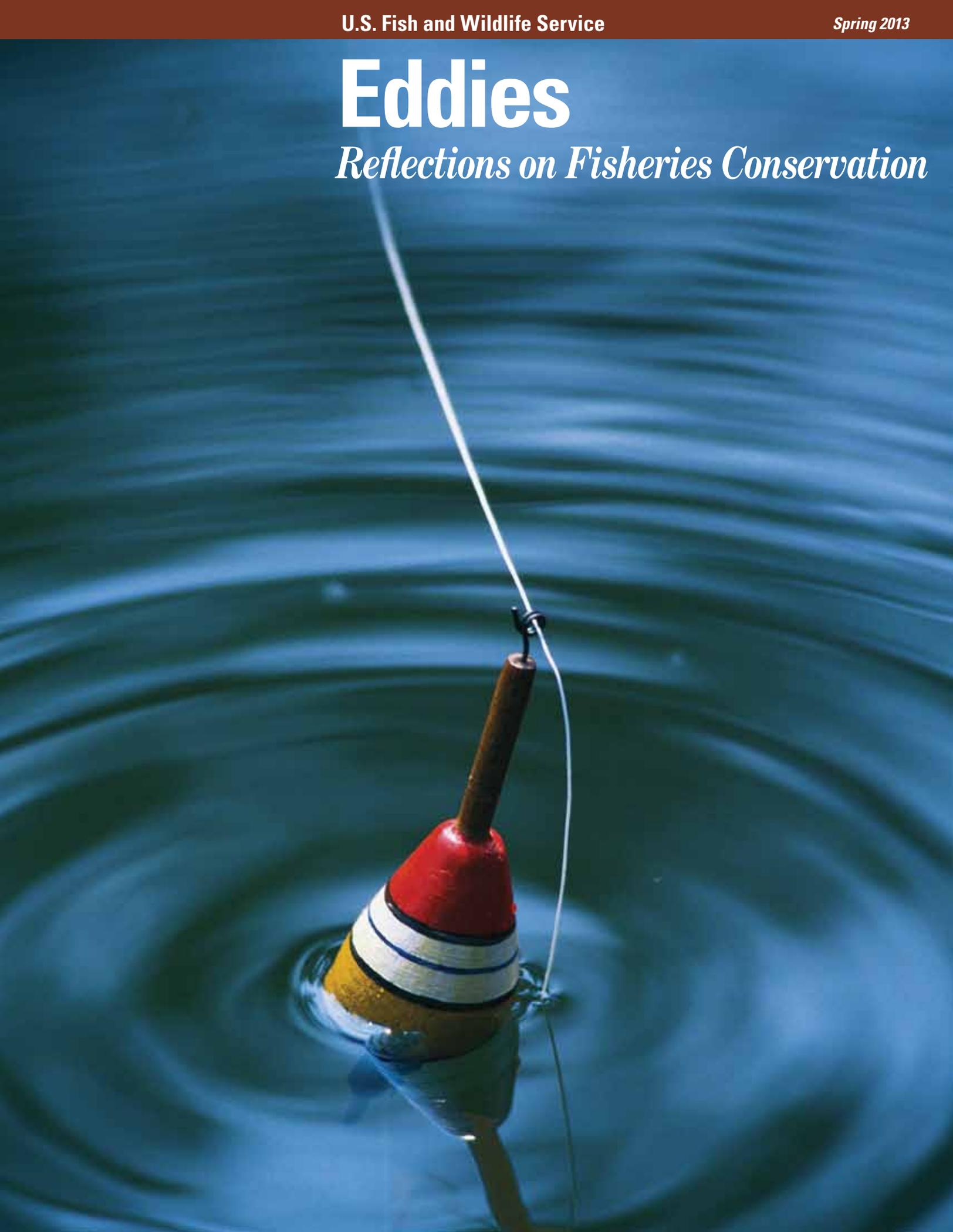


Eddies

Reflections on Fisheries Conservation



Eddies

Vol. 6, No. 1

Publisher

David Hoskins, Assistant Director
U.S. Fish and Wildlife Service
Fish and Aquatic Conservation

Executive Editor

Mike Weimer

Deputy Editor

Richard Christian

Editor

Craig Springer

Contributing Editor

Abigail Lynch

Contributing Writers

Lee Allen	Jennifer Lapis
Jeffrey Anderson	Ted Leeson
José C. Barrios	Mark Maskill
Jim Bowker	Heather Rawlings
Chester Figiel, Jr., Ph.D.	Christopher Scharpf
Ann Gannam, Ph.D.	Tim Smigielski
Macey Hoggard	Randi Sue Smith
Karen Hollingsworth	Robert Speirs
Ben Ikenson	Arsalan Sufi

Editorial Advisors

Mark Brouder, U.S. Fish and Wildlife Service
Dave Erdahl, Ph.D., U.S. Fish and Wildlife Service
Stuart Leon, Ph.D., Chair, U.S. Fish and Wildlife Service (ret.)
Ryck Lydecker, Boat Owners Assoc. of The United States
Mark Maskill, U.S. Fish and Wildlife Service
Tom Sadler, Outdoor Writers Assoc. of America
Bill Taylor, Ph.D. Michigan State University

Assistant Regional Directors – Fisheries

Michael Carrier, Pacific Region
Dan Castleberry, Pacific Southwest Region
Linda Kelsey, Southeast Region
Stewart Jacks, Southwest Region
Tim Jennings, Alaska Region
Sharon Rose, Mountain–Prairie Region
John Schmerfeld (acting), Northeast Region
Todd Turner, Midwest Region

Subscription Service

Mike DeRosa
USFWS Fisheries RM 700
4401 N. Fairfax Dr.
Arlington, VA 22203
(703) 358-1792
michael_derosa@fws.gov
www.fws.gov/eddies

Editorial

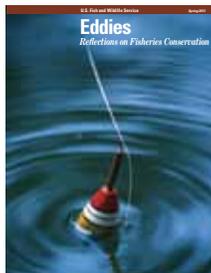
Craig Springer
USFWS Fisheries RM 9100D
500 Gold Ave SW
Albuquerque, NM 87102
(505) 248-6867
craig_springer@fws.gov

Design

Blue Heron
Communications

On the Cover:

Angling is a direct connection to nature, and an American pastime. Superstock



Departments

Headwaters 3
Watermarks 4
Pioneers 8

American Fishes 10
Meanders 30

Features



Bridge Over Troubled Water–12

Ben Ikenson



Wonder and Awe with Birds and Fish–22

Robert Speirs



Nature Explore Classroom–16

Lee Allen



Fish Make You Smarter–28

Karen Hollingsworth



April Gregory

These youngsters had a hands-on conservation experience at a national fish hatchery. See page 22.

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

Beginnings

By Mike Weimer



Tom Busiahn

I'm tapping on my keyboard as I sit under a forest of buildings inside the Beltway that rings Washington, DC. It's here that the business of the country is conducted, sometimes at a frenetic pace. I have to admit, it can be exhausting. At other times moving important issues forward is like pushing a wet rope uphill. It is of course important to be deliberative in making choices because fish conservation affects people, too. But progress can come slow. And in my mind I still need a place to go, to a real forest not of glass, brick, and mortar, but of cellulose, waxy oak leaves colored like a lime, and dark, wet musty duff on the forest floor sliced by bright silver rills cutting downhill. There, fish dally in the eddies dappled in yellow light waiting for a meal to come drifting by.

We all need a place to go. For respite. To recharge. To recreate and to repossess our own self in nature, not passively—but to enter *into* existence. Everyday I see my brother and I on the water with our late father, me becoming hard-wired through experience to become a conservationist. When you instill in a youngster a love for the outdoors and for nature, you bequeath a gift of a lifetime that can't be taken away, but it can be passed along.

Toward that end, we in the Division of Fish and Aquatic Conservation strive to ensure that the future of our fisheries is secure. An opportunity for everyone to enjoy the outdoors is job-one for us: veterinarians and disease pathologists assess hatchery and wild fish in our Fish Health Centers; biologists culture imperiled and game fishes in our National Fish Hatchery System,

and field biologists in our Fish and Wildlife Conservation Offices evaluate fish populations in the wild and find fixes when things aren't right. We research pharmaceuticals for fish more rigorously than drugs used for people; we improve habitats, get fish around migration barriers, and conduct genetic studies. All of these things we do with an eye to the future.

By its very nature, conservation is an investment in the future. More habitat today means more fish tomorrow. We have another charge, too, that is very much forward looking and that's what you will read about in this issue of *Eddies*, engaging, educating, and employing young folks who will be tomorrow's conservationists.

In the story, "Wonder and Awe with Birds and Fish," you will learn about *Hatchery Helpers*, a five-week-long summer program that immerses eager youngsters in conservation work from the community surrounding the D.C. Booth Historic National Fish Hatchery and Archives in South Dakota. They tag fish, band birds, and build things.

Another story is about building. "Bridge Over Troubled Water" relates the work of a high school class in Albuquerque, New Mexico, designing and build needed structures at a sanctuary for an imperiled minnow.

"Nature Explore Classroom" explores the partnership between Creston National Fish Hatchery and the Arbor Day Foundation in creating a very useable space—an outdoor classroom built by youngsters—on the hatchery grounds that encourages kids to learn about nature.

We wrap this one up with a Meanders essay from author Ted Leeson. He muses on panfish, writing "In the angling universe of my youth, they were the force of gravity that held everything together."

When things don't seem so much "together" for me I can slide my kayak into the Potomac River. The greenish-blue spasm in the flesh of an American shad writhing in my hands reminds me why we go about our business inside the Beltway. ♦

Mike Weimer is the executive editor of *Eddies*, and Chief of the Division of Fish and Aquatic Conservation in Washington, DC.

