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Fishery Resources, Pacific Region
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U.S. Fish & Wildlife Service

High Returns

*Pacific Region Fishery Resources
2014 Program Highlights*

PACIFIC
REGION *One*

*Front Cover: Steelhead hatch from eggs at Quilcene National Fish Hatchery in Washington.
Read how the Service is helping recover ESA-listed Hood Canal Steelhead in 'Trust Resources'
Photo © Florian Graner*

“The nation behaves well if it treats natural resources as assets which it must turn over to the next generation increased, and not impaired in value.”

Theodore Roosevelt



Roy Elicker (left) Assistant Regional Director– Fishery Resources on a successful fishing excursion with Bill Kremers.

Many of us in the Pacific Northwest will remember 2014 as a year of near-record returns. Not in terms of income and capital gains in the financial sector but the number of coho, fall Chinook, and sockeye. Our ‘shareholders’ include more than 40 tribes, nearly 14 million people in four states, and of course, the native animals and plants themselves.

We own, operate, or help administer 38 Pacific Northwest hatcheries and acclimation sites with an estimated asset value of over \$920 million. These facilities propagate over 60 million salmon and steelhead annually, supporting a multi-billion dollar West Coast fishery that supports thousands of commercial, tribal, and sport anglers in communities from California to Canada.

Our network includes over 100 scientists and staff in four field research offices, three fish health centers, and one fish technology center; work to sustainably manage the interactions between hatchery and wild fish. We monitor the size, structure and health of wild salmon populations and native non-game fish, and work collaboratively to restore aquatic habitat. We also provide biological data and decision-support information to regional fisheries managers, help monitor the impacts of climate change, and connect people to waterways and natural resources.

We do this because we believe that when we share our people, our places, and our programs to restore, protect, enhance, and recover our region’s waterways and the native species that call them home, everyone benefits.

I hope you enjoy these snapshots of some of the year’s best returns on our investments.

Roy Elicker

Some of the Faces of Fish & Aquatic Conservation



Like Father, Like Son

No question about it, Gale and John Varner are a dynamic duo. This father-son team volunteer together each Wednesday at Eagle Creek National Fish Hatchery, logging 561 hours of service since 2012. While you can’t put a price on passion, we estimate that their contributions to the hatchery are valued at nearly \$12,000 -- and counting...

People

Engineering Change, Creating Wonder

Biologist Dan Spencer is a builder. From temporary fish weirs to conservation education programs, Dan’s creative engineering has impacted fish and people from Washington’s coasts to inner city Seattle. As the Service’s lead for the Lake Sammamish Urban Wildlife Refuge Partnership, a program linking urban Seattle to natural areas. It’s no wonder he’s the Region’s Nominee for the 2014 Rachel Carson Sense of Wonder Award for visionary leadership in interpretive and environmental education programs.



Community

Co-Managing Change, Rebuilding Runs

Kat Brigham has been a regional leader in aquatic conservation for nearly four decades. A Columbia River Inter-Tribal Fish Commission Commissioner and chair of the Confederated Tribes of the Umatilla Indian Reservation’s Fish and Wildlife Commission, Kat oversees coordinated programs that restore, enhance and protect salmon and Pacific lamprey to the Umatilla Basin. The Tribes’ restoration efforts are paying dividends for both enrolled tribal members and other Oregonians.



Trust Resources

(Gene) Pooling Resources To Maximize Returns

For Christine Kozfkay, conservation and hatcheries are intertwined like a double-helix. A principal fisheries research biologist at the Idaho Department of Fish and Game’s Eagle Genetics Laboratory, Chris works with the Service and our partners to develop and apply high-tech tools, like parentage-based tagging, to the Snake River Sockeye Captive Broodstock Program and other conservation hatchery programs. Chris’ hard work to maintain and increase genetic diversity while rebuilding wild runs is at the forefront of the ever-evolving field of conservation genetics. It’s also one reason that the 2014 Redfish Lake sockeye run was not only the largest since 1991, but that more Snake River Basin sockeye than ever are spawning in the wild.



