



# Our Stories

## *Southwest Science Applications*

### Inventing the SHC Wheel:

#### *The Role of Inventory and Monitoring in Landscape-Scale Conservation*

There's an old quip in the U.S. Army that goes something like this: "I'm not exactly sure what Logistics are, but I'm pretty sure I need some." That humorous take on an essential service that keeps the military wheels in motion (the root meaning of "logistics" is "skilled in calculating") makes for a nice analogy to the work of the Fish and Wildlife Service's inventory and monitoring professionals. Their services, too, have not been widely understood, but there is an increasing awareness they are needed—particularly as the agency implements strategic habitat conservation (SHC). The scientific services "i&m" offers are embedded in the SHC wheel—in biological planning, conservation design, assumption-based research, and outcome-based monitoring—and these professionals are helping the Service reinvent how it carries out its conservation mission. They are, in fact, helping the whole organization become more "skilled in calculating."

So what is inventorying and monitoring? In fish and wildlife conservation, it is the systematic and scientifically sound collection, analysis, interpretation, and management of data for the ultimate purpose of determining conservation and management actions to be taken

***"In our division, we were carrying out this work on National Wildlife Refuges before anyone knew the term." - Andrew Hautzinger***



Hydrologist Kundargi @ Bitter Lake NWR

*USFWS Hydrologist Darrell Kundargi downloading data and calibrating the monitoring station at the Lake St. Francis sink hole on Bitter Lake NWR. The station monitors weather, water levels, and water quality information. Credit: USFWS.*

and whether those actions are yielding the desired biological results. Inventory and monitoring involves consideration of wildlife needs and threats as well as the human dimension of laws and rights.

Andrew Hautzinger, chief of the Division of Water Resources in the Service's Southwest Region, is quick to point out that inventory and monitoring (small "i," small "m") has been around for a very long time. "In our division, we were carrying out this work on National Wildlife Refuges before anyone knew the term. We are physical scientists in

a world of biologists, so we have largely flown under the radar," he says. The inventory and monitoring work of his division involves issues of water quantity and quality and the complex world of State and Federal water rights.

Hautzinger has counterparts within the Refuges program as well as other programs, such as Fisheries and Migratory Birds. The critical importance of inventory and monitoring to SHC (e.g., it's pretty hard to set defensible biological objectives for a species without inventorying the number and needs of that species) has led to the funding of well-staffed Inventory and Monitoring divisions within the Refuges program across the Service. In the Southwest, the I&M division is led by chief Grant Harris and staffed

## Refuges I&M and Whooping Cranes

An excellent example of the scope of work done by Refuges I&M is what was accomplished at Aransas National Wildlife Refuge for the whooping crane, a Federally listed endangered species and a conservation priority for the refuge and Service. At 5 feet in height, whoopers are the tallest bird in North America and one of the rarest. All of the whooping cranes alive today, both wild and captive, are descendants of the last 15 remaining cranes that were found wintering on the Texas Gulf Coast at Aransas Refuge in 1941. Refuges I&M Coordinator Kris Metzger says that by 1980, population numbers grew to an estimated 70 birds, but a drought in 2008-09 led to concerns over possible whooper mortalities. A debate ensued internally and externally over the appropriate management actions to take for whoopers in light of the drought. Metzger says it became clear that a formal protocol for collecting data on the cranes to verify population numbers was needed so that if the refuge took action, it would be correct and defensible. Ecological Services also needed this information, she said, given their role in endangered species recovery.



*A whooping crane resting in vegetation at Aransas National Wildlife Refuge. Credit: USFWS.*

The protocol for surveying whooping cranes took 3 years to develop and involved collaboration between I&M staff, refuge staff, and refuge leaders at the field and Regional Office levels. “What we bring to the table can be a hard sell because it may involve changing the way business is done,” Metzger says. Division Chief Grant Harris adds, “In the end, it is about a commitment to scientific excellence, which is a value we share across the Service. Each player in the process has something to contribute, from the field biologist to the Regional Office biometrician. What we are looking for is a seamless exchange of information that leverages everyone’s expertise.”