Nature SNAPs into focus



Yaneliz Tomasiini

A ladybug ambles over a flower, enlivening an already bright scene.

When is the last time you took a picture of a leaf bigger than your face, or thought about what a squirrel sees as it scurries up a tree? The Students, Nature and Photography (SNAP) program brings these questions into focus for

its participants. Run through the Service's Lower Great Lakes Fish and Wildlife Conservation Office (LGLFWCO) in collaboration with its Friends group the Great Lakes Experience, SNAP is a favorite among the staff. SNAP is an effective means to introduce young

people to nature and the outdoors using cameras and technology, something today's youth have inevitably grown up with as part of their daily lives.

Hobbyist photographers have volunteered their time to work with young people from the surrounding community, teaching them photography techniques, and using the natural world as subjects for their creative artwork. Students learn how to use digital cameras, techniques for successful nature photography, and they get lessons in ecology as they choose subjects to photograph. Each event is designed to meet the individual needs of the students based on age. The youngest students have enjoyed working with a partner to complete a photo scavenger hunt. At the end of the program, the students select their favorite photo and write a brief statement about it, describing the inspirational meaning the image has for them. Students also have their best photographs framed and exhibited at their schools and on the LGLFWCO website photo gallery. ♦ Jennifer Lapis

Dry Run Creek provides wet fun for young anglers

Dry Run Creek is a unique stream adjacent to the Norfolk National Fish Hatchery near Mountain Home, Arkansas. Water flowing from the hatchery—32 million gallons per day—provides quality fish habitat for young anglers to catch and release rainbow, brown, and cutthroat trout. "Dry Run" is now a misnomer; the brook has deep pools, riffles, waterfalls and runs for children younger than 16 years of age to catch trophy-sized fish.

The project began in 1989 and was a collaborative undertaking between the hatchery, the non-profit Friends of the Norfolk National Fish Hatchery, the Arkansas Game and Fish Commission, and many volunteers. The streambed was restructured and opened in 2010 with

streamside fishing platforms, as well as ramps and walkways designed specifically for children and the mobility impaired. These waters run nearly a mile to the confluence with the Norfolk River and provide children the opportunity not only to catch fish, but also to learn about water, stream ecology, and habitat restoration.

The Norfolk National Fish Hatchery and Dry Run Creek combined draw in excess of 200,000 visitors a year, many of



Bill Barksdale

Dry Run Creek is set up to allow children to catch-and-release trophy-size trout near Norfolk National Fish Hatchery in Arkansas.

them children. ♦ Chester R. Figiel, Jr., Ph.D.

Science studies move the needle

For four years running, biologists from the Alpena Fish and Wildlife Conservation Office in Michigan



USFWS

Biologists Andrea Ania and Heather Rawlings teach the Wilson Elementary second grade class about fossils and how they are created.

have taught science classes for one cohort of students at Wilson Elementary School in the Alpena Public School System. It started in second grade and now those same children are in the fifth grade. Biologists visited their classroom once a month to teach a science lesson that matched with Michigan Educational Assessment Program (MEAP) curriculum. These lessons in a lab setting encouraged hands-on learning, with several field trips taken to expose the children to the fascinating local ecosystems of northeast Michigan.

The children were introduced to a variety of learning experiences, and it's apparently paid off. The 2012

school year culminated with state MEAP testing. Wilson Elementary School ranked the highest for Alpena area schools and was number 58 out of 100 ranked Michigan schools. Principal of Wilson Elementary School, Jean Kowalski, explained that "One of the major reasons Wilson ranked so well was because the fifth-grade science MEAP scores—they were the highest we have had in many years." Kowalski attributed the success directly to Alpena FWCO augmenting the science curriculum.

Starting fall 2013, Alpena FWCO staff will start anew to improve science literacy with a class of eager second-grade children. ♦ Heather Rawlings and Tim Smigielski

FEATURED FACILITY

Kenai Fish and Wildlife Field Office

Where: Kenai, Alaska

When: Established 1971

Then: The office was initially established as the Kenai Fishery Services Field Office, with a primary objective of "providing the Refuge Division with technical expertise on all matters relating to the aquatic resources on the Kenai National Moose Range," now called the Kenai National Wildlife Refuge.

Now: The Kenai Fish and Wildlife Field Office collaborates with State, Federal, Alaska Native organizations, and other community partners to protect and restore fish and wildlife habitat, control invasive species, and promote stewardship of fish and wildlife resources. Biologists conserve fish populations through an assessment and monitoring program that provides information necessary to manage subsistence and other fisheries in Southcentral Alaska and Kuskokwim Bay watersheds in Western Alaska. Field office staff work with private landowners in voluntary conservation

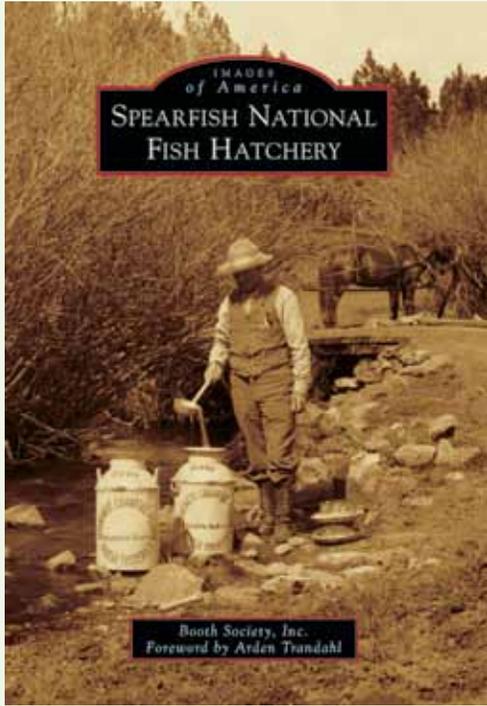


USFWS

Biologists catch juvenile salmon with baited minnow traps to document habitat use in small streams on the Kenai Peninsula.

plans, on fish passage projects, and invasive species prevention and control. Over the years, the field office has developed cost-effective tools that include, underwater video monitoring technologies to monitor salmon, trout, char, whitefish, and other fish populations in challenging Alaska conditions. ♦ Jeffrey Anderson

Every picture tells a story



Arcadia

Flip through the pages of Spearfish National Fish Hatchery: Images of America for a window into the history of the U.S. Fish and Wildlife Service and one of the oldest federal fisheries facilities.

A new book titled *Spearfish National Fish Hatchery: Images of America* (Arcadia Publishing) tells lots of stories in over 200 archival images. The book written by three U.S. Fish and Wildlife Service employees tells the intimate conservation history of one of the oldest Service facilities in the nation.

In 1892, U.S. Fish Commission scientist Barton Evermann was on assignment to South Dakota from Washington, DC. His charge: survey fisheries and locate a site for a federal hatchery. The foray took him to Spearfish Creek. The site was ideal. By 1899, Spearfish National Fish Hatchery started raising trout for the Black Hills and points beyond, and its effects on fishing were profound.

In time, the hatchery's mission changed to diet and genetics research, conservation training, and then to historic preservation

that's now carried on there daily. The station's name changed, too. Today's D.C. Booth Historic National Fish Hatchery and Archives—named to honor the hatchery's first superintendent—is a treasure trove of information related to fisheries conservation. It's the Service's only collection management facility dedicated to preserving fisheries history.

About the authors: Randi Sue Smith is the archive's curator and has handled most of its 175,000 items, including nearly all of the images in this book. Carlos R. Martinez is the facility's director, and Craig Springer is a fish biologist and editor of *Eddies*. All three teamed up to write this book in partnership with the facility's friends group, the Booth Society, Inc., which will receive book proceeds. ♦ Abigail Lynch

Fish Culture Hall of Fame Inductees: Wesley H. Orr and Gary A. Wedemeyer, Ph.D.

Over the last 142 years, the U.S. Fish and Wildlife Service has employed a good number of impressive biologists. Two more of them have been inducted into the Fish Culture Hall of Fame: Wesley H. Orr and Gary A. Wedemeyer, Ph.D.

Orr began his service at the ripe old age of 16, as a laborer at Spearfish and McNenny National Fish Hatcheries in South Dakota. After this experience, he was, as they say, hooked. Orr went on to work at Ennis National Fish Hatchery in Montana for 27 years, and truly left his mark on the art and science of fish culture. Orr revolutionized rainbow trout husbandry and

production. He changed the way rainbow trout eggs are collected, fertilized, and distributed, and in the end established a high-yield rainbow trout broodstock.

Dr. Gary Wedemeyer credits his career in fish culture research to Rachel Carson, a biologist for the U.S. Fish and Wildlife Service whose famous 1962 book, *Silent Spring*, reminded many of the importance of stewardship and conservation of natural resources. Wedemeyer began his own U.S. Fish and Wildlife Service career at the Western Fish Disease Laboratory in Seattle. His first research assignment was to develop methods and standards

needed to improve the health, physiological quality, and survival of juvenile trout and salmon released from federal hatcheries. Wedemeyer's most significant contribution to fish culture was to bring about a greater understanding of the hatchery rearing environment and its effects on the initiation of fish diseases.

The Fish Culture Hall of Fame is a function of the American Fisheries Society, Fish Culture Section, and is housed at the D.C. Booth Historic National Fish Hatchery and Archives in Spearfish, South Dakota. ♦ Jim Bowker

Wild lake trout numbers on the rise, research shows



University of Vermont

Lake trout dwell in deep water and spawn over rocky bottoms.

