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ON THE COVER: BULL ON THE NATIONAL
BISON RANGE. PHOTO: DAVE FITZPATRICK,
VOLUNTEER

Daniel M. Ashe



Seeing the Big Picture

One of the best parts about being the Director of the U.S. Fish and Wildlife Service is having the opportunity to travel throughout our great nation. To quote the late Johnny Cash, “I’ve been everywhere, man.”

From the Arctic to the Everglades, I’m continually awed by the landscapes surrounding me, and wherever I go, I similarly find special people determined to protect our lands, not just because they love them, but because they want them to thrive and sustain fish and wildlife for future generations.

To do this, it’s time to see the big, landscape-scale picture.

Implementing landscape conservation strategies isn’t something that’s “nice to do.” It isn’t an adjunct to our daily efforts to conserve wildlife. It is how the day-to-day work of the agency needs to be done from now on—if we want to be successful into the future.

We must work collaboratively with our partners to use the best available science to set conservation objectives—and to design, implement and evaluate landscape conservation strategies that drive toward those objectives. Only in this way can we maximize the return on our limited conservation dollars.

Only by delivering conservation at appropriate scales can we ensure that our work makes a difference for native wildlife and ecosystems. And only by identifying and prioritizing work that conserves intact and functional landscapes can we ensure that these vital resources are protected for generations to come.

In this issue of *Fish and Wildlife News*, we travel to every region to provide a sense of how these landscape-scale efforts are proceeding. These stories capture just a few of the many examples of landscape conservation work underway in places like the Prairie Potholes, Blackfoot Challenge, Rocky Mountain Front, Flint Hills, Everglades Headwaters and the remote Pacific Islands.

At the same time, we’re focusing on species to conserve entire landscapes. With the greater sage-grouse, our annual \$8 million investment is driving hundreds of millions and eventually billions in conservation dollars across nearly 200 million acres. Our priority focus on monarch butterfly conservation promises to have a similar landscape-scale impact across North America—beyond just that single iconic species.

We need your help.

Many employees and partners may be uncertain about this approach. That’s why we’re creating a community of practice around landscape-scale conservation efforts and developing new platforms and tools to help practitioners share experiences and lessons learned. Like me, I think you’ll be inspired by the examples in this issue and feel empowered to join this growing effort.

The most important thing that we can all do right now is simply get started, try something new and be part of the big picture. Thanks, I’ll see you out there! □

STRATEGIC HABITAT
CONSERVATION

Creating a Community of Practice for Landscape Conservation

In May 2015, project leaders, refuge managers and other Service staff working on landscape conservation gathered at the Service's National Conservation Training Center for the first-ever Strategic Habitat Conservation Practitioners Forum.

Over three days, participants shared their experiences and knowledge implementing landscape-scale conservation. The forum featured sessions and discussions to gather feedback on the Service's ongoing efforts to implement landscape conservation and hear how Service staff and partners are making it happen.

For Paul Souza, Assistant Director for Science Applications, the forum was a key step forward in efforts to institutionalize landscape conservation as the Service's focus for the future.

"We've received comments from leaders at all levels within the Service that they need help applying this conservation approach to their daily work and making sure their efforts contribute to larger landscape conservation goals. It's not easy, and we know that some people feel like they're alone in this," he says. "Being able to get together with peers from other programs and regions helps break down that isolation and shows how others are tackling the very same issues."



Catherine Phillips, project leader in the Panama City Field Office, at the Practitioners Forum: "If we're going to make progress, we have to get together and learn from each other."

For many participants, the discussions represented the first steps toward creating a community of practice—a mutual support system for experienced practitioners to share what they know, and for those newer to this approach, to learn from what's been done before. Even those forum participants who have been working on landscape conservation for years came away from the event with new ideas and energy.

"Strategic, landscape-scale conservation is a scientific process, and getting together to share information and discuss progress is how scientists move the needle. That's why this forum needed to happen," says Catherine Phillips, project leader in the Panama City Field Office. "If we're going to make progress, we have to get together and learn from each other."

Implementing a more systematic approach to setting priorities and designing, delivering and evaluating conservation actions to accomplish those priorities isn't an enormous departure from what most biologists and land managers know and do every day. But landscape conservation

requires a level of rigorous adaptive management that isn't always easy to sustain. And to be effective, the approach requires cooperative goal setting and conservation design above and beyond what most conservation professionals are used to seeing.

Phillips says she hopes the Practitioners Forum is the beginning of a true community of practice. But she's aware of the difficulty of creating and sustaining such a community—especially given the pressures and demands most practitioners are under today.

"For a community of practice to be successful, it has to be organic. It has to meet the needs of practitioners and be sustained by them," she says. "It's actually started happening, but not in a formal sense. We've begun talking more regularly with folks in other regions, continuing the discussions we began at the forum, and that's encouraging."

Many of the forum participants believe more needs to be done to make sure practitioners feel like they have the tools and answers they need. The participants also concluded that project leaders and refuge managers may need far different sets of answers than biologists and conservation design experts.

"I'm not sure we're ready for prime time—meaning engaging partners—until we've settled on our own points of reference and have a simple 'Rosetta Stone' to consistently translate what it is we are doing in terms that can be easily understood by our partners in the landscape in which we operate," says Mike Bryant, refuge manager at Alligator River National Wildlife Refuge in North Carolina. "Clarity is key, but it's difficult."

Phillips agrees, noting that effective landscape conservation requires the Service to engage partners and find shared solutions, a task that's often hard for different programs and field stations within the Service to accomplish.

"All of our partners have different missions and areas of focus. They also have different contributions to make, and approaches they apply to their work," Phillips says. "Our challenge is to find ways to fit the pieces together to make a bigger contribution to the landscapes we're working to protect. That's why this dialogue needs to continue and expand."

Souza is on the same page. "I believe that the only way we are truly going to tackle large-scale and long-term conservation challenges are to face them together." □

STRATEGIC HABITAT
CONSERVATION

Selecting Surrogate Species

The surrogate species concept is one way for the Service to help set thoughtful priorities with state partners. In theory, by taking action to conserve surrogate species, the Service not only addresses that species' needs but also creates cascading benefits for other species on the landscape.

The Service published draft technical guidance regarding surrogate species in 2012 and requested feedback on the approach from staff and scientists outside of the agency. Since that time, a small team of dedicated employees has worked steadily to respond to and incorporate thousands of comments and suggestions from staff, partners and peer reviewers.

A major theme across the comments emphasized that the science surrounding the use of surrogate species is still inconclusive. While many methods for surrogate species selection have been proposed, few examples exist that can confirm a causal relationship between conservation actions that benefit surrogate species and improvements in other species that share the landscape. As is often the case, one size does not fit all. In some parts of the country, the guidance proved to be a helpful tool in developing Strategic Habitat Conservation approaches with biological objectives set for species that represented others; in other areas it didn't work as well.



The brewer's sparrow and numerous other species that rely on sagebrush habitat are benefiting from conservation efforts for the greater sage-grouse.

For these reasons, the Service rewrote the draft technical guidance to be used as a tool where appropriate. This non-prescriptive technical reference document is designed to address the comments received during the peer review and help employees and partners understand the strengths and limitations of a surrogate species approach. The document uses real world examples to help explain when this approach can best be applied. It also recognizes that other approaches can be used to set science-based priorities with our partners.

"The surrogate species approach was intended to empower our employees to think bigger and find creative and efficient solutions to the conservation challenges we face. But it's just that—an approach, not an end in itself," says Paul Souza, Assistant Director for Science Applications. "Our overarching goal is to work with our partners to identify shared landscape-scale priorities, leverage resources and

achieve greater conservation gains. We want to ensure our goals are clear—this is simply SHC's first step. If there are other approaches that accomplish this goal more effectively in a given landscape, we should use them."

By recasting the guidance as a reference document, the Service hopes to give employees across the agency the green light to innovate and experiment. This is, after all, the way scientific advances are made. To that end, the Service is supporting the creation of a community of practice among landscape conservation professionals, and emphasizing its role as a learning organization that constantly improves its methods and practices.

"Adaptive management has always been at the heart of our work. That won't change, but we can and must do a better job of sharing what we learn and using our successes and setbacks to improve how we design and deliver conservation in the future," Souza says. "I hope and expect that the Service will make significant contributions to the science behind species conservation, so that in future years we can develop even more effective approaches that help practitioners across the planet." □



MORE INFORMATION

The Technical Reference Document can be found at www.fws.gov/science.

STRATEGIC HABITAT
CONSERVATION

225 Million Monarchs

Finding out what works to strategically conserve habitats for monarch butterflies

Consider the monarch butterfly, North America's most beloved butterfly. The species has specific habitat requirements throughout its lifespan, many of which it shares with other insect and avian pollinators, and a remarkable annual migration across thousands of miles over many generations.

But over the past 20 years, the monarch population has dropped more than 90 percent, compelling the Service to take a lead role in its conservation. This sharp decline, combined with the butterfly's species-specific requirements, makes it a strong candidate to benefit from Strategic Habitat Conservation, also known as SHC.

SHC is a process of critical thinking about why, how and where the Service does habitat management by documenting reasons for management actions and learning to make subsequent management actions more effective. »

A monarch butterfly in Minnesota.



MARGARET BUETTNER

SHC Step 1:**Biological Planning**

In the United States, monarch butterflies occur in eastern and western migratory populations. From wintering grounds in evergreen forests tucked away in a small area of the Sierra Madre Occidental Mountains west of Mexico City, Eastern monarchs make a 3,000-mile annual flight to breeding habitats across the United States and Canada.

Monarch populations are surveyed each year on their wintering area in the Mexican highlands by measuring the area of forest occupied by the butterflies. This measurement is a population index and it has declined from a high of more than 18 hectares in 1996–97 — corresponding to 1 billion butterflies — to a low of 0.67 hectares in 2013–14, about 33 million monarchs.

Subsistence timber harvesting in Mexico has been a problem, but the dramatic population drop over the last decade is thought to be due to habitat deterioration in the species' core Midwestern breeding range.

Although the population index number inched up to 56.5 million in 2015, it's not enough to save the species. The Service has set a population goal for Eastern monarchs of 225 million butterflies by 2020, the equivalent of roughly six hectares of occupied forest.

Through Biological Planning, managers build a shared conceptual or expert-based model of a species' conservation needs. The model serves as a foundation for future conservation efforts by identifying conservation targets; describing



current and desired future conditions; and refining species-habitat relationships.

Ultimately, the model helps managers identify uncertainties and use the best science available to make assumptions and wisely focus conservation investments. A key part of SHC is subsequent research or monitoring, which will test and support or refute these assumptions.

The simplest conceptual model for monarchs is that the species requires native milkweed to lay their eggs on and for their caterpillars to eat. Most experts agree that milkweed abundance is the first acute (or grave) limiting factor for monarch butterflies. Nectar plants are also critical for food during the breeding and migration seasons, and their availability is the second acute limiting factor.

SHC Step 2:**Conservation Design**

Conservation Design involves using the best tools and information available to merge the results of Biological Planning into

strategies for achieving population objectives.

The loss of milkweed from nearly 90 million acres of cropland in the Corn Belt and the continued loss of pasture and other grasslands will be difficult to mitigate. Several Conservation Design approaches have been proposed for monarchs, and each is useful:

- Using public-private partnerships to restore monarch habitat, including augmenting public and Conservation Reserve Program (CRP) lands with higher densities of milkweed planting;
- Restoring prairies;
- Managing roadsides and utility corridors for milkweed and nectar plants;
- Engaging gardeners, schools and others to create gardens of milkweed and nectar plants known as way stations; and
- Working with farmers to restore and manage parts of their land for milkweed and nectar plants.

These strategies should target known or suspected important breeding and migration areas.

SHC Steps 3 & 4:**Conservation Delivery and Monitoring**

Based on the Conservation Design strategies, managers can begin delivering conservation on the ground.

From schoolchildren to CEOs, the Service has been enlisting conservation partners, landowners and the public to plant native milkweed and protect monarch habitat. In the Midwest, prairie restoration remains a goal, and other strategies are underway as well.

Monitoring these “deliveries” creates opportunities to find out what works and what doesn’t. Through this learning process, the Service is able to gauge progress and make future management more effective and efficient while reducing uncertainties.

The expansive range and unique lifecycle of the monarch presents challenges to range-wide monitoring. Fortunately, researchers and citizen scientists have been working for decades to monitor the species and its migration patterns.

The Service is also drafting a National Monitoring Strategy for monarchs and milkweed to monitor the effectiveness of conservation efforts. A sampling design will drive the collection of data about milkweed, flowering nectar plants, monarch eggs and larvae, and the presence of monarch butterfly adults.

The monitoring should resolve some of the uncertainties regarding monarch biology including:

■ Can we improve the estimation of wintering population densities since monarch populations expand and contract at the wintering site depending on temperature, clustering more tightly in colder weather?

■ Can we better understand the relationship between milkweed density and monarch reproductive output? Does a high density of milkweed attract an equivalently high density of monarch females? Does a high density of milkweed or monarch caterpillars attract parasites?

■ Do corridors along roads have adequate survival rates to help achieve population objectives?

