



America's Birds: In an Alarming State

Nearly a third of America's 800 bird species are endangered, threatened or in significant decline because of, among other threats, habitat loss and invasive species, according to the first ever comprehensive report on this country's bird populations. In Hawaii, the report states, more birds are in danger of extinction than anywhere else in the United States.

At the same time, the report, *The U.S. State of the Birds*, highlights instances of birds that had been declining, among them many species of waterfowl, are now rebounding, thanks to habitat restoration and other conservation measures.

"Just as they were when Rachel Carson published *Silent Spring* nearly 50 years ago, birds today are a bellwether of the health of land, water and ecosystems," said Secretary of the Interior Ken Salazar, who released the report on March 19. "From shorebirds in New England to warblers in Michigan to songbirds in Hawaii, we are seeing disturbing downward population trends that should set off environmental alarm bells. We must work together now to ensure we never hear the deafening silence in our forests, fields and backyards that Rachel Carson warned us about."

The report, whose creation was coordinated by the U.S. Fish and Wildlife Service, indicates a 40 percent

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Focus on: Climate Change

Starting on page 8, *Refuge Update* examines the unprecedented challenges posed by climate change and innovative responses starting to take shape.

RefugeUpdate

March/April 2009 Vol 6, No 2

Snakes Alive!



In Florida, an exploding population of pythons is threatening national wildlife refuges in the Florida Keys and north as far as Arthur R. Marshall Loxahatchee Refuge. (USFWS)

by Susan Morse

In south Florida, the genie is out of the bottle – and the U.S. Fish and Wildlife Service knows from experience it's not going back in. This time, it's a top-of-the-food-chain predator and a prolific breeder. And it's not yet clear if the combined efforts of federal and state agencies will be enough to stop its spread.

The critter is the Burmese python, an Asian snake that can grow to more than 20 feet and nearly 200 pounds. It is showing signs of outgrowing the 400 square miles of Everglades National Park where it has established a breeding population. Estimates now put the number of pythons there at between 20,000 and 30,000. A predator of virtually every Florida creature from white-tailed deer to endangered wood storks and

adult alligators, the python is threatening national wildlife refuges to the south in the Florida Keys and north as far as Arthur R. Marshall Loxahatchee Refuge.

Eliminating the pest is no longer feasible; managing it is the only option. The Refuge System's invasive species coordinator Michael Lusk strikes a determined tone: "Our role here is to keep [the problem] from spreading further. That's where we're showing leadership."

While officials consider tactics from legislative actions (two bills are being drafted), to tracking the snakes via radio transmitters (surgically implanted by University of Florida researchers), to developing a biological control (still years away), the National Wildlife Refuge System is taking steps. *continued on pg 5*

East Coast Wetlands Are Disappearing

Nearly 60,000 acres of vital wetlands are disappearing every year from coastal watersheds in the eastern United States, according to an authoritative new interagency report that covers 1998 to 2004. Researchers said that an estimated 18 percent of these losses occurred in tidal salt marshes and the remaining 82 percent in marshes and forested wetlands within the watersheds.

Overall, however, America's total wetlands increased by nearly 32,000 acres a year because of gains reported in inland areas. The report, *Status and Trends of Wetlands in the Coastal Watersheds of the Eastern United States*, was released in early February by the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service.

The study targeted coastal watersheds of the Atlantic Ocean, Great Lakes and Gulf of Mexico. A majority of the coastal wetland loss occurred in the Gulf of Mexico. The estimates there were made



Nearly 60,000 acres of vital wetlands are disappearing every year from coastal watersheds in the eastern United States, according to a new report. (USFWS)

before two major hurricanes – Katrina and Rita – struck in 2005.

“Wetlands in coastal watersheds provide essential habitat for many migratory birds, fish, including a number of endangered species,” said Rowan Gould, the Service’s acting director. “The wetland loss in coastal watersheds is even more of a concern due to the additional losses of tidal salt marsh resulting from

hurricanes after the study period and the future threats posed by rising sea levels due to climate change.”

Coastal subsidence and erosion processes were important factors affecting wetland loss and distribution, especially along coastlines where wetlands cannot migrate inland

because shorelines are artificially hardened or too steep, the report stated.

Intense commercial and residential development and the accompanying discharges of pollutants further degrade coastal wetlands. More than half of the country’s population now lives in coastal counties at densities approximately

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Greg Siekaniec

Chief's Corner What We Do Now

Accelerating climate change is a most compelling conservation challenge. While

it might actually benefit some fish and wildlife species, it will certainly devastate others. In short, it will have more far-reaching impacts on wildlife and wildlife habitat than anything we've seen so far.

With 177 national wildlife refuges along maritime coasts, the National Wildlife Refuge System, in concert with the U.S. Fish and Wildlife Service, is taking a strategic approach because we know

the challenges can't be ignored. That is one reason we have focused on climate change in this issue of *Refuge Update*.

As we work to devise conservation strategies that will help fish and wildlife adapt, the key word is “strategic”. We know some of the issues we will confront, including the quantity and quality of available water and the probability that we see more wild fires with greater intensity and rates of spread. Other issues will be clarified as we fill in our knowledge gaps.

The Refuge System’s scientists, wildlife managers and policy professionals have built a legacy of leadership over the

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RefugeUpdate

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This newsletter is
published on recycled
paper using soy-based
ink.



Extreme Makeover for Bird Sightings

by Mike Carlo

For decades, refuge visitors used decidedly low-tech methods of reporting birds they saw: they wrote entries in a sightings log book. Most data just accumulated in the log books, and refuge staff was left with the task of figuring out what, if anything, to do with the reports.

Birders: meet high-tech. Developed and offered by Cornell Laboratory of Ornithology, eBird is an online checklist program that anyone with Internet access can use to review bird sightings from locations across North America. Just look at <http://ebird.org>.

Santa Ana National Wildlife Refuge in Texas, one of a handful of pilot sites working with the Refuge System Birding Initiative, has gone a step further with the introduction of eBird Trail Tracker, a reporting/interactive tool that helps visitors learn about the refuge's birds. It is just one way that the Birding Initiative has been working for the past two years to make national wildlife refuges even more birder friendly.

eBird Trail Tracker, a software program, works on any computer. So far, most refuges are using it in a compact kiosk unit with touch screen capabilities. Besides funding, all a refuge needs to get started is a bird checklist, a good map and a semi-high speed Internet connection. The City of Alamo, our gateway city, paid for the kiosk unit – that is, the kiosk, computer unit with touch screen and speakers – with revenue from its hotel/motel tax fund.

According to Barry Bermudez of the Cornell Lab of Ornithology, \$1,800 is the base cost for the customization work, including the refuge map, checklist and deployment. The first year's access fee is \$1,000. After the first year, the yearly access and maintenance fee, which includes all upgrades and content additions to the software, is \$1,500.

Using the Trail Tracker is easy: birders enter and map their sightings, which then become immediately available to visitors both on-site and at the eBird Internet site. Birders can even opt to have a list of their sightings e-mailed to any address.

Refuge visitors have several easy ways to find out which birds have been reported – right down to the time and exact location on a refuge map. Recent birding reports cycle through as a kind of screensaver, with names and photos appearing on the monitor to catch the interest of passing visitors. The software makes it easy to create a link on any Web site where the past week's worth of bird sightings are automatically listed (no extra data entry required). Early results at Santa Ana Refuge, where the link is on our Friends' Web page (www.friendsofsouthtexasrefuges.org) indicate the "recent bird sightings link" is a good way to attract repeat visits.

What's that Bird?

Ever try to help a visitor identify a bird he's heard but not seen? Most visitors are unfamiliar with the songs and calls of such south Texas species as great kiskadees or green jays. Here's where eBird Trail Tracker becomes more than just an electronic reporting tool.

Bird songs and calls, photos, range maps and natural history accounts are provided for almost all birds on our checklist. This makes it easier for birders to confirm a heard-only bird. Don't get me wrong, we still enjoy hearing a visitor shriek an imitation of a plain chachalaca (good clean fun). But the Trail Tracker's bird identification features allow refuge staff to more confidently help birders.

The tracker is not a perfect system: the validity of the data is still at the mercy of the identification skills of birders. But the use of preset filters is an improvement over the pen-and-paper version, so it's almost impossible to see emperor penguin or dodo on our lists again (though I'll kind of miss that). Our reporting data are being saved for future analysis and shared with the public.

At Santa Ana Refuge, we still offer the low-tech reporting option. But the next time someone asks when and where the hook-billed kite has been seen, anyone can use the eBird Trail Tracker to check the exact time and place.

If your refuge is interested in getting an eBird Trail Tracker, contact Barry Bermudez at the Cornell Lab, 607-254-2473. For more information about the Refuge System's Birding Initiative and how to make your national wildlife refuge more birder friendly, go to: <http://www.fws.gov/refuges/birding/birderFriendly.html>. ♦

Mike Carlo is the visitor services specialist at Santa Ana National Wildlife Refuge in Texas.

