

Eddies

Reflections on Fisheries Conservation



Eddies

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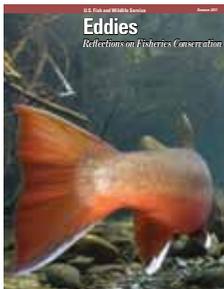
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On the Cover:

National Geographic
photographer Joel Sartore got underwater
with bull trout and took
this image. This photo
was taken in a tributary
of the Wigwam River, in
British Columbia.



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The threatened bull trout grow large. Learn more about the fish on page 16.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.



Headwaters

Our Wonderful World

By Bryan Arroyo



Hazel Arroyo

One of my favorite songs is “What a Wonderful World” by Louis Armstrong. The 1968 song is a perfect poem of optimism and expectation that came along at the height of discord in America: “I hear babies cryin’, I watch them grow. They’ll learn much more than I’ll ever know. And I think to myself, what a wonderful world.” Conservation by its very nature is an expectant look to the future. We work now for what the future may hold.

Thinking of the future reminds me of what biologist E.O. Wilson wrote regarding habitat and our duty to functioning ecosystems. “The one process now going on that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us.” It is because of our future generations that many of us have devoted our professional careers to the conservation of our natural resources. Years ago the Fisheries Program refocused its efforts on habitat.

At a young age I wondered about how nature works and that led me to observe all living things. I read everything that I could find about nature. With that reading came a fascination with habitats and all of their parts. Interrelated and interconnected—these pieces that make up habitat serve many natural functions, but also provide people with a variety of ecosystem services. A true conversation about these services and their actual values—economic and otherwise—is in its infancy, but I see a future where these services would be a part of the decisions made affecting our natural resources. A shift from our current approach that

involves circumscribing and limiting our conservation approach to the requirements of the various legal mandates will be necessary to truly achieve the promise of fully functioning natural systems. Only then can we take a balanced approach to the use of those resources. Much work remains to be done in order for us to evaluate in equal footing the benefits we all derive from fully functioning habitats.

A number of approaches toward ecosystem management have been pursued in the past by the U.S. Fish and Wildlife Service. Today we move toward conservation priorities at a landscape level. We have coined the term Landscape Conservation Cooperatives (LCCs). The LCCs are based on a scientific foundation modeled after the Strategic Habitat Conservation model with its components—planning, implementation, and evaluation. Our landscape approach to conservation is based on a solid scientific foundation and its implementation dictated on scientific priorities. This focus on habitats is more likely to achieve shared conservation goals and engage us in the much needed conversation about ecosystem services.

In this issue of *Eddies*, you’ll read about habitat conservation in action. Chip Gross delivers a story about the how the Fishers and Farmers Partnership makes better habitats in the upper Midwest. A suite of beautiful bull trout images grace our middle pages; the bull trout is a fish highly sensitive to habitat alterations. Lee Allen writes about “rites” of passage for people and fish, and how biologists and engineers team up for the good of habitat.

What a wonderful world we live in, and what a wonderful conservation legacy we can leave to our descendants. It is time to act and act boldly we must.

Bryan Arroyo is the Assistant Director for Fisheries and Habitat Conservation in Washington, DC.

Habitat research reveals surprising results



Although the addition of LWD created some pool habitat, which is preferred by brook trout, populations of brook trout did not increase following the LWD additions. It is likely that factors other than the amount of pool habitat, such as stream flow, limit brook trout populations in the streams of this study.

LWD – it’s a text-message acronym that only a fisheries scientist would use. It’s shorthand for “large woody debris.” Though it may sound clinical, the term is a broad expression of a class of fish habitats associated with terrestrial vegetation, when that vegetation is in the water. We’re talking habitat in the form of downed logs, brush heaps, or root masses of either living or dead trees, all of which in some manner shape the physical contours of streams—their depth, width, stream-bottom type, and the speed at which water flows. These influences from

outside a stream can create the foundational building blocks attractive to fish.

John Sweka, Ph.D., at the U.S. Fish and Wildlife Service’s Northeast Fishery Center located in Lamar, Pennsylvania, recently wrote an article in the scientific publication, *Journal of Fish and Wildlife Management* that examined the effect that LWD had on brook trout populations in several Appalachian streams. Sweka reported on research he had conducted on the response of native brook trout populations after introducing LWD into eight West Virginia streams.

Sweka examined brook trout numbers six years after adding LWD to the streams for the express purpose of creating preferred habitat. The results were surprising. The LWD had no apparent effect on trout numbers. While the created habitats may look “trouty,” the brook trout populations didn’t respond like most any biologist would expect. And that’s not a bad

thing. Sweka said the findings should challenge anyone to question the underlying assumptions made in habitat management—that the habitat being managed is actually the factor limiting fish numbers. Sweka said that boulders rather than LWD may have more to do with creating habitat in the streams he studied, given their steepness, and his results should guide others in the future. “More wood, more trout—that may not be the case in every stream,” said Sweka. You can read his article at www.fwspubs.org. ♦ Craig Springer

John Sweka/USFWS

Interior Secretary Ken Salazar meets Tribal YCC at Creston National Fish Hatchery

Secretary of the Interior Ken Salazar, along with Dan Ashe, Director of the U.S. Fish and Wildlife Service, met with members of the Northwest Montana Tribal Youth Conservation Corps at Creston National Fish Hatchery and learned how the YCC benefits students. Crew members told Mr. Salazar how their work allows them to get close to the outdoors, not just wishfully gaze from a distance, or read about nature from a book—but to be in nature. These two YCCers, Emily McCrae and Jaylin Ducharme, members of the Confederated Salish & Kootenai Tribe described the projects they completed this

summer and how important it is to protect and nurture the natural resources of their Flathead Reservation. So just as the day began sunny, when Mr. Salazar and Mr. Ashe left the Creston hatchery, a group of tribal youth also felt bright ♦ Mark Maskill



In July, Secretary Ken Salazar visited Creston National Fish Hatchery in Montana and met with students from the Northwest Montana Tribal Youth Conservation Corps and the Montana Conservation Corps.

Tami Heilemann/DOI Office of Communications

Fisheries Program turns 140 years old

The mid 19th century America saw many changes: societal upheaval, war, the expansion of industry. Amid all this, concern grew for our natural resources. Thinkers of the day began to see our natural resources not as an inexhaustible commodity, but as treasures worth conserving. Emerson and Thoreau set the philosophical foundations of conservation. Pioneer conservationist, George Perkins Marsh, anticipated the concepts of ecology in his 1864 book, *Man & Nature*. In 1871, a growing concern over our natural resources manifested in a Congressional resolution. In the first piece of legislation recognizing a federal role in conservation of natural resources, the 41st Congress passed the Joint Resolution for the Protection and Preservation of the

Food Fishes of the Coast of the United States.

The resolution recognized “the most valuable food fishes of the coast and the lakes of the United States are rapidly diminishing in number, to the public injury, and so as materially to affect the interests of trade and commerce.” President Grant was given authority “to appoint, by and with the advice and consent of the Senate, from among the civil officers or employees of the government, one person of proved scientific and practical acquaintance with the fishes of the coast, to be commissioner of fish and fisheries, to serve without additional salary.”

And thus, the U.S. Commission of Fish and Fisheries was created.

And to lead the charge as the first Commissioner, President Grant appointed Spencer Fullerton Baird, at the time, Assistant Secretary of the Smithsonian Institution. The U.S. Fish Commission is the progenitor of the U.S. Fish and Wildlife Service. Today’s Fisheries Program has evolved as our scientific knowledge has grown. Today, it is comprised of a network of dedicated professionals engaged in their chosen fields at 70 hatcheries, 64 Fish and Wildlife Conservation Offices, nine Fish Health Centers, and seven Fish Technology Centers. These professionals proudly carry the mantle of 140 years of fisheries conservation – descending from the oldest organized conservation effort in our nation’s history. ♦ Craig Springer

FEATURED FACILITY

Fairbanks Fish and Wildlife Field Office

Where: Fairbanks, Alaska

When: Established 1977

Then: Fisheries Program in northern Alaska began when the Ketchikan station was transferred to Fairbanks. The initial focus in Fairbanks was to provide fishery expertise to the National Petroleum Reserve in northwest Alaska, with later emphasis on baseline fishery studies in Arctic National Wildlife Refuge in northeast Alaska.

Now: The Fairbanks Fish and Wildlife Field Office (FFWFO) works with the Alaska Department of Fish and Game; Canadian Department of Fisheries and Oceans; Alaska Native organizations; communities; and other federal, state, and local agencies to investigate and manage aquatic resources in northern Alaska. FFWFO promotes effective fishery management through research and monitoring of Yukon River salmon and northern Alaska whitefish, char, and Arctic



FFWFO technician releases a Yukon River Chinook salmon after sampling for length and scales.

grayling. These activities occur in the vast region from the Yukon River to the Arctic Ocean and are complemented by fish passage, habitat restoration, outreach, and aquatic invasive species prevention programs. FFWFO holds a lead role in collaborative fishery conservation partnerships in northern Alaska. ♦ Jeff Adams

Orangeburg National Fish Hatchery celebrates a century

It has been 100 years since the first pond was excavated with the help of mules and pond scoops in the creation of Orangeburg National Fish Hatchery. Today the hatchery is an integral part of the community in Orangeburg, South Carolina, near Lakes Marion and Moultrie. The hatchery has made significant contributions to the area's renowned fishing opportunities. Striped bass produced there provide mandated mitigation for federal water projects in South Carolina and beyond, and also for restoration purposes along the coast. Shortnose sturgeon at Orangeburg are used to develop new culture techniques. Redbreast sunfish go to state-managed waters. The total economic impact of recreational fish production at Orangeburg was more than \$13.3 million in 2010, generating 127 jobs in many industries, worth \$3.3 million in wages.

Orangeburg is a destination for tens of thousands of people each year, offering innovative outdoor classrooms, a nature-explore playground, nature trails, bird watching, a 100-acre lake, and a visitor center with aquarium. By hosting special events throughout the year for youth, special needs groups, and senior citizens, the hatchery promotes the quality of life and conservation benefits of fishing and the importance of connecting people, especially children, to nature.



This hand-colored postcard dates back decades. Orangeburg National Fish Hatchery turns 100 on September 28, 2011.

Orangeburg will celebrate a century of fisheries conservation with festivities at the hatchery on September 28, 2011. For more information, visit www.fws.gov/orangeburg. ♦ Judy Toppins

Carp removal benefits June sucker in Utah Lake



This boat load of carp illustrates how prevalent an invasive species can become.

Common carp compete with June sucker in Utah Lake. And that's a problem – the June sucker is an endangered species. The presence of common carp, not only has created

unnatural interactions between the fish species, but has had a bad effect on habitat.