Technology & Infrastructure

People

Diversification Achieved at Fish Culture Course

With wild turkey calls in the air and spring Chinook in the water, nearly 30 fish culturists and biologists from the Service's Dworshak National Fish Hatchery Complex, Idaho Department Fish and Game, and the Nez Perce Tribe gathered along the banks of Dworshak Reservoir in Idaho this spring to learn the finer points of coldwater fish culture from Service Biologist Matthew Patterson and other experts.

The well-attended and highly-lauded training was as unique as the students themselves, offering diverse perspectives on both culture and fish rearing techniques. "As scientists, we

*Buoy Ten Fishing
Photo: ODFW*



get caught up in the minute details of our methodologies and miss the forest for the trees. The forest in this case is not fish or fish food but a balanced and healthy ecosystem," said Patterson.

Patterson's holistic approach is echoed in the philosophy of Becky Johnson, Production Division Director for the Nez Perce Tribal Fisheries: "In the end, I believe it is this diversity of perspective that will help bring balance to the salmonids of the Pacific Coast as well as to the biologists on which they depend," says Johnson. She praises the training as important "to improving and growing our people and programs in the Snake Basin." Just as a diverse ecosystem allows life to thrive, diverse perspectives among our staff and those we work with enable our programs to prosper.

Warm Springs National Fish Hatchery Expands Its 'People Portfolio'

Warm Springs National Fish Hatchery, located in Central Oregon, is no stranger to adversity. Over the past three years the high desert hatchery's crew has reared and released spring Chinook salmon despite drought conditions, wildfires, and infrastructure-damaging river ice.

So when the hatchery faced a personnel shortage earlier this year, acting hatchery manager Mary Bayer parlayed bad luck into an opportunity to provide valuable on-the-job training and receive some much-needed help from Chemeketa Community College and the Confederated Tribes of the Warm Springs Reservation. The Tribe,

which co-manages the hatchery, supplied two "Tribal Aspirations" summer interns to help with fish culture and spawning.

Meanwhile, two Chemeketa Community College student volunteers—a French foreign exchange student and an Air Force Reservist—earned college credit while helping Warm Springs NFH address key maintenance and engineering issues like reducing algae growth in hatchery raceways.

The hatchery's 2014 "staff diversification" strategy paid dividends. After 10 months of gaining a strong understanding of



Edouard Sellier, a French engineering student and volunteer, helps prepare spring Chinook for spawning. Photo: USFWS

the hatchery's water and electrical systems as a volunteer, recent Chemeketa graduate Dan Willis—a former aircraft mechanic—was hired as Warm Spring's NFH's newest Maintenance Technician.



Investing in the Next Generation

For more than 20 years, the Salmon Watch program has brought together dozens of local, state, and Federal agencies sharing the goal of engaging the next generation in salmon conservation. Reaching students with limited access to nature is a priority.

This year the U.S. Fish and Wildlife Service leveraged what had been a modest amount of staff time in the program (1-2 biologists per season) into a major payout, providing 13

agency experts who participated in nearly half of the 41 Salmon Watch field trips.

Salmon Watch and the Service also invested in a new cadre of instructors – students from Mount Hood Community College's Project YESS (Youth Employability Support Services). Aimed at providing young adults with experience in different career fields,

Project YESS students teamed up with veteran Salmon Watch trainers to learn about salmon and their habitat. Project YESS students then became the teachers, leading younger students through lessons on healthy salmon habitat, riparian vegetation, aquatic insects, and water quality.

While sharing salmon ecology with the next generation, teachers often find themselves learning as much as

their students. In the words of one Project YESS student-turned-teacher, "Something I learned about myself as a teacher is that I love sharing the information that I've learned. Being able to work with kids also makes me feel good knowing I got to help teach [others] about how important salmon are to the ecosystem."

A youth angler lands—and releases—a wild steelhead.