Not sure about the song of a great kiskadee? At Santa Ana Refuge in Texas, eBird Trail Tracker can help. (USFWS)



Taking Care of Our World War II Legacy

by Lisa Matlock

"In 1942, [we] were whipped away from our home – like dogs. All our possessions were left... for mother nature to destroy... I tried to pretend it was really a dream and this could not happen to me and my dear family."

– Bill Tcheripanoff Sr. of Akutan, Alaska

Tcheripanoff's story is just one of several retold in a new **Junior Ranger Booklet**, at the center of a partnership aimed at halting vandalism and theft of historic artifacts from the Aleutian World War II National Historic Area, one of the nation's most important World War II sites.

Stewardship, after all, begins with knowledge. That's the concept behind the partnership among Alaska Maritime National Wildlife Refuge, the National Park Service and Ounalashka Corporation (OC) that will launch the Junior Ranger program this September within the Unalaska City School District and for area visitors. Eventually, all Unalaska children will receive historic and stewardship information, as will families visiting the National Historic Area's visitor center, housed in a renovated World War II aeronautics building.

The Aleutian World War II National Historic Area includes acres of fallen World War II-era buildings, gun emplacements, pillboxes and other structures – all remaining from the huge American military build-up following Japan's bombing of Dutch Harbor June 3-4, 1942. The bombardment followed Japan's invasion of Kiska and Attu Islands – the only time during World War II that American soil was invaded. Both islands are part of Alaska Maritime Refuge.

Today, the Ounalashka Corporation, an Alaska Native corporation, co-manages with the National Park Service the Aleutian World War II National Historic Area and World War II Museum in Dutch

Harbor. Both believe a Junior Ranger will help youngsters understand the site's importance and so cut graffiti, vandalism and theft.

The Voices of the Aleutians

The National Park Service used

Junior Ranger Ambassador funding to hire a Student Conservation Association intern to develop the Junior Ranger Booklet, which contains information on cryptographics, a game matching quotes with a historic timeline, and pages where participants can capture family stories, among other features. National Park Service educator Jenni Burr and I co-lead the project. The U.S. Fish and Wildlife Service added a vital environmental element because invasive rats, chemical contaminants and unexploded

ordnance are among challenges left by World War II in the Aleutians.

Burr and I met with Unalaska residents in February 2008 not only to outline the booklet's themes, but also to get the area's most important stories and voices, including those of World War II soldiers stationed far from home. The voices also represent local Aleut people, more appropriately known as Unangan, who were interned by the American government in desolate camps during the war. The stories are sensitive and emotional and require careful presentation to children.

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In Alaska, junior rangers are helping to preserve World War II artifacts. (USFWS)

Snakes Alive! – continued from pg 1

In March, Loxahatchee Refuge became the state's northernmost site to host a Python Patrol class, led by the Miami-Dade Fire Rescue Venom Response Team and senior refuge biologist Cindy Fury. Experts taught staff how to confirm suspected python sightings and capture the animals safely for study – alive, if possible. So far, there have been two unconfirmed sightings at the refuge. Said Loxahatchee project leader Sylvia Pelizza, "It's just a matter of time."

Fury proposed the training after attending a similar event, spearheaded by The Nature Conservancy, in January at Crocodile Lake National Wildlife Refuge on Key Largo, 110 miles to the south. At least nine sightings have since been confirmed on the key, separated from the Everglades by six miles of water. By January, the U.S. Geological Survey (USGS) placed 59 python traps in and near Crocodile Lake Refuge, with the refuge's permission.

Unwieldy "Pets"

How did a native Asian reptile become a major U.S. menace? According to the Service, animal traders imported some 100,000 of the colorful snakes between 1996 and 2006, captive bred them and sold them as pets. But some owners were not charmed when, after a year, their 20-inch hatchlings morphed into hungry eight-footers. They released them illegally into the wild.



A recent report said the Burmese python's potential for range expansion extended into the entire southern third of the country. (USFWS)

A USGS report released in February projected the Burmese python's potential for range expansion, based on climate comparisons for the United States and their native habitat. The report showed their potential range extending into the entire southern third of the country.

One researcher studying the endangered Key Largo woodrat tracked a radio-collared specimen into a python's stomach. Studies of the contents of python stomachs have found white-tailed deer and adult alligators, along with a host of other animals.

Python Catching 101

How do you catch a python? Carefully.

Loxahatchee Refuge biologist Cindy Fury recalls her first training: "I grabbed the snake by the head, as I was taught," she says, "and it slammed into me and then wrapped around my legs. I couldn't move and I could feel it start to squeeze... I said, 'Whoa.'" Another member of the class unwrapped the snake, "because I couldn't do it and still hold the head. It was a really good example of what you don't want to have happen if you're out by yourself in the field."

At the Florida Key Refuge Complex – home of the endangered key deer and Lower Keys marsh rabbit – manager Anne Morkill wants to believe controls can still work. "The Everglades is a goner. Here, we have an opportunity to hold the line." ♦

Susan Morse is a writer-editor in the Refuge System Branch of Communications in Arlington, VA.

East Coast Wetlands Disappearing – continued from pg 2

five times greater than inland counties. Land use changes associated with higher population densities further contributes to wetland losses. Also, wetland restoration activities generally benefit far more acres of inland wetlands than coastal wetlands; higher land costs make coastal wetland restoration more expensive.

The Service and NOAA are working with the Environmental Protection Agency

and the Army Corps of Engineers to develop management and policy recommendations for the conservation of coastal wetlands.

Service programs such as the Partners for Fish and Wildlife Program, Coastal Program and the National Coastal Wetlands Conservation Grant Program are part of a broad effort to encourage voluntary contributions to habitat

conservation. By providing financial and technical assistance to partners, including communities and private landowners, the programs enlist help in conserving coastal areas threatened by development and predicted sea-level rise resulting from climate change.

The wetlands report is online at <http://www.fws.gov/wetlands>. ♦

Whatever Happened to

San Francisco Bay Wetland Restoration Projects

Plans for returning the 3,000-acre Bair Island in San Francisco Bay to a tidal wetland are moving forward, thanks to a partnership between the Port and City of Redwood City, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service and a variety of other partners.

Bair Island was once tidal salt marsh, but, beginning in the mid- to late-1800s, it was diked and drained for agriculture and salt production. The island was added to Don Edwards San Francisco Bay National Wildlife Refuge in the late 1990s. Over time, some levees have been broken by wind and wave action, restoring tidal flow to about half of the island.

The dredged-up Redwood City sediment would have been dumped in the deeper portions of the bay or at sea. Now the material is barged to Bair Island, where

it will raise subsided areas to jumpstart wetland plant growth. “Right now it’s providing some upland habitat for a few doves and pigeons but not much else to benefit wildlife or the bay itself,” says refuge manager Mendel Stewart.

To raise the island’s elevation, the restoration plan requires the placement of an estimated 1.4 million cubic yards of dredged material and fill dirt. The Redwood City dredging is expected to provide about 200,000 cubic yards of material. Once complete, the Bair Island Unit of the refuge will provide not only abundant salt marsh habitat for several endangered and threatened species but will also include much improved wildlife-oriented public recreation opportunities in the form of hiking trails, observation platforms and interpretative exhibits.

The Bair Island Restoration Project was once considered the largest tidal wetland restoration project in the Bay area until 16,500 acres of former salt production ponds were acquired from Cargill Inc. in 2003. Of this total, 9,600 acres are part of the refuge with the remainder managed by the California Department of Fish and Game. The South Bay Salt Pond Restoration project is beginning the process that ultimately will turn these former salt ponds into a mix of tidal marsh, mudflat and managed ponds. ♦

(For more about the restoration project, see September-October Refuge Update, pg 8.)

Chief’s Corner: What We Do Now – *continued from pg 2*

past 100-plus years. With our partners and a strong science foundation, the Service and the Refuge System have shown innovation, creativity and imagination in conserving the wildlife legacy we enjoy today. We will bring all of that – and more – to bear on the climate change challenge we face.

We have started the process. We are undertaking sea-level rise analyses to assess what will happen to our coastal refuges. Using leading-edge science and technology, we are, for example, analyzing the impacts of changing precipitation patterns on waterfowl production habitat and prioritizing land protection actions to maintain sustainable waterfowl populations.

Among the scores of steps we will take in the year ahead, the Service will move quickly to expand our understanding of climate change’s impacts on wildlife. We will work closely with partners to identify the habitats most critical across landscapes. We will look for opportunities to create redundancy and resiliency in the Refuge System just as we have in the past when confronted with conservation challenges. We will move our own agency toward carbon neutrality, and we will educate and engage our citizens about what they can do in their own homes and businesses.

We have to make wise decisions now to ensure that our nation’s fish and wildlife resources will thrive in the future. That

won’t be easy. But we are determined that historians will be able to herald our dedicated professionals and leaders as visionaries who worked to promote wildlife and wildland conservation practices across the landscape. What we do now matters for all time. ♦

Recalling the Battle of Long Island Sound

by David Klinger

When you talk to a “living legend” about legendary matters, what better place to converse than in the living room of a conservation legend?