Occurring in large numbers, common carp in Utah Lake removed much of the submerged vegetation that provided predator refuge for larval and juvenile June sucker. With no place to hide, the young fish are vulnerable. In short, common carp populations limit the recovery potential for June suckers.

The Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service are enhancing

habitat in Utah Lake to improve recovery potential for the June sucker. That means removing common carp on a large scale.

It is work. Biologists pull seines and run traps to remove the all-too-common common carp. They aim to take out at least one million carp every year—that's about six million pounds of fish. The endeavors are funded in part by a \$1,000,000 U.S. Fish and Wildlife Service's State Wildlife Grant. The Utah Department of Natural Resources matched with \$500,000 to facilitate the fishing effort, monitor changes in the Utah Lake fish community, and purchase land and build a facility to use the carp for commercial purposes. Biologists hope to reduce the common carp population in Utah Lake by 75 percent and in the end make things better for the rare sucker. ♦ Connie Young-Dubovsky

Text book example—communicating conservation



Pat Conzenius/Wildlife Forever

This billboard delivers an important conservation message of the national Stop Aquatic Hitchhikers! campaign. In June 2011, the campaign attracted its 1,020th partner organization, which represents state and local agencies, businesses, conservation groups and even lake homeowner associations, all with an interest in keeping aquatic invasive species at bay. The campaign elevates equipment cleaning as a preventative and cost-effective way to deal with aquatic invasive species. The campaign's success will be a case study in a new text book, *Social Marketing: Strategies for Changing Public Behavior*, by Philip Kotler. ♦ Joe Starinchak

FROM THE ATTIC

Notes from D.C. Booth Historic National Fish Hatchery and Archives

You might be surprised at some of the things that are in the fisheries collection in our archives. They help form a picture of the realities of government service, even on a fish hatchery, back in the day. Coming to us from Little White Salmon National Fish Hatchery in Cook, Washington is one such set of items. Their sunny color belies the darkness, and their use probably fell under those “other duties as assigned.”

Neatly contained in a box marked with the Civil Defense symbol are three bright yellow meters, along with instructions and three pocket dosimeters. Sent to Little White Salmon as part of the United States' preparations for the Cold War, they were probably never used. Two of the meters were to be used to detect very high levels of radiation, which would likely signal an evacuation. These high levels could be from a nuclear weapon detonation or a meltdown of a reactor. The third meter was more sensitive, commonly called a Geiger counter, and could be used for training, monitoring of personnel, food, and water in shielded areas, or for



Tamra A. Allen/USFWS

The sunny-yellow color belies the dark nature of these instruments, used to measure radiation in the event of nuclear war. They were part of the Civil Defense program of the 1950s.

follow-up monitoring. The pocket dosimeters were personal monitors, perhaps to be worn by the operators of the counters. The set dates from around 1962. The recent tsunami in Japan, with resulting nuclear reactor problems, makes us wonder if we will need to put these into use. It would take something pretty serious, like a nuclear weapon, to let the counters out of our protective custody. ♦ Randi Sue Smith

Pioneers

By John Bryan

Dr. Mamie Parker



Arkansas Governor, Mike Huckabee, welcomes Dr. Mamie Parker, then a U.S. Fish and Wildlife Service Assistant Director, into the Arkansas Outdoor Hall of Fame in 2005.

The time is four decades ago.

Mamie Parker—this year’s salutatorian of Arkansas’ Wilmot High School—searches for a topic for her graduation speech. This African-American girl—the youngest of an

11-child family in one of the poorest counties in the nation—doesn’t know that she will one day live in the nation’s richest county and administer a \$250 million budget, 2,400 employees, 300 field stations and much more as an Assistant Director of the U.S. Fish and Wildlife Service.

Mamie considers what has shaped her young life. At the top of the list are her mother and the outdoors—themes that will become touchstones for future speeches: for Harvard, for the Aspen Institute, for Congress, and for the Bill Gates Millennium Scholars.

Mamie considers her mother, Cora Parker: a single-parent sharecropper who has given her children an appreciation for the value of people and a drive for education. “If you think education is expensive,” Cora would say, “try ignorance.”

Craig Springer/USFWS

Lessons from Cora Parker will flavor Mamie’s life and leadership style. Mamie’s “Invest in People” initiative will increase employee productivity for conservation during her years as Regional Director of the U.S. Fish

and Wildlife Service's New England Region.

Mamie considers her love for bugs and snakes and worms and catfish. She was Cora Parker's last chance to make one of her children into a fishing companion and a lover of the outdoors. Her classrooms have been southeast Arkansas' and northwest Louisiana's waters including Bayou Bartholomew—at 359 miles, billed as the world's longest bayou, and filled with 117 species of fish. Mamie's love is fishing these waters.

In a few years the U.S. Fish and Wildlife Service will recruit Mamie from a biology class at the University of Arkansas at Pine Bluff. U.S. Fish and Wildlife Service representative Hannibal Bolton will ask her class, "Who likes to fish?" Mamie's raised hand will lead to her career—one that will include a tremendous influence on fisheries and habitat nationwide through her positions in Wisconsin, Missouri, Minnesota, Georgia, Massachusetts and Washington D.C. Her accomplishments will include putting the Atlantic salmon on the endangered species list, negotiating with General Motors to clean up the Hudson, and restoring passage for salmon, shad, alewives and eels on the Penobscot River.

On Mamie's mind this senior year is disturbing news about pollution—including mercury and pesticides—threatening fish habitat. Perhaps this is a theme for her graduation speech.

The epiphany for the speech arrives in a song by Marvin Gaye: "Inner City Blues." A line in the song gets Mamie's attention: "Make me wanna holler and throw up both my hands!"

That's how she feels about pollutants, and she determines that her graduation speech is an opportunity to challenge her classmates to see that they all have responsibilities.

"I've been blessed to be able to touch lives through my voice. That's my gift," Mamie will say in future years after having success engaging the energies of diverse people and organizations to help fisheries and habitat. Hannibal Bolton—who will become a U.S. Fish and Wildlife Service Assistant Director himself—will say, "Mamie's demeanor and approach remove all skepticism. It's all about them and not about Mamie."

High school senior Mamie Parker will one day become an architect, catalyst, and leader for the most important and expansive fish habitat program in the history of the nation. Her *magnum opus* will be the National Fish Habitat Action Plan, a plan that will engage partnerships among federal, state, local, and non-governmental organizations.

Mamie's graduation speech is informed by her passion for catching bass and catfish and grinders with cane poles and nightcrawlers, and by her mother's life lessons. It is received enthusiastically by the whole town—high school graduation is a whole-town affair in little Wilmot.

In the next century the whole town will gather for another Mamie Parker speech—this time in Little Rock for her induction speech into a previously all-white club: the Arkansas Outdoor Hall of Fame. Arkansas Governor Mike Huckabee will do the honors. October 14, Mamie's birthday, will be declared "Mamie Parker Day." The whole town will buy copies of the

full-page-spread newspaper and save them, as Mamie's sister Debra will say, "for bragging rights."

As Mamie looks at her graduation audience she recognizes a secret feeling that she will never fully overcome: a feeling of inadequacy, of not belonging. She is a poor black girl integrated into a white school system, and she will become a black female scientist—a Ph.D. limnologist—in a white male domain. But this feeling will anneal Mamie's passionate belief in the value of individual persons.

Sister Debra will say this in 2011: "Mamie's accomplished a great deal, but I think she's still driven to succeed...and wants to make sure others get the same chance at success as she did."

Mamie's future is a singular trailblazing career that will protect and restore fish habitat in places as focused as Pennsylvania's coal-mine-damaged Williams Run, and as grand as the 295,710-square-mile Great Lakes Basin. Also in her future—after over 29 years with the U.S. Fish and Wildlife Service—is MA Parker Associates: her executive coaching and public speaking company. There will be many more speeches and interviews and consultations, all of which will summon her mother's constant charge: "Keep going and growing."◆

Smallmouth Bass

By Craig Springer

He may have been the most interesting man in the world.

Dieudonné Sylvain Guy Tancrède de Dolomieu—his name reads like you're walking into a vat of cold molasses. He was a radical thinker, fomenting revolution in France; he fought a duel at age 18, sentenced to prison for life and released by a petition of the Pope. He was a ladies' man, cavorted with nobility but never married; he belonged to the Royal Academy of Sciences and professed natural history at a Paris university. His name lives on: an Italian mountain range and a volcano in the Indian Ocean bear his name. Dolomitic limestone is named after him.

Smallmouth bass swim in streams that pour over stones of dolomite carry his name, too. A quintessential American fish was named by the French ichthyologist Bernard Germain de Lacépède, in honor of his countryman—both of whom never laid eyes on a live specimen. Two hundred years ago, Lacépède called it *Micropterus dolomieu*, as we still do today.

With five hundred years of angling literature behind us, expressions of how fish behave on the end of a line have grown threadbare by so much wear. Yet, it is hard not to personify some game fishes because they are so memorable. The smallmouth bass is one of them. It is irascible—the consummate game fish. Early in the 20th century, the smallmouth bass was the celebrated game fish in these United States. U.S. Fish Commission biologist, Dr. James A. Henshall, author of the 1881 treatise, *Book of the Black Bass*, wrote, “The black bass is eminently an American fish; He has the arrowy rush and vigor of the trout, the untiring strength and bold leap of the salmon, while he has a system of fighting tactics peculiarly his own. I consider him, inch for inch

and pound for pound, the gamest fish that swims.”

Originally, the smallmouth bass ranged through the upper Midwest to Quebec, southward to northern Alabama, and west to eastern edges Kansas and Oklahoma. Because of its sporting qualities, it has been widely introduced across the country, sometimes to the detriment of native fishes. In the late 1800s smallmouth bass went over the Appalachian Mountains into the Atlantic seaboard. Fish Commissioners of the western states and territories sponsored the delivery of smallmouth bass to their waters in the 1880s.

Cast in tones of greenish-brown, it's no surprise this fish is admirably called “bronzeback.” Surprisingly though, some have a difficult time identifying their quarry. U.S. Fish Commission biologist Fred Mather wrote this 1880s poem, “Bass,” to help anglers know the traits and habits of the smallmouth bass, so as to not be confused with largemouth bass, the only other known black bass at the time.