■ Is restoring monarch habitat near agricultural habitat effective given the widespread use of aerial spraying and neonictinoid and other pesticides?

■ Are way stations effective at attracting monarchs?

SHC enables the practice of adaptive management. It's flexible enough to allow managers to change strategies depending on how successful conservation delivery was to producing favorable biological outcomes. Monarchs are just one of the species that benefit from this conservation framework. □

KURT JOHNSON, Science Applications, Headquarters, and
REX JOHNSON, Midwest Region

? MORE INFORMATION

To learn more about the Service's "Save the Monarch" initiatives, visit fws.gov/savethemonarch.

Bad Actors: 11 Animals We Hope You Never Meet in Midwest Waters

In an era when the Midwest is frustrated by a seemingly endless litany of unwelcome guests in our waters, from zebra mussels and Asian carp to Eurasian watermilfoil and spiny water fleas, the Service has decided that enough is enough and is going on the offensive.

The Service hopes to stop the next invasion by non-native critters of Midwestern waterways

before it even begins. We've scoured the globe and created a bad-actor list of 10 fish and one crayfish that we want to make sure never find their way to the Midwest. Nearly all of these animals would find our rivers, lakes and streams a suitable home. Coupled with their unfortunate tendency to invade new places, we've decided the risk these animals pose to our environment is too high.

Why Prevention is Key
Experience has taught us that invasive species remedies are costly, both in time and in resources. Additionally, society loses billions of dollars a year

because of the damage invasive species cause to industries and the environment. Stopping invasive species before they cross our borders is the most efficient and cost-effective approach to battling these unwelcome guests.

In the absence of a magic crystal ball to show us future invasive species, we turn to science to help us create a lineup of our bad actors. We use a process we call Ecological Risk Screening Summaries to focus our prevention efforts. Starting our bad-actor search with freshwater animals, we use international databases, scientific literature and a computer model to locate areas of the United States that provide the right climate, such as temperature and rainfall patterns, for animals known to be invasive in other parts of the world. The potential risk an animal poses to our country's waters increases when we find a strong climate match.

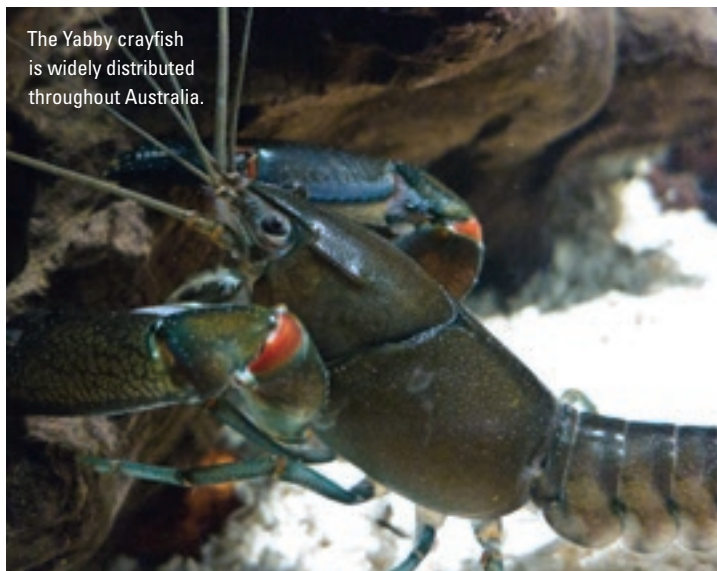
Preempting the Next Invasion
Ecological Risk Screenings have revealed our bad actors.

Amur sleeper. Crucian carp. Eurasian minnow. European perch. Nile perch. Prussian carp. Roach. Stone moroko. Wels catfish. Zander. Yabby crayfish.

The next step is to keep them out.

The Service used the information collected in the Ecological Risk Screening Summaries to support a proposed rule to list the 11 species as injurious under the Lacey Act. If the rule becomes final, it will make the import and interstate transport of any of these animals illegal, except with a permit for certain purposes. »

The Yabby crayfish is widely distributed throughout Australia.



MATTHEW STINSON/CREATIVE COMMONS

The Wels catfish is found throughout Europe.



ANDREA JANITZKI/CREATIVE COMMONS

The zander is already found in one lake in North Dakota. But the ban on interstate transport would contain the fish to North Dakota.

Another crucial part of the effort to stop animals before they enter our country is our partnership with industry and state conservation agencies. In 2013, the Service signed a Memorandum of Understanding with the Pet Industry Joint Advisory Council and the Association of Fish and Wildlife Agencies. Both groups agreed to help us in our efforts by voluntarily refraining from the importation of high risk species not yet introduced to the country in trade. Their ongoing support is a vital part of our future success.

The interplay of science, policy and partnerships is important in our fight to keep invasive animals out of U.S. waters. We hope that the names on our bad-actor list slip from your memory in a few months or years. That would mean our offensive is doing the job: With help from our partners, we would have the next invasion before it ever became a problem. □

KATIE STEIGER-MEISTER, External Affairs, Midwest Region

Proposed BP-Deepwater Horizon Oil Spill Settlement Largest in U.S. History

On October 5, U.S. Attorney General Loretta Lynch, announced a “major step forward in our effort to deliver justice to the Gulf region.” Flanked by four Cabinet-level leaders, Lynch explained, “We have secured a historic resolution of our pending claims against BP, totaling more than \$20 billion — making it the largest settlement against any entity in American history.” BP was the party primarily responsible for 2010’s Deepwater Horizon oil spill, the largest environmental disaster in U.S. history.

If approved by a federal judge, the settlement agreement would end a long and arduous legal journey that brought the U.S. Department of Justice together with five Gulf states and four federal agencies to make BP pay penalties for Clean Water Act violations and damages for injuries to natural resources.

While a “major step forward,” Lynch emphasized the amount of work that remains. The 350-page written agreement known as the consent decree is a *proposed* agreement; it will be finalized only after Justice considers all comments made during a 60-day public comment period that ended December 4. Lynch strongly encouraged all interested parties to provide their views on the proposed agreement.

\$5.5 billion provided for RESTORE Act projects

The \$20 billion total agreed to by BP includes a \$5.5 billion penalty under the Clean Water Act. In accordance with the RESTORE Act of 2012, which set up a framework for restoring the ecosystem and economy of the Gulf Coast region, 80 percent of the \$5.5 billion will go to environmental restoration, economic recovery projects, and tourism and seafood promotion in Florida, Alabama, Mississippi, Louisiana and Texas.

A RESTORE Council composed of representatives of the five Gulf states and six federal entities — the Departments of the Interior, Commerce, Agriculture and Homeland Security as well as the Army and the Environmental Protection Agency — has been hard at work since 2012 identifying potential restoration projects and developing regulations to make the Gulf Coast environment and economy more sustainable and more resilient.

\$8.8 billion provided in natural resource damages

The agreement also stipulates that BP must pay \$8.1 billion in natural resource damages to compensate for injuries to the Gulf of Mexico ecosystem caused by the spill and spill-response activities. This sum includes \$1 billion already made available by BP to fund restoration activities before resolution of litigation. BP has also agreed to pay up to \$700 million for injuries not now recognized but possibly identified in the future.



The guidance for using the damages, which will be paid over 15 years, is described in a proposed restoration plan published by the Deepwater Horizon Natural Resource Damage Assessment (NRDA) shortly after Justice filed the consent decree.

As with the proposed consent decree, the public comment period for the draft restoration plan ended on December 4. Justice and the NRDA team are reviewing public input and anticipate finalizing both documents this spring. □

NANCIANN REGALADO, Deepwater Horizon Natural Resource Damage Assessment, Southeast Region



Sand dunes on the Perdue Unit at Bon Secour National Wildlife Refuge in Alabama.

Comprehensive Ecosystem Restoration Plan Proposed to Address Massive Deepwater Horizon Oil Spill

When the U.S. Department of Justice announced on October 5 that it had reached a proposed settlement with BP, the Deepwater Horizon Natural Resource Damage Assessment Trustees also announced achievement of a major milestone: A proposed \$8.8 billion, 15-year restoration plan for the Gulf of Mexico was available for public comment. The plan, if approved, will be funded by the historic \$20 billion settlement agreement.

Natural resource trustees act on behalf of the public to assess injuries caused when oil or other

hazardous substances enter the environment. They then seek to recover monetary damages and develop and implement plans for restoring, rehabilitating, replacing or acquiring the equivalent of the natural resources that were damaged. The Deepwater Horizon Trustees have worked since the day of the spill to fulfill their responsibilities to the public.

The 1,400-page Draft Programmatic Damage Assessment Restoration Plan and Draft Programmatic Environmental Impact Statement is an ecosystem-scale compre-

hensive restoration plan. Because the oil spill occurred across a vast geographic area and affected a wide array of natural resources, habitat types and species, the proposed plan identifies restoration goals and restoration approaches rather than specific restoration projects. Identification of individual restoration projects will be accomplished by future implementation groups that will focus on restoration needs in specific geographic areas.

The draft plan's five goals are restoring and conserving habitat; restoring water quality; replenishing and protecting living coastal and marine resources; providing enhanced recreational opportunities; and providing for monitoring, adaptive management and administrative oversight. Trustees identified 13 restoration targets: wetlands, coastal and nearshore habitats; habitat projects on federally managed lands; nutrient reduction; water quality; fish and water column invertebrates; Gulf sturgeon; submerged aquatic vegetation; oysters; sea turtles; marine mammals; birds; mesophotic and deep benthic communities; and recreational opportunities.

Department of the Interior Secretary Sally Jewell praised this progress, saying the proposed plan "...brings renewed hope for a fully restored Gulf of Mexico to millions of Americans who value the Gulf for its contributions to our economy, our environment and plentiful recreational opportunities."

She also committed her bureaus to continuing to work with Gulf Coast communities to ensure they are engaged in recovery and restoration efforts. These efforts will "generate jobs, improve water quality, support our tribal responsibilities and result in an improved wildlife habitat for migratory birds and hundreds of vulnerable species," she explained.

Trustees are reviewing public comments and hope to finalize the plan this spring. □

NANCIANN REGALADO, Deepwater Horizon Natural Resource Damage Assessment, Southeast Region



MORE INFORMATION

Visit <www.justice.gov/enrd/deepwater-horizon and www.gulfspillrestoration.noaa.gov>.

For more information on the draft plan and the other work of the Deepwater Horizon NRDA Trustees, please visit <www.doi.gov/deepwaterhorizon>.

In Southern California, Dia de Los Muertos Celebrates the Role of Monarch Butterflies in Honoring Ancestors

The small community of Santa Paula in southern California joined the Service at the Santa Paula Agriculture Museum on November 1 to celebrate Dia de Los Muertos (Day of the Dead) and the integral role monarch butterflies play in Hispanic culture and native ecosystems.

"This celebration honors the cultural significance of monarch butterflies in their role representing the spirits of ancestors in the Hispanic community," says Steve Henry, field supervisor for the Service's Ventura Fish and Wildlife Office. "As this season's monarch migration gets underway, we are also celebrating the important role monarch butterflies play as indicators of the health of our pollinators."

More than 140 people from the Ventura County area joined the

celebration, which included native garden tours, seed giveaways, butterfly-themed arts and crafts, a bee hive demonstration, and educational booths by community partners.

Monarch butterflies and other pollinators such as bees, birds, bats and other insects help pollinate more than 75 percent of the world's flowering plants and nearly 75 percent of its crops. Often unnoticed by humans, pollinators carry pollen from one plant to another, fertilizing them as they collect nectar. Without these hard-working animals, wildlife would have fewer nutritious berries and seeds, and humans would struggle to produce many fruits, vegetables and nuts, from blueberries to almonds.

Undertaking one of the world's most remarkable and fascinating



ASHLEY SPRATT/USFWS

A monarch butterfly enthusiast shows off his seed packet full of native California wildflower seeds.

migrations, many monarch butterflies travel thousands of miles over many generations from Mexico to the United States and Canada. In the Hispanic community, as part of the Dia de Los Muertos celebration, the monarch butterfly migration is symbolic of the journey home by ancestors who have died. The celebration coincides with the arrival of monarch butterflies along the California coast to gather and roost in coastal groves of both non-native eucalyptus and such native trees as sycamore, Monterey cypress and Monterey pine.

Unfortunately, North American monarch butterfly populations have declined in recent years from loss of breeding, migrating and overwintering habitat. Loss of native milkweed and nectar plant habitats has had a devastating impact on their populations and the migration phenomenon because native milkweed is the only plant on which monarch

? MORE INFORMATION

To help monarch butterflies and native pollinators, plant milkweed native to your region, cultivate native nectar plants, avoid the use of pesticides, participate in citizen science projects and get involved in the Service's Schoolyard Habitat Program. For more information on monarchs, visit www.fws.gov/savethemonarch.

butterflies lay their eggs and on which the caterpillars feed. Ingesting the plants helps protect the caterpillars by making them toxic to predators such as birds. In their adult stage, monarchs rely on a variety of native nectar plants, which flower at different times and provide the food monarchs need to reproduce and migrate. □

ASHLEY SPRATT, External Affairs,
Pacific Southwest Region

Checking it Twice

Sixteen Service special agents from the Mountain-Prairie Region helped Colorado Parks and Wildlife (CPW) at a wildlife checkpoint along I-70 near Idaho Springs, Colorado in October. The agents, along with approximately 200 other officers from nine agencies, ran

22 inspection stations. The purpose of the checkpoint was to enforce Colorado hunting regulations as well as collect data on where people hunt, what they hunt and how long they have been hunting. This data will help CPW plan when and where to open hunting or fishing areas.