A recent peer-reviewed scientific paper authored by U.S. Fish and Wildlife Service biologists reveals that lake trout populations in Lake Michigan may be on the mend. A paper titled “Evidence of Wild Juvenile Lake Trout Recruitment in Western Lake Michigan” that was

recently published in the *North American Journal of Fisheries Management* reports the first evidence of consecutive year-classes of naturally produced lake trout living beyond the fry stage in Lake Michigan. Dale Hanson, lead researcher, and four of his colleagues at the Green Bay Fish and Wildlife Conservation Office concluded a high proportion of young lake trout caught in recent winter surveys were of wild origin.

Lake trout were wiped out in Lake Michigan from parasitic sea lampreys and overfishing in the 1950s. Since the 1960s national fish hatcheries have stocked lake trout but lampreys, fishing, pollution, and the invasive alewife have hindered the fish’s recovery. Researchers

can determine whether a lake trout originated naturally in the wild or from a hatchery, where the latter is given a unique fin clip. Until recently virtually all lake trout caught in the wild had fin clips.

Now, lake trout without fin clips are on the increase, and that’s good news. In the last two years the fisheries scientists from Green Bay have pulled up lake trout from the depths of Lake Michigan where up to 27 percent of the lake trout hatched each year were naturally produced. They surmise the increase is partially due to a reduction in alewife as forage. A diet heavy in alewife causes a vitamin B1 deficiency in lake trout eggs, and thus poor survival of young fish. ♦ Craig Springer

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

Everybody loves the jar. Down on a shelf in the archives sits an old jar, filled with preserved trout. Special groups are sometimes given a tour of this storage area and someone usually notices this jar of fish. It is a distinctive jar, straight sided, about a foot tall, with a sealed lid, held on by a flat knob and threaded clamp. Sloshing in liquid, five fish fill the jar, nose down. Are these unique scientific specimens, carefully preserved for future studies? Perhaps type specimens used to pen a scientific name of now endangered trout? Unfortunately, no—they are just trout. Different species, the jar could be used to illustrate the differences between brown, rainbow, and brook trout. Hatcheries often have sets of preserved fish set aside for educational purposes.

However, it’s the jar and not its contents that are special. Once used in an exhibit display in the Hector von Bayer Museum of Fisheries History, the jar calls to mind hatchery laboratories and research of a hundred years ago. Placed on exhibit in the



Craig Springer/USFWS

Once a museum exhibit, this jar still shows visitors to the D.C. Booth Historic National Fish Hatchery and Archives the differences between brown, rainbow, and brook trout.

museum in the 1980s, the jar was the museum object, with the fish just window dressing. The exhibit was dismantled about 10 years ago, and the jar returned to storage with concerns about safety. It sits on an open shelf where it can easily be observed, with plenty of ventilation. The preservative used to pickle the fish is unknown, but the seal is holding. Someday, with appropriate precautions, the jar will have to be emptied. A new storage location will be assigned, likely a closed cabinet to avoid breaking this wonderful antique. ♦ Randi Sue Smith

By Ann Gannam, Ph.D.

Dr. John Halver



D. C. Booth Historic National Fish Hatchery & Archives

Dr. John Halver, a decorated World War II officer, pioneered scientific research in fish nutrition.

Dr. John Halver is widely known as “The Father of Fish Nutrition” because of the many notable achievements and discoveries he made in the area of fish nutrition. He was a professor emeritus in nutrition in the School of Aquatic and Fishery Sciences, University of Washington. But this was not the only professional hat Halver wore through his long career. Of note was his position with the U.S. Fish and Wildlife Service as director of the Western Fish Nutrition Laboratory in Cook, Washington. Halver oversaw the design and construction of the laboratory from 1950 through 1953. He then equipped it, staffed it, and directed the research for the next 22 years. The work at the laboratory included the study of protein, vitamins, minerals, comparative biochemistry, and metabolism of fishes. It was here that Halver and his staff made breakthrough findings in the nutrient requirements for Pacific salmon.

John Emil Halver was born in Woodinville, Washington, in 1922. Halver descended from Finnish and Danish-Norwegian stock and lived in the same town as his pioneering grandparents in western Washington. He grew up on a farm caring for milk cows and developed a milk route to sell his product, showing early in his life that he was hard working and innovative. When he was older he worked summers on a tug boat, and it was the sort of labor he wanted for the rest of his life. But his mother had another plan in mind. She had him apply for a college scholarship. He won the

scholarship by demonstrating how to use wheat straw to make paper, and started his studies in 1940.

Halver received a B.S. in chemistry from Washington State College (Washington State University) in 1944. He was called to active duty in Europe with the U.S. Army as an infantry officer shortly after D-Day. He returned from World War II a highly decorated captain. After the war, Halver earned a M.S. in organic chemistry from Washington State University in 1948. Halver taught for a stint while also doing graduate coursework in the Department of Agricultural Chemistry at Purdue University in Indiana in 1949. A Ph.D. in medical biochemistry from the University of Washington followed in 1953, and it was during his doctoral studies that Halver commenced his career with the U.S. Fish and Wildlife Service, establishing the Western Fish Nutrition Laboratory. He directed the lab until 1975.

Using fish as his experimental animal, Halver developed a notable research diet named *H440*, the H for Halver, and 440 for the number of tries to get it right. *H440* became the basis for test diets used for trout and salmon primarily, but many other fishes too, to determine nutritional requirements, specifically vitamins. Later *H440* was modified to determine amino and fatty acid requirements of fish. As a nutritional biochemist Halver was inducted into the National Academy of Sciences in 1978, for his work tracing and curing the cause of liver cancer in hatchery rainbow trout. He determined the

cancer was caused by aflatoxin B1 in peanut meal used in the fish diet. Peanut farmers customarily washed newly harvested peanuts and stored them wet for later processing. Halver suggested the peanuts pass on a conveyor belt through a drying system before storage. This prevented the growth of the organism that produced the cancer-causing toxin.

Changing hats in 1976, Halver joined the faculty at the University of Washington, becoming a full professor of nutrition. During his time in the research arena both with the U.S. Fish and Wildlife Service and the University of Washington, Halver and collaborators made notable discoveries in fish nutrition that benefitted conservation and commerce.

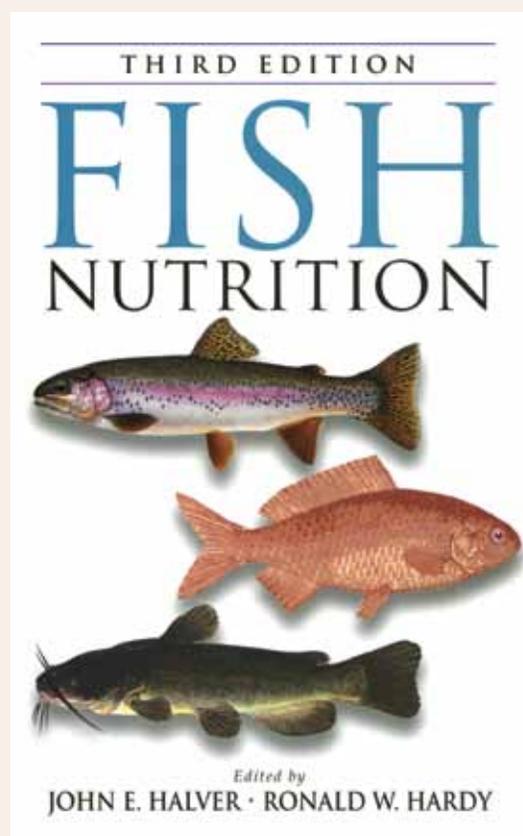
Halver learned about the relationship of vitamin B-12 with anemia in salmon and how vitamin C affects responses to disease and trauma and identified other water soluble vitamin requirements for trout and salmon. He described specific signs of deficiency in fish; developed amino acid test diet requirements for salmon; and determined the role of omega-3 fatty acids in cell membrane structure. He also established a fish feed quality control program for testing hatchery feeds.

By any measure, Halver was a very successful scientist. By this measure — the amount of information that he shared with the scientific community — his work was profound. He published over 200 scientific

articles and wrote or edited several books including three editions of *Fish Nutrition*. His peers in his professional circle in the American Fisheries Society took note: in 2000 he was inducted into the National Fish Culture Hall of Fame at the D.C. Booth Historic National Fish Hatchery and Archives in Spearfish, South Dakota. The induction gave him the moniker, “The Father of Fish Nutrition.”

Dr. John E. Halver — a man who consulted some 60 foreign governments on fish culture and served his country in war on foreign shores — passed away at the age of 90 at his home in Seattle, mere miles from his place of birth. But Halver’s contributions to fisheries conservation live on, in the work carried on daily by fisheries professionals in the U.S. Fish and Wildlife Service, and around the globe. ♦

Ann Gannam, Ph.D., is a Fish Nutritionist at the Abernathy Fish Technology Center in Abernathy, Washington. She wrote the story “From Horse Heads to Pellets,” in *Eddies*, Fall 2008.



John Halver's work in fish nutrition endures in print. This book was first published in 1972, and its third edition came out 30 years later.

Bowfin: North America's Freshwater Thug

By Christopher Scharpf



Doug Stamm

The two nasal tubes on the bowfin's snout, as seen in this photo, allow it to detect prey in dark and murky waters of eastern North America.

Spoken aloud, the scientific name of the bowfin—*Amia calva*—is one of the prettiest of fish names. Yet the mellifluousness of its moniker totally belies the thuggish nature of the fish it signifies. Many fishes are voracious predators, but the bowfin is one of the meanest fishes in North America. In fact, it may be the only fish in the world that has left the water of its own volition to attack a man on land (more on that below).