And when retired eight-term New York congressman Lester Wolff sat down with the U.S. Fish and Wildlife Service in the study of Theodore Roosevelt’s Sagamore Hill estate, the talk quickly turned to the legendary personalities he battled in the quest four decades ago to establish Oyster Bay National Wildlife Refuge in New York.

It pitted the freshman congressman against some of New York State’s most powerful political forces – Governor Nelson Rockefeller and New York City planning czar Robert Moses, among them – and marked a turning point in the Empire State’s environmental maturation.

“Long Island Sound was a very precious resource, and it was being despoiled,” recalls Wolff. “It was almost a ‘dead sea’ at the time.” Among the conservation

threats of the mid-1960s that Wolff cited were the legacy of suburban development, wetlands filling, proposed nuclear power plants across Long Island, and, finally, a bridge – proposed, in that era, as America’s second longest.

The oral history conducted with 90-year-old Wolff records the eight-year struggle to create Oyster Bay Refuge, which became something of a pawn in the midst of a titanic struggle that began in 1965 with the fight to block a 6 1/2-mile suspension bridge that would have connected Long Island to Rye as a convenient short-cut around traffic-choked New York City.

“Moses’ solution,” according to Robert Caro, author of *The Power Broker/Robert Moses and the Fall of New York*, “(was to) build another bridge across Long Island Sound to the east, a huge ‘Sound Crossing’ between Oyster Bay and Rye. Presumably, when that bridge was completed, there would be another bridge to its east – and then another, and another. Moses would, if he had his way, cover the Sound with bridges as the Tiber was covered with bridges in Rome.”

3,000-Acre Water-Covered Refuge

Says Wolff, “Robert Moses had very strong ideas about opening up Long Island to areas of New England, but there was also the question of why we came to live on Long Island. I had a good friendship with Nelson Rockefeller. After we stopped the bridge, Moses never spoke to me again. It became a very difficult fight.

“We devised a plan to protect the area by getting federal protection and set it up as a wildlife preserve. I got the ear of (Interior) Secretary (Stewart) Udall, who was very cooperative.” The resulting 3,000-acre water-covered refuge is unique in consisting solely of bay bottom and adjacent shoreline up to the mean high tide mark; 90 percent of New York’s commercial oyster harvest comes from the marine refuge.

“Some congressmen represent the needy. I represented the greedy,” Wolff joked, belying his roots on Long Island’s tony North Shore, home to millionaires since Roosevelt first settled in the distant fishing village in 1884. Wolff, a former tap dancer, television broadcaster, and university instructor, was swept into Congress in the Great Society landslide election of 1964; he soon gained a reputation as an activist congressman and an international diplomatist.

The two-day video shoot is part of continuing efforts by NCTC and the Service’s heritage committee to document the Service’s history with video and oral histories from its retirees and other notables who’ve left significant imprints on the Service and on conservation. Access to Sagamore Hill allowed NCTC videographer and production division chief David Cooper unlimited opportunity to compile a substantial body of footage of Roosevelt’s home and personal artifacts for future video productions, including close-ups of trophy mounts from his hunting expeditions to the American West, Africa and South America; Roosevelt’s personal library; and the private office that served as the summer White House from 1901 to 1909. ♦

David Klinger is senior writer-editor at the National Conservation Training Center in Shepherdstown, WV.



More than 25 species of waterfowl – among them, canvasback ducks – depend on Oyster Bay National Wildlife Refuge, NY, for survival. Former congressman Lester Wolff led an eight-year struggle to establish the refuge. (USFWS)

FOCUS . . . *Climate Change*

Bold Approaches for Climate Change

The U.S. Fish and Wildlife Service is embarked on an aggressive effort to address rapidly changing climate conditions, bolster stronger relationships with partners, expand existing conservation strategies and lay the foundation for developing and implementing broad approaches to adaptation.

The Service's sweeping climate change strategy, as well as actions now underway throughout the Refuge System, underscore the urgency attached to dealing with the most compelling conservation challenge of our time. The Service's draft plan makes clear the need to develop the capacities to address such complex issues as sea-level rise and the adaptive capacities of wildlife species and natural systems.

A team of nearly 40 Service leaders worked on the latest revisions to the climate change plan. The revisions reflect the more than 400 sets of comments submitted by supervisors on behalf of their staffs during an employee-comment period. The revised version is expected to be released in late May; the Service then intends to seek partner and public comments before completing the plan later this year.

Meanwhile, throughout the Refuge System, steps are being taken to help wildlife adapt to climate change; mitigate levels of greenhouse gases in the Earth's atmosphere; and expand awareness about the effects of climate change among Service employees, the general public and agency partners. Adaptation, mitigation and public engagement are the Service plan's three categories of essential action.

The Service is actively partnering with organizations such as the U.S. Geological Survey, state fish and wildlife agencies, universities and non-governmental organizations to identify and apply climatic models to help wildlife biologists understand what and where changes are going to occur and how those changes will occur over time. This kind of information is integral to planning specific conservation activities, including acquisition for National Wildlife Refuge System lands.

Analyses that forecast the effects of sea-level rise have been completed for many coastal units of the Refuge System. In some places, such as Chincoteague National Wildlife Refuge, VA, the data will guide long-range planning (see page 12). At other stations, such as Alligator River Refuge, NC, the information is

How Alligator River Refuge Is Planning and Adapting

by Mike Bryant

In the face of a global event like **climate change**, what can I do as a land manager? I choose to be an independent critical thinker and remain receptive to the consensus of the best available science – a science that tells us that for 177 coastal refuges, the changes are becoming evident and are likely to continue at a rapid pace.

Few landscapes are as vulnerable to the effects of climate change as

North Carolina's Albemarle Peninsula, the location of four national wildlife refuges – Pocosin Lakes, Swanquarter, Mattamuskeet and Alligator River. While water is as much a part of this landscape as the land itself, the anticipated rising seas will dramatically change this complex ecosystem of estuaries, swamp forests, marshes and meandering rivers. More than 540,000 acres on the peninsula are currently under conservation protection as national

The Service is "greening" its infrastructure, increasing the use of alternative energy and seeking to become carbon neutral.



Alligator River Refuge, NC, and The Nature Conservancy are collaborating on a innovative sea-level adaptation project. Lessons learned there could be applied to other coastal areas in the United States and abroad. (USFWS)



The U.S. Fish and Wildlife Service's climate change strategy, as well as actions now underway throughout the Refuge System, underscore the urgency attached to dealing with the most compelling conservation challenge of this century. (USFWS)

supporting efforts to buffer the eroding effects of wind and tides (see page 8). Across the country, cutting-edge science and technology are being used to gauge the effects of changing precipitation patterns on waterfowl production habitat and guide land-protection actions.

Greening the Infrastructure

Meanwhile, slowing the acceleration of climate change through mitigation – reducing the sources and enhancing the

sinks of greenhouse gases – is receiving increased attention. The Service is “greening” its infrastructure, increasing the use of alternative energy and seeking to become carbon neutral by 2020.

The efforts include a renewed emphasis on reforesting land, which not only helps strip greenhouse gases from the air through carbon sequestration, but also creates viable – and interconnected – habitat. The Service’s carbon

wildlife refuges, North Carolina Wildlife Resource Commission game lands, North Carolina Coastal Reserves, Department of Defense reservations and local government and private lands. Some private lands are owned by conservation organizations; others are under conservation easement.

Rising sea water is changing estuarine and freshwater systems while drowning the land. The peninsula’s soils may be degrading at a sharply accelerating rate because of the interaction of peat and saltwater. Certain microbes and natural plant communities – pond pine shrub pocosin, for one – are undergoing

changes in species composition from woody trees and shrubs to marsh as a result of saltwater intrusion.

In the case of Alligator River Refuge, sea-level rise modeling projects that we could lose 67 percent of the refuge’s unique pocosin swamp land and 90 percent of its dry land by 2100. In a 2006 report, the nonprofit Defenders of Wildlife called the refuge one of the 10 stations most vulnerable to the effects of climate change.

Accept – and Adapt

For many years, coastal geologist Stan Riggs, who is affiliated with

sequestration working group met April 7-8 to discuss how best to advance carbon sequestration programs.

The Service’s carbon neutral team met on March 24 to set in motion plans to, among other goals, reduce the carbon footprint of the Service’s workforce by 10 percent a year. An initial step will be a review of energy consumed in buildings, by station vehicles and during employee commutes.

In many locations, refuge staff, members of Refuge Friends groups and partners are implementing programs to keep the public up to date about the multiple threats posed by climate change.

“Ultimately, this may be our most important function,” Refuge Chief Greg Siekaniec said before the Congressional Research Service in April. “We believe we have a responsibility to help the public understand the issue.”

