to reduce existing, repetitive flood damages through various flood-control options, including structural and non-structural; and to assist responsible communities in avoiding potential future damages and economic losses.

The Placer County Structural Flood Control Project on Miner's Ravine began by elevating 33 single-family dwellings to 2 feet above the base flood elevation (BFE). When completed, these elevations will remove the homes out of harms way and eliminate the repetitive flood damages and resultant losses.

Funding for the project was through FEMA’s Hazard Mitigation Grant Program. The Federal share was $1,257,897. Based on previous damage assessments, the State of California, in cooperation with FEMA, determined that the project is expected to return benefits of $7,200,000 in future avoided damages.

Quick Facts

Sector:
Public

Cost:
$1,677,196.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Police Department Seismic Retrofit Strengthening A Critical Facility

King County, Washington

Seattle, WA - Early in the 1990s, the City of Seattle, Washington, decided to do an overall survey to determine the weaknesses and integrity of several older buildings. One of the worst identified was a police station that had been built in 1926, and purchased as is by the city in 1985 with an appraisal value of $2.3 million.

A project to strengthen and seismically retrofit the building began in August of 1995 and was completed in January of 1998. Capital Improvement funds paid for the approximate $957,000 retrofit program.

Diagonal bracing was done on the east and north walls of the basement and the first and second floor. One major brace was run through the middle of the building while extra members were strategically placed throughout each floor. Certain walls were reinforced with fiberglass and epoxy. In the basement, micro piles were driven into the footings, and additional diagonal and vertical braces were installed to carry the load should the building rock. Steel angles connected the floors and walls.

A new emergency generator system was installed using bolted footings with springs that allow for earthquake movement without disruption of service. Many member supports added additional strength to the eight bays of trusses lined in a series across the roof. Windows throughout the building were covered with safety film. "This was a difficult job that took over a year to complete," Robert Snyder, City Architect and Engineer for the project said. "The police department remained active throughout the retrofit."

The southwest corner of the building had always been a weak spot. When a 6.8 magnitude earthquake struck the Puget Sound Region of western Washington, the integrity of that corner, which is also an exit stairway, was seriously compromised. Temporary steel braces were added to secure the walls, as well as vertical reinforcements bolted through from the outside.

After the earthquake, no one throughout the police department experienced even non-structural damage. "Some phone books fell over, and some file drawers came open," was all one secretary could report. There were a few cracks in the safety covered windows, that would have shattered had the film not been applied. On the roof, the scupper shifted, causing leakage though the seams and into the interior of the building. The City of Seattle had the foresight to retrofit, save people from serious injury and possible death, and save the historic and valuable 75-year-old building from total destruction.

Quick Facts

Sector:
Public

Cost:
$957,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Local Sources

Poquoson Home Protection
Elevating After Hurricane Isabel

Poquoson City, Virginia

Poquoson, VA - On September 16, 2003, Tim Morrison and his family finalized the purchase of their new home. Though eager to move in, the Morrison family had to wait until the renters currently occupying the house moved out.

But within days, Hurricane Isabel moved into the area with a vengeance. Nine inches of water covered the first floor living space, with flood water over 5 feet deep surrounding the house. The hurricane blew down trees and branches, leaving debris everywhere.

Being located in a high-risk flood area, fortunately, the Morrisons had flood insurance on the structure and the renters had flood insurance on their personal belongings.

Along with many of their new neighbors, the Morrison's structure was "substantially damaged," receiving flood damage equal to or exceeding 50 percent of its pre-disaster market value. The total cost of elevation, repair and foundation construction was estimated at $120,000.

The Poquoson building official determined that elevating their home was needed to meet the floodplain ordinance and prevent future damages.

Having obtained a Standard Flood Insurance Policy through a local insurance agent with the National Flood Insurance Program (NFIP), Tim was able to take advantage of the Increased Cost of Compliance (ICC) part of his policy to help pay for his mitigation solution. After obtaining a proof of loss, a repair estimate and substantial damage declaration, an ICC claim was filed.

The Morrisons packaged the ICC benefits with a low interest loan from the Small Business Administration (SBA) to repair and elevate their home. In addition, they also added content coverage to their flood insurance policy.

"Without Federal assistance we wouldn't have been able to do what needed to be done," Tim Morrison explained. "I really liked working with SBA, our insurance adjuster showed up within days after the damage and our contractor did a great job."

Elevating their home not only gave them peace of mind and put their biggest investment out of harms way, their flood insurance rate was significantly reduced. The Morrisons turned a devastating situation into a positive and effective solution.

In late August of 2006, Tropical Storm Ernesto made landfall dropping heavy rain over Mr. Morrisons home. Though the flood waters were about 1' lower than Hurricane Isabel's, they still reached a level of 3'. While some of his personal property in a storage shed was lost, Mr. Morrison's home stayed high and dry.

Quick Facts

Sector:
Private

Cost:
$120,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

Public School Retrofit Program
Efforts Prompted By Parents and Staff

King County, Washington

Lake Washington, WA - It was April 29, 1965, when the last major earthquake struck western Washington State. While aware of the possibility of another event, locals had been lax in their efforts to take action. With population growth over the years, and the building of more schools in the Lake Washington School District, parents and district staff members began vocalizing their concern about the risk of earthquake and what would happen to their children in such an event.

In early 1992, local engineers assessed the safety of the school buildings. Since schools did not have a lot of money, local funds would be used, and a plan was developed.The plan would determine the cost to complete structural and non-structural projects for seismic retrofit.

The school district including Kirkland, Redmond and parts of King County imposed a construction levy on the 1992 general election ballot to raise funds for seismic upgrades, a safety program, and also an Americans with Disabilities Act (ADA) program. A two year levy was initiated in 1996 and a four year levy in 1998 with total funds, for retrofit alone, in the amount of about $6 million. Structural and non-structural retrofitting has been done.

On February 28, 2001, mitigation and safety measures in the Lake Washington School District were tested when a strong 6.8 earthquake struck the Nisqually Basin and Puget Sound area of western Washington. Most of the schools in the district are built on a liquefaction zone which caused the ground to "roll like jelly," said Forrest Miller, Director of Support Services for the School System. "The buildings were all tested and nothing failed. The only thing that fell was one light fixture in the oldest building which was built in 1952."

There are several successes to this story. Mr. Miller stated he is "so impressed with the people in this district who got things done!" Because of their vision and perseverance, lives as well as millions of dollars were saved. Due to their on-going safety drills, the children and teachers were well trained, and were actually training the adults on what to do.

Custodians and other appropriate employees have received the Applied Technology Council (ATC) Training, which teaches rapid visual assessment of interior structures. Immediate inspection can be done after an incident, which, in this case was instrumental in allowing classes to resume with minimal loss of time. Teachers and other school employees were tested beforehand to determine responsibility during earthquake and fire drills so every student would be accounted for and in their pre-decided location.

The benefits are many. There are 25,000 students in the Lake Washington School District, which is the fifth largest in the state of Washington. There was no loss of life or injury, and 40 buildings in the district were saved by either new construction or seismic retrofit. To construct a new school building today would cost at least $36 million, and to find temporary housing for classrooms in case of damages would have cost thousands.

Quick Facts

Sector:
Public

Cost:
$6,000,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Local Sources

FEMA

Railroad Bridge Removal Providing Flood Control

Salinas Municipio, Puerto Rico

Salinas, PR - The community of La Margarita (303 homes) was developed in 1973 in an A-Zone floodplain along the west bank of the Nigua River. Since it was developed, it had been affected by four major floods.

The adverse effects of the floods were aggravated by a 1906 steel railroad bridge located just north of the community that was no longer in use. This abandoned structure accumulated debris washed down stream by rushing water, creating a dam that directed the river current into the community. After the floods caused by Hurricane Hortense (1996), the community organized a group called 'Comit, Ro Nigua de Salinas, Inc.' to propose mitigation projects to benefit Salinas and, especially, La Margarita.

The objective of the committee is to serve as a proponent and coordinate interagency action for short-term mitigation projects. The long-term objective is to support and promote a flood control project proposed by the US Army Corps of Engineers (USACE) that would ultimately result in the reclassification of the township of Salinas as a non-flood zone. Concurrent with these two main objectives, the committee provided and coordinated personal and family mitigation actions by means of weekly orientation and home mitigation workshops.

The first short-term mitigation project consisted of removing the old railroad bridge, known as "Puente Negro" (Black Bridge), for its adverse effect on the community. This action required amendment to PR Law 118 that protected the structure for possible future use. The committee lobbied for amendment of the law with State Senator Enrique Melendez, and Representative Guillermo Valero to present the necessary changes in legislation.

The next challenge was to provide historic documentation of the bridge as required by the State Historic Preservation Office (SHPO). The documentation was coordinated and financed entirely by the committee. The USACE supported the proposal, and provided scientific and engineering data on which to base the mitigation project. Other government agencies such as Municipal and State Civil Defense Office, Natural Resources Department, Institute of Puerto Rican Culture, and professional organizations were rallied by the committee to provide support and assistance. Most significant was the community's desire for a solution to the problem. In August 1998, the bridge was removed, just a month before the passage of Hurricane Georges (September 1998).

The timely removal of the bridge, just before Hurricane Georges, minimized damages to homes and personal property, and reduced the risk of losing lives in La Margarita. The community was flooded but not nearly as bad as in the past. Such was the committee's argument during the two years of struggle for the approval of the mitigation project.

The 'Comit, Ro Nigua de Salinas, Inc.' efforts and achievements were recognized by United Funds by awarding it the 1999 Golden Rule Award.

Quick Facts

Year:
1996

Sector:
Public

Cost:
$31,600.00 (Actual)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Local Sources

Redlands Fire Demonstration Garden
Fire-Resistant Landscaping

San Bernardino County, California

Redlands, CA - Residents of the urban-wildland interface, an area encompassing more than a third of the City of Redlands, have a place to go where they can learn how to modify vegetation at their homes and use fire-resistant materials to make their homes fire safe. Since 1992, Redlands has participated in disaster recovery efforts related to seven different Federally declared disasters, including five major floods, an earthquake, and a wildland fire.

Bolstered by grants from FEMA and the Governor's Office of Emergency Services (OES) totaling more than $217,000, the city of 60,000 residents implemented a three-fold plan to reduce the menacing impact of natural disasters. Included in the plan is a fire demonstration garden, one of five in California that graphically and three-dimensionally shows how defensible space landscaping around structures in an urban-wildland interface area can save homes. The Redlands Fire Demonstration Garden is the result of a partnership between public agencies and private businesses and is designed to show homeowners how fire-resistant landscaping may help save their homes in a wildfire while also helping to lessen or prevent erosion.

Donations of materials and labor from private businesses to establish the garden was combined with the $67,000 of the total Hazard Mitigation Grant Program (HMGP) grant.

Garden exhibits include a model home constructed of ignition-resistant materials and recommended fire-resistant plant materials. Handouts showing examples of cost-effective and fire-safe principles in home design and construction are made available to visitors who can follow a winding pathway through the garden, which features a four-zone planting strategy that involves a variety of fire-resistant plants. Exterior walls and the roof of the model home demonstrate mitigation measures, including fireproof roofing and siding materials, spark arrestors, screens designed to keep flying embers from entering structures, and hardening of eaves with fireproof materials. "Bird stops" are added to the ends of the tiles, to demonstrate effectively preventing the birds from stuffing combustible materials in the roof. The garden also illustrates how to create "defensible space" around structures—space where firefighters can fight fires more safely while protecting homes.

Many people in the fire-risk areas of Redlands have used the garden as a model, taking home the ideas shown there and making their homes fire safe. Through the City's Firesafe 2000 program, funded by a separate $150,000 FEMA/OES mitigation grant, the city provided funds for 38 single-family dwellings and a separate 10-home project. Homeowners each received $3,000 to pay for getting rid of excess and fire-prone vegetation, and for installing irrigation systems and revegetation with fire-safe plants, in a program administered and monitored by Temby.

Vegetation shown is not specific just to Redlands, but types of plants that could be incorporated into fire-safe revegetation anywhere in Southern California. "People find out that fire plantings don't have to be ugly," said Temby.

Quick Facts

Sector:
Public

Cost:
$67,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Redlands Schools Seismic Mitigation Protecting Students and Computers

San Bernardino County, California

Redlands, CA - The Redlands Unified School District has a year-round campus program resulting in virtually continuous high occupancy and use of all school facilities. The district has 21 buildings. Of these, 19 are schools and offices, and two are for support services.

In July 1992, two earthquakes struck the area an hour apart, both over 7.0 magnitude on the Richter Scale. Landers was the epicenter for one earthquake while the other was in the Big Bear area. Both were felt at Redlands' schools as well as others in San Bernardino County. Redlands Unified School District facilities sustained damage and items were shaken from shelves, causing life safety hazards.

The San Bernardino County Office of Education, working on behalf of both the Redlands and Colton Unified School Districts, applied for a grant through FEMA's Hazard Mitigation Grant Program (HMGP). The grant and was awarded, and the school district embarked on a non-structural mitigation program.

The Redlands district concentrated on securing portable rolling cabinets and computer hardware. The portable cabinets are used for supplies that are moved between classrooms. Although, these cabinets have foot locks, a potential tipping hazard remains. Hence, a custom-designed strapping and floor attachment system was developed to stabilize cabinets during use but still allow for portability. Life safety is the primary benefit of securing rolling cabinets because injuries, even death, may be prevented through this type of mitigation.

Hold downs for all desktop computer hardware (monitors, CPUs and printers) have been installed. The value of the Redlands district's computer equipment is $1 million. Protection of this critical business asset is considered to be well worth the cost of doing the mitigation project. The benefit/cost ratio could be far more than one-to-one if computers and other valued equipment that have been mitigated withstand the forces of the next earthquake disaster.

The cost of this project was $74,150. Half of the funding came from the HMGP grant obtained by the San Bernardino County Schools Office for non-structural mitigation at public schools in the county. The Redlands School District contributed matching funds for this project.

Quick Facts

Sector:
Public

Cost:
$74,150.00 (Estimated)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Home Relocation
Protecting from Future Hurricanes

Sampson County,
North Carolina

Garland, NC - The Williams' home had experienced two episodes of flooding due to hurricanes. In 1984 flood waters entered the house soaking duct work, all flooring and carpets as well as damaging utilities and appliances. The family was displaced from their home for two months. When Hurricane Fran (1996) soaked eastern North Carolina in 1996, the Williams' house again had flood damage and the family was again displaced from their home for about two months.

In 1984, the Williams family repaired their home using combined funds from FEMA ($28,000) and their own savings ($5,000). Again in 1996 a combination of monies, $25,000 from FEMA and $7,500 from personal savings, was needed to repair the home. When the final repairs were completed, Mr. Williams requested the help of the Sampson County Commissioners to relocate his home out of the flood zone. The County awarded him a block grant, and in the spring of 1999 the Williams home was relocated 3-1/2 miles out of the flood zone.