**Influence of whooping crane population dynamics on its recovery and management** by Matthew J. Butler, Grant Harris, and Bradley N. Strobel is the 2014 winner of The John R. Morgart Award for Outstanding Contribution to Scientific Publications and can be downloaded at <http://www.sciencedirect.com/science/article/pii/S0006320713000980>. The protocol developed for Aransas is available at [http://www.fws.gov/southwest/refuges/docs/WHCR\\_Winter\\_Abundance\\_Survey\\_Protocol\\_2014\\_single.pdf](http://www.fws.gov/southwest/refuges/docs/WHCR_Winter_Abundance_Survey_Protocol_2014_single.pdf).

by biologists, biological statisticians, landscape ecologists, and remote sensing specialists, including I&M Coordinator Kris Metzger. In Fisheries, the New Mexico Fish and Wildlife Conservation Office, led by project leader Tom Sinclair, has supervisory fish biologists like Stephen Davenport who also carry out inventorying and monitoring work, for Refuges, Bureau of Reclamation, and the Southwest Landscape Conservation Cooperatives (LCCs). The Migratory Bird Program’s Regional Nongame Migratory Bird Coordinator, Bill Howe, and Assistant Coordinator Dave Krueper oversee inventory and monitoring of nongame birds at national and hemispheric scales, regularly engaging with partners inside and outside the Service.

While i&m professionals have different niches to fill and roles to play within the Region, they regularly work in collaboration and their goal is the same: To increase the Service’s scientific capacity to carry out its mission to conserve fish and wildlife and their habitats and to create a body of scientific knowledge that can be built upon for years to come.

In Refuges I&M, this means taking a holistic and comprehensive approach that begins by looking at a refuge within the

context of its ecosystem and asking the question, “What are the most pressing conservation and management issues to be addressed?” Once priorities are identified with a given refuge, Harris says, I&M relies on its skilled and experienced staff to develop scientifically sound protocols for inventorying species populations and habitat conditions

and monitoring them over time. This information helps to ensure that the management actions taken to address a conservation priority are the right ones, carried out in the right places, are based on peer-reviewed science that will stand up to scrutiny, and are having their desired effect. “We provide information that managers and decision makers can

*USFWS Hydrologist Paul Tashjian at the oxbow on Bitter Lake NWR. Paul is working with the Refuge to reconnect the oxbow with the Pecos River. The oxbow, a U-shaped body of water, was created when the river was previously channelized to straighten it, thus isolating part of the river bed. Credit: USFWS*



## Watershed Is Boundary for Refuges Division of Water Resources

Ninety percent of the work the Division of Water Resources carries out is on refuge lands, where, in Division Chief Andrew Hautzinger's mind, the highest compliment he can receive is to be treated as if he is a member of a refuge's staff. At the same time, he adds, "We are really trying to scale up the narrative that we are telling. It's about more than looking at inflow and outflow on 'refuge x'; it is also about our neighbors, such as the Forest Service, National Park Service, State agencies and private landowners. We are making a landscape assessment and looking at how our refuge, in its hydrologic context, is affected by other issues in the watershed." Hautzinger says he is encouraged that coordinators of science in different programs and organizations are talking together and also changing the scale from "postage stamp management" to working with partners across the watershed. "We are developing a much broader network of partners than those just related to refuge operations," he says. In the process, they are accessing a wider suite of tools, emerging technologies and approaches because of that expansion into broader scientific communities.

"From a hydrologist's perspective working on river systems," Hautzinger says, "the watershed is your boundary. So you try to understand, from the very beginning, all the connectivity between the bottom, middle, and upper portion of a watershed; and you know that everything you see at the bottom is a result of what happened upstream." One of the most empowering things about his 25-year career spent in three Federal land-management agencies has been the opportunity to serve as the translator between different worlds and different bodies of science. "This is a catbird seat job," he says. "We can tell biologists what engineers can and can't do on their dams; and we can tell dam operators that they can make a big difference by operational changes that improve environmental conditions for aquatic habitat below their dam. This is very much the center of our point of influence."