Toward those ends, refuges are promoting citizen science. For example, they hold Bio Blitzes, day-long events where people meet with wildlife biologists and other experts not only to learn about wildlife, but also to document biodiversity. The Refuge System has joined with Cornell Lab of Ornithology to, among other objectives, encourage people to track birds, whose nesting habits and migratory changes can be climate indicators. ♦

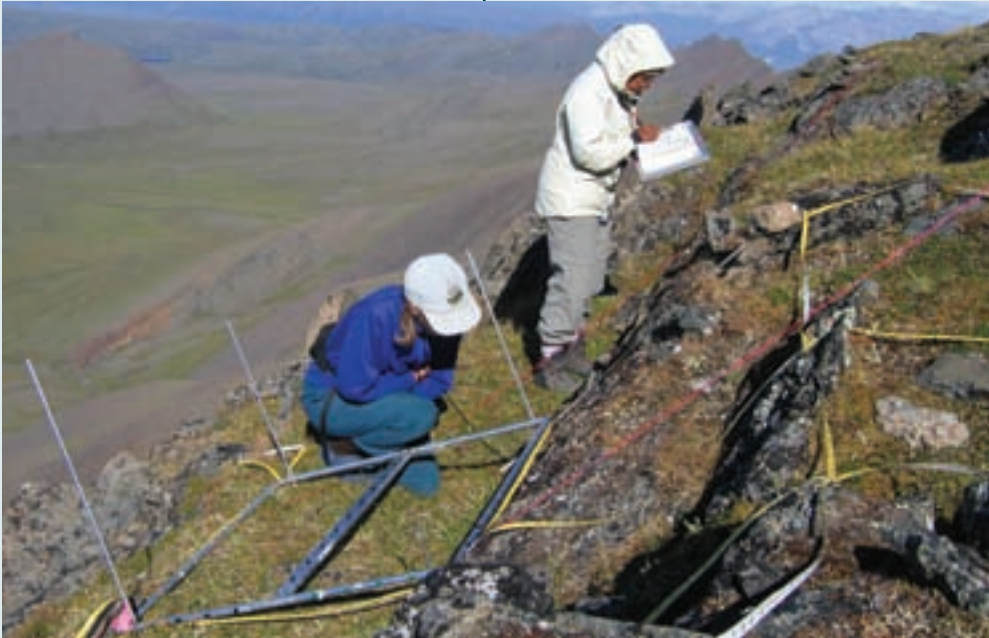
East Carolina University, has studied and published both academic and popular literature that focuses on the vulnerability of the state’s coastal zone, which is only a foot or two above sea level. His advice: “Accept and plan for environmental change – and adapt.”

Two years ago, The Nature Conservancy’s North Carolina chapter approached the U.S. Fish and Wildlife Service about collaborating on an experimental, innovative adaptation project at Alligator River Refuge aimed at making the refuge more resilient to sea-level rise.

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FOCUS . . . *Climate Change*

Rapid Climate Change Is Transforming the Arctic



by David Payer

The Service's listing of the polar bear as threatened in May 2008 focused international attention on the rapid changes taking place in the Arctic. The designation marked the first time that a species was federally listed because of habitat loss explicitly linked to climate change.

In this case, the habitat is sea ice, which polar bears use as a platform to hunt seals. Based on expected future ice conditions, U.S. Geological Survey researchers predict that two-thirds of the world's polar bears will be lost by the middle of this century, including all of the bears in northern Alaska. Other species associated with sea ice, such as walrus and some seals, are at grave risk as well.

The Arctic is experiencing some of the most rapid and severe climatic change on Earth – and the rate of change is expected to increase. A science plan now taking shape will promote partnerships to address the Service's highest priority issues in the region. (USFWS)

Tracking Change on Wildlife Refuges

by Kathy Granillo

For the past 100 years, we have conducted refuge management within a relatively stable climate. But now we understand that climate change is accelerating: the Earth's temperature is rising, and precipitation patterns are becoming more variable.

As we anticipate the dramatic changes that climate change could bring, inventorying and monitoring (guided by well-developed goals and objectives) of Refuge System resources will help us determine the impacts on our resources and how best to use this information in our management decisions.

An inventory is a survey that documents the presence, relative abundance, status and/or distribution of abiotic resources, species, habitats or ecological

communities. Monitoring is a survey that is repeated to determine changes in the status and/or demographics.

The information gathered in monitoring is used to assess change in key environmental attributes of ecosystems, habitats or plant and animal populations (surveillance monitoring). It also is used to evaluate the effects of management actions (targeted monitoring). Both forms of monitoring have a place in refuge management.

In the past, refuges have conducted various inventories and implemented an array of monitoring programs, although usually for only a small subset of refuge resources. Waterfowl surveys (both breeding and wintering) are the notable exception.

Tough Decisions Ahead

Long-term monitoring will help us understand how plants and animals

While recent sea-ice changes are dramatic, they are really just the tip of the iceberg. The Arctic is experiencing some of the most rapid and severe climatic change on Earth – and the rate of change is expected to increase. In Arctic Alaska, recent warming far exceeds the global average. In some areas, trees are moving northward and into higher elevations; shrubs are invading tundra. On the Arctic National Wildlife Refuge, mosses are declining, permafrost is warming, and glaciers are receding as the climate becomes warmer and drier. Given this changing landscape, the ranges of many terrestrial species are expected to move northward. Others specifically adapted to high latitudes, such as lemmings, arctic foxes and muskoxen, are likely to decline because they will have nowhere to go.

Ecologist Patricia Reynolds has studied muskoxen on the Arctic Refuge since 1982. Since the late 1990s they have

become increasingly rare. Reynolds believes that a primary reason is more frequent “icing events,” in which rain during winter creates a layer of ice that makes food less available for this Arctic herbivore. Reynolds is working with the Alaska Department of Fish and Game and others to unravel the mystery of the disappearing muskoxen.

Rethinking Refuge Management

Climate change is challenging us to rethink how we manage America’s largest and northernmost national wildlife refuge. We will need to make hard decisions about how to deal with species that may no longer be able to thrive, and how to manage invaders that may be better adapted to a new climatic regime.

The refuge and the U.S. Fish and Wildlife Service’s Field Office in Fairbanks have joined forces to develop and implement an Arctic Strategy.

Working cooperatively with partners, we are modeling potential effects of Arctic change on Service trust resources. We are also identifying critical research and monitoring needs to refine our predictions and inform adaptive management. A workshop was held in November 2008, and a science plan will be completed during 2009. The plan will establish our science needs over the next five years, and will promote partnerships to address the Service’s highest priority Arctic issues.

The Arctic of the future will likely be very different. Through scientifically based management, we are striving to conserve Arctic ecosystems in the face of uncertainty and rapid change. ♦

David Payer is supervisory ecologist at Alaska’s Arctic National Wildlife Refuge.

are responding to climate change. The information we gather also will alert us to some of the cascading ecological effects that are extremely hard to predict with

any accuracy. Monitoring the status and trends of all species on refuge lands will not be possible; difficult decisions will need to be made about which species and

habitats as well as which attributes to monitor. We need to make these decisions in the larger landscape context and complementary to what others are doing in the conservation matrix.

No surprise, then, that the U.S. Fish and Wildlife Service’s draft Climate Change Strategic Plan proposes a national biological inventory and

monitoring partnership and within that framework, a long-term ecological monitoring program on refuges.

There are many ways to scale such a program. To a certain extent, it should allow inference at multiple scales. We can use that information to work together across the system with our many conservation partners to track our changing climate, understand the effects on wildlife and wild places and effectively manage our conservation landscape.

The long-term ecological monitoring program launched in 2004 at Kenai Refuge in Alaska is an example of this kind of effort. Working cooperatively with the Forest Service inventory and analysis program, staff members there sample breeding land birds, vascular and nonvascular plants and arthropods on 350 plots at five-km intervals across two million acres. The Kenai program documents ecological condition and

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Inventorying and monitoring Refuge System resources will help us determine the impacts of climate change on our resources and, in turn, make sound management decisions. (USFWS)

FOCUS . . . *Climate Change*

Where SLAMM Foretells a Wetter Future

In a preview of things to come at the Refuge System's coastal units, Virginia's Chincoteague National Wildlife Refuge, perched on a fragile, 37-mile-long barrier island, will be incorporating sea-level rise projections into its new 15-year Comprehensive Conservation Plan (CCP).

The projections were generated through SLAMM modeling, short for Sea Level Affecting Marshes Model and now being used to measure the potential effects of sea-level rise. The models simulate the dominant processes involved in wetland conversions and shoreline modifications during long-term sea level rise.

"Sea-level rise will be the underpinning element of the refuge's new CCP," Chincoteague Refuge manager Louis Hinds said. The refuge, with nearly 1.5 million visitors a year and one of the system's most popular units, is located on Assateague Island, whose 14,000 acres

include beaches, dunes, salt marshes wetlands and maritime forest.

