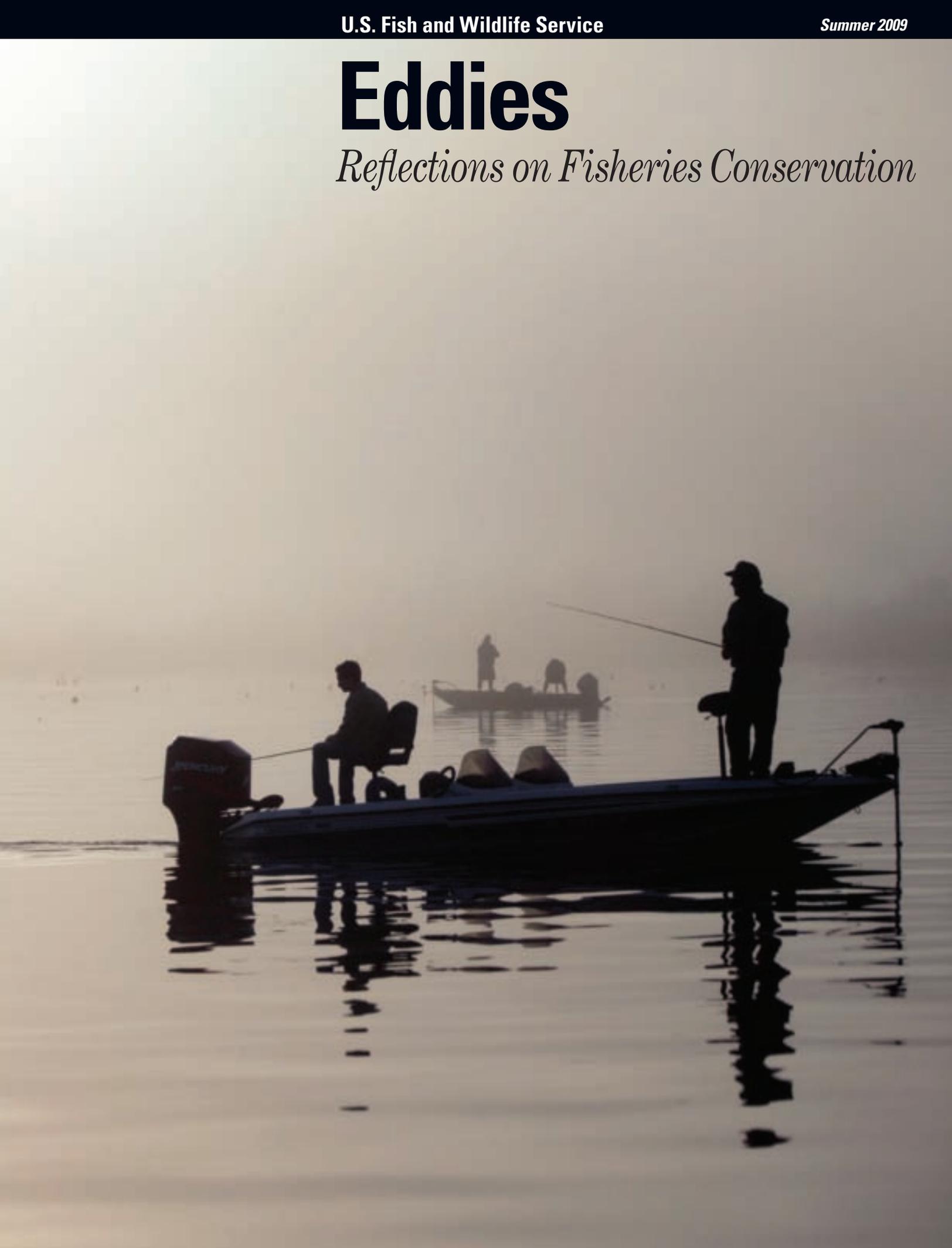


# Eddies

*Reflections on Fisheries Conservation*



# Eddies

Vol. 2, No. 2

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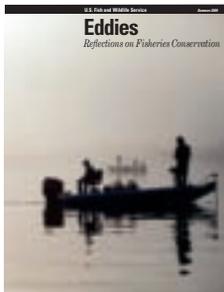
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Anglers work the shallows in the mist.  
Mitch Kezar photo



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Craig Springer

*Reservoirs provide tremendous angling opportunities throughout the U.S.*

***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

## *Stitches in the Fabric of Fisheries Conservation*

By Bryan Arroyo



USFWS

By definition, they are simply artificial bodies of water. Reservoirs of all sizes dot the American landscape. A deeper look into reservoirs reveals things aren't so simple. Because of their inherent artificial nature, they can have both positive and negative consequences to fisheries.

Regardless of size, reservoirs typically have their genesis in some societal need. They provide power; they store water to irrigate our vegetables; they improve the quality of life by preventing floods downstream. Reservoirs store the water that people need to drink.

People need water – and so do fish. It's self-evident, I know. But what may not be so evident is that manmade lakes, as artificial as they may be, have become a part of the societal fabric, and that's what this issue of *Eddies* touches upon.

Probably since time began, mankind has altered the environment to suit societal needs. The Hohokum culture hundreds of years ago in the arid American Southwest engineered the means to deliver what came from the sky. That engineering, though greatly more sophisticated in the present, continues today.

Reservoir building in the United States accelerated during the 1930s, with Franklin Roosevelt's "New Deal." Dam building hit its highpoint in the 1960s. As a consequence, we have water bodies where just about anyone can get to one of them in a day's drive, or less. These places are where we come to know our grandparents, or our children. It was, and remains, no exception for me. Though I cut my angling teeth as a toddler on New York's Hudson River, I came of age fishing for largemouth bass in a reservoir with my

father in Puerto Rico where I grew up. Now, with my wife and two daughters, we enjoy fishing on reservoirs in northern Virginia.

In this issue of *Eddies*, you will read about the challenges and opportunities of fisheries management in reservoirs and the waters that feed them, and the waters that drain them.

U.S. Fish and Wildlife biologist, Dr. Karl Hess, writes in his story "Dancing with Reservoirs" about the conundrum to conservation that reservoirs create. "We are confounded by something that is unnatural, yet indisputably a natural part of our lives," writes Hess. He makes a compelling argument that reservoirs need to be treated as something that are here to stay.

Reservoirs are an unnatural part of life for paddlefish. The story "Jurassic Pork" tells you how we manage a fish that needs long reaches of river to survive.

Creel clerks may be the only fisheries professionals you ever meet on a lake. So what happens to the information that you provide the clerks? Florida Fish and Wildlife Conservation Commission writer, Bob Wattendorf, lays it all out in his "Creel Survey" story.

"What's B'low," an evocative story by Ryck Lydecker, will have you think twice about what is and what was under your favorite reservoir. The statistics he presents on recreation on reservoirs are instructive.

Most reservoirs were built for multiple purposes, and provide services many are unwilling to go without. Fisheries conservation needs to be meshed in those multiple purposes, and that requires fisheries professionals in my charge to be fluent in other "languages" like hydrology and engineering. I know we are up to the challenges of looking out for the interest of fish and anglers. Be assured, the people that we employ are highly competent professionals.

Fishing is a legacy to pass along, and I encourage you to take the Angler's Pledge as I have to take someone new fishing. You can learn about the Pledge on page 7.

I am immensely proud to be given charge of the nation's premiere fishery management agency as the new Assistant Director. It is a high honor to serve you.

---

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

## Science connects brook trout in Nash Stream



Carla Bartlett/USFWS

*Brook trout broadside.*

The population of brook trout in northern New Hampshire's Nash Stream has been greatly reduced. The science of genetics aims to turn that around. Many of its tributaries hold small populations of brook trout, but their ability to move within, and into, neighboring tributaries and to reach the Nash Stream mainstem is limited. Numerous road culverts keep trout from moving about the drainage.

The conservation genetics lab at the Lamar Fish Technology Center in Pennsylvania has examined the genetic relationships of brook trout throughout the Nash Stream drainage, assessing the gene flow between brook trout populations, both above and below presumed barriers. The resulting data infer whether fish can move through culverts.

Working with New Hampshire Department of Fish and Game and U.S. Geological Survey, the genetic data from Lamar are integrated

with habitat information and results from a concurrent tagging study to identify which culverts most limit brook trout movement. Culverts can be strategically replaced in Nash Stream and expedite brook trout restoration. ♦ Meredith Bartron

## Protect Your Waters

Anglers and boaters can unknowingly introduce invasive organisms into aquatic ecosystems via their unwashed boots, boats, and tackle. So make sure you properly clean and dry anything that comes into contact with the water—that includes your dog—before moving on to a new water body. When boating or fishing, it's important to avoid transporting aquatic organisms. See [protectyourwaters.net](http://protectyourwaters.net). ♦ Joe Starinchak

## Hunt. Shoot. Fish. Share the pride.

National Hunting and Fishing Day is September 26, 2009, but the new materials available at [www.nhfd.org](http://www.nhfd.org) are designed as a year-round celebration of the NHF Day theme. Speeches at school, lectures for civic groups, presentations at club meetings – these are just a few of the uses for new communication tools now available free from NHF Day. PowerPoint slides, sample script, automated slideshow with audio, speaking tips, handouts and more, all can help you deliver a compelling message about hunting, fishing and conservation. That is, conservation in America succeeds because of hunters and anglers who generate \$100,000 every 30 minutes for fish, wildlife and habitat programs. ♦ Denise Wagner



## STOP AQUATIC HITCHHIKERS!™

Prevent the transport of nuisance species.  
Clean all recreational equipment.