*USFWS Hydrologist Darrell Kundargi working with an SCA intern to measure water flow in the canal at Cibola NWR. The canal flow leads to a co-op farm and the Hart Mine Marsh Unit. The Service collaborates the monitoring of the canal with both the farmer and the Bureau of Reclamation. Flows into the Hart Mine Marsh are important, as they support habitat for the Yuma clapper rail, an endangered marsh bird. Credit: USFWS.*

act on with confidence and that they can build on from year to year," Harris says. That information can be applied on or beyond the refuge, Harris notes, and can help to ensure that scarce conservation resources are applied where they matter most.

What they do has implications beyond a single refuge or the Refuge System. Harris says, "Monitoring allows us to avoid being duplicative as we work with

States and other Feds and partners at the landscape scale." He cites I&M's work with the National Park Service as a case in point. "We don't want to be doing the exact same thing they are doing. They bring botanical and abiotic expertise to Refuges, and they see us as the faunal experts, so we address their bird monitoring. By working together and pooling resources, we are scientifically and fiscally efficient," he says.

*The South Weir water gauge on Bitter Lake NWR that acts as a water measurement station. Weir gates are an example of how the Division of Water Resources measures water quantity to calculate water flows. Credit: USFWS.*



Hautzinger and his staff work alongside their sister I&M division in Refuges to address issues related to the one resource no living thing can survive without: water. In the West, it is all about water and always has been, demonstrated in the fact that western states established a body of law in the 1800s about how scarce water resources would be allocated. The governing principle in western State water law is "first in time, first in right." In the early 1900s, the Federal Government put forward a doctrine of Federal reserved water rights that allows the Government to reserve sufficient water to fulfill the purposes for which public lands have been set aside for the American people. Hautzinger explains that within the Federal system, of which the Service and its National Wildlife Refuge System are a part, the operative word is "comity"--the legal principle that political entities will mutually recognize each other's legislative, executive, and judicial acts and reciprocate each other's judgments out of deference, mutuality and respect. This is the terrain in which he and his team of six operate as they carry out their work to determine how much water is required to meet the needs of wildlife within the Southwest Region's refuges. "Wildlife is at the top of the list for us, but not for everyone. Sometimes interactions are adversarial; often, the conversation occurs over 20-30 years if it



*The threatened Pecos bluntnose shiner (above left) and Arkansas River shiner (above right) are just two of the many species Supervisory Fish Biologist Stephen Davenport and his team monitor. Credit: USFWS.*

involves Federal reserved water rights,” Hautzinger says.

For Hautzinger’s division, inventory and monitoring involves establishing water flow gauges to determine how much water is coming into a refuge and how much is going back into the riverway, then navigating the politics of ensuring wildlife get what they need. On the water quality side, he and his team are looking for things such as dissolved oxygen levels, levels of salinity, and pollutants, all of which are factors in the viability of wildlife.

For supervisory fish biologist Stephen Davenport, the importance of inventory and monitoring can’t be overstated. “The key product of the New Mexico Fish and Wildlife Conservation Office is data, and science is data-driven. Without data, I’m just another guy with an opinion,” Davenport says. With data, he points out, Fisheries can provide the technical

support needed by partners, Refuges, LCCs, and others. “For example, if we have data that show resilience of a fish population for 5 years, and then 2 years in a row we see catch rates have gone down sharply in concert with the river drying up, we can then give an expert technical recommendation based on data. We can say that the river drying was a factor in causing the decline of the fish. Without consistent protocols for inventorying and monitoring, you don’t know the distribution of the fish or its abundance either, so you can’t make such judgments with surety,” he says.

Davenport emphasizes that study design is always crucial. “Getting the right amount of data at the right times of year for a long-enough period of time is what enables us to analyze the information and say what environmental factors

are causing declines and increases in fish populations,” he says. For threatened and endangered species, this information is valuable for the development of biological opinions and recovery plans. His scope of responsibility includes monitoring of the threatened Pecos bluntnose shiner, as well as a suite of fish in the Pecos for the Bureau of Reclamation to determine if their activities are causing declines in fish populations. His work is very much driven by partner needs. For example, the Great Plains LCC funds Davenport to do long-term monitoring on one of its priority species, the Arkansas River shiner. He notes that the Fisheries program has responsibility for monitoring the Rio Grande silvery minnow, a species of concern to the binational Desert LCC.