The effort to determine the possible long-term effects of sea-level rise began nearly two years ago when representatives of the refuge, the National Park Service and the town met to discuss the recurring need to repair washed-out ocean-side parking lots, Hinds says.

"We looked at National Park Service maps that showed how Assateague Island had changed over a period of 120 years," he said. "There were any number of land forms and beach areas that had disappeared."

Quickening Pace

Work on Chincoteague's SLAMM project began in May 2008. SLAMM was initially developed in the mid-1980s with Environmental Protection Agency funding. The system, which involves the



Virginia's Chincoteague National Wildlife Refuge, perched on a fragile, 37-mile-long barrier island, is incorporating sea-level rise projections into its new 15-year management plan. (USFWS)

Reviving the Land – and the Air

by Bob Ford and Pete Jerome

In the mid-1990s, Ray Aycock, a U.S. Fish and Wildlife Service biologist with a penchant for innovative partnerships, and his Refuge System colleagues wanted to restore roughly 50,000 acres of marginal refuge farm land in the Lower Mississippi Valley. Randy Williams, who then worked for an energy company and later founded an environmental consulting firm, was looking for ways to offset the carbon emitted by his company's generating plants.

Together, with the support of the National Fish and Wildlife Foundation, they would plant the seeds that launched the Service's terrestrial carbon sequestration initiative. The initiative,

the first of its kind among federal natural resource agencies, so far has added 40,000 acres of land to the Refuge System and altogether restored 80,000 acres to native wildlife habitats – mostly bottomland hardwoods – with more than 22 million trees that in 99 years will sequester more than 30 million metric tons of carbon.

Today, reducing the impact of greenhouse emissions by increasing the amount of carbon removed by and stored in forests or other plant communities is a prominent element in the Service's plans for responding to climate change. With the involvement of energy companies and conservation organizations, the Service is moving aggressively to expand

use of a specialized suite of software, has since been refined extensively.

The Chincoteague study area included the eastern shore of Maryland and Virginia on the lower end of the Delmarva Peninsula. Scientists and engineers were consulted to define variables and outline the sites to run model simulations. Federal agencies supplied most of the raw material (such as aerial photo imagery, surface elevations, accretion, erosion, tidal ranges and salinity) used in the computer analysis. Wetland vegetation information from National Wetlands Inventory maps was checked for accuracy and corrected if necessary.

The final SLAMM projections were wrapped up in late February. "When they are mapped, the projections don't look severe until 2025," Hinds said. "But from 2025 to 2050, sea level rise would render the refuge impoundments unusable as designed and, without constant pumping, turn them into open water. Many of the lower marsh islands become mudflats. By 2100, all of

Assateague Island would be a small sliver of sand and mud flats."

The CCP process moves to the public hearing stage later this year. "SLAMM is a planning tool that allows me to make informed decisions about the repairs to infrastructure such as dikes and water control structures," says Hinds. "Second, the visual products created by the analysis such as maps and tables are perfect to stimulate the public into conversation about climate change and sea level rise"

Planning for the CCP continues with the aid of the Tennessee Valley Authority, which has assisted several other refuges with their CCPs because of the agency's expertise in land-management planning. "We're going to consider such matters as impoundment management on coastal refuges," Hinds says. "If you have a fresh-water impoundment that is breached by salt water, what are your options?"

Meanwhile, he notes, sea-level rise will be one cornerstone on which the new CCP will be based. "Every strategy that

we set will take into account the effects of short- and long-term sea-level rise and the likelihood of more storms with greater intensity. Future land acquisition policies will be shaped by the SLAMM data. We'll be showing the community why we need to be thinking about upland land acquisition to replace habitat that will be inundated," Hinds says.

So far, the Refuge System has applied SLAMM to coastal stations along the Atlantic, the Gulf Coast and the Caribbean. Additional analyses are planned for Pacific refuges in 2009. As at Chincoteague Refuge, SLAMM results will be crucial elements in developing refuge and landscape-scale adaptation strategies and in revising refuge CCPs.◆

the use of this tool to include private landowners and to diversify the habitats available for sequestration.

More and more, energy companies are seeking to restore wildlife habitat to "offset" their emissions elsewhere. Conservation groups provide a vital link between industry and the Service, facilitating the partnerships that make restoration possible. Diverse partnerships have developed to include the Trust for Public Land, The Conservation Fund, The Nature Conservancy, Illinova, Dynegy, Entergy, American Electric Power, DTE Energy, Texaco, Ducks Unlimited, Volkswagen, Gaiam, the Carbon Fund and utility consortiums such as PowerTree and Utilitree.

Typically, energy companies purchase and restore land based on the Service's



The seeds for the U.S. Fish and Wildlife Service's terrestrial carbon sequestration initiative were first planted in the Lower Mississippi Valley. (USFWS)

priority conservation needs, donate the restored lands to the Refuge System, provide limited operational funds and retain the right to sell or market their carbon credits to energy companies or others. It's a win-win process for everybody.

Terrestrial carbon sequestration is a key part of the Service's campaign to restore native habitats

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FOCUS . . . *Climate Change*

Connecting the Conservation Landscape a New Priority

by Mike Scott and Bob Adamcik

Climate change brings both a new urgency and a new character to the concept of protecting land and the role of the National Wildlife Refuge System in that effort.

The drivers for land protection have evolved over the decades as the Refuge System has grown. First was protection for plumage birds from market hunting, followed by establishment of game ranges, preservation and restoration of wetlands for waterfowl and then by support for endangered species.

Through the decades, lands (and more recently, waters) have come into the system from the public domain, via fee simple acquisitions and donations and through easements. Throughout, however, the basic land protection model has remained essentially unchanged: Establish planning boundaries, acquire management control over lands within the boundaries, and apply various conservation practices as appropriate.

The era of climate and land use change that confronts us now imposes a mandate for a different model of land protection and very likely new roles for all entities associated with this effort. These roles will include an expansive view of landscape conservation that will require more integration, collaborative planning and extensive cooperation, often beyond refuge boundaries. The objective: To keep integrity, diversity and health of existing refuges and to connect them as much as possible with the rest of the conservation landscape.

The premise for integrated land protection as a response to climate change presumes that our greatest tool to facilitate wildlife adaptation to this threat is the natural ability of plants and animals to evolve and adapt. Our job is to give them the room and time to do so.

Tripartite Approach

Underlying this premise is a tripartite approach to how we identify lands for protection and subsequently manage them. The three parts are commonly referred to as “representation, redundancy and resilience.” In other words, we must assure that multiple, ample areas representing the full range of habitats be brought into the conservation landscape, and that we manage that landscape to control the stressors other than climate (e.g., invasives, encroachment, pollutants) that detract from the natural evolutionary processes occurring within the natural systems.

Each element of this trinity of tasks presents unique challenges. Identifying and selecting key representative species and habitats will require making many choices about what to include and what to leave out. Subsequently locating and protecting tracts that correspond to these management targets will be a cooperative venture with many partners exploring both traditional and innovative

“Expansive view of landscape conservation that will require more integration . . . ”



The drivers for land protection have evolved over the decades as the Refuge System has grown to include more land – and water. (USFWS)



The era of climate and land use change imposes a mandate for a different model of land protection. (USFWS)

protection strategies well beyond fee simple acquisitions and easements and will include incentive programs for our conservation partners on private lands.

Managing these conservation targets will be challenging. Minimizing non-climate stressors is closely related to traditional management practices on refuges, but because refuges often are too small to maintain viability of management targets, reducing those stressors will require collaborative negotiating with off-refuge entities to an extent perhaps not yet experienced. This is made necessary as we confront the many new pressures for land development: alternative energy development and associated corridors, expanding agriculture pursuing biofuel production and new urban and transportation infrastructure to accommodate an increasing human population.

The Refuge System cannot meet these challenges alone. Its traditional approaches to planning and setting priorities for acquisitions, identifying

management goals and implementing conservation will limit our ability to contribute unless we promote and participate in a new model of highly strategic and collaborative land protection across the continent.

While the nature of such a model has yet to be described, it is waiting in the wings for an opportunity to emerge. At that point, the Refuge System has the opportunity to take the lead in forging, coordinating and implementing a thoughtful, dynamic and collaborative land conservation effort and serve as a catalyst to shaping a future American conservation landscape that will support the adaptation of species to climate and other environmental changes. ♦

Mike Scott and Bob Adamcik are wildlife biologists. Scott is with the U.S. Geological Survey, Adamcik with the U.S. Fish and Wildlife Service



At Cape Romain National Wildlife Refuge, SC, a 20-mile-long barrier island refuge, harsher and more frequent storms coupled with rising sea levels are eroding ocean-facing beaches and drowning valuable habitat. On the northeast corner of Bull Island, a three-mile stretch of Boneyard Beach is strewn with the gnarled remains of hundreds of once-thriving oaks, cedars and pines. (Ricky Wrenn)

Awards for Refuge System



Marie Springer, Volunteer of the Year (USFWS)

The National Wildlife Refuge Association and the National Fish and Wildlife Foundation have honored Refuge System supporters and employees with 2009 National Wildlife Refuge System Awards. New Jersey's Marie Springer was recognized as Volunteer of the Year; the Friends of Pool 9 in Iowa is the Friends Group of the Year.