STEVE SEBEN/USFWS

South Sound Prairies Communications Partnership Reaches Out to Olympia Youth

The Service, with the assistance of the National Park Service's (NPS) Rivers, Trails and Conservation Assistance Program, has formed the South Sound Prairies Communications Partnership to develop a broader base of community support for all prairie species in the South Puget Sound prairies of Washington state.

The partnership recognizes farmers, ranchers and the Department of Defense for their conservation efforts, and works to expand this productive model through education, volunteer opportunities, media events, prairie tours, "prairie appreciation" days and more. A key strategy is to create and promote educational activities and events that get residents involved in prairie appreciation and protection.

With that in mind, the partnership teamed up with instructor Karina Champion, whose seventh-grade students at Olympia Regional Learning Academy (ORLA) in Olympia, Washington, are studying prairie ecology and restoration.

Stephanie Stroud, a community assistance fellow with the NPS Rivers, Trails and Conservation Assistance Program, is integrating a design component within Champion's prairie curriculum that allows students to design and build their own prairie garden.

In September, the class met Stroud at Seattle's Olympic Sculpture Park for a tour of



Students from ORLA learn about landscape architecture and "find their park" by listening to sound recordings from local and national parks in Washington.

the once-industrial-site-turned-native-oasis and a lesson in using landscape architecture to approach environmental opportunities and challenges. Students walked through a functioning prairie in an urban environment, experiencing firsthand many of the park's successful, high-impact design solutions. Students also toured the NPS PARK(ing) Day installation, where a parking space was transformed into a mini-park for a day. The installation featured a "sound map," encouraging students to think about using all five senses when considering a design solution.

In October, Stroud was in the classroom, sharing videos about landscape architects and the many kinds of projects they work

with, and teaching site analysis of the school campus. The students were encouraged to think like designers as they headed outside to conduct a site inventory.

Five teams created maps showing pedestrian and vehicular circulation, wildlife patterns, sun and shade direction, site constraints, and ideas for thinking "outside the box." When the maps were overlaid, students could see how all the site elements play a part in designing their prairie garden and how many good ideas can be incorporated into one design.

In November, the students used their skills as budding landscape architects to create a concept design for their prairie garden, to be built at ORLA within the next year. They made design decisions using their site maps, and integrated their artistic ideas for the garden's shape, color and texture. They used their education in prairie ecology to select appropriate plants and take into consideration the wildlife that may use the school prairie as habitat.

This year's seventh-graders will help next year's class learn about prairies and nurture the school prairie garden. South Sound Prairies Communications partners believe this cycling of students with ORLA's prairie curriculum will help create a lasting connection to the local prairie landscape and strengthen students' skills as designers and stewards of the land. □

TAYLOR GOFORTH, External Affairs, Pacific Region

UNCOVERED: Urban Wildlife Refuge Partnership Bringing Saw Mill River Back to Life in Yonkers

At one time, Yonkers, New York, was an industrial powerhouse. The historic city between New York City's Bronx Borough and a spacious expanse of the Hudson River was used to being described in superlatives: the largest elevator and carpet mills in the world; the birthplace of plastics and FM radio; as well as a treasure trove of industries, Hudsonian-styled mansions, one of America's oldest golf courses and storied gardens. In the mad rush to industrialize, the Saw Mill River, which once served as the city's lifeblood, was entombed in concrete and buried under parking lots and factories, a transgression shrugged off in the name of progress.

In an all too familiar parable in the industrial Northeast, one day the factories were shuttered, the metal presses and looms grew silent, and Yonkers, like many post-industrial cities of America's "Rust Belt" fell quickly into decline. The workshops gave way to brownfields, once picturesque boulevards increasingly showcased blight rather than opulence, and disinvestment and economic devastation led to further environmental degradation, social upheaval and racial divisiveness as highlighted recently in HBO's *"Show Me a Hero"* docudrama. For many, Yonkers was done. »

Youth from the Groundwork Hudson Valley Green Team maintain the Saw Mill River. The river was once buried under a parking lot.



LINDSAY YOUNG/PACIFIC RIM CONSERVATION

It is for these reasons that so many dignitaries and well-wishers who gathered along the banks of the restored Saw Mill River in October prefaced their remarks with “I can’t believe this is happening.” Standing at the podium, flanked by young faces reflecting the new diversity of Yonkers, and overlooking the now babbling and daylighted Saw Mill, Cynthia Martinez, the Chief of the National Wildlife Refuge System, unveiled a russet sign emblazoned with words designating Yonkers as an Urban Wildlife Refuge Partnership. The designation served as a culmination of a decade of commitment and relentless determination to restore the Saw Mill to an ecologically viable tributary. But the appellation was for more than a reclaimed tributary.

At the designation event, standing alongside Yonkers Mayor Mike Spano, stood a beaming Rick Magder, the head of Groundwork Hudson Valley, a local nonprofit that played a central role in the civic partnership leading to the

river’s restoration. Magder declared that a new era had indeed arrived for Yonkers and that the restoration of the river was just a starting place for a host of ambitious greening projects planned for the community. He further directed the audience’s attention to Michael Horne, refuge manager for Wallkill River National Wildlife Refuge, standing nearby, and his staff, including refuge biologists Marilyn Kitchell and Ken Witkowski. Wallkill staff had made numerous trips to Yonkers to work with Groundwork on a variety of restoration projects. He reminded the audience that they were there not simply to celebrate the work that had been done but to revel in the alliance that now flourished between a refuge and a community leading to real environmental change.

The partnership between Yonkers and the Service was developed over the last three years by Groundwork Hudson Valley and its youth conservation program. Young people from Yonkers are

working at Wallkill Refuge in New Jersey to improve habitat along the Wallkill River. In turn, Wallkill staff visit Yonkers to help youth improve biodiversity along the Saw Mill River and soon-to-be constructed Yonkers RailTrail.

The crowd lingered as long as they could. Young people gathered to work on Eastern phoebe nesting boxes to be installed along the river. A local teacher who had brought students to the event read the quote by Aldo Leopold on the new sign: *“The good life of any river may depend on the perception of its music; and the preservation of some music to perceive.”*

While there is still much to be done to restore the environment of the region, at least the partnership between the Service and Yonkers has added voices to the chorus now singing the river’s rebirth. □

CURT COLLIER, Deputy Director, Groundwork Hudson Valley

Tishomingo National Fish Hatchery May Hold Solution for Rare Turtles

As crickets sing sunshine to sleep, it’s a wake-up call for alligator snapping turtles. They make a living by the dark of the night in big creeks, rivers and marshes in the southern United States. In Oklahoma, they are not quite as abundant as they used to be. They once occupied much of the eastern third of the state, but habitat loss and over-harvest reduced this animal to living in only a few select sites. And that’s when Tishomingo National Fish Hatchery stepped in with a captive-rearing program for this most interesting animal. What animal has a piece of flesh on its tongue it can wiggle to lure in unsuspecting fish and then prey upon them with a forceful snap of its jaw? This one.

Starting in 1999, scientists at the hatchery brought the animals on station and developed captive-breeding and -rearing techniques, with much success. While they have not abandoned their work with paddlefish, catfish and the endangered Arkansas River shiner, the alligator snapping turtle has risen in importance to stave off a potential listing under the Endangered Species Act.

Toward that end, turtle biologist Brian Fillmore recently co-authored research findings in the specialized scientific journal, *Chelonian Conservation and Biology*. Think of the journal as “all things turtle” for scientists. While it might be a specialized audience reading about Fillmore’s work, what is reported is of significance to conservation in

East Oklahoma and beyond.

Fillmore and his four co-authors examined how young turtles raised and given a head start at the hatchery survived the rigors of the wild.

Captive rearing and releasing have worked for other species in the past. White-tailed deer and wild turkey were once a rarity; now they are quite common, thanks in part to “re-stocking” as a conservation measure. But will it work for alligator snapping turtles? The upshot: It sure looks like it could.

Alligator snapping turtles from Tishomingo were tagged, stocked in the Caney River and Pond Creek in northeastern Oklahoma, and later re-caught. Some of the 246 tagged turtles were never seen again. Others were caught multiple times for several years in the nets baited with dead fish set out in the late afternoons. When

those turtles were re-captured, scientists measured their size and weight. The data were compared to data from alligator snapping turtles of the same age that were kept at the hatchery over the same period. It showed that the released turtles put on more mass and size than those kept in captivity.

That piece of information alone is encouraging. It may show that captive-bred alligator snapping turtles can quickly find the food and space that they need to survive in waters that provide required habitat.

The ultimate sign of success will, of course, be a naturally breeding population, much like deer and turkey. But alligator snapping turtles are not deer; they aren’t quite so visible or as easily monitored. And that should be the next step in this turtle conservation endeavor, say Fillmore and his co-authors, to determine if repatriated turtles will naturally reproduce. □

Brian Fillmore (right) and a volunteer measure an adult alligator snapping turtle.



Endangered Hawaiian Petrels Moved to Start New Colony at Kilauea Point National Wildlife Refuge



A Hawaiian petrel chick in its mountain burrow.

ANDRE RAINE/KAUAI ENDANGERED SEABIRD RECOVERY PROJECT

Ten downy endangered Hawaiian petrel chicks were flown by helicopter last fall from their nesting area in the Na Pali Kona Forest Reserve to a new colony protected by a predator-proof fence at Kilauea Point National Wildlife Refuge.

In the early morning of November 3, two teams were dropped by helicopter onto mountain peaks managed by the Hawaii Department of Land and Natural Resources’ Division of Forestry and Wildlife. There, the teams headed for 10 nest burrows that had been monitored throughout the breeding season.

Each burrow contained a large, healthy chick. The chicks were carefully removed by hand, placed into pet carriers, hiked up

to the tops of peaks and loaded onto the helicopters. Like any precious cargo, the carriers were securely strapped into the helicopter.

“This translocation will establish a new, predator-free colony of the endangered Hawaiian petrel to help prevent the extirpation of the species from Kaua’i,” says Michael Mitchell, the Service’s acting project leader of Kaua’i National Wildlife Refuge Complex. “Petrels, like many other native Hawaiian species, are facing tremendous challenges with shrinking habitat and the onslaught of invasive species. Translocating the birds to Kilauea Point National Wildlife Refuge ensures that this colony of birds will be protected for our children and our children’s children.”»



The chicks are loaded onto a helicopter.

The chicks were flown to Princeville Airport where an animal care team assessed their health. From there, they were driven to their new home within the predator-proof fence in the Nihoku area of the refuge.

The endangered Hawaiian petrel, or 'ua'u, is one of two seabird species endemic to the Hawaiian Islands. Its population has declined dramatically due to a number of threats, including predation by introduced mammals (such as cats, rats and pigs) and collisions with manmade structures during the birds' nocturnal flights from breeding colonies in the mountains to their ocean foraging grounds.

Surrounded by fine mesh stainless steel fencing 6.5 feet high, the 7.8-acre enclosure at Nihoku protects the birds from predators. The area inside the enclosure has also been partially restored with native vegetation, and seabird-friendly nest boxes, specifically designed to mimic natural burrows, have been installed.

The effort was a collaboration among the Service, American Bird Conservancy (ABC), the Hawaii Department of Land and

Natural Resources' Division of Forestry and Wildlife, the Kaua'i Endangered Seabird Recovery Project, Pacific Rim Conservation and others.

"Predator-proof fencing and translocations of this type are necessary conservation strategies in Hawaii to deal with widespread non-native predator populations that cannot be readily eradicated," says Dr. George Wallace, vice president for Oceans and Islands at ABC. "For the Hawaiian petrel, which is threatened by non-native predators in their montane nesting areas, creation of a colony protected from predators will be a major step forward in stabilizing and recovering its Kaua'i population."

Hawaiian petrel chicks imprint on their birth colony the first time they emerge from their burrows and see the night sky, and they will return to breed at the same colony as adults. Since the chicks were removed from their natural burrows before this imprinting stage, they will emerge from their nest boxes and imprint on the Nihoku area, returning to the site as adults.

In the meantime, human caretakers will hand-feed the young birds a slurry of fish and squid and carefully monitor their growth until the birds leave their new nest burrows and fly out to sea. The petrels will remain at sea for the next three to five years.

The new colony will be the only fully protected colony of federally listed seabirds anywhere in the Hawaiian Islands and represents a huge achievement toward recovering this species. □

Outfoxing Mange in the San Joaquin Kit Fox

The endangered San Joaquin kit fox is facing a new threat and the Service is joining others to help save the species. In addition to habitat loss, predation and human-induced mortality, a sarcoptic mange disease epidemic has hit the fox in Bakersfield, California, until recently a thriving population hub for the species.