Photo © Soul River

**total hours
volunteered
for Region 1
in 2014:
20,271 worth**

\$517,323

A Yakama Nation tribal member fishes for fall Chinook salmon on the Klickitat River. Tribal restoration efforts are one factor in 2014's high rates of salmon returns to Columbia Basin rivers. Photo: Ryan Hagerty/USFWS



Community

Value-Added: Fish Facility Helps Firefighters Lick Flames, Protect Community

July usually finds staff at central Washington's Entiat National Fish Hatchery focused on tagging half a million fish. This July, however, the three-person Entiat crew faced a more daunting task – defending the facility and community from wildfire. On July 9, a blaze erupted in nearby Mills Canyon and by noon the next day was making its way rapidly down the ridge above the hatchery.

Hatchery Manager Craig Chisam and his staff quickly shifted gears from fish health to human safety. Working with area fire crews, Entiat NFH was turned into a base of operations with a helicopter landing pad, a water source, and space to support nearly 100 firefighters, 15 fire engines, and a bulldozer.



As flames came down the ridge towards Roaring Creek, four-tenths of a mile from the hatchery, the seasoned firefighters in the group predicted an 80 percent chance that it would jump the creek and head toward the facility. Against those odds, and thanks to hundreds of gallons of water from hatchery ponds dropped every four minutes, this portion of the fire was contained, saving hatchery grounds.

But Entiat NFH wasn't the only beneficiary; its role as a base and water source enabled area firefighters to protect nearby Entiat River Valley residents and their homes. Ultimately the blaze, which burned 22,000 acres, was contained. The hatchery, which also hosts annual Outdoor Skills Days for area first through eighth graders, received recognition from the Entiat Valley Chamber of Commerce for outstanding service to the community.

Combined Leverage: Coordinated Fish Passage Efforts At Wanapum Dam Saves Time, Fish, And Money

The February 2014 discovery of a 65-foot long crack in Wanapum Dam's spillway weir raised alarm bells. Not only were there health and safety concerns, but needed repairs were going to render the dam's fish passage ladders and those upstream at Rock Island Dam non-functional in the middle of one of the largest Columbia Basin salmon returns.

Crisis has a way of pulling communities together, and dam operators, Grant and Chelan Public Utility Districts, rallied a coalition of tribes, private, state, and federal organizations to engineer alternative fish passage solutions for Pacific lamprey, sockeye, coho, and ESA-listed Chinook and steelhead. The Service worked as part of the team that raced against time to design and install salmon-friendly passage structures and a trap-and-transport program for adult Pacific lamprey.

The coordination paid off swimmingly. Nearly one million adult fish successfully passed through Wanapum's and Rock Island Dam's modified fish ladders,

ensuring upstream angling opportunities and supporting fish reintroduction efforts led by the Okanagan Nation Alliance, the Confederated Tribes and Bands of the Yakama Nation, and the Confederated Tribes of the Colville Reservation. Out-migrating yearling Chinook and juvenile steelhead also exceeded ESA-mandated survival standards for the dams.



In 2014 Service hatcheries provided more than 94,000 excess adult salmon to Pacific Northwest tribes, food banks, stream nutrient enhancement initiatives, and educational programs. Photo: Ryan Hagerty/USFWS

Partners used the lamprey trap-and-transport program as an opportunity to research and monitor lamprey passage and migration, and the PUDs even saved costs by repairing boat launches during the reservoir draw-down required for

repairs. The biggest payoff? Affirmation for the Service that even a modest investment of fisheries expertise in stakeholder groups has value, and proof that protecting salmon can be truly a community effort.

Steelhead Celebration Creates Diversity Dividends

Last September the Service and Soul River Runs Deep co-sponsored a Reggae-themed celebration of wild steelhead, bringing the rhythm of nature into the city of Portland. Military veteran Chad Brown, Soul River organizer and owner of the non-profit New Currents Outdoors, was inspired to start the organization after personally finding peace from Post-Traumatic Stress Disorder through fly fishing. Brown strives to bring that same gift to youth and help them see the natural world as a "hip, cool place to be."

