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RefugeUpdate

National Wildlife Refuge System

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INSIDE: Wind-blown native plants on the Lanphere Dunes at Humboldt Bay National Wildlife Refuge in California. Managing the dunes, in light of the constant disturbance they experience, is a time-consuming but fascinating job. See Focus section. (Andrea Pickart/USFWS)

San Luis Refuge Visitor Center Meets LEED Platinum Standards

By Madeline Yancey

The headquarters/visitor center at San Luis National Wildlife Refuge Complex in central California is the first U.S. Fish and Wildlife Service facility to earn the U.S. Green Building Council's highest rating.

The 16,500-square-foot center is certified as LEED platinum. LEED stands for Leadership in Energy and Environmental Design.

The center, which opened in 2011, was funded by the American Recovery and Reinvestment Act. It was designed by Catalyst Architecture of Prescott, AZ, and built by West Coast Contractors of Reno, NV, with Service input and assistance. To earn the platinum label, the center met standards for energy conservation, renewable energy production, water efficiency, use of recycled materials in construction, and indoor environmental quality and control.

Because elements incorporated into the visitor center are widely available, it serves as an example to builders and homeowners who want to construct environmentally friendly houses, neighborhoods and communities.

Two photovoltaic solar panel arrays provide more than half of the center's electrical needs. Many other elements minimize energy use. Tall windows and clerestory

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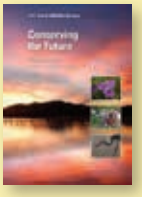
"A Nature Guide Is an Interpreter" Of Many Disciplines



"Interpretation is an art, which combines with many arts," said Freeman Tilden, author of *Interpreting Our Heritage* and a father of interpretation.

That philosophy is the essence of the draft Strategic Plan for Interpretation, which has one overriding goal: to strengthen, formalize and institutionalize interpretation within the Refuge System.

The draft plan, having gone through a six-week public review process, is now back in the hands of the *Conserving the Future* Interpretation and Environmental Education implementation team. The plan is expected to be finalized later this year.

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From the Director

Balancing Endangered Species and Development

Almost 17 years ago, the U.S. Fish and Wildlife Service, Travis County in Texas, the city of Austin, numerous conservation partners, private landowners *and* developers worked together in the spirit of shared sacrifice to reach a compromise that protects endangered species and balances development in one of the fastest-growing areas of the United States.

Dan Ashe

The result was the Balcones Canyonlands Conservation Plan (BCCP), among the first regional multi-species federally protected habitat conservation plans we ever issued.

The BCCP allows development, even when that development results in incidental "take" of an endangered species. In return, the developers agreed to set aside 30,428 acres of endangered species habitat in western Travis County, the Balcones Canyonlands Preserve.

It has not been easy or simple—few things worth doing are.

The result is a preserve for the conservation of eight endangered species, including the black-capped vireo and golden-cheeked warbler, as well as 27 other species believed to be at risk.

The black-capped vireo and golden-cheeked warbler certainly benefit from the preserve the BCCP established. Balcones Canyonlands National Wildlife Refuge, which was established in 1992 to protect nesting habitat of the warbler and vireo, also benefits.

The land managers of the preserve and the refuge meet regularly to discuss how to best manage for these species. They also discuss such common management

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Chief's Corner

Giving Nature a Hand

Mother Nature is pretty good at taking care of herself.

Ecosystems are full of forces that provide for renewal. Some occur annually, like flooding in bottomland hardwoods. Others are periodic, like fire in longleaf pine forests. There are infrequent, catastrophic events—major hurricanes, stand-replacing wildfires, tornadoes and derechoes—that reset the clock on natural succession of the landscape.

Jim Kurth

As our population continues to grow and more wildlife habitat is converted to human uses, the fragmented landscape often prevents the ecosystem from functioning naturally. These fragmented lands, which include most of our national wildlife refuges, require management that mimics the ways natural landscapes function.

Over the years, we have developed a wide variety of management practices to ensure that refuge lands provide healthy and vibrant habitat.

We have studied the ways that natural disturbances—like the ones described in the Focus section of this issue of *Refuge Update*—help shape ecosystems. We have continued to learn and adapt our land and water management practices to accommodate such disturbances. No one manages land for wildlife better than

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Refuge Update

Sally Jewell
Secretary
Department of the Interior

Dan Ashe
Director
U.S. Fish and Wildlife Service

Jim Kurth
Chief
National Wildlife Refuge System

Martha Nudel
Editor in Chief

Bill O'Brian
Managing Editor

Address editorial inquiries to:
Refuge Update
USFWS-NWRS
4401 North Fairfax Dr., Room 634C
Arlington, VA
22203-1610
Phone: 703-358-1858
Fax: 703-358-2517
E-mail:
RefugeUpdate@fws.gov

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Inside

The Art of Questioning at Ozark Plateau Refuge

By Anna Harris

Asking good questions is an art. Shea Hammond, wildlife specialist at Ozark Plateau National Wildlife Refuge, is well on his way to becoming a master. The refuge is closed to the public, yet it is so connected to community that its education center was donated by a local admirer and an abutting landowner is seeking to establish a conservation easement.

The refuge sits atop karst topography in the heart of the Ozark Mountains. Commonly referred to as "the Bat Refuge," it is known for protection of the Ozark big-eared bat, the Indiana bat, the gray bat and other species found in its numerous caves. Researchers and citizen scientists come for a chance to study bats; students and tribes come to learn about caves; Scouts and other wilderness explorers come to test their survival skills in the remote eastern Oklahoma location; and, perhaps most impressive, individuals come to participate in workshops designed to connect them to the natural world.

That's what puts this refuge on the map. When Hammond describes the partnership he has developed with the Ozark Tracker Society to provide Deep Nature Connection workshops, as he did at a National Conservation Training Center class last year, he gets to the heart of a major part of *Conserving the Future: Wildlife Refuges and the Next Generation.* He's a passionate U.S. Fish and Wildlife Service employee on a one-man refuge who brings together people of all backgrounds, abilities, ages and ethnicities, and he encourages them to immerse themselves in nature.

The society and the refuge have hosted half-a-dozen Deep Nature Connection workshops. The workshops are funded by a grant from the Environmental Protection Agency. They feature facilitators skilled in the art of questioning, a strategy designed to enhance participants' knowledge, comfort and abilities in the outdoors, and to test the edges of their curiosity.

Ozark Plateau National Wildlife Refuge wildlife specialist Shea Hammond works with a young attendee at a recent Deep Nature Connection workshop the refuge developed with the help of the Ozark Tracker Society. (Alex Kent/alexkentphoto.smugmug.com)

I attended one of the weekend-long workshops in January. It focused on Bird Language, a program pioneered by environmental educator Jon Young. Bird Language seeks to teach participants not about bird identification but about a larger awareness of the interactions between people and birds in their natural surroundings. Through a process of slowing down, focusing on the present moment and asking questions, participants begin to relate in new ways to birds, the outdoors and one another.

The Deep Nature Connection workshops often take place at the refuge. But because of weather and other considerations, 60 of us met at Lake Fort Smith State Park in Arkansas about two hours away. Veterans, teachers, hunters, developers, people with disabilities and families welcomed one another. Included in this diverse mix were nine interpreters from other Arkansas state parks. Already comfortable guiding people outdoors, they came to learn new questioning techniques.

The log cabin accommodations added to the ambience. Inside, stone fireplaces became gathering spots for eating and sharing stories. Outside, Lake Fort Smith brought sounds of geese, ducks and kingfishers. Around dusk, raptors, songbirds and an occasional deer would reveal themselves.

It was gratifying to watch how facilitators gently guided participants to experience deeper connections with the surrounding wildlife and with each other. I came away convinced that what's going on in the Ozarks can serve as a model for the entire National Wildlife Refuge System.

Outreach to the community obviously takes many forms. Million-dollar visitor centers are wonderful assets. However, there are many other ways to make a lasting impression. By asking the community what it wants and responding, Hammond is developing the next generation of conservation stewards. This is part of what *Conserving the Future* is asking us all to do.