This relocation project was completed just four months before Hurricane Floyd (1999) struck eastern North Carolina. This home sustained no damage as a result.

Unfortunately, Hurricane Floyd completely destroyed Mrs. Williams' mother's home which was in the same flood zone area they had just moved out of. "Judging from the water in my mother-in-law's home, I would have had at least 4 to 5 feet of water in my house if it had not been moved!" states Mr. Williams.

The fact that there was no damage to the home as a result of the hurricane clearly speaks to the benefit of the relocation. The combined costs to repair the home were $53,000 in FEMA funds and $12,000 in personal savings for a grand total of $65,000. The amount of money awarded by the county to relocate the home was $53,000. The benefit to cost ratio is 2:1.

Quick Facts

Sector:
Private

Cost:
$118,000.00 (Actual)

Primary Activity/Project:
Relocation

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Repetitive Losses in Mississippi Using Digital Photos For Identification

State-wide, Mississippi

The State of Mississippi - Repetitive loss sites have been prevalent in several flood prone counties across the State. In an effort to prevent or minimize future losses, the Mississippi Emergency Management Agency decided to develop a customized Geographic Information System (GIS) application that would allow them to query and map the repetitive loss sites.

The Mississippi Emergency Management Agency teamed up with FEMA and the Mississippi Automated Resource Information System (MARIS) to provide the necessary data and programming required for the project. FEMA personnel provided all field survey work including a detailed database of digital photography for the repetitive loss sites. This database was then integrated into a customized ARCVIEW software application that allowed users to select a repetitive loss site on a map. The user could then open a digital photograph of the selected site.

As the digital photographs were compiled, several locations that were listed as "repetitive loss" sites were actually vacant land. This discrepancy alerted the Mississippi Emergency Management Agency and FEMA to cross examine the records to see the dollar amounts of people who claimed damages. The estimated benefits were derived to be about a 3:1 ratio.

Quick Facts

Sector:
Public

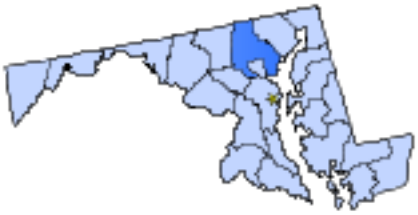
Cost:
$100,000.00 (Estimated)

Primary Activity/Project:
Flood Insurance

Primary Funding:
National Flood Insurance Program (NFIP)

FEMA

Residential Elevation Provides Peace of Mind



Baltimore County, Maryland

Miller's Island, MD - As Hurricane Isabel traveled up the Chesapeake Bay, the Peytons sat on their deck and watched the water rise, higher and higher towards their elevated home. They invited Carol's parents to come from their home next door to watch the storm. While they watched, the water kept rising and when it receded, her parent's home had been inundated. "I felt very secure, being this high, but it was scary," states Carol. "We've never had water on these lots until now."

The experience of the Peyton family truly is a tale of the two houses they own, one protected and one un-protected. In 1999 they built their first home to exceed hurricane and floodplain standards, about two feet above base flood elevation (BFE). It was designed with foundation flow vents in the ground level garage with overhead doors front and back, elevated the electric panel, furnace, air conditioner and hot water heater. The washer and dryer are on the first living room floor. The second home, on the ground level, was not built to exceed any standards.

The performance of the flood protection measures was tested by the strength of Hurricane Isabel and witnessed by the homeowners. "The water came in so fast and carried so much debris, broken pier boards, peoples' decks and planking, oil tanks, we couldn't get the front garage door open. After the storm, we had a neighbor's deck that was about 25 feet by 18 feet setting on our front yards, with furniture, a grill and a satellite dish still on the deck. Debris was crashing into our houses and damaged our garage doors. The furniture in my parents' front porch was bobbing around like it was in a blender!" Peyton said. The elevated home sustained damage to the garage doors and debris on the property; the ground level home with its contents was a total loss.

Elevation provided the Peytons with peace of mind as well as financial comfort. The cost of rebuilding would have significantly exceeded the one time investment of compliance. Power was maintained during and after the hurricane because of the 10,000-watt gasoline fueled generator located on a side deck. There was no loss of food or other temperature sensitive items, and the Peytons believe that having lights discouraged looters. Unfortunately, the neighboring house was declared substantially damaged and will be razed. A new, elevated home is planned for the same location.

"We felt so secure that night [when Hurricane Isabel struck the Chesapeake Bay], because we were up high. I am so glad we built high. And have flood insurance. Now we will build elevated for my parents," Peyton concluded.

Quick Facts

Sector:
Private

Cost:
$30,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Retirement Villa Elevation
Keeping Senior Citizens Safe

Placer County, California

Roseville, CA - The City of Roseville in Placer County, Calif., has experienced repetitive flooding in 1986, 1995, and 1997 from several small creeks. After witnessing the damages from the 1986 floods, the owner of the Sunrise Retirement Villa, a 200-unit senior citizen facility, implemented significant mitigation measures.

The building plans for Sunrise Retirement Villa called for the building to be built at 2 feet above the base flood elevation (BFE) for a 100-year flood. The owner and builder, Ed Latin, elected to build the facility at 4 feet above BFE. Latin invested approximately $800,000 to $1 million of private funds for poured concrete foundations that would raise the entire development 6 feet. This additional elevation removed the building from the flood level, reduced the flood insurance premiums and provided security to the operation of the business.

At the time of the 1995 flood, there were 250 seniors in residence at the Villa. The floodwaters rose to within 1 foot of entering the residence. Flooding occurred all around the property but no water penetrated the building. Emergency generators provided power for heat and meal preparation, and the residents stayed warm, dry, and healthy.

When asked how much he had saved in avoided damage due to mitigation efforts, Latin stated he would have lost between $3 and $4 million in property and business losses including shutting down operations for one year.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

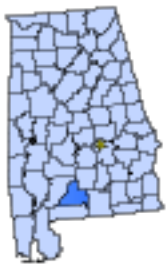
Sector:
Private

Cost:
$1,000,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Business Owner

Bridges of Conecuh County
Protecting Pilings From Scour



Conecuh County, Alabama

Conecuh County, AL - Conecuh County Engineer, Winston Foshee, knew that without preventive action the County was facing the potential for failure of seven bridges. Working with the Alabama Emergency Management Agency (AEMA), Conecuh County received Hazard Mitigation Grant Program (HMGP) funding to retrofit seven bridge sites and add a new bridge to reduce road damages and improve public safety.

The steel support pilings at seven bridge sites in Conecuh County were exposed due to streambed scouring. Exposure of the pilings had caused corrosion and weakened the pilings.

Each year, and with each flood event, the loss of material and increased scour were leading to bridge failures. To strengthen the pilings on the bridge spans, the existing concrete encasements around the steel piles were extended to encase the exposed pilings. Filter fabric and riprap were also placed around the encasements to protect the streambed from continued scour that would expose more steel piling. The work was performed by the county as an in-kind contribution. Thus, the HGMP funds were solely utilized for materials expenses. This approach allowed the county to accomplish more with less funding.

It was estimated that failure of each bridge span would have required the replacement of 150 feet bridge span per site at an approximate cost of $300,000 per bridge, for a total cost over $2.1 million. In contrast, retrofit to the pilings and riprap for all seven sites cost $86,000 and extended each bridge spans' useful life another 30 years. Following Hurricane Ivan, it appears the piling retrofits were successful at stopping the problem and, as Foshee describes it, allows each bridge span to "help heal itself."

In another project, just south of the community of Nymph, an inadequate culvert was replaced with a 40-foot steel and timber bridge span. Repetitive damages due to the inadequate culvert had begun in the early 1990s. Damage occurred during a flood in 1990, Hurricane Opal in 1995, and a spring flood and Hurricane Georges in 1998. For example, the spring flood of 1998 caused $9,000 in road damage, trapped the 900 area residents, and prevented direct fire and rescue services to the southern part of Conecuh County. The $20,000 replacement span was sized for the drainage area, eliminating road damage, and providing safe passage in and out of the area during flood events.

Hurricane Ivan represented a small test of these mitigation measures, as floodwaters did not exceed record levels in Conecuh County. Both projects, however, were designed to address problems that had accumulated over time from repetitive, small events. By having these mitigation measures in place, there was no accumulation of damages to the bridges from Hurricane Ivan.

Quick Facts

Sector:
Public

Cost:
$86,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Staying High and Dry
Elevated Richmond Restaurant

Richmond City, Virginia

Richmond, VA - When the owners of a new Buffalo Wild Wings Grill and Bar franchise considered opening in the historic Shockoe Bottom entertainment district, they knew the area was prone to flooding. Their decision to make the building flood resistant soon paid off.

The new restaurant opened a little more than a year before Tropical Storm Gaston came on August 30, 2004. The flood reached 8 to 10 feet above street level in some areas. It damaged 48 businesses and left many people homeless.

But Buffalo Wild Wings sustained only minor water damage and was ready to reopen in 4 days. Their initial investment of $130,000 protected over a million dollars in capital and untold revenue.

The owners had decided to build up the floor 5 feet. They took the fuse boxes, the hot water heater and the air conditioner compressor from the original ground floor and moved them to the modified floor, the top floor and the roof.

Renovating the entire building cost about $1.3 million, with the floor modification accounting for about 10 percent of the total, according to Steve Green, the manager on duty when the flood hit. “That 10 percent saved the other 90,” he said. “We decided to go with a concrete floor in the bar, even though the standard for [a] Buffalo Wild Wings (franchise) is a wood floor,” said Green. “If we had wood floors, there definitely would have been more damage.”

The restaurant just had to hose the mud off the concrete floor in the bar and clean the carpet in the main dining room to get back in business. “The total cost to get the restaurant ready for business after the flood was less than $5,000, and most of that was for labor,” Green said.

Although the restaurant fared well, Green personally did not. “I lost my car, and so did my assistant manager,” he said. Other establishments near Buffalo Wild Wings did not fare well, either. A popular pizza place, just a block away, is in near ruins after the flood.

“I think they were underinsured,” Green said. “It’s going to be tough for them (to recover).”

Quick Facts

Sector:
Private

Cost:
$130,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Property Owner, Commercial

River Road Project
Keeping Road from Eroding

Oxford County, Maine

Hiram, ME - Along the Saco River on River Road, the river bank eroded within 2 feet of the roadway's edge. The shoulder was too narrow even for guard rails. Northbound traffic in the winter was in danger of sliding directly into the river. Each heavy rain event made the situation worse.

The Town of Hiram recognized that if no action was taken, the entire road would be lost. Also, the continued erosion along the road threatened Central Maine Powers Hiram Fall Dam, which is immediately downstream. The Town was awarded Hazard Mitigation Grant Program (HMGP) funds for this project in December 1997. The Town subsequently closed a 1,170 foot section of road, moved it 30 feet back from its location on the river, and elevated that section 8 to 10 feet.

The project was completed in May 1998. In June 1998, more than 10 inches of heavy rain caused flooding across central Maine. The relocated section of the River Road was not damaged and remained open to traffic. The project is expected to save the Town and its residents $772,055 in avoided damages, including loss due to dam failure.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$103,298.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Roadway Drainage Modifications Preventing Erosion Damage

Belknap County, New Hampshire

Alton, NH - The floods of 1990, January 1996 and October 1996 have repeatedly eroded the road and ditches in the southern section of the Town of Alton in Belknap County.

The Mitigation Project replaced six undersized culverts and installed riprap along the ditch line. Increased culvert sizes improved the discharge rate, preventing washouts.

The Town of Alton considers this project a success. June 1998 rains flooded and eroded many other roads in Alton. However, the June rains did not impact the project area, minimizing traffic disruption and municipal costs.

At least $15,000 in damages were avoided in June 1998. Some lessons learned include the need to use pre-cast concrete headers instead of masonry headers. Pre-cast concrete better survives the frost heaves. Also, larger rocks and gravel in ditches are better left exposed. The loam sometimes picks up and clogs the drains and culverts.

Quick Facts

Sector:
Public

Cost:
$48,060.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

Flooded Rockhill Property Relocation Project

Calvert County, Maryland

Calvert County, MD - The Rockhill property was situated immediately at the water's edge of the Chesapeake Bay and within the V-Zone (elevation 8 foot based on National Geodetic Vertical Datum (NGVD)). This portion of Calvert County was included in the Federally declared disaster in 1996.

Although the Rockhill property did not sustain damage as a direct result of the disaster, it has been damaged repeatedly by flood and flood-related erosion. During the years between 1978 and 1985, claims for water damages to this property were paid on five different occasions; these claims totaled $16,000. The property's location at the water's edge, coupled with the historical record of serious storm damage in the area, made a future predictable.

The house, a single story building, resting on concrete block piers and steel piles was placed on a new foundation and a new septic system installed. The structure was relocated 65 feet to the west of its present location, away from the reach of high tide on the Chesapeake Bay. Relocation would remove the building entirely from the potential dangers in the 100-year floodplain.

This alternative presented the opportunity for a permanent solution to a repetitive and potentially severe problem. Costs for the acquisition would exceed $101,167 versus $34,923 for relocation, and the acquisition would have been more disruptive to the owners. Relocation of the building removes it from the Coastal High Hazard Area, therefore, eliminating the risk to persons and property from flood and flood-related erosion damages. Savings, in dollars and to lives, realized by not needing to deploy emergency services personnel are immeasurable.

The future potential exposure on this property, for insurance claims to the National Flood Insurance Program (NFIP), is removed with the completion of the project. Using land already owned by the occupants provides cost savings and allows the property owners to remain in the area.

Quick Facts

Sector:
Private

Cost:
$34,923.00 (Actual)

Primary Activity/Project:
Relocation

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Safe Room Initiative Pays Off
Tornado Initiative Rebate

Cleveland County, Oklahoma

Moore, OK - Charles Atchley and his wife escaped unscathed after the 1999 Oklahoma tornado, but decided not to take their good fortune lightly. They took advantage of a FEMA tornado initiative ($2,000 rebate) and installed a below-ground safe room.

During the tornado of May 8, 2003, Atchley and his three grandchildren took shelter in his safe room. His wife was at work at the time of the storm. He quickly took shelter after hearing the warning siren. When the storm passed, his family left the shelter safe and sound. Once again, this family was lucky and had no damage to their home, but Atchley said the storm shelter gives him "peace of mind" he wouldn't trade.

The shelter unit is neatly recessed into the ground and only the door can be detected nestled within the manicured landscape of the backyard. Atchley has stocked his safe room with the necessary supplies for survival and even included a black-and-white TV that runs on batteries. "I even get reception in the storm shelter," he boasted.

The below-ground shelter is a prime example that shelters don't have to be eyesores because the only trace visible on this unit is the access and two wind-driven turbines for air circulation.

The City of Moore has established a shelter registration program. Property owners with shelters register with the fire and police departments so their shelter can be checked following a tornado in the event debris has fallen on the ground level doors. Having a noisemaker such as a whistle in the shelter supplies is recommended.