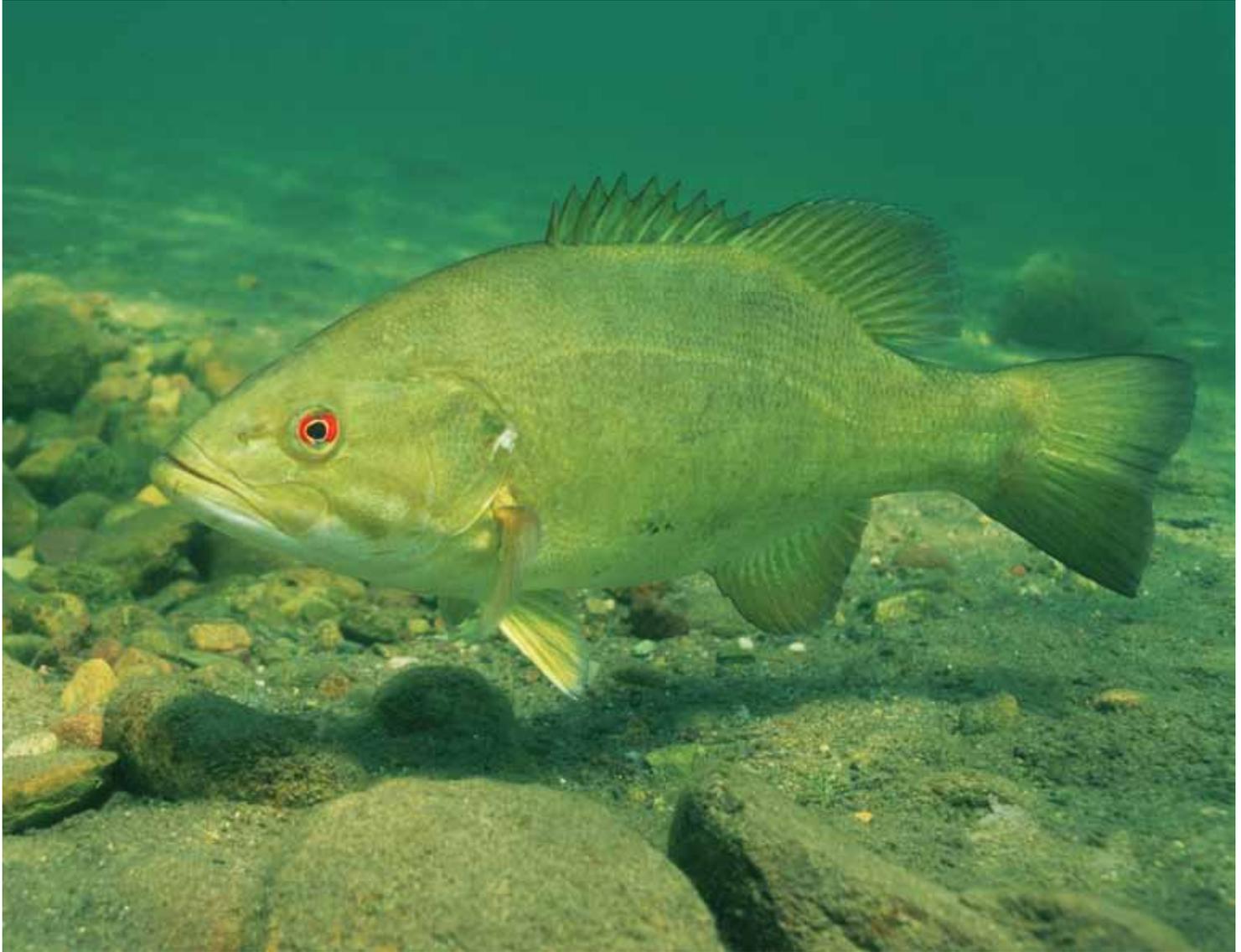
*The little-mouth has little scales,
there's red in his handsome eye. The
scales extend on his vertical fins, and
his forehead is round and high. His
forehead is round and high, my boys,
and he sleeps the winter through. He
likes the rocks in the summertime,
Micropterus dolomieu.*

It's corny, but it gets to the point. Smallmouth bass live in clear lakes with scant vegetation and cool, boulder-strewn streams with deep pools and moderate current. They prefer a lake bottom of boulders, ledges, or bedrock crevices. Stream smallmouth bass go to different parts of the stream according to time of day, but a bouldery bottom is prime

real estate. Smallmouth bass strongly associate with rock bass and northern hog sucker. There's some evidence of a symbiotic feeding relationship between northern hogsucker and smallmouth bass. The hogsucker has a concave forehead, a useful design for plowing into flowing waters. The concavity pushes the water over its head and its body down to the creek bottom where it peruses the bottom for food with its fleshy lips. The northern hogsucker frequents water during the day where nocturnal crayfish may hole up, avoiding sunlight. They dislodge crayfish, and there the smallmouth bass wait for easy pickings. So as a sucker feeds, so too does the smallmouth bass, underscoring the ecological relationships of two very different fishes.

Smallmouth bass eat mainly of crayfish, minnows, and insects with little doubt that the former is the favored fare. But since crayfish are nocturnal, they are not always readily available. Crayfish are most vulnerable at dusk and dawn, times when both animals are active. Smallmouth bass also dine on small birds, mice, snakes and salamanders, grasshoppers, and hellgrammites.

Smallmouth bass take up housekeeping in the root tangles of an old sycamore tree, under overhanging willows, or undercut banks on the outside bend of a creek. Rocks are extremely important for breaks from current and visual breaks for places to hide. Rocks are also necessary for spawning. Spawning starts when the water reaches 60 degrees in April or May—earlier than any of the sunfishes. Maturing at three years of age, the male fish fans out a four-foot-wide nest of large gravel in water less than three feet deep. Boulders or submerged



USFWS

Named for a French geologist by a French ichthyologist, the smallmouth bass is the quintessential American game fish.

logs and overhead shrubbery are almost always associated with nesting sites, probably to lessen the avenues whereby predators can attack. Three or more females may spawn in a single nest and a good smallmouth stream may harbor 400 nests per stream mile. The eggs hatch in about eight days then the sac fry immediately fall between the rubble where they cannot be seen. Two weeks after the eggs are laid,

tiny black fry rise from the rubble to hover above the nest. All the while the male relentlessly stands guard. Shortly thereafter, the fry disperse and fend for themselves.

With some luck, one in every several thousand fry may live long enough to make a memory, seizing a crankbait or hair bug and heaving out of the water like no other fish its size can do. ♦

Craig Springer remembers catching a smallmouth bass over slabs of fossil-littered limestone on an Independence Day picnic in 1974. He wrote a thesis on smallmouth bass habitat modeling 18 years later.

By W. H. "Chip" Gross

Healthy Farms and Fish

The Fishers & Farmers Partnership



When the National Fish Habitat Action Plan (NFHAP) was completed in 2006—signed into action by the Secretaries of the Departments of Commerce and Interior—the following four ambitious objectives were to be met in just five short years:

- Conduct a condition analysis of all fish habitats within the U.S.
- Identify priority fish habitats and establish Fish Habitat Partnerships targeting these habitats.
- Establish 12 or more Fish Habitat Partnerships throughout the U.S.
- Prepare a “Status of Fish Habitats in the U.S.” report by 2010 and every five years thereafter.

After much hard work by many federal and state agencies, as well as nongovernmental organizations, the first three objectives were achieved on time, and the fourth—the status report—was released in April 2011. Objective three was even exceeded, with 17 successful Fish Habitat Partnerships having been created.

One shining example of how anglers and landowners have worked together to improve fish habitat and fishing is the Fishers & Farmers Partnership (FFP), located in the Upper Mississippi River Basin. The Partnership includes large areas of Iowa, Minnesota, Wisconsin, Illinois, and Missouri.

The FFP represents both natural resources conservation and agricultural interests, including both state and federal agencies and nongovernmental organizations on its steering committee. The

Riparian ribbons snake alongside rivers and streams in the upper Midwest as vestiges of larger woodlands replaced by farms vital to the American economy.

FFP's goal is to use voluntary, non-regulatory means to conserve the 30,700 miles of streams in the Upper Mississippi River Basin. That particular landscape covers 189,000 square miles, two-thirds of which support agriculture. The Basin's flowing waters are habitat to about 20 percent of the freshwater fish in the U.S.

Heidi Keuler, a fishery biologist with the U.S. Fish and Wildlife Service's LaCrosse Fish and Wildlife Conservation Office in Wisconsin, was recently named coordinator of the FFP. "The Fishers & Farmers Partnership works with landowners to add value to their farms while restoring aquatic habitat, both on-site and downstream on the Mississippi," said Keuler, describing the essence of the endeavor. "Approved projects are undertaken by landowners, with flexible cost-share funding and technical support provided by conservation partners. Our aim is to keep agricultural profitability high, while at the same time keeping soils and nutrients on the land."

Projects selected by landowners may include: stabilization of eroding stream banks, reconnection to floodplains, construction of stream habitat, installation of prairie and forest buffers, exploration of alternative land uses, optimization of fertilizer application rates, enhanced grazing rotations, fencing to protect streamside vegetation, and better livestock watering systems.

Keuler said rivers—and fisheries—quickly respond to such management practices, but also adds, "While benefits are genuine and measurable, we understand that success at the Basin scale may take decades." Once

projects are completed, the FFP helps landowners showcase their successful projects. In addition, it shares lessons learned with FFP organizations and other landowners, as well as monitors fish populations and habitat at the project site as well as downstream.

Ken Lubinski is the U.S. Geological Survey advisor to the FFP, as well as its Science Team Leader. He emphasizes that the Partnership is a "bottom-up" approach. "Farmers know best what practices will most benefit their land," Lubinski said. "We need to enable farmers to identify and address issues for which we can help provide funding."

