

Eddies

Reflections on Fisheries Conservation



Eddies

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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

More than a Profession

By Bryan Arroyo



Fisheries conservation is, by its very nature, an investment in the future. The many dedicated people who work in fisheries conservation—all of them—are our greatest asset. For it is through them and their collective efforts that we sustain the diversity of aquatic life today, and provide a foundation for conserving the future.

We employ some 800 or so professionals in the U.S. Fish and Wildlife Service's Fisheries Program. Geneticists and maintenance workers, veterinarians and fish culturists, pharmaceutical researchers and animal caretakers—the breadth of occupations you will find in the Fisheries Program is surprisingly diverse. And I find this delightful. There is a benevolent melding of generations, from Baby Boomers to Gen-Y who bond in the common cause of conservation. They share a fidelity to our mission.

It is a “cause” for our people to conserve America's fisheries, with an unwavering commitment. The origin of that commitment is a little more difficult to define, but I venture to say that the profession of conservation found them, rather than the other way around.

Most everyone I know who works in conservation came to it from experience early in life, usually with family. I know that I was no exception. As a child and throughout my life I have cherished every moment spent outdoors, particularly fishing. What you are exposed to shapes you. You'll see that, as you read about the fine folks we feature in this issue of *Eddies*. Nearly to the person,

it was experience in nature—using all the senses—that brought our people to their careers. In most cases, playing in water and catching fish was part of that. But, in reality, it was the fish and the wonder of water that caught us as kids. It's that sort of deep dedication at a spiritual level that steers many of our employees through three-decade-long careers.

Dr. Samuel Snyder, a professor of religion and Fellow at the National Sporting Library, speaks frankly about the matter in his Meanders story “Love of Sport and the Conservation Ethic.” Professor Snyder argues an imperative—that children must experience wildness afforded by a fishing pole—for it is the “love of sport” that produced some of the greatest conservation thinkers of our time, like Aldo Leopold. Without that experience in the present day, we will lack a future in conservation.

In this issue of *Eddies*, we treat you to swatches of the whole cloth. The 15 public servants profiled in the following pages represent the wide array of talents we need in fisheries conservation. It takes a diverse range of talents to keep our program operational. Administrative assistants move the paper so that biologists can move fish, recover species, and answer research questions. It takes maintenance mechanics to keep the infrastructure functioning, so that animals in our care can prosper. Our scientists explore the molecular structure of organisms with DNA sequencers in laboratories, or ride horses into wilderness waters to study wild trout. They detect new diseases and map habitat with modern technology. But it is the singularity of our mission, grounded in science and the resolve to see things through that bind our work force.

Philosopher Jose Ortega y Gasset said this about human character: “Excellence means when a man or woman asks of himself more than others do.” It's pleasing to know this trait exemplifies those who work in fisheries. There's much to be said about fidelity to mission—the benefits accrue to you and to the fish.

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

Town turns 100, outdoor classroom born



West Virginia Daily News

Congressman Nick J. Rahall, II, third from right cuts the cake with dignitaries helping out.

The National Fish Hatchery System Volunteer Act of 2006 called for the creation of outdoor classrooms at National Fish Hatcheries and White Sulphur Springs National Fish Hatchery, WV, was chosen as the site of first pilot project. During the Hatchery's 5th Annual Freshwater Folk Festival in October, dignitaries dedicated the Anniversary Amphitheater to the Hatchery's

namesake town for its 100th birthday. Keynote speaker, Congressman Nick J. Rahall, II, said "I am so happy as Chairman of the House Natural Resource Committee to play a small part in furthering the work that is done here at the National Fish Hatchery. This Hatchery was the very first in the nation to participate in the National Outdoor Classroom Pilot Program." Mr. Rahall noted

that conservation education helps children and their families connect with nature, stimulating interest in science and the outdoors. The Anniversary Amphitheater is only the beginning of the outdoor classroom that will soon turn the federal fisheries facility into a "living" outdoor discovery zone with trails, teaching space and aquaria with native fish fauna. ♦ Matthew Patterson

For friends, by friends

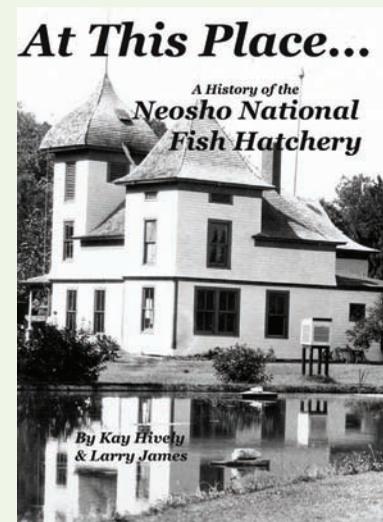
A new book, *At this Place: a History of the Neosho National Fish Hatchery*, will benefit the Friends of the Neosho National Fish Hatchery.

With over 100 historic photographs supplied by Larry James, writer Kay Hively cobbled together the history of the oldest operating National Fish Hatchery.

The two researched newspapers, memoirs, and log books kept by past personnel dating back 120 years.

Hively interviewed 13 former hatchery managers who worked at the Missouri facility. Hively called it a walk down memory lane, given she's been involved with the Hatchery for nearly 30 years.

Hively and James received no compensation; all book proceeds go to the Friends Group. Contact Hively at rkhively@sbcglobal.net. ♦ Craig Springer



Kay Hively

Fish art contest connects kids to conservation



USFWS

Brook trout leap in colored pencil, drawn by tenth-grader R. Hasegawa of New Jersey.

A great way to connect kids to conservation is through the Wildlife Forever State-Fish Art Project. The Project has two primary components: Fish ON! lesson plans for students in grades 4-12, and a national art contest in which students paint or draw their official state-fish in its natural habitat.

Each artist also writes an essay describing the fish's habitat, physical characteristics, and behavior. The national art contest deadline is March 31, 2010.

For more information about the Wildlife Forever State-Fish Art Project and more detailed contest information, visit www.statefishart.com. ♦ Denise Wagner

FEATURED FACILITY

Idaho Fish Health Center

Where: Ahsahka, Idaho
When: Established 1969

Then:
Dworshak Fish Health Center was established to support Dworshak National Fish Hatchery, a part of the U.S. Army Corps of Engineers Clearwater River Steelhead Mitigation project.

Now:
In 1997, the name changed to the Idaho Fish Health Center. It provides fish health services throughout the state, including the Kootenai Tribe of Idaho and the Nez Perce Tribe and their hatchery and research programs. Extension service is provided to commercial aquaculture producers on request. Like at all nine USFWS Fish Health Centers, biologists strive to be on the cutting edge using the latest technology and clinical assays to better serve conservation.

Participation in the National Wild Fish Health Survey (NWFHS) is extensive, in which dozens of aquatic



Kathy Clemens/USFWS

A mottled sculpin held by a biologist at the Idaho Fish Health Center.

species are sampled at hundreds of sites. Wild fish are sampled in Idaho and eastern Washington in cooperation with Indian tribes, state agencies, and the U.S. Forest Service. NWFHS results are available to anyone via a database, open to the public, used primarily to manage fisheries. Idaho FHC has a certified electroshocker operator and crew adept at collecting all species of fish. ♦ Kathy Clemens

Genetics reveal much about redhorse



Steve Fraley/NCWRC

Sicklefin redhorse

Dr. Greg Moyer at the Warm Springs Fish Technology Center, GA, led research into the genetic makeup of a fish that ironically remains unnamed by science. Moyer and colleagues Mark Cantrell, U.S. Fish and Wildlife Service, and J.D. Rousey, Valdosta State University, published their

research in the *North American Journal of Fisheries Management* in October. Commonly called the sicklefin redhorse, the fish is aptly named. Its head is horse-like and the fins of breeding males are brick-red, but Moyer and colleagues looked deeper—into the genetic diversity

of populations in the Little Tennessee River and the hatchery broodstock being used to restore this fish depleted in the wild. The scientists learned that the fish in the wild and the hatchery were not different in their genetic diversity, and that fish in the hatchery were not related. Conserving this genetic diversity is important in

restoring fish populations to ensure healthy populations. Moreover, the scientists say their research points to the utility of genetic data in fisheries management. ♦ Craig Springer

Reasons for anorexia in spawning bass revealed

Ardent anglers know that nest-guarding smallmouth bass put all their attention in protecting their young, with little energy put into finding food. Now, fish physiologist Dr. Kyle Hanson at the Abernathy Fish Technology Center in Washington knows why. Hanson and colleagues, Drs. Alfonso Abizaid and Steven Cooke from Carleton University, delved into the cause and consequence of anorexia in smallmouth bass. The answers lied in looks at blood chemistry and manipulations in feeding. Their findings will be published in the science journal, *Hormones and Behavior*.

Hanson and his colleagues caught nest-guarding male bass and took blood samples over the period that offspring progress from eggs to fry and their eventual independence from

the parent. They tested the blood for the hormone, ghrelin, which is known to regulate appetite. They learned that the hormone is lowest during the egg stage and increased as the young grow toward independence, a period that lasts about three weeks. The scientists also injected groups of nesting bass with ghrelin and force-fed crayfish to others, testing their swimming abilities and aggressiveness toward nest predators. Fish with full bellies didn't swim as well; similarly, sated bass were less aggressive

after eating. The research reveals that anorexia actually allows male smallmouth bass to better protect offspring. ♦ Craig Springer



Marie-Ange Gravel/Carleton University

Dr. Kyle Hanson and colleagues tested the aggressiveness of anorexic bass on nest predators.

Native walleye gain stronghold

Native walleye are gaining a new stronghold in Virginia's New River, thanks to a grant from the Dingell-Johnson Sport Fish Restoration Fund in partnership with the Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Tech and the West Virginia Department of Natural Resources.

From 1997 to 1999, VDGIF partnered with Virginia Tech to investigate the genetic structure of walleye in the upper New River and in the downstream Claytor Lake. They found two distinct populations isolated by spawning habits – a

non-native lake stock, and a native river stock. The latter, though small in number, had the reputation of producing large walleye, including what would become the Virginia state record.

The partnership shifted from research to conservation, hoping to re-establish a viable native walleye recreational fishery on the 74 miles of the New River above Claytor Lake. VDGIF and Virginia Tech joined West Virginia hatcheries in rearing and releasing the native walleye as the centerpiece of its *Restoration and Enhancement of the New River*

Walleye Fishery project. From 2002 to 2007, it stocked about 566,000 New River walleye and recorded an increase in spring electrofishing catch samples on the river from 1 to 17 walleye per hour. At the same time, fishing success skyrocketed. Angler hours doubled and annual native walleye catch rose from 320 to 2,247 fish.

Walleye restoration on the New River is working for anglers, and for that success VDGIF was selected for the 2008 American Fisheries Society Sport Fish Restoration Outstanding Project award. ♦ Karl Hess, Ph.D.

FROM THE ATTIC

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

We don't exactly know when U.S. Fish and Wildlife Service employees started wearing uniforms. But by 1896, U.S. Fish Commission employees faced some of the same apparel issues employees face today.

The Wanamaker Clothing Company was one supplier, with workers sending in their measurements and preference for kersey or flannel suits. Overcoats were available and made of heavy, dark navy blue cloth, lined with dark-gray repellent, Ulster pattern, cut to reach within 12 inches from the ground. They were double-breasted, two rows of one-inch buttons and a four-inch Ulster collar. Each breast had outside vertical pockets, with two side pockets with flaps. They ran \$14 to \$17, depending on the fabric you picked, and samples were provided.