“You never know when you have to make a little noise to let emergency personnel know you’re safe and sound in your shelter,” states Atchley.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

FEMA

Safer Shelters Become a Reality
Initiation for Shelter Retrofit

Sarasota County, Florida

Sarasota, FL - Florida's hurricane shelter deficit and a State initiated shelter construction survey resulted in an ambitious 9-year Shelter Retrofit Program in Sarasota County. Although State inspectors found Sarasota County Government supported shelters useable, the shelters were still in need of improvement.

Sarasota County has 33 hurricane shelters located in 116 separate buildings. Most of the 116 buildings need improvement to meet State hurricane shelter standards. The hurricane safety of the shelters, most of which are located in school buildings, are or may be marginal due to such deficiencies as masonry walls that are not reinforced, open spans or lack of an engineering analysis.

The County's Emergency Management Department has undertaken an ambitious 9-year Shelter Retrofit Program to correct these deficiencies and expand shelter capacities. The Shelter Retrofit Program is also consistent with the County's Local Mitigation Strategy, which was adopted by the County in 1999.

The retrofit program is being funded from the local one-cent sales tax extension approved by voters in 1999; State- and FEMA-funded mitigation grant programs, matched by County infrastructure funds. The program includes evaluation of all current shelters and where necessary and cost beneficial, retrofitting of existing buildings. Phase One will retrofit 10 buildings at a cost of $1.8 million funded by a grant and a local 12.5 percent local contribution. Phase Two will retrofit 23 buildings at an estimated $2.8 million funded by a grant and 12.5 percent in local funds. The total cost of the future Phased Shelter Retrofit Program will be an estimated $4.6 million to retrofit and expand Sarasota County's hurricane shelters and will be funded by local, State and Federal monies.

Sarasota County partnered with the Sarasota County School Board to undertake this program and to work cooperatively to ensure that present and future new school construction would provide hurricane safe buildings. The retrofitting of the following three school buildings was completed in 1999 and 2000 with local funds: Tuttle Elementary School, which went from the ability to shelter 500 people to 1700; Ashton Elementary School, which went from 500 to 1500 shelter spaces; and Brookside Middle School, which went from 500 to 1100 shelter spaces. The construction of a new high school that meets higher shelter standards and provides additional shelter space in the southeastern portion of the County has also been completed. The school was funded by the school district. Over $3 million in additional funds were necessary to construct the building to meet these higher hurricane standards.

When the project is completed, hurricane shelters will provide a higher degree of safety to those using them during disasters. In addition, the retrofit program will result in several thousand more safe shelter spaces over the current shelter capacity.

Quick Facts

Sector:
Public

Cost:
$4,600,000.00 (Estimated)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Local Sources

Santa Rosa Island Public Works Rebuilding Building After Hurricanes

Escambia County, Florida

Santa Rosa Island, FL - Santa Rosa Island has experienced serious repetitive flooding and wind damage as a result of numerous storms over the past several years, including Tropical Storm Alberto in 1994 and Hurricanes Erin and Opal in 1995. Hurricane Erin completely demolished the original Santa Rosa Island Authority (SRIA) Public Works building located on the sound. The building was a concrete, slab-on-grade structure built in the early 1950s.

The SRIA has one of the more progressive hurricane-resistant building programs in the United States. SRIA has adopted prescriptive requirements for coastal construction that include the requirement that all new and substantially improved residential buildings across the entire island be elevated on pile foundations.

This project involved rebuilding the original structure using mitigation funds under Section 406 of the Disaster Protection Bill. The new building was raised 4 feet above the BFE, (referenced to the National Geodetic Vertical Datum, 1929 FEMA-FIRM). The building was placed on a foundation with concrete block piers. The lower area of the building was converted to storage.

Although Hurricane Georges (1998) did not cause significant flooding at Santa Rosa Island, there is the potential for inundation with high velocity water and wave action. The flood depth for this area from Hurricane Georges was approximately 9 feet.

The original public works building was built at a grade elevation of 4 feet and had an approximate total structure and contents value of $185,000. Based on this information, if the building had not been elevated, the damage from Hurricane Georges would have been 29 percent or $53,650.

This project has resulted in a building that now has a significantly lower risk of future damage from flooding. All files, computers and critical contents of the public works building have been located above the Base Flood Elevation (BFE) in the new building. Since the public works building is a critical facility, this is an example of an important success.

Quick Facts

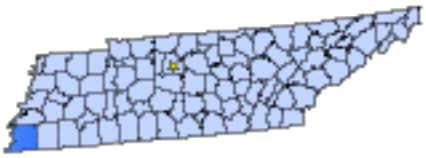
Sector:
Public

Cost:
$250,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Community Rating System (CRS)

Seismic Mitigation of Water System Protecting the Public Water Supply



Shelby County, Tennessee

Shelby County, TN - Shelby County is located within the impact area of the New Madrid fault system. At the University of Memphis' Center for Earthquake Research and Information, they have reported a 40 to 60 percent probability of a New Madrid Seismic Zone earthquake in the magnitude of 6.0 to 6.3 within the next 15 years. Memphis Light, Gas and Water (MLGW) own and operate the water supply system for Shelby County, excluding the incorporated towns other than Memphis and certain private wells. The need to protect and maintain stability of the water supply system for the entire Shelby County area was significant.

The MLGW has initiated a seismic retrofit project to protect its Davis Water Pumping Station (located in southeast Memphis), and to enhance the survivability of the connections between the water distribution lines in 55 (one-third) of the city's production wells. MLGW withdraws water from aquifers of approximately 170 independent wells.

Retrofit plans included reinforcing and anchoring masonry walls; strengthening steel frames; improving the connection of concrete wall and roof, securing anchorage of pipes and valves, and bracing of pipelines; bracing of treatment and control equipment; and protecting an overhead crane.

The estimated cost to replace the pumping station in the event of a large earthquake is over $17 million. Additionally, each day the station is not in service costs $1.4 million. The total projected savings is $112 million. Increasing the capability of water well connectors to withstand a 6.5 to 7.5 magnitude earthquake, at a cost of $9,280 per connector, prevents an estimated loss of $188,000 per day for each connector damaged.

Quick Facts

Sector:
Public

Cost:
$968,800.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Seismic Retrofit of Fire Stations Structural and Non-Structural

Orange County, California

Orange County, CA - The Orange County Fire Authority (OCFA), one of the largest regional fire service organizations in California, identified the seismic vulnerability of 22 fire stations throughout the Orange County area. OCFA provides fire suppression, emergency response medical, rescue, and fire prevention services. Its service area covers 511 square miles, protecting more than 1.1 million residents. The OCFA has 20 automatic and mutual aid agreements with other jurisdictions for use of assignments of resources in the event of major emergencies.

Structural and non-structural seismic retrofit of all the fire stations located within the OCFA jurisdiction was completed. Strengthening included wood-shear wall installation; anchor bolts and hold downs at the existing plywood shear walls; foundation bolting, metal shear clips and nailing at the roof-to-wall interface; steel brace frames and grade beam footings next to each apparatus door; removal and replacement of damaged roof structures; and sprinkler system installation. Asbestos abatement was also done at the same time.

Given California's continuous string of disasters, it is vital to improve building integrity in order to ensure safety of employees and maximum performance of all operations. These mitigation measures will increase the reliability of essential building components, mitigate risk to life safety, and minimize future structural damage.

Quick Facts

Sector:
Public

Cost:
$2,764,476.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Local Sources

FEMA

Seismic Retrofit of Mobile Homes Protecting Against Flood and Earthquake

Pierce County, Washington

King County, WA - Rainier Manor Mobile Home Park with more than 75 homes sits in a "bowl" on the banks of the Puyallup River. In 1995, due to excessive spring rains and an early snow melt in the mountains, the levy overflowed, flooding over half of the homes that were situated in the lowest parts of the mobile home park and within the confines of this "bowl." Most of the mobile homes were destroyed or had damages of more than 50 percent of their value, exceeding the 50 percent rule of the National Flood Insurance Program (NFIP).

This initiated a visit by an NFIP agent. The agent discovered that the residents were not following any type of standard in their recovery efforts, which prompted him to persuade them of the importance of supporting and enforcing regulations to maintain their eligibility in the flood program. Informing the residents, all retired and on limited incomes, of the regulations they were violating made them quite upset, prompting them to argue for a variance because they didn't want the added expense of the requirements.

The NFIP and the Small Business Association (SBA) set up a Disaster Field Office (DFO) in the mobile home park to educate and convince residents to not only elevate for flood but also seismic retrofit for earthquakes at the same time. A team of counselors made individual counseling available to each homeowner. Homeowners were shown renderings of what their homes could look like, and the counselors assisted in going to dealers in the area to find the best prices for new mobile homes. To help soften the expense for the homeowners, a mission assignment was developed with the U.S. Army Corp of Engineers to do an elevation for each homeowner, so each one would know what was necessary for his or her individual home.

Through the Hazard Mitigation Technical Assistance Program (HMTAP), a video was produced to educate dealers and all stakeholders from transporting to set-up and installation of mobile homes. New seismic standards were incorporated with the best methods for tying mobile homes to their foundations. With their homeowner’s insurance and help with SBA loans, all the residents in the Rainier Manor Mobile Home Park, elevated and retrofitted their homes.

A 6.8 magnitude earthquake struck the Puget Sound Region on February 28, 2001. Not one home sustained any damage. The success of this story is not only the fact that no homes were damaged in this earthquake event, but that the agents from the NFIP and SBA turned an otherwise disastrous situation into a positive result with their patience, guidance and assistance, creating a safe environment for every resident in the Rainier Mobile Home Park. The average replacement cost for each mobile home was approximately $40,000, with an average $10,000 to $15,000 for each retrofit/elevation.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$2,000,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Technical Assistance Program (HMTAP)

Seismic Retrofitting of Buildings
University of California Santa Barbara

Santa Barbara County, California

Santa Barbara, CA - For many older facilities, one mitigation option to protect against seismic hazards is the seismic rehabilitation of existing structural elements. An example of the benefit of such mitigation measures can be found through an analysis of the case of North Hall at the University of California at Santa Barbara.

The North Hall facility is a three-story reinforced concrete structure, designed and built in 1960. It was originally thought that the building was designed to the 1958 seismic load-resistance building code, which did not prescribe the more modern types of earthquake-resistant construction. However, a 1973 engineering investigation discovered that the building was instead designed for only one-tenth of the 1958 requirements, creating unsafe conditions at the facility.

Fortunately, the construction work to correct the original design errors occurred at about the same time that the Uniform Building Code was being revised to include substantial earthquake resistance provisions. The facility was partially rebuilt in 1975 by adding interior and exterior shear walls to provide additional seismic resistance. The decision was then made to rebuild the structure according to the provisions of the revised building code; the upgrade made the North Hall Building the only building on campus built to that advanced level of seismic standards.

The 1976 cost of the seismic retrofit was $288,000 for this three-story building with a total floor area of 24,480 square feet. Thus, the cost of the retrofit was $11.76 per square foot. The 1976 cost of replacing the building would have been about $60 per square foot. Thus, the retrofit cost was about 20 percent of the replacement cost. Present replacement costs for this building would be about $150 per square foot.

The timing of the work could not have been better. In 1978, approximately 2 years after work was complete, an earthquake struck Santa Barbara. Because the mitigation work had been completed on the North Hall, the damage to that structure was very minor, and did not impact structural integrity. By contrast, substantial damage was sustained by the unretrofitted buildings on the campus that were not built to the provisions of the new building code. Total damage to unretrofitted buildings on the University campus alone came to over $3.8 million. On the basis of direct costs alone, retrofitting to the provisions of the 1976 building code proved to be cost-effective.

Quick Facts

Sector:
Public

Cost:
$288,000.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Private funds

FEMA

Shelter from the Storm
Citizens Flock to Fire Dept's Shelter

Talladega County, Alabama

Talladega County, AL – The Wintorboro Fire Department's community shelter was put to its first test during Hurricane Ivan on Sept. 15, 2004. The shelter provided a safe haven for residents during the high winds and tornado warnings produced by Hurricane Ivan.

Prior to 2004, residents in the area would arrive at the Winterboro Fire Department looking for a safe place to stay during severe weather. Fire Chief Kevin Sturdivant said his team of 20 volunteers would take them in and line the people in the fire station's hallway. However, this was not a safe situation, as the fire station is not built to withstand the high winds produced by tornados.

In 2003, Alabama Emergency Management Agency (AEMA) provided a $17,200 grant to install a subterranean, stand-alone shelter in the embankment leading to the Fire Department. The grant provided 75 percent of the cost. Donated firefighters' labor, cash contribution from Talladega County, and site-preparation work by a local contractor provided the remaining 25 percent costs. The shelter holds 50 individuals and contains bench seating, and telephone, Internet access, television, and VHF radio capability. The shelter is designed to FEMA community shelter specifications. It is able to withstand an F5 tornado (winds over 250 mph) and the entrance can withstand the impact of 200 miles-per-hour windborne debris. The shelter was completed and ready for use in Jan. 2004.

As Hurricane Ivan approached Alabama, members of the community began assembling at the Fire Department. Seventeen people took shelter from the severe weather for approximately 16 to 20 hours. Among the people was a wheelchair-bound resident who lives near the shelter. The gentleman, who has his own key to the shelter, was able to arrive on his own to the wheelchair-accessible shelter. Fire Chief Sturdivant says, "The shelter is a great benefit to the community that I hope will save lives in the future."

Over the last three years, AEMA has provided grants for approximately 11 community shelters. Locating these shelters throughout the State provides a greater level of life-safety protection from tornados. More community shelters are planned as funding becomes available.

Quick Facts

Sector:
Public/Private Partnership

Cost:
$17,200.00 (Actual)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
State sources

Sheandoah River Property Elevation Project More Economical

Shenandoah County, Virginia

Shenandoah County, VA - On many occasions, heavy rains caused the Shenandoah River to overflow its banks into the 100-year floodplain, causing a repetitive problem that has increased in intensity and frequency. The property along side the river has been flooded on three occasions since 1981. During the flood of September 1996, water levels reached 7.5 feet on the main level. Damages to the structure and contents totaled $153,000.

Since the flood velocities are generally negligible and debris had not been present in any past flooding events, the potential for foundation and outside structure damage was minimal. The cost of acquisition was estimated at $400,000 but elevation costs were estimated at $102,225. The alternative to acquisition was particularly attractive to the residents who had lived in the area for over 15 years and wished to remain.

The entire structure was elevated 13.5 feet, approximately one foot above the base flood elevation. Backfill was used to eliminate the existing basement. A brick and steel foundation provides support for the newly elevated structure, and installation of a dirt berm completed the project.