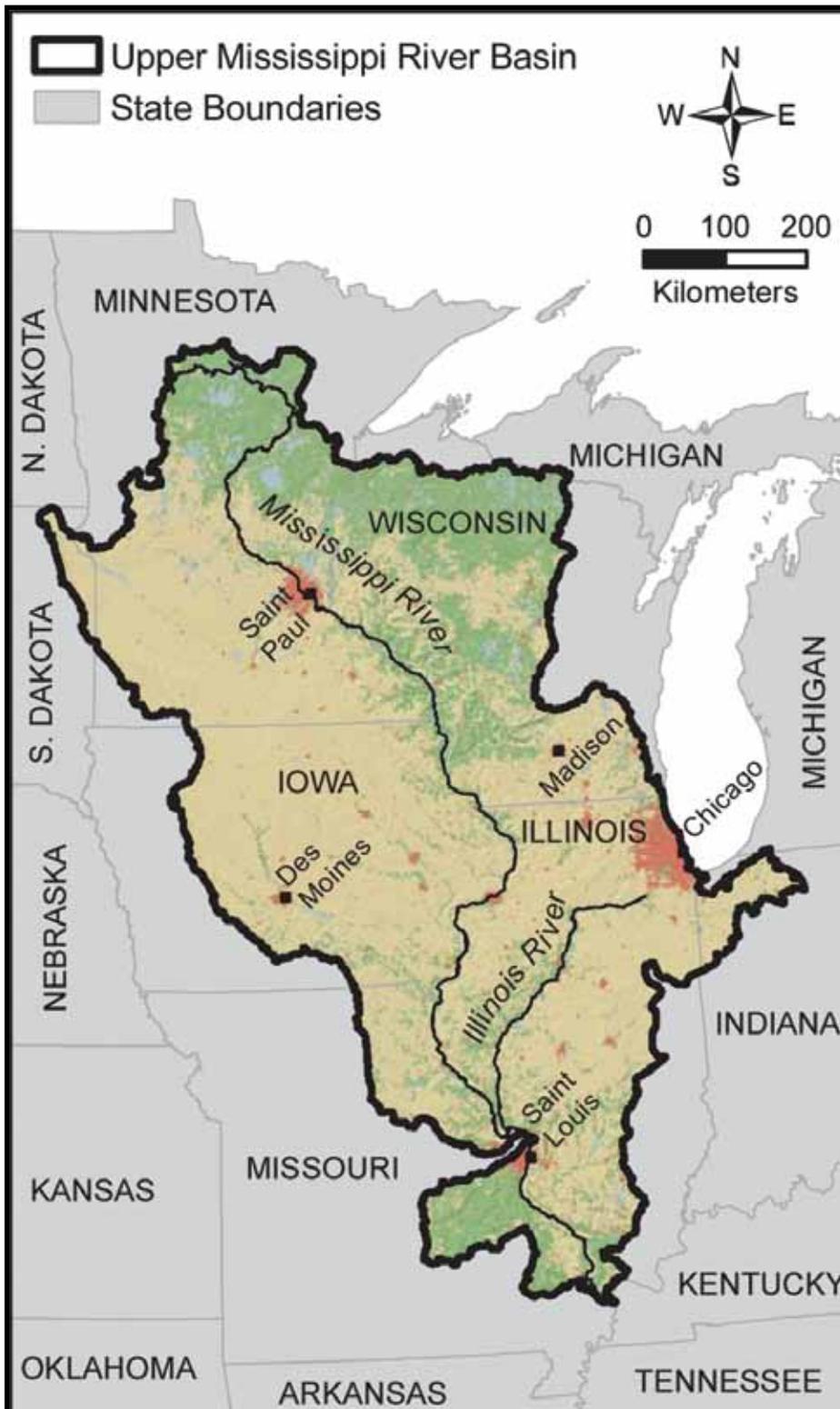
Lubinski also said that the goal is not necessarily undertaking a lot of projects, but rather funding projects that will likely multiply themselves. "And more than anything else," he added, "for this Partnership to succeed long-term, it's the farmer's voice confirming the program's value that will encourage the federal government and others to continue support."

One successful project Lubinski highlighted took place on Missouri's Bourbeuse River, involving landowners who improved stream crossings, installed fencing, and built off-stream watering systems for cattle. Fencing and alternate watering systems keep cattle out of the creek, reduce erosion, prevent trampled banks, and keep cows from polluting the stream with manure.

The project put control and decision-making into the hands of local landowners. Funding was provided



*The Fishers
& Farmers
Partnership will
be working on
three projects in
2011: Seven Mile
Creek watershed in
Minnesota, Boone
River watershed
in Iowa, and the
Merrimac watershed
in Missouri.*



The upper Mississippi River basin drains farms and fields from seven states.

by FFP and partners through a flexible cost-share program. In 2008, this landowner committee became the first group to receive National Fish Habitat Action Plan funds under the sponsorship of the Fishers & Farmers Partnership.

Once projects were completed, neighbors naturally wanted to see the end results. In turn, they began asking questions about how they could improve their farms. Word began to spread, and neighbors not only helped each other choose materials and equipment for additional projects, but cooperated in ordering livestock tanks and pipe at acceptable costs.

“This project was successful because it was more flexible than other conservation programs,” said Dave Dunn, a participating farmer. “The focus was on looking for ways that conservation goals and farming programs and productivity could be advanced together.”

Roger Wolf is director of environmental programs and services for the Iowa Soybean Association, and also serves as co-chair of the FFP steering committee. He stresses the importance of encouraging landowners to take the lead in tackling conservation issues.

“This is about bringing resources together to address fish habitats, but also keeping the livelihood of agriculture a priority,” Wolf said. He added that farmers not only care about making a profit from their land, but also about the fish and wildlife that live upon it.

The National Fish Habitat Action Plan was developed as the most



ISA

Small streams in the Midwest drain farm lands, and in those waters swim important fishes, like this smallmouth bass enjoyed by father and son.

comprehensive effort ever attempted in this country to treat and avert the causes of fish habitat decline. Why was it needed? More than 30 percent of U.S. fish populations are in decline, and half of U.S. waters are impaired. But thanks to the Fishers & Farmers Partnership—and the other 16 such Partnerships formed across America—this trend is slowly being reversed.

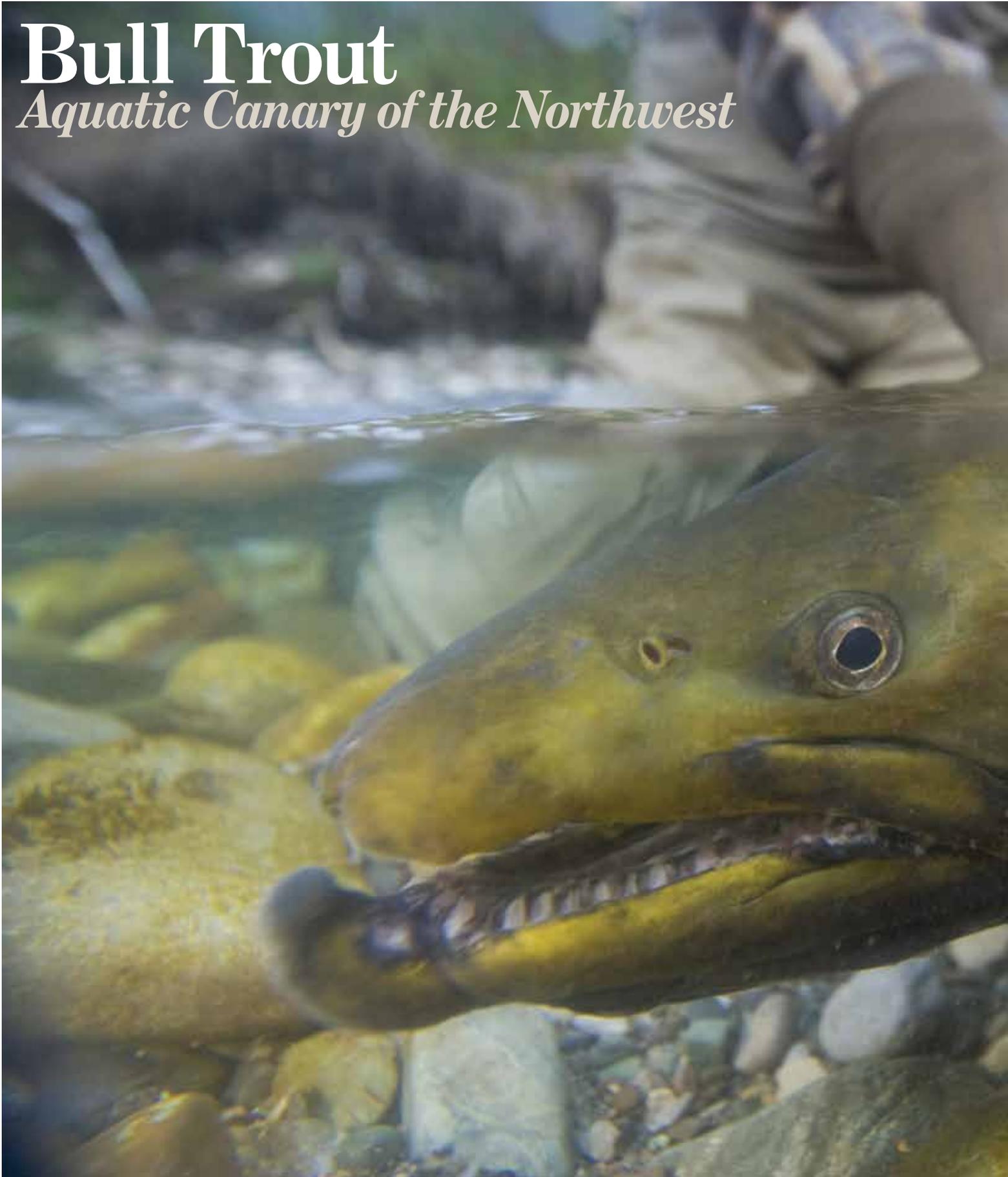
For more information about the National Fish Habitat Action Plan, go online to www.fishhabitat.org. To read more about the Fishers & Farmers Partnership, go to www.fishersandfarmers.org. ♦

W.H. "Chip" Gross is the author of six books, and is the former editor of *Wild Ohio* magazine.

By Wade Fredenberg

Bull Trout

Aquatic Canary of the Northwest





*The bull trout, *Salvelinus confluentus*, more than any other salmonid in the western United States, is sensitive to its habitat conditions. Since being listed in 1998 under the Endangered Species Act as “threatened,” bull trout have come to signify the importance of clean, cold, complex and connected headwater streams—making the fish an “aquatic canary” of ecosystem health.*

Bull trout once thrived as the dominant apex predator in the Columbia River Basin and coastal rivers of Washington and Oregon, extending north into British Columbia and Alberta. Bull trout migrate during summer, traveling up to 150 miles from lakes and rivers upstream to their natal headwaters to spawn. The spectacular fish in these photos originated from Lake Koocanusa in northwest Montana and were photographed in a spawning tributary of the Wigwam River in British Columbia by National Geographic’s Joel Sartore, accompanied by U.S. Fish and Wildlife Service fish biologist, Wade Fredenberg.

Joel Sartore/National Geographic



Fish tails. Migrating adult bull trout enter small crystalline spawning streams in September, where these large fish—commonly up to 15 pounds—can be extremely vulnerable to predators. Consequently, bull trout depend heavily on the use of instream cover, like logs, brush heaps, or undercut banks. In their absence, the next best cover might be the shadow or shoulders of a buddy. This sinuous “stacking” behavior seems to be a mechanism to achieve a sense of security. The precision with which these fish bend their bodies to match one another is amazing to watch.