***“Without data, I’m just another guy with an opinion.” - Stephen Davenport***

### **Fisheries and the Pecos River**

Supervisory fish biologist Stephen Davenport and his team in the New Mexico Fish and Wildlife Conservation Office are funded by Refuges I&M to monitor the fish community on the Rio Hondo, a small tributary of the Pecos River that flows through a portion of Bitter Lake NWR near Roswell, NM. The Rio Hondo is in bad shape as a result of channelization and effluent from the City of Roswell’s sewage treatment. The refuge discovered not only a State-listed fish, but also found Federally listed invertebrates in the spring-fed Rio Hondo.

“What we are doing rolls up into a much larger Refuges restoration effort to restore portions of the refuge and improve water quality,” he says. The Pecos has had two recent restoration efforts, one to restore a meander bend and remove a mile of channelized river and another to widen the river and create habitat at specific points. Davenport is overseeing the inventorying of fish in the Rio Hondo to establish a baseline of what is currently there so that when the restoration is complete, the fish can be restored in both the Pecos and the Rio Hondo. He and his team will go on to monitor the persistence of the species and the trajectory of fish populations over the long term, providing data that will allow the refuge to gauge the success of the restoration project.



*Monitoring site on the Rio Hondo, Bitter Lake NWR east of Roswell, NM.*



*Migratory bird conservation should occur rangewide wherever the stressors exist, which includes breeding, migration, and wintering landscapes. Reddish egret nestlings (left) and adults (right) on Zigzag Island, Laguna Madre, TX. Credit: M. Clay Green.*

The Migratory Bird Program is also involved with Southwest LCCs and has a special appreciation for their landscape-scale, partner-driven approach. As Regional Nongame Migratory Bird Coordinator Bill Howe points out, “One thing that sets us apart as a program is the scale at which we operate: Our geographic scale is determined by the birds we are working with—it is range-wide, so it is national and hemispheric in scope, depending on the species.” Howe explains that the job of the Migratory Bird Program as a whole is to conduct the inventory and monitoring that will determine the population status of all 1,026 nongame migratory birds in North America that are protected by the

Migratory Bird Treaty Act. As those data are gathered, the program works with partners internally and externally, nationally and internationally, to help direct or facilitate conservation actions where they are most needed.

Assistant Coordinator Dave Krueper further explains, “To accomplish conservation of migratory birds, we look at their full annual cycle, which includes breeding, winter, and migration two times per year; and we do that over a period of as much as twenty years. We are looking for the bottlenecks, the limiting factors that are affecting their sustainability.” Depending on their findings and the species’ life cycle, conservation actions may be needed in breeding grounds as far north as Canada or the Arctic tundra



or in wintering habitat as far south as Mexico or Argentina. “We have to be prepared to address both,” Krueper says. “Taking conservation action in a breeding habitat won’t solve a problem that is occurring in wintering habitat.”

Howe and Krueper point out that conducting the i&m that is required to keep a finger on the pulse of migratory

### **Migratory Bird Program and Reddish Egrets**

The Southwest Region Migratory Bird Program works on a range-wide basis with the Southeast Region and Mexico on reddish egrets, a rare bird that specializes in hypersaline lagoon systems such as the Laguna Madre in Texas as its breeding grounds. “This is a priority for us because there are probably less than 20,000 of these birds in the world—perhaps as few as 5,000 breeders—and 40 to 50 percent of the birds occur in Texas,” Nongame Migratory Bird Coordinator Bill Howe says.