The Refuge System is often described as the front porch of the Service. Shea Hammond has pulled up a chair and is listening.

Anna Harris is the Refuge System's Conserving the Future *coordinator.*

Conservation Lessons in Vermont's Northwoods

By Maria Young

Hard at work with loppers, bow saw and a swing blade, an eighth-grader from Stratford, NH, paused to share the complexities of conservation work as he had begun to see them.

"Last spring, we were planting trees," he said. "Now, we are cutting trees down."

So it was that—through the Nulhegan Watershed Conservation and Education Initiative—more than 50 seventh- and eighth-grade students living near Silvio O. Conte National Fish and Wildlife Refuge's Nulhegan Basin Division in northern Vermont experienced firsthand the vagaries of conservation management.

Nulhegan Watershed Conservation and Education Initiative students help Trout Unlimited staff members survey fish species that are present in Vermont's Black Branch, a tributary of the Nulhegan River within Silvio O. Conte National Fish and Wildlife Refuge. (NorthWoods Stewardship Center)

The recently completed two-year initiative was funded by a National Fish and Wildlife Foundation Nature of Learning Program grant and led by the NorthWoods Stewardship Center. Via the initiative, the students used the watershed refuge as their classroom, first to study how climate change and increased water temperature affect Atlantic salmon native to the Nulhegan Basin. Then, they focused on the American woodcock.

They started each phase by asking: What is the goal of conservation?

In spring 2011, the students asked that question as they looked down a steep eroded bank along a wide sweep of the Connecticut River. There, the answer was clear. Years of agricultural grazing had led to destabilization of the riverbank as the soil and its vegetative cover eroded. Nearby farmland and a highway made that particular area a conduit for runoff into the river. Sediment and agricultural inputs of nitrogen and phosphorous degraded water quality, to the detriment of native cold-water fish species.

The answer that day was to *plant* trees—white pine and white ash saplings. Though slow growing, those trees are well-suited to the sandy environment and have a substantial root system that provides stability. The conservation goal was clear: improve water quality by stabilizing the riverbank and enhance fish habitat by providing a future source of shade and woody debris.

In fall 2012, the same students found themselves in the Nulhegan Basin Division's 134-acre Woodcock Management Demonstration Unit 1. To understand the conservation goal there, they learned that American woodcock need areas of habitat for courtship, nesting, foraging and roosting—all within a half-mile.

With guidance from Silvio O. Conte Refuge wildlife biologist Rachel Cliche, the students helped create singing grounds—open areas near dense cover where the male woodcock can perform his dawn and dusk courtship flight and singing ritual. To return the site to open singing ground, the students had to *cut down* trees.

"One of my principal goals has been for the refuge and our staff to serve as a resource for the larger community, which can be a challenge given our low population density," says Nulhegan Basin Division refuge manager Mark Maghini. "The initiative has been successful in meeting that goal in that it helps the local schools achieve their science curriculum needs while getting kids engaged in actual refuge fieldwork."

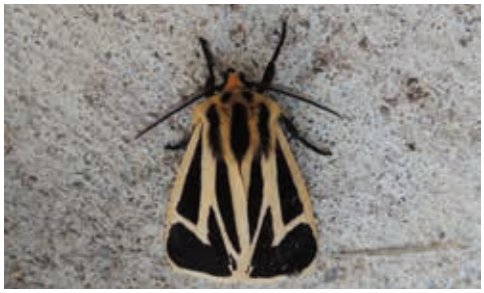
How much effort was involved on the refuge's part?

"For the value achieved, I'm almost embarrassed to say, very little," says Maghini. "But, in some ways, that's how the Conte Refuge operates—we depend on our partners a great deal. We offer them support in efforts that meet their mission, and in turn their work benefits the refuge's overall goals."

One of those goals, as the Refuge System's *Conserving the Future* makes clear, is to foster the next generation of land stewards. Through the Nulhegan Watershed Conservation and Education Initiative these students learned that, to address the habitat requirements of wildlife and encourage species' survival, sometimes we in conservation must plant trees and sometimes we must cut trees down.

Maria Young is education and outreach director at the NorthWoods Stewardship Center in East Charleston, VT.





These three moths are among the 190-plus species to be documented at Trinity National Wildlife Refuge in Texas. They are, from left, Chlorochlamys chloroleucaria, Idaea tacturata *and* Apantesis vittata. *(Stuart Marcus/USFWS)*

The Moths of Two Southern Refuges

By Stuart Marcus and Denise McInturff

Trinity River National Wildlife Refuge in Texas is known for its bottomland hardwood forest, reptiles, amphibians and waterfowl.

Bon Secour National Wildlife Refuge in Alabama is known for a sugar-white sand beach, nesting sea turtles, migratory birds and the dune-dwelling endangered Alabama beach mouse.

Lately, though, both of these refuges have become known as meccas of moths. The moth might be one of nature's underappreciated species—at least compared with its more celebrated cousin the butterfly. But these two refuges, in their own way, have discovered the moth's beauty and abundance.

At Trinity River Refuge, an hour northeast of Houston, staff and an avid moth enthusiast have documented more than 190 species in 26 families since April 2012.

This has been done without benefit of a formal moth survey. Instead, most of the moths have been found near the refuge's new headquarters building. The facility is on one of the few high places within in the frequently flooded bottomland hardwood forest habitat. The moths have been documented with a DSC-H2 digital camera.

If information on the major Web sites dedicated to moths (Butterflies and Moths of North America, BugGuide and Moth Photographers Group) is correct, this documentation has earned a new distinction for Trinity River Refuge's home county. Liberty County now ranks No. 1 in Texas in terms of number of moth species publicly recorded.

At Bon Secour Refuge, on the Gulf Coast, Richard L. Brown, the director of the Mississippi Entomological Museum, has collected five previously undescribed and unnamed species of moth on the refuge.

Brown has been conducting research at Bon Secour Refuge since 1989.

In several peer-reviewed journal articles over the past six years, the five new species he collected there have been named: *Sinoe kwakae; Schinia psamathea; Sparganothis tessellata, Sparganothis azulispecca* and *Cenopis unicolorana*.

"I like the diversity of colors and forms among moths along with their wide range of habits and behaviors in the caterpillar stages as well as adult," says Brown. "Moths are cool because they have a natural velcro to lock their wings to their body—and this came about before humans ever thought about going to the moon."

The photos on this page, we hope you will agree, show just how intricate and beautiful the moth can be.

Stuart Marcus is refuge manager at Trinity River National Wildlife Refuge in Texas. Denise McInturff is park ranger at Bon Secour National Wildlife Refuge in Alabama.

These moths collected by entomologist Richard Brown at Bon Secour National Wildlife Refuge in Alabama have been described as new species. They are Sparganothis tessellata, *left, and* Sparganothis azulispecca. *(Mississippi Entomological Museum)*

Refuges Dominate Service Science Awards

Refuges were front and center in the three Service 2012 Science Awards. Baron Horiuchi, the Service's only horticulturalist, received the individual Rachel Carson Award for Scientific Excellence for efforts to restore rare native plants at Hakalau Forest National Wildlife Refuge in Hawaii. The staff at Maine Coastal Islands National Wildlife Refuge received the group Rachel Carson Award for Scientific Excellence. Linda Welch, Sara Williams, Michael Langlois, Beth Goettel, James Fortier, Brian Benedict and Teressa Cultrera were honored for landscape-scale, collaborative science in managing the needs of migratory birds, especially in the face of proposed offshore wind energy development. Grant Harris, Southwest Region biological services chief, received the Science Leadership Award, in part for work with the Refuge System Inventory and Monitoring program.

A Caribou "First" at Alaska's Kanuti Refuge

By Chris Harwood

"Will I see caribou on Kanuti Refuge?"

This was one of the many questions my young British volunteer, Dylan Smith, asked me that first day we arrived at the Kanuti National Wildlife Refuge's field cabin during breakup in early May 2012. I had to tell Smith it was "very unlikely" because, in my previous four springs working there, we had only seen one caribou.

