

Widespread U.S. Drought, El Niño's Return, Warm Global Temperature Characterize 2002

—By Patricia Viets

When the temperature and precipitation statistics for 2002 were calculated and analyzed, the results came as no surprise to scientists at NOAA's National Climatic Data Center in Asheville, N.C.

For 2002, the United States had warmer than normal temperatures and below average precipitation, which led to persistent or worsening drought throughout much of the nation.

"Our scientists constantly monitor the climate, state by state, nationally and globally," said Thomas R. Karl, director of the center. "The climate monitoring group, led by Jay Lawrimore, produces "state of the climate" reports for each month, each season and each year.

Working from the world's largest statistical weather database, Lawrimore's group also found that 2002 is very likely to be the second warmest year globally.

The return of El Niño affected hurricanes in the Atlantic and precipitation patterns in some parts of the world.

U.S. Temperatures

Anne Waple, a scientist at the
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Mike Chamberlain/NOAA

Firefighters face a raging wildfire near the fire incident command post east of Meeker, Colo., Aug. 19. Downburst winds produced by cumulonimbus clouds combined with extremely dry conditions to produce this major crown run fire.

Drought-Driven Wildfires Set State Records in 2002

—By Marilu Trainor

The year 2002 was one many meteorologists and firefighters won't soon forget. Wildfires, some lasting months, set records for acres burned in Arizona, Colorado and Oregon.

NOAA supported the fight against those fires by deploying its cadre of 56 specially trained National Weather Service meteorologists, called incident meteorologists, or IMETs for short. Experts in fire weather forecasting, their primary job is to help ensure the safety of both the public and firefighters.

Weather and fuel are the two key ingredients in fire behavior. IMETs provide support to land management agencies from their home offices as well as when deployed to remote locations. Up-to-date meteorological information helps agencies' planning and suppression efforts.

"This was a year for large timber fires in many states because of multiple-year drought conditions," said the Weather Service's fire weather program manager, Rusty Billingsley in Boise, Idaho. "The number of fires, acres burned,
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Fire Weather

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personnel involved, costs to manage these fires as well as IMET dispatches didn't quite match those set during the record 2000 season. We approached new records, but cooler and wetter weather came to the fire areas this year and helped everyone out."

According to the National Interagency Fire Center, also in Boise, about 7.1 million acres burned in 2002 as of Nov. 15. This nearly doubles the previous 10-year average of four million acres per year. Of the 71,160 fires reported this year, only 610 escaped and became classified as large fires which span 100 acres or more.

Larry Van Bussum, the Weather Service staff meteorologist at the interagency center, deploys IMETs to their assignments. When comparing the 2002 to the 2000 season, he pointed out this year's IMET dispatches represented 20,860 man hours and 174 separate dispatches, versus 21,910 man hours with 204 dispatches in the year 2000.

Van Bussum said, "By mid-July, we were in full swing in deployments and IMET swap-outs. That type of demand usually doesn't happen until August."

"The Southeast, especially Florida, started their season in earnest by late March coming out of a dry winter," said Mike Edmonston of the weather forecast office in Jackson, Miss. He was assigned to the Okefenokee National Wildlife Refuge fire located in southeast Georgia. The May 1 fire started as a prescribed burn, and lightning strikes the next day made the fire grow even larger.

"The basic strategy for this fire was to keep it contained in the swamp and fight it when and if it tried to escape," Edmonston said.

Robert Berkovitz worked 25

days away from the Phoenix forecast office. He recalls giving an unusual shift-change briefing at the Middle Fire in New Mexico in early April. "This was the first time in my 25-year history of going on fires that I was briefing fire crews while there was snow on the ground," he said.