The damages that occurred during the flooding in 1996 exceeded the total cost of the elevation project that was covered by NFIP insurance. Elevating it decreased future insurance payouts by placing it well above the base flood elevation.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$102,225.00 (Actual)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Resisting Wildfires and Floods
Simi Valley

Ventura County, California

City of Simi Valley, CA – Set in a valley between two mountainous areas of brush-covered wildlands north of Los Angeles, the City of Simi Valley faces multiple risks from natural hazards including wildfires, earthquakes and floods. Yet it is considered to be "the safest city of 100,000 or more" in California, according to City officials.

The Simi Hills and Simi Valley are considered to be a high-hazard area. There are numerous secondary faults, and seismic risk is high. There is always a threat of flood and mudflows following wildfires, which can denude the hills straddling the city to the north and south, causing erosion and damage to the watershed. City and fire officials are fully aware of these risks. "We wanted to keep the hills and mountain vistas," said Gaddis Farmer, deputy director of the building department. The City, in cooperation with Ventura County, strictly manages growth and development in the wildland/urban interface to ensure infrastructure and safety services keep pace with growth.

There is an effective partnership between building officials, the City's fire service, City officials, and officials and decision makers for the neighboring unincorporated areas of Ventura County where the wildlands abut Simi Valley's city limits. Within the city, California's Uniform Building Code and other requirements are incorporated into every decision on proposed housing and commercial development. Builders are regulated, and "policymakers must buy into it," said Farmer.

Developers of new projects are required to take several mitigation measures before building permits will be issued and projects approved. These measures include: greenbelts (landscaped, irrigated areas); buildings constructed with non-combustible roofing systems; eaves boxed-in, enclosed with stucco or plaster; exterior walls made of stucco, at least seven-eighths of an inch thick; duel glazed windows; smoke detectors in every bedroom; spark arrestors on fireplaces; homes and commercial structures of 5,000 square feet or more have interior sprinkler systems; and brush cleared from 100 to 200 feet (depending on vegetation and terrain) away from dwellings.

Since the wildfires, attention has been directed to the Simi Hills. Erosion control measures, including lines of sandbags and K-bars (concrete barriers), are placed in advance of the rainy season to direct water flows from hills above home developments. Reseeding of hills, along with other mitigation measures, has also been done. FEMA's Hazard Mitigation Grant Program (HMGP) provided funds for flood control basin projects in 1994. Two drainage culverts have since been constructed with six more to be built.

The City used its geographic information system (GIS) to identify some 200 homeowners most at risk following the recent wildfires, and provided information to all homeowners in flood-prone areas about precautions they should take. When the wildfires raged across the Simi Hills north of the City, none of the homes in planned developments was damaged or destroyed. Homeowners did not have to be evacuated. Only three older homes, in outlying, sparsely populated areas near the city, were lost.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Smart Recovery Mitigation Campaign
Ohio's Mitigation Awareness Program

State-wide,
Ohio

The State of Ohio - The Ohio Emergency Management Agency and Department of Natural Resources spearheaded a "Smart Recovery" awareness campaign. The campaign aimed at educating the public about mitigation methods and strategies as well as persuading individuals as members of their communities to make smart recovery decisions.

The campaign's intent is for mitigation to become synonymous with "smart recovery." There are two main goals of the campaign. The first is to increase the general public's awareness of natural hazard risks and related costs versus the benefits of mitigation. The second is to enhance the realization that individual and community mitigation activities can reduce the injuries, loss of life, and loss of property resulting from a disaster.

The campaign developed printed materials promoting smart recovery; aired radio, television and cable public service announcements; printed media advertisements; distributed caps, pins and stickers at public fairs and other public events; and developed a portable exhibit for use at State and local fairs, home shows and other public events.

For the State, there are several benefits of the Smart Recovery Mitigation Campaign. The public will understand what mitigation means and how they can apply it to reduce future disaster damages. At-risk individuals will take more responsibility for reducing damages by pursuing mitigation projects and purchasing appropriate insurance. The Ohio community leaders will better understand how to utilize mitigation measures to build safer communities and foster strong economic development. The at-risk communities will be better prepared to develop plans that identify mitigation opportunities and implement mitigation projects that will result in safer communities.

Quick Facts

Sector:
Public

Cost:
$250,000.00 (Estimated)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
State sources

FEMA

Snake Warrior Island Mitigation and Improvement

Broward County, Florida

Snake Warrior Island, FL - Flooding has plagued many of the neighborhoods in this South Broward County, Florida, area since development in the 1940s and 1950s. The area primarily consists of single-family homes and small businesses. Prior to 1997, the subdivisions did not have an appreciable stormwater drainage system. Roadside swales were originally constructed throughout the subdivisions to collect stormwater, but they quickly became clogged with silt, rendering them no longer effective.

The primary means of stormwater runoff disposal consisted of evaporation and percolation. Thus, the residents struggled with frequent street flooding, standing water for extended periods of time, and house flooding under even normal rainfall conditions. County officials recognized that a heavy, sustained downpour from a tropical storm system could be catastrophic.

The flood mitigation initiative began with a conscientious effort to involve groups and individuals who would be most impacted by a project in both the design and implementation phases. The local homeowners associations, local political leaders, and the county commission came together to identify the primary needs and interests of the communities. A drainage project became an integral part of the larger South Broward County Neighborhood Improvement Project.

Drainage improvements were combined with beautification, the construction of a limited -use recreational park, and an effort to provide a centralized sewer system. Warrior's Island is an example of the multidimensional configuration of the project. At completion, the land will play multiple roles as a stormwater retention area, a State archaeological site, and as a public recreation area.

The project has divided the neighborhoods into five sections and corresponding project phases. The drainage system has been designed to internally treat and convey the runoff from low intensity storms (3.5 inches of rainfall over a 24-hour period) without discharging to the wetlands system. In more localized storms, excessive runoff would flow into a canal that drains to the ocean. In more intensive, longer duration storms that raise the height of water in the canal system to full capacity, the water is then routed to the wetland system.

At Snake Warrior Island a series of eight interconnected wetlands are being created. Native wetland species, such as fire flag, pickerel weed, arrowhead, and spikerushes have been planted to support wetland functions. Existing native vegetation is being conserved on-site, and an exotic plant removal program has been implemented. The project as a whole cost $120 million funded primarily by utility operating funds and the tax-generated general fund. More than $4.8 million has been designated for wetlands restoration at Snake Warrior's Island and runoff retention. FEMA is providing 50 percent of the Hazard Mitigation Grant Program (HMGP) funds.

Quick Facts

Sector:
Public

Cost:
$4,810,440.00 (Estimated)

Primary Activity/Project:
Wetland Restoration

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Snow and Ice Control Project
Battling Sleet and Freezing Rain

District of Columbia,
District of Columbia

Washington, DC - During the snow season of 1993-1994, severe cold conditions caused frequent sleet and freezing rain. Over 14,000 tons of sand and large amounts of salt were used on the roadways resulting in environmental damage. The damage included stopped-up catch basins, fouled storm sewers, and broken degritting equipment. This caused littered streets and polluted air. Additionally, the level of grit discharged into the Potomac River violated EPA standards.

The Department of Public Works (DPW) in Washington D.C. is charged with control of ice and snow on the roadways of our nation's Capitol. Traditionally salt and sand were used to treat the roadways. The project called for the replacement of sand with liquid chemicals. To do this, 82 spray units were mounted on DPW box spreader trucks, 41 DPW tailgate spreader trucks were equipped with spray units, and five liquid spray tanks were mounted on DPW trucks. This equipment allowed the DPW to conduct the procedural innovation of anti-icing in addition to the standard de-icing.

The project addresses the recurrent and repetitive environmental problem by eliminating the extensive use of sand. This approach reduces risks to the public by more effectively removing snow and ice from the roadways. Most importantly, the dangers associated with slippery sand residue following the storm are also eliminated. A minimum of $3 million was saved in charges to remove sand pollution from roadways, the storm sewer system, and the water purification system.

Quick Facts

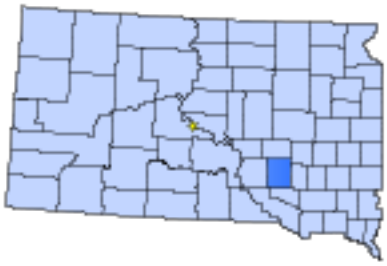
Sector:
Public

Cost:
$322,500.00 (Actual)

Primary Activity/Project:
Mitigation Planning/Disaster Resistant Universities

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

South Dakota Electric Cooperative
Moving Power Lines Underground



Aurora County,
South Dakota

Aurora County, SD - Winter ice storms in early 1995 brought heavy mechanical stress to the overhead power lines, poles, hardware, and wire in this City. As a result, the utility was weakened, and its ability to withstand normal stress brought about by natural forces was impaired.

These damages would have made the lines increasingly vulnerable to each ice storm. The damaged overhead line was replaced with an underground distribution line of the same voltage. Cable was buried four feet under the ground's surface. Approximately 770 people depended on the electricity provided by this line.

By replacing the overhead line with underground cable, the threat of ice and wind damage was decreased. The use of underground cable will also eliminate "sagging," which all damaged power lines will experience over time. Property and economic losses due to unexpected electrical outages will be reduced.

Quick Facts

Sector:
Public

Cost:
$316,642.00 (Estimated)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Sportsman's Paradise
Changing Vacation Spot for Recreation

Berkeley County,
West Virginia

Berkley County, WV - Sportsman's Paradise was initially a place for weekend visits and summer vacations. Approximately 10 years ago it became a year-round community. It is located in one of the lowest lying areas of the State, with some properties having an elevation of 21 feet below the base flood elevation.

The January 1996 flood event was caused by snowmelt from a 3 foot blizzard and rain from a 100-year storm. As a result, FEMA provided assistance to the State of West Virginia by identifying mitigation opportunities in the State. This aided the State in developing applications for Hazard Mitigation Grant Program (HMGP) funded projects. The funding for the project was a combination of HMGP and State monies.

Berkley County, a State leader in the adoption of regulatory codes to protect the lives and property of its residents, has floodplain ordinances, which require all substantially damaged properties to be elevated when rebuilt. For many residents this requirement was both financially and physically problematic.

Initially, letters were sent to all property owners in Sportsmen's Paradise inviting them to participate in the voluntary program, some chose not to at that time. September 1996 brought severe flooding to the area again. Following that incident, the number of participating owners rose to 32: that’s 50 percent of the owners in the community.

This project provided the opportunity to get 32 structures out of the floodplain and therefore reduce the level of flooding in the area. Permanently removing these properties from the floodplain eliminated the need for future Federal disaster relief or National Flood Insurance Program (NFIP) payments in this area. Additionally, large quantities of debris (including junk cars, boats and car parts), representing potential implements of destruction during a flood, were removed.

The benefits to the residents in reduced human suffering, both physically and mentally, are immeasurable. Dollar values for avoided expenditures for emergency services personnel and equipment must also be counted as benefits. Transforming the land to open space will provide all residents with increased opportunities for recreation and additional recharge areas for future flood events.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$636,957.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Below Ground Storm Shelter
Shelter Protects Family and Neighbors

Oklahoma County, Oklahoma

Okalahoma City, OK - Twenty-seven years ago, Mr. Price had a below ground storm shelter installed in the backyard of his family's Oklahoma home. Severe storms and tornadoes frequent the area and are a cause of great anxiety for the residents. Severe injury and death as a result of wind whipped debris are not uncommon.

The shelter is 12 feet by 16 feet complete with lighting for the stairway and ventilation. The total cost was $1,800. Inside the shelter, a cabinet was installed where preparedness supplies are kept. Items include a battery powered radio, water, personal hygiene supplies and prescription medications as well as irreplaceable family valuables. Additionally, Mrs. Price keeps a large suitcase packed with blankets and extra clothing. Because the shelter is located below a large tree, it is registered with the fire and police department in the event the tree is blown over during a storm. "We use the shelter every time it gets bad," states Mrs. Price. "We gather up family members, neighbors; it is open for anybody. One time we had thirty-eight people, two ducks and three dogs!"

On May 9, 2003, Mrs. Price heard about the approaching storm on TV; a tornado watch was in effect. A television reporter was interviewing a new neighbor and she asked where a shelter was. She was told, "Go to Grandma's house" and found her way to the Price shelter.

Mrs. Price described the sounds of the storm as a lot of noise like rocks hitting the door of the shelter and a loud roar. After the storm when they opened the door, debris had blocked visibility to the house, the power poles were all down and the air felt very heavy. There was some roof and window damage to the Price home, estimated at $11,000, and the car was damaged. Insurance coverage will reimburse for most of the damages. "Fifteen people walked out of the shelter without a scratch. I don't have one thing in this house worth a life," states Mrs. Price. "I feel safe in the shelter."

Quick Facts

Sector:
Private

Cost:
$1,800.00 (Estimated)

Primary Activity/Project:
Safe Rooms/Community Shelters

Primary Funding:
Private funds

FEMA

Storm Shutters Spare South Annex Saving Hundreds of Thousands in Repairs

Charlotte County, Florida

Punta Gorda, FL - What do you do if Hurricane Charley is about to pay an unwelcome visit in just two days and 75 percent of your office building's exterior walls are ceiling-to-floor glass windows?

If the building is the Charlotte County South Annex, which houses critical governmental, management, and administrative offices, the solution is easy. You simply put up the galvanized metal shutters that were funded in part by a grant to the State under the Hazard Mitigation Grant Program (HMGP). With the shutters in place, the Annex suffered only minimal damage. An investment of less than $10,000 saved the taxpayers over half a million dollars in losses avoided in just one hurricane event.

"If it wasn't for the shutters," said George Dahlke, Charlotte County Facilities Construction and Maintenance Project Manager, "all the glass in the building would have been gone. Without the windows, we feel that the uplift [of the wind] would have taken the roof off."

The county's grant application was approved in 2003. Shutters were purchased for $9,546, using a combination of local funds and the HMGP grant and installed for the first time on August 11, 2004, in anticipation of Hurricane Charley. Two days later they were severely tested when 125 mph winds slammed the coastal city.

Only one shutter was damaged. Hit hard by flying debris, it was dented, causing one pane of glass to crack. But both the shutter panel and the glass stayed in place and were not blown out. The shutter panel prevented the wind from penetrating the structure and causing major wind and water damage.

Flying debris damaged the roof, creating leaks. Water entered, damaging some of the building's contents. However, this damage was minimal in contrast to other buildings according to Charlotte County Facilities Manager, Michael Sheridan.

"The Health Department Building, without shutters, located about a mile away, is badly damaged - broken glass panels, roof and ceiling uplifted - they're still not in service [nearly five weeks later]. It may cost $500,000 to repair," he related.

Sheridan credited the shutters on the 20,000 square foot South Annex Building with saving the county approximately $600,000 in repairs. That is the amount that would have been needed had the glass panels been broken and the wind and water penetrated the building. The total repair estimate for the South Annex is $80,000, with 80 percent earmarked for roof repairs due to damage from flying debris. The remainder is for damage to the contents from the roof leaks. The monetary loss avoided by installing the shutters was $520,000.