That was okay, given that our focus was to study the breeding ecology of the whimbrel, a large migratory shorebird. And, after all, caribou are primarily an animal of the tundra. Kanuti Refuge is primarily boreal forest and wetlands.

Caribou are primarily animals of the tundra. Kanuti Refuge is primarily boreal forest and wetlands. But occasionally caribou wander onto the refuge, where calving was documented last spring. (Dylan Smith/USFWS)

Still, most winters we occasionally see a few caribou wander onto the refuge from the small Ray Mountains Herd to the south, and once or twice a decade we see larger groups from the Western Arctic Herd wintering at the refuge. Indeed, in the winter of 2011-2012, at least 2,000 caribou arrived from the north in late fall, foraged on lichens in the old-growth black spruce woodlands and departed in early spring.

Little did I know that Smith had a bit of the "luck of the British" in him.

Only four days into our two-month stint and just one mile from our cabin, we saw three caribou, including one with antlers. During May, almost all caribou that still have antlers are pregnant females. A photograph of this group suggested that all three were females. One week later we saw two groups of two caribou each with antlers—likely all pregnant females. Then, for a week beginning in late May, we observed a female with a tiny calf beside her near our bird study area.

This was the first time refuge personnel had documented calving by caribou at the refuge. After our sighting, we interviewed caribou biologists, local hunting guides and Alaska Native hunters about caribou calving at the refuge. None had ever observed it, although some suspected it has occurred occasionally before. Sometimes, documenting such phenomena is merely being at the right place at the right time—especially in a place the size of Kanuti Refuge.

At 1.6 million acres, the refuge is about as big as Delaware. It sits atop the Arctic Circle, with approximately a third of the refuge above that parallel and two-thirds below. Protecting breeding habitat for migratory birds is central to its mission. Nearly 130 species of birds spend part or all of the year on refuge lands. Still, the refuge's boreal forest is home to 37 species of mammals.

Before our stint was complete, Smith saw all of the other big mammals that reside on the refuge: moose, black and brown bears, lynx, river otter and even a curious wolf that approached within 20 yards. Observing these animals for the first time seemed pretty special to him.

While seeing these elusive and rare mammals is always a thrill for me, too, this stuffy old avian biologist was most excited about spotting my first Kanuti Refuge newborn caribou.

Chris Harwood is an avian wildlife biologist at Kanuti National Wildlife Refuge in Alaska.

As part of the Walking Wetlands program, commercial farmers at Tule Lake National Wildlife Refuge in northeastern California regularly flood fields and leave part of their crop as winter forage for wildlife. (Bill O'Brian/USFWS)

Walking Wetlands Enrich Habitat and Farmland

By Bill O'Brian

Everybody's heard of crop rotation. It's fundamental to farming. Wetland rotation is lesser known. But at Klamath Basin National Wildlife Refuge Complex it's fundamental to conservation and waterfowl-habitat building.

Tule Lake Refuge in California and nearby Lower Klamath Refuge on the California/Oregon border are the only national wildlife refuges on which commercial agriculture is mandated. The Kuchel Act of 1964 requires the refuges to be "dedicated to wildlife conservation and for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith."

So, the refuges host two farming programs: a rare land-lease operation and a more common cooperative venture.

The key to making both programs conservation friendly is a habitat-building tool the refuge complex developed called Walking Wetlands, or wetland rotation. It is implemented differently for each program.

Land-Lease Farming

Under the land-lease program, administered by the Bureau of Reclamation, 17,000 acres at Tule Lake Refuge and 5,000 acres at Lower Klamath Refuge are commercially farmed. Private farmers grow potatoes, wheat, barley, alfalfa and onions, but no more than 25 percent of the lease lands can be in row crop at once.

Walking Wetlands gives these farmers incentives to flood their acreage on a rotating basis and/or to convert it to organic land. For instance, a lessee who floods acreage in the fall and over the winter receives a two-year extension on the lease at the original five-year lease rate. A lessee who floods acreage in the summer receives a three-year extension at the original rate. A lessee whose land goes organic receives another three-year, rate-hike-free extension.

"We've worked hard at not trying to mandate a thing. It's all incentives and choices" for the farmers, says Klamath Basin Refuge Complex project leader Ron Cole. "The incentives have been successful in reducing the application of chemicals on the refuge—following goals set forth by Interior policy and the Secretary." So far, about 20 percent of the land-lease acreage is organic.

For the refuges, the beauty of Walking Wetlands' rotational flooding of farmland is that it provides ever-rejuvenated wetland habitat.

For the farmers, the beauty is that flooding a field for a year or two vastly improves soil nutrients, suppresses pests and eliminates the need for fumigants and fertilizers. All of this saves the farmer money, minimizes chemicals on the refuge, increases crop yield by about 25 percent and increases the value of the leases, which bring revenue to the refuges.

"If you don't take care of the soil, the soil doesn't take care of you," says Bill Walker, the CEO of Walker Brothers Farm, which grows 3,000 acres of potatoes on Tule Lake Refuge. "Walking Wetlands goes hand in toe with that."

His daughter, Tricia Walker Hill, is general counsel of Walker Brothers, whose clients include Frito-Lay and In-N-Out Burger. The Walking Wetland concept is "good for our finances and good for the community," she says. "You love what you know, and you'll save what you love. Klamath Basin farmers love this place, and part of this place is wildlife."

Walking Wetlands "proves itself in this soil," says U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program biologist Loren Ruport. "It wouldn't work everywhere, but generally it would work

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Conserving the Future **Focus** . . . **Managing for Disturbance**

A Big Challenge: "Overcoming Uncertainty"

By Bill O'Brian

The National Wildlife Federation defines natural disturbance as "any event that causes a disruption to the current state of an ecosystem. Disturbances can be localized—only impacting a small patch of land—or they can affect an entire forest or wetland. The results of a disturbance can be short-lived or long-term. Sometimes it takes a few months for an ecosystem to bounce back, and other times it can take decades."

The federation delineates several types of natural disturbance: fire, flood, wind, disease, severe storms, insect swarms, volcanic activity, drought, long-term freezing and earthquake.

This *Refuge Update* looks at some of those disturbances and how U.S. Fish and Wildlife Service employees manage for them at national wildlife refuges.

John Schmerfeld, the Refuge System's climate change coordinator, knows about disturbance.

"One of our biggest challenges is overcoming uncertainty about extreme events, random natural events. We don't have the ability to predict floods or fires or droughts or hurricanes with any great certainty. But we can plan for them generically," he says, "by incorporating extreme-event adaptation measures into planning."

Specifically, Schmerfeld would like to see the Refuge System factor disturbance resiliency into decisions about:

- placement of facilities—"so we're not building in a floodplain, for instance," or on shifting barrier island sands.
- placement of wetlands, impoundments, canals and other water control structures that can be vulnerable to disturbance.
- land acquisition. "Are we going to purchase lands that the models show are going to be underwater in 10 or 15 years?" he asks. "Or should we think critically about buying a little bit farther in, a bit higher?"
- placement and design of roads regarding interaction with water. Can culverts be included to allow water (and wildlife) passage? Can roads be built for the 500-year flood instead of the 100-year flood?

The Honey Prairie Fire at Okefenokee National Wildlife Refuge in Georgia burned for almost a year in 2011-12 before it was declared out. (Howard McCullough/USFWS)

"We don't really have the luxury not to think critically about this," Schmerfeld says.

He cites two important sources of information that can help: the Refuge System Inventory and Monitoring program and the Department of Defense Strategic Environmental Research and Development Program (SERDP).

The I&M program, which was established three years ago and is based in Fort Collins, CO, is gathering data about disturbance trends.

SERDP, a well-funded program, might point the way for the Refuge System. SERDP is modeling extreme disturbance events and incorporating those models into long-term planning at military bases, especially coastal installations. "What I'd like to do is try to piggyback on that science," Schmerfeld says.

This *Refuge Update* focuses on natural—and not human—disturbance, but Schmerfeld says "it's difficult to decouple" the two.