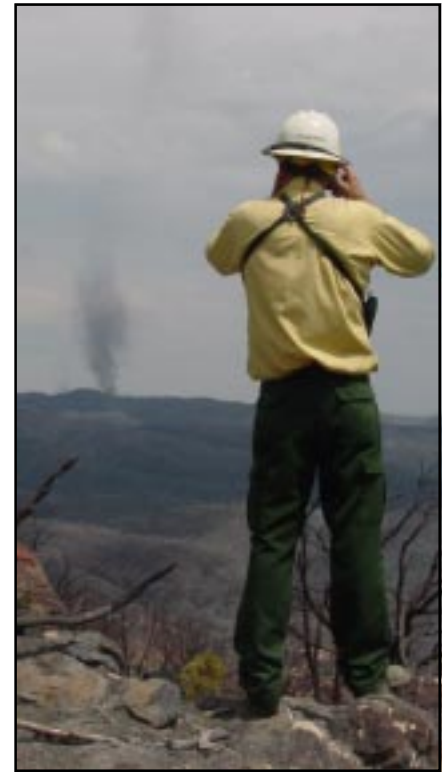
Michael Richmond of the Fairbanks, Alaska, forecast office, was dispatched May 26 to the West Fork Chena Fire burning in rough, mountainous terrain 50 miles east of Fairbanks. The fire started three days earlier when the temperatures reached the 80s in the Alaska interior.

"This warm weather dried the forest floor, and the birch and aspen hardwood trees had not greened-up yet. This fire was started when embers from a homeowner's burn-barrel escaped in a stiff wind and spread rapidly into the adjacent forest. The fire reached 33,000 acres before it was fully contained in early June," he said.

Near the northeast Arizona town of Show Low, two fires merged on June 25, making the Rodeo-Chediski Fire the largest fire in Arizona recorded history. Almost 500,000 acres were charred and at least 450 homes and buildings were destroyed. The Flagstaff weather forecast office provided support to the IMETs and local agencies. Meteorologist-in-charge Mike Campbell said, "The commitment of National Weather Service meteorologists helped ensure public and firefighter safety, and was crucial to evacuation planning and decisions.

"The partnerships formed during this catastrophic wildfire paved the way for NOAA Weather Radio service that is now in place to improve flash flood warning service to the burn area," he said.

Mike Chamberlain supported five wildfires this year and clocked



John Saltenberger/NOAA

A firefighter spots a giant dust devil during the Mustang Fire near Dutch John, Utah.

41 days away from the Grand Junction, Colo., forecast office. He recalled his June 24 to July 6 assignment to the Valley Fire, which came close to the town of Durango. "This fire looked very ominous when viewed from town and the interagency command post. Fortunately, a quick and massive response by air attack brought this fire under control, yet 400 acres burned and several structures were lost in one afternoon," Chamberlain said.

Oregon was one of the states where multiple fires received sustained attention from meteorologists and firefighters. The Medford forecast office was in high gear providing support to the IMETs and local land management agencies.

Medford meteorologist-in-charge Roger Williams said, "Managing IMET dispatches during a long season, along with our day-to-day operations, would be very difficult *continued on page 7*



Stanton K. Lum/NOAA

Janice Long.

Janice Long Is the January Employee of the Month

—By Dane Konop

Janice Long has only been the Administrative officer for NOAA's Human Resources Management Office in Silver Spring, Md., since July. But she has made such an immediate, positive impression on her supervisor and clients that she's been named the January Employee of the Month.

Her supervisor, human resources chief Zane Schauer, called her "probably the most proactive person I've ever known in any capacity. She's so conscientious."

Schauer said Long always does more than is expected of her. "She has her standing duties—she takes care of budget, office supplies, administrative things—but I don't think a week goes by where she doesn't come up and ask if we wouldn't benefit from a new standard operating procedure, or from tracking something we don't now track or if we can't get a better seat for someone who has a bad back."

Long's success on the job should come as no surprise to anyone who knows her work history. In a sense,

she has been preparing for the job of administrative officer most of her life, having started with the federal government as a student intern in the early 1970s.

A native of Washington, D.C., Long said, "My first job was working at Agriculture. I think I was about 14. I was in the co-op program," she said, "which meant I went to school and I worked, too. I had a foot in the door for a [full-time] job."

"I was motivated to do better in life," she said. "I was always in church. That has helped me."

Long wasted no time after graduating at the top of her class from Dunbar High School, where she majored in business. The day after graduation ceremonies, she started work full-time as a GS-2 clerk at the Department of Transportation. "I was updating the interstate highway maps, and I enjoyed the government. I learned a lot. At that time I was enjoying typing and everything."

She then moved to the independent agency Action, where her career hit an apparent snag.