Employees and the community also avoided losses in time-off from work and interruption of services due to lengthy repairs. Just two days post Charley, with minimal repairs still in progress, the South Annex was up and running. Employees were back at work providing much-needed services to Charlotte County residents.

The proven success of the shutter mitigation at the Charlotte County South Annex Building has spurred the Facilities Department to embark on a program to encourage continued mitigation in the entire county. "Mitigation has taken a front row seat," declared Dahlke.

Quick Facts

Sector:
Public

Cost:
$9,546.00 (Actual)

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Storm Water Management
Managing Storm Runoff

Brunswick County,
North Carolina

Southport, NC - The impact of Hurricane Floyd (1999) on the City of Southport, while not devastating, created enough storm water drainage to again tax the systems in place. The City Council and City Manager are working together to obtain funding for a new storm water management system. Their plan includes contracting with a design engineering firm for a new storm water management and drainage system. Currently, the firm is in the design process. "We (the community) funded this project through the Powell Bill because we didn't want to wait for FEMA money," stated Rob Gandy, City Manager.

The Powell Bill (State Street-Aid Allocation Law, Chapter 136-41.1 through 136-41.3) is part of the General Statutes of North Carolina. Purposes for which Powell Bill funds can be used include improvements or new construction of local municipal Powell Bill streets as defined in the statute. The City of Southport is using the eligibility requirement I., A., 4, "Construction of Necessary Storm Drainage for Protection of Streets."

The project is currently in the design phase. The completed project will be a new storm water management system. When completed, the new system will manage storm water runoff resulting from another hurricane event. The improved drainage will keep streets and homes from flooding, eliminate health and safety hazards, avoid the costs of repetitive damage repair and create a more sustainable community.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

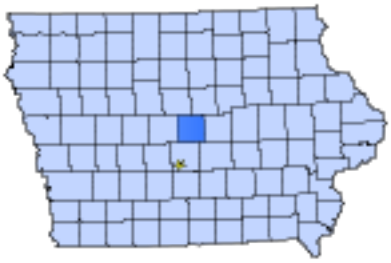
Sector:
Public

Cost:
$150,000.00 (Estimated)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Story County Acquisitions
Properties Transformed for Training Uses



Story County,
Iowa

Story County, IA - The Arrowsmith development in Story County is located approximately 2 miles north of Ames, Iowa, and has received repetitive flooding within the last 7 years. The six properties included in this acquisition experienced flooding in 1990, 1993, and 1996. The types of damage caused by these flooding events included collapsed basement walls, damaged porches, damaged exterior walls, damaged interior walls; and destroyed furnaces, water heaters, and other household appliances. These homes suffered more than $318,747 in real property damage from flooding.

This project was funded with $549,662 from FEMA in cooperation with Iowa Emergency Management Division (now Homeland Security Department of Emergency Management), and an additional 25 percent contributed by Story County and the property owners. At least $732,884 was budgeted to acquire the properties, properly dispose of any hazardous materials, demolish the structures, and return the area to a natural habitat.

The project has been a great success for Story County. In 1998, the county experienced more flooding. At the time of this most recent flooding, site visits were made to the acquired structures, which at the time had not been completely demolished. FEMA Region VII personnel determined that all of the structures would have suffered over 50 percent damage again, only 2 years after the previous flood. The estimated present savings after just one flood event are as high as $541,900, not including avoided costs of warning, rescue and evacuation.

To aid the task of demolition, the vacant houses were transformed into classrooms and practice sites for the Iowa State Fire School. From June 18 through June 21, 1998, fire and emergency personnel from across the state and some surrounding states utilized the flood properties to study arson investigation techniques, practice fire-fighting strategies and conduct other hands-on training.

Quick Facts

Sector:
Public

Cost:
$732,884.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Beach Improves Municipal Structures Retrofitting to Resist Hurricane Damage

Horry County, South Carolina

Surfside Beach, SC - At only a half a mile from the beach and 25 feet above sea level, the most critical government buildings in Surfside Beach have always been in grave danger during hurricanes.

However, on August 14 and 15 of this year, when Hurricane Charley made landfall near Surfside Beach, those buildings sustained no damage.

Wind gusts were recorded at over 90 mph, but the Town hall, Civic Center, Public Safety Department, Rescue Squad, and the Public Works buildings were not harmed. "The eye of the storm went directly over Surfside Beach," said Jan Lewis, Executive Assistant for the Town. "While the hurricane was a minimal Category 1, the effects were felt with gusts approaching 100 mph resulting in trees being uprooted, power lines down and other measurable debris."

These buildings house many critical functions during all aspects of storm encounters so in August of 2001, the town of Surfside Beach applied to the South Carolina Emergency Management Division (SCEMD) for a hazard mitigation grant in the amount of $126,143. The grant was approved with 75 percent being funded by the Federal Emergency Management Agency (FEMA). The purpose of the grant was to secure the weak areas and increase the strength of town government structures, thereby reducing the loss of equipment, and most importantly, the loss of life. During tourist season, the population can reach 35,000.

The mitigation project was completed in August of 2002 and included retrofitting eight critical facilities with storm shutters to protect window openings, hardening roof structures to withstand hurricane wind forces, providing additional wall strengthening, hardening overhead doors to protect against the impact of flying debris, and providing stiffening to horizontal supports (bar joists) where needed.

These facilities would definitely have been vulnerable to damage from Hurricane Charley's wind speeds if mitigation had not been performed. "Protecting critical facilities is important, especially in coastal areas at risk from hurricanes," said Shawn Putnam, State Hazard Mitigation Officer. "This project is a great example of how mitigation can help a community recover quickly from a disaster."

Quick Facts

Sector:
Public

Cost:
$126,143.00 (Estimated)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Critical Facility Damage Reduction
Hospital and Government Teamwork

Baldwin County, Alabama

Foley, AL - Teamwork among hospital and government personnel resulted in a hospital ready to face Hurricane Ivan on Sept. 15, 2004. Hurricane Ivan, a Category 3 storm, packed winds over 100 mph when it passed over the South Baldwin Regional Medical Center, in Foley, Alabama. Protecting the critical facility began far ahead of the winds.

Working with local, State, and Federal partners, the Medical Center conducted a vulnerability study and obtained hurricane shutters through a Federal and State grant. Charles Eubanks, Director of Plant Operations, indicated, “Our preparation time to protect the hospital’s windows was reduced to 3-4 hours due to the new shutters, and we were able to use the time savings to further prepare for the approaching hurricane.”

It was the impressive efforts of the hospital maintenance personnel that brought their Hurricane Plan into action. The plan included installation of shutters, preparations around the grounds, and set-up of the back-up systems, such as the generator. The success of the Hurricane Plan is attributed to the partnership in the plan’s development by facility staff, medical professionals, and Baldwin County Emergency Management personnel.

Protected from damages, the hospital remained operational during and immediately following Hurricane Ivan. Significantly, forty patients, including four on ventilators, were able to remain and 10 doctors were onsite to address post-disaster medical needs. Stephen Pennington, the Medical Center’s CEO, said, “The excellent cooperation among our employees, physicians, and patients allowed us to continue to provide high quality care throughout the storm. We are grateful to local, State, and Federal emergency management agencies for their help in preparing our hospital for this disaster."

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Other FEMA funds/ US Department of Homeland Security

Tillamook County Cow Pads Protecting Livestock

Tillamook County, Oregon

Tillamook County, OR - The February 1996 floods resulted in the death of 700 dairy animals on the farms in the Tillamook floodplain. Almost every farm lost cows. The flooding on the Nehalem River also had a very significant impact on the Sunset drainage district and all its members, resulting in widespread devastation, as well as damage to the levee system. The district encompasses nearly 1000 acres, most of which is agricultural land supporting six dairy farms. In Nehalem, the Marti Dairy farm lost their whole herd and their house, too.

The total economic loss in this area was estimated to be $5 million in both livestock and milk production. There are approximately 18 dairies in Tillamook County that need elevated refuge areas for livestock because their locations are in areas susceptible to severe flooding.

The creation of cow pads is an innovative solution to saving livestock during flooding. In the February 1996 flood, farmers couldn't get their cows to higher ground. This FEMA Hazard Mitigation Grant project provided funds to bring higher ground to the cattle. Tillamook County determined that the amount of fill for the cow pads was permissible on the 100-year floodplain.

With appropriate permits in place, FEMA mitigation funds were used to construct four cow pads on three farms. These large mounds of dirt will serve as a safe holding area during flooding. The pads are built to an elevation of approximately 4 feet. above the 100-year base flood elevation and will be large enough to accommodate the entire herd. The Chelone Dairy Farm will have a massive cow pad that covers almost an acre to hold 600 cows. The pads will be built in close proximity to existing barn structures, which are subjected to flooding, and will be the location and foundation for new milking barns.

At the same time, this project solves another problem for the Oregon Department of Transportation (ODOT): what to do with the excess soil and rock debris from landslides on roads and highways in the area. The project got a jump start, when Oregon Department of Transportation volunteered to supply rock and soil from nearby landslides free of charge. Over 200,000 cubic yards of dirt from the massive Fishery Point slide on Highway 101 south of Nehalem has been used to construct the cow pads. According to the Tillamook County Community Department, ODOT was pleased to have a useful disposal site for excess dirt.

Community meetings were held with residents to identify properties that would benefit from being elevated by determining flood zone and repetitive flooding history and projection. In addition, the County worked on a continual basis with Oregon Emergency Management.

This project is expected to save over $5 million in losses. Farmers will no longer fear flooding, and will no longer lose cows and have to replace their stock. The cow pads will provide a safe haven for the herds.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$241,000.00 (Estimated)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Town Farm Road Culvert Project
Keeping the Road Open

Oxford County, Maine

Norway, ME - In the Town of Norway on Town Farm Road, just off its intersection with Route 118, there is a stream that runs across the foot of the road. The culverts under the road continually overflowed making the road impassable. Six times in eight years the road was shut down. After the October 1998 floods, the road was shut down for three days.

The Town knew that it needed a solution to the extremely costly and inconvenient repetitive damage on Town Farm Road. The Town elevated the road by one foot from Route 118 to 100 feet beyond the stream. The Town also replaced two inadequate 6 foot culverts with one 11 foot by 10 inch culvert.

The project was completed in November of 1997. In June 1998, more than 10 inches of heavy rain caused flooding across Central Maine. Town Farm Road, however, did not wash out and remained open to the public. Savings in avoided damages from the June 1998 event and subsequent events over the life of this mitigation project are estimated to be $42,738.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$25,079.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Town of Fredericksburg
Acquisition Despite the Lack of Funds

Washington County, Indiana

Fredericksburg, IN - The small community of Fredericksburg lies along the Blue River in southeastern Indiana, 20 miles northwest of Louisville, Kentucky. With a significant portion of its development in the floodway, this community of 129 residents experiences significant repetitive flooding and consequent damage.

When a Federal disaster declaration during the summer of 1996 made Hazard Mitigation Grant Program (HMGP) funding available, members of the community immediately sought assistance in getting people out of the way of future flooding. A major obstacle for the Town of Fredericksburg was its very limited tax base and virtually no money to contribute to a project. The townspeople achieved their goal of flood mitigation by working with their local Regional Planning Commission (RPC).

The RPC has been coordinating the HMGP and Indiana Housing Finance Authority funding for the acquisition of 29 floodway properties, including 17 residences. As a result of thorough planning, coordination, and cooperation, the town's project will allow 17 households the chance to begin anew, out of the floodway. As of November 13, 1998, there have been 13 acquisitions completed. The remaining properties were acquired by the end of February 1999.

The steady progress of this voluntary acquisition project has prompted assistance from other programs and agencies, including conservation planning from the Department of Natural Resources, as well as development of nearby Federally subsidized low-income housing funded by the Indiana Housing Finance Authority. Participants are finding relief from flooding, and Fredericksburg is taking the opportunity to develop portions of the town that lie on higher ground. Savings in avoided damage from this project is expected to be at least $1,117,300.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$965,258.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Town of Louise Acquisition Project

Humphreys County, Mississippi

Louise, MS - Gill Quarter, a low-income, 22-home subdivision in the Mississippi delta Town of Louise, is located within the Silver Creek floodway. Seasonal flooding of the subdivision is a constant threat to the homeowners and has caused great damage to their homes.

The Mississippi Emergency Management Agency, the Town of Louise, the South Delta Planning and Development District, and the Mississippi Department of Economic and Community Development participated in the project to provide Hazard Mitigation Grant funds and Community Development Block Grant funds to acquire the structures and relocate the residents to new affordable housing and rental units.

The most valuable information source was the combined experience of the participants. But the best benefit was the removal of people and structures from the floodway.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$800,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Town of Vinton Acquisiton Project

Roanoke County, Virginia

Vinton, VA - The primary risk in Virginia's Roanoke Valley is from flooding caused by tropical storms and localized thunderstorms and heavy rains. The Roanoke River and numerous smaller streams traverse the valley, which is surrounded by the Blue Ridge Mountains. The area has experienced 17 major flooding events between 1877 and 1995 with the four largest floods occurring in the last 25 years.

The Midway community within the Town of Vinton, Virginia, is close to the confluence of Glade and Tinker Creeks. A large portion of the community is within a National Flood Insurance Program (NFIP) Zone AE with 11 structures in the floodway. This area has had major flooding four times within 25 years.

FEMA, the State of Virginia, local governments and the Norfolk and Southern Railroad assisted in submitting this project for Hazard Mitigation Grant Program funds. The project removed the 11 houses from the floodway and purchased 13 vacant lots adjacent to the residential parcels.

Since the 11 homes have been removed, the area has not experienced flooding. However, based on past damage assessments, the savings in avoided future damages are expected to be at least $687,874, plus the savings in disaster response costs.

Quick Facts

Sector:
Public

Cost:
$556,706.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Harris County Flood Control Changes Made After Allison

Harris County, Texas

Harris County, TX - Tropical Storm Allison descended on southeast Texas in June of 2001 and dumped 37 inches of rain in 12 hours, claiming 23 lives. Portions of major highways were submerged, 30 counties affected, businesses were destroyed and 1,611 damaged, 155 schools sustained water damage and over 35,000 homes were affected by flooding. The Texas Medical Center campus and buildings sustained damages that are expected to exceed $2 billion. Tropical Storm Allison is now the flood of record for the Houston metropolitan area and Harris County.

Harris County is subject to frequent severe flooding from tropical storms and hurricanes. Historically, the county experienced 16 major floods from 1836 to 1936, some which caused deaths and flooded downtown Houston. In 1935, the Texas State Legislature established the Harris County Flood Control District (HCFCD) to have sole responsibility for the management of storm water and its results. Funding for the district is through a dedicated property tax.