Uniforms were probably wool, not washable, but typical of standard men's clothing. In 1896, fish culturists at Leadville National Fish Hatchery, CO, made about \$60 per month, and the superintendent about twice that. Uniform allowances are not mentioned. Cooks made about \$40 per month and probably were not uniformed. Leadville often preferred female cooks, for a better influence on the men. However, male cooks could shovel the snow around the mess hall.

Overalls were to be worn to protect the uniform if employed in dirty work, same as protecting any other suit of clothes. Old clothes could be worn where "work is of such a nature that overalls would not afford adequate protection." Then, as now, "It is desired that all station employees be uniformly dressed and present as neat and business-like appearance as possible." ♦
Randi Sue Smith



Brass buttons adorned U.S. Fish Commission coats circa 1890. The USFC became the Bureau of Fisheries in 1903, as shown on this patch.

April Gregory/USFWS

By Lee Allen

Dr. Kenneth D. Carlander



Iowa State University Special Collections

U.S. Fish and Wildlife Service fishery biologist, Dr. Kenneth Carlander, led the Iowa Cooperative Fish and Wild Research Unit.

If the worth of a man's existence on this planet is measured by what he does, how he does it, and what he leaves behind, Dr. Kenneth Carlander (1915-2002) has left an impressive legacy.

"Although a Federal Cooperative Wildlife Research Unit program had been initiated at Iowa State University as early as 1934, its mission did not include fisheries research until Dr. Carlander became its leader in 1947," according to current Iowa unit leader Dr. David Otis.

Carlander was employed by the U.S. Fish and Wildlife Service while functioning as an adjunct professor at Iowa State University, the first – and for many years, the only – faculty of the Department of Natural Resource Ecology and Management. In that venue for two decades, he is now acknowledged as the father of the Cooperative Fishery and Wildlife Research Unit concept. These units scattered across the country represented part of U.S. Fish and Wildlife Service research capabilities until the mid-1990s when they were amalgamated with the U.S. Geological Survey.

What today's Cooperative Unit Program does, according to Dr. Scott Bonar who works out of an Arizona Cooperative Fish and Wildlife Research Unit is "seamlessly bring together groups that have different strengths, using many different brains and viewpoints to solve problems in the protection of our nation's natural legacy. The Coop System is more valid and beneficial today than it was at its origin."

It's ironic that founding father Carlander – himself a fishery biologist – was not a fisherman, nor did he personally get involved in the field work of some 100 graduate students. He did involve himself in a variety of research studies throughout his career however – from sturgeon to swordfish, trout to tuna, and bluegill to bass – results of which ended up in the 1953 publication, *Handbook of Freshwater Fishery Biology*. Volume 1 of the internationally recognized treatise on age and growth data was followed by a Volume 2 on the *Life History Data of Centrarchid Fishes of the U.S. and Canada*, and a Volume 3 that dealt with *Ichthyopercid and Percid Fishes*.

"While I was chairperson of the department in which Dr. Carlander spent his professional life, I referred to him as my professional grandfather and only called him Ken after many years due to great respect for the man," says Dr. Robert Summerfelt, Professor Emeritus, Department of Natural Resource Ecology and Management at Iowa State University. "He was soft-spoken with an unassuming personality and neither his voice nor words were ever harsh. He represented the best of academic scholarship as well as a personal lifestyle that followed the Golden Rule."

Spiritual in belief and a teetotaler in practice, Dr. Carlander still felt comfortable in support of his students at socials involving beer mugs and rowdy behavior. "He was our advocate and didn't judge us," said former Carlander doctoral student and employee Dr. Richard Noble, now retired. "His quiet demeanor typified his behavior at scientific meetings and made him a

great listener. While perhaps not the greatest classroom teacher because he stuck closely to his well-developed lectures, when he spoke in a succinct fashion with carefully selected responses, people listened. He considered students, current or past, as his academic family, scheduling gatherings at his house and filling his not-so-new personal vehicle with as many students as he himself could personally drive to scientific meetings. A man of high integrity, he expected the same from his students. He was a scientist, a teacher, a mentor, and a friend and his greatest strength was his advocacy for those he taught.”

His student support was shown in many ways. “One harsh winter in the middle of an oil crisis, the heating oil supplier for married student housing ran out of fuel. Dr. Carlander extended an invitation for my wife and I to move in with him until conditions changed,” remembers Dr. Mike Van Den Avyle, who adds, “His unselfish help and advice set an example that always guided my behavior as an educator.”

There are many examples of his extending financial support to international graduate students and true to that concept, upon his death an endowment was established for a scholarship fund for graduate students majoring in fisheries biology. The ISU Limnology Laboratory also offers an internship co-named for the eminent aquatic ecologist for students who seek research experience in the aquatic sciences.

During his career, Carlander accumulated an impressive arsenal of accolades. He is listed among Iowa State University’s People of Distinction and is acknowledged

as a Distinguished Professor of Fisheries. In addition to his publishing career – starting with his first research publication in 1939 dealing with walleye growth rates in Minnesota lakes – he served as a past president of the American Fisheries Society as well as head of the Iowa Academy of Science. He was a U.S. Representative of the International Association of Theoretical and Applied Limnology and with a strong interest in international peace initiatives he served several years as consultant for the Ford Foundation in Egypt and later in Indonesia.

Carlander’s papers are housed in the Iowa State University Library Special Collections Department and are still used by students researching various aspects of fish and animal ecology as well as those studying United World Federalists and other peace and world government organizations.

The Panhandle-Plains Historical Museum in Texas maintains his early day bird specimen collection, a youthful endeavor thought to have made him the first State Ornithologist in Texas. ♦

Lee Allen writes from Tucson, AZ. He wrote “Fish in the Forest” in the spring 2008 *Eddies*.



Iowa State University Special Collections

Dr. Kenneth Carlander (l), an adjunct professor at Iowa State University, teaches students Calvin Fremling, James McCann, and James Schmulbach about paddlefish in 1958.

American Fishes

Walleye

By Hal Schramm, Ph.D.

Painted in muted shades of gray, green, and brown, it's indistinguishable hovering close to a dimly lit rock bottom. Walleye are far from colorful. Here is a sport fish renowned more for its flesh than its fight. Except for their pearlescent eyes, from which they derive their name, and a white tip on the caudal fin, a plainer fish doesn't swim in fresh water. Throughout most of its range the fish is not imperiled, nor are thriving populations the result of heroic restoration efforts.

Uncharismatic as it may be, bigger-than-life statues in Port Clinton, Ohio, Baudette, Garrison, Isle, and Ray, Minnesota, and Garrison, North Dakota celebrate this fish. And rightfully so. The walleye has value—cultural and economic.

The walleye is native to the Missouri River, Ohio River, and the Great Lakes basins. A unique strain, the Gulf Coast walleye, is native to the Tombigbee and Coosa rivers in Alabama and Mississippi.

The walleye life cycle is relatively simple. Walleye spawn in the spring at water temperatures near 50 degrees. They migrate up rivers to spawn on gravelly shoals at night, but they will also spawn on rocky shores in lakes. In the 1960s, Dr. Gordon Priegel, learned that the walleye population in Lake Winnebago, Wisconsin, also spawned in floodplain marshes and oxbow lakes of tributary rivers. It seems walleye spawn where walleye choose to spawn. The common denominator is moving water.

The young walleye quickly behave like their piscivorous parents. Growth is rapid when forage fish are abundant, from 4 to 10 inches before their first winter. The world-record

walleye caught in Old Hickory Lake, Tennessee, weighed 25 pounds.

Walleye have been stocked into numerous reservoirs. Although these fish can migrate into the rivers that were impounded to create the reservoir, most fish move downlake and spawn on the rock rip-rap on the dam. Downstream migration is highly unusual among migratory fish. The prevalence of downlake migration in reservoirs may result from spawning-site fidelity. That fidelity may account for lake- and river-spawning stocks in the same population.

Spawning-site fidelity – returning to areas where spawning habitat exists – perpetuates populations, but this trait also makes the fish vulnerable to habitat alteration. Walleye in several navigation pools of the upper Mississippi River have fidelity to spawn in just a few places. Any habitat alteration that limits spawning could severely affect these creatures of habit.

Although common throughout the north-central states, not all lakes or river reaches there support walleye. But walleye fishing is so imbued in the culture in northern states that several million resident and visiting anglers spend tens of millions of days fishing walleye each year. They expect to catch walleye. Throngs of engaged anglers keep walleye management on the front burner. This can be good for walleye, but convincing these anglers that not all waters support the fish has been difficult. Where compatible with wise conservation and within hatchery production limits, walleye have been stocked to supplement, sustain, or establish walleye populations.

More than 200 million walleye are stocked annually into public waters

to attempt to satisfy the demand for walleye fishing. Most are stocked as fry, so propagation efforts only require collecting broodstock, hatching eggs, and transporting the fry. Ample research has demonstrated better returns from larger fingerlings stocked in the fall, and several state fish and game agencies produce limited numbers of these larger fish. Rearing the fry to fingerling stage is constrained by the young walleye's appetite for fish.

One recipe for rearing large fingerlings is *extensive culture* – stocking walleye fry into predator-free and forage-rich, off-hatchery ponds or wetlands, and harvesting the larger fingerlings in the fall. This process is relatively inexpensive but labor intensive.

An alternative solution, *intensive culture*, involves rearing walleye at high densities in hatchery tanks and raceways. Despite their irrepressible appetite for live fish, progressive (and patient) hatchery managers are refining methods for rearing walleye from fry to fingerling stage on prepared feeds. The trick is training the fry to eat prepared hatchery food. The fry are concentrated at very high densities in hatchery tanks and fed a highly palatable high-protein diet. Automatic feeders dispense tiny food granules every few minutes so the little walleye are literally swimming in food. Feed training is complete in a couple weeks and the walleye are weaned from the gourmet starter diet to a less expensive hatchery diet. They are fed in raceways and tanks throughout the summer. In the fall, the fish are easily harvested and 6- to 8-inch advanced fingerlings are distributed to designated public waters.

Walleye are not really all that finicky about where they live or who their neighbors are; but, like most of America's native fishes, they have habitat requirements and tolerances. Walleye survival is best in large, relatively clear lakes with sand, gravel and rock bottoms. Self-sustaining populations are most likely where walleyes share these lakes with smallmouth bass and muskellunge. Strong walleye populations are unlikely in shallow, muck-bottom lakes with abundant northern pike or largemouth bass. Ironically, research to identify "good" walleye lakes has been driven by the need to get the best return from the limited fish provided by hatcheries.

We are all concerned with the energy crisis; fish deal with it. For a fish, survival boils down to minimizing energy expenditure while consuming sufficient energy to meet metabolic demands, to fuel development of eggs and milt, and to have at least a little left for growth. For walleye, the solution to the energy crisis hinges on water temperature. The optimal temperature of adult walleye has, surprisingly, received limited study but appears to be around 72 degrees. The walleye's physiological machinery is most efficient at or near this temperature. In Lake Erie, many of the large adult walleye that spawn in the warmer, shallower, and more productive western basin travel up 200 miles to the cooler, deeper, eastern basin, returning to the western basin in the fall and early winter. Although less fertile, the eastern basin provides sufficient quantities of preferred slender-bodied, soft-rayed forage fish like emerald shiners and rainbow smelt for growth. Despite the energy spent in the round-trip migration, the lower metabolic costs of living in the cooler water allow for ample net energy gain by the large fish.