[www.ProtectYourWaters.net](http://www.ProtectYourWaters.net)

## Mescalero Apache youth in natural resources



Michael Montoya/Mescalero Apache Tribe

*Mescalero Youth Conservation Corps, in its fourth year, is funded by Fisheries and Habitat Conservation in Washington, D.C. It is administered by the New Mexico Fish and Wildlife Conservation Office.*

The Mescalero Youth Conservation Corps is more than summertime employment. It is more than a job after school or on the weekends. It is character-building. We practice integrity, humility, and courage; we honor our ancestors by caring for the very homelands which they sacrificed their lives to protect. It is a pathway to our future, a bridge between school and work, a conduit to a career in natural resource management. It is trust, based on loving and respecting yourself, having concern for team members, and working together for the good of the community. It is pride built upon self-awareness in who we are as Indian people, conscious of our heritage, obligated to preserving the blessings of the Creator. We honor our elders, our traditions, and our culture. We cherish our lands, our forests and our water, and we pledge to create a better world for generations yet to come. ♦ Michael Montoya, Youth Program Manager

## FEATURED FACILITY

### Gavins Point National Fish Hatchery and Aquarium

**Where:** Yankton, South Dakota  
**When:** Established 1956

**Then:**  
Gavins Point was established to provide mitigation for the Upper Missouri River Development Plan, a series of hydroelectric power dams on the Missouri River.

**Now:**  
Gavins Point evolved into a cold, cool and warmwater production and broodstock hatchery. Every year the hatchery produces 8 to 10 species of fish for recovery, restoration, mitigation, recreation, research and tribal fisheries. Since 1961 the hatchery has produced more than 5 billion fish, stocked in the Midwest. Today, emphasis is on the recovery of endangered pallid sturgeon. The hatchery holds a captive broodstock, spawns wild fish on station and produces fish that are released into the Missouri River and its tributaries.



USFWS

*Gavins Point National Fish Hatchery on the banks of the Missouri River.*

Paddlefish, walleye, yellow perch, bluegill, black crappie, largemouth bass and rainbow trout are some of the species raised at Gavins Point National Fish Hatchery. On the web: [www.fws.gov/gavinspoint](http://www.fws.gov/gavinspoint). ♦ Jeffery Powell

## From good to great – Sport Fish Restoration gets it done in Oklahoma



*The Sport Fish Restoration Program created this trout habitat in Oklahoma.*

Evening Hole, a tailwater fishery on the lower Mountain Fork River near Broken Bow, Oklahoma, provided little in the way of trout habitat. But, Oklahoma Department of Wildlife Conservation biologists envisioned its potential. Through careful planning, and the use of Sport Fish Restoration Program funds, they completed one of the most labor- and research-

intensive stream restorations in Oklahoma's history.

The 1,600-foot Evening Hole consisted of a wide, shallow stretch of stream that heated to high summer temperatures. The stream had little in the way of logs or boulders – in-stream structure that creates fish habitat. Biologists reshaped the

channel and imbedded huge logs and rock material into the streambed to form a narrow, swift-flowing stream with cooler water. They also diverted water to a nearby 1,200-foot stretch of wooded stream to create a new trout stream, now known as Lost Creek. It empties into Evening Hole. The biologists planted vegetation, stabilized the stream banks, and added riffles, runs, pools, woody cover, and gravel and cobblestones to provide habitat for trout and the bugs they eat. Lost Creek and Evening Hole both now provide a year-round hotspot for trout fishing in a scenic place.

The projects received the Outstanding Sport Fish Restoration Project of the Year Award from the American Fisheries Society in 2007. Sport Fish Restoration Program funds were supplemented with angler donations, and the U.S. Army Corps of Engineers, and the Oklahoma Department of Tourism dollars. Trout come from Norfolk National Fish Hatchery, in Arkansas. ♦ Thomas McCoy

Oklahoma Department of Wildlife Conservation

## Got friends?

The Division of Fisheries and Aquatic Resource Conservation does. This was made clear when members of 15 Friends Groups associated with the National Fish Hatchery System, and Fish and Wildlife Conservation Offices across the country gathered in the nation's capital in March. They embraced the newly organized National Fisheries Friends Partnership (NFFP). This first annual meeting marked a historic moment in the 138 years of fisheries conservation in the U.S. Fish and Wildlife Service. The NFFP will promote the development of more Fisheries Friends Groups at other Fisheries field stations.

Fisheries Friends are non-profit organizations that provide an independent citizen voice to advocate for the conservation of national aquatic resources for the benefit of present and future generations. The NFFP board approved its mission statement and bylaws, elected officers, and met with prospective new member Fisheries Friends Groups. The number of Fisheries Friends Groups supporting the Service's Fisheries Program has increased significantly during the last two years, and continued growth is to be expected. ♦ Sarah Leon



*Friends of Inks Dam National Fish Hatchery in Texas harvest catfish from a pond.*

Cindy Fronk/USFWS

## Make a difference – show someone how to fish

Picture the first person who took you fishing. Now picture yourself inspiring that same passion. Pass on the legacy of the sport and help protect and preserve our nation's waterways for future generations by taking the Angler's Legacy Pledge. A program developed by the Recreational Boating & Fishing Foundation (RBFF), Anglers' Legacy asks those who already fish and boat to:

**Give back what you've been given – the gift of fishing.**

**Take at least one new person out on the water each year.**

# Anglers' Legacy™

A national mission from  TAKE ME FISHING™

**Protect the legacy for tomorrow – Take the Pledge today.**

Since 2006, more than 150,000 boaters and anglers have signed up to become Anglers' Legacy Ambassadors. According to a 2008 survey of Ambassadors, most take more than four people a year fishing. That could

mean more than 575,000 people have been introduced to fishing and boating as a result of the program! Want to get involved? Host a Pledge drive of your own with the Anglers' Legacy Partner Pledge Drive Kit. Join the movement at [AnglersLegacy.org](http://AnglersLegacy.org). ♦ Stephanie West

## FROM THE ATTIC

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

Cork, wood, glass, and metal – and they all float. Floats are a common item around water, but the many materials used to make them were, well, uncommon.

Some of these are obviously buoyant, but for some materials you wonder who thought of the idea. My favorites in the Archives are the metal floats from

Yellowstone National Park, and glass ball floats found on an island refuge. The metal floats are basically hollow, sealed cylinders of sheet metal. They appear to have been tied on to whatever needed to be floated. We have no idea who made them, except perhaps a blacksmith at the Yellowstone National Park. What they were used for is not certain. Research by the Yellowstone curator has turned up some interesting stories of fisheries work in the park, but no real information about the floats. Glass floats were common on fishing nets, but you have to wonder why they didn't break. The homemade floats are special, too, like a block of 4 by 4 wood, painted orange, with a swivel clip. It looks functional, quick to make, and cheap. ♦ Randi Sue Smith



Randi Sue Smith/USFWS

*Old floats used by fisheries workers came in all sizes, shapes and materials.*

# Pioneers

By David Klinger

## Jim Warren



*Fish health biologist, Jim Warren, tested the effects of Apollo 11 moon dirt on aquatic animals in 1969.*

Ask a random sampling of U.S. Fish and Wildlife Service employees how they feel about their work. One or more will quickly and enthusiastically characterize their work as “Out of this world!”

Yet only *one* U.S. Fish and Wildlife Service employee holds legitimate title to a job description that’s been truly “extraterrestrial” in its scope.

Jim Warren began his career in 1960 as a \$4,040-a-year fish biologist, tucked away amid the fir trees of Little White Salmon National Fish Hatchery in woodsy Washington’s Columbia River gorge.

Within a decade, fortune had bestowed on Warren the title of “Defender of the Known Universe Against All Contaminating Alien Life Forms.” Clearly a responsibility well outside his official job description – and the pay still nothing to write home about.

Warren, whose only previous experience as a superhero was two years in U.S. Army artillery school during the waning days of the Eisenhower administration, bounced around the National Fish Hatchery System out West for most of the 1960s, until landing in La Crosse, Wisconsin, as a fish health manager. “People would bring me a bucket of fish and I would figure out what was wrong with them,” Warren characterizes his early career.

Shortly after his arrival in Wisconsin, the call came for Warren to relocate temporarily yet again to Clear Lake City, Texas, where the fish biologist would tackle a hush-hush, super-sensitive assignment – one with a decidedly terrestrial cast. Government scientists had been given a bag of rocks and dust that contained the potential for contamination of the planet. It would be Warren’s job to figure out if they were safe.

And that’s how Jim Warren – whose previous experience dealt mainly with cleaning up redmouth disease and bacterial gill rot in backwoods Idaho and Nevada raceways – shifted career gears briefly. Fate occasionally offers a few, fortunate civil servants such chances, and he seized it.

Warren would become NASA’s point man in its quest to learn whether the Earth and all of its fishy denizens were under any threat from the world’s first moon rocks, picked up and brought back in 1969 by astronauts Armstrong and Aldrin of Apollo 11.