Brown's mission to connect youth with nature fits with the investment the Service and its partners make in engaging the next generation as stewards of our natural resources. As part of the its Urban Wildlife Conservation Program, Service

staff helped lead fly-casting clinics and create fish art with the estimated 200 kids and 300 adults in attendance. The agency also donated 100 beginner fly-rod kits to the celebration's youth participants, gear that does much more than catch fish.

"At the end of a program, I see a rough attitude that has softened with laughter because of time spent in the outdoors, said Brown. "Promoting outdoor diversity, environmental advocacy and educating city youth, inspiring them to be conscious

ambassadors of the outdoors can save our world and ultimately, us."



Chad Brown (left), leads fly fishing expeditions with inner city youth and veterans. Photo: Soul River

Partners we worked with in 2014



Multiple helicopters worked in tandem during the Mills Canyon Fire to pull water from an Entiat NFH hatchery pond typically used for free fishing outdoor skills days. Photo: Josh Homer/USFWS

Trust Resources

Security Deposits: Can Hatchery-Raised Fish Accelerate Recovery of a Listed Species?

When Puget Sound steelhead were listed as 'Threatened' under the Endangered Species Act in 2007, area fishery managers saw an opportunity to address a research question and a paradox: could hatchery-propagated fish contribute to the recovery of declining Hood Canal steelhead?

That's why the Hood Canal Steelhead Project, a 16-year study involving Quilcene National Fish Hatchery, non-profit Long Live the Kings (LLTK), NOAA-Fisheries, six other partner organizations, and community volunteers was launched. The Project combines innovative steelhead rearing and monitoring techniques honed under the LLTK's and NOAA's Hama Hama Steelhead Project with on-the-ground recovery efforts to recover three local populations.

With only an estimated two to four percent of wild steelhead eggs surviving to smolt stage, Quilcene NFH's state-of-

the-art isolation facility provided a critical staging area and security deposit. Eggs pumped from wild steelhead nests in the Dewatto and Duckabush Rivers were transported to the hatchery and incubated in quarantine. Hatchlings were moved to protected rearing tanks, fed, inspected for health, then transferred to LLTK's Lilliwaup hatchery until their eventual release in Hood Canal study areas.

Quilcene's part in the long-term study concluded in 2014, but not before successfully raising and transferring nearly 75,000 steelhead to assist the research. Its eight-year role was 'integral' to supporting the Project, says NOAA scientist and lead investigator Dr. Barry Berejikian, who's studying the benefits and risks of hatchery supplementation by comparing three hatchery-supplemented Hood Canal steelhead runs with wild runs over the course of two (four-year) generations.

"Seeing the lasting legacy of hatchery programs will help managers make informed, science-based decisions and further guide hatchery reform efforts," Berejikian notes.

federal agencies, five tribes, and nonprofits such as the Western Native Trout Initiative and Trout Unlimited to formalize the Interior Redband Trout Conservation Agreement.

The Agreement provides a framework to identify and manage conservation populations, investigate critical uncertainties, and maintain genetic integrity, all with the goal of ensuring more drastic and costly measures will not be needed in the future. For this robust and unique species today's investments will pay out big returns tomorrow.

Yet for all their strength, these trout have been reduced to just 42 percent of their historical range. While not at imminent risk, conservation efforts are critical to assure the long-term viability of the fish's populations and habitats. That's why in 2014 the Service partnered with the Oregon Department of Fish and Wildlife, five other states (fish and wildlife divisions), three



Redband Trout
Photo © Joel Sartore

Increasing Rates of Return: Bringing Back the Redband Trout

A truly beautiful and unique species, the interior redband trout symbolizes wildness and persistence to conservationists, anglers, and Tribes.

"Redband trout aren't your run-of-the-mill fish," says Warren Colyer, Trout Unlimited's Director of Western Watersheds. "They're scrappy – tough – a fish that has been so adaptable, they survive in places most other trout don't... that's an admirable trait, and one worth our time and effort to restore and protect."