The HCFCD has employed many structural mitigation measures such as channelization, detention facilities, bridge elevations and construction of levees and/or flood walls. Since 1994, the district has been aggressively pursuing acquisition and buyout as their major non-structural mitigation measure. Over the last 12 years the district has purchased 440 properties (vacant lots and houses) at a cost of $40 million. Their pro-active buyout program continues both during a federal declaration and between flooding periods. Their goal is to move people out of harms way and allow the land to return to a natural state. Their process has been fine tuned to a fast track approach and because it is on-going, the response time and potential for increased costs have been greatly reduced. Additionally, the district seeks partners to share in project costs. Active partners, for example, are the US Army Corps of Engineers (USACE), Texas Parks and Wildlife Department, FEMA Hazard Mitigation Grant Program (HMGP), City of Houston Parks and Recreation Department, and the Department of Housing and Urban Development (HUD).

Since its creation, the district has completed structural and non-structural flood control projects at a cost of approximately $4 billion. The boundaries of the district encompass 1,756 square miles, 22 watersheds and more than three million inhabitants, including the City of Houston which is the fourth largest city in the United States.

This same area was flooded by Allison; however, damages were significantly less. HCFCD was awarded HMGP money to buy out over 600 substantially damaged homes as a result of the storm.

Quick Facts

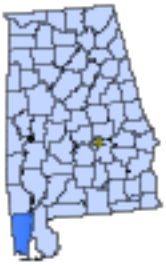
Sector:
Public

Cost:
$5,800,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Repetitive Flood Damaged Homes
Two Approaches



Mobile County, Alabama

Dauphin Island, AL - Only a year after they were built, the homes at 1301 and 1303 Chaumont experienced their first flood damage from Hurricane Camille in August 1969. After years of repetitive losses, however, Hurricane Ivan (2004) did no further damage to either home. The homeowners and the Town of Dauphin Island had taken action to permanently eliminate or reduce the flood risk to these structures.

Hurricane Camille brought 12 inches of water into the family home at 1301 Chaumont, causing over $10,000 in damages. Over the 30 years the family lived in this home, they experienced many more floods. The flood damages doubled to $20,000 when Hurricane Frederic (1979) brought three feet of water into the house. The flood damages continued to occur - four inches and $4,500 in damage from Hurricane Elena (1995); eight inches and $12,000 in damage from Hurricane Danny (1997); and nine inches and $16,000 in damage from Hurricane Georges (1998).

The home at 1303 Chaumont also experienced repetitive flood damage. Hurricane Danny caused eight inches of flooding and $7,000 in damages, and Hurricane Georges resulted in 12 inches of flooding. The ownership of the home had changed over the years with the most recent owner experiencing both of these significant floods.

Working with the Alabama Emergency Management Agency, the Town of Dauphin Island applied for and received grants to address both repetitive flood-damaged homes. In 2001, the Town of Dauphin obtained a Federal and State grant to elevate the home at 1303 Chaumont. For approximately $50,000, the home was elevated over 12 feet. In 2002, a grant was received through the Flood Mitigation Assistance (FMA) Program to acquire the home at 1301 Chaumont. The voluntary acquisition paid the homeowner the fair market value of the home. After demolition of the home, the land was deeded to the town and made into a neighborhood park.

On Sept. 16, 2004, Hurricane Ivan brought a record 38 inches of flooding as a result of tidal surge. Without the property acquisition at 1301 Chaumont and elevation at 1303 Chaumont, the losses from Hurricane Ivan would have included substantial damage or destruction of these two family homes.

Quick Facts

Sector:
Public

Cost:
$50,000.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Two Tangier Island Elevated Homes Rising Above the Wrath of Isabel

Accomack County, Virginia

Tangier Island, Virginia — As a third generation Tangier Island resident, Sarah Crockett is no stranger to storm tides and the damages they create. “With [Hurricane] Floyd [1999] the water got into my house, ruined the carpets and floor and stuff. Tide came in once before, too, but that was long ago.” After floodwaters broke into her home, she decided it was time to put a stop to it. Help came from FEMA’s Hazard Mitigation Grant Program (HMGP). FEMA provides up to 75 percent of the project cost, with the remaining 25 percent coming from some other non-Federal source. This can come from the commonwealth, local government or private sources.

The HMGP funds paid to have the Crockett house’s elevated three concrete block courses above ground level. “My neighbor, who stayed on the island during [Hurricane] Isabel, told me water came up to the third row of blocks on my house,” Crockett said. This time, however, floodwaters threatened but never entered the house. A great relief to Crockett since “this here island is a little bit of heaven.” With her home more resistant to disaster damages because of the HMGP work, she has no intention of leaving.

The home of Betty Dise, one of Crockett's neighbors, also fared well during Hurricane Isabel because of mitigation efforts. During Hurricane Floyd, Dise had water above her ankles throughout the house. Because of that experience, she also decided to participate in the HMGP elevation project. She filled out an application at the HMGP meeting at the local school shortly after Hurricane Floyd, even though she did have flood insurance that covered the personal property lost in Hurricane Floyd. She also encouraged family and friends to apply.

After being chosen for the elevation project, Crockett contributed $3,500, 5 percent of the total project cost. She said, “It was money well spent. I told family and friends that even if they need to get a loan to cover their contribution they should do it.”

Dise feels very secure now that the house has been through another disaster without being affected. However, she is sad for the other residents who did suffer damage again. “Isabel damaged my brother’s house, the roof is torn apart and the floors and carpet were ruined. Thank the Lord I only lost some shingles,” Dise said. Her house was surrounded by water, according to her son who kept watch on the property, but it didn’t get in this time.

Bill Reynold, town manager of Tangier, is working hard on plans to get more homes on Tangier Island elevated above the flood level. Hurricane Isabel damaged 99 homes and 50 businesses. The total loss resulting from Isabel is estimated to be $1,963,325. Reynold's own home had 10 inches of water in it. “We met with the mitigation folks from FEMA and know the steps… that are necessary to get more houses raised. I have 65 residents that are requesting to participate in an elevation project.”

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Typhoon-Resistant Home on Guam
Homeowner Reinforces Building

State-wide,
Guam

Guam - Dawn Santos is no stranger to disasters. After all, she lived in Guam for 15 years. "I lived through several typhoons," Santos recalls. But when Typhoon Omar swept through the island in 1992, the Santos family lost everything. Their house and possessions were destroyed. Santos was hired by the Federal Emergency Management Agency (FEMA) during the Typhoon Omar recovery operation, and is now a FEMA Community Relations Field Officer. Before the Santos' rebuilt their home, they were given information from FEMA on ways to make their home more typhoon-resistant.

"We got a brochure from FEMA that showed how to secure the house and the roof with hurricane clamps. Even though it was a wood house, we reinforced the supporting concrete pillars with steel and braced the pillars to the foundation below and the roof above," Santos explained. The Santos' couldn't find the same kind of hurricane clamps that were pictured in the brochure, so they made their own.

As a FEMA disaster assistance employee, Ms. Santos applied what she was preaching to protect her home and possessions. (1) She used her past typhoon experiences as an incentive to reduce potential damages from the next one. (2) She used a publication from FEMA as a guideline. (3) She customized hold-downs when none were available on the island. (4) She funded the project herself.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Homeowner

FEMA

Underground Power Lines Provides Protection from Severe Storms

State-wide, Minnesota

The State of Minnesota - High windstorms and ice storms have cause overhead power lines in Minnesota to become hazardous and at risk of failure. Statewide, the ice storms are heavy enough to break the lines and the windstorms are high enough to blow down the lines. Several electric cooperatives have experience repetitive outages during a single storm because the lines break in several areas from heavy ice and high wind.

The State of Minnesota has taken a pro-active role in providing some relief to communities that encounter repetitive power outages by converting damaged power lines to underground cables. Across the State, there have been more than 92 miles of damaged, overhead power lines converted to underground cable since 1995.

The underground cable will eliminate the problems associated with heavy ice breaking the lines, high wind blowing down the lines and manual, time-consuming labor to repair downed lines. Local electric cooperatives continue to express interest in power line conversions, and the State plans to continue supporting conversions to underground lines because they are a proven effective mitigation measure.

Quick Facts

Sector:
Public

Cost:
$3,585,308.00 (Actual)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Unger Acquisition
Family Handled Repetitve Loss Property

Hampshire County,
West Virginia

Hampshire County, WV - In 1993 the Unger family had purchased a former vacation cabin to use as a permanent residence to escape renting. They had, at the time, two infants and were glad to get affordable housing. The salesperson assured them that the structure was out of the floodplain. But after the birth of their third child, they were forced from their home by the January 1996 flood event on the North River.

They repaired their flood-damaged house with monies received from FEMA and again reoccupied the dwelling. They were then informed by a local resident that the dwelling site had been flooded many times in recent memory, including the event associated with Hurricane Agnes (1972).

Lacking the means to pursue legal action against the seller of the property, they were content to remain and hope for the best. Unfortunately, in September of 1996, another flood event associated with Hurricane Fran forced them from their home.

The Ungers applied for funds from the Hazard Mitigation Grant Program (HMGP) in October 1996. They remained with the program and were one of only three identified property acquisition projects to be approved in early 1998 from an initial field of 99. They waited patiently while the process was completed and their mortgage was satisfied in February 1999.

The best partners in this process have been the Capon Valley Bank, West Virginia Division of Natural Resources, and the Hampshire County Commission. The Capon Valley Bank agreed to forego foreclosure while the project was viable and the process was moving. The Division of Natural Resources agreed to take title so that the site could be used as a public access site. The Hampshire County Commission provided up -front funding for the project.

The most valuable source of aid and information was the regional FEMA staff. In an atmosphere of confusion and ambiguity, they were the guide to completing this project and advancing all others currently underway. Considering the frequency of flood events and average cost to assist the Ungers in repairs, the projected savings from this project are $51,343 over the next 30 years.

The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Private

Cost:
$46,275.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

United Way of Santa Barbara
Protecting Property and Operations

Santa Barbara County, California

Santa Barbara, CA - On the morning of Jan. 10, 1995, the staff of the United Way arrived at their facility in downtown Santa Barbara to find 3 feet of water in their offices. Flooding destroyed computers, carpet, furniture, workstation partitions, electrical wiring, and irreplaceable documents. Elevators, the alarm system, cabinets and interior walls were also damaged.

Flooding in the city was the result of seven hours of heavy rainfall the night before that generated runoff from the nearby hills, plus an unusually high tide which overwhelmed the city's pumping systems and fill culverts.

Everything that was destroyed or damaged had to be replaced before United Way could return to normal. Included in the overall loss was the cost of business interruption, emotional impact on staff members, and the effects on United Way's customers during the several months it took to restore operations.

To protect its property from future disasters, United Way developed and implemented a plan to floodproof it’s building. Funds for this project came from a community-wide campaign that generated more than $550,000 from private and public sources. Several contractors and other professionals donated time to mitigate the facility.

Mitigation included installation of three flood control panels (doors) that can be activated to prevent water from coming into the building and reaching the 3-foot level sustained in the 1995 flood. A 2-foot deep trench was dug around the building foundation and filled with sealant to waterproof the structure. Water-resistant walls, doors, cabinets, and carpeting that can be removed one square at a time, were installed. Critical infrastructure including electrical outlets, electrical panels and the alarm system were elevated.

The cost of repairs of damage from the 1995 flood was $450,000. This included the cost of repairing or replacing electrical, elevator and alarm systems, computers, carpet, cabinets, doors, furniture and interior walls. The cost of mitigation including installation of flood doors, the trench and sealant, and elevation of critical lifelines was $100,000. This 4.5 to 1 ratio shows how much United Way will save by spending money for mitigation measures before the next flood occurs.

Quick Facts

Sector:
Private

Cost:
$100,000.00 (Estimated)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Local Sources

University of Mississippi
Structural Seismic Evaluation

Lafayette County, Mississippi

Lafayette County, MS - The University of Mississippi, located within the New Madrid seismic risk zone, has a number of buildings subject to seismic risk. These buildings, at any given time, house a large number of students/faculty, and are all closely located within a high density area. An evaluation of the risk was needed in order to develop a mitigation strategy.

Mississippi Emergency Management Agency, Central United States Earthquake Consortium, University of Mississippi Schools of Engineering and Minerals Resource Institute, and the Mississippi Department of Geology developed a plan of action for conducting a structural evaluation of the buildings, a geological study of the area, and real time modeling of probable seismic events. Access to the University's CRAY Computer enabled the project to manage the complex data and run the seismic modeling. Geology and Engineering staff and graduate students provided data collection and evaluation that was not available or affordable from the private sector.

The findings of the seismic evaluation will be incorporated into future land-use and building/development plans. The project is also being used as a case study for the Schools of Engineering and Architecture at the University of Mississippi.

Quick Facts

Sector:
Private

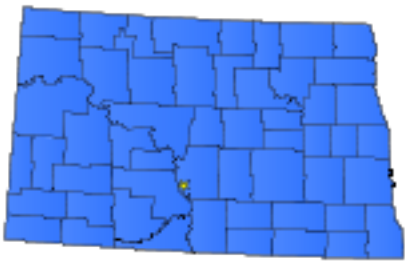
Cost:
$450,000.00 (Actual)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
Academic

FEMA

University of North Dakota Backflow Valve Project



State-wide,
North Dakota

The State of North Dakota - During the spring flood of 1997, much of the damage was caused by sewer back-up after the city's lift station failed. This resulted in tremendous damage to personal property in lower levels of buildings throughout the city, including the University of North Dakota.

The University of North Dakota installed several backflow valves in buildings that suffered substantial damage during the 1997 flood.

At a cost of $19,589 the university installed backflow valves in five buildings that had in excess of $1,278,136 of damage. This minimal cost will cover future damages caused by sewer back-up in an area where such flooding is common.

Quick Facts

Sector:
Private

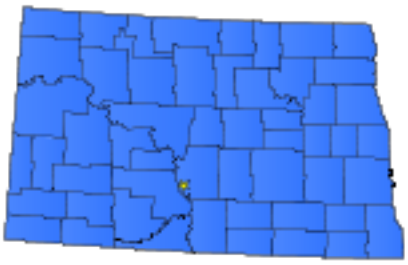
Cost:
$19,589.00 (Actual)

Primary Activity/Project:
Utility Protective Measures

Primary Funding:
Academic

FEMA

UND Wheels Project
Keeping Research from Flooding



State-wide,
North Dakota

The State of North Dakota - When the Red River of the North flooded in April of 1997, several pieces of very costly equipment were submerged in the basement of a building at University of North Dakota. The equipment was immobile due to its weight and size.

A very simple and cost effective measure was taken: the addition of wheels. By mounting wheels on the large research equipment, employees can now roll the equipment into the elevator and up to a higher and safer floor.