"When we think about landscape-scale planning," he says, "one of the prime drivers is human development and land-use change. Those are significant drivers that you have a difficult time decoupling from natural disturbance. Those things become additive and synergistic in mostly bad ways."

Schmerfeld points out a sometimes-overlooked aspect of disturbance. "All of these events—flooding, hurricanes—make our job managing invasive species more difficult. When disturbance comes and upsets an ecosystem that is intact, oftentimes it creates opportunities for invasives to gain footholds."

And, he says, "climate change exacerbates pretty much every stressor we have on the [Refuge] System," including natural disturbances.

Regardless of the disturbance(s) in question, Schmerfeld suggests proactive planning is the key: "I'm hopeful that managers feel like they have the leverage and the support to make innovative decisions that are based on the best science we have, the best data we have at hand."

At Forsythe Refuge, Lessons From Sandy

By Donald Freiday

Hurricane Sandy, the largest Atlantic tropical system on record, seemed to have Edwin B. Forsythe National Wildlife Refuge in its sights when it made landfall in New Jersey on Oct. 29, 2012. Sandy brought winds up to 90 mph and pushed a massive surge onto beaches and shorelines. The hurricane's eye went directly over Forsythe's Wildlife Drive.

Even before the storm, U.S. Fish and Wildlife Service staff prepared for the impact. The refuge was closed to visitation, and personnel made sure everyone was safe and accounted for. The hatches were literally battened down, as maintenance staff locked the shutters on the new hurricane-proof visitor information center.

Talk about disturbance. Hurricane Sandy's eye went directly over Wildlife Drive at Edwin B. Forsythe National Wildlife Refuge in New Jersey and left this damage to the eight-mile auto tour loop. (USFWS)

Luckily, damage to refuge buildings was minimal, but on the refuge's 47,000 acres of land, mostly salt marsh, it was a different story. Immediately after the storm, assessment flights by helicopter and a thorough on-the-ground rapid assessment by a team of Service personnel revealed extensive damage and alteration to the refuge.

Forsythe's eight-mile Wildlife Drive, a birding destination for 100,000 visitors each year, was breached or washed out in several locations. Repairs have been completed, and the drive has been reopened. However, access to the refuge's Holgate unit, part of the Brigantine Wilderness Area and a popular surf-fishing destination, was destroyed and remains closed while partners restore access.

A bigger problem than the damage to areas of public access, from an ecological perspective, was debris. Sandy left a 22-mile debris field in the refuge's sensitive coastal marshes and wetlands. Salvage operations have begun to remove more than 150 boats, fuel oil tanks, chemical drums and other hazardous materials that need to be disposed of properly.

Sandy also deposited dozens of docks and piles of debris from destroyed homes on the refuge.

Refuge biologists have been monitoring habitat changes and damage caused by the storm.

"Our freshwater impoundment was inundated with [highly saline] bay water, which caused the elimination of freshwater invertebrates, which will have to recolonize from upstream sources within the watershed," says biologist Bill Crouch. "Overall, I was surprised how little the habitat seems to be negatively affected. Some marshes appear to have been 'cleaned' of trash that had washed up on them over the years. On Holgate, dunes were flattened and pushed westward, covering salt marshes in some cases. Salt marsh species will suffer, but beach nesting species may have more habitat now."

Disturbance can be beneficial. For example, the storm surge likely deposited a layer of sediment/silt on portions of the salt marsh. This kind of deposition might build up marsh levels, allowing them to keep up with sea-level rise, but that is a subject of ongoing research.

Sandy was a learning process for the refuge. We were reminded that, in vulnerable coastal areas, management plans need to take into account the destructive potential of large storms. Tour roads, beaches and impoundments can be damaged, and buildings must be constructed to resist such storms.

The storm also served as a reminder of the vital role of partners, including the Friends of Forsythe (who have been incredibly supportive), the Barnegat Bay Partnership, the Federal Highway Administration, the New Jersey Department of Environmental Protection and the U.S. Army Corps of Engineers.

"Due to the large scale of the storm, it has been important for the refuge to work with all of our partners to coordinate," says refuge manager Virginia Rettig. "That ranges from cleanup of contaminants to habitat restoration projects."

Donald Freiday is visitor services manager at Edwin B. Forsythe National Wildlife Refuge in New Jersey.

Floods: Tough for Humans, Better for Nature

By Stacy Shelton

For several weeks after a historic flood swamped the Bald Knob National Wildlife Refuge in north-central Arkansas in May 2011, refuge manager Bill Alexander and his one-man maintenance crew needed a boat to get around.

"It was just like an ocean out here," Alexander said.

Snowmelt from an above-average snowfall, coupled with torrential spring rains, resulted in massive floods across the Mississippi River Valley. Dozens of national wildlife refuges were affected, including 27 in Arkansas, Kentucky, Louisiana, Mississippi and Tennessee.

Bald Knob Refuge was inundated after the protection levee surrounding the refuge was overtopped as the White River rose over 15 feet above flood stage. The only previous flooding of this magnitude on record occurred in 1927 and 1945.

Flooding is a way of life in the Mississippi River Basin, despite levees and channels built to control the river. May 2011 was exceptional, but not unprecedented. And while floods are devastating at first, the long-term effects can be beneficial. Floods recharge wetlands, restock oxbow lakes and provide new habitat for fish and other aquatic species. Silt-laden and nutrient-rich floodwaters have historically built up soils on farmland and wetlands throughout the delta as these sediments are deposited.

Waterfowl were minimally affected, Alexander said. The refuge, established in 1993 for migrating waterfowl like northern pintails and mallards, provides a winter home for half a million birds. By the time the flood occurred, waterfowl had flown north. The flood prevented a normal planting season, but fortunately it receded by the end of June to allow for some crop and moist-soil production, which provided supplemental food resources for waterfowl that winter.

Staff at Bald Knob National Wildlife Refuge in Arkansas needed a boat to get around after May 2011 floods overwhelmed the refuge. "People have been trying to tame these rivers for years, and it just can't be done," says refuge manager Bill Alexander. (USFWS)

In the days after the flood, as Alexander traversed his refuge by boat, he found drowned deer, rabbits, armadillos, coyotes and other dead animals. Interestingly, by mid-June, fish began dying, apparently from low dissolved oxygen caused by decaying vegetation.

Floods recharge wetlands, restock oxbow lakes and provide new habitat for fish and other aquatic species.

"It took a toll, but wildlife is resilient," Alexander said. "We're at the foothills of the Ozark Mountains, and a lot of the animals were able to flee to higher ground."

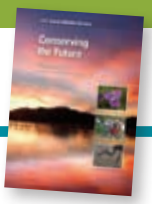
That fall, when refuge workers conducted deer counts, the numbers were significantly higher than pre-flood. Night counts ballooned from 30 to 40 deer on a good night, to as high as 87, he said. The "why" is still a mystery, but could be attributable to increased visibility as grass, weeds and reforested areas were still recovering from the recent flood. Rabbits also appear to have responded positively.

Property damage included a 1,500-square-foot house used to temporarily house interns and employees and a refurbished Federal Emergency Management Agency (FEMA) trailer that had been used as the refuge office since 1998. Luckily, the floodwater stopped within one inch of the subfloor of the new American Recovery and Reinvestment Act-funded visitor station.

Alexander estimates the loss of facilities and equipment, including pumping stations, was about $500,000. The refuge's co-op farmer suffered significant losses because of the flood. He had approximately 150,000 bushels of rice stored in the refuge granary, which was severely damaged. He was responsible for repairs to the granary, which included replacing motors, augurs and floors.

"People have been trying to tame these rivers for years, and it just can't be done," Alexander said. "It's all bad if you look at it from man's point of view, because we put dollar values on everything. From nature's point of view, a high flood every now and again is beneficial."

Stacy Shelton is a public affairs specialist in the Southeast Region office in Atlanta.