Joel Sartore/National Geographic



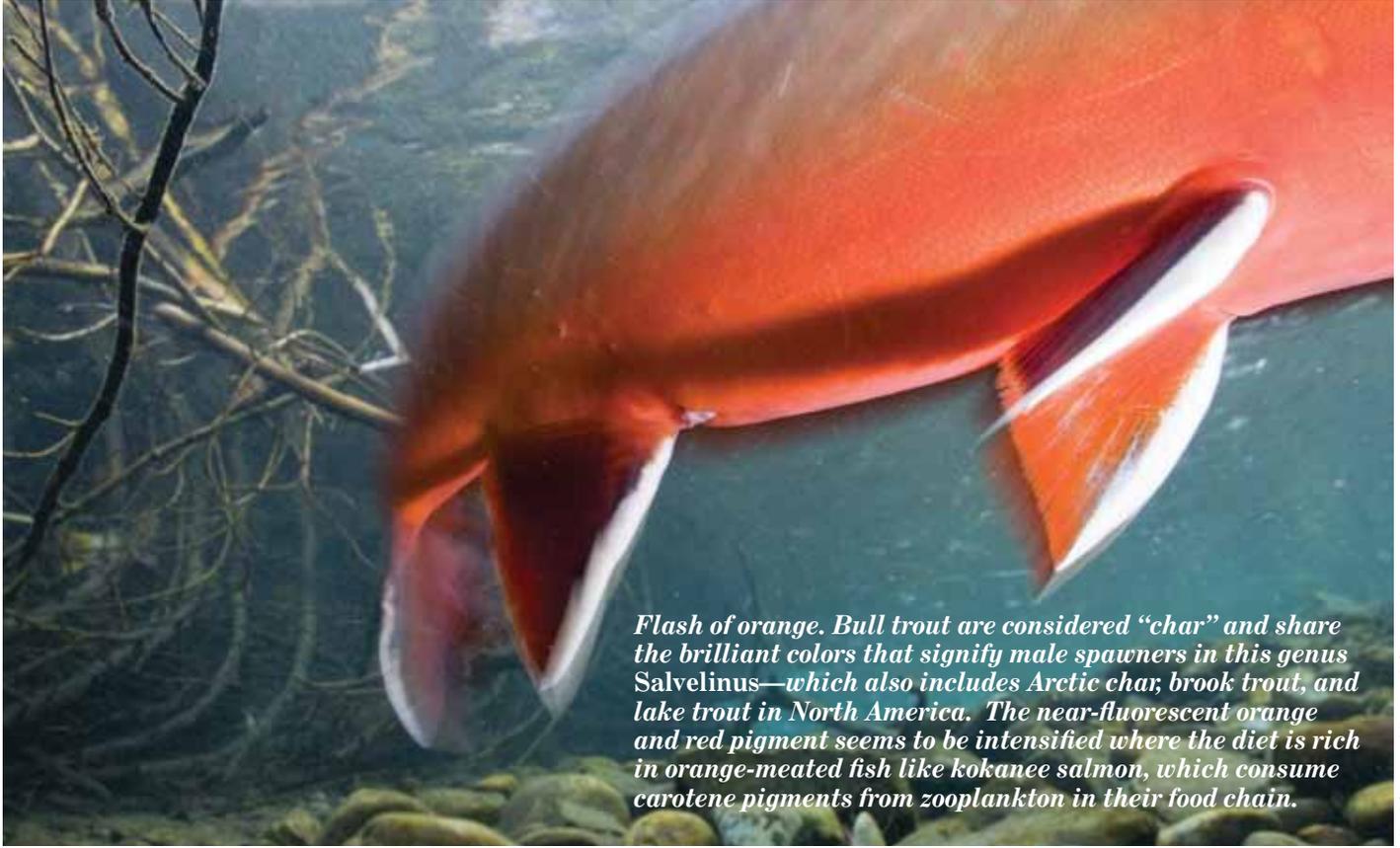
Red bellies. The brilliant orange and red display, with black and white stripes is characteristic of spawning males. In contrast, the more muted olive-drab and pink-spotted sides typify the spawning females that loosely school together in this shallow run.

Joel Sartore/National Geographic



Slab side. The toothy male bull trout, like many of the salmon, develop a pronounced “kype” where the hooked lower jaw fits neatly into a notch on the end of the nose. On females, the kype is minimal. Unlike salmon, bull trout do not die after spawning and may live up to 15 years and spawn multiple times through life.

Joel Sartore/National Geographic



*Flash of orange. Bull trout are considered “char” and share the brilliant colors that signify male spawners in this genus *Salvelinus*—which also includes Arctic char, brook trout, and lake trout in North America. The near-fluorescent orange and red pigment seems to be intensified where the diet is rich in orange-meated fish like kokanee salmon, which consume carotene pigments from zooplankton in their food chain.*

Joel Sartore/National Geographic



Split view. Fish habitat is more than water. What you see above the stream is also habitat for fish. Streams are after all conduits of their watersheds. The fallen tree in this photo is cover for bull trout. The U.S. Fish and Wildlife Service and our partners pay proper attention to ensure bull trout have a clean, cold, complex and connected habitat, for if that’s achieved, the fish will thrive.

Joel Sartore/National Geographic



Mouth agape. This colorful spawning extravaganza is put on annually in the fall by thousands of northwest bull trout. Because of the high numbers in the Wigwam River run, we witness extreme “agonistic” behavior amongst the males. They are competitive and combative. Here, a male bull trout flashes his warning “gape,” a display seldom captured on camera. No wonder these predator fish can consume prey up to half their own length in a single gulp.

Joel Sartore/National Geographic

Rites of Fish Passage in New England

Call it a “Rite of Passage” if you will, one that has gotten more difficult over the years as fish have had to try to navigate over, around, or through a variety of obstacles simply to get from Point A to Point B.

“Historical fish migration routes linking feeding and spawning habitats have been significantly impacted by culverts, dikes, dams, and other barriers on waterways throughout the United States, and as a result, many native fish species have been pushed to the point of disappearing,” says Brett Towler, Ph.D. He’s an engineer/hydrologist for the U.S. Fish and Wildlife Service’s New England Region.

“Habitat degradation is the Number 1 cause of fish and aquatic species decline and barriers to fish movement contribute to that degradation. Since 1998, the National Fish Passage Program has sought to reconnect those fragmented waters as a solution.”

Small dams and earthen dikes, seemingly innocuous culverts and road crossings, all numbering in the thousands can do the same as large, multi-purpose dams—they confound fisheries management, and they are costly barriers to overcome.

According to National Fish Passage Program statistics, an estimated 2.5 million barriers to fish migration exist in the U.S. including 85,000 dams (25,000 of them in the Northeast), and up to 90 percent are now just obsolete relics of an industrial past. “There’s always going to be environmental issues associated with fish life cycles,” says New England Region Fish Passage Engineer Brian Waz. “There are lots of old New England mill

dams that no longer serve a purpose and in cases where we can’t do a dam removal, we try to install a fishway so eventually we’ll be at a point where fish have an unimpeded flow to pass upstream under their own volition.”

Some fishways are simplistic in design and elemental in construction while others, more complex fish lifts and lofts like those at hydropower dam projects, are built like big elevators with operators needed to give fish a free ride during spawning season. “We’ve found that one size doesn’t fit all and we have to take into consideration swim speeds, size, and life stage of all the fish in the waterway,” says Regional Fish Passage Team Leader Curt Orvis. “It’s our job to factor in all the variables—from hydrology and biology to timing of migrations—and successfully put the parts together.”

“Survival of anadromous species relies on their ability to travel without disruption and fish have had it rough ever since humans started impacting their waterways,” adds student trainee/intern Bryan Sojkowski. “Our job as fish passage engineers is to open up these blocked avenues and allow fish the freedom to access areas previously off-limits. It’s a complicated science because engineering structures have to be designed to accommodate the fish’s biological needs and if both processes are not addressed properly, the problem hasn’t been solved.”

The New England Region fish passage engineers and ecohydrologists dedicated to this mission were busy removing approximately 62 barriers in 10 states (nearly 500 habitat miles) in 2010 with 2011 plans to remove another 24

barriers, thus freeing up an additional 200-plus habitat miles.

“Those figures are accurate for on-the-ground fish passage projects,” notes Regional Office liaison Janice Rowan. “And don’t overlook the added value of our engineers who contributed to the completion of other fish passage projects in another 16 states. Across the country, 140 barriers were breached en total last year and in the process restored access to 1,830 stream miles.”

While the number of projects and the miles opened vary from year to year, the effort-versus-return ratio is relatively consistent. “The latest economic estimates show some half a million dollars of benefits achieved with every mile of habitat opened up by fish passages,” says Orvis. “Fish passage work is essential in the life stages of a number of fish species, has links to threatened and endangered fish and mussels, and is critical to the entire food web for all peoples.”

Dan Kuzmeskus, Northeast Regional Chief of Fisheries Field Support, was instrumental in developing the U.S. Fish and Wildlife Service’s National Fish Passage Program. “We’ve insidiously destroyed former ecosystems and success of the whole game ends at the first dam. These small, unregulated barriers have virtually stopped runs of anadromous fish. If we could provide passage to these spawning populations, we could re-establish their historical numbers which would help ocean productivity while restoring aquatic and terrestrial river populations. But in order to move the environmental needle, we have to restore what all critters rely on—and that’s habitat.”



Brett Towler Ph.D./USFWS

An understanding of math, hydraulics, hydrology, and fish biology intermix in creating fishways like this one on the Androscoggin River in Brunswick, Maine. Called a vertical-slot fishway, it was designed by the U.S. Fish and Wildlife Service's New England Region fish passage engineers.

Recognizing the importance of the work and the need for trained personnel to carry it on, Dr. Towler has expanded his duties to include an adjunct faculty spot at the University of Massachusetts/Amherst, in a partnership effort offering another rite of passage, a Master of Science, Civil Engineering degree option titled *Fish Passage Engineering/ Ecohydrology*. “To our knowledge, we’re the only program currently doing this,” he says.

“This partnership, now a year old, is off to a great start, linking together unique resources to

address a growing professional demand, while fostering research in watershed ecology and fish passage engineering,” says university liaison and environmental engineering professor Dr. David Ahlfeld.

The increasing demand for expertise in this area was demonstrated by the standing-room-only sessions at the recent three-day National Conference on Engineering & Ecohydrology for Fish Passage at UMass/Amherst, a national forum for researchers and practitioners to

exchange findings and experiences on fish passage issues.

“We’ve been working on this daunting problem for years and while it won’t be solved completely anytime soon, we’re playing a role toward that goal by using the skill sets of engineers to help advance an environmental concern,” says Towler. ♦

Old Man and the River



USFWS

Michigan's Black River is home to native brook trout, the beneficiary of habitat conservation work of the Alpena Fish and Wildlife Conservation Office.

"Do you know what it's like?" I said. "It's just like when we were kids and we heard about a river no one had ever fished out on the huckleberry plains beyond the Sturgeon and the Pigeon."

"Were they big trout?"

"The biggest bloody kind."