If you're a pet owner, you've probably heard the word *mange*. Sarcoptic mange is a highly contagious and potentially fatal skin disease for canines caused by parasitic mites. In foxes and other closely related species such as coyotes and wolves, sarcoptic mange is caused by a canine-specific variety of mite unable to survive and reproduce on humans. Domestic dogs are easily protected from the disease by monthly tick and flea prevention medication.

After colonizing a mammalian host, the microscopic mites burrow into the skin, depositing eggs, exoskeletons and fecal waste along the way. This leads to intense itching and hair loss, leaving the host more vulnerable to other parasites and skin disease. If left untreated, sarcoptic mange can eventually result in death due to factors such as secondary infection, hypothermia, dehydration and starvation. While mange has been widely documented in red fox populations across the globe dating back to 1689, it has been documented in the San Joaquin kit fox within just the last three years.

In Bakersfield, there have been more than 90 known cases of mange in the San Joaquin kit fox population.

TORY WESTALL/CSU STANISLAUS ENDANGERED SPECIES RECOVERY PROGRAM

In 2013, the first cases of mange were reported in an urban population of kit fox inhabiting Bakersfield. Since then, there have been more than 90 known cases of mange in this population, with the number of infected individuals increasing each year. This outbreak is particularly troubling because Bakersfield hosts the last remaining stable population of San Joaquin kit fox.

Historically abundant throughout the San Joaquin Valley, kit foxes now exist in small, fragmented populations. The overall population size of the San Joaquin kit fox is estimated to be as low as 3,000. While populations in natural areas are subject to fluctuations in abundance due to availability of prey and water, urban kit foxes live in an environment with a constant source of human-related food and water resources and fewer natural predators. Over the years, kit foxes in Bakersfield have maintained a population size of several hundred individuals and with consistently high reproductive rates, but that stability may now be at risk.

Supported by funds from the Service, researchers at the University of California, Davis, School of Veterinary Medicine; the California State University,



Stanislaus, Endangered Species Recovery Program; and the California Department of Fish and Wildlife are teaming up to stop this epidemic. They plan to test the use of over-the-counter mange-preventive collars.

Kit foxes will be trapped at high risk sites in Bakersfield. Individuals with mange will either be dosed with a topical parasiticide or taken to the California Living Museum for rehabilitation, depending on severity of the infection. Uninfected foxes will be divided into two groups: a treatment group and a control group. The treatment group will be fitted with mange-preventive collars, and the control group will not be treated. Foxes in both groups will then be monitored for nine months using radio-tracking collars and remote cameras to detect differences in the occurrence of mange between the two groups.

Based on the results of this study, researchers can determine whether mange-preventive collars will be an effective tool for controlling this outbreak on a larger scale. □

DANA HERMAN, Sacramento Fish and Wildlife Office Biologist, Pacific Southwest Region

Iowa Reaping Benefits of North American Wetlands Conservation Act

In the heart of Iowa, a quiet transformation is underway. For the past 24 years, a remarkable coalition of private landowners, conservation organizations, and local, state and federal officials has partnered to transform more than 47,900 acres of land into vibrant habitat for hundreds of species of birds and other wildlife.

In the last 10 years alone, more than 250 partners have raised nearly \$50 million, which the Iowa Department of Natural Resources (IDNR) has used as matching contributions for 20 federal grants from the Service under the North American Wetlands Conservation Act (NAWCA). Almost all properties in Iowa that have been acquired are publically accessible for outdoor recreation, hunting and fishing.

NAWCA grants allow organizations such as IDNR, local groups, Ducks Unlimited, The Nature Conservancy and others to work with willing landowners to purchase land, restore native habitats and enhance wetlands to increase their value for wetland-

dependent birds, plants and other wildlife. NAWCA funds are also used on conservation easements, which protect the natural values of the land while families maintain private ownership and the right to continue to farm the land, live on the property and conduct other compatible uses.

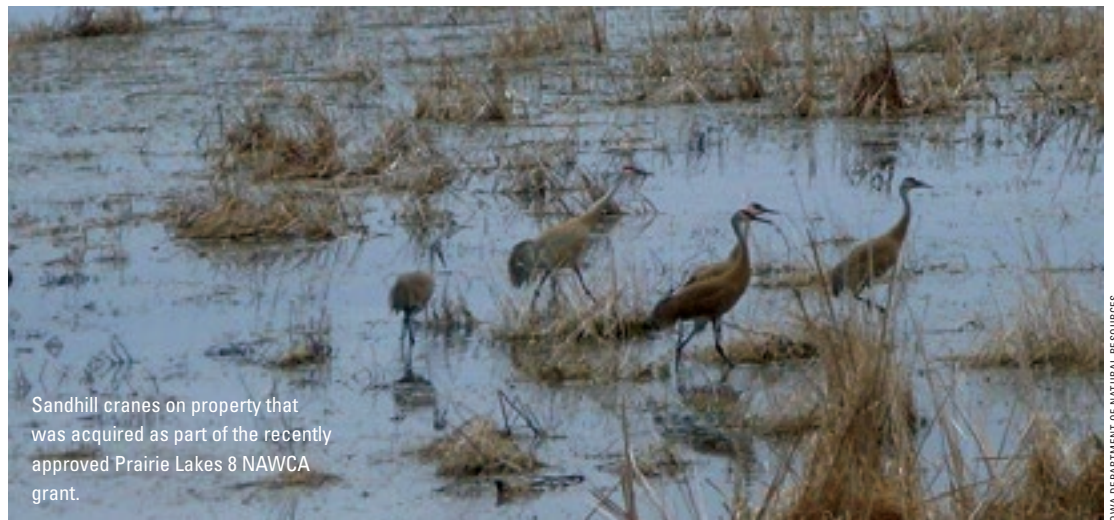
In Iowa, where only 0.3 percent of land is managed by the federal government, these projects make a big difference for wildlife protection.

In Iowa, IDNR Special Projects Coordinator Todd Bishop has been orchestrating the use of NAWCA funds for 12 years. He oversees several large project areas, where multiple NAWCA grants have been awarded. For example, he has overseen the completion of five phases of the Prairie Lakes Initiative and has three more phases in progress. IDNR's goal is to protect 15,000 acres in the Prairie Lakes region of Iowa for the benefit of many species of waterfowl such as lesser scaup, rails and other species.

A biologist by training, Bishop has a knack for spreading the word about the value conservation easements and acquisitions bring to the community. In one of the Prairie Lakes phases, for example, Bishop reached out to Linn County Parks Department, which had never tackled a wetlands restoration project. By the end of the project, the department was enthusiastically identifying birds on the property, spreading the word about public access and clamoring to partner on another NAWCA project. Last spring, a pair of sandhill cranes nested on the property for the first time in modern history, an event that drew bird watchers from all over the area.

The Iowa Prairie Lakes projects show how NAWCA supports federal-private partnerships that strengthen both natural and human communities and successfully preserve local landscapes. With work like that, you could even call it a quiet storm. □

NISA MARKS, Migratory Bird Program, Headquarters



Sandhill cranes on property that was acquired as part of the recently approved Prairie Lakes 8 NAWCA grant.

IOWA DEPARTMENT OF NATURAL RESOURCES

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STRATEGIC HABITAT CONS

A full-page background image showing a sunset or sunrise over a body of water. The sky is filled with orange and yellow clouds, and the water reflects the light. Overlaid on the image is the title 'STRATEGIC HABITAT CONS' in large, white, sans-serif capital letters. The text is partially cut off on the right side. Below the main title, there is a faint, mirrored reflection of the same text in the water.



Sunset on Lake Michigan

The Next Generation of Wildlife Conservation

Broadening our
perspective

by PAUL SOUZA *and* TOM MELIUS

The Fish and Wildlife Service has worked tirelessly for generations to conserve both celebrated locations and species and those that are less known but just as important. We know we are at our best when we work with states, tribes, private landowners and a multitude of diverse interests to set and achieve shared conservation priorities. History shows the amazing results we get when we work with others to clearly define goals, build and implement strong conservation plans, and then refine the plans to get better every day.

COURTNEY GELLEY/USFWS

Some successes have been truly continental in scale, such as waterfowl conservation through the North American Waterfowl Management Plan. They also include conservation of some of the nation's crown jewels such as the Great Lakes, Arctic, Chesapeake Bay, Puget Sound, Everglades, Great Basin and Gulf of Mexico. Conservation successes have also been demonstrated for wide ranging species from wolves to sea turtles. By investing in science and defining up front what success looks like for these species, we are able to concentrate the efforts inside and outside our agency to make conservation happen.

The legacy of conservation for wildlife continues to evolve and our agency has new success stories to share. We continue to use a broad, landscape-scale perspective to find success. The recent and ongoing effort for the greater sage-grouse is one example. Working hand-in-hand with state wildlife agencies, we first defined our goal as conserving the greater sage-grouse now and over the long term. This goal drove the identification of Priority Areas for Conservation, representing the amount and configuration of habitat across 11 states needed to conserve the species. With a common purpose, we worked with others on species conservation, eventually eliminating the need to give the bird the protections of the Endangered Species Act.

Monarch butterfly conservation is, we believe, a success in the making. This charismatic species has created an amazing groundswell of public support in both urban and rural areas in the United States, Mexico and Canada. While we still have a long way to go, this unity of purpose has enabled us to tap into a special energy that is producing results after only a couple of years. We have a better understanding of the migratory needs of the species than ever, and are using that science to build a continental conservation design and restore habitat in

We continue to use a broad, landscape-scale perspective to find success.

the right places that will make a difference for the species' future. The monarch also offers a wonderful and rare opportunity to touch the hearts and minds of the public in a new way, broadening our conservation constituency and making the mission of the Fish and Wildlife Service relevant to a new generation.

Our agency's work across large landscapes continues through these examples and many others showcased during the Practitioner's Forum on Strategic Habitat Conservation held last year (see article page 2). The new generation of successes will borrow the same formula that has worked in the past—clearly defining our goals, using science to develop, implementing and refining a conservation strategy over time, and working with others to get more done for our mission than we could do alone. □

PAUL SOUZA is the Assistant Director of Science Applications. TOM MELIUS is the Regional Director of the Midwest Region.

Idaho Sagebrush



SAGEBRUSH: BARB SCHMIDT; KIDS: GARY PEEPLES/USFWS

Students in North Carolina plant a garden for monarchs and other pollinators behind their school.



Catching On to Surrogates

Preserving Oregon's
Willamette Valley
by working for species
that represent others

(Above) Citizen scientists spent more than 1,000 hours collecting thousands of records across hundreds of square miles on Oregon white oak.

Stretching 150 miles north to south, the Willamette Valley is the economic lifeblood of western Oregon and the soul of an innovative culture infused in its cities including Portland, St Helens, Salem and Eugene. Renowned as Oregon's wine country, the valley is also home to a wide array of habitats, species and natural spaces. But this beautiful valley faces many conservation challenges and has long been the focus of extensive conservation planning.

In 2014, the Service's Pacific Region selected the Willamette Valley for a landscape-scale conservation project using surrogate species. The Service worked closely with the Oregon Department of Fish and Wildlife and other key partners to identify 14 plants and animals that represent five priority habitats to target conservation in the valley.

Now, with such partners as the Confederated Tribes of Grand Ronde, the Wetlands Conservancy, the Willamette Partnership and other local organizations, projects are underway to benefit the surrogates and their habitats. With thousands of species in the region, a surrogate species, strategic landscape approach is the most efficient way to carry out the Service's mission.

(Left) Surveying Oregon white oak. (Below) Students search for mussels.

PHOTOS BY USFWS



“With this approach, we are working on broader landscapes in ways we wouldn’t have been able to otherwise,” says Paul Henson, state supervisor of the Oregon Fish and Wildlife Office and lead for the Willamette Valley project. “The approach allows us to expand our capacity for conservation beyond just listed species or small patches of habitat.”

Two projects focused on two selected species — Oregon white oak and the western pearlshell mussel — illustrate how working on certain species can lead to landscape-level conservation.

As part of a project called “OakQuest,” Service biologists are working closely with Metro, a regional governance group in the Portland metropolitan area responsible for land-use planning and managing more than 16,000 acres of natural areas and parks, to build a map of native Oregon white oak in three metropolitan counties. Oregon white oak is an umbrella surrogate and an excellent species to advance landscape-level conservation.

Metro manages multiple oak-rich natural areas, and improved mapping will help conserve and maintain connectivity among oak habitat managed by Metro and private landowners.

More than 80 trained volunteers led by youth leaders from the Native American Youth Organization were mobilized during the first year of OakQuest. In all, citizen scientists spent more than 1,000 hours collecting thousands of oak locations across hundreds of square miles.

There is strong interest and excitement around conserving oak habitats and associated birds, butterflies and plants.

When Metro asked Tom Salzer from the Clackamas Soil and Water Conservation District for support, he replied: “You [had] me at oak. How much do you need?”

Metro plans to continue these efforts with free landowner workshops on oak-friendly nature-scaping and expansion of mapping efforts throughout the Willamette Valley.