"I was actually RIFed at Action," she said, but was able to get into the procurement field because of a supervisor who placed her in a new job.

In the early 1980s, she went back to the Department of Agriculture for a promotion, then left government when she moved with her husband and daughter to rural Nelson County, Va.

"I canned a lot of vegetables, saw how to skin a deer, ate plenty of deer meat, went fishing and ate the fish that I personally caught," she said. It was a "beautiful and serene" life she said, but "the bugs were too big" and she missed the city.

She returned to Washington and was rehired by Agriculture in 1987.

She also later worked at the

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Stuart Hayes/SAIC

James E. Hall.

James E. Hall Is the Team Member of the Month

—By Ron Trumbula

James E. Hall, data systems project manager for NOAA's National Data Buoy Center, is the January Team Member of the Month.

A contract employee of the Science Applications International Corporation, Hall has been recognized for his significant contribution to the dissemination of real-time marine observations via the data buoy center's World Wide Web site during late September and early October 2002. Hall and his team at Stennis Space Center, Miss., reacted immediately when Hurricane Isidore, then a tropical storm, set its sights on the Mississippi and Louisiana coasts.

Hall knew the popular Web site would be facing heavy user demand as the storm neared the coastline. Recognizing the need to strengthen the Web site's infrastructure, Hall designed and led his team through implementation of upgrades that helped ensure site availability during the anticipated peak demand, as well as future growth in

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Focus On...



Gordon Watts for NOAA

The NOAA *Monitor* team, (left to right) John Broadwater, Tane Casserley, Michelle Fox, June Feggins and Jeff Johnston, poses in *Monitor*'s turret.



Jeff Johnston/NOAA

Anne Miller (left) and Melissa Campbell of the Mariners' Museum sift through buckets of silt from *Monitor*'s turret.

U.S.S. *Monitor*'s Gun Turret Yields Surprising Artifacts

—By Dane Konop

Marine archaeologists and conservators from NOAA and the Mariners' Museum in Newport News, Va., have uncovered an amazing array of artifacts from the gun turret of the sunken ship *U.S.S. Monitor*.

Monitor, not designed for the open sea, sank in a storm on New Year's Eve night in 1862 while being towed off Cape Hatteras, N.C.

When the ship rolled over during its 200-foot descent, its cylindrical gun turret separated from the ship's hull, landing upside down on the sea floor with the inverted hull lying on top. The turret was recovered in August 2002.

Before *Monitor* sank, most of the crew were rescued by boats from the tow ship, but several went down with the ship, including two sailors whose remains were found in the turret. One sailor wore a gold ring on the fourth finger of his right hand, but the ring bore no inscription.

Their remains were immediately removed and sent to the U.S. Army Central Identification Laboratory in Hawaii for possible identification.

According to John Broadwater, manager of NOAA's *Monitor* National Marine Sanctuary, he and other archaeologists and conservators then began removing by hand, one bucket at a time, the tons of silt, clay, debris and coal that had filled the turret. The coal, used to fire the ship's steam engines, collapsed into the turret from one

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Jeff Johnston/NOAA Mariner's Museum conservator Wayne Lusardi examines a lantern recovered from Monitor's turret.

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the ship's coal bunkers when the aft section of hull landed upside down on it. In the nearly century and a half the wreck lay on the sea floor, lumps of coal, coal dust and burnt chunks of coal actually concreted to the metal components of the ironclad turret, making the excava-

tion a painstakingly slow process.

But the work of the NOAA-Mariners' Museum team, bolstered by volunteers, paid off when they discovered hundreds of artifacts.

Under the careful hands of team members, a lantern emerged from the muck, unbroken and with glass fully intact.

Not surprisingly, the team found both of the ship's cannons and related gear and equipment, including a leather gunner's pouch, a brass rammer head and a ladle for melting cannon shot.

Broadwater said that what the team didn't expect to find in the gun turret was the treasure trove of personal artifacts, including a hard rubber hair comb, a pocket knife handle, a leather boot, rubber buttons and a long woolen Navy coat, which may have been discarded by a sailor evacuating ship. The artifacts survived because they were covered in silt in the cold and dark waters on the sea floor.