When the river is at normal flow, Marais des Cygnes National Wildlife Refuge is ideal habitat for 31 mussel species. (Tim Menard/USFWS)

When the river is at low flow, mussels can be stranded on substrate at the eastern Kansas refuge. (Patrick Martin/USFWS)

Drought Can Leave Mussels High and Dry

By Bill O'Brian

The words Kansas and drought are frequently mentioned in the same sentence. Kansas and mussels, less frequently. Kansas, drought and mussels, hardly ever. Unless you work at Marais des Cygnes National Wildlife Refuge.

"Freshwater mussels have no means to 'pick up and move to greener pastures' when times get hard," says refuge manager Patrick Martin. "They may move from one side of the pool to the other, but that's about it. If there's a drought, they have to deal with it. Fortunately, they have the adaptations and resiliency to do so in natural conditions."

The 7,300-acre refuge, which hugs the Missouri border in eastern Kansas, is on a sort of continental divide between ecosystems—eastern hardwood forest and Great Plains prairie. It is traversed by a stretch of the Marais des Cygnes River that supports 31 mussel species.

Cyclical drought is a difficult-but-expected part of life in the nation's midsection, as the past two summers attest. So, the refuge must manage for it.

That the refuge manages for drought in forest and prairie is common among refuges. That it manages for drought and mussels is less so.

In the forest, the refuge adjusts for drought in at least two important ways. First, when the refuge plants seedlings, as it did five years ago for a 776-acre hardwood carbon sequestration project in partnership with The Conservation Fund, drought-resistant species are emphasized. Second, the refuge capitalizes on drought to conduct particularly effective autumn and winter prescribed burns in mature forests.

"Just as flooding is a disturbance that is required for the long-term health of bottomland hardwood forest systems, drought is part of the long-term cycle," says Martin. "Droughts are part of what define what remains forest and what remains prairie, and part of what defines the tree species mix within the forest."

The prairie has built-in resilience to drought. "The hundreds of grass and forb species represent a wide range of tolerance for annual rainfall and air temperature," says wildlife biologist Tim Menard. "Although the species composition of the prairie may shift if a multi-decade drought were to occur, the character of the tallgrass prairie would not be lost."

Still, "drought provides excellent opportunity for growing-season prescribed fires in prairies," Menard says. "Not only does this encourage the growth of forbs the following year, but it also provides the best opportunity to control invading woody vegetation. Whereas a dormant-season burn top-kills trees and shrubs, growing-season burns show a greater percentage of root-kill."

Drought also enables the refuge to control invasive plant species treatable only when wet prairie is dry.

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New Plan Streamlines Fire Response

By Karen Miranda Gleason

How does a national wildlife refuge manage wildland fire—to, among other things, increase feeding areas for migratory birds, rejuvenate habitat for endangered plants and wildlife, reduce invasive vegetation and protect native species along river corridors?

You might expect staff members to pull a dusty fire management plan (FMP) off a shelf and wade through 300 pages to find out.

Fast forward to the Spatial Fire Management Plan (SFMP), a pilot project recently completed at six refuges and two fish hatcheries in New Mexico. The SFMP transforms that old FMP into a series of digitized maps containing data collected by refuge staff. Text and graphics surround the maps. The SFMP is half the length.

A picture really is worth a thousand words. The old FMP tries to explain in words information that is inherently spatial; the SFMP depicts the same information spatially, visually. The SFMP enhances communication among staff, rural fire departments and the public.

Humans "are a visual species," says Cameron Tongier, geographic information system (GIS) coordinator for the Refuge System Branch of Fire Management, which is spearheading the move to SFMPs. "Our goal is to produce simpler plans that are easy to use, not long documents that go largely unread."

The New Mexico SFMP, modeled on Australian fire plans, is the first of its kind in the United States. The National Park Service, the Bureau of Indian Affairs, and the Bureau of Land Management are following suit with similar plans.

What Is an SFMP?

An SFMP is primarily a series of mapsheets—layers of information identifying some habitat designated for full suppression of wildfire and other habitat that could benefit from prescribed fire. Map layers may note previously burned areas and wilderness boundaries beyond which fire plays a natural role. Facilities, roads, water sources and other data critical for fire operations are included.

Text boxes display combinations to locked gates and contact information for cooperating fire departments. Attachments include environmental assessments and other documentation.

Invasive vegetation burns at Las Vegas National Wildlife Refuge. It is one of six refuges and two fish hatcheries in New Mexico that took part in a pilot project to develop the easy-to-use Spatial Fire Management Plan. Pilot plans are also underway for wetland management districts in South Dakota and refuges in Arizona and Massachusetts. (Gerad Montoya/USFWS)

SFMPs can show historic fires and help neighbors determine risk to their property. Map references help fire managers explain proposed actions to refuge managers, biologists, volunteer firefighters and residents.

"It's easier to communicate and get buy-in, because they can see it all on a map," says Jake Nuttall, U.S. Fish and Wildlife Service fire management officer in New Mexico, who helped develop the first SFMP.

Future Benefits

Geospatial maps can incorporate data from various agencies and eventually will be integrated with existing decision-making tools. Data collected for SFMPs also will augment other planning tools, such as habitat management plans.

"Right now, only a handful of staff on refuges can conduct analysis, because it requires some knowledge of GIS," says Tongier. "Our goal is to create the capability for anyone who can use GoogleEarth to be able to go in and run queries and planning scenarios."

Shane Del Grosso, a regional fire management specialist, is working with staff in South Dakota to pilot a second SFMP. He sees potential use for spatial management plans in non-fire incidents. During the 2010 Deepwater Horizon oil spill, Del Grosso was operations section chief overseeing some migratory bird recovery.

"We had boat teams, ground teams and aviation teams covering 689 miles of coastline," he says. "Aviation would spot a wounded bird; we'd coordinate a boat to go get it … We needed to know the location of boat docks, rookeries, cell phone coverage and hazards like power lines we didn't want to fly into … If there had been a spatial management plan in place, that would have saved us a lot of time, and made it easier to communicate as we formulated strategies and tactics."

Karen Miranda Gleason is a public affairs specialist in the Refuge System Branch of Fire Management at the National Interagency Fire Center in Boise, ID.

Moving Dunes Are Healthy Dunes

By Bill O'Brian

"The constant change happening in a sand dune system is the reason I have been able to stay fascinated with my job for over 25 years," says Andrea Pickart. "One of the truly awesome things about dunes is the almost daily renewal I get to see when the wind erases all traces of past activities by humans. It's like being the first person there, over and over."

Pickart has been a U.S. Fish and Wildlife Service ecologist at Humboldt Bay National Wildlife Refuge since 1997 and a dunes manager along the northern California coast since 1986.

"It may sound odd, but one the biggest challenges is managing public use," she says. "Marking trails or boundaries in a shifting landscape is extremely difficult and time-consuming. Keeping visitors off of fragile communities and away from endangered species, when it's difficult for them to find the trail, is a huge challenge."

The refuge's Lanphere and Ma-le'l Dunes units encompass 850 acres and three miles of dunes. Disturbance is constant. And that's the way plants and animals like it.

"For example," Pickart says, "our native dune grass will lose vigor if the sand around it stops blowing, and it will be replaced by species that require stability."

Dunes are landscapes of patches, each with its own disturbance history and each supporting different plant species, Pickart says. That varied vegetation creates microhabitats for varied insects. "The richness of plants and insects supports a greater diversity of mammals, birds, amphibians and reptiles. Our management is geared to preserving this mosaic of microhabitats."

The biggest threat is invasive vegetation. European beachgrass, for example, has no natural predators, overwhelms native species and can over-stabilize the dunes. The refuge has removed invasives, Pickart says, but reestablishment is a concern.

Native plants are colonizing this recently restored foredune at the Ma-le'l Dunes of Humboldt Bay National Wildlife Refuge in California. Previously covered with dense European beachgrass, the dune now has openings allowing sand to pass into the backdunes. (Andrea Pickart/USFWS)

Disturbance is constant. And that's the way plants and animals like it.

Pickart views dune management on at least two scales.