Future walleye management will face many challenges. Certainly

habitat will remain a major concern, but one of the greater challenges will be satisfying an increasingly diverse population of walleye anglers. Walleye anglers, like anglers that focus on other fishes, embody a mixture of motivations and preferences, but the vast majority of walleye anglers fish to put fillets in a pan. Anecdotal information suggests that a catch-and-release ethic and quest for larger walleye may be gaining momentum among walleye anglers. Highly visible, live-release walleye tournaments may accelerate

this shift in walleye anglers' attitudes. As angler preferences diverge, satisfying anglers will become increasingly difficult.

Change will happen, but only in time will fishery managers know what that change will be. Throughout the perpetual transition, the walleye will still be the star of the show, and good habitat will be the stage. ♦

Dr. Hal Schramm leads the USGS Mississippi Cooperative Fish and Wildlife Research Unit in Starkville, MS.



Bob Hines/USFWS

American anglers are wild about walleye.

By Ben Ikenson

Rx: Fish

Side effects may include conservation

Molly Bowman could be the poster child for an emerging generation of natural resource managers. An outgoing woman with a winning smile and affable demeanor, she enjoys an extraordinary job that blends a relatively modern scientific field with traditional fisheries management.

Bowman's career path, however, was in the making long before she knew it.

"When I was a kid, our family spent all of our available free time in the outdoors camping, hiking and biking," she says. "It definitely helped instill the sense of appreciation for wildlife and wilderness that I have today."

It was Bowman's grandfather who introduced the impressionable 15-year-old to his passion for fly-fishing on Idaho's Silver Creek. Later, the teenager volunteered her time one summer to help her aunt, a fishery biologist for the U.S. Forest Service, in marking northern pikeminnow and conducting bull trout population estimates near Eugene, Oregon. "After that," says Bowman, "I knew I wanted to work in fisheries, too."

Bowman did just that after graduating from Montana State University with a degree in fish and wildlife management. Today, she plays a very distinct role in fisheries, working for the U.S. Fish and Wildlife Service's Aquatic Animal Drug Approval Partnership in Bozeman, Montana. It is the only office in the Service dedicated solely to generating and analyzing the data required for drug approvals through the Food and Drug Administration's Center for Veterinary Medicine (FDA-CVM).

"There is a need in public aquaculture for aquatic drugs and chemicals," says Bowman. "In contained environments, fish do get sick, and

fish culturists and managers need tools in order to maintain the health of their fish populations. Our work is not geared only toward creating tools for hatcheries; we also generate a lot of data for non-therapeutic drugs important for field work such as spawning hormones, marking agents, and anesthetics. And while our focus is on the needs of public aquaculture like hatcheries, fish culturists, and fishery managers, the data we generate also benefits private aquaculture as well."

But there are complicated hurdles to the drug approval process unique to the world of wildlife: fish are not exactly rushing to the nearest drugstores to fill prescriptions, and their caretakers do not exactly represent the most profitable demographic to drug companies.

"The drug approval process is expensive and time-consuming," says Bowman. "Not many pharmaceutical companies are willing to spend a lot of money on aquaculture approvals as it's such a small arena that it's hard for them to make much money."

As a consequence, Bowman's office is tasked to collaborate with other federal and state agencies in conducting much of the essential drug-approval research. Bowman and her colleagues in Bozeman deal specifically with research surrounding a drug's efficacy and its impact on fish safety. Bowman herself spends time developing and writing the protocols that must be approved by the FDA-CVM. Once approved, Bowman and colleagues can move on to the real meat of their work – collecting and analyzing data.

"Some of our studies we can conduct here at the Bozeman Fish Technology Center," she explains. "Other studies need fish that are non-native to this

area, or diseases, and we're unable to bring those in. So for those studies, we conduct them at facilities where the fish and the pathogen naturally occur."

The studies can last anywhere from two days to an entire month. Once complete, Bowman gathers the data for review, running appropriate statistics, creating graphs and tables, and, ultimately, writing a final study report to submit to FDA-CVM. Of course, circumstances do not always allow for such a systematic or streamlined approach to getting results; it's often not as nice and neat as it sounds on paper.

"With budget constraints and other issues, I conduct more and more studies 'remotely.' Sometimes, on-site personnel call me to say 'my fish are sick ... we have to start treatment right away.' When this happens, I have to get forms, randomizations, gear and more, all to the study site ASAP. When a disease breaks, you can usually find me rushing around."

As for treatment, it's not "Fish Prozac" Bowman pushes. Lately, she's been conducting studies for the approval of chloramine-T, hydrogen peroxide, and florfenicol. The first two are known as "bath products"; in powder or solution form, they are dissolved in the water where subject fish are treated for external infections such as external columnaris and bacterial gill disease. The third, florfenicol, is an antibiotic that is mixed with feed and is used to treat systemic infections such as systemic columnaris, enteric septicemia, furunculosis, and bacterial coldwater disease.

For the bath studies, Bowman must know the exact dimensions of the tank and volume of water to calculate

the amount of drug needed for each tank for each day of the study. For her feed studies, the fish must be weighed and measured in order to calculate the amount of feed the fish need and, thus, the amount of drug to be mixed with feed.

Bowman's calculation work is the easy part, though. Simply finding a study venue can be a challenge in and of itself. "I first have to work with different agencies to find facilities with enough tanks, fish and staff willing and available to conduct a study. This is especially difficult because we need enough tanks and fish to do replicates: there should be at least three tanks of treated fish and three tanks of control fish. A lot of facilities don't have enough fish to spare to have so many tanks of control fish, which typically have higher mortality rates during the study; and they have to meet their own agency needs. Then we have to find a fish health biologist, if there's not already one for that specific facility. The pathogen must be presumptively diagnosed before we start a study and then confirmed at some point."

On-site or "field efficacy" studies are yet another aspect of Bowman's professional purview. Fortunately, sedative studies, for example, are relatively short and can be conducted anywhere there are enough fish.

"We're currently researching an immediate-release sedative that will allow fish to be put directly into public waters after being exposed," she says. "Right now, the only approved sedatives have a 21-day withdrawal period, making it basically impossible to use in the field – how can you 'hold' your wild fish for 21 days before releasing them after you've sedated them?"



Denver Bryan/Images On The Wildside

Fish: Feeling a little blue under the gills? Help is on the way. Meet Molly Bowman, who works at the only U.S. Fish and Wildlife Service office dedicated solely to generating data required for drug approvals through the Food and Drug Administration's Center for Veterinary Medicine.

The sedative work needs to be completed on many different fish species, at different water temperatures, and at different life-stages. Depending on the fish, some of the work can be done on-site, but most requires travel to field stations.

"These studies are easy to conduct," says Bowman, "and folks are more than willing to work with us because it doesn't require too much field staff assistance – for the most part we're self-sufficient – and we're not killing their fish. When I say they're easy, I mean fairly easy to organize, but physically they're very time-consuming and hard – we've bucketed a lot of water in our day!"

Indeed, physical tasks are the easiest part of a job that entails so much detailed research and coordination. But, as with many of her colleagues in conservation, Bowman's professional challenges are not merely intellectual

abstractions: they are personal calls to make the world a better place.

As a new mother, Bowman hopes to have some of the same effect on her daughter as did her grandfather on her, when they first fished Silver Creek so many years ago. Naturally, the personal brings a sense of urgency to the professional, yielding rewards that are all the more meaningful.

"Not many drugs get approved through FDA-CVM for use in aquaculture, so when one does, our entire little aquaculture community is buzzing with excitement," says Bowman. "It means we have done our job and the drugs are safe for the fish, safe for humans, and safe for the environment. The more research we do, the safer it will be for everyone, and the better the environment will be for future generations." ♦

Hatchery Manager—Carlos Martinez

By Lee Allen

“Running” a Historic Hatchery



Carlos Martinez stands outside the historic Leadville National Fish Hatchery where he recently worked. He still runs the Fish Hatchery 5K at Leadville.

Someone else already coined, “Walk Softly and Carry a Big Stick,” so Carlos Martinez will have to “Run Swiftly and Carry a Big Fish.” As a marathon runner, the relatively new supervisor of the D.C. Booth Historic National Fish Hatchery, in Spearfish, South Dakota, he gets to do both.

“If I hadn’t been lucky enough to join the U.S. Fish and Wildlife Service, I probably would have ended up in some sort of outdoor group, perhaps working with an organization like Outward Bound,” he says. “But I found my niche and enjoy interacting with some of our 160,000 annual visitors. Since 1896, this place has been one of the most unique hatcheries in the nation and as a mountain boy with outdoors in my blood, I like to show the place off.”

The mountain boy background comes from his youth in Leadville, Colorado – 10,000-foot elevation – where he took advantage of high country to enjoy hunting and fishing in a unique fashion. “We called it ‘high laking’ where we had to trek to alpine lakes to fish for native cutthroat trout, and brookies.” Those junkets got sandwiched in between leading his

high school cross country team to four straight state championships while he also set a school record with 14 varsity letters.

Although his original college major was engineering, he started spending more time wandering around the ornithology and mammology labs. “One day it dawned on me that working in a natural resource-related field would be a perfect fit.” Degrees in fisheries biology from the University of Wyoming followed as did a stint with the U.S Forest Service. He signed on at Leadville National Fish Hatchery in 1999.

Moving as swiftly in the professional world as he did on the track, Martinez gave back to the community. He served as race director for 40 running and cycling events, founded and chaired the non-profit Leadville-Lake County Sports Hall of Fame “Honoring the Past to Inspire the Future,” and still found time to direct an annual Fish Hatchery 5K race to benefit that 501(c)(3) group.

“I enjoyed the volunteer and community work in Leadville and plan to return each year to direct

the Fish Hatchery 5K trail run along dirt pathways in the Mt. Massive Wilderness area. The race has been held for five years now and I intend to start a similar event at D.C. Booth Hatchery in 2010.”

He also has some plans for the facility itself. “One item I’d like to accomplish is upgrading our on-site museum capabilities. While we do display a lot of materials, there are still artifacts that remain in storage and the public can’t enjoy them if they stay in a box.

“We also need to make D.C. Booth more well-known and accessible to researchers. That could be as simple as having things in an accessible display case or posting documents and photos on-line. This national fisheries archive has over 15,000 objects and 160,000 pieces of subject material. People aren’t fully aware of the resources available here and I’d like to get the word out that our national archives have lots of historical documents that can help in current research.”

Martinez is familiar with things historic, based on his previous experiences at the Leadville hatchery restoring federally threatened greenback cutthroat trout – once thought to be extinct. There is an irony here: the first trout in the Black Hills of South Dakota came from Leadville, which was built seven years before the Booth facility was constructed in 1896.

Martinez serves as National Broodstock Coordinator. He’s a liaison to Fisheries Friends Groups where The Booth Society is often considered the flagship Friends entity.