In 2008 alone, Springer logged more than 2,000 hours of volunteer time for Wallkill River National Wildlife Refuge in New Jersey and the Refuge System – equal to a full-time employee. She has served as



John Verdon, president, Friends Group of the Year (Phyllis Verdon)

the president of Friends of Wallkill River and has also been helpful at two other New Jersey refuges, Supawna Meadows and Shawangunk Grasslands.

The Friends of Pool 9 – three years old and 400 members strong – are making a difference along their 31-mile stretch of the 261-mile Upper Mississippi River National Wildlife and Fish Refuge. Each fall, their Rivers and Bluffs Fall Birding Festival brings more than 300 people to enjoy and invest in the region and in the refuge. The Friends of Pool 9 are spearheading efforts to revitalize the original Friends of the



Greg Siekaniec, Manager of the Year (USFWS)

Upper Mississippi River Refuges into an alliance of Friends groups.

The 2009 Refuge Manager and Employee awards were presented in conjunction with the North American Wildlife and Natural Resources Conference, held March 16 to 21 in Arlington, VA. Greg Siekaniec, currently Refuge System Chief and formerly manager at Alaska Maritime National Wildlife Refuge, was named the Paul Kroegel Refuge Manager of the Year. Refuge System Employee of the Year is Baron Horiuchi, the Service's

Taking Care of Our World War II Legacy – continued from pg 4

Beginning in summer 2010, the booklets will be made available to children and families living beyond Alaska's borders who discover Alaska Maritime Refuge through the four-day Ferry Naturalist program aboard the *M/V Tustemena*, whose route includes Homer, base for Alaska Maritime Refuge, and Kodiak, Alaska Peninsula and Izembek National Wildlife Refuges.

Since portions of Kiska, Attu and Atka islands – within Alaska Maritime Refuge

– have become part of the World War II Valor in the Pacific National Monument, we expect yet more visitors. The Junior Ranger program will provide a way for the refuge and its partners to reach families with the ever-relevant saga of World War II's effects on people and places in the Aleutian Islands. ♦

Lisa Matlock is the education specialist at Alaska Maritime National Wildlife Refuge.



Baron Horiuchi, *Employee of the Year (USFWS)*

only horticulturalist who is based at Hakalau Forest National Wildlife Refuge in Hawaii.

Siekaniec, a 24-year veteran of the Refuge System, managed the sprawling Alaska refuge for eight years. Beginning his career at refuges in North Dakota, Montana and Wyoming, Siekaniec's land stewardship and conservation ethic continued to land him increasingly challenging leadership positions around the country. He served in the Washington Office as Deputy Chief of Refuges.

Horiuchi has spent the past 13 years successfully developing and implementing propagation and out-planting methods for endangered Hawaiian plants. He has created a unique program that engages many conservation partners and volunteer groups in the management of the Hakalau Forest greenhouse operation.

CARE Honors Two in Congress

The Cooperative Alliance for Refuge Enhancement (CARE), a coalition of 23 nonprofit organizations, has honored Senator Dianne Feinstein (CA) and Representative David R. Obey (WI) for their long-standing support of the National Wildlife Refuge System. The awards presentation was a highlight of a February 24 Capitol Hill reception that was hosted jointly by the U.S. Fish and Wildlife Service and CARE.

Feinstein chairs the Senate Appropriations Committee's Subcommittee on the Interior Department and Related Agencies; Obey chairs the House Committee on Appropriations. They were recognized

for, among other actions, helping to secure \$434.1 million for the Refuge System budget in FY 2008. In the recently-passed American Recovery and Reinvestment Act of 2009, they helped ensure green jobs would be created on the National Wildlife Refuge System by securing \$10 million to build roads, \$115 million for facilities construction and \$165 million for the Service's resource management programs.

Feinstein has also supported the 15,100-acre restoration of San Francisco Bay's salt ponds to wetlands and other projects of the San Francisco Bay National Wildlife Refuge Complex. Obey has worked to protect native fish, wildlife and habitats in places such as the Whittlesey Creek National Wildlife Refuge. Accepting his award, Obey said of the Refuge System, "Some things are too precious to ignore." ♦

How Alligator River Refuge is Adapting – *continued from pg 9*

The project shifts into high gear this spring. Planned steps include reinforcing oyster reefs with blocks of limestone and netted bags of shells to reduce wave energy on delicate peat shorelines, modifying water control structures to reduce salt-water flooding of the refuge's interior, and planting tree species such as cypress, ash and swamp gum that are more tolerant of early salinity changes than the species present today. The tree species will increase diversity, enhance wildlife habitat, conserve soil, improve water quality and sequester carbon.

Refuge staff is assisting with planning and will help design and implement monitoring programs. Lessons learned at the refuge could be applied to other coastal areas in the United States and abroad. Says Dennis Stewart, who has been Alligator River's biologist for nearly 15 years: "It a great alternative to just throwing up hands and saying we can't do anything."

Meanwhile, we've also had discussions with the North Carolina Coastal Federation, which would like to do similar work on private property in the area. Over time, a concerted effort will be

made to involve other federal agencies, state agencies, universities and other organizations in the project.

Alligator River Refuge is a landscape-level test bench for trying adaptive management strategies tailored to new conditions brought about by climate change. This is only a start at trying to manage in the face of sea-level rise. With willingness and partners, we've begun to adapt. ♦

Mike Bryant is manager of Alligator River Refuge and project leader of North Carolina Coastal Plain Complex.

Around the Refuge System

Texas

Twenty-three whooping were found dead on or near Aransas National Wildlife Refuge during the winter, the second-worst instance of whooper mortality in 20 years. Seven of the cranes were adults. Another 34 cranes that flew to the nesting grounds in Canada early last year failed to return to the refuge and are presumed dead. The flock currently numbers 247.

At the refuge, minimal freshwater inflows contributed to a lack of blue crab and fresh drinking water for cranes. At one point, Aransas Refuge staff started a supplemental corn feeding program to help pull the cranes through until they migrate back to Wood Buffalo National Park in Canada.

Most years, the cranes – the only naturally occurring population in the world – begin their northward migration in late March; the bulk of the flock departs during the first two weeks of April. Tom Stehn, the U.S. Fish and Wildlife Service's whooping crane coordinator, said one dead juvenile crane had a virus found for

the first time in the Aransas flock. The infectious bursal disease has been found in released cranes in Florida.

Oregon

More than 130 volunteers in late February brought shovels, boots and enthusiasm to William L. Finley National Wildlife Refuge to cover a hillside with more than 3,000 native plants that will especially benefit the endangered Fender's blue butterfly. The refuge hopes to reintroduce the butterfly in the near future.

Volunteers were recruited from local high schools, scout troops, wildlife organizations and the Friends of the Willamette Valley National Wildlife Refuge Complex. They and refuge staff members planted everything from camas lily bulbs and milkweed plugs to wild onions, oak and bigleaf maple trees, wild iris, dense sedge and shooting star.

Arkansas

Eleven young captive-reared swans from Iowa were released in late January at Holla Bend National Wildlife Refuge as part of an on-going effort to establish a migrating population.

Scientists have used reverse migration imprinting to introduce young birds that have never migrated into the state and let them use their instincts to return to Iowa. Birds produced in the wild have the benefit of families that stick together through the winter, and the adults lead the way south. Scientists

hope the birds released this year will migrate back to Holla Bend Refuge in the fall.

In January 2008, 13 trumpeter swans were released; they migrated north in April 2008, and eight returned to the refuge in November 2008. During the winter, several trumpeter swans without collars and two tundra swans joined the group. The majestic swans, a common migrant to Arkansas 100 years ago, have an eight-foot wingspan and weigh as much as 35 pounds.

Michigan

Staff, volunteers and cooperating researchers have found 36 species of wildlife previously unknown at Shiawassee National Wildlife Refuge – including a duck that has been recorded in the state only once before. The refuge has made a targeted effort to learn more about its freshwater mussels, yielding 18 new species for the refuge. Three species are listed in Michigan as either threatened, endangered or of special concern.

The most surprising discovery was the black-bellied whistling duck. This is only the second time the duck has been recorded in the state. It usually comes no farther north than Texas or Arizona. Another new species is the direct result of habitat restoration; two singing grasshopper sparrows established territory in newly restored native prairie vegetation. The site was previously a soybean field. Altogether there are now 1,006 species identified at Shiawassee Refuge.

Nevada

After three years of extensive habitat restoration and the construction of a



Twenty-three whooping cranes were found dead on or near Aransas National Wildlife Refuge, TX, the second-worst instance of whooper mortality in 20 years. (USFWS)



Moapa Valley National Wildlife Refuge, NV, recently reopened to the public. New attractions include a viewing chamber that features a stream cross section, showcasing the endangered Moapa dace. (USFWS)

short walking trail, a kiosk and a group shelter; Moapa Valley National Wildlife Refuge is now open to public. Visitors can walk through a new viewing chamber that features a stream cross section, showcasing the endangered Moapa dace, a fish found only in the warm springs of southern Nevada.