The damage to this University of the North Dakota research equipment was in excess of $1 million. The cost of $11,100 to retrofit the large equipment will substantially save future losses of equipment at the University in times of flooding.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Private

Cost:
$11,100.00 (Actual)

Primary Activity/Project:
Flood-proofing

Primary Funding:
Academic

Asheville Businesses High & Dry
Ordinances Effective for Businesses

Buncombe County, North Carolina

Asheville, NC - When the Swannanoa River broke its banks and swamped the Biltmore business district of Asheville, N.C. in early Sept. 2004, tough new building ordinances kept a number of businesses high and dry. Unfortunately, many older buildings surrounding them suffered extensive flood damage and, in some cases, were destroyed.

In 1996, Buncombe County and the City of Asheville received updated county-wide floodplain maps from FEMA as part of the federal agency's ongoing national flood map revision process. Using information from the revised maps, the City of Asheville chose to put in place tough ordinances on future construction requiring new businesses to be built one foot above the Base Flood Elevation (BFE).

The 2004 floods resulting from Tropical Storm Frances and Hurricane Ivan put the revised maps and ordinances to the test for the first time. On the nights of Sept. 7-8, Tropical Storm Frances dumped 17 inches of rain on Black Mountain, up the river from the Biltmore business district. By morning, streets and parking lots looked like lakes and dozens of businesses were faced with several feet of floodwater destroying their buildings, inventories and profits. The exceptions were those buildings constructed after the 1996 ordinances took effect.

One example is the Lowe's Home Improvement Warehouse Store located right alongside the river. Constructed in 1998-99, the site required extensive grading, earthmoving and drainage work to comply with Asheville's new ordinances. Soil was excavated from the parking lot site and used to elevate the huge store one foot above the BFE. During the flood, water swamped the parking lot but stopped short of entering the building. The store lost no merchandise and reopened for business as soon as water receded from the parking lot. It became an important asset to a flooded community in need of building materials.

Other businesses that stayed high and dry include a McDonald's restaurant and a Krystal Citi Stop convenience store, both built since the new ordinances took effect. Both were untouched by the flood, which did extensive damage to businesses all around them.

"We were very happy to see our flood zone planning and ordinances pay off," said Natalie Berry, Stormwater and Erosion Control Coordinator for the City of Asheville. "It was important to the employees, their customers and our local economy that they were right back in business after the flood."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Building Codes

Primary Funding:
Property Owner, Commercial

FEMA

Urban Forestry Educational Program
Reducing Vegetation Damage and Loss

State-wide,
Michigan

The State of Michigan - On July 2, 1997, a series of tornadoes and straight-line winds resulted in several deaths and millions of dollars damage in southeast Michigan. Communities were faced with downed power lines, blocked streets, downed and damaged trees, and mountains of tree debris. Many of the problems were associated with the infrastructure and building damage impacted by large older trees. The clean up took months.

The funding by the Hazard Mitigation Grant Program allowed the Michigan Department of Natural Resources, Forest Management Division, the United States Department of Agriculture, Forest Service, and the Michigan Department of State Police, Emergency Management Division to present four seminars to provide information to municipalities on choosing the type of tree to plant, what locations are best for planting, and how to maintain them to increase tree health, decrease hazard trees, and decrease susceptibility to storm damage.

The audience consisted of community decision makers and managers, urban foresters and others responsible for tree planting and maintenance, county emergency managers, and the Michigan Department of State Police, Emergency Management Division's district coordinators. By grouping different people together from each community to discuss urban forestry helped promote a more successful program.

Afterwards, due to strong positive feedback from attendees, the Michigan Department of Natural Resources decided to continue the educational seminars throughout the State. This continued education is the key to reduction of damages and clean-up costs in Michigan.

Quick Facts

Sector:
Public

Cost:
$20,000.00 (Actual)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Valmeyer Acquisitions
Buyouts Create Open Space

Monroe County, Illinois

Valmeyer, IL - Prior to 1993, the Village of Valmeyer was a small farming community in southwestern Illinois. The Village is located 5 miles east of the Mississippi River, just south of St. Louis, Missouri. The Village is protected by levees and, consequently, has rare but extreme flood events. In the Great Flood of 1993, the Village experienced record flooding. The 1993 flood inundated almost the entire Village for months. It caused substantial damage to over 200 homes.

Rather than rebuild in the wide Mississippi River floodplain, the Village of Valmeyer utilized funds from the Hazard Mitigation Grant Program (HMGP), Illinois Department of Commerce and Community Affairs and the Economic Development Administration to mitigate the flood damages. The Village implemented an acquisition project to acquire 242 properties, many of them substantially damaged. An additional 92 structures were acquired using National Flood Insurance Program (NFIP) Section 1362 funding (no longer available). To completely mitigate the threat of flooding, the entire Village relocated three miles away to a bluff overlooking the site of the former Village.

The acquisition project moved quickly, and within 2 years nearly the entire flood-ravaged Village had been acquired and demolished. The site of Old Valmeyer has been dedicated to open space and will be used for recreation and farming purposes. The Village has successfully relocated above the floodplain, and most original town residents now live in the "New Valmeyer." The new Village includes residential areas, a commercial and industrial district, school buildings, churches, and public offices. Located within commuting distance of St. Louis, New Valmeyer is a prosperous community experiencing rapid growth.

Quick Facts

Sector:
Public

Cost:
$8,345,914.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Vernonia Acquisition and Elevations Moving Properties Out of the Floodway

Columbia County, Oregon

Vernonia, OR - Following an extended period of unseasonably cold weather and heavy snowfall in the Pacific Northwest, warming temperatures and rain began thawing the snowpack and frozen rivers throughout Oregon. Streams rose quickly and reached flood stage in many locations. At least 25 Oregon rivers reached flood stage. Mudslides, avalanches in the mountain passes, and road washouts also occurred in many parts of the State. Extensive earth movement was experienced in many areas, including landslides, stream bank erosion, and significant amounts of sediment transport.

Initial assessments reported an estimated $280 million of damage, of which one-third was to private property, and the remainder was to public property. On February 8, 1996, Governor Kithaber declared a State of Emergency for 18 counties within Oregon. By February 9, 1996, a Federal disaster was declared for a total of 27 counties.

In Oregon, the City was aware that a significant number of the structures proposed to be elevated as part of the hazard mitigation project were within the floodway. The City's flood hazard ordinance identifies specific requirements for structures within the floodway. The objective of the acquisition and elevation project was to bring all substantially damaged residences into compliance with the FEMA flood insurance requirements. The best alternative taken was to rapidly implement the program to prevent property damage from recurring within Vernonia's floodways and floodplains at the lowest possible cost and within the quickest timeframe.

The City first worked from a prioritized list of properties to acquire located within the floodway and to elevate houses two feet above floodplain level. In order to inform citizens of the hazard mitigation process, a project manager was hired to gather input and hold a number of public meetings. In addition to these meetings, an Unmet Needs committee formed to address and focus specifically on mitigation. Presentations were given identifying the planning process, floodway/floodplain definitions, and criteria for home elevations. Citizens were given the opportunity to ask questions and provide input on flood prevention measures. The City sent letters to property owners with a return form to confirm interest in the mitigation project.

The majority of residents whose homes were substantially damaged could not afford to elevate their homes. In early 1996, Vernonia was less than two percentage points away from a citywide low-to-moderate income rating. To address the financial needs of this community, the City met with the Oregon Emergency Services, FEMA and Oregon Economic Development.

All of the structures proposed for acquisition are located within the floodway along the Nehalem River. Floodways serve as a natural drainage area as rivers fill to their maximum capacity. Moving the structures out of the floodway would allow water to move freely along its natural course. This in turn will decrease water velocity which would lessen erosion damage.

Quick Facts

Sector:
Public

Cost:
$750,000.00 (Actual)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Technical Assistance Program (HMTAP)

Village of Fort Recovery Acquisition and Relocation

Mercer County, Ohio

Fort Recovery, OH - The Village of Fort Recovery in west central Ohio is 20 miles southwest of the Wabash River. The Village experiences repetitive flooding from the Buck Ditch Basin, which flows through the center of the Village to reach the Wabash River. In 1996 the Village suffered from a damaging flood that prompted the implementation of an acquisition project.

The Village received funding to acquire six floodprone residential structures and physically relocate eight homes and the fire station to previously developed sites outside of the floodplain. In addition, four residences and six businesses utilized retrofitting techniques to floodproof the basements. The Village expects to have the entire project completed by the end of 1998.

The key component to the success of the Village of Fort Recovery Hazard Mitigation Project can be summed up in one word: cooperation. FEMA and Ohio Emergency Management Agency introduced a project development process to assist communities in the development of solid projects that attack the problem by considering alternative solutions that meet the required criteria. Fort Recovery involved the public during meetings, and a core group composed of citizens and local officials was formed to evaluate options and develop the acquisition project application.

Quick Facts

Sector:
Public

Cost:
$871,467.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Virginians Overcome Devastation Stay High and Dry During Isabel

Isle of Wight County, Virginia

Isle of Wight, VA - Like many communities along the Atlantic coast, Hurricane Floyd wreaked havoc in 1999 on Mark and Patricia Thompson's home with 19-inches of floodwater.

"We don't live near a creek or stream. There is a dried up swamp behind us and we actually live in a 500-year flood zone, so we were taken completely by surprise when the water began to come into our home," Mark Thompson explained.

After the floodwater receded from their first floor, the magnitude of the destruction of Hurricane Floyd hit. "That's when you realize how much you've lost. We had no idea how bad the damage was," Thompson added. The house was nearly destroyed: the entire first floor and most of their roof due to high winds.

"That's where FEMA and the State (Virginia) and our local government (Isle of Wight) came in. We tied into a Hazard Mitigation Grant Program (HMGP) project and got an SBA loan (U.S. Small Business Administration) that allowed us to rebuild and elevate our home," he said. "The choice was to elevate or move, and we chose to stay."

When Hurricane Isabel struck in 2003, the Thompson's home came through undamaged; however, their neighbors who came to experience flooding a second time around weren't as fortunate. "They came and stayed with us, and now they plan to elevate their home. We just feel lucky and fortunate that we live in this country," Thompson added. "We just can't say enough about FEMA and the other (agencies) and organizations that helped us."

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Volunteer Engineers Working To Help Communities Recover

State-wide,
North Carolina

The State of North Carolina - During late September 1999, Hurricane Floyd devastated much of eastern North Carolina with heavy rains, resulting in record flooding. Three major rivers and many creeks rose above previous flood levels and in some locations the waters breached their dams. The number of structures, residential and commercial, damaged or destroyed was so great that it exceeded the capability of community inspectors to conduct damage assessments. "The communities couldn't afford consultants," said John Gerber, an engineer with the National Flood Insurance Program (NFIP). "Yet they've got to know if their properties can be restored to meet the local building code."

A group of North Carolina professional engineers volunteered to conduct free assessments of flood-damaged properties for local communities who are recovering from the devastation of Hurricane Floyd. The volunteer engineers look for and tag buildings that sustained "substantial damage," defined as dollar amount damage that exceeds 50 percent of its pre-flood value. The engineers, who are all members of the Professional Engineers of North Carolina, received special training to help the homeowners assess their properties.

Since then, more than 100 engineers have conducted thousands of assessments. The volunteer engineers often work 12-hour days, in areas rife with snakes and vermin. They assess hurricane damage "down east" during the day, staying in campers and old hunting lodges or staying with family or with friends of friends at night.

The magnitude of damage caused by Floyd is great and the engineers help quantify that damage. The estimated private-sector value of their work is more than $100,000. An additional benefit of this volunteer effort is that with timely inspections the victims had the ability to recover much more quickly.

Quick Facts

Sector:
Private

Cost:
$100,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Private funds

Warner Bros Studios
Seismic Retrofit and Emergency Services

Multiple Counties, California

Burbank, CA – During the last 10 years, Burbank has experienced many earthquakes. Two of the most notable were the 1987 Whittier Narrows earthquake and the 1994 Northridge earthquake. These two made Warner Bros. Studios especially cognizant of the potential for earthquake damage that could cause serious business interruption. In addition, their Burbank facility is adjacent to the Los Angeles River. In the event of severe rainstorms, surface ground water is prone to accumulate and overwhelm the area's usually sufficient drainage system.

In recognition of the severe impact a natural hazard could have on its business operations, Warner Bros. Studios established an Office of Emergency Services (OES) in 1987. They have expanded the emergency services operation beyond preparedness activities to damage prevention through mitigation measures. In 1993, non-structural hazard mitigation work included seismic fastening of computers, furniture and shelving systems to avoid damage in a seismic event, with priority then being given to life safety, exits, and applications of heavy-duty film to windows.

After the Northridge earthquake struck the area, Warner Bros. Studios estimated that every dollar spent on mitigation has saved the company $10 in avoided loss. Following this event, the mitigation program became mandatory and has expanded to include new construction budgeting and collaborating with equipment designers to develop unique fastening systems for Warner Bros.' needs. Funding for the mitigation program is now a regular budgetary expense for the company.

In July 1997, the OES held training as an opportunity for staff to establish and update various logistical and prevention measures for the upcoming El Nino. The nature of previous El Nino damages sustained was analyzed, and actions were identified to prevent these damages from recurring.

Warner Bros. Studios has shared the mitigation message by reaching out to their community to share their experience with natural hazards preparedness and mitigation. Its OES has participated in community preparedness training in Burbank and West Hollywood. They view this community outreach as important to preserving the community infrastructure where their employees not only work but also live.

Due to the nature of their business, the entertainment industry, Warner Bros. Studios has been able to reach consumers throughout the nation with the importance of preparedness. When Warner Bros. Studios released its box office hit movie Twister on videocassette, FEMA produced and distributed over 100,000 copies of a multi-hazard preparedness video entitled "Prepare…to Survive." The video was free when renting the Twister movie at video stores throughout the country.

Quick Facts

Sector:
Private

Cost:
Amount Not Available

Primary Activity/Project:
Retrofitting, Non-structural

Primary Funding:
Business Owner

Water Storage Tank Seismic Retrofit

King County, Washington

Mercer Island, WA - Mercer Island in Lake Washington is a busy community with a population of 22,000 and high median income. Located east of Seattle, it is accessed only by the Interstate 90 floating bridge. The islanders are totally dependant on two above-ground steel water reservoirs, four million gallon capacity each, as their main water source. This water supply is also essential for fire fighting.

The City of Mercer Island recognized that there was a potential life safety problem due to the fact that the island is in an earthquake hazard area. Should the tanks fail due to an earthquake, 12 homes, schools, a church and several public buildings situated downstream would be inundated. The Island would lose the primary water supply and the water flow would cover I-90, the main transportation corridor.

The City of Mercer Island applied for and was granted funding through the Hazard Mitigation Grant Program (HMGP) for seismic restraints and structural improvements of the reservoirs and pump station. The pump station pressurizes all the water through a system of pipes to deliver it to the upper end of the island. Because of this critical function, an automatic generator was installed and large pieces of equipment and cabinets were bracketed to the walls. The pump station was also completely structurally retrofitted. The project was completed in March 2000.