NASA reasoned, says Warren, “The Interior Department had some responsibility in protecting the fish and wildlife of the United States. Since astronauts were bringing

foreign material in from the moon, the U.S. Fish and Wildlife Service had a role. With Agriculture and the Public Health Service, the roles were more obvious – protecting poultry, livestock, and humans from moon contamination. Actually, the U.S. Fish and Wildlife Service *didn't* have much authority ... little shreds of legal responsibility in *Title 50 of the Code of Federal Regulations* regulating the movement of critters from place to place, but ...

“Any thinking person would know, because there is no atmosphere on the moon and the moon is continually bombarded by radiation from the sun and has intense heat and cold, that the likelihood of anything infectious to life on Earth that might be coming from the moon was virtually nil. But nobody could rule out toxic agents in the lunar samples. Nobody knew, and nobody could say there was no danger.”

As leader of the Manned Spacecraft Center’s aquatic animal testing section, Warren set up aquaria in a sophisticated series of top-dollar, sealed isolation chambers where a Noah’s Ark of Eden’s creatures – planaria, oysters, shrimp, guppies and mummichogs – were exposed for three weeks to a witch’s brew of dust, gravel, and lunar debris. Other scientists tested their “star dust” on higher-order species ranging from maggots and wax moths to mice and Japanese quail.

“Apollo 11 was spooky. We were really under the gun, with the attention of press and public,” Warren recalls. “This work had never been done before. The whole world was watching. A punctured glove would get you 21 days of quarantine. There was a flimsy little plywood cupola on

top of a motel across the street, where Walter Cronkite would hold forth from his little shack.”

The process, says Warren, was exacting. “Technicians and geologists would open the transport box from the moon in a special, huge vacuum chamber, a phenomenal piece of equipment. They would take the rock and sand and inventory everything, and then portion out the samples for study, grinding everything we used to particles of about two microns in diameter. Our pre-calibrated stainless steel scoops we’d dip into the lunar material and bring out exactly 0.22 grams,” Warren remembers.

“We’d drop it into the aquarium and, of course, we’d immediately end up with a muddy-looking mess in there, all murky. But it did not seem to bother the fish at all. To make a long story short, it didn’t bother anything. It did not create any problem whatsoever.”

Score one for Planet Earth.

Warren, now retired after a storied, 38-year career and living in Vancouver, Washington, went on to perform the same diagnostic services for rock samples from Apollo 12 and 13, although the latter assignment never really materialized. “Apollo 13 had an accident along the way, encountering an asteroid or something that busted a hole in the spacecraft, preventing a lunar landing. They were lucky to get back, as Tom Hanks depicted,” says Warren.

What was the most notable aspect of this fish biologist’s defending the Earth, as he handled the most valuable substance known to man? “Lunch in Texas is a wonderful thing,”

muses the U.S. Fish and Wildlife Service’s foremost “Defender of the Known Universe Against All Contaminating Alien Life Forms.” ♦

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David Klinger is a senior writer-editor at the U.S. Fish and Wildlife Service’s National Conservation Training Center in Shepherdstown, West Virginia. He has never been to the moon, however.



Courtesy Jim Warren

*Jim Warren in retirement.*



NASA

*Astronaut Buzz Aldrin with an assembled seismic experiment.*

## Channel Catfish

By John Bryan



Bob Hines/USFWS

*Channel catfish are popular on a hook and on a plate. They are the official fish of four states.*

“The catfish is a plenty good enough fish for anyone,” said Mark Twain. Although there are four popular species of catfish in the U.S. – blue, flathead, channel, and bullhead - it is the channel catfish – *Ictalurus*

*punctatus* – that is most numerous. Originally distributed east of the Rockies along the Mississippi drainage, the channel catfish is now found in every state except Alaska.

Channel catfish are the only species with spots and a deeply forked tail. The outside edge of the channel cat’s anal fin is curved as opposed to the straight anal fin of the sometimes mistaken blue cat. The coloring of channels leans towards black in clear waters and yellow in muddy waters. The belly is normally whitish. Like other catfish, the channel catfish has no scales, soft fins, and three sharp, stiff, spines – one each at the front of the dorsal and pectoral fins.

As head of U.S. C.A.T.S., 70-year-old Virgil Agee may consult with more expert catfishers than anyone. “Channel catfish are extremely easy to catch,” explains Virgil. “They will hit just about anything – live or prepared. My first choice is a prepared stinkbait.”

Virgil uses 6-pound line with a slip sinker followed by an 18-inch leader and a 2/0 circle hook. If he doesn’t get a bite in five minutes he changes locations. Virgil still remembers his first channel cat: “It was a three-pounder on the James River, south of Springfield [MO], and I was about seven or eight years old. I was using worms - fishing for anything that would bite.”

Although highly adaptable, channel catfish prefer clearer waters where the bottom is sandy or gravelly. Most adults move and feed in darkness. The rest of the time they spend in the protection of logs, rocks, and other cover or deep holes.

It was the combination of deep holes beneath newly constructed TVA dams and the introduction of a German automobile that spawned a widespread urban fish legend: divers

seeing catfish as big as Volkswagens beneath dams. And “below the dam” is a frequent caption for photos of giant catfish. Vlad Evanoff’s remarkable 1978 book, *500 Fishing Experts and How They Catch Fish*, has a photo of a 41-pound channel cat with the caption, “caught below Pickwick Dam.” The favorite bait of the angler, Jake Milliron, is “whole small hickory shad or guts from a big one.”

The record channel catfish was caught in 1964 in South Carolina and weighed only 58 pounds – “only” in comparison to blues and flatheads that reach over 100 pounds. Only three states have produced 50-pound channels, and 20-pounders are trophies everywhere. But the facts don’t hamper continual hyperbolics of storytellers. Catherine Wright’s 2001 *Steamboat Annie and the Thousand-Pound Catfish* was a bestselling picture book for kids. And in Wisconsin a legendary giant catfish was actually a transformed Menominee Indian who broke a taboo.

Big channel catfish can produce as many as 100,000 eggs. When water temperatures reach 75 degrees, males make nests by fanning out debris in cavities in logs, under banks, beneath rocks, and even in barrels or tires. The female arrives and produces a gelatinous mass of eggs and then departs. The male stays and defends the eggs from predators and constantly fans the eggs to remove debris and keep oxygen flowing over them. In about a week the fry are born with a yolk sac that nourishes them for a few days. Then they swim to the surface looking for food and

gulping air to help regulate their buoyancy.

Master catfisher and biologist Fred Murray is associate director of Maymont – a public historic estate in Virginia that includes aquaria containing Virginia fish. “Slow, deep pools near cover,” and “chicken liver” are Murray’s top two tips for catching channel catfish in rivers. “You want to drift your bait slowly. Channel cats are opportunistic feeders.”

Taste is the channel cat’s primary search engine. Tastebuds cover their entire bodies, and are most numerous on their barbels and gill arches. Their taste-smell abilities were confirmed by Missouri Department of Conservation biologist Kevin Sullivan during his 1990s research that included netting tens of thousands of channel catfish. He found that leaving a baited hoop net untouched for 72 hours allowed for the bait’s odor to attract a great number of catfish. “It was not uncommon to catch 400 adults in one three-net grouping.” Kevin – now with the Department for nearly 30 years – also discovered a fishing tip: “One of the best places on any lake during spring spawning time is riprap.” Whether it’s the cavities in the rocks or the abundance of crustaceans, channel catfish congregate there.

Its diverse appetite and adaptability has resulted in a grassroots popularity that has led some states to designate the channel catfish as their state fish. Missouri Governor Mel Carnahan signed his state’s channel catfish bill in 1997. In Iowa, *The Ames Tribune* quoted Senator Amanda Ragan, “The channel catfish was here when pioneers arrived to settle

the state and is still found in all 99 counties.”

American writers from Mark Twain to O. Henry to Jack London reference catfish in their stories, but it was Ben Lucien Berman’s “Catfish Bend” series of southern stories (1952-1967) that is likely most responsible for the channel catfish becoming part of “Americana.” Called “America’s greatest living interpreter,” Berman’s most famous single title was *Steamboat Round the Bend* which was made into a movie starring Will Rogers.

In Berman’s book, *One River to Cross*, catfish sprinkle the lives of many of his salt-of-the-earth characters. There is even one named Catfish Johnny,

“... always in need of a shave . . . when he works, which is not so often . . . lazily in his drawling voice makes Solomon-like decisions, settling a dispute . . . as to the ownership of a choice cove on the river where the catfish bite the quickest.”

In the final chapter of *One River to Cross*, the boat finally reaches the ocean where there are unfamiliar fish. The conclusion about this new water: “It ain’t a natural river. A river’s a river with catfish in her.” ♦

---

John Bryan has written for *Gray’s Sporting Journal*, *Sports Illustrated*, and *Field & Stream*. He lives in Richmond, VA.

# Dancing with Reservoirs



USFWS

*Dams impound and impede. These unnatural structures have become part of the landscape.*

Our opinions of reservoirs clash and collide, confounding any consensus we might seek on their management. Conservationists forswear them, farmers embrace them, native trout anglers are wary of them, and cities and towns thrive on them. We recreate in them, we curse them, and we spend lavishly to build and sometimes tear them down. We are confounded by something that is unnatural, yet indisputably a natural part of our lives.

Agencies like the Fish and Wildlife Service are no less confounded by them. From the flurry of dam construction in the '60s to its abrupt ending in the wake of Earth Day, the Service researched how fish populations, well adapted to the shallower, moving waters of riverine habitat, would fare in the

manufactured environment of deeper, cooler, and stiller waters. Opinions and priorities in the agency changed, however, and funding for reservoir studies ended in 1982.