For western pearlshell mussels, the Service piloted a Freshwater Mussel Academy this past year in Portland to give middle and high school students the opportunity to learn about mussel species and understand how these species are excellent indicators of ecosystem health.

Started by the Service’s Washington Fish and Wildlife Office and the Fisheries Program, the Freshwater Mussel Academy trains these students as citizen

scientists to monitor mussel populations and collect water quality data for long-term evaluation.

The academy is catching on.

“I think whatever you guys presented to the kids in the classroom portion rubbed them the right way,” says a seventh-grade teacher’s assistant. “The students said they would invite you back and even mentioned mussels to me yesterday... so it stuck with them.”

These projects extend conservation benefits far beyond the surrogate species themselves. By protecting Oregon white oak, numerous species of birds, mammals and insects beneficial to oak savannah habitat are also conserved. By protecting the western pearlshell mussels, the Service helps improve water quality for salmon and all of the other species dependent on healthy aquatic systems.

These short-term, innovative successes demonstrate the Service commitment to supporting landscape-level conservation and locally led actions, and show they work. □

OREGON FISH AND WILDLIFE OFFICE,
Pacific Region

Unfinished story

Writing a happy
ending for the silvery
minnow on the
Big Bend reach of
the Rio Grande

by AISLINN MAESTAS

The Rio Grande...the name itself calls to mind stories of America's Wild West and old cowboy movies along the "big river" that forms the natural border between Texas and Mexico. In Mexico, it's known as the Rio Bravo, roughly translated as "fierce river," although that too evokes a reality more past than present.

The river is still "grande" in length, flowing 1,896 miles from southwestern Colorado to the Gulf of Mexico; but in ferocity, it's a different story.

Decades of river alterations and heavy water consumption by cities and farms since the mid-1900s have reduced the river's strength, leaving a scant 20 percent of its natural discharge flowing to the Gulf. Sediment accumulation and resultant channel narrowing have led to increased flooding of riverside communities, degraded water quality and a decrease in healthy habitats for fish and wildlife.

Once, heavy steamboat traffic told the story of the Rio Grande. Today, the river is barely navigable, and an endangered, diminutive silvery minnow tells about impacts of unsustainable use of this formerly mighty river.

Nevertheless, the Rio Grande is a story in search of a happy ending. Not a perfect ending—of a return to the unaltered, free-flowing river of the mid-1800s—but a 21st century happy ending in which conservationists in the United States and Mexico work together to restore and better manage a portion of the river and surrounding lands of great value to both countries.

In 2010, Mexican President Felipe Calderón and U.S. President Barack Obama agreed that the Rio Grande/Río Bravo region, which includes the Big Bend reach of the Rio Grande, encompasses one of the largest and most significant ecological complexes in North America for people and for wildlife.

Flowing through the heart of the northern Chihuahuan Desert, the Big Bend reach is surrounded by nearly 3 million acres of public and private conservation lands in Texas and Mexico. And, it is home to the endangered Rio Grande silvery minnow.

On Life Support

The tale of the Rio Grande silvery minnow, like the river itself, is full of twists and turns. In days gone by, it was the most

Chris Harper and Aimee Roberson navigate the Lower Canyons of the Big Bend reach of the Rio Grande during a monitoring trip.



common fish in the Rio Grande. Now in critical condition, the silvery minnow survives on life support provided by dedicated people across the region.

Before the Service began reintroducing the silvery minnow to the Big Bend reach in 2008, the species had not been found there since 1960, serving as an important indication of how the river had changed.

As the Rio Grande has diminished in size, it has become narrower and deeper, leaving fewer shallow areas with slow moving water to serve as good nursery habitat for young silvery minnows.

“The plight of the silvery minnow is a warning to us that actions we have taken on the Rio Grande are causing significant harm to the river’s ecosystem,” says Chris Harper, an Austin, Texas-based fish and wildlife biologist with the Service’s Partners for Fish and Wildlife Program.

“Likewise, actions we take today to help recover this species will benefit the river as a whole, providing clean water and healthy habitats for a multitude of species.”

Determining what those actions are; deciding where and when to implement them; monitoring success; and adapting to lessons learned are all chapters in this unfolding saga.

“There is much we do not know right now, not just about this fish but about what is going on with other species in the Rio Grande,” says Mike Montagne, project leader of the Service’s Texas Fish and Wildlife Conservation Office. “Our work on the silvery minnow provides an opportunity to assess the status of other fish and wildlife, including the imperiled Chihuahua shiner and Rio Grande shiner.”



The Rio Grande silvery minnow is one of the most endangered fishes in North America.

The Service is working across programs with state and federal agencies on both sides of the border, and with private companies and non-governmental organizations to achieve on-the-ground recovery success.

Success in this case means creating three self-sustaining populations of silvery minnow outside the middle Rio Grande.

At Big Bend, Service experts, along with partners including Texas Parks and Wildlife Department and the National Park Service, are leading efforts to re-establish the fish.

“If successful, the Rio Grande silvery minnow reintroduction effort at Big Bend would help us meet one of our critical recovery goals and contribute to the overall recovery of the species,” says Wally Murphy, supervisor of the Service’s New Mexico Ecological Services Field Office.

It would also serve as an example of how to restore the fish to other parts of the river. >>

LEFT: USFWS. TOP: JEN BACHUS

While far from healthy, this remote part of the river holds promise due to its high-quality freshwater spring inflows. It is the ideal place to combine reintroduction efforts with riverine and riparian restoration.

“Because the Big Bend reach is so remote and not really in anyone’s backyard, we have to work together and leverage resources to get this work done,” says Harper. “It is a vast improvement on the way work has been done in the past and is exemplary of the direction our agency is headed with partnering and collaborative conservation.”

Long-Term Monitoring on the Rio Grande

Equally important to on-the-ground conservation efforts is inventory and monitoring of the Rio Grande silvery minnow and its habitat. The Service has released more than 2 million silvery minnows into the Big Bend reach, but the fish are not surviving to the size and age where they can spawn.

“We need to go step by step and find out what is happening with these fish at every stage of their life cycle,” says Montagne. “There simply is no silver bullet solution to save the silvery minnow. The best we can do is to continue to restock, study, learn and improve. Once we identify the pinch points, we can respond in turn with appropriate conservation management actions.”

Helping to identify these pinch points and answer other questions is the Desert Landscape Conservation Cooperative (LCC). Its coordinator, Genevieve Johnson of the Bureau of Reclamation, describes the Desert LCC as a partnership of public- and private-sector organizations that have come together voluntarily to address climate change and other ecosystem stressors impacting life in the Mojave, Sonoran and Chihuahuan desert regions of the southwestern United States and northern Mexico.

Along the Big Bend reach of the Rio Grande, the Desert LCC is working with

an interdisciplinary team of researchers and managers, led by the National Park Service and others, to develop a monitoring plan to guide management decisions. Recently, the Desert LCC funded a project led by Utah State University to synthesize and analyze data on abundance trends, habitat requirements and population trends of species in this target area.

“This information will inform recommendations for future monitoring and research,” says Aimee Roberson, the Desert LCC’s science coordinator. “Our ultimate goal is to give decision-makers the knowledge they need to most effectively manage the life-sustaining water resources of the Big Bend reach now and into the future.”

Pushing Forward for the Silvery Minnow

Every achievement on the Big Bend reach—whether it is successful minnow spawning in the wild, increased dispersal of the fish from release sites or reforestation of key riparian areas—motivates Service staff to keep pushing forward.

This year, the Desert LCC will co-host a forum on the Rio Grande where stakeholders will discuss what has been done to date, what lessons have been learned and what should be done next for conservation and management of the river and its tributaries.

At the same time, the Service is expanding captive-breeding and monitoring efforts for the silvery minnow along the Big Bend reach. Both efforts are emblematic of the collaborative problem solving called for in the complex environments of this day and age and into the future.

Will there be a happy ending on the Big Bend reach? The little silvery minnow will let us know. □

AISLINN MAESTAS, External Affairs,
Southwest Region



The Big Bend reach supports wetlands with dozens of native fish, mussels that are being considered for listing under the Endangered Species Act and more than 500 species of birds.



Rio Grande Identified as One of Five Emphasis Areas for Southwest Region

As a way of making conservation efforts as effective as possible with limited resources, the Service's Southwest Region is concentrating conservation on five geographies or "emphasis areas," where it can achieve the greatest return on investment. Among the five is the Rio Grande.

Charged with breaking down silos, the Rio Grande Emphasis Area Team (RGrEAT) is uniting Service programs under a single shared vision for the landscape: healthy, abundant riverine and riparian habitats capable of sustaining native fish and wildlife for generations to come. It is also teaming up with a host of partners on both sides of the Mexican border.

Over the next five years, RGrEAT will prioritize conservation issues for the landscape and set measurable goals and objectives. The team has already received \$39,000 in seed funding from the Service and \$67,000 from the National Park Service to advance riparian habitat restoration work and increase monitoring of fish populations on the Big Bend reach of the Rio Grande.

At the same time, the Service has funded an experimental program to rear Rio Grande silvery minnows at Uvalde National Fish Hatchery in Texas to meet stocking needs for the Big Bend reach.

In October, Service staff released the first batches of juvenile silvery minnows into the reach from Uvalde and Dexter Southwestern Native Aquatic Resource and Recovery Center in New Mexico. Monitoring activities for fish, invertebrates, water flow and quality, and habitat conditions will inform science-based instream flow recommendations to support a healthy river ecosystem.

RGrEAT is also emphasizing community engagement and awareness through environmental education and youth employment.

According to Monica Kimbrough, National Wildlife Refuge System Middle Rio Grande coordinator, "We need to understand our communities and create opportunities for residents to connect with and appreciate these resources. An educated and informed public that understands, values and protects the Rio Grande corridor is key to achieving our conservation goals."

Together, RGrEAT's diverse group of stakeholders hopes to achieve tangible, sustainable results for people and wildlife along the Rio Grande. □

Border Crossing

Working together across state lines to protect the magnificent Great Lakes



NOAA GREAT LAKES

(Top) The Great Lakes contain 6 quadrillion gallons of water — one-fifth of the world's fresh surface water.

(Right) Environmental Research Laboratory Aquatic species such as Lake sturgeon depend on a healthy Great Lakes ecosystem to survive.



KATIE STEIGER-MEISTER/USFWS

by JOANNA GILKESON

Ever hear of State Wildlife Action Plans? Every state in the country has a congressionally mandated Wildlife Action Plan that guides their fish and wildlife conservation actions, including actions for species that are not hunted or fished. The plans serve as tailored conservation blueprints, allowing each state to determine and specify their priorities and species of greatest conservation need. The plans are critical and popular because state conservation practitioners can formally identify their needs and justify conservation decisions.

State and Tribal Wildlife Grants through the Service's Wildlife and Sport Fish Restoration Program (WSFR) support the plans and help get them off the shelf and on the ground. Congress requires states to review and revise their plans every 10 years. The latest revision was in fall 2015.

But even as these personalized plans are implemented at the state level, conservation dilemmas are becoming more complex than ever before—ecology, climate and natural processes do not recognize state lines—and conservation practitioners must adapt.

“Within the Great Lakes region, the Wildlife Action Plan coordinators often talk about collaborating more,” says Amy Derosier, State Wildlife Action Plan coordinator for the Michigan Department of Natural Resources. “We understand the importance of looking across boundaries if we want to conserve species and habitats. But given our positions and our state borders, it can be difficult to do this effectively.”

Thinking more broadly about conservation can lead to addressing the true size and scope of an environmental issue more effectively. This landscape-level thinking is at the forefront of current conservation philosophies and will continue as the world changes.

This is where Landscape Conservation Cooperatives (LCCs) rise to meet today's most pressing environmental challenges. LCCs comprise federal, state, tribal, private and nongovernmental entities that come together to address common, cross-boundary conservation issues.

In 2013, the Upper Midwest and Great Lakes (UMGL) LCC initiated a project designed to discuss landscape-level conservation and regional collaboration within Wildlife Action Plans of the nine Great Lakes states. The project connected individual states as they revised their plans and facilitated the sharing of tools, resources and strategies that could support regional efforts across the plans. States involved with the discussion were Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, Pennsylvania, New York and Wisconsin.

Through this LCC effort, states unanimously agreed that regional collaboration was critical to conservation success.

“The LCC has provided a venue and directed resources to help us connect,” says Derosier. “Having the LCC step up to be a facilitator across state lines for the Wildlife Action Plans in this region has been a significant step toward real collaboration. The Wildlife Action Plan coordinators are excited to have our plans revised so that we can begin to coordinate the implementation of our plans across boundaries and help drive conservation in the Great Lakes region.”

Now that the states have finalized their revised plans, the UMGL LCC plans to bring states and their partners together again to discuss commonalities among their Wildlife Action Plans and think strategically about implementing plans for the Great Lakes region and beyond. States will also define resources needed to get their conservation actions on the ground. The LCC will continue to fuel this collaborative energy.

Dave Scott, Midwest Assistant Regional Director of WSFR and co-chair for the UMGL LCC, praises the funding support of WSFR for helping to promote state-based conservation. But, he recognizes that there is more to be done to conserve fish and wildlife and their habitats—the gems—of the Great Lakes.