— Ernest Hemingway, Green Hills of Africa

When a hunting companion tells him of a great, little-known place to kill antelope, the narrator of *Green Hills of Africa* is triggered into nostalgic reveries of childhood experiences fishing the Upper Black River in Michigan's Lower Peninsula. Fed by groundwater recharge in the silt-laden lowlands, the river leisurely wanders through marsh and forested flatlands—a part of Michigan once known as the Pine Barrens—before emptying into Lake Huron. Hemingway, who spent plenty of time casting flies in its frigid

waters, devoted ink on more than one occasion to this meandering muse.

But the writer's immortalized love for the river is rivaled by that of 96-year-old Robert "Bud" Slingerlend, who has worked diligently in recent decades—with help from the U.S. Fish and Wildlife Service's Alpena Fish and Wildlife Conservation Office—to keep the Upper Black the way Hemingway would likely remember it: one of the finest native brook trout fisheries.

“I started fishing the Upper Black in 1949,” says Slingerlend, “and it was the best brook trout fishing I’d ever come across—and I’d been fishing since 1920!”

A founding member and longtime chair of the Upper Black River Council, established in 1993, Slingerlend oversaw efforts of a partnership to restore and maintain the considerable resources of the Upper Black. Part of the only watershed in Michigan’s northern Lower Peninsula managed exclusively for brook trout, the river features—at the top of the food chain—a brookie population thought to be an Ice Age relict. The river’s lower reaches support a population of state-threatened lake sturgeon. The upper reaches provide habitat for the federally endangered quarter-inch-long Hungerford’s crawling water beetle, found here in addition to only three other rivers worldwide.

But conserving the ecosystem has not been simple. After overharvest of the area’s enormous timber resources at the turn of the 19th century and the widespread stream bank erosion that resulted, impediments to the river’s flow now represent pressing challenges. In a rural area dominated by state land, the network of dirt roads lacks adequate ditches and sediment basins, and culvert are small and aging. With rain and snowmelt,

water flows over roads picking up silt, sand, and pollutants, which often flow directly into the river at road crossings. In addition to sedimentation and erosion caused by inadequate culverts, the increased water velocity through culverts makes passage of fish yet another challenge.

Thanks to the U.S. Fish and Wildlife Service’s National Fish Passage and its Partners for Fish and Wildlife programs, funding has helped address some issues. Since 1998, the U.S. fish and Wildlife Service contributed nearly \$475,000, matched by more than \$900,000 from state and private funding, which has enabled a dam removal, several road crossing projects, and many other major improvements. More than a dozen road-impaired stream crossings have been



Courtesy Robert Slingerlend

Michigan State Representative, Robert “Bud” Slingerlend, circa 1964, was a founding member of the Upper Black River Council in 1993.



Charles Krueger Ph.D./GLFC

Native brook trout abound in the Black River.

restored, opening 35 miles of river to fish passage while eliminating tons of habitat-choking sediment. Of those sites, 11 included culverts or bridges that were replaced with larger structures to allow for a 100-year storm event.

“Fisherman report catching larger fish,” says Alpena FWCO biologist Heather Rawlings. “The most dramatic results for the brook trout population is in the headwaters of the main branch.”

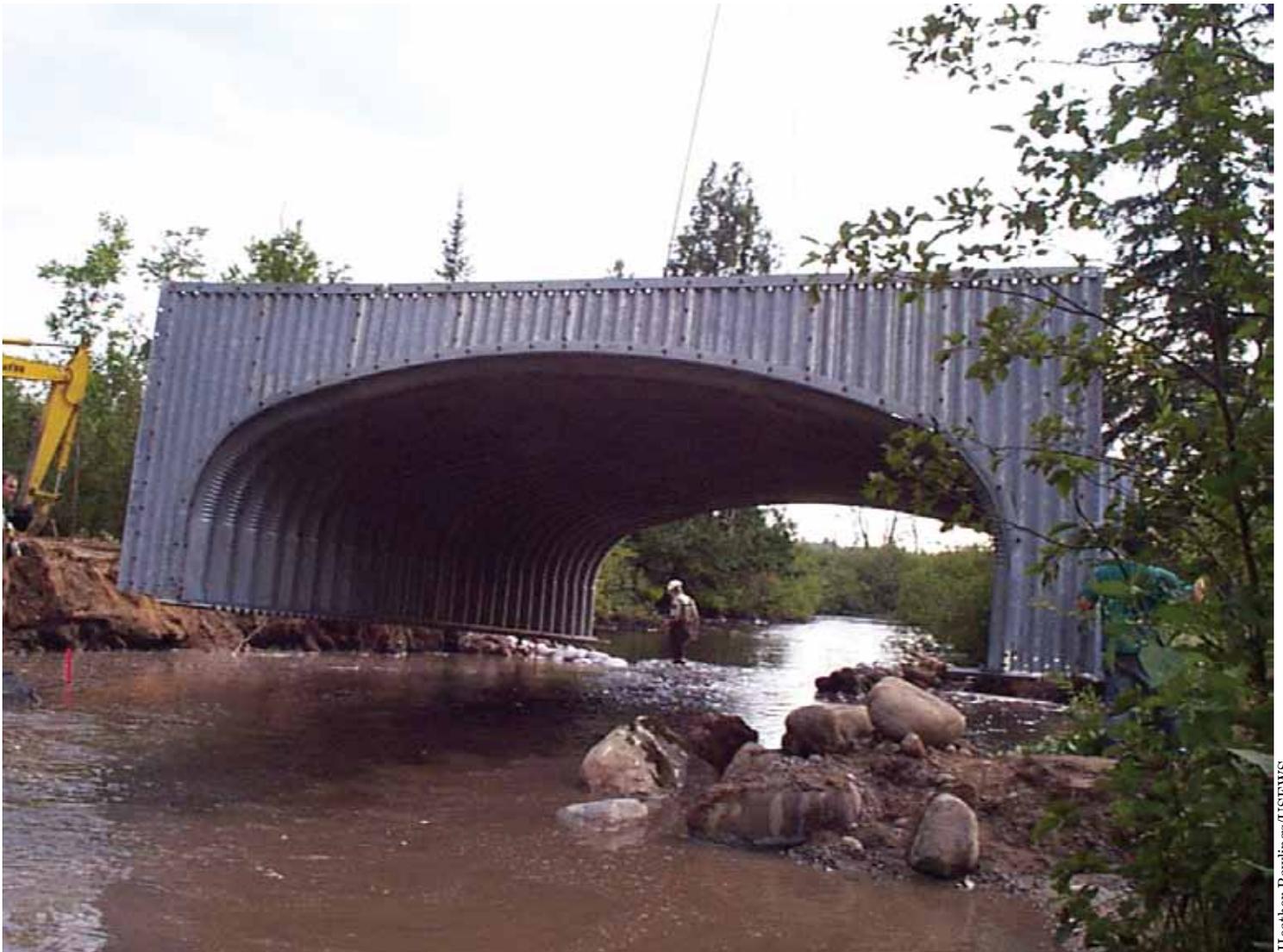
Here in 1999, road approaches were modified, the road surface was hardened with sealant, and a pair of culverts were replaced with a single, large bottomless culvert. Before improvements were made, the number of 8- to 9.9-inch trout averaged about 52 trout per mile, according to surveys. Afterwards, the numbers almost tripled to 136 trout per mile.

“Numbers were also higher upstream of the crossing, indicating modification may have improved fish passage to the extent that this large

section of the river has benefitted,” says Rawlings.

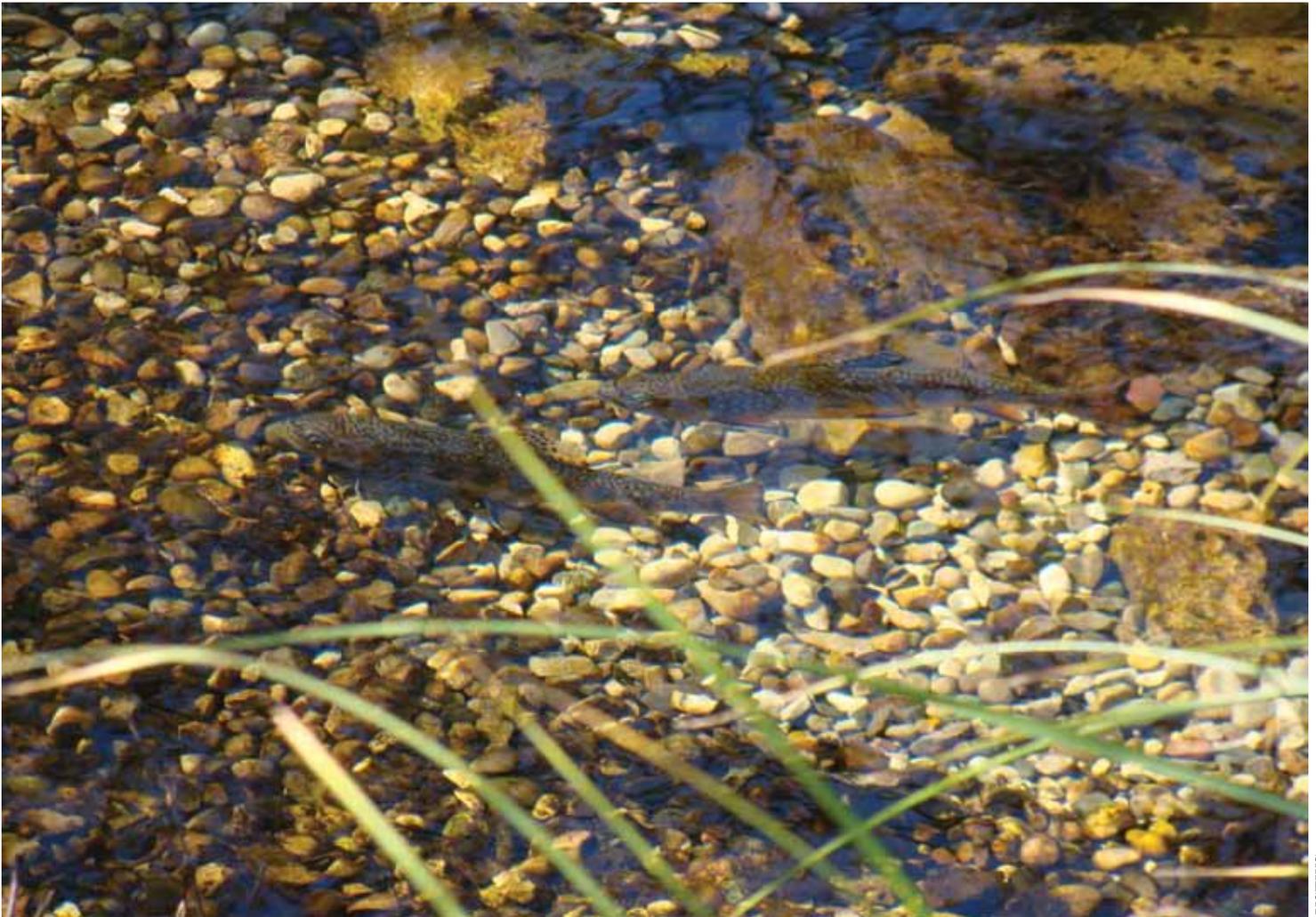
Also, since 2001, a summer work crew, of between three and five students, has worked on strategically placing woody debris into the watershed in order to create diverse in-stream habitat that offers protective cover for young trout and encourage growth of algae and other tiny organisms fundamental to the diet of countless aquatic species.