They are using satellite transmitters to see how reddish egrets move around the globe. “There is so much we don’t know about these birds’ status and life cycle. While they breed in the Bahamas, the Caribbean, the Gulf Coast of the United States, and two parts of Mexico, how they disperse outside the breeding season is very poorly known. There appears to be three different population units with very different dynamics, and that the populations don’t interact with one another much, if at all,” he says. Krueper adds that it is not completely certain whether the bird is simply rare or whether its numbers are declining. “Given that the reddish egret is strictly a coastal bird, we anticipate that climate change could lead to imperilment,” he says. “Our inventory and monitoring will help to determine how plastic these birds are so that we take measures to support them as needed.” As a result of monitoring, follow-up by Mexican cooperators revealed the largest known colony of reddish egrets in the world in Chiapas, Mexico.



*A juvenile reddish egret in lower Laguna Madre, TX that has been fitted with a satellite transmitter. The transmitter will collect data on the reddish egret migration patterns. Credit: M. Clay Green.*

Howe says that regionally, their priorities are based on what species they believe they can have the most impact on, but adds that nearly every species requires multi-regional cooperation. When conservation measures are required for nongame migratory bird species, it occurs through partnerships, Nongame Migratory Bird Assistant Coordinator Dave Krueper says. The Migratory Bird Program’s multi-partner Joint Ventures, for example, take the data supplied by the population side of the house and work through their land bird, shorebird, water bird, and waterfowl committees to address identified needs on the ground. Partners in Flight, an international partnership whose goal since its formation in 1990 is to “keep common birds common” and to address species in actual and serious decline, is one of the most effective tools that has come about to conserve and manage landbird populations at the hemispheric scale.



*A mixed flock of waterfowl and wading birds at Laguna Atascosa National Wildlife Refuge. Credit: USFWS.*

birds has been going on for many years. While the Service surveys waterfowl intensively, the cornerstone of the nongame program is that it addresses large suites of nongame birds as a tool for deciding conservation priorities regionally and nationally. Satellite monitoring has opened up a whole new world for them; but the system still used for monitoring the largest number of birds in the United States is the North American Breeding Bird Survey, operated out of the Patuxent Wildlife Research Center in Laurel, MD. “It is a standardized protocol for roadside counts that has been in use since 1966 and provides a highly effective way to determine population trends for more than 400 species of birds,” Howe says.

The Migratory Bird Program also participates in all three of the Southwest Region’s LCCs, with two international Joint Ventures active in the Desert LCC. The challenge Howe sees in meshing the efforts of multiple partners with the work of LCCs is the scale at which work is accomplished according to mission. “Some of what we do in the Migratory Bird Program crosses the geographic areas of multiple LCCs, so creating

## ***“We must be ready to scale up and scale down in our thinking.” - Bill Howe***

consistencies in our efforts across LCCs is important. We must be ready to scale up and scale down in our thinking, as we hope our LCC partners will do as well,” he says.

Equally important to all those involved in inventory and monitoring in all Southwest Region programs is data management. They say it is essential that the data produced are centrally housed and managed so that it can be used and built upon with confidence by future generations of managers and decision makers. “The information we produce for the Region and the Service isn’t just in someone’s file cabinet or in danger of being washed away by a hurricane,” Harris says. “It is protected and available.”

Harris points out that all the programs are funded by public money and that the public is entrusting the Service with responsibility to deliver on its mission. “They don’t care what division we are

part of; they just want us to do the right things,” he says. “For all of us in inventory and monitoring, the charge is the same: Determine what is at issue, ensure it is a priority, identify what we need to know to address the question or problem, and get the science that will allow on-the ground delivery of actions that will respond to the problem in a way that makes a difference,” he says.

Hautzinger views the landscape-scale focus in the Service as a wonderful beginning of having the pieces fit together in ways that connect different parts of the watershed and fosters understanding of the rich interrelationships. He says, “With this broader scope we are taking, we are bringing Refuges’ influence to bear outside of the boundaries of refuge lands and making a very important contribution to the broader community. We should be very proud of that.” ♦ *Southwest Science Applications Team*

U.S. Department of the Interior  
U.S. Fish & Wildlife Service  
Southwest Region  
Science Applications  
500 Gold Ave SW  
Albuquerque, NM 87102

Dana Roth  
Assistant Regional Director for Science Applications  
505/248-6928  
Or  
505/248-6277

*October 2014*