“Now that we have the LCC engaged, we have a forum that facilitates planning and conservation actions by our state partners that are no longer constrained by political boundaries,” Scott says. “Our conservation actions as a community are focused at a landscape level and more effectively address the issues faced by fish and wildlife resources across our region. By pooling our resources and coming together, we can do better conservation.” □

JOANNA GILKESON, External Affairs, Midwest Region



USFWS

(Above) Swainson's warblers are part of a suite of birds that serve as good indicators for several species of bats.



Sharing the Land

Making sure wildlife doesn't get crowded out of the South Atlantic landscape

by JEFF FLEMING

Loggerhead sea turtles need intensive management, which makes them a poor indicator for the health of beach nesting birds.



ORSULAK/USFWS

Accelerating urbanization will create at least three sprawling mega-regions in the southeastern United States by 2060 — cities linked by suburban corridors.

One will encompass most of the Florida peninsula, and another will link cities along the Gulf Coast from the Florida Panhandle to Houston.

The third will sprawl from Nashville, Tennessee, and Birmingham, Alabama, in the west through Atlanta, Georgia, South Carolina's Greenville-Spartanburg and Columbia before ending in North Carolina's Research Triangle and Charlotte. Now home to 34 million people and a gross regional product of \$1.1 trillion, this mega-region is projected to develop additional land equivalent to that of South Carolina by 2060.

The logistical challenges this mega-region will present are staggering, and finding better ways for people and wildlife to share the landscape is an increasingly urgent priority. »

Regional leaders must anticipate and meet an enormous future demand for infrastructure and resources, while trying to prevent wholesale ecosystem degradation.

That's pressure — on conservationists, business owners, city, county and state planners, policymakers, farmers and citizens. But much of this pressure will fall on the region's wildlife and natural systems.

The partner agencies and organizations of the South Atlantic Landscape Conservation Cooperative (SALCC), including the Service, are working to understand how future development pressure will affect the sustainability of fish and wildlife, and to define desired future landscape conditions that account for these stressors.

Perhaps most important, they're pressing planning and development authorities to consider the needs of wildlife and natural systems when making current and future land-use decisions.

"Things change as you get into the urban frontier," says Rua Mordecai, the SALCC's science coordinator. "What works for larger sustainability efforts in rural areas doesn't work so well as you get into suburban urban communities. By connecting urban planners and conservation professionals, we can help natural and developed environments work together more effectively to sustain both species and ecosystems."

Along with other Southern LCCs, the Southeast Climate Science Center, the Service and many other federal and state agencies, SALCC partners are working overtime to develop a first generation Southeast Conservation Adaptation Strategy in just 15 months.

This region-wide strategy is designed to spotlight the needs of the area's diverse fish and wildlife and protect the more than \$17 billion in annual economic activity these resources support.



The SALCC is working with experts from the American Planning Association to influence the way future development and planning decisions are made. Together, they're focusing on preserving and protecting the region's exceptional aquatic diversity and providing the public with more opportunities to access these resources.

The Tennessee River watershed, for example, is home to more than 270 fish species — more than four times the number found in the Columbia or Colorado watersheds.

"This is about taking shared action and knocking down barriers that keep these conversations from occurring," Mordecai says.

The SALCC has also brought the Service together with representatives of more than 80 organizations to develop a shared vision for the South Atlantic geography. Partners have identified target levels for a suite of natural resource indicators that define a healthy ecosystem capable of supporting abundant and diverse populations of native fish, wildlife and other species.



(Top): The American oystercatcher needs healthy beaches.

(Above) The South Atlantic area is continually adding more people and roads. It may never top Times Square, but who knows?

Through aggressive monitoring and evaluation, the SALCC continues to test underlying assumptions and revise indicators as needed.

For example, biologists initially believed loggerhead sea turtles might closely represent or be good indicators for healthy beaches capable of supporting beach-dependent nesting birds such as the American oystercatcher.

But they soon discovered that the turtles' need for intensive management, including predator control and active nest relocation, made them a poor indicator for the health of beach-nesting birds. As a result, researchers developed revised indicators and continue to test them.

"We've got to be careful about picking big charismatic species and leaving behind big chunks of aquatic diversity found in this geography and other parts of the Southeast," Mordecai says. "We know no one species is a perfect indicator. The point is to look at collective indicators."

The emphasis on monitoring and evaluation is helping SALCC members make important and surprising new connections between species and ecosystem health. This includes the discovery that a suite of birds found in forested wetlands, including such species as Swainson's warblers, serve as good indicators for several species of bats.

"It's no surprise that the initial suite of species identified and the population objectives set for them are often imperfect and incomplete," says Bill Uihlein, the Service's Southeast Assistant Regional Director for Science Applications. "By applying adaptive management principles and evaluating their effectiveness, we can continually refine and improve as we learn. For example, critical evaluation has already yielded information such that some of the species have already been replaced with more suitable species."

The SALCC is helping partners evaluate and monitor data more quickly than ever. The blueprint has already been revised twice, and partners are planning regular annual updates to help both land managers and policymakers improve their ability to respond to change.

"Sometimes our typical plan revision time frames don't work. Five- to 10-year scales are way too slow, given the rapid change we're seeing," Mordecai says. "We've got to give managers and policymakers the information they need to make accurate, timely decisions."

Service project leaders formed the South Atlantic Leadership Team (SALT) to help the agency align its conservation work to contribute to the blueprint's desired future conditions. The result has been an unprecedented effort to work across programs and field stations at a landscape scale.

"SALT is bringing capacity together across nearly 40 field stations, and tapping the experience of more than 60 project leaders to develop innovative ways to help achieve shared biological objectives," Uihlein says.

While planning for the future is critical for proactive conservation, taking action today is also essential.

Last summer the SALCC's work played a vital role in securing \$1 million for prescribed fire work at St. Marks (Florida), Okefenokee (Georgia) and Great Dismal Swamp National Wildlife Refuges (North Carolina and Virginia).

For the Service and its partners, it's all part of thinking big and planning for the decades to come.

As Uihlein says, "We want to end up with the future landscape we choose, rather than the one someone else leaves us." □

JEFF FLEMING, External Affairs Southeast Region



In turn, the Service and participating agencies and organizations have begun aligning conservation work to achieve these targets and measure shared success at a landscape scale. It's called the South Atlantic Blueprint, available at <www.southatlanticlcc.org>.

"The blueprint is helping us make better decisions about where to deliver conservation for the future," says SALCC Steering Committee member David Viker, Chief of the Service's National Wildlife Refuge System in the Southeast Region. "We're in a dynamic business—the best place today could be under water or pin-striped with black asphalt in 10 years."

Connect the Connecticut

A landscape conservation design for the Connecticut River watershed takes shape

by BRIDGET MACDONALD

Encompassing New England's largest river system, the Connecticut River watershed provides important habitat for a diversity of fish, wildlife and plants from such well-known species as the bald eagle and the black bear to threatened and endangered species such as the piping plover and the dwarf wedgemussel.



The watershed is also a source of clean water, recreation, food, jobs and more for millions of people living in Vermont, New Hampshire, Massachusetts and Connecticut.

The best long-term strategy for sustaining natural resources across this kind of large landscape is to keep vital parts of it intact and connected. Connect the Connecticut is a collaborative effort to identify the best places to start—the areas within the watershed that partners agree should be priorities to ensure that important species, habitats and natural processes will be sustained into the future, even in the face of climate change and land alteration.

“This is truly a groundbreaking effort, building on a long history of collaborative conservation in the watershed,” says Ken Elowe, a former state wildlife agency director in Maine who now heads the Service’s Science Applications Program in the Northeast Region.

“For the first time, we have the science capability to pinpoint habitat needs—what kind, how much and where—to sustain fish and wildlife species at desired population levels across a large area like the Connecticut River watershed,” Elowe says. “And we will know how the watershed contributes to broader species and habitat goals for the entire Northeast.”

Using the best available science and information from the North Atlantic Landscape Conservation Cooperative (LCC), a team of partners representing 20 state and federal agencies, academic institutions, and private organizations spent more than a year creating a conservation “design” for the watershed. Outlining a network of core areas—intact, connected and resilient places within the watershed—the design serves as a roadmap for conservation.

The effort also featured a modeling approach developed by the Designing Sustainable Landscapes Project at the University of Massachusetts Amherst.



Connecticut River

One of the keys to developing the Connect the Connecticut design was selecting 15 species as representatives for others that rely on similar habitats within the major types of natural systems in the watershed.

For example, the blackburnian warbler was selected to represent hardwood forests. By ensuring that high-quality habitat for these representative species was included in the design, the partners were able to address the needs of a range of fish and wildlife.

More than just a map, the conservation design includes a variety of datasets and tools that people from all sectors can access to make more informed decisions about managing lands and waters that provide habitat for wildlife, and support local economies and the overall health and well-being of communities.

Service staff members in the watershed region describe Connect the Connecticut and how the design can help inform their work:

Andy French, project leader, Silvio O. Conte National Fish and Wildlife Refuge:

This effort has generated scientifically based products that visually illustrate a sense of priority and importance for connecting a mosaic of partner-conserved lands. The design highlights strategic opportunities to focus our communication and collaborative efforts with our many partners who are working at various scales within this large and vibrant working landscape.

Several of the products, such as the representative species models, help inform

land acquisition decisions made by the refuge, as well as by our partners. Together, the models project the impacts of climate change, road crossings and barriers to aquatic species passage.

Further, these products will also help us assess and quantify land management and restoration opportunities in our Habitat Management Plans and our place within the 1.8 million-acre existing conservation network in this watershed.

Georgia Basso, biologist in the Service Coastal Program and liaison to the Long Island Sound Study:

The design gives us the potential to be much more strategic in habitat restoration and land acquisition for the Long Island Sound Study, a state and federal partnership to restore and protect the sound.

It offers perspective we didn't have before and provides an extremely powerful tool for helping prioritize limited dollars in important areas where it is expensive to do conservation work — coastal Connecticut and New York.

The design shows quantifiably where the highest quality forest is located. Combined with what we already know about this region, it can show us where it is most beneficial to increase connectivity, and will help us better allocate the money we have to protect land in a variety of ways, such as increasing buffers and working against development forces to mitigate impacts. □

BRIDGET MACDONALD, Science Applications, Northeast Region



Blackburnian warbler



Black bear

Protecting the Flint Hills

Surrogates
of the Vast
Tallgrass Prairie

by STEVE SEGIN



Greater prairie-chickens on the booming grounds in the Flint Hills, putting on their best dance moves in the largest remaining block of tallgrass prairie in the world.

Who hasn't imagined traveling back in time to witness an important event in history—or simply to correct a mistake?

Yes, actual time travel is still just science fiction, but in the Flint Hills of Kansas, anyone can look back into the past and see what the vast tallgrass prairies of the West looked like for millennia.

And today, a committed group of partners is working to protect, restore and expand this vanishing part of the North American landscape before it's gone forever.

In 1806, when explorer Zebulon Pike first gave this area the name Flint Hills, there were 170 million acres of tallgrass prairie in North America. A century later, nearly all of it had been plowed under to feed a rapidly growing nation.

Only 4 percent or so of that once vast ecosystem remains—roughly 80 percent of which is found in the Flint Hills of Kansas and northeastern Oklahoma. That this remnant still exists is due to the unique geography of the Flint Hills.



Topeka shiners are a surrogate for other species.

Early settlers found that the rocky flint beneath the grasses made it difficult to plow or farm. They left vast tracts of the prairie undisturbed to provide forage for grazing cattle as well as habitat for more than 100 native species of grassland birds and 500 native plant species.

To help protect and conserve this unique and important landscape, biologists and land managers from the Service and the Kansas Department of Wildlife, Parks and Tourism (KDWP) have joined with landowners and local communities to create the Flint Hills Legacy Conservation Area (FHLCA).

Established in 2010, the FHLCA is designed to help maintain the integrity of tallgrass prairie wildlife habitat, stream water quality and the rich agricultural heritage of the Flint Hills by acquiring and protecting up to 1.1 million acres of habitat through voluntary, perpetual conservation easements.

Nearly 50,000 acres have easements or are awaiting appraisals.

These conservation easements will also help to protect the region's sustainable ranching culture and the many landowners who have been stewards of the tallgrass prairie for generations.

"The Flint Hills has a strong and rich history of preserving the ranching heritage and the tallgrass prairie ecosystem. The U.S. Fish and Wildlife Service's conservation easement program will provide a voluntary opportunity to preserve this heritage for future generations," says Mike Collinge, a Flint Hills rancher.

Working together, a cross-programmatic interagency team of state and Service employees also identified a set of key species endemic to the tallgrass prairie ecosystem that can serve as biological indicators of ecosystem health.

These preliminary "surrogate" species were jointly identified from those previously recognized in the Kansas State Wildlife Action Plan and on Service priority species lists. They include the greater prairie-chicken, northern bobwhite quail, Henslow sparrow, upland sandpiper, Eastern meadowlark and selected guilds of mussels and fish.