Team members were also surprised to find a tea kettle and several pieces of silver flatware,

including spoons and forks engraved with sailors' names and initials. Oddly, all the flatware that can be linked to *Monitor* seaman belonged to sailors who drowned. Perhaps these men took a few small valuables with them when they attempted unsuccessfully to abandon ship. Or kitchenware may have ended up in the turret when a galley area collapsed through the inverted turret's wooden floor after sinking to the sea floor.

Conservators plan to remove the ship's two intact 11-inch Dahlgren cannons from the turret this year.

The Mariners' Museum is now conserving the recovered artifacts, a process that could take 12 to 15 years. Much of the work and many of the artifacts can be viewed by the public at the museum.

The discoveries thus far have generated more questions than answers. But conservation will allow historians to examine the artifacts for decades to come to learn more about the sinking of the world's first modern warship. ☹



Tane Casserley/NOAA Jeff Johnston (left) and John Broadwater remove buckets of silt from Monitor's turret, which also filled with tons of coal when one of the ship's coal bunkers collapsed into it.



Jeff Johnston/NOAA Marine archaeologists recovered several pieces of silver flatware from Monitor's turret, some engraved with the names and initials of Monitor sailors.

2002 Climate

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center, has been keeping a close watch on the climate of the United States throughout the year. Waple reports that the average temperature for the contiguous United States in 2002 is expected to be slightly more than 53.6° F (12.0° C) and one of the 20 warmest years since national records began in 1895, but cooler than last year, which was the seventh warmest year.

The average temperature during the 1895-present record is 52.8° F, with the warmest year on record occurring in 1998.

The year 2002 began with the fourth much warmer than average winter in the last five years. The summer season was one of the warmest since the 1930s.

Temperatures in Alaska were above average in all four seasons, and 2002 will approach or exceed the warmest year on record for the state.

U.S. Weather

“As the year began, moderate to extreme drought covered one-third of the contiguous United States, including much of the eastern seaboard and northwestern United States,” according to Richard Heim, who assesses and reports on drought conditions throughout the United States. “The combination of generally warmer and drier than average conditions led to the total drought area growing to slightly more than 50 percent during the summer months, largely due to a rapid intensification of drought in the Southwest. This value fell to 36 percent by the end of November as precipitation from land-falling tropical systems and a more active storm track helped alleviate drought in much of the eastern part of the country.”

The most extensive national

drought coverage during the past 100 years (the period of instrumental record) occurred in July 1934 when 80 percent of the contiguous United States was in moderate to extreme drought. Although the current drought and others of the twentieth century have been widespread and of lengthy duration, tree ring records indicate that the severity of these droughts was likely surpassed by other droughts, including that of the 1570s and 1580s over much of the U.S. Southwest and northern Mexico.

In the western United States, where precipitation for 2002 is on pace to set record or near-record lows in many states, the lack of adequate rain and snow and the resulting low snow pack stressed water supplies and caused devastating impacts on agriculture. Severe drought in Montana that began in some places more than four years ago forced farmers to abandon more than 20 percent of the winter wheat crop for the second consecutive year, the first such occurrence since the Dust Bowl era of the 1930s.

The extremely dry conditions also contributed to an extremely active wildfire season that included the largest wildfires of the past 100 years for the states of Colorado, Arizona and Oregon.

Extremely dry conditions in the U.S. Northeast improved, with four consecutive months of above normal precipitation for the region from March through June. Abnormally dry conditions were largely absent near the end of the year. Above average rainfall from September through November also brought significant drought relief to the Southeast, where more than four years of drought had affected much of the region from Georgia to Virginia.

In Texas, heavy rainfall alleviated drought, but led to severe flooding

in southern and central parts of the state in early July. Strong thunderstorms also brought widespread flooding to western Minnesota and North Dakota and resulted in hundreds of millions of dollars in damage and crop losses in June.

Atlantic Hurricane Season

Of the 12 named storms that formed in the Atlantic basin during 2002, four became hurricanes and two were classified as major hurricanes (category 3 or higher on the Saffir Simpson hurricane scale), slightly less than the annual average of five to six hurricanes and two to three major hurricanes. A strengthening El Niño episode in the equatorial Pacific suppressed the number of hurricanes and weakened the storms that did develop in 2002, according to NOAA's Climate Prediction Center.