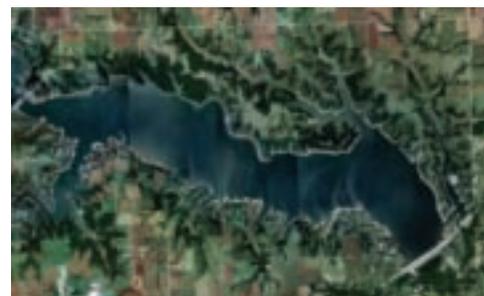
Since then, reservoirs have fared poorly in the U.S. Fish and Wildlife Service. Its National Fish Hatchery System produces and stocks a litany of sport fish and nongame in reservoirs for mitigation. Its National Fish Passage Program removes dams and other barriers. Still, reservoirs remain at the periphery of the U.S. Fish and Wildlife Service's mission, except when dismissed as landscape aberrations or blamed for the loss of aquatic species. Unnatural in origin, reservoirs have been out of place for a quarter century in an agency whose mission is to conserve what is natural.

Times and attitudes are changing, though. The U.S. Fish and Wildlife Service is now teaming up with state fish and wildlife agencies and others in a new national Reservoir Fisheries Habitat Partnership (RFHP). Founded under the umbrella of the National Fish Habitat Action Plan, the RFHP is a candidate fish habitat partnership with a goal to change how we think about and how we manage reservoirs for fish and their habitat. It starts with one observation, and two commonsense ideas.

First, reservoirs are essential to the American quality of life. They provide seven percent of the nation's power; water for homes, industrial uses, and agriculture, and flood control for thousands of communities. They provide habitat for many of our aquatic species. They are centers of outdoor recreation for millions of Americans, accounting for almost



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*Above and below: Depending on the watershed, reservoirs differ in shape as seen here from space.*

\$50 billion in annual fishing-related revenue and supporting over 25 million anglers – 17 million who are boaters. Reservoirs provide wildlife viewing to 71 million Americans total, including 47 million bird watchers – all of whom spend another \$45 billion in the pursuit of nature. Reservoirs are America’s gateway to nature, her recreational economic engine, and a source of national security at a time of climate change.

Second, reservoirs may be human artifacts, but their placement and function in river and watershed systems blurs the distinction between natural and unnatural. Unless we decide collectively as a society to remove them, the only ecologically credible – and *responsible* – option is to treat them as naturalized parts of the *natural* landscape. Declaring reservoirs unnatural – or bad – and then either wishing them away or ignoring them is not an option, and there is no science in that.

Third, if we accept reservoirs as interconnected parts of natural

systems, we must change how we manage them. In the past, we managed them as insular waters, separate from their watersheds. This does not work. No matter how hard we may try to conserve fish populations and their habitat by targeting our work on impoundments alone, there will always be a ceiling to our efforts: silt and nutrients will still flow from above, exotic plants will still encroach from outside, and ill-timed and ill-proportioned water releases will still play havoc downstream.

Reservoirs are part of the natural world, and they matter for its well-being. They are strong indicators of the health of the watershed above and they are key regulators of its health below. Like the beating heart, reservoirs are, despite their artificiality, vital parts and pathways of natural systems. The lifeblood of a living watershed passes into and through them. Clog the reservoir from bad farm management practices above, or weaken its ability to serve the limbs below by inadequate or improperly timed flows, and the



Florida Fish and Wildlife Conservation Commission

*Impounded water creates fish habitat and angling opportunities for this young family.*



*On a log, this scientist logs data related to changes in flooded bottomland hardwoods.*



USFWS

*Sand and gravel mining can influence fish in streams and reservoirs.*

watershed withers and dies. This is how the RFHP sees reservoir conservation.

Looking from the top of the watershed to the reservoir below, RFHP partners are addressing the systemic watershed failures that clog reservoirs, reduce their capacity and flow, and degrade fish habitat. Two RFHP partners in particular have taken the lead.

Iowa's Department of Natural Resources led innovation at Rathbun Lake, an 11,000-acre impoundment built by the Army Corps of Engineers in the late 1960s. There, public and private partners came together to address high sediment loads and bacteria threatening the lake. They implemented an array of water quality projects to fix the lake by healing the upper watershed. They installed 1,000 acres of riparian buffers; restored 10,000 acres of wetlands; developed profitable land uses that are protective of water quality; and helped farmers adopt

best land management practices. A major indicator of their success is higher crappie production in the lake proper, a species sensitive to high water turbidity.

Further south, the Texas Parks Wildlife Department is tackling degradation of two major reservoirs on the San Jacinto River by addressing management needs in the upper watershed. The higher of the two reservoirs, Lake Conroe, faces invasion of exotic aquatic plants caused by high nutrient loads from development. In contrast, Lake Houston faces rising sedimentation from upstream gravel dredging. To fix the two lakes, Texas is working above the lakes to implement a variety of watershed restoration projects, including outreach to farmers to reduce nutrient flow, restore wetlands to filter out nutrients and sediments, and proper use of settling ponds by dredging operations.

Conservation below impoundments is no less vital to the integrity

and health of reservoirs and their watersheds. The Army Corps of Engineers and The Nature Conservancy (TNC), both RFHP partners, formed a Sustainable Rivers Project to manage water flow on nine reservoir-impacted river systems. Dam releases on the Green River, for example, are being redesigned to mimic natural flow and temperatures while continuing to provide in-reservoir public recreation (now extended by six weeks) and flood control to below-dam communities. Benefits are accruing to the reservoir's sport fisheries and flowing to the downstream ecosystem and its rich assortment of aquatic species.

Elsewhere, the Corps and TNC are looking to downstream floodplain restoration as a practical way to scale back the need for reservoir storage. Healthy floodplains are able to hold excess water from floods, effectively substituting, in part, for storage space now set aside in reservoirs for emergency flood control. This will



Fishing, boating, skiing – and water conservation, reservoirs provide many services.



USFWS



USFWS

Above and below: What goes on upstream influences waters below, such as heavy sedimentation seen here.

permit reservoirs in the future to hold more water for human uses and for fisheries, while allowing more flow for downstream ecosystem benefits. Increasing reservoir water levels will also provide a vital buffer against the more frequent droughts expected as a result of climate change.

RFHP's focus on watershed health for reservoir management does not preclude the need to conserve or improve reservoir fish populations and their habitats. The Missouri Department of Conservation (MDC), also a RFHP partner, is pioneering innovative reservoir restoration at Table Rock Lake, a 43,100-acre reservoir created by the Corps in the Ozark Mountains of southern Missouri.

Like many reservoirs, fish habitat in Table Rock Lake has diminished over time. MDC is restoring part of that habitat with its fleet of habitat barges that haul timber and rock offshore to re-create spawning and nursery habitats. In addition, MDC is stabilizing shorelines, planting shoreline vegetation, restoring wetlands and riparian corridors vital to fish movement and fish habitat, working with landowners to reduce nutrient flow, and oxygenating downstream tailwater fisheries.

The Reservoir Fisheries Habitat Partnership is dancing with reservoirs. It's an affair of choice and necessity, born from years of near-sighted reservoir management. The health of our inland fisheries hangs in the balance. We can no longer afford to shun reservoirs like wallflowers at a dance. It's time to treat them like the belles of the ball. ♦

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Karl Hess, PhD, is a fish biologist with the U.S. Fish and Wildlife Service at its headquarters office in Arlington, VA.



Missouri Department of Conservation



Missouri Department of Conservation

*Above and below: Recycled concrete makes fish habitat in Missouri's Table Rock Lake.*

By Craig Springer

# Jurassic Pork

*No bones about it – paddlefish are survivors*

They've been around since plants made coal. Now they contribute to the creel. They grow like a pig, and by some accounts smoked paddlefish – the other, other white meat – is better than pork cutlets. These Jurassic survivors are living through another age, one pocked by reservoirs behind lofty dams and pollution and excessive harvest.

Paddlefish are wonderful oddities of nature. Their jaw is the only bone in their body. Their “paddle,” fully one-third of their body, is super-charged with nerves to sense their only prey, microscopic plankton. They feed by swimming with their over-sized mouth agape, filtering out of the water these finely sized foods.

Paddlefish are indeed relicts from the primal past, the kind of past you might see conceptualized in a natural history museum fresco. You know the type: a misty view, foreign-looking ferns and conifers that tower over otter-tailed reptiles that must have made quite a splash lumbering through the water. Not depicted though in the waters waded by the long-extinct dinosaurs, are paddlefish. They swam there then. What's most remarkable is a good many wobbly trips around the sun later, and they swim American waters still, that is, waters of the Gulf Coast, Mississippi, Missouri, and Ohio River basins.

In this current geologic period, paddlefish took a marked decline, particularly in the middle 20th century. As reservoir building increased, paddlefish numbers decreased. What reservoirs created in habitat for largemouth bass, walleye, yellow perch and the likes, they ruined for paddlefish reproduction.



*An Oklahoma angler hefts his prehistoric catch.*

Nels Rodetford/ODWC

Brian Elkington knows what they need and he knows a little about paddlefish throughout their range. Elkington is a U.S. Fish and Wildlife Service fish biologist stationed at the Columbia Fish and Wildlife Conservation Office in the Missouri town of the same name. As dams proliferated, they changed how and when streams flow, and inundated shallow gravel bars in rivers paddlefish need to spawn, says Elkington. Moreover, major-sized dams impeded their upstream spawning migrations, which can be rather extensive. And we're not talking about mere miles, but major exoduses to whole new waters.