Hawaiian Groups Restore Big Island Habitat, Cultural Connections

On the scenic Big Island of Hawaii, native shrimp, damselflies, and endangered Hawaiian waterbirds depend on a unique water body called anchialine (pronounced "AN-key-AH-leen") pools. These brackish pools along Hawaiian coastlines are recharged by both groundwater and seawater and usually occur where other aquatic habitats, such as streams and wetlands, are uncommon. However, the wealth of native species these pools support is threatened by an influx of invasive plants and fish including the prolific red mangrove.

To recover this valuable resource, the Service and Hawaii Fish Habitat Partnership supported community and volunteer work led by Malama o Puna. This environmental nonprofit has been coordinating efforts by native Hawaiians, the Big Island Invasive

Species Committee, Hawaii Wetland Joint Venture and others to restore a network of over 20 anchialine pools on the island's Kona Coast. The project adds to an island-wide effort to keep Big Island estuaries and coastal areas red mangrove-free.

Several hundred volunteers including lineal descendants of the area were the driving force for making the Alula Bay restoration happen. Five-months and 15 community work-days of intensive labor removed an entire 0.7 acre stand of invasive mangrove and pickleweed. The partners replanted native vegetation and 'daylighted' 12 anchialine pools in an area with numerous cultural features, including a heiau, or ancient Hawaiian temple structure. Their efforts prove restoring habitat not only conserves culturally valuable species like the Hawaiian duck, it recaptures community and cultural connections too.