And he does it all with a smile. “It took me some soul searching when I was young to find myself, who I was, and what I wanted to accomplish in life, but I made the right decision because I continue to wake up every morning excited about going to work.” ♦

Wading through the Gene Pool

As a teenager, John Wenburg spent countless hours observing the fish in the many tanks he had set up around the home of his abundantly obliging parents. “I went a bit overboard in junior high school,” he confesses. “At one point I had more than 40 aquariums in my house.”

Fast forward a few decades and the now Dr. Wenburg is still wiling away the hours in pensive contemplation. But these days, the subject of his study is smaller than even the most diminutive guppy.

“We are looking at the true building blocks of life – genetic material, amino acid sequences, that kind of stuff,” says Wenburg, who directs the U.S. Fish and Wildlife Service’s conservation genetics laboratory in Anchorage, Alaska. “We basically use DNA sequencers to identify amino acid sequences or the size of target DNA fragments in the organisms we are studying.”

If it sounds a little esoteric, the findings plainly speak for themselves and play an important role beyond the lab’s high-tech corridors. Applying advanced techniques in

conservation genetics to a variety of fish management issues, the lab is engaged in more than 30 projects at any given time. The lab is currently using genetic analysis of Yukon River chum salmon to determine the proportion of fish that are migrating to specific spawning grounds along the 2,000-mile river through Alaska and Canada. Scientists take small fin clips from fish in the lower river and through genetics tell you where they will be months ahead of time.

“This is a huge benefit to harvest management in the river during the migration,” says Wenburg. “And it provides a direct link from real-time genetic analysis to resource management decisions.”

Another choice example is the lab’s work with Dolly Varden. It’s a sport fish and an important source of food for residents of Western and Arctic Alaska. In some communities where there are few salmon, Dolly Varden represent up to 80 out of every 100 pounds of the subsistence fishery catch.

“We are looking at their population structure, migration patterns and evolutionary relationships to closely related char species across Alaska and Russia,” Wenburg says. “In some areas only about two percent of all habitat is suitable for overwintering. We use

genetic mixed-stock analysis to determine what stocks contribute to the overwintering aggregates in key areas.”

Wenburg’s work at the lab is the crowning achievement on a densely filled, and surprisingly varied resume that includes stints as a SCUBA Divemaster, a commercial pilot in South Dakota, a floatplane bush pilot, and guide for a fly-out fishing lodge in Alaska. A common theme running throughout his professional biography, however, has been an ardent appreciation for the outdoors which began long before the demands of work, and even before his obsession with aquariums.

“I was fishing since I can remember,” says Wenburg, who grew up in Nebraska. “I used to sit in the front yard and cast a rubber weight into a coffee can with a little Zebco reel, practicing for crappie and bluegill fishing.”

Wenburg is a little more nuanced in his outdoor pursuits now. He is an experienced angler pursuing tarpon and permit whenever he can. In the fall, he hunts caribou, black-tailed deer and mountain goat.

It is no small consolation that Wenburg’s work and his passion for the outdoors go hand-in-hand. “Conservation is extremely important to me,” he says. “The quality of experience is a big part of that. Things like remoteness, aloneness, roadlessness, and real wilderness are critical for my psyche. I am proud of the U.S. Fish and Wildlife Service’s mission. I appreciate that we are unique among federal agencies in that we are first and foremost a conservation agency. It means a lot to know that I work for something I believe in.” ♦



Brad Ellis

John Wenburg caught this tarpon while angling in Belize.

By David Klinger

From Basket Maker to Beltway Shaker

In popular college vernacular, “basket weaving” is considered a metaphor for an easy course. It’s not that easy in Washington, where the intricacies of government really do touch people’s lives.

And in the case of Cecilia Lewis – barely three months into her new career as a fishery biologist in the U.S. Fish and Wildlife Service’s Division of Fisheries and Aquatic Resources Conservation – the literal weaving of baskets imparted a unique and valuable perspective that will serve her well as a budding young biologist.

For the self-described “normal, rural kid from Effingham, South Carolina,” baskets have proven an interesting dimension in her preparation for a life’s work, still very much in its formative stage for the 27-year-old Lewis.

Baskets – and the cottage industry spawned by the native sweetgrass of South Carolina’s “low country” – formed the focus of her work for the U.S. Forest Service’s Center for Forested Wetlands Research in Charleston before she entered graduate school and arrived at the U.S. Fish and Wildlife Service earlier this year. The marine plant was first gathered by African slaves and fashioned into simple, but highly-prized, bowls and baskets that



Cecilia Lewis knows from experience that people and natural resources are woven together.

their descendants, most of them women, still sell by the roadside to beachgoers along coastal U.S. Highway 17.

Lewis’s oral histories with local basket weavers about the abundance and decline of the economically valuable grass – now disappearing, in part to development – imparted a depth of understanding about the interdependence between people and resources that ought to serve Lewis well in the Fisheries Program. Humans and fish are economically and culturally as intertwined as the craft culture

that the sweetgrass has sustained for generations.

“This was my first experience in exploring the human dimensions of scientific research,” says Lewis. “I enjoyed it, and found that you really need to take the time to build relationships and sensitivity to cultures before you can get information. Organisms you are sampling don’t talk back, so communication (with people) is what’s important.”

To view the U.S. Fish and Wildlife Service through the fresh eyes of a Cecilia Lewis is to imagine a future of boundless career opportunities ... a promising young person whose most significant marks in life have yet to be made, a career that is, as yet, largely an unpainted canvas.

Life for small-town Lewis in Washington is now an exciting – and occasionally perplexing – world of apartment living and Metro commutes, traffic gridlock and downtown bustle – a world away from Effingham, South Carolina, where “a big thing was when our road got paved.” It’s been a challenge, she says, to “stay grounded ... and when you meet good people, you hang onto them.”

“In the short time I’ve been here, I know the tasks I’m doing are valued, but I’m not sure I’d be completely missed if I disappeared today,” she says. “But, with time, I will leave my mark.”

Her new job is an introductory smorgasbord of entry-level tasks that support a field network of Fish and Wildlife Conservation Offices, ranging from preparing 2011 fiscal year budget justifications to researching questions on airborne hunting to tracking population data on trust species like salmon. “I’m doing a little bit of everything, giving

me a broader overview of how the U.S. Fish and Wildlife Service works with others.

“It’s a bit intimidating, seeing how your work goes through many hands and many edits. You’ve got to just feel your way through ... and ask really good questions,” says Lewis.

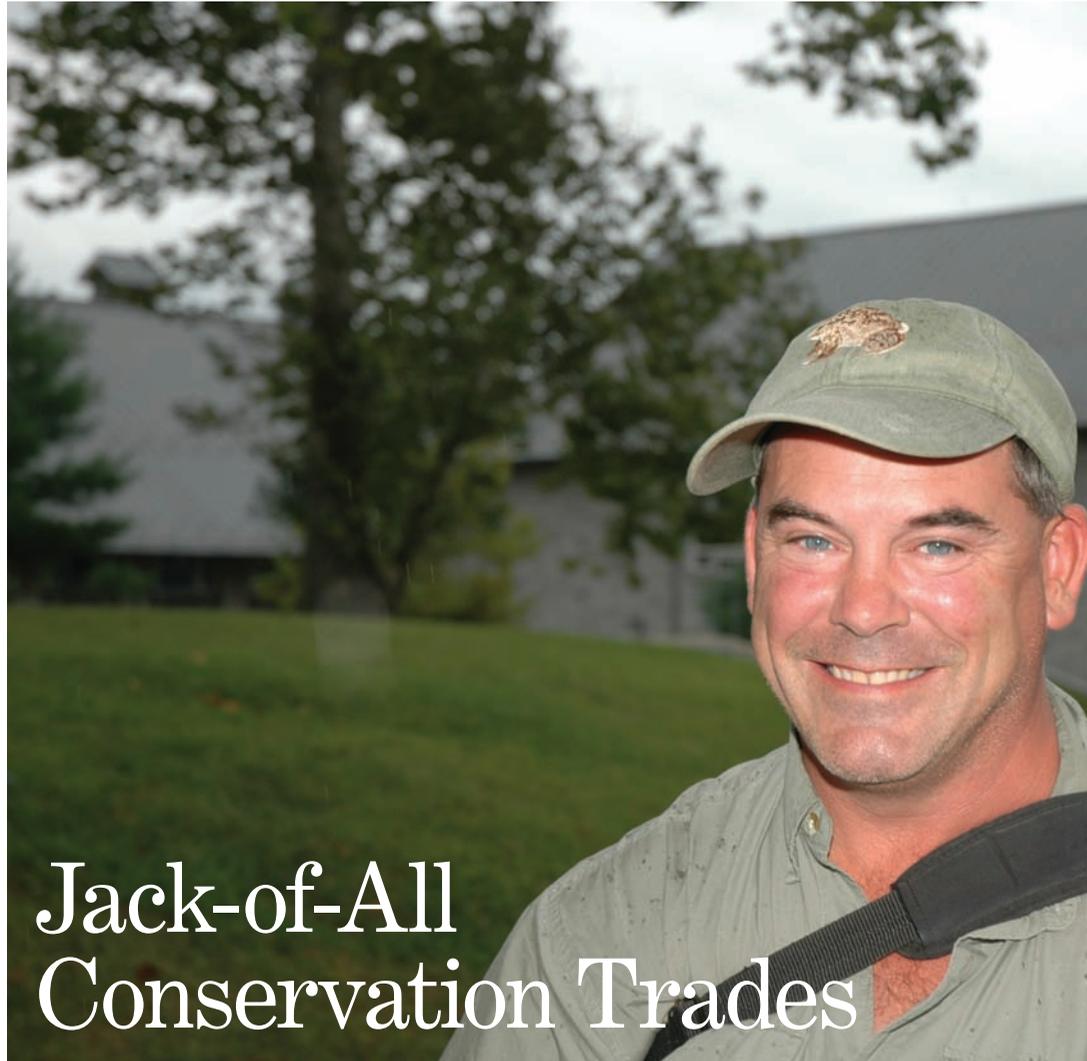
Her interest in conservation, Lewis admits, stems not from any rural childhood immersion in the out-of-doors or hunting and fishing, but from the educational programming she encountered on public television. In much the same way as marine biologist Rachel Carson (who never glimpsed the ocean until she reached graduate school) Lewis says, “I was hooked. I didn’t spend much time on the coast while growing up, but aquatic habitats and aquatic species just intrigued me.”

That vicarious interest led her to a B.S. in marine biology at the College of Charleston in 2004, followed by concentrated coursework in marine science at Western Washington University’s Shannon Point Marine Center in northern Puget Sound. She entered the U.S. Fish and Wildlife Service via its “Student Career Experience Program,” while completing her M.S. at Michigan State University this past spring. “I turned in my thesis on a Friday, started working here on a Monday,” says Lewis.

“I’m fascinated by the ‘big picture’ issues in Washington, and how they trickle down to state and local governments ... how sound policies make a difference locally. Having worked for the South Carolina DNR, I’ve seen how federal rules and regulations can affect local areas. Maybe I can help close that gap between what happens nationally and what occurs in the field.” ♦

*“With
time,
I will
leave my
mark.”*

By David Klinger



Jamie Bettaso on the campus of the National Conservation Training Center.

Jamie Bettaso doesn't need training in biological diversity. He's lived the concept.