Bowfin lurk in the quiet, weedy areas of swamps, small streams, ditches,

ponds, oxbow lakes, bayous, borrow pits, and estuaries throughout the lowlands of the eastern United States and the southernmost portions of Ontario and Québec. They're "prehistoric" fishes whose ancestors populated the fresh and marine waters of the world 135 to 95 million years ago. Two species of fossil bowfin, 35 to 50 million years old, are known from Colorado and Wyoming.

The sole-surviving species is just that—a survivor. Bowfin can tolerate high temperatures and low oxygen

levels that kill other fishes by using their swim bladder to breathe atmospheric air. In addition, their gills maximize gill-to-water contact and maintain their structural integrity when exposed to the air. These are handy adaptations in waters that go stagnant when decaying plants use up most of the oxygen, or dry to mud puddles in summer droughts.

The bowfin's ability to breathe air has led to claims that it can aestivate like lungfishes for up to 21 days when

waters dry up, then “come back to life” after the next substantial rainfall. But such claims are based on anecdotal reports and have not been backed up by laboratory experiments.

Still, the bowfin is one mean, scrappy fish. It looks it, too. With a bullet-shaped body, armor-like plates around its head, and an unsmiling, fearsome mouth, it has the unmistakable appearance of a fossilized fish that’s come to life. Its canine-like teeth are sharp and numerous, giving it a carnivorous scowl. And its long, undulating dorsal fin (the bowfin of its name) allows it to swim forwards and backwards with equal dexterity.

Scientists call the bowfin a “predatory generalist,” which is just a fancy way of saying it eats anything that moves. Fishes, worms, crayfishes, insects, leeches, mollusks, frogs, toads, salamanders, snakes, lizards, and small rodents have been found in bowfin stomachs. Active at night and dawn and dusk, the bowfin hunts with a strikingly quick lunge, opening its large mouth, sucking in prey, and then slamming the jaws shut. Total elapsed time: 0.075 seconds.

Bowfin are unique among North America’s “living fossil” fishes (the others are sturgeons, gars, and paddlefish) in that they build elaborate nests and protect their young, two behaviors normally seen in more “advanced” fishes. Spawning takes place in spring or early summer, usually at night. In shallow water, males construct a bowl-shaped nest among weeds, tree roots, or under logs. Males bite off sections of plants and place them into the nest, forming a kind of “bed.” Sometimes they uproot plants by fanning their caudal and pectoral fins. Once the

nest is complete males wait patiently for a female to arrive.

Eggs hatch after 8 to 10 days. Bowfin larvae have an adhesive disc on their snouts with which they attach themselves to plant material in their nest. About nine days later they are free-swimming and follow the male closely, forming a tight school or “ball” of young. Should a baby bowfin become separated from the school, it swims in circles until the male reappears. And should an intruder come near, be it a fish, stick, net, swimmer, or even another bowfin, the male attacks. In one extreme case of bowfin aggression, a 14-inch male that was guarding 30 to 40 fry rushed at a snake collector who was standing on the bank. The bowfin actually propelled itself eight inches out of the water and up a slightly sloping grassy bank several times.

In addition to aggression, male bowfin will resort to trickery to protect their young. Males have been seen creating diversionary splashes, giving their young a chance to swim away from danger. Males also have been seen using their tails to create a mud screen between their young and any approaching predator.

The bowfin’s aggressiveness makes it a tough angry fighter at the end of a line, but they’re also notorious tackle busters. After grabbing a lure, bowfin often return to the bottom, tangling the fishing line on logs, roots, tree limbs, and aquatic vegetation. Many bowfins simply bite through the line with their needle-sharp teeth. Landed bowfin may at first appear docile, but suddenly spring to life, tangling nets and line with violent thrashings of their body.

Bowfins are generally considered to be poor to eat, but Native Americans were reportedly fond of them, and residents of the Deep South use them for dishes such as fish balls, jambalaya and gumbo. Creamed bowfin on toast is said to be soothing for children with stomachaches. In Louisiana, bowfins are cultured in commercial hatcheries for their roe, which is marketed as “Cajun caviar” or the decidedly more upscale trade name “Choupique Royale.”

The bowfin has given rise to two unusual superstitions. According to one legend, bowfin meat possesses the power of turning raw after it has been cooked and allowed to sit overnight. And as if that weren’t miraculous enough, a bowfin wrapped in Spanish moss and buried during the correct phase of the moon will seven days later transform itself into a black moccasin snake!

Perhaps the most important value of bowfins to humans is strictly academic. As a living relict from the past, the bowfin is an important fish in the study of vertebrate evolution, and is a mainstay in comparative anatomy and vertebrate zoology labs.

Apparently, being a thug — as well as an over-protective parent — is one way to survive millions and millions of years. ♦

Christopher Scharpf is a Fellow of the North American Native Fishes Association. He writes advertising for money. He writes about fishes for fun.

By Ben Ikenson

Bridge Over Troubled Water

Engineering students make waves for imperiled minnow



Angela James/USFWS

Student-designed and student-built, this bridge at the Rio Grande Silvery Minnow Sanctuary near Albuquerque, New Mexico, is the product of a cooperative effort to engage, educate, and employ youth in conservation projects.

After being suspended from an Albuquerque, New Mexico public high school for possessing a pocketknife, David Pope decided to enroll in a local charter school that emphasizes architecture and engineering. Through one of its programs, the 17-year-old spent time studying not in a classroom but outdoors, in a small patch of cottonwood forest skirting the banks of the Rio Grande near a barren industrial zone dominated by graffiti-tagged warehouses and auto body shops. It may seem an unlikely place for the conservation of a tiny native

fish that has been teetering on the brink of extinction for decades as a result of wide-scale habitat alteration: the Rio Grande silvery minnow, once found throughout some 3,000 meandering miles in New Mexico and Texas, has been reduced to less than 10 percent of its ancestral range, and its plight is further exacerbated by prolonged drought conditions. But last year, here on these few acres of open space, Pope and dozens of his peers helped create the Rio Grande Silvery Minnow Sanctuary and Education Center.

“It was a pretty awesome experience,” says Pope. “We all got pretty familiar with the bosque (riverside forest) and we got to see our work help transform it.”

Completed last autumn, the sanctuary is a quarter-mile stretch of waterway diverted from the river and engineered to replicate its original conditions, with small islands and plenty of oxbows and shallows in which the fish have historically flourished. For the minnow, its benefits are twofold: they can be bred and reared here for subsequent release elsewhere; and during drought times when stretches of the river are expected to dry up, fish can be collected and brought here, since water levels will be constantly maintained. Also, with kiosks and information on the species, the place will double as a much-needed tool to educate a community that remains relatively unfamiliar with the fish. Yet another positive dimension of the project, of course, is that it was largely designed and built by high school students who live in a city plagued by gang violence, drug abuse, and a teen pregnancy rate not unlike that of the once-prolific minnow.

The sight of teenagers congregating in the woods by the river would give any reasonable Albuquerque resident pause, but it has been a particularly gratifying one for Joaquin Baca, a hydrologist and an environmental education specialist with the Service’s fisheries program who helped coordinate the work. “This project is a remarkable example of how to get urban youth not just interested but directly involved in conservation work,” says Baca. “They dove right in, learning along the way and applying that to the work.”

As part of the Service’s *Connecting Youth with Nature* initiative, Baca and colleagues Angela James and Weston Furr at the New Mexico Fish and Wildlife Conservation Office began reaching out to prospective partners in June 2011.

By October 2011, 10 students from Amy Biehl High School, located downtown, conducted preliminary work to remove non-native vegetation such as tamarisk, which persists on many riverbanks in the Southwest infusing soil and water with alkali to the detriment of native species.

The following summer, the local nonprofit New Mexico Volunteers for the Outdoors helped the Service construct a birding and interpretive trail at the site.

A third stage began in September 2012 when Pope and fellow 10th-graders from ACE Leadership High School initiated a conception stage, researching and developing ideas for kiosks and bridges. “ACE” stands for architecture, construction and engineering. Over a period of eight months, the students applied themselves to the work as part of their classroom curriculum, and teamed with Service engineers and a local architect to develop a budget and materials list, design ADA-compliant structures, and apply the finer points of their lessons in biomimicry.

“Biomimicry is a way to connect with nature that helps us understand and formulate design solutions,” says Kris Callori, principal architect at Environmental Dynamics, Inc. “Nature has been designing products and systems for 3.8 billion years; there are success stories all around us.”

Callori taught a string of eight lessons on the design principles of biomimicry and helped the students explore how they could inform the kiosk designs.

“We went to the site with the question ‘How does nature communicate?’” explains Callori. “The students each found an inspiring organism to ask this question of, and then went back to the classroom and studied ants, mycelium, and various plant species. We discussed the patterns that each of these organisms share, and which ones could be relevant to our kiosk designs ... incorporating elements of movement, multi-directional broadcasting, color, and shadow.”

Eventually, kiosk and bridge designs were exhibited for review by Service engineers. From 100 designs, they selected three of both to inspire the build. Pope’s design for a 30-foot bridge was selected as an alluring centerpiece that spans the width of the waterway.

“They [the engineers] made only one adjustment: put a few inches of gravel at the bottom of each of the post holes before we put in the concrete,” says Pope proudly.