The refuge, about 60 miles from Las Vegas, was established in 1979 to secure habitat for and protect the fish. The process of habitat restoration began by restoring springs and restocking the stream channels with dace from other areas of the Muddy River headwaters.

In addition to spring and channel restoration, re-vegetation with native plants, removing non-native species and enhancing stream flows have benefited the Moapa dace and the White River springfish as well as other the endemic species.

Alabama

For the first time in 10 years, a status survey has been taken of the endangered Alabama cavefish, a small colorless fish found nowhere but Key Cave National Wildlife Refuge. The

survey – led by a University of Alabama researcher under an Endangered Species Act grant – was a success, with two fish and several cave crayfish found. Sightings of any kind are extremely rare. The fish is one of the rarest in the world.

Key Cave Refuge, located in an area with many underground cave systems, is also habitat for an endangered gray bat. The

health of the bat colony is important to the continue survival of the Alabama cave fish; it largely feeds on small crustaceans that in turn feed on bacteria that grows on the feces of the bats.

Oklahoma

Wichita Mountains Wildlife Refuge has been a part of the Refuge System for roughly 108 years; maintenance foreman Edwin “Drum” Drummond has been a member of the refuge staff for more than half of those years. In March, he marked his 60th years of service at the mix-grass prairie refuge.

Drum was born and raised at the station, where his father, Earl Drummond, worked as an animal handler. Refuge manager Jeff Rupert says of Drum: “Not many managers have the luxury of having a living history book working on their refuge. If I need to know if one of my ideas will work, all I have to do is ask Drum, and he’ll tell me if it worked the last time someone tried it.” Drum grew up with Lynn Greenwalt, the son of another Wichita Mountains employee, who served as a director of the U.S. Fish and Wildlife Service.

Wetlands

The Migratory Bird Conservation Commission has approved the allocation of \$11.5 million in Duck Stamp funds to add more than 3,500 wetland acres of breeding, resting and feeding habitat to seven units of the National Wildlife Refuge System:

- 🌿 Great Dismal Swamp Refuge, NC, 51 acres to protect, restore and maintain habitat for waterfowl;
- 🌿 San Bernard Refuge, TX, 1,454 acres to provide habitat for wintering waterfowl, including mallard, gadwall and northern pintail;
- 🌿 Silvio O. Conte Refuge, acquisition of 80 acres to preserve and protect important migratory waterfowl habitat, and provide feeding nesting and resting habitat;
- 🌿 Grand Cote Refuge, LA, 265 acres to protect and enhance wetlands for migrating and wintering waterfowl;
- 🌿 Tualatin River Refuge, OR, 225 acres to manage as a migration and wintering area for waterfowl, especially tundra swans;
- 🌿 North Central Valley Wildlife Management Area, CA, 388 acres to protect, restore and maintain wetlands for waterfowl and other migratory birds; and
- 🌿 Grasslands Wildlife Management Area, CA, a permanent easement of 1,077 acres protecting and enhancing a major wintering area for migratory waterfowl.

To date, more than five million acres of wetlands have been purchased using Duck Stamp revenue.

Palmyra Atoll Refuge Becomes Ramsar Site



Palmyra Atoll National Wildlife Refuge has been designated a Ramsar Wetland of International Importance – the first in the United States to include coral reefs. (USFWS)

Palmyra Atoll National Wildlife Refuge has been designated a Ramsar Wetland of International Importance – the first in the United States to include coral reefs. Among other benefits, the Ramsar designation typically leads to increased attention to a site, which can lead to increased interest by the scientific community.

About 1,000 miles southwest of Hawaii, the refuge is a string of 52 islets, comprising

one of the most diverse and spectacular coral reef systems in the world. More than 130 species of stony corals populate the reefs. It includes 680 acres of uplands and more than 15,000 acres of submerged coral reefs and tropical lagoons. It is one of the only pristine wet atolls left in the tropical Pacific.

The lush vegetation supports over a million birds of 29 species. Palmyra also provides a rest stop for the bristle-

thighed curlew, a species of concern. Some 4,000 miles from Alaska, Palmyra is the first place the bird rests on its journey to French Polynesia. Only 6,000 of these rare birds are thought to exist, and several hundred of them spend the winter on Palmyra.

Palmyra Atoll Refuge is one of the few remaining coral reef ecosystems with intact food chains and great biodiversity: it supports one of the last forests of a flowering tree that is particularly popular among nesting seabirds. Entry to the refuge for visitors is by Special Use Permit only.

The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are 158 Contracting Parties to the Convention, with 1,828 wetland sites on the Ramsar List of Wetlands of International Importance. ♦

Reviving the Land – and the Air – *continued from pg 13*

throughout the Lower Mississippi Valley. The area's forested wetlands habitat shrank from 24 million acres to less than five million acres in a highly fragmented landscape during the latter part of the 20th century. Two years ago, the Service began to expand its carbon program nationally working closely with those energy companies and conservation groups.

The effort is gaining traction. Elsewhere in the Southeast, the Service is examining alternative habitat restoration techniques that encourage carbon sequestration in the Florida Everglades, through the longleaf pine belt and across the expansive pocosin wetlands of the Carolinas.

In the prairie pothole region, the Service and its partners, led by Ducks Unlimited

(DU), are working to secure habitat for nesting waterfowl and other migratory birds. DU established a carbon credit program armed with the latest science about carbon storage in grassland ecosystems. In the Sacramento Delta of California, partners are developing a process to “farm carbon” by restoring vegetation and rehydrating organic peat soils.

Other opportunities for sequestration projects are plentiful, but national and global markets for carbon-sequestration credits are still taking shape. Also, local economics and the capacity of natural communities to sequester carbon can influence the ability of partnerships to work for both carbon sequestration and wildlife habitat.

Over the long run, carbon sequestration seems likely to become even more prominent as a way of restoring native habitats that benefit priority fish and wildlife populations. With this and other innovative tools, the Service and its partners will strive to enhance and connect critical wildlife corridors and blocks of habitat as we face accelerating climate change, the most compelling conservation challenge of our generation. ♦

Bob Ford, a senior scientist in the Southeast Region, focuses on climate change issues. Pete Jerome is a refuge supervisor in the region.

Not So Strategic Habitat Conservation

A True Story

by David Viker

Ten years ago, during my first week as manager of Hillside, Morgan Brake and Matthews Brake National Wildlife Refuge in rural Mississippi, I was out kicking some dirt with the project leader when we began discussing plans for the coming year. I clearly remember him saying, “I like diversity. I like to manage for diversity. When I look across the landscape, I like to see diversity.”

Now, at that time my “landscape” was only what my eyes could see from the top of that levee ... not what was needed on a larger, more important scale to meet the needs of wildlife that flew, lumbered, and swam beyond the reach of my eyes.

So, my enthusiastic staff and I set out to create diversity as it had never been seen before. We planted trees in some places and created moist soil units in others. We allowed scrub-shrub to grow in areas while keeping open water in other spots. With each passing month, we continued to diversify.

Indeed, we attracted lots of wildlife through our “diversified” efforts, but in reality it was just more of the same species. Back then we did not realize how our efforts could contribute to a much larger landscape. We certainly helped keep common birds common, and we produced more deer, squirrel, and turkey than I’d ever thought we would.

Create Movement Corridors

However, we did little to meet the needs of priority forest interior nesting birds, which require larger wooded blocks; we did not take advantage of opportunities to create movement corridors for black bear; and, heck, we didn’t even increase crop and moist soil production in the most beneficial places for ducks!

And I’m now embarrassed to admit we were less than an hour’s drive from the Lower Mississippi Valley Joint

Venture office, where folks working on conservation design – a term probably not invented back then – could have shown us the latest GIS tools to help us better understand how we fit into the larger landscape. Looking back, I wish those folks would have come to the refuge, kicked the dirt with us, and let us know how they could help. Shame on me for not seeking out those who might have helped me answer the most basic management questions of “why” and “where”. Instead, I was too focused on “what” and “how”.

If I had thought about the right conservation in the right places, I would not have planted a single tree at Matthews Brake Refuge unless the area could be flooded each winter for ducks. I would have continued to manage the many moist soil units at Morgan Brake Refuge, but with more of an eye

towards meeting the needs of migratory shorebirds. And at Hillside Refuge, I would have planted every tree I could and worked with partners to build and connect corridors for forest interior nesting birds and black bear.

I can honestly say this was one of the most enjoyable jobs I’ve had with the U.S. Fish and Wildlife Service, and we did lots of good things. But we didn’t do the best things.