Elkington has handled a paddlefish or two on the rivers, but more impressive is that he has handled thousands of data points in a database maintained by the U.S. Fish and Wildlife Service for MICRA, or the Mississippi Interstate Cooperative Resource Association. MICRA comprises 28 states and federal agencies concerned about natural resources management in the Mississippi River basin; 22 of the states have paddlefish populations presently. Since 1997, biologists from Columbia have handled the data from thousands of paddlefish caught from those populations.

Looking at the thin blue lines on a map that shows the paddlefish's range, you can see why the services of Elkington and MICRA are needed. These big arterial rivers vein the country's heartland – and that essentially is the range of the paddlefish. The dendritic meanders cross the straight and artificial lines of state boundaries. But the highly mobile paddlefish knows no better. One three-foot-long wild fish tagged and released in the Ohio River at Mt. Vernon, Indiana in 1998 was

## Harvesting Data

by Barry Bolton

Anglers in Oklahoma enjoy the finest paddlefishing in the nation, and in doing so they not only are catching thousands of fish each year, but they are also contributing to science and funding their own sport through the paddlefish research and processing center.

In February 2008, the Oklahoma Department of Wildlife Conservation (ODWC) opened the paddlefish research and processing center at Twin Bridges State Park near Miami. The center collected important biological data, processed paddlefish fillets for anglers and salvaged paddlefish eggs.

The ODWC gathers large quantities of useful data for managing paddlefish in Oklahoma. Certain types of biological data can only be collected once the fish is dead. Prior to opening the research and processing center, the Department had collected information from only 240 fish since the late 1970s. The research and processing center makes it possible to collect data from thousands of fish that are already being harvested by anglers. In just a few months, ODWC biologists found themselves years ahead of where they were in terms of researching and managing the species.

In two years of operation over 10,000 fish have been brought to the paddlefish research and processing center by anglers,



*Paddlefish roe.*

where both male and female fish are professionally cleaned and packaged. Workers at the center gather eggs to sell as caviar, and the income derived pays for paddlefish research and improved angler access. Oklahoma paddlefish caviar was dispersed throughout Europe and Asia.

The ODWC is able to gather age and growth data on male and female paddlefish and get an accurate picture of the total harvest. Additionally, biologists recorded a day-by-day documentation of the annual paddlefish spawn for the first time. Information gathered during the spawning season can be compared with future spawning runs to better understand how these unique fish relate to their habitat, including water temperature and flow. The center is open during prime paddlefish snagging months, typically Feb. 15–May 15.

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Barry Bolton is the Chief of Fisheries for the Oklahoma Department of Wildlife Conservation in Oklahoma City.

caught by an angler eight years later in the Missouri River at the toe of Gavins Point Dam at Yankton, South Dakota. One presumes it would have gone further to spawn had it not run headlong into the concrete edifice. That fish had navigated some 1,136 miles, moving over several jurisdictional boundaries. Another fish tagged at Gavins Point National Fish Hatchery went the other direction and was later caught in the Kaskaskia River in Illinois. Thus, you can see that managing paddlefish in a localized fashion is not so practical. Basin-wide coordinated management is needed, and that is where MICRA comes in.

Toward that end, Elkington and his colleagues in the Columbia office receive the snouts of recaptured paddlefish where they extract tiny tags as big as a nickel is thick implanted in the fish at an earlier date. Some of the fish were tagged only recently, others date to 17 years or so. Paddlefish live 30 years.

No matter the age of the tag, the resulting information that is yielded tells biologists about fish movement, how the fish grow, and in some cases a general sense of population size.

Another important statistic yielded from the tags is the origin of a fish – tagging data tells Elkington if they were spawned naturally in the wild, or were tagged at a hatchery before their release into the wild. Since 1995, more than 22,200 adult paddlefish have been caught and tagged in the wild, and 2,037 of them were later recaptured. The database kept up in Columbia also includes 2.1 million paddlefish raised and tagged in the National Fish Hatchery System and hatcheries operated by the state agencies. Raising paddlefish in captivity is essential to conservation. Given that dams have blocked access to upstream habitats and drowned some spawning beds, captive rearing is necessitated in the short term, a point also underscored

by increased demand for their roe in the caviar industry.

Captive culture has been good for paddlefish and for fishing. Witness what has happened in Oklahoma. In the Sooner State, there are adequate fisheries supporting regulated harvest by anglers. And some of that is made possible by Tishomingo National Fish Hatchery. After a 50-year hiatus above Texoma Dam, paddlefish are in the Red River on the Oklahoma-Texas line and in numbers that are harvestable, put there by the Tishomingo hatchery and the Oklahoma Fish and Wildlife Conservation Office. They have done the same at Oologah, Eufaula and Kaw reservoirs in Oklahoma and John Redmond Reservoir in Kansas.

The plan according to Tishomingo's manager, fish biologist Kerry Graves, is to put fish out for eight to 10 years. At the end of the period, the fish should be mature and ready to reproduce on their own. They are

## Caviar and Law Enforcement

by Dan Burlleson

In the early and mid-1990s the caviar market in the U.S. began an upward swing. Commercial fishermen in the Midwest were getting an average of \$20 per pound for paddlefish roe, \$15 per pound for shovelnose sturgeon roe, and you couldn't give away bowfin roe. These prices peaked in January 2008 at \$115, \$120, \$25 per pound, respectively.

With these price increases came an increase in the number of

commercial fisherman – and an increase in violations related to the harvest, sale and export of North American caviar – along the Ohio, Mississippi and Missouri rivers. These violations included: commercial fishing without the appropriate state license; fishing in closed waters; failure to report harvested fish; selling to unlicensed roe buyers; failure to properly process the roe for human consumption; the use of illegal commercial fishing

gear; and the take of endangered pallid sturgeon.

After the commercial fisherman sold their harvested roe to middlemen, the violations



*USFWS special agents collect poached fish.*

Dan Burlleson/USFWS

expected to start making major runs upstream into the rivers that feed the reservoirs. The work is paying off above Kaw and Oologah dams. Brent Bristow with the Oklahoma Fish and Wildlife Conservation Office has caught in nets young paddlefish that were untagged. That means they were naturally hatched there. On Kaw Reservoir, if size is any measure of success, it looks like paddlefish there have hit the mark, topping out at 100 pounds and four feet long.

Paddlefish management is a unifying issue for the MICRA group. The range-wide stock assessment of paddlefish continues from Montana to Louisiana to West Virginia. Elkington and crew will keep up with the data necessary to manage what is arguably one of the greatest natural curiosities that carries the lexis of nature from a whole other time. ♦



*Cliff Wilson (r) and Lee Erickson, Columbia FWCO, check a paddlefish for tags on the Missouri River.*



*Jaw tags are easy to read on paddlefish.*



*Marie Delatour, a USFWS volunteer from Normandy, France, tags a young paddlefish at Blind Pony Fish Hatchery in MO.*

continued. The middle and end buyers falsified records in order to obtain export permits and in some cases declared a less desirable species, like bowfin, when in fact they were exporting a species that required an export permit, such as sturgeon or paddlefish. Law enforcement personnel, while reviewing applications for export permits, documented cases where the same harvest had been sold to two individuals, where the harvester sold more roe than they had reported harvested and where the harvester was not licensed.

Over the years, federal and state wildlife officers have documented, apprehended and prosecuted

several caviar poachers. Several law enforcement methods that have been used to make these arrests include surveillance, covert work, records examination, and riverside inspections.

Commercial fisherman can realize incomes of \$30,000 to \$80,000 from the harvest of caviar and there is at least one commercial fisherman who grossed an income of \$180,000 per year from selling caviar. Without the caviar sales, these same commercial fishermen would realize incomes of \$10,000 to \$20,000 if they were only able to harvest rough fish.

It is currently not known what effect the increase in fishing pressure for

roe-producing species may, or has caused on populations. The overall populations of roe-producing species are not accurately known. It is also not accurately known how large a “sustainable harvest” should be. Each state sets and regulates seasons, quotas and or length limits for those waters contained in or along their borders. The regulations change from state to state. Law enforcement has made an impact on illegal commercial fishing but much more needs to be done. ♦

Dan Burleson is a USFWS special agent in St. Peters, MO.

By Chris Horton

# Reservoirs on the American Landscape

*Are they a boon or bane?*



*Targeted by individual and tournament anglers, reservoir bass fuel a significant economic engine.*

Reservoirs are arguably a part of the American landscape. For some people, they conjure nothing more than images of concrete fortifications constructed in the middle of a pristine stream, blocking native stream-

dwelling fish from reaching their spawning grounds. No doubt, many reservoirs do just that, although some have been modified to allow for fish passage around imposing structures. However, the fact that reservoirs are not a natural component of a river's ecosystem is a hard notion for many people to overcome, fish passage or not. For those individuals, reservoirs will always be viewed as nothing more than man's interference with nature.

On the other hand, many anglers, boaters, homeowners, water authorities and local communities see reservoirs in a completely different light, and with good reason. They provide a reliable source of water for millions of Americans, while providing flood protection for millions more downstream. In a day and age when everyone is concerned about carbon footprints, many reservoirs provide a reliable, clean form of energy from hydropower. From a socioeconomic perspective, entire communities have sprung up adjacent to reservoirs, servicing the lakeside homeowners and visitors that come to partake of the recreational opportunities that they present. The simple fact of the matter is that reservoirs have become an essential, and largely accepted, component of the American landscape.