Anchialine pool shrimp
Photo © Mike Yamamoto

2014 Restoration Projects Completed with Service Support

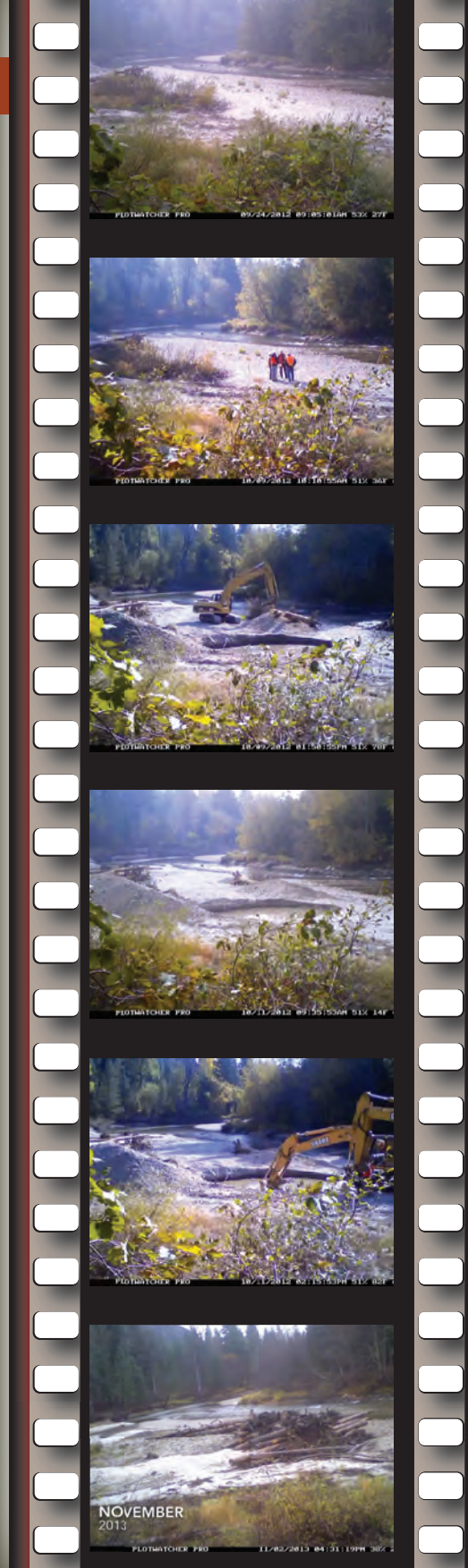
Acres Reopened to Fish Passage: 160

Barriers Removed or Bypassed: 32

Miles Reopened to Fish Passage: 120

Instream/Shoreline Miles Restored: 14

Ratio of Partner to Service Funding: 4:1

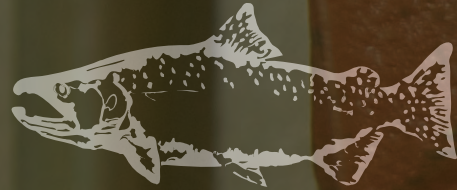


Engineered log jams like the ones placed in the Entiat River create habitat for native fish like Chinook. Watch the YouTube video at <http://youtu.be/zmPJkaKide0>

Technology & Infrastructure

2014 returns (in comparison with ten-year return average).
Source: Fish Passage Center

SPRING CHINOOK +144.3% COHO +245.8% FALL CHINOOK +201.9% STEELHEAD +92.9%
SUMMER CHINOOK +128.3% SOCKEYE +319.5% PACIFIC LAMPREY +129% WILD STEELHEAD +118.5%



Bene-fish-ial Impacts of Circular Tanks

The business of raising healthy fish is complex. These days increasing temperatures and reduced water supply due to changes in climate are adding to the already challenging world of hatchery management. That's why the Fishery Resources program, along with others like the Freshwater Institute and Washington Department for Fish and Wildlife, is investigating the cost-effectiveness of Reuse Aquaculture Systems—or RAS—at certain facilities.



RAS have the potential to reduce freshwater consumption by up to 70 percent or more by cleaning and reusing much of the water instead of replacing it with new surface or well water. What's more, RAS may also reduce labor costs associated with cleaning raceways, and enable hatchery managers to use higher water velocities to better 'exercise' fish.

In 2014, Hagerman National Fish Hatchery in Southern Idaho installed a pilot RAS to determine if steelhead trout can be produced using less water and still return home in greater numbers than their cousins raised in traditional cement raceways. Studies underway at Hagerman NFH are