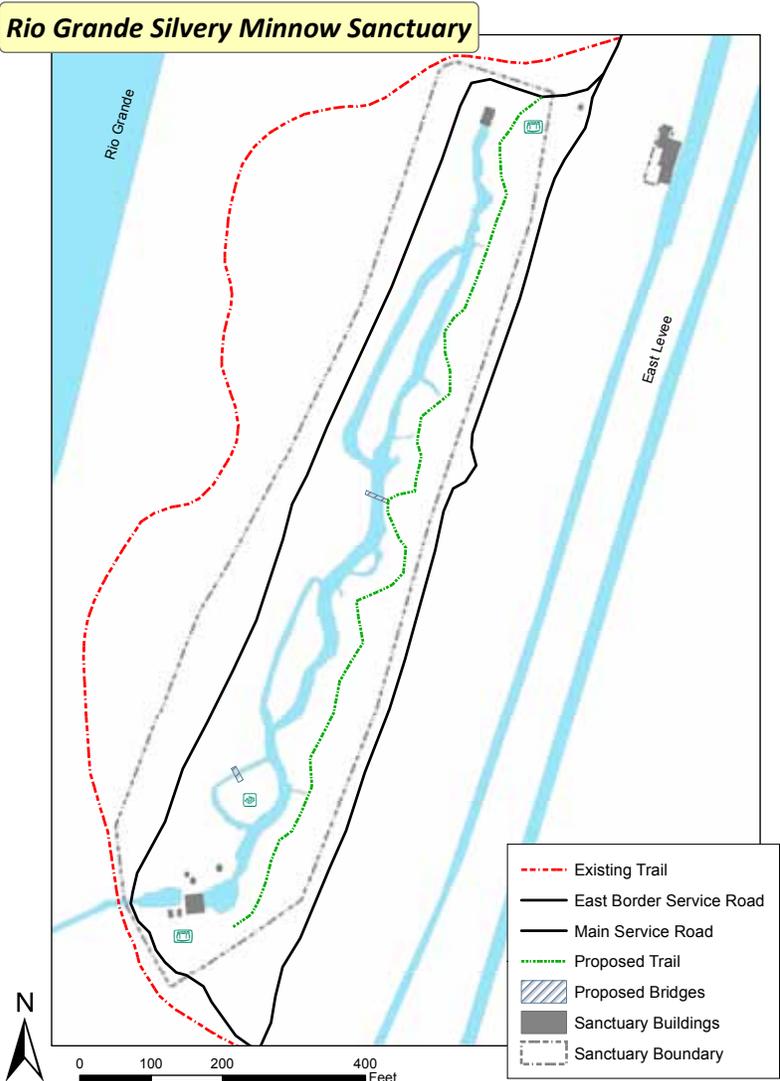
Pope’s teacher at ACE Leadership High School Rob Shauger is likewise proud. “David took the initiative to design a computer model on the tight timeline of two weeks, spending on average eight hours each day and night working on it,” he says. “It’s a remarkable sign of success for our school that engineers approved a design from a student who left his traditional high school for more meaningful educational experiences.”

The project also represents a significant milestone in silvery



David Pope

Student David Pope, ACE Leadership High School, created this bridge design as part of his studies in engineering and fish biology.



Joaquin Baca/USFWS

Rio Grande Silvery Minnow Outdoor Education Center concept map.

minnow recovery work. While the Southwest Native Aquatic Resources and Recovery Center in Dexter, New Mexico, rears the majority of minnows in the state, and there are smaller facilities used for the same purpose, “the Sanctuary is not only a rearing facility but also a refuge for existing wild populations during times of drought, which is important for maintaining genetic diversity of the fish,” says Baca.

As such, the facility meets a “refugia requirement” ordered by the Biological Opinion released when the minnow was listed as endangered in 1994. With a possibly contentious new Biological Opinion due to be published later this year, the place could prove helpful in boosting community support. Current budgetary and maintenance issues have precluded scheduling the Sanctuary’s official public opening, and how the facility may brighten the long-term outlook for the fish remains to be seen.

But it is likely to yield certain other far-reaching benefits.

“Perhaps most important,” says Baca, “the project represents a kind of template for connecting young people to the environment and creating future generations who can apply practical skills to helping restore it.”

Pope, for instance, who wants to pursue a career in electrical engineering, says “the cool thing for me is that engineering processes can be really important to conservation projects like this one.”

If his bridge provides apt metaphor for connecting youth with nature to forge a healthier environment, he, for one, is content to be crossing it.



USFWS

The Rio Grande silvery minnow was listed as endangered in 1994.

A number of partners were involved in the Sanctuary project: Amy Beihl Charter High School, ACE Leadership Charter High School, New Mexico Volunteers for the Outdoors, EDI Architecture, New Mexico Plant Society, Bernalillo County Master Naturalists, New Mexico State University Cooperative Extension, and the New Mexico State Parks. ♦

Ben Ikenson is a former speech writer for the U.S. Fish and Wildlife Service, and the author of two books. He wrote "Old Man and the River" in *Eddies*, Summer 2011.

By Lee Allen

Nature Explore Classroom

Creston National Fish Hatchery hosts one-of-a-kind facility



Stephanie McDonald, member of the Northwest Montana Youth Conservation Corps, helps square up a platform in the Nature Explore Classroom.

Those of us who love the outdoors don't need a reminder about why we are enamored—but for those who have not yet joined that parade, the words of naturalist Henry David Thoreau ring true: “We can never have enough

of nature...in wilderness is the salvation of mankind.”

Nearly two dozen acres of wooded Kalispell, Montana forest at the Creston National Fish Hatchery



is now home to a unique concept known as a Nature Explore Classroom, a children’s interpretive center, the only one of its kind housed at a national fish hatchery. The innovative outdoor classroom serves as a model to connect children with the natural world and engage youth in facilitating nature-based teaching, playing, and learning.

“Because we had a successful track record of working with youngsters via our tribal youth program, the Chief of Fisheries in our headquarters office in Washington, DC, Stuart Leon called and said, ‘Have I got a deal for you.’ It was a deal we couldn’t turn

down despite the extra work and commitment it would mean over the long term,” says Creston National Fish Hatchery Manager Mark Maskill. “It was a life-changing

decision for this facility because you don’t just build a project like this and walk away. You have to commit, maintain, grow, and nurture it and we were willing to do so.”

The Nature Explore Classroom at Creston was funded by a \$29,000 grant from U.S. Fish and Wildlife Service’s Division of Education and Outreach, and administered by the Arbor Day Foundation and Dimensions Educational Research Foundation. “There are 170 certified Nature Explore classrooms scattered across the country in diverse settings, all working toward providing a safe outdoor space where a connection and an interaction can be made with the natural world,” said Nature Explore Outreach Director Susie Wirth.

Based on a cost-to-build/benefits-returned ratio, the classroom creation was a bargain because of donated materials and volunteer labor. “The U.S. Fish and Wildlife Service supports a variety of youth outreach efforts to instill in children a life-long sense of wonder, an appreciation of the environment, and a curiosity about nature,” says National Conservation Training Center project manager Mary Danno. “This project further exemplifies the Department of the Interior’s focus on the three Es: Engage, Educate, and Employ. We’re making a difference in the lives of our youth.”

Learning about nature in a natural environment is a tailor-made response to what child advocacy



Youngsters Ariana Sydiar (l) and Oscar Metallo work on their construction skills in the Nature Explore Classroom.

expert Richard Louv called ‘nature-deficit’ in his *Last Child in the Woods* book, a lack of nature in the lives of today’s wired generation. Louv’s contention is based on a growing body of knowledge indicating direct exposure to nature is essential for healthy childhood development and for the physical and emotional health of both children and adults. “The more high-tech we become, the more nature we need,” Louv proclaims in his book.

“We want to encourage children to put the electronics aside, get outside, and enjoy the natural world around them. With the help of a nature-based classroom they can build anything and be anything,” says Creston Outdoor Education Coordinator Evie Bradley. “Adults will also experience the rich learning that takes place in a Nature Explore Classroom as we encourage creativity in a natural setting.”

While outdoor classroom design principles are based on lots of research and field-testing to ensure things are developmentally appropriate, Creston National Fish Hatchery hit that mark — ironically in the shape of a fish!

“We took an under-used wooded area and built a multi-use pavilion next to a number of deer trails which were used as natural corridors to separate areas designed for music and movement or crawling and climbing,” says Maskill. “Looking down on the conceptual blueprint, we said ‘By golly, doesn’t that look like the shape of a fish’...unintentional, but uncanny in its accuracy.”

Included in the station stops are props children can use to let their imagination run wild. “Anything youngsters can be fascinated with,” Bradley says. “We have deer antlers, willow baskets to collect items, magnifying glasses to examine the discoveries and log them in a journal, an art area with blocks where kids can put their math skills to work, easels for the artistically inclined and a wooden dance floor with a wooden marimba, slap drum, and rain sticks.



Mark Maskill/USFWS

Two areas of the Nature Explore Classroom can be seen here, the Music & Movement Area in the foreground, and the Climbing Area in the background.

When you play in nature, whole new worlds open up for you.”

Although open to both young and the young-at-heart and open every day of the year for free visitation, “we tried to focus in on the third grade age group as our baseline,” Maskill says. “We want teachers to bring their classes here with the hope that the kids will want to return with their parents and siblings and make it a follow-up family adventure.”

Thirteen-year-old twins Jordan and Jaden Bernal of Big Fork, Montana were on hand at the open house last fall, accompanying grandfather Dave, the project supervisor who led the building effort that included Northwest Montana Native Youth Conservation Corps student carpenters from the Confederated Salish and Kootenai tribes.

“There’s lots of stuff for kids to do,” says Jordan. “I ran around, danced



Quite by accident, the final design for Creston National Fish Hatchery’s Nature Explore Outdoor Classroom took on the shape of a fish.