Though reservoirs present problems for some fish populations, the impounded waters behind the dam create a unique niche in which other fish species can thrive. Perhaps no other group of fishes has benefited more from the new habitat that reservoirs afford than the black bass.

*The simple fact of the matter is that reservoirs have become an essential, and largely accepted, component of the American landscape.*



Ranger Boats

*Better than caffeine, a morning trophy provides an exhilarating wake up.*

Largemouth, smallmouth and spotted bass have taken full advantage of these relatively new water bodies, and the construction of reservoirs across the country has facilitated the spread of these sport fishes well outside of their native range. As a result, reservoirs have helped to elevate the black basses as the most sought after sport fish in the United States. In practically every state of

the Union, you can find reservoirs that contain one or more of the black bass species. With the vast majority of reservoirs open to public access, it is easy to see why bass fishing is so popular.

In 1967, Ray Scott, founder of the Bass Anglers Sportsman Society (BASS), held the first highly publicized bass tournament on

Beaver Lake, a reservoir in northern Arkansas. This event marked a new era in American sport fishing history. For the next four decades the popularity of bass tournaments would grow beyond anyone's expectations and help propel the American freshwater fishing tackle and bass boat industries to what they are today. Although bass tournaments frequently are held on natural lakes



Chris Horton

*An early morning gathering at Lake Amistad serves as preamble to a day of intense fishing.*

and rivers, the abundance of reservoirs around the country made it more likely that an angler in any state could get interested in bass fishing.

Reservoirs that provide good fishing, especially bass fishing, can have tremendous impacts on local economies. Popular bass fisheries attract bass tournaments. These tournaments bring not only the participants, but also their families, sponsors, tournament crews and spectators. A city that hosts a professional-level tournament, like the Bassmaster Elite Series, can be inundated with thousands of fans, both local residents and travelers

from afar. Although these events are typically short-lived, the television and other media coverage that accompany the tournaments expose the rest of the angling world to a new bass fishing destination.

Following the 2006 Bassmaster Elite Series tournament on the south-Texas reservoir, Lake Amistad – an event broadcast on national television – the town of Del Rio found itself in the spotlight. Anglers itching for a trip to a new destination, and who had never heard of Lake Amistad, began trailering their boats southward. The number of boat trailers in the parking lots at Lake Amistad boat ramps increased by 212 percent

between 2006 and 2009, according to the National Park Service which administers the Amistad National Recreation Area. Overall visitation to Amistad increased by more than 30 percent during this same time period.

Even though these events may last only a few days, a single tournament can still inject new money and new life into local economies. Lay Lake, a reservoir on the Coosa River in central Alabama, hosted the 2007 championship tournament, the Bassmaster Classic. The city of Birmingham reported that 88,000 people attended the event over the three days of the tournament, with an estimated economic impact of \$25.6

million. In 2008, the Bassmaster Classic was held in Greenville, South Carolina, where the anglers fished Lake Hartwell, a reservoir on the Georgia-South Carolina border. The Associated Press reported that the tournament had a \$43-million economic impact on the area. Healthy reservoir fisheries can be a catalyst for local economies.

The vast majority of the 530,000 members BASS spend much, if not most, of their fishing time on reservoirs. That probably holds true for a significant portion of the 12.5 million license-buying anglers who say they primarily target the black basses. The popularity of bass fishing is undoubtedly linked to the abundance of reservoirs across the American landscape. With that popularity comes a significant investment back into

all aquatic resources. Bass fishing is an equipment-intensive sport, and anglers buy a lot of gear. That results in significant excise tax dollars returning to all state fisheries management agencies, even to the benefit of nongame species, through the Sport Fish Restoration fund.

Reservoirs unquestionably present some challenges to watershed and ecosystem management. However, they provide tremendous benefits to local communities as well as providing families across the country with places to fish. The challenge is to strike a balance that allows for the enhancement of those reservoir fisheries while minimizing or eliminating some of the downsides that reservoirs can present to the watershed downstream.

Reservoirs have gotten a bad rap for far too long. Investing in healthy reservoirs, improving their fisheries and increasing their compatibility with the streams they impound are worthwhile investments, especially from the angler's perspective. ♦

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Chris Horton is the Conservation Director of the Bass Angler Sportsman Society in Kissimmee, FL. Formerly, he was a reservoir research biologist for the Arkansas Game and Fish Commission working with the black basses.



Chris Horton

*Searching for the day's best fishing hole.*

# What's B'low

To an Eastern eye it looked like any sailboat regatta getting underway; the calculated chaos of a dozen hot-rod sloops tacking back and forth in brisk air behind the starting line. The idea is to keep moving, and maneuvering, with the goal of crossing the line precisely when — but not a second before — the gun goes off.

On this day the start is a downwind leg, with the breeze behind the boats, pushing them to the first mark on the triangular course. But it's the backdrop for that first marker buoy, the lodgepole pine-fringed slopes of alpine tundra with 13,000-foot-plus Mt. Baldy and the Ten Mile Range beyond, that says this isn't Newport, Rhode Island or even Newport Beach, California.

This is a Rocky Mountain high sailboat race and yes, it's in Colorado, on Lake Dillon. At 9,000 feet above sea level, this reservoir playground for Denver, hosts dozens of sailboat races during the short summer season and this race is the annual Dillon Open.

Predictable yacht names on the boats' transoms flash in and out of view during the 10-minute sailboat ballet before the gun: Liberty, Second Wind, Jolly Mon — but then the deep red hull of a local contender with the name Dillon's B'low sprints toward the line. The name appears to be some sort of play on mountain winds — and presumably it is — but an arrow stenciled on the stern, pointing straight toward the water's surface, says there's more to the story. Only later, after learning that the original silver mining town of Dillon, Colorado lies 150 feet below.

Lake Dillon is one of several thousand man-made water bodies throughout the country that serve a variety of purposes. This lake lies less than 10 miles west of the Continental



Ryck Lydecker

*It's literal. The former town of Dillon, Colorado is below.*

Divide but through the marvels of mid-twentieth century engineering, it serves water to Denver 70 miles away.

Like U.S. Army Corps of Engineers' Lake Dillon in Ohio or even northern California's own tiny Lake Dillon, as well as the vast majority of the nation's reservoirs and river impoundments, this man-made lake is put there for several purposes.

According to a report of the National Recreation Lakes Study Commission, the federal government built some 1,800 lakes during the 20th century in 47 states, usually for navigation, flood control and power generation. Eleven federal agencies manage these lakes and in its June 1999 report, the Commission noted that those lakes hosted 900 million "visits" per year and generated \$44 billion in economic impact at that time. Some 97 percent of the lakes are within an hour's drive of a large town, thus providing close-to-home boating, fishing, and camping.

But how many people who play on these water bodies, like the visiting sailors racing on Lake Dillon, might wonder about what's below their keels?

Wouldn't it be a good idea if visitors and locals alike understood and appreciated "their" lake, how it came to be, for what purposes, and how it fits in the natural and human landscape that surrounds it?

Those questions and others surfaced last year 2,000 miles to the east around the shores of man-made Lake Cumberland near Jamestown, Kentucky. There, Amanda Patrick at Wolf Creek National Fish Hatchery decided that its 100,000 annual visitors could gain a better "sense of place" about the hatchery by having the answers.

Patrick, who is Education Specialist, and the Friends of Wolf Creek Hatchery brought in an expert in place-based education, Steven Glazer, to help frame questions and design a learning program that would take visitors on a "quest" for answers. In

February of this year, Glazer, Patrick and 20 other participants created the hatchery's own "Catch a Rainbow Quest" as a self-guided interpretation tool for visitors.

## The Deeper Story

Initially the group considered creating the "quest" within the hatchery, telling the story of the rainbow trout's life cycle, Patrick says. But after viewing the site, they widened the scope to take in Lake Cumberland to see, as Glazer puts it: "The larger story of this place—a lost river, a man-made lake, a habitat transformed, and the on-going restoration and mitigation efforts here."

What does Glazer mean by the "larger story?" He explains:

*Floating in the air above Jamestown, looking across to the far horizon, a visitor finds a scene of overwhelming beauty: the water reflects forest, rolling ridge lines, and the light-play of sun, clouds and sky. Looking down from the gunwales of a boat one feels immersion in vast, timeless nature... and perhaps the rush of that "Quest for the elusive striper." From below the dam, one turns back to discover a "great wall": a vast attempt at flood control, hydropower, and recreation generation. Other, subtler clues are not so easily seen.*

*More than 150 feet below the surface of the lake—beyond sight, beyond light—are the remains of towns: roads, bridges, homes, farms, and more. Hidden within the lake water itself is the ghost of what was once a more sinewy, swift and shallow river. As lake habitat differs from river habitat, different communities of fish now inhabit this place. Below the dam is premier rainbow trout fishing that attracts anglers from across the region... thanks to the stocking efforts of Wolf Creek NFH. Two thousand fish are released into Hatchery Creek each month.*

As they began writing the Quest, Glazer says, the group developed an internal, over-arching theme dubbed "Dam Dualities" which, as he puts it, "Helped us to juxtapose before and after, above and below, cost and benefit; and tell a story that you can really see and learn right here, in and from this place." They wanted visitors to "decode clues in the built and natural environment and see the life cycle of rainbow trout up close." Today, the "Catch a Rainbow Quest," guides visitors through a historical narrative in an engaging, self-guided fashion using clues found on site.