Although I wish I could get those two years back, there is a Chinese proverb that says, “The best time to plant a tree was 20 years ago. The second best time is now.” ♦

David Viker is the chief of Migratory Bird for the Southeast Region of the U.S. Fish and Wildlife Service.



Plenty of habitat for deer, not so much for black bears. (USFWS)

Putting Food on Alaskan Tables

by Andy Aderman

There was good news galore recently in Goodnews Bay and Platinum, neighboring villages on the shore of the Bering Sea in southwest Alaska, an isolated area where the average annual household income is less than \$7,000. Community hunters marked the end of a hunting moratorium by harvesting 13 bull moose whose meat had a grocery store equivalent value of more than \$50,000.

It was a major event for the villages whose residents, like those of many other small Alaska communities, live a subsistence lifestyle; the bulk of their diet is composed of foods obtained through hunting caribou, seals and waterfowl; fishing; and gathering.

The moose harvest reflected not only the skills of the hunters, but also the long-term support of biologists at Togiak National Wildlife Refuge and a highly effective management strategy designed to establish a population of moose near the villages. The plan was devised by the villages, working in concert with Togiak Refuge and the Alaska Department of Fish and Game.



Careful planning – and patience – led to the establishment of a thriving population of moose. (USFWS)

When work on the plan got underway, there were virtually no moose in the vicinity of these villages, in part because of habitat conditions. In any event, whenever a stray moose was encountered, it was often promptly harvested, effectively preventing the establishment of a permanent population. Altogether, six moose were harvested from the Goodnews drainage during the period 1983-2004.

Trying a Moratorium

Togiak Refuge and the state agency encouraged the village councils to implement a moratorium on harvesting moose until the population reached sustainable levels. It wasn't an easy process. Asking Yup'ik Eskimo to hold their fire when a moose is in their sights runs counter to long-held cultural values, which stipulate that it is wrong not to harvest an animal that has given itself to a hunter.

But we could point to examples of hunting moratoriums that had been effective. In the adjacent Togiak River drainage, the moose hunting season was closed in 1981 after an aerial survey found only three moose. The closure lasted 17 years until a viable moose population became established. On the lower Yukon River, affected villages supported a five-year moratorium on moose hunting that began in 1988.

During ensuing meetings in Goodnews Bay and Platinum, discussions were held in the local dialect as the pros and cons of the

management strategy were considered. Ultimately, with support from the elders, the villages agreed to the moratorium in 2004.

The villages honored the agreement. They also participated in our monitoring program. At least once a year, residents selected by the villages' councils helped refuge biologists conduct aerial moose population surveys that typically ranged over 1,700 square miles.

Everyone had agreed that a total of 100 moose (we didn't specify numbers of bulls or cows) had to exist, or five years had to have elapsed, before the moratorium would be lifted. The numbers were drawn from our long-term research on moose productivity in the adjacent Togiak River drainage; knowledge of appropriate harvest levels (~10%) to allow the moose population to continue to grow while at the same time providing for a meaningful harvest; and, knowledge of the difficulty in reaching areas to be opened for hunting.

Three years after the moratorium was instituted, signals from radio collars the biologists had attached to captured moose indicated that the moose population was expanding westward, toward the villages. The 2008 count of moose within traveling range of hunters reached about 115. Both state and federal regulatory boards then established hunting seasons for fall 2008, ending the moratorium one year ahead of schedule.

Convincing hunters of the need to protect cow moose remains the most important – and difficult – part of Alaska's effort to expand the moose population. However, we suspect that fresh moose meat for so many families will go a long way toward promoting the proper management of the moose and other wildlife resources. ♦

Andy Aderman is a wildlife biologist at Alaska's Togiak Refuge.

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decline among grassland birds during the past 40 years and a 30 percent decline of birds of aridlands.

“Although some coastal birds are increasing, shorebirds that rely on coastal habitats for breeding and refueling on migration are besieged by human disturbance and dwindling food supplies,” the report states. “Sea-level rise caused by accelerating climate change will inundate shoreline habitats. Half of all coastally migrating shorebirds have declined; for example, red knots have declined by an alarming 82 percent.”

Studies conducted by the Service and the U.S. Geological Survey (USGS), including the annual Breeding Bird Survey, combined with data gathered through volunteer citizen science program such as the National Audubon Society's Christmas Bird Count, show once abundant birds such as the northern bobwhite and marbled murrelet are declining significantly.

However, the new report also includes convincing evidence that birds can respond quickly and positively to conservation action. The data show



Although some species of birds are rebounding, nearly a third of America's bird species – the northern bobwhite among them – are at risk, according to new report. (USFWS)

dramatic increases of many birds, among them pelicans, herons, egrets, osprey and ducks, a testament to cooperative conservation partnerships that have protect and enhance more than 30 million acres of wetlands.

“These results emphasize that investment in wetlands conservation

has paid huge dividends,” said Kenneth Rosenberg, director of Conservation Science at the Cornell Lab of Ornithology. “Now we need to invest similarly in other neglected habitats where birds are undergoing the steepest declines.”

The report is part of the U.S. North American Bird Conservation Initiative, whose partners include the American

Bird Conservancy, the Association of Fish and Wildlife Agencies, the Cornell Lab of Ornithology, the Klamath Bird Observatory, the National Audubon Society, USGS and the Service. The report is available at <http://www.stateofthebirds.org>. ♦

Tracking Change on Wildlife Refuges – continued from pg 11

characterizes biological diversity over the entire refuge.

Fulfilling the Promise, recognizing the need for collecting more baseline data and for coordinated monitoring, included two important recommendations. One was to develop baseline and trends data for refuge resources; the other was to create database systems to store and analyze inventory and monitoring data. In response to these recommendations, the Refuge System's leadership chartered a team to develop a list of baseline data that all refuges should collect. The Baseline Inventory Recommendations Report is available at: <https://intranet.fws.gov/region9/refuges/biologywebsite/>

Another team developed a centralized database that all refuges can use to store information; yet another team established a distributed geodatabase that allows refuges to track and map refuge data. Both databases are now available. More information is available at: <https://intranet.fws.gov/region9/refuges/rlgis/>

In 2005, the Northeast and Midwest Regions formed the Biological Monitoring Team to address biological monitoring and adaptive management projects. Visit their Web site to learn more: https://intranet.fws.gov/Region3/ScienceExcellenceandLandscapeConservation/bio_monitoring.html.

With the information gathered in these on-going efforts, we can work together across the Refuge System and with our many conservation partners to track our changing climate, understand impacts on wildlife and wild places and more effectively manage our conservation landscape. ♦

Kathy Granillo is the Southwest Region's refuge biologist and acting regional climate change coordinator.



RefugeUpdate

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A Look Back ... Averill Thayer



Averill Thayer (USFWS)

As a boy growing up in Idaho, Ave Thayer loved wild places. He came to Alaska out of curiosity as a young man and spent an entire career there.

At the University of Idaho, he studied electrical engineering, forestry, wildlife management and biology – but he never got around to taking enough English courses to graduate.

Working later for the Alaska Game Commission when it was still part of the U.S. Fish and Wildlife Service, he had to write reports. “I could see being the subject of a lot of ridicule for turning in a badly done report...so I put in a lot of extra photos. Those reports made a hit... they weren’t as dried and scientific as they should have been.” Thayer believes that those reports – and the fact that he took the Wilderness Act very seriously – were key to his appointment as the first manager of Arctic National Wildlife

“There has never been, in the history of the world, any kid who was not drawn to wild areas... Some people lose that when they become adults.”

Ave Thayer

Refuge in 1969, a position he held until his retirement in 1982.

Thayer believed it was not radical or unrealistic to expect that at least some of the undefiled country still remaining in Alaska should be preserved. His management of the Arctic Refuge set a tone that tone was especially appreciated by Roger Kaye, a fellow pilot and friend who wrote *Last Great Wilderness: The Campaign to Establish the Arctic National Wildlife Refuge*.

“Visionaries in the regional office knew that Ave Thayer was a game agent who had a world view. He had a quiet demeanor of humility and respect,” says Kaye. “Ave began a management approach appropriate to the idealistic purposes of the refuge, especially the concept of ecological integrity.”

“Refuge management should put protection first – leave the land alone,” says Thayer. When a Congressional

staffer once suggested that a gas pipeline would be just a thin line across the refuge, Thayer said that would be just like a “thin razor cut across the Mona Lisa.”

As refuge manager, Thayer turned down requests for an air strip, shelter cabins and a research station, considering them all artificial attractions that create overuse. He did write an article encouraging canoeing on the Sheenjek River because he expected such visitors to become supporters of the refuge.

As recently as 2005, he wrote to Congress explaining that the Arctic Refuge “draws polar bears to come ashore and dig their maternal dens in snow. It draws thousands of caribou, trudging hundreds of miles north to give birth and nurture their calves in the undisturbed refuge. So I urge you to protect this little corner of our nation.” Now 83 and living in Fairbanks, he plans another trip this summer to the refuge and he also intends to continue being vocal in its defense. ♦

Send Us Your Comments

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