"By identifying shared surrogate species, we were able to develop a less biased approach with our Kansas partners, resulting in a demonstrated need for more scientifically based information," says Mike Estey, a biologist with the Service's Habitat and Population Evaluation Team.

Since then, the team has been working to test whether these species can effectively serve as indicators for the health of other species and the ecosystem itself, and to identify critical information gaps that need to be addressed in order to better

understand how various species complement and interact with each other at a landscape scale. Other barriers such as a lack of access to private lands and limited management tools and resources have also been identified.

"There are some challenges ahead of us," says Stephen Torbit, Assistant Regional Director for Science Applications in the Service's Mountain-Prairie Region. "This first step was to define species and determine what data we needed to have, and we are well on our way to completing that."

This species-focused conservation approach brought Service employees together from across the region, helping to break down programmatic and field-based barriers to leverage the expertise of dozens of staff.

"We were able to tap into biological and programmatic expertise from every program in the region," says Torbit. "We successfully brought together multiple programs into a team focusing what we need to know to improve our understanding of the ecology and management of the Flint Hills."

The use of surrogate species enabled the team to implement a strategic, landscape-scale approach to conservation in the Flint Hills that will help the Service and its partners test, evaluate and adjust their conservation work to gradually improve efficiency and magnify the impact of available resources.

"We have to adjust our goals and priorities to fit our fiscal and statutory capabilities," says Torbit. "But the real takeaway is that any new information will benefit species and habitat conservation in Kansas, regardless of the outcome of this particular process." □

STEVE SEGIN, External Affairs,
Mountain-Prairie Region



Conservation for Sustainability

(Top) Landscape connectivity is the most often recommended climate adaptation strategy in conservation science literature. (Facing page) Climate change is having profound effects on biological systems in Alaska. Waterfowl, like this emperor goose, are nesting eight days earlier on the Yukon-Kuskokwim Delta, with increasing temperatures a likely cause.

Programs and international partners stand together to ensure the future of Alaska's rich social-ecological system

by CHARLA STERNE *and* MIKE SPINDLER

Alaska is home to millions of migratory birds, hundreds of thousands of caribou, some of the world's largest salmon runs, a significant proportion of the nation's marine mammals and half of the nation's fish catch. The state's harsh climate, pristine waters and vast, un-fragmented landscapes have allowed natural processes to unfold with little human interference for most of history.

Yet in recent decades, even Alaska has begun to show signs of stress due to rapid change.

Oil and gas development, mineral mining, logging and biofuels, population growth and urbanization are fragmenting the landscape.

Road and infrastructure development is increasing access to remote areas, further fragmenting habitat and facilitating the introduction of invasive species.

Accelerating climate change amplifies each of these impacts.

The state's average annual air temperature has increased at two to three times the global rate, while its growing season has lengthened by 50 percent over the last century. The average extent of summer Arctic sea ice in Alaska waters has declined by more than 30 percent since 1979. Permafrost, which physically supports the ground surface and influences water availability and species distributions, has been warming since the 1960s.

The combination of climate and land-use change is disrupting Alaska's biological systems. Waterfowl are nesting on the Yukon-Kuskokwim Delta an average of eight days earlier from when than they were in the 1980s, as May temperatures increase, leading to earlier snowmelt and breaking up ice on the river. On the Kenai Peninsula, warm summers followed by warmer winter temperatures have contributed to making spruce bark beetle infestations in southcentral Alaska part of the largest outbreak recorded in North America. As ice-free winter conditions in southwest Alaska increase, the percentage of pacific brant overwintering in southwest Alaska, rather than their traditional winter areas in mainland Mexico, has increased from about 2 percent of the population to 20–30 percent. >>



Many more changes are expected.

These changes are forcing the conservation community to rethink longstanding assumptions about how best to manage Alaska's lands and ecosystems sustainably for both people and wildlife. By collaborating at a landscape scale, the Service and its partners are moving forward to address these challenges in new and innovative ways.

"The time to act is now," says Amanda Robertson, coordinator of the Northwest Boreal Landscape Conservation Cooperative (NWB LCC). "We have the unprecedented opportunity to protect and sustain an ecologically connected landscape while it is still relatively intact, which is far easier than restoring it once it's gone."

From Species to Landscapes

Making this conservation opportunity a reality requires strategies that make wise use of declining budgets while effectively integrating the Service's interests with those of partners to address increasingly complex conservation challenges.

In January 2013, the Alaska Region identified priority species for the geographic areas of each of the five LCCs in Alaska using consistent criteria, including biological status, ecological significance and social importance.

These selections, which include such species as polar bear, black brant, buff-breasted sandpiper and caribou, will be evaluated regularly to ensure that conservation remains focused on the right things in the right places, and that these priority species support broad ecological benefits wherever possible.

Working together across programs, regional teams are now developing conservation frameworks that identify measurable objectives, limiting factors and key threats for each species, as well as determining critical information gaps and prioritizing management actions into a near-term conservation strategy.



RYAN HAGERTY/USFWS

(Top) An open pit gold mine near the headwaters of the Little Chena River, Fairbanks. The Chena River is the second most important Chinook salmon spawning stream in interior Alaska. (Bottom) The Yukon River Chinook salmon, which is a keystone to the overall health of the river systems on which they depend and associated terrestrial ecosystems, is bringing conservation partners together in an effort to ensure its future.

Focusing on these species and their associated conservation frameworks brings needed emphasis to conservation investments, allows the Service to align staff expertise and resources where they can have the greatest impact, and helps shape landscape planning efforts.

Regional leaders are also developing a prioritized regional science plan based on needs identified in conservation frameworks and directing resources toward implementing highest priority actions.

These priority species and conservation frameworks are also important resources as LCCs integrate shared landscape conservation priorities and objectives into their landscape conservation designs.

The Alaska Region and the NWB LCC

The NWB LCC is one of the nation's largest LCCs, spanning more than 330 million acres of boreal forests, alpine habitat, wetlands and rivers that range from sea level to the highest point in North America—Mount Denali. This landscape features the region's major metropolitan hubs and transportation infrastructure, including the two largest cities in Alaska—Anchorage and Fairbanks—and the largest city in Canada's Yukon—Whitehorse.

As a true international collaboration, the NWB LCC is a growing partnership among more than 26 U.S. and Canadian federal and provincial/territorial agencies, nongovernmental organizations, tribes/first nations and institutions of higher education.

The NWB LCC seeks to conserve “a dynamic landscape that maintains functioning, resilient boreal ecosystems and associated cultural resources.” Partners are working on the science to guide shared conservation efforts geared toward maintaining landscape connectivity for wildlife, people and ecosystem processes. This is a goal around which the conservation community and stakeholders can easily coalesce.

The Service both benefits from and contributes to NWB LCC landscape-planning processes and products. Service biologists and managers can work with partners to maintain the landscape characteristics necessary to sustain priority species. At the same time, LCC planning products can be used to refine regional conservation and land-use plans, and can help Service managers see the resources they manage in the broader context of the landscape.

The Alaska Region's priority species figure prominently in the LCC's landscape planning effort, with seven of 11 LCC focal species also identified as Alaska Region priority species. These include the Yukon River Chinook salmon, a keystone to the overall health of river systems, associated terrestrial ecosystems and interconnected watersheds.

The Yukon River Chinook salmon is prized as a subsistence and commercial species and is a globally significant resource; their management is guided by multinational treaty obligations. The species' future depends upon the ability of conservation partners to join forces and think large-scale.

Alaska's refuges play an important role in maintaining the ecological connectivity of the NWB landscapes. The Bureau of Land Management's Central Yukon Resource Management Planning effort encompasses more than 60 million acres, which includes much of the intervening land between seven national wildlife refuges, three

national parks and several other state and native corporation land management units.

BLM planners are applying NWB LCC products to help plan for landscape resilience and identify priority areas needing special management attention. There is general agreement among LCC partners that close cooperation could enhance future connectivity between the parks and refuges.

The results of this effort will also show how partner organizations can take a more holistic approach to planning and informing on-the-ground conservation and policy decisions.

For instance, watersheds surrounding Kanuti National Wildlife Refuge are highly vulnerable to current and potential future mineral exploration and development due to their high mineral content and easy access to major transportation corridors and infrastructure. Kanuti is working with BLM on behalf of the six other northern and interior Alaska refuges to develop planning alternatives that would best protect watersheds upstream from the refuge. Science provided by the NWB LCC will also help BLM guide mineral development in more sustainable ways.

Conservation challenges facing Alaska demand a strategic, proactive and collaborative approach that relies heavily on cross-program integration and partnerships with landowners, state and local governments, tribes, federal agencies and conservation organizations. By standing shoulder to shoulder and using a landscape approach, stakeholders will ensure that trust resources and the communities they support can enjoy a more certain future. □

CHARLA STERNE, Climate Change Coordinator, Alaska Region, and MIKE SPINDLER, Kanuti National Wildlife Refuge, Alaska Region

Islands of Shelter by Design

Wildlife and people benefit from forward-looking landscape conservation vision for California's Central Valley

by SCOTT FLAHERTY

For migrating birds, such as waterfowl, and other wildlife, the Service's 10 refuges and six wildlife management areas in California's Central Valley have served for decades as islands of shelter in a shifting sea of agricultural development. But for wildlife and managers of these refuges, the present and future reality looks increasingly grim.

Consecutive years of severe drought and its associated problems have had a devastating impact on the land's ability to support wildlife and people across a 42,000 square-mile landscape nearly as large as West Virginia.

For partners in the California Landscape Conservation Cooperative (CA LCC), the Central Valley is a global biodiversity hotspot and a priority for conservation. It provides significant resting and nesting spots for tens of millions of birds migrating along the Pacific Flyway and habitat for other wildlife, including dozens of imperiled species. The valley is also the largest producer of fruits, vegetables and other agricultural products in the nation.

This landscape, stretching more than 450 miles from Shasta County in the north to Kern County in the south, is highly vulnerable to continuing land-use changes, invasive species, climate disruption, pervasive drought and other factors contributing to habitat loss and fragmentation.

"It wasn't that long ago when I would hear about climate change and mentally acknowledge it as something we would deal with at refuges in the future," says Dan Frisk, project leader at the 68,000-acre Sacramento National Wildlife Refuge Complex. "Now climate change is right in my face, and I am managing a refuge through consecutive years of severe drought. It's a challenge."



USFWS

Dan Frisk is project leader at the 68,000-acre Sacramento National Wildlife Refuge Complex.

The giant garter snake, a threatened species, can be found on agricultural and refuge wetlands and other waterways in California's Central Valley.



BRIAN HANSEN/USFWS

For Frisk and his colleagues, those challenges mean being strategic about how, when and where to use available surface water—both permanent and temporary—to feed seasonal wetlands and other habitats for migratory birds and threatened and endangered species such as the giant garter snake, valley elderberry longhorn beetle and vernal pool species.

Frisk and other project leaders and refuge managers are not just changing the way they manage their land; they're expanding the refuge's traditional alliance of partners and working with the CA LCC and its Central Valley Landscape Conservation Design (LCD) Project.

In addition to refuge managers and biologists, there is strong participation from the Service's Ecological Services and Fisheries and Aquatic Conservation programs and the Central Valley Joint Venture.

The LCD Project engages resource managers and scientists who have been working for decades on conservation in the Central Valley, including members of state, federal and local agencies, nonprofits and existing partnerships.

Together, they're working to develop climate-smart adaptation strategies and actions using an adaptive-planning cycle that helps them identify impacts of climate change and other stressors, and evaluate possible management responses.

"We're developing a shared vision for the future of the Central Valley's biodiversity, identifying adaptation strategies that will help resource managers identify on-the-ground actions that anticipate and address future conditions," says CA LCC Science Coordinator Rebecca Fris.

Over the past year, partners held three workshops to develop a shared landscape conservation design.

“It's beneficial to hear from new voices at the table. I am always learning something new or acquiring more depth of knowledge on things I've learned from others.”

Dan Frisk, project leader at Sacramento National Wildlife Refuge Complex

"We benefit from our work with our traditional refuge partnerships, but the LCD workshops really amp things up by providing new models that are really making a difference to how we are managing on the ground," Frisk says. "It's beneficial to hear from new voices at the table. I am always learning something new or acquiring more depth of knowledge on things I've learned from others."

The group began by identifying the most important factors affecting biodiversity in the Central Valley—water availability, combined with a broad mix of human activities that influence landscape conditions.

Then, partners projected how varying changes to these drivers would affect habitat conditions in the valley. The resulting Central Valley Future Scenarios document provides partners with a range of possible conditions to consider when developing management actions over the 50-year planning horizon.

"The best case scenario we labeled California Dreamin.' At the other end, it was California Dust Bowl," Frisk says, adding that all scenarios indicate increased demands for resources, especially water. "At the end of the day I ask myself, 'what can I do?' and focus on the things we can control."

To develop effective shared adaptation strategies and actions for these varying conditions, the partnership identified a shared list of habitats, groups of species and individual species that can be used as indicators of a healthy, functioning network of ecosystems in the valley. Experts then assessed the vulnerability of these priority habitats and species to the changes described in the future scenarios.