So, whenever you see a body of water, Glazer and Patrick concluded, look and ask: Is this natural or man-made? If natural, where does the water come from? What's unfolding right here? And where does it travel downstream, on the next part of its journey? If man-made, what's lurking beneath the surface?

What was here before? And what is different because of the changes in the waterscape?

In other words, we should all try to ponder "what's b'low." ♦

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Ryck Lydecker is the chairman of the Sport Fishing and Boating Partnership Council, and an associate editor of Boat U.S. Magazine. He writes from Alexandria, VA.



Kentucky Historical Society



Kentucky Historical Society

What's below Lake Cumberland.

# The Relevance of Creel Surveys to Fisheries Conservation

*One-on-one surveys with anglers yield rich and powerful fish management data*



Florida Fish and Wildlife Conservation Commission

*A creel clerk may be the only fisheries professional an angler may ever meet, and the encounter is crucial for good fisheries management.*

Among the research tools supported by Federal Aid in Sport Fish Restoration are angler surveys, still often referred to by the quaint and somewhat anachronistic term “creel surveys.”

Dan McCall, a freshwater fisheries biologist working with the Florida Fish and Wildlife Conservation Commission (FWC) since 1970, has stopped countless anglers to inquire about their fishing success and what they had in their cooler or live well, but seldom has he seen a wicker creel full of fish.



FFWCC

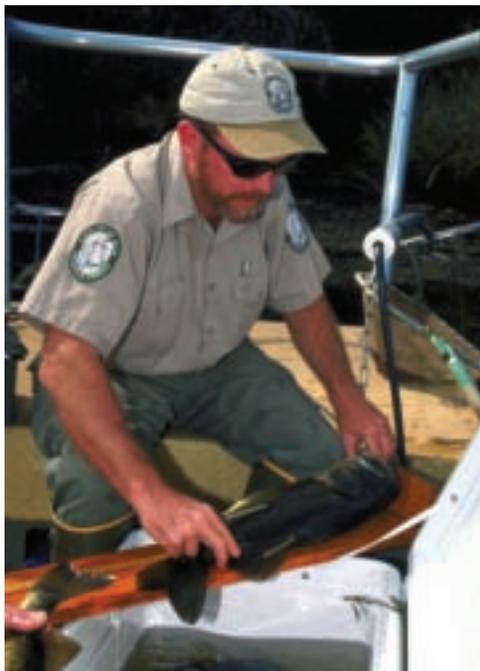
*Traditional creel basket used to hold an angler's catch.*

Freshwater fisheries biologists consider angler survey information to be nothing less than vital to conservation of our resources. Even when block nets covering an acre of water where all fish were killed for study was more socially acceptable, there were proponents of creels who felt and thought that talking to anglers about their actual catch was more relevant. After all, the very definition of “fisheries” relates to the interaction between fish populations and anglers that use them.

McCall has used his time on the water to further give a face and conscience to the FWC that has won over many supporters. As he says: “I have always had a good rapport with fishermen. Very seldom would I find someone who was grumpy and unwilling to listen. Many people just want to talk about the lake and fishing, and I find myself staying too long and have to get moving to the next angler. I remember one man I interviewed in my first years on Lake Okeechobee, who let it be known that he didn't want to be bothered by anyone when he was fishing. After I explained the purpose of the creel survey, and he could see I disturbed his fishing area very little, he understood and was very helpful and courteous at each subsequent visit. He became a good friend.”

By asking an angler how long they have been fishing, what they caught, what they released and checking what they harvested, fisheries scientists can estimate catch rate,

## *Freshwater fisheries biologists consider angler survey information to be nothing less than vital to conservation of our resources.*



*A creel clerk measures an angler's bass before returning it to the angler. This information is vital to scientific management of your fisheries.*



*A line of biologists tag young bass for research.*

Florida Fish and Wildlife Conservation Commission

harvest rate, and the average size of the sport fish in a given water body. This information is then used to track trends and compare to other lakes and rivers to ascertain how the fishery is doing. Combined with non-lethal methods such as electrofishing and monitoring young-of-the-year in small beach seine-hauls, pop nets or other sampling gear, biologists can determine the need for conservation management steps such as habitat restoration, fish stocking and harvest regulation changes.

Some anglers just don't want to be bothered by talking to an agency representative and prefer to say they "just started and haven't caught anything" to get the clerk to go away. Dan points out though that "most complaints come from the fact that many of the winter visitors aren't catching fish, but others are. I try to be as helpful as possible without giving away another fisherman's

secrets. Some fishermen are very protective of their 'secret' spots. Others just love being out on the water, whether they catch their limit or not."

Thus, while obtaining crucial research data, a good creel clerk can also act as an agency emissary and help with outreach and public relations. In fact, their being on the water at the right time can even save lives. Another anecdote from McCall reflects a time in 2003, on a particularly bad weather day, when he avoided his usual route to keep out of rough water and was waved down by two men who had been clinging to an overturned boat for 18 hours. After retrieving them and heading for the boat ramp, his boat started taking on water due to a loose bilge pump wire. He beached the creel boat on a spoil island and was subsequently rescued by two FWC conservation officers.

The cornerstones of good creel surveys are the sampling design that allows random sampling to be meaningful to an entire water body and to a full-fishing season, the effectiveness of the creel clerk doing the interviews, and a means of evaluating the accuracy of the angler responses.



*Fishing stories are legendary, but what an angler tells a creel clerk is essential for smart management.*

FFWCC



Florida Fish and Wildlife Conservation Commission

*Anchor tags like these are often used to help estimate the size of fish populations.*



Florida Fish and Wildlife Conservation Commission

*Hidden microwire tags embedded in a fish's cheek often identify it as being from an FWC hatchery – this wand detects the tag.*

Sampling design has to carefully reflect prime fishing areas versus those seldom used that may either be non-productive or serve as fish refuges. Sampling design also accounts for when the survey is conducted, such as night versus day, twilight versus noon, weekday versus weekend, stormy weather versus a bright sunny day. With this information, the partial data from relatively few interviews can reflect a more complete picture. In 2007-08, FWC estimated fisheries-dependent

effects of sportfish catch, harvest, effort and success rates from creel survey data collected from 16 major freshwater bodies throughout the state. This is way down from the number of creel surveys conducted in the 1970s and 1980s partially due to budget and staff issues, but it also reflects the need to ensure that we continue meet the most rigorous scientific standards.

Since creel clerks who conduct these interviews cannot talk to every angler, when and where they momentarily interrupt an angler's recreation to gather this information must be carefully controlled.

Each angler asked to participate represents many other anglers who are not checked, so it is very important that accurate information is attained. The interviewer needs to know how long the angler has been fishing, and what they harvested as well as what they released. They may also measure the fish, check them for tags and ask questions about where the angler lives and other information that helps to explain results, including information on how much they spent or how far they drove. These latter questions are often part of basic economic analyses that show the value of recreational fishing and can be used in discussing the importance of maintaining and enhancing boat ramps, fishing piers, boardwalks or manicured shorelines.

For biologists to make the decisions that ultimately impact the quality of anglers' fishing, they need honest information. False responses that over or underestimate catch can lead to unnecessary or unrealistic solutions. For example, an underestimate of angling success could lead to stricter harvest or size limits when they aren't necessary and eventual stunting of the fish population, when fewer big fish are

harvested to allow others to grow rapidly. In case of an overestimate of angling success, the decision may be made to not consider habitat improvements because the fishery is doing so well, to delay a proposed fish stocking, or to prevent appropriate harvest regulations from being implemented.

Of course, biologists consistently use multiple sources of data to reduce the chance these types of errors will occur. But with recurring budget cuts, creel surveys become increasingly cost-effective. They are less expensive than electrofishing, seining or trawling.

Innovative efforts to supplement on-the-water creel surveys with aerial or satellite imagery combined with Internet surveys, angler logs and social media like Facebook, Twitter, and online surveys may help lessen the costs and encourage collaboration. The Internet is also making it easier to provide this information to the angling public as a value-added return on their license fee and excise-tax investments into conservation of recreational fisheries.

McCall's creel survey, electrofishing, and trawl sampling information showed a serious decline in largemouth bass and black crappie populations over the last several years, and resulted in the new regulations for bass and crappie on Lake Okeechobee. These rules help protect the bass and crappie until their populations recover from a series of major habitat issues resulting from fixed water schedules as well as hurricanes, droughts and aquatic plant management issues associated with nutrient loading.

Creel surveys conducted by Dan McCall in Florida and others like him all over the country provide

timely information that together with other field data influence policies and regulations.

Thanks to these regulations and thousands of acres of new vegetation, the fish populations on Lake Okeechobee are increasing. McCall now gets many comments about all the small bass and forage fish that are seen. Give the lake a couple of years and the fishing will be as good as ever. Ongoing creel surveys will help determine when it is time to change regulations, document the need for habitat intervention and help point anglers to some of the best fishing in the world at the right time and with the right gear. ♦

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Bob Wattendorf writes for the Florida Fish and Wildlife Conservation Commission in Tallahassee.