The biologist in the U.S. Fish and Wildlife Service's Arcata, California, field office is a veteran of three federal agencies, about four disciplines, and an abundance of species ranging from northern red-legged frogs and tidewater gobies to snow geese and marbled murrelets.

"Jack-of-all trades, master of none," Bettaso cracks, perched in the "treehouse" of the National Conservation Training Center's library in August while taking a break from a recent pesticides course.

Bettaso's well-known to librarians in Shepherdstown, West Virginia, as a prodigious consumer of technical reports and obscure citations about little-known species that the NCTC office offers as an electronic lifeline to far-flung field biologists in the agency, hungry for data via its scientific literature search service.

"I enjoy studying the taxa that may be a bit underrepresented across-the-board in state and federal studies and projects," says Bettaso. "I've had long, tangible field experience working with multiple taxa, and I can think of those animals as a 'collective' now."



Jenny Peterson/USFWS

Currently, he focuses on western pond turtles and foothill yellow-legged frogs for the Trinity River restoration program, where the U.S. Fish and Wildlife Service has been engaged for a decade studying the effects of the Lewiston Dam and altered water flows in this, the largest tributary in the Klamath River system. It's a realm of old-and second-growth redwood and Douglas fir forests, played-out placer mining, prized salmon and steelhead runs, and a sometimes contentious collection of river users ranging from the Hoopa Indians to river-runners and outfitters.

"We're looking at a lot of things on the Trinity – all of the ecosystem components of the river system – and how things like water temperature, the descending hydrograph of the river, the management of flows from Lewiston, are influencing species like frogs," says Bettaso.

The self-described herpetologist started as do many others in the U.S. Fish and Wildlife Service – a childhood collector of snakes and turtles, in Bettaso's case in Livonia, Michigan, a Detroit suburb.

A three-year stint in the late 1980s as a medic and parachutist with the 82nd Airborne at Fort Bragg included a brief deployment to Honduras for "Operation Golden Pheasant" in the waning months of the Iran-Contra era, where an intended intersession between Nicaraguan Sandinistas and anti-communist rebels turned into a gentler humanitarian mission administering shots to Honduran orphans. "Medicine was appealing to me. I saw it as a practical backcountry skill for biology." Bettaso continued his service as medic and engineer in the California National Guard for nearly a decade.

Bettaso settled in amid the woody, bucolic surroundings of Humboldt Bay, California, receiving his B.S. and M.S. in wildlife biology in 1995 and 2004, respectively, from Humboldt State University in Arcata, prime generator of field biologists on the Pacific Coast. "It was a perfect time to be a wildlife student in northern California, where our 'bread-and-butter' money was earned on spotted owl and marbled murrelet surveys during the height of the Northwest forest debate."

Bettaso hooted for owls for the Bureau of Land Management for three summers, alternating his third-season daily routine between night-time owl prowls and pre-dawn

murrelet expeditions. "We never saw murrelets during any of our surveys," he laughs. "Heard them, because they call on the wing ... but never saw them." Five years as aquatic ecologist for the U.S. Forest Service's nearby Redwood Science Laboratory followed.

Bettaso, now at the relatively ripe age of 45 for a term employee who's completing his fourth and final year, retains the air of an itinerant field biologist – a sort of worldly generalist skilled in many different facets of natural history that typified the classical Biological Survey naturalist at the turn of a previous century. He's the kind of guy whose muddy hip waders and rain-stained field journals probably remain within arms-reach in a disheveled office cubicle.

"I've got the perfect mix of 40 percent field time and 60 percent office time, and when the frogs start breeding as early as January on the West Coast, I'm out there," he says. "Field work – year-round herpetology – is just so great. It's interaction with species at the very base level. I know that cast of characters and I know the landscape."

"I feel fortunate to be in my current position, with crossover opportunities in fish health and contaminants. It's a little unusual to have a career that's bridged birds and amphibians and fish, pathogens and pollutants, but knowing – really knowing – a very big backyard is so nice, and leads me into larger interests like global climate change and emerging infectious diseases in amphibians." ♦

Administrative Assistant—Cindy Fronk

By Kay Hively

Above and Beyond



USFWS

Cindy Fronk at Inks Dam National Fish Hatchery in Burnet, Texas.

When Cindy Fronk was in high school, she dreamt of being a journalist. But youthful dreams don't always work out. For Cindy, however, a few years of experience brought her to a job in the U.S. Fish and Wildlife Service – one that surpasses those young dreams.

As an administrative assistant at Inks Dam National Fish Hatchery in Burnet, Texas, Fronk manages employee time cards, and assists with all aspects of purchasing and contracting. It's a full-time job. But in the past year, Fronk has created a new and powerful outreach dynamic to her work, above and beyond her official job duties. She's developed an outdoor discovery area, and she has

worked with local educators and the community as the hatchery hosted education events. She also organizes volunteers for the non-profit Friends of Inks Dam National Fish Hatchery she helped create.

Initially, Fronk took on the challenge of starting an outdoor education program at Inks Dam because of her own love for the outdoors, of hiking, biking and camping. The potential she felt the property had to offer in its natural assets and amazing history was another motivating factor. The hatchery, with some features built in the 1930s by the CCC, sits on 160 acres next to the Colorado River. Fronk knew that with a little TLC, the site would make a great educational area.

Marc Jackson, manager of Inks Dam National Fish Hatchery, is grateful for Fronk's drive and determination. "She really has taken the initiative and is doing a great, great job," he said. "She's making a difference for us."

Indeed. Working with the newly minted Friends Group, local Master Naturalists, the community library, schools, and the Texas Parks and Wildlife Department, Fronk developed a plan to hold outdoor workshops, create nature trails, an amphitheater area, and to remodel an old CCC building as an education and history center – and that's just to start. She is also creating an "Outdoor Discovery Zone," designed to connect people to the outdoors and conservation of our natural resources on National Fish Hatchery properties and provide a better understanding of the conservation work done in the National Fish Hatchery System.

Fronk's ambitious efforts were put to the test in May 2009, when the first large group of students, 215 fifth-graders, came to spend the day at the hatchery. "We set up stations along our new trails," said Fronk. "Staff people and some of our volunteers manned the stations. It worked out just fine."

As the students hiked the trails, they had a chance to learn about local plants, fishes, birds – and conservation. They also learned about the operation of the hatchery and that to operate a facility like this, it takes people skilled in biology, fisheries, mechanics, management, plumbing and many other subjects.

Fronk herself offers a great example. After attending Texas Tech for a year, she volunteered for the U.S. Army and was soon a trained soldier serving in combat during Desert Storm in the early 1990s. While a soldier, she realized she had an aptitude for computer work and took the opportunity to gain valuable training and experience in computer technology. After her military service, Fronk worked for the Texas Railroad Commission and for the Police Department of Round Rock, Texas. In both jobs, she discovered and honed yet another natural skill – organization.

"I learned I was very good at organizing people and events," says Fronk. "I discovered that I really enjoyed doing those kinds of things. I like setting up training sessions and getting people and projects together," Cindy explains.

As she gained experience, Fronk learned to pool her skills and interests. Her old interest in journalism, as well as her computer

and organizing skills, finally came together when she accepted a job at the Inks Dam National Fish Hatchery, incidentally, in her own hometown. And, as luck would have it, her deep love for the outdoors blended beautifully with her talents and training. ♦

Fronk developed a plan to hold outdoor workshops, create nature trails, an amphitheater area, and to remodel an old CCC building as an education and history center...

By Lee Allen

Veteran Veterinarian



USFWS

Sonia Mumford pauses on the trail in Washington.

You know you've got a problem when your story deadline is imminent, you've been unsuccessful to date in tracking down your interview subject, and you're told by her office, "She's kind of hard to get in touch with right now because we're heading into spawning season."

The extensive time spent in boots-on-the-ground (or in-the-water in this case) is all part of the job for Sonia Mumford, DVM, Veterinary Medical Officer for Olympia Fish Health Center, Pacific Region, in Washington state.

She's been there since 2001 following career stops involving small animal medicine in Michigan, veterinary medicine certification in North Carolina, and aquatic animal medicine and collections work at the New England Aquarium in Boston.

"The transition from individual animal medicine to herd health management was challenging," says the woman who knew from an early age that she was destined to care for critters of some kind. "It's intrinsic

to my inner being, this wanting to be a part of the solution. It didn't have to be fish. It could have been anything from sea lions or penguins to gazelles or grizzly bears as long as I could help advance the cause." When asked if she chose her career path by whim, accident, or design, she responded: "Maybe a little bit from each category.

She got indoctrinated to the outdoors early. "Growing up in the Galveston, Texas coastal area, I started visiting the pier in my playpen when Dad would take us fishing every weekend. As soon as I got big enough to hang on to my Mickey Mouse fishing rod, I quickly learned how to hold my own with other anglers.

"My parents told me when I was just five years old, I stated my intent to become a veterinarian and obviously I've never changed my mind. While I was actively interested and involved in environmental causes in college, joining student environmental efforts and leading campus-wide recycling efforts, I became deeply convinced I needed to somehow work in a conservation-related capacity. I still wanted to focus on becoming a veterinarian, but hoped I could figure out a way to incorporate the two overriding interests. I was fortunate enough to participate in some good opportunities along the way that led me to where I am today."

Her duties at the Olympia Fish Health Center include providing fish health diagnostics, certification, and troubleshooting to federal fish hatcheries in the area, as well as fish health and disease assistance to state, tribal, and private entities. She also instructs a course on "Introduction to Fish Histology and Histopathology." She's well-qualified to do so as the Olympia Fish Health Center was the first center in the U.S. Fish

and Wildlife Service to provide diagnostics by combining traditional microbiological techniques with histological procedures, providing a wider perspective on problems of fish health and a greater ability to ensure a more accurate diagnosis.

Prior to 1996, little was known about pathogens or disease among wild fish. But that was before the appearance of *Myxobolus cerebralis*, causative agent of Salmonid Whirling Disease that decimated wild trout populations in the intermountain West. Funding for fish disease work began in fiscal 1997 and since then, U.S. Fish and Wildlife Service National Fish Health Centers, in cooperation with other partners, have been conducting the National Wild Fish Health Survey.

On her own time, she's an outdoorsy person on a number of levels, occasionally chasing fish for sport rather than research. She also enjoys kayaking, sailing, and hiking, and has completed the Washington State University Master Gardner program allowing her to putter semi-professionally in her own garden.

Facing a benchmark birthday – and, no, you're not allowed to know which one – she's happy where she is, but has more she wants to accomplish in the future. "My master plan is to end up teaching. One of the lessons I learned in my college involvement on environmental issues is that one person can accomplish a lot, but there are limits in both doing and in delegating. Teaching allows an opportunity to share knowledge with larger audiences, more than I could accomplish on my own. I'd like to share the specialized fish pathology I've learned along the way – the microanatomy of fish, looking at them at a cellular level, why they get sick and die, and what we can do about that." ♦

In a Good Place

Where Michael Goehle is stationed is atypical of the idyllic locales where many of our fisheries employees work. It reflects the diversity of assignments the U.S. Fish and Wildlife Service performs in the watery realm.

Some of us wander the Alaskan bush, scouting the Yukon River's coho. Some of us rear Atlantic salmon, protective as parents, nestled snugly within the green hills of Vermont. Some of us ride with the White Mountain Apaches, stocking trout in Arizona backcountry streams.