On a large scale, the dunes are part of an intact ecosystem that attracts more than 260 species of birds and includes a stable dune forest next to an estuary supporting brackish marsh, salt marsh, eelgrass beds and mudflats.

On a smaller scale, the dunes themselves benefit an array of wildlife. For instance, wind erosion can generate ponds that provide breeding habitat for red-legged frogs, Pacific chorus frogs, newts and other amphibians. A dune blowout can create unvegetated sand that provides nesting habitat for 40-plus species of native bees. Beyond being crucial for native wildflower pollination, the bees' nests provide pockets of food for burrowing animals like striped skunks and gray foxes.

And pollination is essential to the many kinds of berries in the dune forest that help sustain migratory birds and other wildlife.

The intricate network of mammal tracks that can be found every morning on the dunes attests to the importance of the more open habitats to larger mammals that emerge from the forest to seek their prey in the scrub-like vegetation

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Drought Can Leave Mussels High and Dry — *from page 11*

Along the river, the refuge gives a helping hand to mussels, which are imperiled continent-wide. Some of the refuge's mussel beds have the greatest mussel biomass in Kansas—and the Marais des Cygnes River is in a mostly prairie watershed with many water demands.

"Fortunately," says Menard, "the Kansas Department of Wildlife, Parks and Tourism manages the 7,500 acres of watershed directly upstream and cooperates closely with the refuge regarding river management issues"—particularly water flow.

That's important because an abrupt manmade decline in flow during drought can leave mussels stranded on dry substrate. When that happens, Martin says, "staff must hike in and visually inspect as many mussel beds as possible. If a stranding occurs, it's typically not just one or two individuals—it's hundreds or thousands. Our response is a simple but time-consuming effort of moving, by hand, the mussels one by one to deeper, more permanent and thus safer water."

Drought can also threaten mussels by gradually reducing the river to a series of unconnected pools. Under those circumstances, contaminants are dangerous to mussels. For example, Martin says, "studies show that mussels are very susceptible to ammonia, with a higher intolerance in juveniles."

Oddly and mysteriously, though, there is evidence that extended dry spells and low river flow might increase reproduction in some mussel species.

So, as with prairie and forest on the edge of Great Plains, drought may have subtle benefits even for freshwater mussels.

Walking Wetlands — *from page 7*

where a historical wetland left an organic base" of fertile soil.

Cooperative Farming

The cooperative farming program is administered by the Service on 4,000 acres at Lower Klamath Refuge and 2,500 acres at Tule Lake Refuge. It is similar to crop-sharing at other refuges where a farmer must leave 25 percent of the grain on refuge land as wildlife forage. But—in a Walking Wetlands twist—this program's farmers also must flood private land elsewhere in the basin to create off-refuge wetland habitat for waterfowl.

"If you give the ground a rest and run a wetland through it, it makes sense ecologically and for wildlife. Over time, you'll see everything thrive," says Michael Noonan, who since 1997 has farmed about 14,000 acres, all organically, on the two refuges as part of Walking Wetlands. "I don't know a lot, but I know when something works."

Whether on the refuge or private land, say Cole and Noonan, Walking Wetlands mimics the flood-and-recede action that used to be natural before Klamath Basin lost 80 percent of its wetlands to human development and agriculture in the 20th century. Walking Wetlands is a win-win, they say—replenishing soil for farmers and habitat for wildlife.

"You love what you know, and you'll save what you love. Klamath Basin farmers love this place, and part of this place is wildlife," says Tricia Walker Hill, a potato farmer who participates in the Walking Wetlands program.

Moving Dunes — *from page 13*

of the semi-stable dunes, Pickart says. "Our job as managers is to be sure the natural processes that maintain disturbances at many different scales are functioning. That means removing over-stabilizing vegetation."

Dunes require three conditions to exist: a sand source, sustained winds strong enough to move a lot of sand, and topography low enough to allow the dunes to migrate. Humboldt Bay Refuge's dunes have existed for thousands of years and were re-formed by a major earthquake in 1700. Today, seismic activity might help mitigate another challenge for the dunes: climate change.

A major issue for Pickart is "trying to understand and project the way sea-level rise and extreme climatic events may interact with and/or amplify the disturbance regime."

Interestingly, Pickart says, evidence suggests that tectonic "rebound" of land may be slowing the effects of sea-level rise in parts of the dunescape.

The Power of Winter

By Bill O'Brian

Don't try to tell Nancy Pau, Gary Burke, Matt Poole or Graham Taylor that winter is not a bona fide natural disturbance.

They are, respectively, wildlife biologist, engineering equipment operator, visitor services manager and project leader at Parker River National Wildlife Refuge in Massachusetts.

They know that winter is a profound disturbance that has varied effects on wildlife, habitat, infrastructure and visitors at the barrier island refuge.

Nancy Pau, the biologist, points out winter's beneficial effects on habitat and the challenges it poses for wildlife.

Snow blankets the Atlantic Ocean beach at Parker River National Wildlife Refuge north of Boston. Winter has varied effects on wildlife, habitat, infrastructure and visitors at the barrier island refuge—some beneficial, some not. (Matt Poole/USFWS)

"Winter and its thaw are very important to the salt marsh's ability to grow in elevation over time," she says. "Much of the salt marsh is frozen over the winter, including portions of tidal creeks. As the tides ebb and flood, it pushes ice chunks onto the marsh surface. These ice chunks have sediment—mainly mud from creek bottoms—and various organic matter. This is believed to be a main way that marshes get sediments, which is very important to it being able to grow and accumulate, especially with rising sea levels."

She notes that spring snowmelt also fills vernal pools in the refuge's dunes. Those pools, which are the only source of freshwater for wildlife on the island, provide breeding habitat for amphibians and reptiles. And winter precipitation fills the refuge's three freshwater impoundments.

On the minus side, Pau says, winter means limited and lower nutritional food resources for wildlife as well as less foliage cover and thus more vulnerability to predation. And wind and wave action associated with Nor'easter storms of increasing intensity erode beaches in a way that, combined with other factors, can harm habitat.

Gary Burke, the equipment operator, knows all too well the toll winter takes on infrastructure. Freezing and thawing moisture causes frost heaves and potholes in refuge roads. Snow removal, grading of gravel and increased heavy equipment fuel and facility utility consumption make winter expensive for the refuge. Winter restricts projects such as boardwalk, trail and sign maintenance.

Plus, Burke says, his least favorite aspects of winter are "working outside in extreme cold on equipment that has broken down" and "a snowstorm on a weekend."

Matt Poole, the visitor services manager, dislikes that winter reduces the number of people who come to the refuge, but he says the season is "a time of unique beauty, particularly when the marsh and dunes are festooned with a blanket of snow."

And Poole likes that "ongoing Web-based communications about current or new bird sightings can significantly influence visitation in a positive direction. For instance, if a snowy owl is reported to have been seen on the refuge, the word spreads like wildfire."

Graham Taylor, the project leader, says the most difficult management challenges winter poses are disruptions of facilities operations, postponed partner meetings and refuge closures for dangerous conditions.

However, he says, "I think the biggest plus is that the weather itself—snow, cold temperatures, etc.—help shape the various habitats here for the wildlife seasons to come: migration and breeding. Heavy snows can provide the freshwater needed for our inter-dunal swales and seasonal wetlands for the Eastern spadefoot toad [which hibernates on the refuge in winter] as well as our managed impoundments. The winter storms can also improve nesting habitat for beach nesting birds, such as the piping plover and least tern. Winter also keeps all but the hardiest visitors away, which helps reduces disturbance to wildlife at one of the most stressful times of their year."

There's one thing Taylor really doesn't like, though: "A late-season snow, especially after mid-March, when spring is starting to show signs of arriving."