Florida Fish and Wildlife Conservation Commission

*The outcome of fisheries management – quality fishing.*

# Meanders

By Craig Springer

## Song of a Summer Past

The dog days of summer are easily remembered, limned with thoughts of being on the water. They are sun-drenched memories, as joyful as an Allman Brothers song.

*Don't fly mister bluebird, I'm just walking down the road. Early morning sunshine tells me all I need to know.*

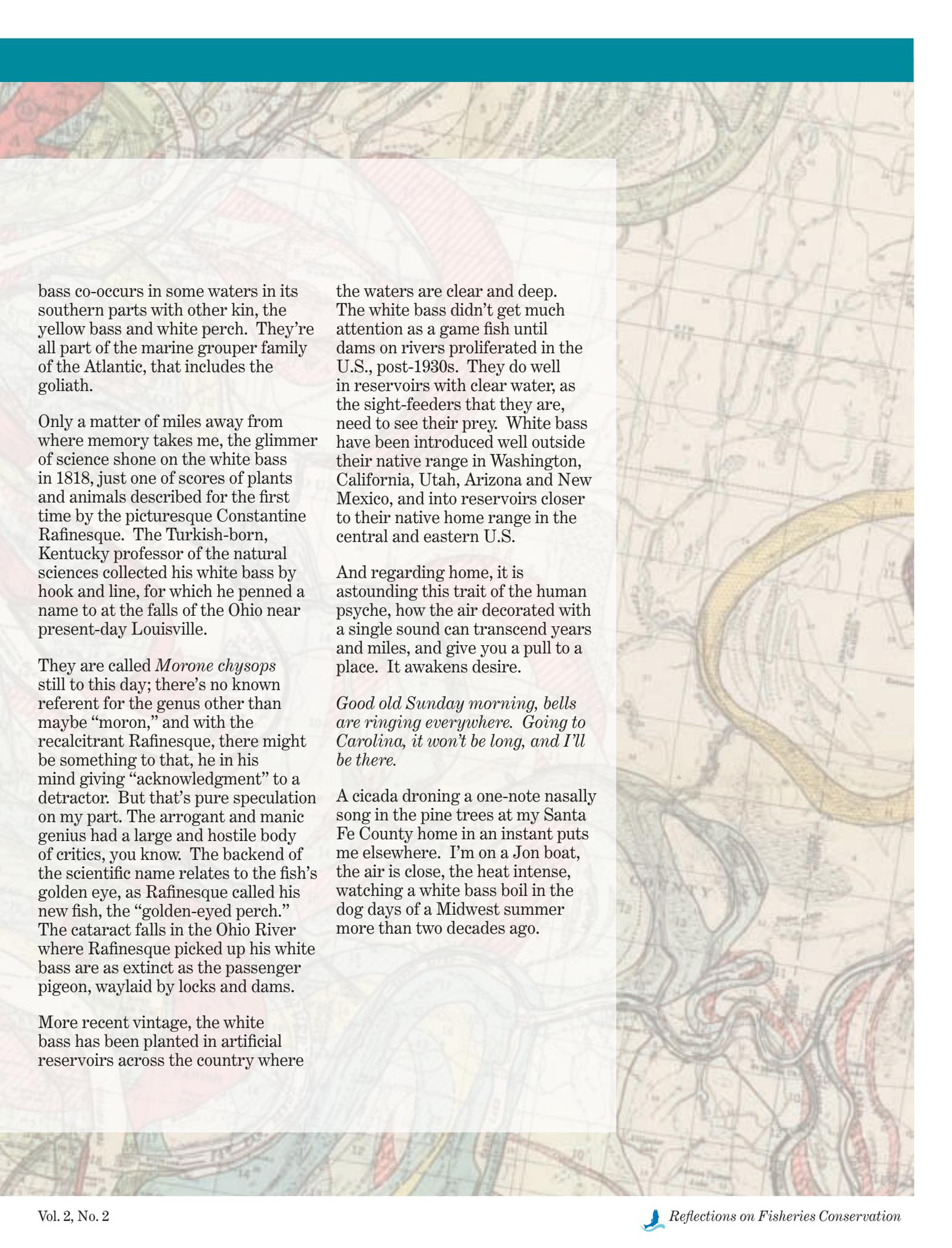
The buzz of bugs floated onto the flat and still waters, coming to my ears gentle and sporadic like waves splashing on a shoal. I was a creel clerk at Caesars Creek Lake for the Ohio Division of Wildlife, checking angler harvest. From the maples and hickories, the box elders and dogwoods on shore, masses of cicadas droned incessantly. If sound had color, theirs would be a monochromatic shrill. It seemed like they were serious about their future. They looked to mate, breed and die in a span of days. The air was memorable that summer day; it stood stock still, thick like an over-cooked pot of stew – soppy wet like Midwest summer air is prone to be.

I killed the engine and walked forward. Standing on the gritty ply-wood bow of a short, well-used government-issued Jon boat, I watched the water surface turn into froth in a flurry of feeding fish. A school of white bass boiled the surface in a feeding frenzy, probably picking off luckless gizzard shad that would seize up at the sight of a mirror. This ball of white bass was easy pickings for a pair of anglers

who I had approached. I stood by on my bow as an observer; as the two anglers participated in the food chain.

White bass have a sterling look about them, and a sterling quality on the end of a line. They will take a bright jig with iron tenacity, and make a run that pumps your forearm. A white bass is aptly named, for a fish pulled fresh from the water in summer sun looks intense, like polished chrome. The bluish-olive tinge, the color of good lake water on top of their back protects them from being seen by predators from above, like herons and ospreys and other fish-eating fish. They transcend into broad silvery sides with tinges of gold on the bottom. Their most distinguishing look is the stripes, sometimes six of them, sometimes eight, that run the lateral length. Below the lateral line, the stripes are faint, obscured. The whole fish in fresh condition looks like it is cast in a light steely blue, like a well-worn blued shotgun barrel.

The white bass is to the striped bass what a rainbow trout is to a cutthroat – really close kin. Save for seasonal spring movements up the St. Lawrence, the two didn't overlap much in nature. There used to be some archaic thought that the white bass was a relic of a land-locked striped bass population, the artifact of being separated from a parent stock for an epic amount of time. The thought runs not too dissimilar to land-locked kokanee and its sea-run sister, sockeye salmon. The white



bass co-occurs in some waters in its southern parts with other kin, the yellow bass and white perch. They're all part of the marine grouper family of the Atlantic, that includes the goliath.

Only a matter of miles away from where memory takes me, the glimmer of science shone on the white bass in 1818, just one of scores of plants and animals described for the first time by the picturesque Constantine Rafinesque. The Turkish-born, Kentucky professor of the natural sciences collected his white bass by hook and line, for which he penned a name to at the falls of the Ohio near present-day Louisville.

They are called *Morone chrysops* still to this day; there's no known referent for the genus other than maybe "moron," and with the recalcitrant Rafinesque, there might be something to that, he in his mind giving "acknowledgment" to a detractor. But that's pure speculation on my part. The arrogant and manic genius had a large and hostile body of critics, you know. The backend of the scientific name relates to the fish's golden eye, as Rafinesque called his new fish, the "golden-eyed perch." The cataract falls in the Ohio River where Rafinesque picked up his white bass are as extinct as the passenger pigeon, waylaid by locks and dams.

More recent vintage, the white bass has been planted in artificial reservoirs across the country where

the waters are clear and deep. The white bass didn't get much attention as a game fish until dams on rivers proliferated in the U.S., post-1930s. They do well in reservoirs with clear water, as the sight-feeders that they are, need to see their prey. White bass have been introduced well outside their native range in Washington, California, Utah, Arizona and New Mexico, and into reservoirs closer to their native home range in the central and eastern U.S.

And regarding home, it is astounding this trait of the human psyche, how the air decorated with a single sound can transcend years and miles, and give you a pull to a place. It awakens desire.

*Good old Sunday morning, bells are ringing everywhere. Going to Carolina, it won't be long, and I'll be there.*

A cicada droning a one-note nasally song in the pine trees at my Santa Fe County home in an instant puts me elsewhere. I'm on a Jon boat, the air is close, the heat intense, watching a white bass boil in the dog days of a Midwest summer more than two decades ago.

# Eddies

*Reflections on Fisheries Conservation*

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Summer 2009

## Muskie Capital of the South

Its nickname, “The Muskie Capital of the South,” is earned. Cave Run Lake sits behind a dam on Kentucky’s Licking River in the Daniel Boone National Forest. Muskellunge are native to the Licking River. This 8,700-acre U.S. Army Corps of Engineer reservoir is muskellunge habitat.

Since 1973, the Kentucky Department of Fish and Wildlife Resources (KYDFWR) has stocked 105,000 muskellunge 9 to 13 inches long from its Minor Clark Fish Hatchery, into Cave Run Lake. It is premiere muskie water.

Cave Run Lake is one of three quality muskellunge reservoirs managed by the KYDFWR. The U.S. Fish and Wildlife Service’s Sport Fish Restoration Program funds muskellunge stocking. Federal manufacturing excise taxes on fishing tackle, boat trolling motors, and motorboat fuels are distributed to state fish and wildlife agencies, supporting fish management activities to benefit anglers. ♦ Thomas McCoy



*All grins, angler Sarah Terry of Mt. Sterling, Kentucky, caught this current Kentucky state-record muskellunge in Cave Run Lake in November 2008. This monster muskie went 54 inches and 47 pounds. A clipped fin revealed that this fish was stocked by the KYDFWR.*

KYDFWR