The partnership is moving forward to develop adaptation strategies and a set of maps to guide climate-smart actions in the future.

Frisk believes the formal conservation design process will benefit the Sacramento refuge complex into the future. "I know that our management needs and challenges are going to be addressed because the refuge is at the table and part of the design process," he says.

For Frisk, the future is now. With his staff, he's working to manage his water allocation to ensure seasonal wetlands are irrigated and "filled with groceries" for the millions of migrating waterfowl and other wetland-dependent birds that descend on the refuge's wetlands between August and April. He knows that this year, refuges may be one of the few places in the valley with a welcome mat out for the birds.

"We typically see about 300,000 acres of post-harvest rice fields and other agricultural land in the valley flooded and ready for migrating birds to feed on," Frisk says. "This year we're expecting somewhere between 75,000 and 100,000 acres. Our refuges may be the only show in town, and we have to be ready." □

SCOTT FLAHERTY, External Affairs, Pacific Southwest Region

For more information about the Central Valley LCD Project, visit <CaliforniaLCC.org>.

The San Joaquin kit fox, an endangered species, is one of several Central Valley species that will be assessed for their vulnerability to a changing landscape over the next 50 years.



SCOTT FLAHERTY/USFWS



Seasonal wetlands at Sacramento National Wildlife Refuge host millions of migrating waterfowl as well as provide habitat for rare species.

CARLY SWEET/USFWS

This is a series of curiosities of the Service's history from the U. S. Fish and Wildlife Service Museum and Archive. As the first and only curator of the museum, Jeanne M. Harold says the history surrounding the objects in the museum give them life.



A large industrial printing press, likely a Linotype or similar, with a large roller and a frame labeled "GODD PRINTING PRESS CO" and "CHICAGO ILL U S A".

got it to print his etchings himself. Riggers had to be hired to get it from his basement and put onto a custom pallet. Shippers had to be found to get it to West Virginia. When it arrived, we couldn't even get it off the truck because our lift couldn't accommodate its weight. So we had to get a special lift to do that. We then had to move all the furniture to get it in the museum storage area, rent special dollies and use about a million workers to push it in. Whew! Hope we don't have to move it again! This will discourage me from my habit of rearranging the furniture!

NCTC has a new poster in our Chronology series. This is a chronology of USFWS signs from 1903 until present. It is a 12-inch-by-18-inch poster and goes with our previous series of badge and patch chronologies. Email <jeanne_harold@fws.gov> with your name and address if you would like one.

In one of our cabinets sits a small garbage can made out of an elephant's foot (highlighted in Curator's Corner earlier). Upon seeing this object, I am constantly (and fondly) reminded of one of my elderly volunteers who is now passed to the great beyond. He often offered me his words of wisdom from his experiences traveling in African elephant country. He warned me never to drive over elephant poop, because the large critters eat very thorny plants, and the thorns don't digest well and end up in the poop. He said he once got a flat tire from one of these thorns. I am glad that there are very few elephants roaming around West Virginia and more glad that white-tailed deer don't pass big thorns in their poop! On a more serious note: Our volunteers mean the world to us, and they give us their time because they are passionate about wildlife conservation. Thank you, volunteers.

A photograph of an adult elephant and its calf walking from left to right. The adult elephant is in the foreground, and the calf is slightly behind and to the right. They are both walking on a light-colored, sandy or dusty ground. The background is a plain, light blue sky.

In the Instructional East Building at NCTC sits an awesome airboat. It is the first all-aluminum airboat that could be loaded onto a trailer by one person. It has an airplane engine, no seat (the driver knelt), a car steering wheel, and was invented by maintenance folk in the late 1940s at the Bear River

transitions

Headquarters



Bill Wilen, a career Service employee with nearly 40 years in the National Wetlands Inventory (NWI) Program, has retired. Bill started with the program shortly after earning a Ph.D. in forestry from the University of Massachusetts and saw NWI grow into a leadership role on wetland conservation.

Bill was there in 1987 when President George H. W. Bush declared “no net loss of wetlands” and helped develop the Service’s decadal status and trends report of the nation’s wetlands that measures the success or failure of achieving that goal. Bill also participated in the beginning and completion in 2014 of the Service’s 40-year effort to map all wetlands of the lower 48 states thereby completing a major NWI milestone. Most recently, Bill helped develop, field test and in April 2015 overhaul the coding of the Wetland Classification System, which is the Federal Geographic Data Committee (FGDC) Standard for the country. In 2014, the Department of the Interior honored Bill with the Distinguished Service Award—its highest honor—for his

technical support and unfailing advocacy for wetland conservation. Bill plans on spending his retirement fishing, managing his forest in Massachusetts, road biking, and most likely working on strengthening wetland regulation and protection. □

Southeast



Donald J. Voros, refuge manager at Southwest Louisiana National Wildlife Refuge Complex, retired at the end of 2015 and shared a few thoughts before he went.

As I sit here reflecting upon 41 years with the federal government (38 with the Service and three with the military) and before I turn my computer off for the last time and celebrate unloading about 25 passwords from my brain, the first thing that comes to mind is: WOW, what a journey!

The Fish and Wildlife Service gave me the opportunity of a lifetime to travel and aid in the management of this country’s natural resources all across America. I had the opportunity to work throughout the Southeast Region on refuges in North Carolina, South Carolina, Georgia, Florida and Louisiana as a refuge manager; worked in Alaska as refuge manager at

Arctic National Wildlife Refuge and later as the Acting Deputy Assistant Regional Director for the Federal Subsistence Program in Anchorage; had an incredible experience working in Washington, DC, as the Branch Chief for Wildlife Management and later worked in all the Pacific Coast states as a refuge supervisor. What a tour and what a challenge.

I think back on the numerous big issues I worked on: the compatibility lawsuit, the first Environmental Impact Statement for the National Wildlife Refuge System, creation of the Hanford Reach National Monument, restoration of the Salton Sea, Arctic Refuge oil and gas exploration and development, federal management of subsistence hunting and fishing in

Alaska, hurricane recovery from Hurricanes Rita and Ike, and more. What an opportunity and adventure.

More importantly I will not forget all of the great people in our agency who believed in me and helped me along the way—too many to list all names and many are retired so I will not even try. But let me say this: My generation is leaving behind an incredible system of lands and water bodies that represent numerous hard-fought battles to protect. It is now time to pass the baton to the next generation. Be courageous, take calculated risks, be persistent with your initiatives and think and implement your decisions tactfully.

God bless and goodwill to all! □



Still Going Strong

At 64 years old, Wisdom the Laysan albatross is the world’s oldest known banded bird, and in November she and her mate returned to Midway Atoll National Wildlife Refuge and Battle of Midway National Memorial. Wisdom has raised as many as 36 chicks and is sitting on another egg. Wisdom has nested at Midway Atoll each year since 2008.



MARA KOENIG/USFWS

We're All Connected

On November 20, Minnesota Valley National Wildlife Refuge started a cooperative relationship with Chongqing Jinyunshan National Nature Reserve in Chongqing, China. The two sites are partnering to promote educational exchanges and practical cooperation in environmental education and protected area interpretation cross cultural experiences. Pictured here are Refuge Manager Tim Bodeen and Mou Weibin, director of the Chongqing Jinyunshan National Nature Reserve.

honors

Pacific Southwest



The Service's Schoolyard Habitat Program "is helping bridge the way to nature from the classroom," says **Karleen Vollherbst**, the newest winner of the Sense of Wonder Award. The award celebrates the legacy of former Service employee and conservationist Rachel Carson by recognizing excellence in the field of environmental education and interpretation.

Vollherbst has completed 15 Schoolyard Habitat projects in the Sacramento, California, area, involving more than 3,000 students and their parents, 200 teachers, community members and Youth Corps service members. Schoolyard Habitats are created by students for students, usually on school grounds. They may include wetlands, meadows, forests and variations based on the local ecology. Many projects are started by one group of students and continued by future classes, providing habitat for

local wildlife and curriculum connections in the classroom. Vollherbst is now working at Stone Lakes National Wildlife Refuge in California.

She co-authored the *Schoolyard Habitat Project Guide*, and helps design and teach the schoolyard habitat program courses at the National Conservation Training Center. She also organizes annual training sessions and serves on the Pacific Southwest's Connecting People with Nature team. □

Midwest



The Prairie Science Class (PSC), an education partnership between the Service's **Prairie Wetlands Learning Center** and **Fergus Falls Independent School District 544**, has been recognized by the North American Association for Environmental Education (NAAEE) with its award for Outstanding Service to EE by an Organization (Regional Level). Accepting the award were the Service's Molly Stoddard (pictured, right) and Monique Davis (pictured, left), a fourth-grade teacher in the Prairie Science Class.

The PSC mission is to explore the prairie pothole ecosystem and manage the Prairie Wetlands Learning Center. Teachers from the Fergus Falls District are stationed at the Learning Center, where they coordinate instructional activities with their teaching peers at Cleveland Elementary School. The class also has the assistance of Student Conservation Association interns as well as Service environmental education specialists from the Prairie Wetlands Learning Center.

"For more than four decades, NAAEE has promoted excellence and impact in environmental education thanks to the tireless efforts of our members, supporters and affiliate organizations," says NAAEE Executive Director Judy Braus. "Our award winners represent bright spots across North America that show progress in our field across multiple disciplines and approaches, from teaching and community engagement to research and environmental justice." □

Service-wide

Two Service teams were honored as winners of 2015 Federal Energy and Water Management Awards for deploying cutting-edge practices that significantly reduce carbon pollution, protect the environment, reduce energy costs, and implement innovative practices and technologies.

One winning team **rehabilitated the Northeast Regional Office Building**, in Hadley, Massachusetts, in conjunction with the GSA and the building owner.

The LEED gold-rated building features a 108 kW solar PV system – the largest renewable energy system on a building fully occupied by the Service—as well as aggressive recycling, two pollinator gardens, innovative HVAC systems, energy-efficient lighting, low-flow fixtures, superinsulation and low-emitting materials to provide a healthy work environment. Thanks to these multiple sustainable strategies, the building effectively takes the greenhouse-gas emissions of 75 cars off the road. A new plumbing system will save an estimated 136,425 gallons of potable water annually.

On the other side of the country, the other winning team **designed and constructed the Corn Creek Administrative Office and Visitor Center at Desert National Wildlife Refuge** in Las Vegas, Nevada.

The new high-performance LEED Platinum-certified Visitor Center at the Corn Creek Field Station is net-zero energy use with a 91.5 kW solar PV power system and showcases state-of-the-art sustainable design techniques and technologies including water-source heat pumps as well as heat-reflecting paint, a cool roof, integrated daylighting and energy-efficient lighting, energy recovery ventilation, and water conservation technologies. Many building elements are composed of recycled materials.

Both winning projects showcase efficiency features that can be replicated and offer visitors the opportunity to learn from site displays. □

in memoriam

Southeast



Denny Holland (pictured with wife, Kathy) died November 20 in Eufaula, Alabama,

after a long struggle with cancer. He was 81. Denny embraced the U.S. Fish and Wildlife Service mission as his own when he was a small child and his dad served as refuge manager at Carolina Sandhills National Wildlife Refuge in South Carolina. His father managed at several other refuges, and Denny followed this conservation tradition by serving at refuges throughout the Southeast Region, including Santee National Wildlife Refuge, Cape Romain National Wildlife Refuge, Holla Bend National Wildlife Refuge, Eufala National Wildlife Refuge, Back Bay National Wildlife Refuge and Chincoteague National Wildlife Refuge. During his more than 30 years of active service, Denny mentored both his staff and colleagues, and passed on the Service gene to a daughter who works for the agency.

In so-called retirement, Denny was a founding member of the FWS National Heritage Committee—a nationwide steering committee for Service history work. He also was a founding member the FWS Retirees Association, a group that began with a dozen or so

members, and now, 15 years later, numbers more than 2,000 retirees. Denny also continued to teach courses at the National Conservation Training Center and conduct oral histories.

Denny was involved with the Service for 76 years, and the agency has been immeasurably enriched by his myriad contributions. □

Alaska

Clay Hardy, a career Service employee who played a pivotal role in the research that aided development of the Alaska National Interest Land Conservation Act (ANILCA), died October 7.

He worked more than 30 years with the Service. Those included nearly a decade in Alaska, where he and his team scoured the vast Alaskan landscape by air, water and land to identify the best habitats to add to the National Wildlife Refuge System. The information, so-called "d2 studies," was called for under the authority of the Alaska Native Claims Settlement Act. It added roughly 56 million acres to the Refuge System.

Hardy was among the people invited to the White House on December 2, 1980, when President Jimmy Carter signed ANILCA. For the next eight years, Hardy filled several positions related to implementation of ANILCA and served as the Service's representative on the Alaskan Land Use Council. Among his honors was the Department of Interior Meritorious Service Medal. □

parting shot

For Rails

Service biologists teamed up with Girl Scouts of California's Central Coast in November to build floating nest platforms that will be used by federally endangered light-footed clapper rails in Ventura County this spring.



ASHLEY SPRATT/USFWS

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