Mike Goehle prowls the industrial backwaters of Buffalo, New York, on guard for alien invaders that congest and clog the vital arteries of the Great Lakes.

His are "lunch bucket" waters – the working rivers and barge canals of this gritty industrial powerhouse. Buffalo – Rust Belt metropolis of wharves and grain silos, whose prosperity peaked in the 1920s ... and whose legacy of environmental neglect is still felt.

For Goehle, it's home. He considers himself fortunate to work in a place where he was born, educated, and now raises a family. "I spent most of my summers over on Oneida Lake," he said. "Dad was an insurance salesman outside Buffalo. He'd drive across upstate New York on weekends and go walleye and perch fishing with me. By ninth grade, I figured out I'd be involved in wildlife. Once in college, I felt there would be more opportunities in aquatics in the Great Lakes."

Goehle took a roundabout path to land a U.S. Fish and Wildlife Service job less than 10 miles from where he was born. Awed by the northern

lights as he lay in the bed of an Alaska hotel, "I told my dad that's where I wanted to go to college." He wound up at the University of Alaska - Fairbanks on a competitive shooting team scholarship. There, he earned his B.S. in fisheries management in 1995, and an NCAA championship ring his senior year.

Goehle returned home in 1998 to add an M.S. in Great Lakes multidisciplinary studies from Buffalo State College. He worked locally as assistant manager of the Niagara River research station of the Great Lakes Center, a state university facility, while also picking up his Coast Guard captain's license.

He then daringly chunked it in 2002 – the permanent state job, after just settling down and getting married – for a term-limited, four-year position with the U.S. Fish and Wildlife Service, at no greater pay. "Sometimes you gotta just take a risk and look long-term," Goehle says.

He has since risen to become the Northeast Region's aquatic invasive species coordinator at the Lower Great Lakes Fish and Wildlife Coordination Office in Amherst, New York. His beat is a corner of the country bedeviled by Eurasian ruffe, Asian carp, and New Zealand mud snails – a region with boundaries bracketed by Eurasian water milfoil in western New York to snakeheads in suburban Maryland to the aptly named rock snot, or didymo, of New England.



Michael Goehle turned up this muskie while on the look out for invasive species in the NY State Canal.

Dennis Clay/USFWS

From his start in the agency – largely intensive field work, like surveying Lake Erie for the prolific, aggressive round goby and pulling the insidious water chestnut by the canoe-full from backwaters like Tonawanda Creek – he now pursues from the broader, more desk-bound perspective of a regional aquatic invasives coordinator.

"I've really grown a lot, balancing administrative and field work. It's been a monumental challenge," says Goehle, a recent graduate of the agency's leadership development training. "It's hard to prove where our successes have been, and I don't see this invasives problem going away in our lifetime. But it's preventable. Sometimes the best we can do is to prevent them from spreading, like the flu.

"But I enjoy what I do. I'm happy in this place." ♦

The Gospel of Fish

Over Chinese take-out at a nondescript Arlington, Virginia, luncheonette, Washington Office fishery biologist Tom Busiahn explains how a Midwest farm kid just happened to wind up here, and how he's found the balance – that “sweet spot” – in the big city between bass fishing and bureaucracy. It's entirely possible, Busiahn says, musing over his beef with broccoli.

“When Dad came back from World War II, he'd seen enough. He wanted nothing to do with guns” says Busiahn. “He did take us fishing ... but he died when I was 12. My stepfather expanded our world into hunting and fishing and – oh, my – we fished the Minnesota River for everything ... walleye, smallmouth, channel catfish, carp, up in the lakes at camp on our pontoon boat, grilling hamburgers ... and listening to the Minnesota Twins on the radio.”

The descendant of German immigrants who homesteaded the corn and soybean country of western Minnesota, Busiahn, 56, knew his life's work would be defined not by farming, but by fish.

“I was a proficient student of German. My last summer at home, I had the choice of going to Europe, or fishing every single day of the season. I fished,” he says with satisfaction.

As an undergrad at the University of North Dakota, where he received his B.S. in fish and wildlife management in 1974, Busiahn worked summers for the state game and fish department, equipped with a truck, a boat, a net, and a partner. They'd sample prairie ponds in western North Dakota,

sometimes hitting six lakes in one day. “It was tremendous, tremendous field experience,” he recalls.

Now in Arlington, Virginia, as the U.S. Fish and Wildlife Service coordinator for the National Fish Habitat Action Plan – an ambitious attempt conceived nearly a decade ago to mimic for fish what the North American Waterfowl Plan's done for ducks – Busiahn never envisioned a career with a decidedly eastward tilt. “I always thought I was going to go west, but my first job was exactly the opposite.”

Busiahn became an assistant district biologist for the Virginia Commission of Game and Inland Fisheries following his M.S. in fisheries science at South Dakota State University in 1977. Amid the burgeoning conglomeration of municipalities around Norfolk that crowd Virginia's southeast corner, Busiahn stocked predatory fish in the water supply reservoirs around Chesapeake Bay to boost the diversity of the local sport fishery.

Stuck in traffic one day and knowing he didn't want to raise his kids in the city, Busiahn departed for the wilds of northern Wisconsin, where he became tribal fisheries biologist for the Red Cliff Band of the Lake Superior Chippewa.

“I was one of the first two tribal biologists in the Great Lakes,” he remembers. “The Chippewa have a long history of fishing, hunting, and gathering. They regulate their own fishing on Lake Superior, harvesting a half-million pounds of lake trout and whitefish, but they didn't have

a lot of professional help.” Busiahn instituted biological sampling and data collection to support quotas, seasons, and enforcement.

“I learned that as long as you stay out of tribal politics, you won’t have problems,” says Busiahn, who helped form a new governing body – the Great Lakes Indian Fisheries Commission, now in its 25th year. “In cases of political controversy about fish, we separated the technical and scientific issues from the political and legal ones, reducing time spent in court.” The Great Lakes, Busiahn says, is where he honed his human relations skills, committing a dozen career years to the tribes.

Joining the U.S. Fish and Wildlife Service in 1991, as the supervisor of the Ashland Fish and Wildlife Conservation Office in Wisconsin, Busiahn continued his immersion in chronic North Woods fisheries needs, ranging from lake trout and “coaster” brook trout restoration to control of aquatic nuisance species. He even had a hand in establishing the Whittlesey Creek National Wildlife Refuge, becoming for awhile “a fisheries manager who was a refuge manager.”

Now, Busiahn plays on a much broader plane, recruited to the Washington Office’s Branch of Fish and Wildlife Management Assistance in 2000. He has emerged as a sort-of prairie evangelist for fish, crediting both Bush and Obama administrations and Congress with finally getting systematic about fish habitat deterioration. Formed around individual fish species or regions, the voluntary, non-regulatory



Tom Busiahn at work in his Arlington, Virginia, office outside Washington, D.C.

effort he oversees pits serious dollars against some of the nation’s biggest fisheries needs in 200 funded projects, applying a joint-venture-like approach similar to its counterpart waterfowl plan, with heavy emphasis on local problem-solving.

“I call it a blueprint for aquatic resource conservation for the 21st

Century,” Busiahn says of the action plan. “It’s a new business model on a broad landscape scale. *This* is strategic habitat conservation. By 2010, this whole country is going to be blanketed by fish habitat partnerships.” ♦

*He has emerged as
a sort-of prairie
evangelist for fish...*

By Kay Hively

The Fish Come First



Rhoda Brown

James Henne has worked in NM and SC.

If a hurricane is bearing down, how do you protect several thousand fish from the surging tides? If you are James Henne, assistant manager of Bears Bluff National Fish Hatchery, you batten down the hatches.

Working at a hatchery on a barrier reef off the coast of South Carolina has its challenges, but Henne enjoys coming to work each day to face them.

“This is a great job,” he says, “no two days are alike. I may do some of the same things, but each day is different and I usually never do the same jobs two days in a row.”

Having a job that challenges is only one of the reasons Henne likes his job with the U. S. Fish and Wildlife Service. He also is glad he can be outdoors each day, even though as an assistant manager, he does have papers to push.

But, no matter what chore he is doing, Henne says the most important thing is taking care of the fish. At Bears Bluff, “The fish are first. That was the philosophy at this station when I got here and now it’s my own philosophy as well,” he said.

Those fish Henne and his three other colleagues take care of are the Atlantic sturgeon, American shad, red drum, and cobia. All of them live at sea, but the American shad and Atlantic sturgeon make forays into freshwater to spawn. All are sought by anglers. The red drum and cobia make their living in the saltwater. Bears Bluff National Fish Hatchery is located on Wadmalaw Island, a 40-square-mile barrier island in the Atlantic off the South Carolina coast. The hatchery encompasses about 30 acres.

Teamwork is vital and Henne says everyone at his hatchery understands that. “Everyone shares the duties and, in an emergency, we all know we have to work together. If things are busy, we may work at the hatchery for 24 hours straight. We all understand that, and we depend on each other,” he said.

Some of that work has included diet studies, and essential life-history studies, on top of culturing fish to restore once abundant stocks in coastal rivers of the Southeast. The results of their work have been published in rigorous scientific journals.

Henne grew up near Annapolis, Maryland, home to the U. S. Naval Academy. That is where Henne got some early schooling in fisheries. “Almost everyone in my neighborhood was either a navy family or fishing family,” he said. “Just about everything we did was either in or near the water.”

A career in fisheries did not enter Henne’s thoughts until he attended a community college. “I had a very good biology teacher my first year in college,” Henne said. “He influenced me a lot and made me aware of possibly having a career in fisheries

biology. He introduced me to the U.S. Fish and Wildlife Service.”

Having been born, raised, and now working, on the east coast, Henne was happy early in his career for the chance to work at the Mora National Fish Hatchery and Technology Center in New Mexico. “That was very different from what I had been used to,” Henne said. “But it was a good opportunity and a good experience. I’m glad I got to serve out there.”

There aren’t many hurricanes in New Mexico, but Wadmalaw Island is subject to the severe storms. This means that Henne and his fellow workers must have a plan to protect both the fish and the facilities at Bears Bluff. “We have learned over the years that the best way to protect our fish is to keep them where they are, and just lock everything down. We have a generator big enough to keep the place running for about a week,” he said.

In years past, the policy was to take selected fish – mostly endangered species – off the island by truck to another, safer facility. But, in a hurricane, traffic is so congested that it was difficult to move from place to place.

“We learned that fish don’t do well, sitting in a tank, on a hot highway, not going anywhere,” Henne said. “Our best protection is to care for them here. If it gets really bad, only the humans are moved from the island.”

Henne has been at Bears Bluff National Fish Hatchery for almost six years and, thus far, there have been no hurricanes. “They have come close, but no direct hits yet,” Henne said. “But we’ll be ready if one comes. We’ll take care of the fish. That’s our job and that’s our biggest challenge. That’s number one with us.” ♦

Mussel Building

Despite a rather comfortable summer morning in June of 2006, the heater in Rachel Mair's Toyota pickup truck was on full blast for the commute to work. The constant and uncontrollable shivering were tell-tale signs of a bad fever, but calling in sick just wasn't an option. This was her first day of work at White Sulphur Springs National Fish Hatchery in West Virginia, and her first day with the U.S. Fish and Wildlife Service.