Another consideration of the work is the Hungerford’s crawling water



Heather Rawlings/USFWS

The U.S. Fish and Wildlife Service’s National Fish Passage Program helped ensure that culverts and road crossings are adequately designed so as to allow fish to move about to important habitats throughout the year.



USFWS

Gravels free of sediment are needed by brook trout to successfully reproduce. The light-colored stones indicate that they have recently been turned over by these spawning fish, their fertilized eggs lying in the spaces between the rocks. Brook trout spawn in the autumn of the year.

beetle. When work takes place in areas where the rare bug lives, the crew makes a wide berth; on the other hand, biologists are hopeful that the crew's work placing woody debris in sites where the beetle does not occur may eventually attract the species.

Additionally, the crew helped remove problematic beaver dams, repair stream bank erosion sites, and assist in the 2010 creation of artificial spawning habitat that features three stone and gravel riffles that mimic ideal trout spawning conditions.

Like a tributary that feeds a larger stream, the work stemming from the two U.S. Fish and Wildlife Service programs feeds a much broader effort, the focus of more than half a dozen government agencies at all levels, several nonprofits and other organizations, and scores of landowners. Yet so much of the collective force of the partnership can be traced to a single source, the man who became rooted to the banks of the Upper Black long ago.

After the brook trout fishing had made such a profound impression on him, Slingerlend built a little

cabin along the river in 1950. By around 1970, he noticed that "the fishing had gone to pot," and shared his observation with the Michigan Department of Natural Resources. That was the beginning of what would become intensive conservation work here. But it's only one chapter in a story that opens with remarkably inauspicious beginnings.

Born in a log house in 1915, Slingerlend spent lots of time outdoors as a kid. He was adept at fishing by five and owned his first rifle at ten. "In those days, we fished and hunted for food, not for fun,"

Slingerlend recalls. “My mother would say, ‘Son, we don’t have meat in the house.’ And I’d go out hunting. Shot a lot of rabbits.”

A hobo and transient worker during the Great Depression, Slingerlend lived an early hardscrabble life like something imagined by that other American literary giant, John Steinbeck. “My dad taught me how to hop freights,” he says. And so, after high school, Bud travelled around looking for work, and quickly learned to avoid the Chicago yards, because, as another hobo warned him, the

The Upper Black River Council partners include a multitude of citizens and landowners, county road commissions; Huron Pines; Montmorency Conservation District; Trout Unlimited; Montmorency County Conservation Club; Sturgeon for Tomorrow; Michigan Dept. of Natural Resources; Michigan Dept. of Environmental Quality; Natural Resources Conservation Service; Tip of the Mitt Watershed Council; Northeast Michigan Council of Governments; Michigan Fly Fishing Club; Canada Creek Ranch; Black River Ranch; and the Pigeon River Advisory Council.

“railroad cops will shoot and bury you.”

But at just 76 pounds in a time when there was plenty of competition for manual labor jobs, work wasn’t always easy to secure. Unlike the Joad Family destined for California to escape the Dust Bowl in *The Grapes of Wrath*, Slingerlend “dropped off a freight” in his home town of Morley, Michigan, one afternoon, where an old school teacher spotted him and intervened to help him obtain a college scholarship. Slingerlend thrived at school, especially in math, chemistry and physics. Eventually, he became a chemical engineer for Chrysler in Detroit. Upon retiring from Chrysler, Slingerlend then pursued a career of distinguished conservation work that breaches far beyond the banks of the Upper Black.

Serving as a member of Michigan’s House of Representatives in the 1960s, Slingerlend was involved in the creation of several monumental bills. He wrote one that became the Water Pollution Control Act of 1965, making prosecution for pollution possible for the first time in state history. He also introduced the Bottle Bill, which created a ten-cent deposit/redemption fee for all carbonated beverages sold in Michigan—the highest bottle deposit charged in the country. And because he introduced a special \$500,000 appropriations bill supporting what was largely considered a bizarre plan to introduce salmon to the Great Lakes, he is partly responsible for the tremendous growth of a sport fishery that now generates four to six billion dollars annually.

Diminutive in stature, Slingerlend has what current Council chair Carol Rose calls “the constitution of a

hummingbird.” Rose remembers when Slingerlend, an elk guide well into his 80s, took under his charge a man in his forties and his adolescent son for a winter elk hunt. “There was snow on the ground and the going was challenging for the hunter and his son,” says Rose. “Not so for Bud, who was forced to stop periodically just to let the man, half his age, and the boy, catch up and catch their breath!”

Eventually, Slingerlend arrived at a decision to leave northeastern Michigan to relocate near his wife’s hometown in southern Michigan. He asked Rose to succeed him as Council chair. “Bud was always first to say that he wasn’t a biologist or fisheries professional,” says Rose, “but he always felt confident that the Council would succeed because he surrounded himself with really smart people who were. We continue with that approach by working with experts across various fields, from entomology and wildlife biology to hydrology and forestry.”

Finally, Slingerlend helped the Michigan Natural Resources Trust Fund acquire a beautiful 80-acre spread that straddles the east branch of the Upper Black; it was the property on which he had built his little fishing cabin six decades ago. It was here that he and his wife had made their home for the past three. It was also where he’d drawn inspiration throughout his career, spending much time walking his land, observing the river and the web of life it nurtures, and, of course, casting for brookies.

“But my legs were starting to give out,” says Slingerlend. “I could still get into the river, but I wasn’t sure I could get out. In any case, even



USFWS

The upper Black River winds its way through forested flatlands as it pours toward Lake Huron, providing habitat for fish, wildlife, and people.

though the river gets a lot more fishing pressure, it's a lot better than it was."

Now managed by the Michigan Department of Natural Resources, Slingerlend's old property is open for all to enjoy as he once did; he hopes, too, that others will draw inspiration from the river here. It's a fitting legacy for someone who spent most of life devoted to a relationship with the outdoors that is rarely matched, even in great literature. ♦

Learn more about the Upper Black River Council at www.upperblack.org.

Visit the Alpena Fish and Wildlife Conservation Office, here www.fws.gov/midwest/Alpena/.

Learn about the National Fish Passage Program at www.fws.gov/fisheries/fwco/fishpassage/index.html.

By Melanie Dabovich

Small Fish, Big Efforts

Habitat conservation proving its worth for Pecos bluntnose shiner



Paul Tashjian/USFWS

The sandy-bottomed Pecos River runs 926 miles through New Mexico, covering a variety of terrain including high-elevation mountains in the north to flat plains and open grasslands in the east and the Chihuahuan desert in the southeast before emptying into the Rio Grande in Texas.

Though it measures only about three inches long, a small, silvery fish in eastern New Mexico has attracted the attention of a large group of scientists and biologists from several state and federal agencies armed with high-tech science. They are determined to ensure its long-term survival in the Pecos River.

The Pecos bluntnose shiner only exists in a roughly 200-mile span of the Pecos River in New Mexico sandwiched between Sumner Dam near Fort Sumner and Brantley Reservoir north of Carlsbad amid the sparse desert terrain. The shiner, named due to its short, rounded snout, was listed by the U.S. Fish and

Wildlife Service as threatened under the Endangered Species Act in 1987. The fish has been drastically reduced in its native habitat, which also once included portions of the Pecos in west Texas.

The tale of the shiner's precarious predicament is a history lesson on

dam building on the Pecos, according to Stephen Davenport, supervisory fish biologist with the U.S. Fish and Wildlife Service's New Mexico Fish and Wildlife Conservation Office in Albuquerque. Complicated water management, intermittent flows and river modifications have imperiled the shiner's habitat.

"This is a classic case that hits Western fish," Davenport said. "You have the de-watering of rivers in places that have less water historically, and the water that is there is developed for irrigation. That leads to the fragmentation of rivers by dams and habitat changes associated with the human use of water resources."

The headwaters of the Pecos River are located north of Pecos, New Mexico in the Sangre de Cristo Mountains. The cascading mountain trout stream becomes a wide flat-flowing prairie river, flowing for 926 miles into the Chihuahua desert, emptying into the Rio Grande in neighboring Texas. The river's drainage basin is around 44,300 square miles.

In the past 11 decades, three dams have been built on the Pecos to aid in water storage, flood control and sediment retention. The dams—Santa Rosa, Sumner and Brantley—are essential to delivering water to local irrigation districts, but the intermittent flows have led to a reduction in base flows and periods of drying. And dry years combined with tough drought years take their toll on shiner numbers—in a recent dry period between 2004-2005, the shiner catch rate was a mere two fish per 100 square meters. Davenport explains that the shiner has been able to survive in its 200-mile span between

dams mainly because the Pecos is less fragmented through this stretch.

Data collected by Davenport reveals the Pecos bluntnose shiner needs a mobile sand bed, wide river channel and a river that can establish a connective floodplain, explains U.S. Fish and Wildlife Service hydrologist Paul Tashjian. Water depth, velocity and sediment activity are key to preferred shiner habitat. The fish uses a broadcast spawning method during reproduction, during which the female emits eggs that are semi-buoyant; they incubate as they bounce downstream, hopefully into healthy rearing habitat. The Bitter Lake National Wildlife Refuge, located nine miles northeast of Roswell on the banks of the Pecos River, sits at a juncture between two very different habitat areas that play an important role in the fish's survival rates.

"Everything north of the refuge is good habitat but is prone to drying, and south of the refuge the river is always wet but it's poor habitat because it has narrow channels," Tashjian says. "You don't find many adult fish in the southern portion, and that's a big concern."

Bitter Lake National Wildlife Refuge has served as the main site for shiner habitat study and restoration efforts over the past three years. The restoration is organized into three phases at the refuge, or middle unit, and also at river sections above the refuge known as the north unit. The first phase of the Pecos habitat restoration effort reconnected a former, ox-bowed channel of river. The second phase restored the river by lowering the bank line and destabilizing the banks by removing water-guzzling, invasive salt cedar,



Stephen Davenport/USFWS

The Pecos bluntnose shiner is shown above in the palm of a fish biologist's hand. The silvery fish measures only about three inches long.

or tamarisk, trees along the river and replacing them with native plants.