Mark Maskill/USFWS

Nick Adamson (l) and Zac Tapia, members of the Northwest Montana Youth Conservation Corps couldn't resist playing with the building blocks in a moment of levity.

on their dance floor, played music, and took lots of pictures.” Adds sister Jaden: “There were lots of birds and friendly people everywhere.” However both girls did admit the day’s highlight for them was the free cookies and lemonade.

Even Denise Wagner, conservation education coordinator with the Service’s Division of Fish and Aquatic Conservation got handed a hammer on her numerous site visits, becoming one of the willing participants with a tangible goal in mind. “With only two weeks to get the work completed, the YCC crew and everyone else involved worked hard preparing the area for the project. Everyone also laughed a lot, worked together as a team, and an amazing camaraderie emerged. At the end you could just tell every single person involved was very proud of a job well done.”

“We want to be valued as a good community member,” says Maskill. “The hatchery has always provided tours as a platform to talk about our conservation work: ‘here’s the fish, here’s how we raise them.’ The Nature Explore Classroom allows us to take what we’ve been doing many steps forward, it’s outside the box for us. We can now tie what we do for fisheries conservation into the Nature Explore Classroom, and vice-versa. Providing a quality learning experience that provides a positive impact on young people’s lives—that is very gratifying.” ♦



Mark Maskill/USFWS

In nature, one finds inspiration and the desires to explore and learn.



Mark Maskill/USFWS

Creston National Fish Hatchery employees Evie Bradley (l) and Dave Bermel nurtured the project to fruition.

“We can never have enough of nature...in wilderness is the salvation of mankind.”

Henry David Thoreau

Creston National Fish Hatchery had its genesis in the New Deal era. Built by the Works Progress Administration, it opened in 1940. The hatchery raised brook, rainbow, and cutthroat trout for waters in Glacier National Park. Through the 1950s and 1960s, the hatchery worked on fish restoration projects with the Montana Fish, Wildlife and Parks. In the early 1970s, the hatchery’s priorities shifted toward supporting the Tribal Trust responsibility of the U.S. Fish and Wildlife Service, and provided several trout species for seven Indian reservations in Montana.

Through the 1990s, Creston National Fish Hatchery raised fish to mitigate the effects on the Flathead River fishery

caused by Hungry Horse Dam. Hatchery biologists raised kokanee salmon and created a leading-edge investigational bull trout broodstock. Creston was the first and only hatchery to rear the threatened bull trout (see *Eddies*, Summer 2011).

Currently, Creston rears westslope cutthroat trout and rainbow trout for restoration, mitigation, tribal, cooperative and educational fishery management programs. Creston distributes over 950,000 fish into Montana waters each year. Fish from Creston yield over 150,000 angler-days with an estimated annual economic benefit to Montana valued at \$7.5 million dollars. ♦

—Mark Maskill

By Robert Speirs

Wonder and Awe with Birds and Fish

Hatchery Helpers engage and educate youth about nature

Shared joy and wonder abound as the small birds were recovered from the nearly invisible mist nets. Black-capped chickadees, white-breasted and red-breasted nuthatches, house finches, black-headed grosbeaks, and downy woodpeckers all flew into the hands of the children who were part of the Hatchery Helpers volunteer program.

Killing two birds with one stone is an age old aphorism that faced Director Carlos Martinez at the D.C. Booth Historic National Fish Hatchery and Archives. While the children were only banding and releasing their birds, they were metaphorically killing others. The beautifully manicured grounds were in need of constant attention, red

squirrels were invading the exhibits and stashing their winter stores in unwanted locations, youth living near the hatchery seemed oblivious or indifferent to the hatchery's existence, and recruitment of new outdoor professionals was on the decline. The youth volunteer program piloted at the D.C. Booth seems to be addressing all of those concerns.

Young people under the direction of an adult supervisor volunteer their mornings for five weeks each summer. They perform needed repairs, enjoy stimulating activities, learn history, are educated on the environment and fisheries conservation, and undertake projects that tax the resources of more mature volunteers. Students ages 10 to 13 banded birds, marked fish, groomed trails, reclaimed and developed attractions, pulled weeds, and polished statues and solar collectors. They handle animals, too: they live-trapped and removed unwanted squirrels--and one skunk. There's more, the youngsters held garbage collection contests, read conservation literature, took scientific, historic, and educational tours, learned fly tying and fly fishing, and practiced what they learned on the water.

Dr. Kent "KC" Jensen from South Dakota State University graciously gave his time to set up his nets for a bird banding session. The best time to capture the small birds is early morning, so the nets had to be set up around 6:30 AM. This was



Robert Speirs

A house finch in a mist net captured the attention of a Hatchery Helper crew.

about two hours earlier than the children normally arrived and their supervisor had told them he would be there if they wanted to come early. He didn't hold out much hope that they would rouse themselves from bed or persuade their parents to get up that early before work. He was wrong.

They pedaled themselves in or cajoled their moms for a ride. Soon almost a dozen kids were running from each capture sight to the next to see what new feathered treasure they had acquired.

Fewer than a dozen volunteers are permitted to use the nets in South Dakota. Imagine your grandmother's hair net only 6 foot high and 100 feet long suspended between two driven steel poles. Dr. Jensen presented and explained the use of all of his equipment. He had numbered bands that matched the diameter of each species' leg, special pliers to firmly attach each leg band, and a journal that included as much detail as he could gather. He weighed each individual bird captured and noted their gender and age. He demonstrated how to identify the males from the females and how to distinguish between adult and immature birds. The kids gathered around him as if he were Santa and each piece of information a present.

We caught less than 10 birds, but each one went from his hands into the hand of a child to be released. In more than 35 years, and more than 7,500 banded birds, he has only had two nongame



This young Hatchery Helper clips the adipose fin off of a trout. Biologists mark fish in this manner to identify them in the wild as having originated in a hatchery.



Robert Speirs

Dr. Kent "KC" Jensen, South Dakota State University shows a crew of Hatchery Helpers a black-capped chickadee retrieved from a mist net.

birds recaptured. To the doctor's wonder and that of the children, three of the birds we caught that morning had already been banded. He cautiously instructed them in his art, how to release without inflicting damage or adding stress. Many of the nuthatches sat in wonder on the children's hands long after they had been opened. "Why don't they fly away? I'm not holding them. Why do they still sit on my hand when they could leave?"

How do you spark a child's desire? How do you encourage a love for nature and things wild within the confines of a city park? Spearfish and all of the cities of the Black Hills have an unfair advantage when it comes to cultivating young naturalists. Declining numbers of young people are engaging with the outdoors and their natural world. It was a wonder to watch the sparks in these kids' eyes.

“Now I know what I want to do with the rest of my life,” claimed one little girl. It was exactly what the Hatchery Helpers program had hoped to hear.

A group of tourists were visiting the D.C. Booth Historic National Fish Hatchery and Archives. It was in the evening and the staff was gone, but it is still possible to visit the grounds and feed the fish. One of nature’s dramas began to unfold before the incredulous and apparently unwilling eyes of the visitors. A mallard duck was taking her newly hatched chicks for their first swim. The hatchery’s mammoth brown trout took notice.

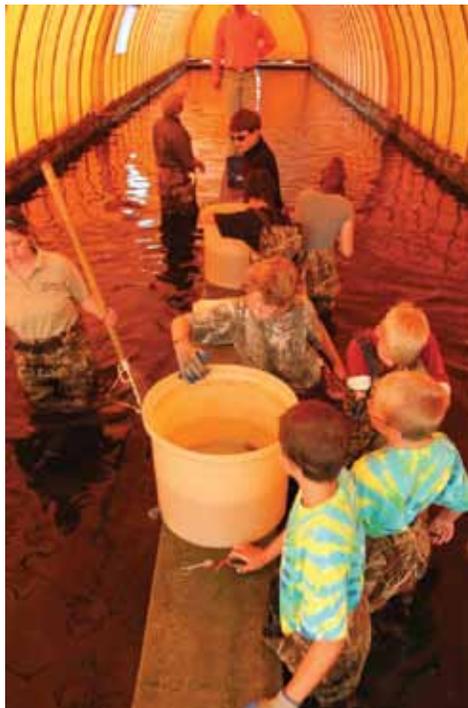
Someone dialed 911. The police station is only about four blocks away and I suppose more out of curiosity than anything else, an officer was dispatched. While it might have been interesting to shoot at the big fish as they rose to take down another duckling, I doubt it would have met the strict guidelines for discharging a weapon within city limits.

I heard that story Monday morning at a staff meeting as I prepared to begin teaching a summer session of middle school students who volunteer to work at D.C. Booth. Students range in age from 11 to 13 years old and I was hired to teach them lessons about nature. They spend their mornings for five weeks working to improve the facility and grounds for the more than 160,000 tourists that visit the hatchery each season. Little did I know that two days later, that the drama involving the tourists would repeat itself before the tender



Robert Speirs

Hatchery Helpers clear a trail at the D.C. Booth Historic National Fish Hatchery and Archives, which receives about 160,000 visitors each year.



April Gregory

Hatchery Helpers corral trout in a raceway so as to clip their fins before eventual stocking in the wild.

eyes of my young lady and gentlemen charges.

On Wednesday the students arrived for their orientation, accompanied by a steady drizzling rain. Despite the inclement weather, the kids were ecstatic to be onsite and were amazed by the amount of wildlife that lives on the grounds of the hatchery.

I unloaded some snacks and the kids were taking a break, when an unfortunate young trout leapt out of the water and landed amid a group of mallard drakes. The ducks spent the next five minutes in a tug-of-war

over that small rainbow. I wasn't even aware that mallards ate fish. First one, then another, would grab the trout, and in a waddling sprint, dash away to try and hide his catch. The kids thought it was hilarious to watch and cheered one bird over the others whenever it would grab the prize.