In near delirium, she pulled in to the hatchery parking lot and promptly locked her keys in her truck. Sweating profusely from the fever, she struggled to break in through the back window. Mair would discover later that evening that she had contracted Rocky Mountain Spotted Fever while photographing rattlesnakes in North Carolina the week before, running a 104.5-degree fever.

Needless to say, this was a first day to remember, and a true testament to Mair's dedication to her work. This dedication has carried Mair all the way from her unassuming beginnings as a little girl fishing with her father on the Chesapeake Bay to an award winning career with the U.S. Fish and Wildlife Service.

At an early age she noticed the striped bass she and her dad sought were getting tougher and tougher to catch. She also noticed an increase in the number of people living in the Chesapeake Bay watershed and became keenly aware of their impact on the rivers and streams, and the affect on the quality of water in the Bay. Yearly trips to the cabin on the Albemarle Sound confirmed her suspicions over time. The hard clams she would muck around for when the tide went out became harder and harder to find. She felt strongly that she needed to do something to help.

In 1995, Mair started taking night classes in biology at Tidewater Community College in Virginia Beach, VA. After transferring to the Fisheries and Wildlife Department at Virginia Tech in 1998 to complete a bachelor's degree in biology, Mair heard a guest speaker on freshwater mussels in class. The speaker, a graduate student on a mission to recruit undergraduate help, informed the class that freshwater mussels were the most imperiled group of animals in the world. If that wasn't a strong enough sell, he said the field work involved a lot of snorkeling. Mair was sold and began seasonal work with the university's freshwater mussel program in the summer of 1998. Mair was lucky enough to get her first exposure to mussel collecting on the Clinch River, one of the best mussel rivers in the world. By 2001, she was a full-time research specialist and before long was running the mussel propagation program at Virginia Tech. Before her tenure was up at Virginia Tech, Mair assisted in the release of over half a million juvenile freshwater mussels from over 40 species.

Fever aside, Mair hit the ground running when she joined the U.S. Fish and Wildlife Service. In 2008, she received the inaugural Rachel Carson Award for Scientific Excellence, for her work in developing new culture systems and feeding protocols for the culture of federally endangered freshwater mussels. The award recognizes employees who exemplify the best in scientific contribution and application

to achieve extraordinary results in conservation.

Ever since those early days on the Chesapeake Bay, Mair has been achieving extraordinary results. In fact, last year she helped release the first propagated freshwater mussels into the Chesapeake Bay watershed to help clean up the water entering the Bay. So, as she sought out to do, she managed to find a way to help. ♦



Rachel Mair of White Sulphur Springs NFH with a tank holding mussels.

David Garst/USFWS

Maintenance Mechanic—Vern Tolliver

By Ben Ikenson

Working under the Hatchery's Hood

Growing up in northwest Washington, Vern Tolliver spent a lot of his free time outdoors, fishing and hunting. And because he needed a way to get to his favorite hunting and fishing spots, he also spent more than his fair share of time fixing cars. “My dad said, ‘Son, if you want to be able to drive a car, you better be able to know how to fix it,’” he recalls. “I think I was 14 when I rebuilt an engine from start to finish for the first time.”

Today, Tolliver is a maintenance mechanic at the Makah National Fish Hatchery in Neah Bay, Washington, where he has been helping keep things running smoothly for the past 17 years. A skilled craftsman and welder, he is described by his boss as a creative and inventive problem solver who keeps blueprints in the back of his head. “In short,” says hatchery manager Caroline Peterschmidt, “he’s the perfect guy to have running your maintenance operations.”

With bushy mustache and unassuming demeanor, Tolliver himself is hardly the boastful type. After all, in his line of work, actions speak louder than words, and of his actions, the words he uses characteristically downplay his ingenuity. “Basically, I just try to always keep on top of things,” says Tolliver. “You know, I grease the river pumps, check the pump house, that kind of thing. You have to have a good ear to hear problems with machinery.”

Fortunately Tolliver possesses excellent hearing – as well as an appreciation for the spirit of teamwork that is so essential to work at the hatchery. “When anything happens, the whole crew jumps in,”



Caroline Peterschmidt/USFWS

Vern Tolliver keeps the water flowing at the Makah National Fish Hatchery.

he says. “As far as maintenance, there’s no way I could do it all by myself.”

Prior to taking the job at the hatchery, Tolliver served as a maintenance supervisor for a public school district. He clearly prefers the work environment at the hatchery, which combines the best of both worlds – mechanics and the outdoors

– that he loved so much as a kid. In a sense, he is still a bit of that eager teenager working on rebuilding the old Chevy to get to his favorite spots in the great outdoors.

“Nothing beats being able to walk outside at any time and be in a beautiful natural setting,” says Tolliver. “It’s a great place to call your ‘office.’” ♦

A skilled craftsman and welder, he is described by his boss as a creative and inventive problem solver...

Restoring Ancestral Waters

As a kid growing up on the Fort Apache Indian Reservation, in Whiteriver, Arizona, Chris Kitcheyan would sometimes ride along with his dad, a game warden, on patrol duty checking fishing permits. Today, Kitcheyan regards his work as a fishery biologist at the U.S. Fish and Wildlife Service’s New Mexico Fish and Wildlife Conservation Office as more than the culmination of professional aspirations; it’s a cultural imperative that was instilled in him long ago. “I believe my family and culture had a direct impact on me becoming a fishery biologist,” he says. “They emphasized the importance of respecting all creatures and taking care of the land because this was all we had.”

Among other things, Kitcheyan is taking care of native lands by restoring native trout, among other efforts, and helping Indian tribes do the same as an effective tribal liaison for the office. A prime example is his work with the Rio Grande cutthroat trout working group, which consists of federal, state and private agencies—and now tribes.

“Tribes must have an active voice to express their own viewpoints relating to native fish conservation,” says Kitcheyan, “and it is essential for tribes to network with non-tribal agencies to conserve the native Rio Grande cutthroat trout.”

Before his involvement, tribes did not play much of an active role in the collaboration to restore this rare subspecies. Within the past two years, however, the Southwest Tribal Fisheries Commission and the Santa Clara Pueblo have joined the working group.

Likewise, tribes have been learning about the U.S. Fish and Wildlife Service’s conservation goals and the potential for funding efforts on their own lands under the auspices of the Western Native Trout Initiative, a multi-partner effort formed in 2005 to address the decline of 15 native trout across the western U.S. In 2007, the Pueblo of Santa Clara was awarded funds to restore the native Rio Grande cutthroat trout on their homelands in the Santa Clara Creek watershed in central New Mexico.

“The Tribal Council even passed a resolution designating the headwaters for only native trout,” says Kitcheyan. “The Pueblo has developed an open dialogue with the U.S. Forest Service, the New Mexico Department of Game and Fish, and Trout Unlimited. The Pueblo is also in the process of developing a memorandum of agreement with the New Mexico Department of Game and Fish to acquire native trout to introduce back into the headwaters. And, the Pueblo and our office are working together to remove all non-native trout, construct a fish barrier to keep out non-native trout, and conduct habitat improvements along the stream.”

Kitcheyan has helped involve other tribes with Rio Grande cutthroat trout conservation efforts as well. With the Mescalero Apache Tribe, he conducted fish surveys in their effort to establish a broodstock population from which to restore waters on tribal lands; and he has assisted in fish population assessment surveys for the Jicarilla Apache and the Taos Pueblo. Also, in cooperation with the Pueblo of Laguna, he was involved in the creation of the first fish passage structure on tribal lands, which will reduce sediment deposition on streambeds used by cutthroat trout.

Helping tribes on the ground is just a part of the job. Kitcheyan is also actively involved with various educational outreach programs designed for Native American youth. Additionally, he participates in the recovery efforts for the endangered Rio Grande silvery minnow while keeping tribal participants informed about recent events and activities that may potentially affect tribal sovereignty. ♦



USFWS

Chris Kitcheyan pauses along a New Mexico trout stream.

By Lee Allen

From Abstraction to Application

For the non-scientific and the uninitiated, you've got to admire someone bold enough to hang the success of their master's degree on a thesis entitled: *Gar fish Ichthyotoxin: Its Effect on Natural Predators and the Toxin's Evolutionary Function*.

Kenneth Ostrand did so, successfully, and in fact went on to achieve a Doctor of Philosophy in Fisheries Science with a dissertation of equal intellectual ilk: *Regional and Local Abiotic Determinants of Fish Assemblages in Ephemeral Streams*.

While not bedtime pleasure reading, professional compendiums such as those are just a small part of Dr. Ostrand's collection of technical reports, refereed publications, peer reviews, technical reports, and professional presentations – wordsmithing that is both required and rewarding. “I write because it is our currency, that is, it's what we get paid to do,” says the supervisor of the Physiology Program at the U.S. Fish and Wildlife Service's Abernathy Fish Technology Center in Longview, Washington.

“Today's younger professional churns out more copy than I once did, but my mentors David Wahl and Gene Wilde helped me focus on the fact that doing good science, enjoying it in the process, and cataloging the results is what will be lasting down the road.

“Writing is also rewarding in the sense of seeing projects completed, research results that are often displayed in the form of publication. To me, it's analogous to mowing a lawn. Lots of effort goes into the work, but when it's done you can stand back and stare at it, admiring how the finished product

looks and taking pride in your accomplishment.”

Ostrand worked for the U.S. Forrest Service in Alaska in the 1990s. In the near decade since then, he has logged U.S. Fish and Wildlife career time in Utah, lots more time in Texas, and a stint in Illinois before assuming his current post in July 2004. His professional committee credentials are extensive as are his awards and accolades.

He's a certified fisheries professional via the American Fisheries Society, and a trained electrofishing expert. Ostrand is accredited in boat safety and cold water survival as well as an open water scuba diver. Separating work from play, he's a serious long-distance runner and an occasional upland bird hunter.

“Interestingly enough, while I enjoy hunting and fishing from a social perspective, outdoor activities have not been a lifelong interest,” he acknowledges. “I didn't spend much time in the field or on the water growing up, but got involved in hunting when I was in grad school. It was a good way to get out with professors and other students and get to know them, commiserating about school and work while enjoying wildlife from a non-scientific perspective.”

Ostrand has spent his work days over the last six years dealing with ecological physiology addressing the Pacific Region's fishery resource issues. As such, he's not like the postman who goes for a walk on his day off. “I do wet a worm occasionally,” he says, “but I'm out there to bring things home to put in the freezer. I catch fish for supper.” For someone who may spend a

day handling 300 bass electrofishing, it's hard to get overly excited when a single fish tugs at the end of the line.

While he does take pleasure from do-it-yourself woodworking projects at home, he also enjoys outdoor activities on the water, like sailing with his family, and the time spent jogging to keep in shape. He also enjoys getting up in the morning and going to work.

“We’ve all had jobs where we showed up for the paycheck, but that’s not the case here. The whole reason I’m in this field is because of what we can accomplish. I can both teach and contribute to environmental issues.

At the end of the day, that’s what continues to keep me going and satisfied with what I do. I’m fortunate to have the ability to do something good and make a difference.”