“Just that action of removing salt cedar trees allows the river channel to be locked in place,” Tashjian notes.

The third and current phase involves further habitat restoration and salt cedar removal south of the refuge towards Bottomless Lakes State Park near Roswell. This portion of the shiner’s habitat is narrower without a good sand bed, and Davenport explains that ample sand creates the type of habitat the shiner needs to thrive.

In order to get a more accurate picture on what’s happening underwater with the shiner, Davenport says 15 monitoring sites have been set up at different field sites along the Pecos. At these sites, scientists collect fish for identification and gather data such as water temperature, salinity and physical

water chemistry parameters. This data goes into a long-term database, which provides information to local, state and federal agencies working on shiner recovery.

Because a lack of water flow will translate to a reduced number of shiners, it is imperative that water is found to keep the river flowing. Yvette Paroz, fisheries biologist with U.S. Bureau of Reclamation works with nearby Carlsbad and Fort Sumner irrigation districts as well as private landowners through a complex method to procure water resources.

“When the river dries, the population suffers. But we have a limited amount of water in the Pecos River and the reservoirs, so it is critical to effectively allocate water and obtain water sources,” Paroz says. “If you have water and you’re not using it, we want it. We even have private landowners that pump groundwater

into the river. Thanks to hard work in getting the word out there, we have a wide variety of people and groups trying to pitch in to make things work for all water users.”

Paroz explains that the Bureau of Reclamation, along with the U.S. Army Corp of Engineers and state agencies including the New Mexico Department of Game and Fish, State Engineer, and Interstate Stream Commission are all on the same page when it comes to working towards the common goal of shiner habitat restoration and conservation. Due to their efforts, the river has not dried out and has kept flowing since 2004.

In turn, fish biologists are using the latest technologically advanced methods to monitor and analyze the shiner population and its habitat. Hydrologic models are being created with data gauges, colored infrared aerial photographs, and video imaging. Water flow data is broadcast via satellite, and LiDar (Light Detection and Ranging) uses optical remote radar sensing technology to create high-resolution, digital elevation mapping for floodplain modeling and terrain analysis along the Pecos.

The detailed data collection and analysis focusing on the shiner culminated into a population status study and subsequent scientific journal article authored by several Service biologists titled “Spatiotemporal Population Trends of *Notropis simus pecosensis* in Relation to Habitat Conditions and the Annual Flow Regime of the Pecos River, 1992-2005.” The 14-year study involved numerous fish collections at sampling sites, data analysis and calculations, findings regarding causes of reduced populations and methods for conservation. Their findings were published in the 2008



Ken Stimmert

A large tractor removes salt cedar in the north unit along the bank of the Pecos River as staff members monitor the process. Salt cedar, or tamarisk, is a water-guzzling, invasive species that is being removed along the river banks in order to destabilize the river bank and allow the river channel to be locked into place, creating a better habitat for the shiner.

volume of *Copeia*, a scientific journal published by the American Society of Ichthyologists and Herpetologists.

So why should people who fish, boat or live along the Pecos be concerned about tiny fish with a unique nose that can easily fit in the palm of one’s hand? Davenport explains when it comes to overall river ecology, the shiner is basically the “canary in the coal mine.”

“If the fish are healthy and staying alive, then fish health equals a healthy river,” Davenport says. “Every river should be seen as a resource for

the public to enjoy, and the fish in that river are part of the landscape. They’re part of that river.”

Tashjian notes he is encouraged by efforts from agencies such as the Bureau of Reclamation and the New Mexico Interstate Stream Commission to find water supplies for the fish and keep the river from going dry.

The story of the shiner so far is one of success, Davenport says. The catch rate has drastically improved and is now at 18 fish per 100 square meters.

“We were able to produce the water and the river is staying whole and the fish populations are responding as everyone hoped they were,” he said. “Our goal was to have a healthy, stable population and we’ve reached that point.” ♦

Melanie Dabovich is an Executive Assistant for Science Applications with the U.S. Fish and Wildlife Service in Albuquerque, NM.

Meanders

By Gary Edwards

In Search of an Organic Act

The U.S. Fish and Wildlife Service's Fisheries Program turned 140 years old this year. Since 1871, responsibility for the nation's fisheries has expanded, diversified, and undergone considerable change. In many ways change itself has been the one constant.

In the early years, federal fisheries conservation focused on fish culture. As state fish and game agencies developed the scientific capacity and financial support to assume responsibility for the fishery resources within their borders, the federal role became less clear. Without an "organic act" of Congress that clearly specified a role, congressional appropriations year by year have directed conservation activities.

The year 1974 saw pronounced change. Lynn Greenwalt, Director of the U.S. Fish and Wildlife Service, established a task force of non-federal fishery managers, "to review the national fish hatchery program, and to reach judgments of appropriate roles for federal and state level governments in that field." Although the task force supported federal fish culture, it recommended "that the States assume full management and financial responsibility for stocking the inland public waters within their respective boundaries." The Fisheries

Program has been further scrutinized since, its purpose and plans refined, with initiatives coming along, including the National Recreational Fisheries Policy; the Sport Fishing and Boating Partnership Council; a Recreational Fisheries Executive Order.

Over the last forty-plus years the Fisheries Program has struggled without an organic act. Much like a trout waits in a stream for the right morsel to drift past, so too has the Fisheries Program. This does not diminish the conservation successes made in fish culture, nutrition, and health by our biologists. Our dedicated men and women advanced reservoir management, fish genetics; they restored fish species like Atlantic Coast striped bass and lake trout in the Great Lakes.

Entering the 1990s the importance of aquatic habitat conservation received increased attention. "It's the habitat" echoed throughout the realm of fisheries conservation, but had often gone unheeded in favor of addressing the symptom and not the cause. However, since the advent of the National Fish Habitat Initiative in 2001 that ultimately led to the endorsement of the National Fish Habitat Action Plan (Action Plan) in 2006, the Fisheries Program has had a foundation to integrate hatcheries and habitat conservation. The Action Plan along with the U.S. Fish and Wildlife Service's commitment to Strategic Habitat Conservation, Landscape Conservation

Cooperatives, and climate change, provides the opportunity to focus energy and expertise on fish habitat conservation as never before.

In this author's opinion ensuring "fish passage" should be central to habitat conservation. In my former position as the U.S. Fish and Wildlife Service's Assistant Director - Fisheries, when asked what I would tackle if I could do just one thing, my unhesitating answer was always "restoring the ability of fish to move unobstructed in the nation's waterways." The importance of fish passage is best summed up in a short article titled "Poetry in Motion," in the Summer 1998 of the *Atlantic Salmon Journal*. Pete Bode wrote, "A free-flowing stream is a wonderful thing with an ecological mission and all; and magical music to massage the mind, too precious to kill with a concrete wall."

The U.S. Army Corps of Engineers has catalogued 75,000 dams greater than 6 feet in height, but there are tens of thousands of smaller ones across the country impeding flowing waters and restricting fish movement. This does not include the thousands of perched culverts and low water crossings that have the same effect—they all block fish passage. Most of the nation's large dams are not realistic candidates for removal. But this would not prevent the Fisheries Program from taking a leadership role to have large dams operated in a fashion that reduces their current impact nor does it prevent the agency

from leading the way to remove small dams and replace culverts that have out lived their usefulness.

Although the National Fish Habitat Initiative and Action Plan serve the Fisheries Program well, their guiding principles should become organic legislation to cement a lasting role for the Fisheries Program. The National Fish Habitat Conservation Act introduced in 2009, but not enacted could serve that purpose. The current version of the bill is sound. It would provide a much welcomed legislative foundation for the Fisheries Program. The Action Plan would be the primary frame work for habitat conservation.

In this author's opinion there are several amendments that supporters of the bill should consider. One would be to identify a role for local watershed councils. While watershed councils can clearly be involved as a partner organization, they could be even more effective if given recognition and a meaningful role. Another area for consideration is urban waters. Although the current bill does not exclude them as restoration projects, they are deserving of specific mention, particularly those waters in low-income or economically depressed areas. Funding under the current bill is dependent on appropriated funds and private donations. Given the current economic climate and the challenges facing federal budgets, it would seem prudent for Congress to establish a dedicated funding source

similar to the Sport Fish Restoration Act. This would ensure that funding is available for habitat conservation projects. One way to accomplish this would be by transforming the current bill into an amendment to the Federal Water Pollution Control Act (Clean Water Act). This could provide restoration projects dedicated funding, and would enable the Clean Water Act to fulfill the promise to make waters "fishable" by focusing not just on chemical purity, but also on biological integrity.

When looking back through my career and 140 years of conservation, one wonders what those early fishery pioneers like Spencer Baird, Livingston Stone, and D. C. Booth would think about the current state of fishery management, and the achievements of those men and women who followed in their footsteps. They might be dazed and confused given that they lived in an era with a significantly different view of conservation. "Catch and release" fishing is nouveau. Fish species were not being placed on an endangered species list, and climate change was not threatening to change the aquatic landscape.

Conversely, one also wonders how the next generation of biologists will look back on us. Will they agree that we rose to the challenges and opportunities that were presented to us? Will they say that we missed something that we should have known? Will they know that we did our very best? I am confident

that the National Fish Habitat Restoration Act would be the buttress that the Fisheries Program needs to see habitat conservation into the future. ♦

Gary Edwards formerly worked for the U.S. Fish and Wildlife Service as the Assistant Director-Fisheries in Washington D.C. and as the Deputy Regional Director for the Alaska Region. Before joining the Fisheries Program, he worked for the Arizona Game and Fish Department.

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Eddies

Reflections on Fisheries Conservation

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Summer 2011



Transforming Habitat

Early in our nation's history, rivers ran wild and fish were plentiful, moving freely throughout their native habitats. In the ensuing years, culverts, dikes, dams and diversions, built for irrigation, flood control, electricity, water supply, and transportation became fish barriers. As a result, some native fish are gone and others are on the brink of disappearing. Today, an estimated six million barriers no longer serve their original purpose.

Launched in 1999, the National Fish Passage Program (NFPP) works with communities to conserve aquatic resources and restore free flowing rivers. NFPP is a voluntary, non-regulatory program that provides financial and technical assistance to remove barriers. In 12 years, 950 barriers have been removed, opening 15,500 river miles and 82,100 wetland acres with an additional 300 fish passage projects designed and engineered with the express purpose of getting fish upstream. It's been good for fish and people: these accomplishments have created economic benefits of \$8 billion. ♦ Susan Wells



Trout Unlimited

Spread Creek near Jackson, Wyoming, is habitat for Snake River cutthroat trout. Now, with a dam gone, there's more habitat available. The fish barrier was removed under the auspices of the National Fish Passage Program, in partnership with many others.



Trout Unlimited