With the exception of 2002 and 1997, years that were both affected by El Niño, at least three major hurricanes have developed in every season since 1995, with five or more major hurricanes occurring in three of those seasons (1995, 1996 and 1999). However no long-term trend in hurricane strength or frequency has been observed in the Atlantic Basin.

Global Events

Scott Stephens, who studies the weather and climate from a global perspective at the National Climatic Data Center, reported that other climate signatures typical of El Niño also emerged in countries such as Australia, India and Indonesia as the El Niño episode evolved during the year. Drought in Australia became more widespread and severe, and a new record warm winter maximum temperature was set for Australia.

Other conditions common during an El Niño episode included a drier than average sum-

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mer monsoon season in India and drier than normal conditions in Indonesia during May-October. The June-September monsoon season for India as a whole was characterized by large-scale drought with seasonal rainfall (June-September) 19 percent below normal.

In contrast, heavy rainfall in northeastern India, Nepal and Bangladesh brought severe flooding and caused approximately one thousand deaths in June. The most damaging typhoon to affect Korea since 1959, Typhoon Rusa, made landfall on the Korean Peninsula at the end of August.

In parts of central Europe heavy rains fell during the first 13 days of August, causing disastrous floods on the Elbe and Danube rivers, with more than 100 lives lost and damages estimated at \$30 billion.

In Africa, severe drought continued across parts of the Greater Horn of Africa. Widespread flooding occurred in Morocco during November and in parts of Madagascar during January-May as four tropical cyclones impacted the island nation.

Global Temperatures

"Data collected from weather and climate stations, satellites, ships, buoys and floats indicate that the 2002 average global temperature will very likely be the second warmest on record, slightly cooler than the record warm year of 1998," Karl said. "The ten warmest years have all occurred since 1987, with nine of them since 1990."

During the past century, global surface temperatures have increased at a rate near 1.0° F/century (0.6° C/century). But the trend has been three times larger since 1976, with some of the largest temperature increases occurring in the high

latitudes.

In 2002, warmer temperatures and shifts in atmospheric circulation patterns contributed to the greatest surface melt on the Greenland Ice Sheet in the 24-year satellite record. There was also a record low level of Arctic sea ice in September, the lowest since satellite monitoring began in 1978, according to the National Snow and Ice Data Center.

Data collected by NOAA polar-orbiting satellites and analyzed for NOAA by the University of Alabama in Huntsville and Remote Sensing Systems in Santa Rosa, Calif., indicate that temperatures centered in the middle troposphere at altitudes from two to six miles are also on pace to make 2002 the second-warmest year for the globe. The average lower troposphere temperature (surface to about five miles) for 2002 will also very likely be the second warmest year on record. ☺

Fire Weather

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to accomplish without total participation from each meteorologist. We've trained our forecasters in all program areas including fire weather so that we can keep our operations going without a hitch while the IMETs are sent away to fires.

Lead forecaster Mike Stavish calls the Medford forecast office his "home away from home." That's because he was gone 59 days and worked 826 hours at wildland fires this summer. He shared top honors for deployments this year with another co-worker, Frederick Bunnag, who was gone 61 days or a total of 854 hours.

"Being out so much was an opportunity that allowed me to refine my forecasting skills while gaining valuable experience with the terrain, fuels and fire behavior

in my own back yard," Stavish said.

Eric Evenson of the Burlington, Vt., forecast office was called to the Biscuit Complex in southwest Oregon's Kalmiopsis Wilderness Area. The fire eventually grew to more than 499,570 acres and turned out to be the largest fire in Oregon since 1933.

"The Biscuit fire is an excellent example of why I work as an IMET for the National Weather Service," Evenson said. "Our mission of protecting life and property is an integral part of fighting wildland fires. It is a great feeling knowing that what an IMET does on a fire 'matters' to those on the front lines. We are challenged to provide the best possible service, we accept the responsibility and we accomplish our mission. Our contributions make a difference, and that is the reward we feel."

When John Saltenberger, an IMET and forecaster from the Portland forecast office arrived at the Mustang Fire near Flaming Gorge Reservoir in Utah in July, he instinctively knew this fire would be a challenge.