On February 28, 2001, a 6.8 magnitude earthquake struck the Puget Sound Region. Mercer Island sustained a great deal of shaking. Those located close to the reservoirs during the earthquake say that the water in the reservoirs "sloshed for an hour." The water tanks "rode" through the earthquake with minimal to no damage and performed the way the retrofit was designed. Power went out throughout the island but the automatic generator came on maintained the function of the pumps. Overall, the power was out for over six hours. Subsequent engineering inspection has determined that there is no threat of collapse. The timely mitigation project eliminated danger to the homes and structures as well as protecting the water supply. Minimally, the project saved over $9 million in home replacement costs.

Quick Facts

Sector:
Public

Cost:
$1,386,281.00 (Actual)

Primary Activity/Project:
Retrofitting, Structural

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Wayne Gibb's Home Elevation
Taking the Initiative

Sonoma County, California

Forestville, CA - Wayne Gibb lives on a quiet street about a quarter of a mile from the banks of the Russian River. But when the rain-swollen river jumped its banks in 1986, Gibb's backyard was flooded with more than 5 feet of water, and the floodwaters poured into more than 30 houses on the block.

Gibb estimates damage to his home exceeded $35,000. Even though the National Flood Insurance Program (NFIP) reimbursed him for a portion of his losses and he reduced costs by doing his own home repairs, it was more than nine months after the flood until his home was made habitable again.

The NFIP estimates the value of repetitive losses for Sonoma County between 1977 and 1995 totaled $30.3 million - nearly six times as much as losses for Malibu County, which is second highest for repetitive losses in California. Since 1995, the county government has made eight local emergency declarations, and in that same time span there have been four major Presidential declarations due to winter floods.

When floods ravaged Sonoma County and Forestville again in 1995, Gibb witnessed a replay of a scenario he thought would be a once-in-a-lifetime experience. His home was flooded a second time in less than a decade. Again, he was displaced for nearly 10 months. Again, many of his valuable belongings and his home office were destroyed.

With the likely prospect of sustaining more repetitive damage in the future was unacceptable to him. Gibb sought an alternative through structural mitigation. He decided to elevate his home and fund the project himself. He salvaged his existing foundation and raised his home 8 feet, 3 feet above the 100-year-flood level. He cut costs by working more than 30 hours a week for four months on the project and by hiring friends and neighbors to help.

Actual cost to Gibb for the elevation project was about $60,000, plus $80,000 as an estimated value of his labor. Installing dummy windows on the ground level preserved the aesthetic integrity of his home. So while the elevated space below is used only for storage, the home looks like a larger two-story building.

In 1998, flooding again occurred in Sonoma County. That year, Federal disaster declarations for flooding were made in 41 California counties. While the Russian River in the Forestville area did not reach catastrophic levels, local communities prepared for the worst and Gibb left his home for one night.

As it turned out, floodwater 4 feet deep had run under the elevated portion of the structure. Gibb was left with some cleanup to do, but there was no major damage done to his home. His home was intact. His actions to protect his belongings before the flood hit by moving items to a higher elevation than previously and mooring vulnerable yard property to protect it has kept it all from floating away.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Private

Cost:
$60,000.00 (Estimated)

Primary Activity/Project:
Elevation, Structural

Primary Funding:
Homeowner

Weather Radio Distribution
Ensuring Adequate Hazard Warning

Wayne County, Michigan

Wayne County, MI - Located in southeastern Michigan, Wayne County frequently experiences severe weather and tornadoes. In 1997, a dangerous tornado moved through parts of Detroit and the surrounding suburbs of Highland Park and Hamtramck injuring 90 persons. It was the most costly tornado the State had experienced, with damages estimated at $90 million. The tornado traveled nearly 5 miles and was 2,500 yards wide. The tornado was part of an outbreak of 13 tornadoes in southeastern Michigan, the largest number for a single day since records have been kept.

With over 2 million residents, the County needed effective mitigation measures to adequately warn people of the potentially severe weather. The Hazard Mitigation Grant Program (HMGP) provided funds for the County to purchase, distribute and install National Oceanic and Atmospheric Administration (NOAA) weather radios to every school, hospital, and nursing care facility in the County, for a total of 860 radios.

The County also conducted an all-day tornado shelter/spotter workshop for employees of those facilities. The workshop will enable them, especially in the schools, to plan and prepare for severe weather. The workshop was videotaped and will serve as a training video on tornado spotting for police, fire, and public service personnel in jurisdictions throughout the County. The video will also become part of the in-service training for County personnel and serve as a Statewide training tool in the near future.

The all-day recorded workshop was telecast on the Statewide school internet during the Severe Weather Week in March of 1999. The telecast allows all schools with internet capabilities to watch the video and begin to plan and prepare for severe weather in their school district.

This project will ensure that adequate warning time be more readily available to residents in the County. The benefit of early warnings will be a reduction in both the loss of life and the extent of injuries to persons in an impacted facility.

Quick Facts

Year:
1998

Sector:
Public

Cost:
$21,000.00 (Actual)

Primary Activity/Project:
Education/Outreach/Public Awareness

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Wilcox Pond Culvert Upgrade Preventing Roadway Overtopping

York County, Maine

Biddeford, ME - During large rain events, West Street, a major road in Biddeford, has had to be shut down. The area of West Street by the Wilcox Pond outflow culvert overtops during these events causing washout and structural damage to the road bed. In addition to the loss of road access, the washout creates a 7 mile detour for public safety vehicles and the potential for threats to the safety and health of the residents.

The City decided that upgrading the drainage capacity of the outflow culvert at Wilcox Pond could reduce the potential for overtopping the roadway. Funds from the Hazard Mitigation Grant Program (HMGP) were awarded for this project in November 1997. In the process of upgrading the culvert, the City reset the culvert angle to permit direct outflow downstream. In addition, the City installed rip-rap on the banks to reduce erosion. The City also changed the slope of the roadway to provide easy runoff.

The project was completed in May 1998. In June 1998, more than 10 inches of heavy rain caused flooding across southern Maine. The Wilcox Pond Culvert area was not damaged and remained open to traffic. Savings in avoided damages from the June 1998 and subsequent flooding events over the life of this mitigation project are estimated to be $230,000.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$17,795.00 (Actual)

Primary Activity/Project:
Flood Control

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Wildfire Mitigation in State Park Protecting the Ecosystem

State-wide, Minnesota

The State of Minnesota A tornado and several windstorms caused severe damage in Itasca State Park, located in northwestern Minnesota, and has a half a million visitors each year. The storm damaged and blew down numerous pine trees throughout the park. As the downed, wet trees dried, the potential for a catastrophic wildfire greatly increased in the park. The bark beetle exists in all pine forests, but usually does not present a threat to a healthy forest. However, the storm created the perfect breeding environment for the bark beetle. Any significant increase in the beetle population could have caused the damaged or healthy trees to become infested, die, and increase the threat of wildfire.

The subgrantee, the Minnesota Department of Natural Resources (DNR), has been conducting a bark beetle control project in the park, thereby reducing accumulation of dead tree fuel. In May of 1996, the DNR installed four adult bark beetle traps per acre in the affected areas. The traps have been and will continue to be monitored and maintained weekly. The project may take up to 5 years to sufficiently reduce the bark beetle population to a safe level for the pine forest in the park. Since the project is ongoing, the State legislature has provided additional funding to continue the project beyond the scope of the FEMA-approved project.

The loss of the old growth pine ecosystem would cause significant changes to the overall ecosystem including lichens, trees and shrubs, the herb layer, soil moisture, and use by mammals, insects, birds, amphibians, and reptiles. If a loss of pines occurred, there would be no way to regenerate or replace the existing old growth ecosystem.

The catastrophic loss of the pine ecosystem due to a bark beetle outbreak would completely change the appearance of the park and would detract from the visitor experience. In addition to the bark beetle control, the park has created a new interpretive trail to point out the damage caused by the storm and educate its visitors on the storm's effect. The interpretive trail is appropriately named the "Blowdown Trail."

Quick Facts

Sector:
Public

Cost:
$162,390.00 (Actual)

Primary Activity/Project:
Vegetation Management

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

Willis Creek-Locust Grove Flood Mitigation Project

Allegany County, Maryland

Allegany County, MD - This project represents the second phase in Allegany County government's plan to remove residential properties from the 100-year floodplain along Willis Creek. Severe flooding in 1984 resulted in 29 homes receiving serious damages from water. Seventeen of these properties were purchased, and the remaining twelve were elevated above the 100-year floodplain. The Maryland Historical Trust ruled that the flooding in 1984 eliminated any historical value that Locust Grove may have possessed.

Flooding in January 1996 was at the 500-year level, resulting in eight of the remaining structures receiving substantial damages. These properties became highly desirable for acquisition in accordance with the goal of the Maryland State Hazard Mitigation Plan: to remove as many residential properties as possible from the 100-year floodplain.

This project consists of the purchase and demolition of eight substantially damaged properties located in the 100-year floodplain. Following this, the vacant land would be graded to match the surrounding terrain, allowing it to return to its natural state. The placement of use restrictions on the deeds of the vacant land will prevent future residential or commercial development in the area.

Following the January 1996 flood event, one homeowner received over $29,000 in claims payment from the National Flood Insurance Program (NFIP) and another homeowner needed to borrow over $54,000 from the Small Business Administration (SBA). When multiplied by the number of substantially damaged properties in the project, the benefit savings were obvious. The increase in open space in the area provides the entire community with additional recreational opportunities.

The largest benefit from this, and all acquisitions, is to the people (residents and emergency services personnel) who are no longer subject to peril at this location. These properties received damages more than 50 percent of their market value, making them a priority for the Hazard Mitigation Grant Program (HMGP). Had the owners tried to repair the structures, they would have been subject to stricter building codes which would have required elevation, a costly technique. The acquisition of the properties created permanent benefits by removing them from the need for future disaster aid.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$299,250.00 (Estimated)

Primary Activity/Project:
Acquisition/Buyouts

Primary Funding:
Hazard Mitigation Grant Program (HMGP)

FEMA

Wind & Flood Resistant Home
Protecting a Personal Investment

Brunswick County,
North Carolina

Southport, NC - Frank and Pamela Taylor know the pain of losing a home to disaster. In 1988, fire claimed the couple's 4,000 square foot historic house in Michigan. "We were away when our home was destroyed," recalled Pamela Taylor. "When we arrived at the scene, we were greeted by the charred remains of what was once a source of pride and comfort." They vowed never to lose a home to disaster again.

In 1994, when the Taylors purchased a lot in Southport, North Carolina, they were determined to build a house resistant to disasters-most notably the floods and hurricanes that pose such a threat to the ominously named Cape Fear. They asked themselves, "What should we do to have the least damage?"

In the city of Southport, strict building codes exist for construction in the floodplain. The Taylors' property is in an A-Zone, and their project was among the first that had to comply with the new rulings. The Taylors chose to exceed the code, using their own money to protect their single best investment.

Having worked in commercial construction for years, the Taylors acted as their own general contractor. They built their main floor 17 feet above sea level to protect against flooding. To lessen their vulnerability to hurricanes and high winds, the Taylors installed hurricane shutters over heavy-duty glass windows, used extra pilings under the house, and mounted brackets all around to tie the roof, walls, floor and foundation together. The home was built to sustain 195-mph winds. Additionally, the hot water heater, air conditioning unit and electrical switches have all been elevated.

The Taylors stayed in their home during Hurricane Dennis (1999) and there was no structural damage. When asked why they evacuated during Hurricane Floyd (1999), they did so because of the predicted category of the storm and the noise of the wind they endured during Hurricane Dennis. They were never concerned about their safety, and still feel very secure that their mitigation efforts have protected their financial investment as well as greatly increased their peace of mind.

In the end after Hurricane Floyd, they lost only two pieces of siding from their home. The original purchase price of the lot was $150,000. The estimated value of the home is $500,000 with another $150,000 in estimated value of contents. Clearly, with an $800,000 total personal and real property value, plus the emotional value, the cost to build safely and wisely has already proven beneficial.

Quick Facts

Sector:
Private

Cost:
$400,000.00 (Estimated)

Primary Activity/Project:
Building Codes

Primary Funding:
Homeowner

FEMA

Winning The War Against Flooding
Clearing the Creek to Keep the City Safe

Genesee County, New York

Batavia, NY - Plagued by repeated flooding from the Tonawanda Creek, the City of Batavia, located in Genesee County in western New York, suffered millions of dollars in damage to its homes and businesses over the years. So the citizens of Batavia decided to do something about it.

One of the first steps was to enact and enforce a strict building code in compliance with the requirements of the National Flood Insurance Program (NFIP) to reduce losses to new structures in the area. The next step was to remove some of the causes of flooding. This was done in several ways. For example, a dike and berm system was built around Kibbe Park, located on the banks of the creek on the south side of the City. These structures channeled high waters into the park, containing it within the area rather than spreading throughout.

The community then cleared the creek within the City limits; improved the creek bank to reduce snagging; and installed flap gates on storm outlets to stop back flow through the system. The community has been successful in keeping streams in the City clear of debris--one of the keys to prevent flooding--and is in the process of obtaining permits to keep banks located upstream clear.

The January 1998 storms caused Tonawanda Creek to rise to levels associated with a 25-year event. Fortunately, there was only minor damage due to flooding and only a small residential area along Tonawanda Creek suffered any appreciable damage. The involved citizens of Batavia believe their efforts, which have been relatively inexpensive and already bearing fruit, will, in the long run provide immense savings to homeowners and businesses.

Quick Facts

Sector:
Public

Cost:
Amount Not Available

Primary Activity/Project:
Flood Control

Primary Funding:
Local Sources

FEMA

Wisconsin Mitigation Video
An Education and Training Tool

State-wide,
Wisconsin

Darlington, WI - Several communities in the State of Wisconsin experience repetitive flooding. The City of Darlington is one that has successfully reduced its risk through a variety of flood mitigation measures. In cooperation with The Wisconsin Emergency Management and Department of Natural Resources (DNR), they created a video to encourage other communities to follow in Darlington's example.

The video explains how repetitive flooding forced the community to look at mitigation options. It discusses how Darlington brought civic leaders, business owners, and citizens together in the flood mitigation planning process. It also demonstrates how one community used seven steps in mitigation planning to address its flooding problem and find long-term solutions. The message relayed is that every community is unique and needs to go through a planning process to find the right solution for their community. But the most significant point is that communities must be pro-active instead of reactive to determine their future.

The video has been used as a practical training tool and will be used in conjunction with the DNR Community Flood Mitigation Guidebook, a community planning document. Local officials have been very satisfied with its practical and applicable use for their needs, and the video has provided them with an insight to the success of mitigation projects and mitigation planning.

Standard Homeowner's insurance policies do not cover flood damage. The National Flood Insurance Program makes Federally backed flood insurance available to homeowners, renters, and business owners in participating communities.

Quick Facts

Sector:
Public

Cost:
$8,688.00 (Actual)

Primary Activity/Project:
Land Use/Planning

Primary Funding:
State sources