Around the Refuge System

California

The San Francisco Bay/Estuary, which includes four national wildlife refuges, has been named the United States' 35th Wetland of International Importance under the Ramsar Convention.
There are more than 2,000 such sites worldwide. The Ramsar Convention is an international treaty signed in Iran in 1971 to encourage voluntary protection of wetlands. The San Francisco Bay is the largest estuary on the Pacific Coast. It accounts for 77 percent of California's remaining perennial estuarine wetlands. The bay/estuary Ramsar site is home to more than 1,000 species of animals. It hosts more wintering shorebirds than any other U.S. Pacific Coast estuary south of Alaska. It is also important to more than 130 species of resident and migratory marine, estuarine and anadromous fish species. It includes Don Edwards San Francisco Bay Refuge, Marin Islands Refuge, San Pablo Refuge and Antioch Dunes Refuge.

Maryland

Ground has been broken on a project to link Blackwater National Wildlife Refuge with a new state park that will honor abolitionist Harriet Tubman and help tell the story of her early life and the Underground Railroad. The park's 17 acres adjacent to Blackwater Refuge will offer views of marshes, woodlands and fields that are reminiscent of the backdrop for Tubman's early years. The park's visitor center, scheduled to open in January 2015, will be connected physically and intellectually to the refuge's visitor center through programming, multi-use trails and roads. Tubman was born in 1822 not far from what is now the refuge and escaped slavery at 27. She returned to Maryland's Eastern Shore at least 13 times and freed approximately 70 enslaved family members and acquaintances. She was known for her ability to live off the land. This spring President Obama established federal, state and private lands as the Harriet Tubman Underground Railroad National Monument.

Nevada

Desert National Wildlife Refuge has opened new trails and informational exhibits at its Corn Creek headquarters area. There are now five area trails, three of them wheelchair-accessible. Some have panoramic views of the Sheep Mountain Range. On the trails, visitors can find a refugium for the endangered Pahrump poolfish, a prehistoric grinding stone, a cabin built with ties from an abandoned railroad, and places to observe some of the 320 bird species on the refuge.

This new trailhead portal at Desert National Wildlife Refuge in Nevada marks a transition from desert to riparian habitat. (USFWS)

Palmyra Atoll

Palmyra Atoll National Wildlife Refuge is rat-free one year after a major effort to remove the invasive predators, the U.S. Fish and Wildlife Service, The Nature Conservancy and Island Conservation have declared. Removing non-native rats was the top priority for the Palmyra Atoll Restoration Project, a multi-year effort to protect 10 nesting seabird species, migratory shorebirds, the rare coconut crab and one of the largest remaining native Pisonia grandis forests in the tropical Pacific. Palmyra Atoll, about 1,000 miles south of Honolulu, includes 25 islets covering 580 acres of land, and thousands of acres of healthy coral reefs. An article about the rat-eradication project appeared in March/April 2012 *Refuge Update*.

Midwest Region's New Online Look

All 66 national wildlife refuge and wetland management district Web sites in the Service's Midwest Region have migrated to the new content management system's sleek redesign. Regional administrators and trained field staff across the country have been migrating refuge and WMD sites into the new CMS since early last year. "Our external affairs staff did a great job setting up training for migrators and developing videos for content managers. And we had a cadre of about a dozen—mostly field—visitor services folks who migrated the sites amid their other duties," said Midwest Region visitor services and outreach chief Maggie O'Connell. Nationally, about 25 percent of wildlife refuge and WMD sites accessible through the Refuge System's main Web site—*www.fws.gov/refuges*—have migrated to the new CMS.

Six Transit in Parks Grants

Six Refuge System-related projects have received $2.72 million in grants from the Paul S. Sarbanes Transit in Parks Program. Rocky Mountain Arsenal National Wildlife Refuge Complex, CO, received $1.73 million for the Rocky Mountain Greenway project that will connect Rocky Mountain Arsenal Refuge, Rocky Flats Refuge, Two Ponds Refuge, and ultimately, Rocky Mountain National Park via a multi-use trail. Wichita Mountains Refuge, OK, received $444,500 for a multi-use trail to connect it to the town of Medicine Park and Fort Sill. Ridgefield Refuge, WA, received $250,000 to help replace a pedestrian bridge. Patuxent Refuge, MD, received $100,000 to replace a 40-passenger electric tram for visitors. Merritt Island Refuge, FL, received $100,000 to develop a transit plan. Back Bay Refuge, VA, received $94,000 to replace a public tram. Because Congress repealed the Transit in the Parks Program, this is the final round of such grants.

Alaska

Three national wildlife refuges, the University of Washington and seven other research institutions collaborated on a study that sheds light on cyclical

changes in sockeye salmon runs over the past 500 years. The results were reported in the January 2013 *Proceedings of the National Academy of Sciences*. The study reveals cycles in salmon abundance on a scale not previously imagined. Salmon managers have long understood that run size is variable, changing from year to year and often showing cyclic change that persists for decades. However, this study documents cycles lasting up to 200 years. The implication to salmon management is that high variation in abundance and cyclicity of short-to-extremely-long duration must be recognized, and harvest regimes must be designed with flexibility to scale up or down. Given that the global salmon industry is valued at more than $3 billion annually, and given the ecological/social importance of salmon, this is important not just for Alaska refuge managers but for salmon managers everywhere. The study took place on 25 lakes throughout southwestern Alaska, 14 of which are on Togiak Refuge, Alaska Peninsula/Becharof Refuge or Kodiak Refuge. More than four million sockeye salmon annually return to their natal waters on these refuges. But more than 10 million salmon destined for these spawning areas annually are intercepted by the commercial fishery. A significant conservation concern is whether this level of harvest is sustainable.

Wyoming

This photograph and others of two mountain lion cubs cornered on a fence by coyotes at National Elk Refuge went viral online in late March/early April. The photos, taken by outdoor recreation planner Lori Iverson, attracted more than 3 million views in one week, according to the U.S. Fish and Wildlife Service Mountain-Prairie Region office. The cubs were spotted the next day, apparently unharmed.

Washington

This winter and spring, the Service transferred endangered Columbian white-tailed deer from Julia Butler Hansen Refuge for the Columbian White-Tailed Deer to Ridgefield National Wildlife Refuge about 60 miles away. The deer were moved to save them from potential loss due to the impending failure of a dike between Hansen Refuge and the Columbia River. If the dike fails, much of the refuge will be flooded, placing the deer at risk. Columbian white-tailed deer are unique to southwest Washington and western Oregon and are listed as endangered under the federal Endangered Species Act. The project, funded by the Service and the U.S. Army Corps of Engineers, relocated 37 deer to Ridgefield Refuge and 12 deer to a nearby island. Two of those 49 deer died during the move and eight died soon after. "It is important to note that these losses roughly equate to the natural mortality rate for the Columbian white-tail deer population, typically between 15 and 20 percent," said Hansen Refuge project leader Jackie Ferrier. "We believe the translocation was very successful. The deer were in jeopardy where they were, and now they are on another refuge within their historic range where they will help contribute to recovery goals."

Texas

The 2012-13 winter survey at and near Aransas National Wildlife Refuge estimated that 257 whooping cranes overwintered there. That number includes about 105 pairs and at least 33 chicks. At least 22 cranes were identified outside the primary survey area. The results were based on seven surveys conducted using a new protocol. An article about that protocol, which was developed by Aransas Refuge and the Refuge System Inventory and Monitoring program, appeared in March/April 2013 *Refuge Update*.

From the Director — *continued from page 2*

concerns as invasive species, over-abundant deer populations, public use and wildfires. And they work together on research projects to better understand the birds.

By working together the refuge and preserve accomplish much more than either could alone. Throughout the nation, we are working with local partners to share information and learning, and achieve more for conservation than any one group could achieve on its own.

We are committed to helping local stakeholders conserve the nature of America. The best wildlife conservation often grows from the ground up, nurtured by people who have worked the landscape and conserved it for future generations—people who see tangible benefits from the natural world every day, including jobs, food, clean water, clean air, building materials, storm protection and recreation.

The Balcones Canyonlands Preserve, for instance, sits atop and helps protect a series of aquifers, including the Edwards Aquifer that is the primary drinking water source for more than 1.5 million central Texas residents.