The cheers turned to cries of dismay when a hen wood duck tried to bring her newly hatched clutch through the big rainbow and brown trout pond. Some of these fish weigh in at over 18 pounds. A big brown trout's hooked jaws are lined with teeth. The fish more than made up for the loss of the



Robert Speirs

These youngsters helped with conservation projects for five weeks, benefiting birds, butterflies, fish, and people.

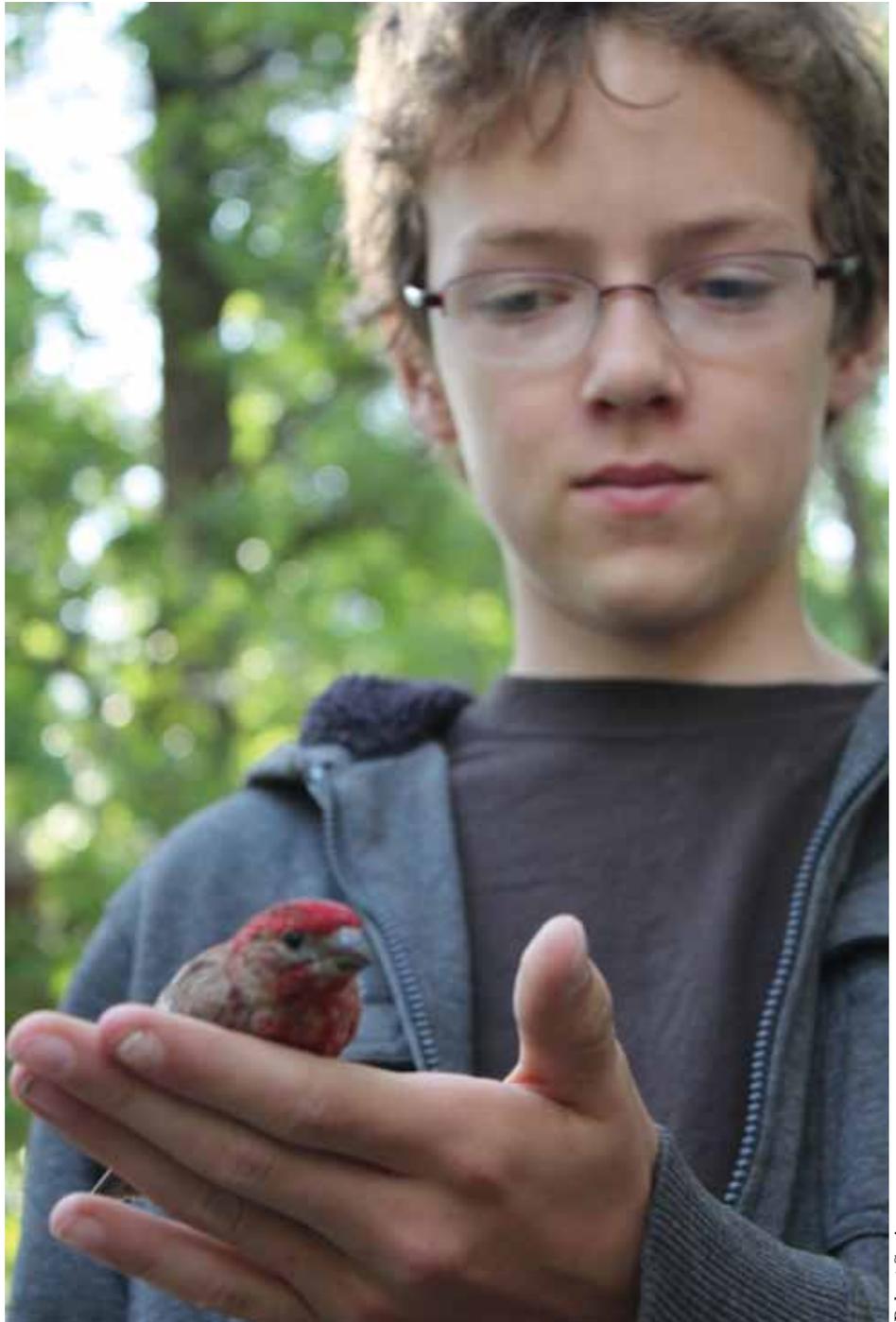
young trout and soon only half of the ducklings remained. The kids began to cheer the remaining chicks on in their flight to escape. Tears began to flow as more chicks were lost and they pumped their fists in the air when the first little bird made it to a drainage grate and supposed safety.

But the grate proved unsafe for the young birds and soon they were all swept below the water's surface. The duck's frantic calls were drowned out by the cries of the children. Hatchery worker Mitch Adams came to the rescue with a dip net and had four healthy birds rescued to the great relief of my students. But two dazed and sodden chicks looked doomed. They weakly paddled in circles with their heads flopped to the side. One of my students asked, "Can you save them?"

A better naturalist than I would have allowed the lesson of survival to continue, but I raised a blonde, blue-eyed little girl myself and so I gathered the injured chicks up. Though they looked beyond hope, quick warmth and a chance to dry off brought them around. Less than an hour later, revived and cheeping, they rejoined their hen.

Death comes every day. I have a wood duck or two of my own in the freezer. But if given a chance to help wildlife, fewer people move more quickly than hunters and children. Nature's lesson learned; ducks eat fish, fish eat ducks, and people help when they can. ♦

Robert Speirs writes for the *Rapid City Journal*, teaches high school English, and guides Hatchery Helpers in the summers.



Robert Speirs

It may be that the bird caught the boy. This young man caught, measured, and banded a house finch that is about to fly away.

By Karen Hollingsworth

Fish Make You Smarter

Young writers and painters muse over favorite fishes

It all began back in 1998, inspired by a child's homework assignment, and has become one of America's most effective K-12 conservation education programs.

Launched in 1999 Wildlife Forever's State-Fish Art Program continues to teach and inspire thousands of kids across America with the free school curriculum *Fish On!* Using art as a tool to teach youth about fish and aquatic conservation, students learn about then create an original illustration of an official state-fish. They also compose in their own words an essay, story, or poem related to their chosen fish, its behavior, habitat, and conservation needs.

The program culminates in the nationwide State-Fish Art Contest with an annual entry deadline of March 31st. On Earth Day a diverse panel of judges selects winners for each of the four grade categories from each state and international entries. A second panel of judges determines the winning essays. The creativity and hard work of the young first place winners is recognized at the State-Fish Art EXPO each summer.

The ultimate purpose of the program is to create future stewards of our aquatic resources by connecting kids to nature—and getting them outdoors fishing. Prior to 2012 only the artwork was judged and awarded. We decided it was time to honor the science side of our contest and look for that special “spark of conservation awareness” that can be found in the written word.

The U.S. Fish and Wildlife Service's Division of Fish and Aquatic Conservation partners with this

award, judging the essays in the upper Grades 10-12 Category. They also present the Fish Make You Smarter Awards at the annual EXPO. The 2012 winning essays in the Grades 10-12 Category are highlighted in this article. We had a tie with two very different styles, of both writing and painting, rising to the top.

Macey Hoggard, a 10th grader from El Dorado, Arkansas, went underwater and sent out a delightful *Note from a Longear Sunfish* written from the fish's point of view. From Suwanee, Georgia, Arsalan Sufi's thought-provoking poem, *Contradiction*, was written on the fly. “While I spent almost ten hours on my artwork, I wrote my poem *Contradiction* in my friend's car on the way to school in less than ten minutes. My conclusion? Sometimes,

we produce our greatest works on a whim. I'm not really sure why this is; it's almost . . . contradictory,” she reflected in her acceptance speech.

Douglas Grann, President & CEO of Wildlife Forever is excited about the new award. “The essays are just as amazing as the art designs. In only one page I can find their personal connection to the watery world they just studied. I can ‘hear’ a conservation voice emerging.”

To learn more about the State-Fish Art Contest please visit www.statefishart.org. ♦

Karen R. Hollingsworth manages Wildlife Forever's State-Fish Art Program. She's an award-winning wildlife photographer and is featured in numerous publications including the *Smithsonian Book of National Wildlife Refuges*.



Longear Sunfish

Macey Hoggard

Note from a Longear Sunfish

By Macey Hoggard

Hi, just feasting on a couple of aquatic insects down here. It doesn't take many to fill me up because I am so small. I don't grow very large, much more than 4.5 inches really. Sometimes I grow a little bigger. I guess being small has its perks. I can easily hide from bigger things that might try to eat me. All of the thick vegetation that I live around helps hide me as well.

Anyway, right now, I am protecting my partner's eggs. Since I am the father, I stay here over the nest to fan the silt away from these eggs while she eats in deeper water. The babies arrived not long after they were conceived in August. There are usually about three to four thousand of them each time she lays. I have to cover them with small rocks to better protect them. I have to be sure to not harm them as well.

Finally, my partner is back. I need to go to the surface of the water to find some more bugs to eat. These bugs are the biggest part of my diet. Sometimes I go down to the bottom, near the heavy aquatic vegetation, to find other fish eggs to eat. I never eat my own, but others make for a fine meal. I have to eat soft foods because I lack teeth on my palatine bone. I also have a small mouth. So I am pretty much limited on what I consume.

Although I am lacking in the mouth area, I am a pretty fast swimmer. My anal fin has not one, not two, but three spines. My dorsal fin has at least seven spines. My fins help me swim and catch food. Now, can you guess what kind of fish I am? I am *Lepomis megalotis*, or the longear sunfish for short.