"The topography of the fire area on the remote northern slope of the Uintah Mountains varied between 6,000 and 8,000 feet above sea level. Temperatures over the arid brush lands regularly rose above 100 degrees while humidity dropped below 10 percent," Saltenberger said.

"Cumulous cloud buildups and dry thunderstorms threatened to overwhelm the fire crews with dangerous wind shifts. Sudden down bursts could fan the fire into a frenzy. Dust devils and fire whirls scattered ash and dust over everything and everyone in their path," he said.

"The staff at the weather forecast offices and every IMET are to be commended," Billingsley said. "We answered the call to duty and are gearing up for 2003." ☺

Long

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Federal Energy Regulatory Commission before coming to NOAA in 1990 as a support services assistant in the Office of Legislative Affairs in Rockville, Md.

When that job was abolished four months later, she took a job in the NOAA Facilities Division with a broader variety of administrative duties, then moved to the Office of the Chief Information Officer before joining the human resources staff.

Her extensive background working in a wide variety of federal agencies has stood her well. "It's been great to get the experience and flexibility working in different places," she said. "It's helped me mature quite a bit from a GS-2."

In her 25 years of full time government experience, there's not much she hasn't seen in the office place—a definite advantage for someone who must keep an office running smoothly.

After all her job changes, Long said she's finally in the perfect job for her. "I do feel like I'm in the groove now," she said. "I like where I am in Human Resources. They are wonderful people. They work really hard. And it just makes you want to do so much for them. Even the managers work very hard," she said. "I'm just excited about being in the human resources office because of the challenges we have together, because we're a team."

According to Schauer, her work is improving the productivity of NOAA's human resources employees across the board, and that shows up in the services they provide to the general work force.

Long's impact is felt NOAA-wide, Schauer said, even though she is actually the only employee in the office who isn't a human resources specialist. Schauer said he describes the human resources

practitioners as "the people behind the people" at NOAA, and Long as "the person behind us." ☺

Hall

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demand. The innovations included a dual server configuration and load balancing switches.

Isidore's approach led to an unprecedented 770,000 hits on the center's Web site. With two operational Web servers, the site's outbound traffic quickly doubled, with data being transmitted at a record two megabits per second.

A week later, the approach of Hurricane Lili resulted in more than one million hits, requiring a third server to handle the increased load. As the storm came ashore in Louisiana, Hall and some of his team worked through the night to monitor the Web site and to correct an internal network problem that was impacting Web site updates.

"The actions of Hall and his team meant that commercial and recreational boaters, fishermen and others who depended on timely, accurate marine weather and sea conditions received a steady stream of real-time data," said Brig. Gen. Jack Kelly, USAF (Ret.), director of NOAA's National Weather Service. "They made certain that critical information on wind speeds and direction, barometric pressure, air and sea surface temperature and wave conditions were readily available throughout these dangerous events."

Paul Moersdorf, director of the data buoy center, said, "Jim's innovative solutions and quick action not only kept the real-time marine observation data available for forecasters and the public, but also accomplished long-term capacity and performance improvements that will help meet high

demand from mariners and meteorologists during future storms."

Hall noted that good timing and luck also played a role in the successful outcome. Some months earlier, he informed the data buoy center of the need to upgrade the site's infrastructure. The equipment was purchased and shipped just weeks before it was needed. "We were in the middle of installing it when Isidore came along. We shifted into high gear and managed to finish the job during one very long week," Hall said.

Hall and his team had actually been planning the upgrade for some time to meet the increased demand. "Use of the Web site mushroomed over the last couple of years," he said.

At the height of the 2000 storm season, hits during the month of October totaled nearly 4 million. October 2001 saw twice the number of hits (8.2 million). The hits doubled again (17.7 million) during September of 2002.

"At the peak of the last storm season, we were seeing up to 30,000 concurrent connections to the Web site at any given time," Hall said. "The demand for weather information is just growing astronomically. We can see the surge in activity each storm season." ☺

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Address comments to:

Editor, The NOAA Report

1315 East-West Highway

SSMC3, room 10853

Silver Spring, MD 20910

301-713-9042 (voice)

301-713-9049 (fax)

Email: dane.konop@noaa.gov

NOAA Report Online: <http://www.publicaffairs.noaa.gov/nr>

Jordan St. John, director, OPCA

Dane Konop, editor