The wildlife of Travis County, including the golden-cheeked warbler and the black-capped vireo, have a protected area to call home; development in the area continues; the people of Travis County have a beautiful and lasting connection to nature; and the conservation world has working partners in the developers and landowners in Travis. What could be better?

The endangered golden-cheeked warbler is one of several species to benefit from the multi-partner Balcones Canyonlands Conservation Plan, which includes the refuge of the same name in central Texas. (Greg Lasley)

"A Nature Guide Is an Interpreter" — *from page 1*

Among the plan's approaches that have gotten solid support are:

- Develop a Refuge Ambassador Program that will train employees in providing excellent customer service. While the specifics on how to provide sustainable training are still being finalized, the broad concept that refuges need to strengthen community relations reflects the *Conserving the Future* philosophy.
- Ensure that every refuge has interpretive support, whether at the refuge or from a regional office or other centers of excellence.
- Establish by January 2015 a minimum interpretation standard for welcoming and orienting visitors, including a means to welcome people to refuges that are closed for public visitation.
- Use a blended approach for interpretation delivery that includes kiosks and self-guided components on wildlife refuges with Web-based and mobile platforms that can reach multiple audiences.

The plan also recommends that by 2014, a "visitor services connect" online site be established to share, among other ideas, innovative and successful interpretation-through-art examples. On the site, professionals also will be able to learn about the use of emerging technologies to convey complex biological information and the concept of a land ethic in a way that will encourage people to care about the natural resources that sustain them.

"A nature guide is an interpreter of geology, botany, zoology and natural history," said Enos Mills, a protégé of John Muir and author of *Adventures of a Nature Guide*. The draft interpretation strategy—soon to be coupled with an environmental education proposed strategy—is a step toward ensuring that many more Refuge System staff and volunteers can be inspirational nature guides.

To keep pace with progress by the *Conserving the Future* Interpretation and Environmental Education implementation teams and others, go to *http://AmericasWildlife.org/*.

In coming weeks, the Communications implementation team will offer its second draft strategic plan and the Hunting, Fishing and Outdoor Recreation team will put forth its first draft plan.

San Luis Refuge Visitor Center Meets LEED Platinum Standards — *continued from page 1*

windows—all north-facing—let in light while avoiding direct sunlight from the south that would overheat the building. Natural ambient light is enhanced with skylights that magnify incoming light and by light-colored ceilings that reflect natural light into rooms. Ultra-efficient LED and florescent fixtures, which turn off automatically when no one is present, provide light when ambient light is unavailable or insufficient.

The clerestory windows open during cooler nighttime hours to vent hot daytime air. This airflow works with the cooling and ventilation system to cycle air throughout the building. Wooden arbor structures shade the lobby from direct morning and afternoon sunlight. All of this keeps the building cool during the area's hot summers.

The walls and ceilings are made of 10-inch structural insulated panels (SIPs). SIPs, which are rigid foam cores sandwiched between two layers recycled wood chips, provide high R-value insulation. This results in energy savings of 12 to 14 percent over standard stud or wood-frame construction. SIPs also result in less on-site construction waste because they are assembled elsewhere and arrive ready to install.

The center uses less than half the water of a standard comparably sized building, thanks to low-flow fixtures and automatic faucets in the restrooms, as well as native-plant landscaping that requires little water once plants are established.

Decorative concrete floors eliminate the need for carpeting, which would require regular cleaning and replacement. A portion of the volume of the concrete floor is fly ash—a hard-to-dispose-of waste product from coal-fired power plants. Countertops are made from 60 percent recycled glass chips in concrete or 60 percent post-industrial metal shavings in resin. The counters are as attractive and durable as non-renewable granite. Close to half the lumber used was certified by the Forest Stewardship Council as sustainably harvested.

The headquarters/visitor center at San Luis National Wildlife Refuge Complex in central California is the first U.S. Fish and Wildlife Service facility to earn the U.S. Green Building Council's highest rating for energy efficiency and environmental design. (USFWS)

The center also features low-VOC (volatile organic compounds) paint and low-VOC flooring, wall materials, sealants, adhesives and pre-manufactured wood products. Volatile organic compounds are a source of indoor air pollution and toxins. Low-VOC materials are much less harmful to people and the environment. To further reduce indoor air pollution, only "green" cleaning products are used for day-to-day housekeeping.

The visitor center serves as headquarters for San Luis National Wildlife Refuge, Merced National Wildlife Refuge, San Joaquin National Wildlife Refuge and Grasslands Wildlife Management Area. It includes a state-of-the-art interactive exhibit hall with more than 20 displays about wildlife and habitats protected by refuge lands, as well as a 1,000-square-foot classroom with audio-visual capability that will serve the environmental education needs of local public school and college students for decades to come.

Madeline Yancey is a writer-editor student trainee at San Luis National Wildlife Refuge.

Chief's Corner — *continued from page 2*

the U.S. Fish and Wildlife Service staff working on national wildlife refuges.

At Mississippi Sandhill Crane National Wildlife Refuge, where I started my refuge career in 1979, the coastal savannas on which the cranes depend were so degraded that the birds were on the verge of extinction. We found only two nests in 1981. Timber companies had tried to drain the land, convert it to pine plantations and keep fire out.

Over the past 30-plus years, the refuge has worked hard to return fire to the landscape, restore natural hydrology and remove the pine plantations. The landscape has returned to its more natural state, and the birds have responded.

I saw on Facebook that the refuge had already found 15 crane nests by mid-April, and there's plenty of time for more to be found. When bad budgets and big bureaucracy start to wear us down, it helps to remember stories like this can be found throughout the National Wildlife Refuge System.

Ira Gabrielson told us in 1941 that "the conservation battle cannot be a short, sharp engagement, but must be grim, tenacious warfare—the sort that makes single gains and then consolidates these gains until renewed strength and a good opportunity makes another advance possible."

Keep up the good fight.

RefugeUpdate

USFWS-NWRS
4401 North Fairfax Dr.
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A Look Back . . . Phil DuMont

The Sand Lake Civilian Conservation Corps camp, under the direction of Phil DuMont, created the "largest waterfowl refuge in South Dakota," according to the *Morning American* newspaper in Aberdeen, "achieving an enviable record both in work accomplished and in the education and professional training for the boys."

DuMont achieved another enviable record, too. During a single year as manager of Sand Lake National Wildlife Refuge, he banded 16,453 birds of 93 species, a near-record high in North America.

DuMont was with the National Wildlife Refuge System from 1935 until 1972, working side by side with J. N. "Ding" Darling, Ira Gabrielson and J. Clark Salyer. In fact, he was hired by Darling to identify potential wildlife areas for protection in Iowa, later becoming a biologist at Malheur Refuge in Oregon and then manager of Sand Lake Refuge, where he made his mark banding birds. He once told the Aberdeen Lions Club that the Dakota pothole was the best nesting area in the nation, while the cow was the greatest natural menace to wildlife through its grazing habits.

Phil DuMont was with the Refuge System from 1935 until 1972. One year, as manager of South Dakota's Sand Lake National Wildlife Refuge, he banded 16,453 birds of 93 species. (USFWS)

DuMont's fieldwork took him to all 50 states, Mexico, several South American countries, Europe and East Africa. Before coming to the U.S. Fish and Wildlife Service, DuMont spent 16 months studying and collecting in Madagascar for the American Museum of Natural History. He was also one of the first biologists to research albatross-airplane collisions on Midway Island. His extensive research on ornithology and conservation was donated to the University of Iowa, but his son recognized the value of DuMont's archives to the Service and donated information related to his Refuge System career to the National Conservation Training Center.

The collection included the original 1902 survey of Florida's Pelican Island, prepared for the Committee for the Protection of North American Birds of the American Ornithologists' Union, of which DuMont was a member. The committee, however, did not file that original survey with the General Land Office because it would have immediately opened the land to homesteaders. Instead, an official survey—marking a slightly larger area—was not completed until after the island had been declared a bird reservation by President Theodore Roosevelt in 1903.

DuMont was born in Minnesota and raised mostly in Iowa. He was 93 years old when he died in 1996.

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