Arsalan Sufi

Largemouth Bass

Contradiction

By Arsalan Sufi

Largemouth Bass
Known by so many names —
bigmouth
bucketmouth
Southern largemouth
Micropterus salmoides
And the official fish of so many
states —
the Sunshine State
the Magnolia State
the state that houses the Smoky
Mountains
the state that I call home.

I can't help but wonder why.
Attractive?
Not at all.
dark blotches
jagged stripes
large lower jaw
Pleasant?
Doubtful.
incredibly aggressive
consuming small fish
preying on snails, frogs, and small
birds.

What could it possibly be?
Ecological importance?
I don't think so.
You're too invasive.
You devastate ecosystems.
But....
You do possess a niche in the
environment.
You are rather majestic.
And after all, you did inspire my
artwork.

You're strange.
I feel that I shouldn't respect you.
Yet in an odd way, one just as odd as
this poem, I do.

Meanders

By Ted Leeson

Red, White, and Bluegill

Among angling aristocrats, Atlantic salmon have long been celebrated as “the fish of kings,” no doubt because the two have so much in common: the aloof arrogance and inflated sense of self-worth, a fussiness about habitat, expensive tastes. And as far as I am concerned, they deserve each other. Give me a panfish any day—a fish of the people, blue-collar rather than blue blood, a working-class fish, a fish for great republic. I’ve never understood how the bald eagle, a scavenger and a thief, could have been chosen as our national symbol, whereas the honest sweat-of-the-brow bluegill never even made the shortlist. I guess the Founding Fathers didn’t fish much.

Panfish, of course, doesn’t denote a particular species but a loosely defined assemblage with varying regional representatives — a little like Congress but harder working and better behaved. The core of the group comes from the *Centrarchidae* family — the sunfishes — itself a kind of melting pot whose chief ingredients include bluegills, pumpkinseeds, redears, redbreasts, green sunfish, warmouths, rock bass, and white and black crappies. A kind of odd-man-out, the yellow perch is not a sunfish but no less a panfish wherever it is found. I am not aware of any single place that’s home to all these species at once. They crop up in various mixes and proportions in different

geographical areas, and membership in the category of panfish (or “bream” or “brim,” depending on where you live) has always been a matter of shifting local interpretations, further complicated by a host of colloquial names: shellcracker, stumpknocker, goggle-eye, sun perch, longear, speckled perch, white bass, and so on. In practice, the term ultimately falls into that set of expressions, like “I’ll do it in a minute” or “I have strong feelings for you,” that are universally understood but not necessarily taken to mean exactly the same thing by everyone.

Fishermen don’t trouble themselves much about such discrepancies, instead focusing on the collective virtues of the fish. And foremost among their merits is a relentless availability. Like the other indispensables of American life — duct tape, canned chilli, and WD-40 — panfish can be obtained virtually everywhere. I’ve taken them in creeks and rivers, brackish water and fresh, 10,000-acre lakes and quarter-acre stock tanks, old quarry pits, prairie potholes, golf-course water hazards, abandoned strip mines, backyard ponds, irrigation ditches, and once, the ornamental fountain pool behind a fancy hotel. As a group, they are America’s most widespread and abundant gamefish. And they are nothing if not game. I’ve caught them by accident and on purpose, on handlines, trotlines, poles cut from tree limbs, garage-sale spincast outfits, fly tackle that cost slightly less than my car, and every kind of gear in between. I’ve grabbed a few by hand and (in a mercifully

brief period of angling dementia) jigged them up through two feet of ice. Equally ready for a few casual casts after work or the formalities of an organized expedition, panfish are a fish-of-all-trades, up for anything, anytime. They are a welcome counterweight to the forces of high-tech angling and a persistent reminder that fishing is finally about fish, not equipment.

Accommodating and enthusiastic, genial and cooperative, panfish are custom-cut for the neophyte. In the angling universe of my youth, they were the force of gravity that held everything together. The ones I could catch whetted my skills and honed my instincts. Those that proved better at being fish than I did at being a fisherman gave me a continuing sense of purpose. Without panfish, I might well have sunk into juvenile delinquency, or golf. The pinnacle of every summer was the day my father, a man who did not readily leave the house, squeezed our whole family into a station wagon and endured the eight-hour drive to a lake in northern Wisconsin. He herded us directly from the car into a rowboat where, except for a few moments stolen to dig more worms, we spent a week or two yarding in unimaginable numbers of perch and rock bass and bluegills. The little ones bit readily. And bigger ones proved just discriminating enough to teach you something but still catchable enough that you could learn the lesson. At a time of life as yet uncorrupted by a lust for magazine-cover specimens, panfish fulfilled the greatest promise in all of angling—pure action.

We ate them, too, by the stringerful, with butter and lemon and onions, fried, baked, broiled, and grilled, and best of all, without guilt. Even today, in a time when quality angling for high-profile species increasingly hinges on catch-and-release, you can still sit down to a plate of bluegills or crappies without the slightest twinge of conscience or the fear of a second-rate meal. They come by their name honestly, for a pan is the highest destiny of these sweet-eating fishes. Bony? Sure, a little. And a steamed crab is mostly shell. Who's that going to stop?

Once you've got panfish in your soul, they never really leave. Not many seasons ago, a friend and I extorted an invitation to a pay-to-play trophy trout lake in the high desert of eastern Washington. The morning's fishing, though not fast, produced some remarkable trout, among the biggest of my life. Noon found us prospecting the lower end of the lake. Approaching deeper water near an earthen dam, we suddenly doubled up — smaller fish, it was clear, but dogged and determined fighters. To our utter disbelief, they turned out to be a pair of identical yellow perch a full pound a piece, with deep blue-green backs

“Accommodating and enthusiastic, genial and cooperative, panfish are custom-cut for the neophyte. In the angling universe of my youth, they were the force of gravity that held everything together.”

and lemon-lime flanks that shaded into fat, cantaloupe bellies. With no real idea how they got there, but a pretty good one about how to get them out, we burned up half a box of trout flies and a whole afternoon happily catching perch in a \$200-a-day lake where a five-pound rainbow scarcely elicits a yawn. That evening when our host, proud of his fishery and eager for a report, asked how we'd done, we just told him, “Couldn't have been better.”

And we meant it. In this age of scientific fisheries control, of measurements and projections that produce finely calibrated angling regulations, panfish may well be the last unmanaged gamefish in America, left to themselves, on their own as they've always been and doing just fine, thank you. It's ironic that a whole sector of the fishing

industry now thrives on whisking anglers off for their remote and pristine destinations to experience sport of unspoiled abundance, fishing “the way it used to be.” Any eight-year-old kid with a cane pole, a bike, and panfish in his heart can lead you to just such a place.

And maybe that's what I like best about them: panfish are the most

democratic of gamefish. They do not care who fishes them and bite equally for everyone. They're unimpressed by the cost of your tackle, indifferent to the methods you use, unconcerned about the bait you favor, and sometimes, whether there's any bait at all. Panfish are angling's version of the single-shot .22 rifle — sturdy and dependable, workmanlike and unpretentious. If panfish formed a baseball team, they'd be the Cubs; if you could play them on a jukebox, they'd be Hank Williams tunes; if panfish were a beer, they'd be whatever's on sale.

Oh, and there's one last thing. Except for the more cosmopolitan perch, panfish are pure homegrown. Though, much like American life, they've been exported around the world, panfish are indigenous only to North America, native to no other part of the globe. So picture this for a moment — a red-and-white bobber twitching above the slab of sunset-colored bluegill. Now there's something worth printing on the back of a dollar bill. ♦

Ted Leeson is the author of: *Inventing Montana; Jerusalem Creek: Journeys into Driftless Country; The Fly Tier's Benchside Reference; and The Habit of Rivers*, and others, not to mention a mountain of magazine stories. He teaches writing at Oregon State University.

Eddies

Reflections on Fisheries Conservation

U.S. Fish and Wildlife Service
Div. of Fish and Aquatic Conservation
MS ARLSQ 700
4401 North Fairfax Drive
Arlington, VA 22203

STANDARD PRESORT
POSTAGE AND FEES

PAID

U.S. DEPARTMENT
OF THE INTERIOR
PERMIT G-77

U.S. Fish and Wildlife Service
<http://www.fws.gov/eddies>

Spring 2013



Impediments No More

Kayakers can now run past the old stacked-stone Ram Works Dam on South River near Waynesboro, VA. The Appalachian Partnership Coordination Office removed the 10-foot-tall dam allowing boaters to pass downstream and fish upstream. According to U.S. Fish and Wildlife Service biologist Keith McGilvray, brook trout and American eel have some 27 more miles of spawning and nursery habitat now that the impediment is gone. Important partners, Trout Unlimited and the Virginia Department of Game and Inland Fisheries, participated in the dam removal on this Shenandoah River tributary.

As with most National Fish Passage Program projects the Service rarely goes at it alone. Since 1999, the Service and over 750 partners from public and private interests have removed 1,345 barriers, opening 20,229 stream miles and 155,454 acres of wetlands to fish. These projects benefitted 90 species of fish and mussels. In 2012 alone, 227 barriers removed yielded 2,546 stream miles and 36,630 wetland acres.



Breaching barriers takes the form of simply removing obsolete dams, replacing poorly designed



Mark Miller

With an obsolescent dam on Virginia's South River now gone, kayakers pass downstream while American eel and brook trout can move upstream to spawning and nursery habitat.

road culverts, or installing engineered fishways that allow migratory fish, like Atlantic salmon, to pass upstream unimpeded by concrete and steel edifices. To learn more, visit www.fws.gov/fisheries/whatwedo/nfpp/nfpp.html. ♦
José C. Barrios