Dr. Ostrand’s supply of ready answers slowed perceptibly when asked just what he did in his supervisory role. Not because he didn’t have an answer, but because no one had previously asked him to synopsise his job description. “My job is to hold things together and make sure we’re still making forward progress for the good of the fishes,” he eventually admits. “I try to interject balance and not lose sight of the mission of conservation. There are so many side issues – stimulus projects, budgeting problems, support for esoteric science – all



Dr. Kenneth Ostrand leads the Physiology Program at the Abernathy Fish Technology Center in Longview, Washington.

things that seem to keep popping up and sometimes get in the way. You have to sift through them all to find the ones that make lasting contributions down the line.”

And in the process, he says without exaggerating or being condescending, “I’m the luckiest person in the world to have a great job with great people and be doing something that matters.” ♦

A Whisper from the Water

The old adage “hind sight is 20:20” rings true. Looking back, I can’t imagine a better career than working for the U.S. Fish and Wildlife Service. It was my calling. I was born to fish, and to study fish. This calling was whispered to me in my youth.

My family moved from the arid southern New Mexico town of Capitan to Madison County, Arkansas when I was 10 years old. Having arrived late the night before, I was awake at dawn eager to explore my new surroundings. I still remember the day I filled my lungs with the humid air on a June morning as wispy blankets of fog rose skyward, burning off with the rising sun. With pant legs wet from dew, I clambered down the bank to the creek below our new home. I might as well have taken a trip to the moon, the future discoveries were so rich.

The clear, running water was foreign to me. Ankle-deep, I flipped over stones to explore what lie beneath. I flinched as a crawdad scampered to safety beneath another rock. Never had I seen such a creature! Curiosity possessed me to capture it. From stone to stone I stalked the little crawdad until, alas, it was trapped. With cupped hands I tossed it upon the bank as if it were an angry wasp. Intrigued by the crawdad’s defensive pose and beady black eyes as it backed toward the water, I studied it. Locked in a stare with a crawdad, the adventure for me – an age of discovery – had begun on this little stream.

These “tween” years, the point where young people are caught between carefree childhood and the responsibility of an adult, are often awkward. It is likely, however, the

most important point in a person’s life. It is a time when we learn who we are, what interests us, and the potential of what we might become. It’s a point in life where a boy decides what kind of man he will be. At this age we may not understand the inclinations that form our minds, yet the roots of our future begin to grow and embed themselves into our heart and soul. My next two formative years were spent splashing in the creeks, fishing in farm ponds, and exploring the War Eagle River. Imagining I was a scuba diver, I would clutch a rock to my chest to sink to the bottom of the river. With wide open eyes I’d peer into the blurry, murky depths hoping to catch a glimpse of what dwelled in the underwater realm. It was the greatest years of my childhood. Had I known then it would form my future I would have paid closer attention to the whispers steering me to what lay ahead.

Our family moved to the Oregon-Idaho border town of Fruitland where my obsession for the water continued. I fished for catfish, carp and sturgeon on the Snake River, caught trout on the North Fork of the Boise River, and crappie in the lakes. After a few short years we moved again. Back to the arid Southwest; yet this time the suburbs of Phoenix. As sparse as it is, I still managed to find wild waters and seek out fish. With budding talents in art, I was certain to become a commercial artist and enlisted into the U.S. Army to earn money to study. I toured the globe before cashing in my G.I. Bill for college. Everywhere I went the water whispered to me to seek what dwelled beneath. Whether it was Chechudo Island off the southern coast of Korea, in the Persian Gulf in Saudi

Arabia or the Gasconade and Piney Rivers near Ft. Leonard Wood, Missouri, I found ways to fish – even if it was with dental floss and safety pins baited with MREs.

I tell you all of this, because for over ten years I was misguided. As I planned to enroll in art school, I announced to my would-be father-in-law my intentions to marry his daughter. He was a bit concerned about my career choice, and made a suggestion that opened my eyes. He said to me “since you are so obsessed with the water, why don’t you seek a career in fisheries management.” I had never heard of such a career...fisheries ...I can study fish? The whispers from the water were now shouts from the bluffs. Within weeks I had researched universities and talked with professional fish biologists. On fire for my future, I was from that point on, committed to becoming a fisheries professional.

I believe each and every person is programmed for a purpose and on occasion it takes time or guidance to discover what that is. Exposure to myriad opportunities may well open the door for what we become. Discovering that purpose, that becomes the challenge.

Other “tweens” are entering their own adventures with nature – their age of discovery. I can only hope it



Jeff Finley beams over a hefty catch of endangered pallid sturgeon caught on the Missouri River.

will be on a little stream – and that they encounter the mysteries of the depths, and want to uncover the riddles that lie beneath the riffles, and piece together the puzzles that perplex fisheries management. ♦

Jeff Finley is a fishery biologist with the Columbia Fish and Wildlife Conservation Office in MO. Captain Finley, U.S. Army, will be back from Iraq in December 2010. He wrote “Romancing the River” in *Eddies*, spring 2008.

Meanders

By Samuel Snyder, Ph.D.

Love of Sport and the Conservation Ethic

At the end of his influential textbook, *Game Management*, the great American forester Aldo Leopold noted that a “conservation ethic” is a “motivation” that emerges from “love of sport” and is capable of expanding into a broad range of action. His esteemed career in conservation was rooted in a childhood of hiking, hunting, fishing, and birding. Leopold saw early on that nature-based experiences expand one’s ecological awareness and ethical concern for the natural world. For Leopold, this was the source of his famous “land ethic.”

For my doctoral degree, I studied the role of cultural values amidst the politics of fish and river restoration. Following the streams of this research, I ranged from New Mexico to Vermont to study, volunteer in, and observe river and trout restoration projects. Throughout these studies, I heard a common sentiment repeated time and again. When I asked anglers, Trout Unlimited volunteers, or fish biologists why they were engaged in restoration projects, many explained that their conservation concerns emanated from years of angling, hunting, or recreation in nature.

A love of sport and love of nature, over time, evolved into a gradually expanded ecological

knowledge. This knowledge, then, in varying ways led to lifestyles of engagement – whether through grassroots participation or employment in agencies such as the U.S. Fish and Wildlife Service.

However, to say that love of sport and ecological awareness were the primary catalysts for a conservation ethic is to miss what I noted in the depths of conversation. Many described an ecological ethic that emerged from experiences in nature perceived and articulated in ways quite religious.

Whether one is traditionally religious or not, the ideas of religion and spirituality run rampant throughout the streams of angling culture dating back to at least the mid-1400s, in the writings of the potentially mythical Dame Juliana Berners. As a scholar of religion, I see that religious rhetoric provides unique and powerful mechanisms for articulating experiences and their meanings. Anglers frequently use religion’s signifying language – the sacred, the holy, or even ascriptions of divinity – to explicitly describe personal and communal understandings of the fishing, fish, or the waters of fishing.

Reflecting on religion and fishing, Tom McGuane wrote that “humans have suspected” their connection “for thousands of years.” In *A River Runs Through It*, Norman Maclean’s family held that very suspicion, believing

there existed “no clear line between fishing and religion.” There is a deep and moving history of religion in angling that is as varied as the waters anglers fish, articulated in streams of literature – and some claim fly fishing as the most literary of all outdoor pursuits.

Being on a cascading mountain stream, or a purling spring creek in the plains means more than simply catching fish. It is deeper than that. I think it has to do with an inherent desire to engage the earth. The solitude and sounds of a stream, the careful turning over of rocks in search of nymphs and larvae, and many other aspects of angling, easily, indeed naturally, foster a belonging to nature.

Amidst all of this religiosity in my fieldwork, I came to encounter fishing as something more than just a religious recreation – it is, what I call, a gateway activity. Angling reaches into nature; it teaches the angler about nature and offers an avenue toward ecological knowledge and its attending environmental concern.

Like Leopold, the great conservation pioneer of the Pacific Northwest, Roderick Haig-Brown believed fishing offered an opportunity for contemplating the natural world and the human relationship to it. As traced in his writings, such as *The Seasons of a Fisherman*, fishing provided the primary means



for perceiving fish, rivers, and watersheds in all their glory. Haig-Brown spent a good portion of his career articulating not only the spiritual benefits of rivers and fishing, but the need to protect and conserve the very sacred places where one's wonder of the world might expand. If fishing was a spiritual process for him, he explained in *The Living Land*, that "conservation is a religious concept – the most universal and fundamental of all such concepts . . . without moral concepts and without a sense of responsibility for the future of the human race, the idea of conservation could have little meaning."

Both Haig-Brown and Leopold believed that science should guide conservation. However, they also felt that without something akin to spiritual values and religious grounding – which they thought could come from fishing – that the analytic world of science would not hold water. Both argued in their vast array of writings that a balanced approach to conservation combined scientific knowledge and cultural or aesthetic values emergent from the world of experience.

In my research, when asked if fly fishing leads one to pay attention to the "health" or "state" of the environment, one long-time fishing guide in New Mexico emotionally replied, "Well of course. Being out there on a stream over the years, you notice changes from stream degradation to water loss." Another angler replied more broadly, "If you enjoy the environment in any way, you cannot help but support organizations and take care of nature

when you are out there." Anglers often agree, then, that they must sustain the waters that sustain them. This belief is embodied in the countless initiatives from federal leadership to grassroots organizations devoted to fish, rivers, and watersheds.

If our values have emerged from life experiences in the woods and on streams, then we need to ensure that the next generation has those same opportunities so that they, too, might carry on the good work of a conservation ethic in action. In an age where "fishing" on a video game seems more popular than fishing in real life, we need to encourage children to get outside. We must motivate a conservation ethic through a love of sport. We must encourage them to hunt, fish, or play in nature where they may have their own religious experience – and use those moments to encourage ethics of conservation as leading thinkers such as Leopold once spelled out for us all.

Samuel Snyder recently completed his Ph.D. at the University of Florida's Graduate Program on Religion and Nature with a dissertation entitled *Casting for Conservation: Religion, Popular Culture, and the Politics of River Restoration*. He has published in *American Fly Fisher*. He is the 2010 John H. Daniels Fellow at the National Sporting Library where he is continuing research into the history of American fly fishing and the conservation of fish, rivers, and watersheds. He writes from Anchorage, Alaska.

Eddies

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During the Fisheries Program's nearly 140-year history, those who dedicated their life's work to conserving America's fisheries have met defining moments head-on. They helped feed the country during the westward expansion and the Great Depression, stocked farm ponds, restored fisheries, and recovered listed species. Our employees have used the best science and sweat to meet challenges.

Now in the 21st Century, we are again at a defining moment, perhaps more daunting than all others – how to address fisheries conservation on a landscape scale in a changing climate. We may hold more imperiled species in the National Fish Hatchery System, and aquatic organisms may face potential extinction events. Our habitat and population biologists will need to be at the top of their games. Our Fish Technology Centers will be asked to develop new genetics and disease detection tools. Invasive species may spread by new vectors, which our biologists will need to control. We'll need to accomplish all of these things in close concert with our many partners and the American public, taking advantage of our collective capacities and spirit.

Our rock-solid foundation enables us to draw lines in the sand at this point in our history, built on sound science and the ground-breaking work accomplished by our predecessors. Our current workforce has learned from the past, is poised to face the challenges, and set precedent for those conservationists who will take our place tomorrow. ♦ Joe Moran



Geneticist Dr. Greg Moyer tests the genetic make up of fish tissues at the conservation genetics lab at Warm Springs Fish Technology Center in Georgia.

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