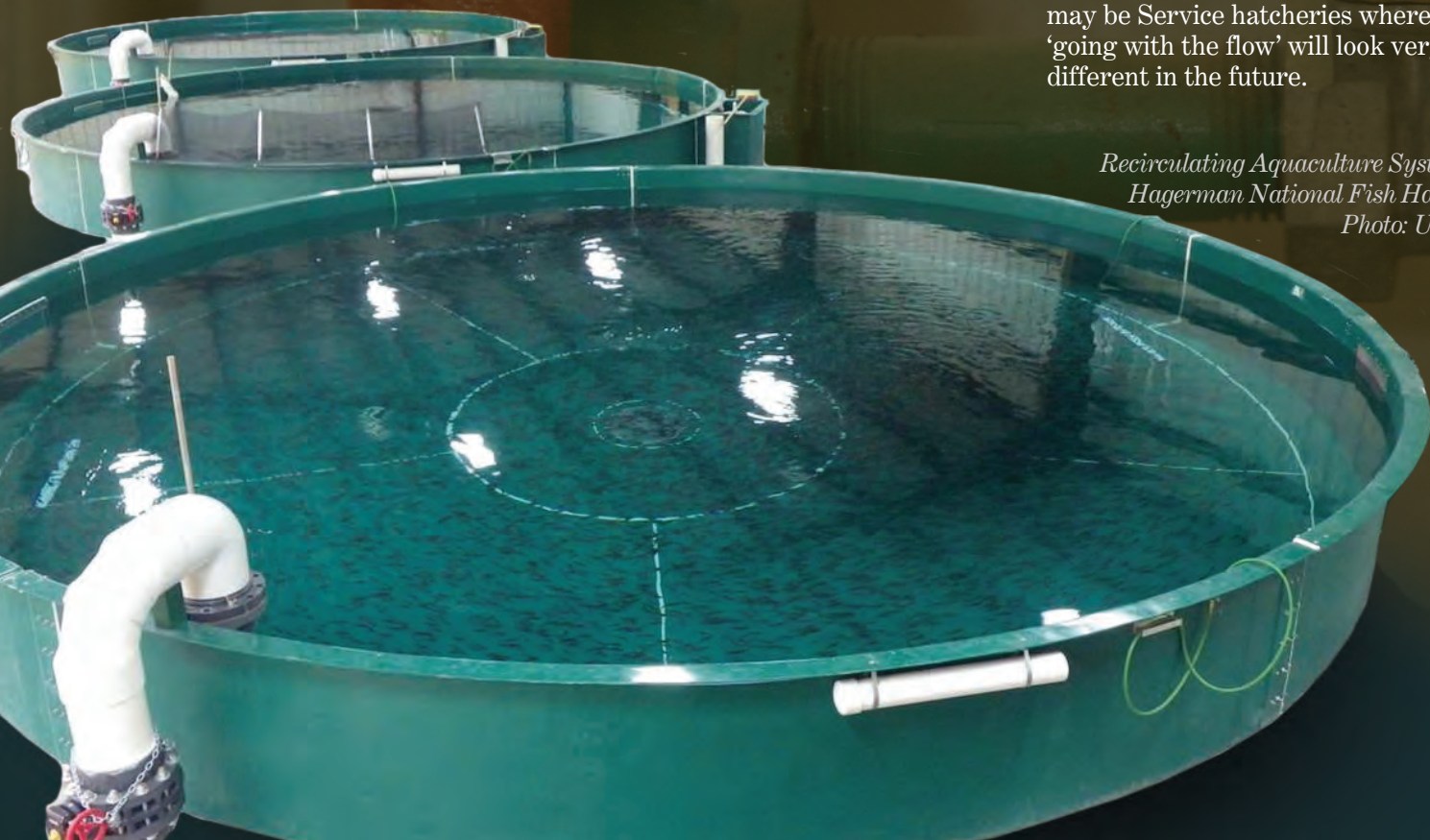


designed to provide information on water usage, production costs, and the performance of fish raised in RAS systems.

Meanwhile, the Abernathy Fish Technology Center in Washington has constructed a smaller-scale, on-site RAS to study whether the physiological effects of swimming in circular tanks may improve the survival of hatchery-reared steelhead and Coho.

These studies will be used by the Service to help determine if and how RAS can be employed to ensure continued production of quality fish in the face of climate change and increasing production costs. If RAS systems turn out to be effective, there may be Service hatcheries where 'going with the flow' will look very different in the future.

Recirculating Aquaculture Systems at Hagerman National Fish Hatchery. Photo: USFWS



Peculiar Fish Help Market A Multi-Media Curriculum

Talk about improved rate of returns - the Service and OSU 4-H Extension Service have developed a high-tech multi-media pilot curriculum on Pacific Lamprey for 4th-6th grade students. The Pacific lamprey in the Classroom curriculum helps students meet core standards in science and social sciences while learning about this blue-eyed eel-like fish that has dwelled in northwest rivers for millions of years.

The curriculum -- also developed in collaboration with the Columbia River Inter-Tribal Fish Commission -- combines text, graphics and video to deliver compelling content that provides concrete returns. Students

Genetic Stock 'Index' For Assessing Culvert Restoration Effectiveness

Each year, conservation agencies and organizations, including the Service, remove or rehabilitate culverts that block fish passage on Western U.S. public lands. In 2014, the Service

are able to move through the six learning modules at their own pace in an intuitive process using computers or tablets. Service biologists were also able to highlight several classroom lessons with live lamprey, to the delight of students curious about this unusual fish.

Piloted with over 600 Portland-metro area students, the innovative lamprey curriculum yielded big education gains for students who reported on surveys that this program doubled their knowledge of the native lamprey. Teachers were equally as excited,

provided technical assistance and funding support resulting in removal of 32 culverts and other barriers, re-opening up 120 miles of stream habitat. But how do scientists know if their efforts are working, or which restoration efforts are most effective?

Service and Trout Unlimited scientists worked with the U.S. Forest Service to study that

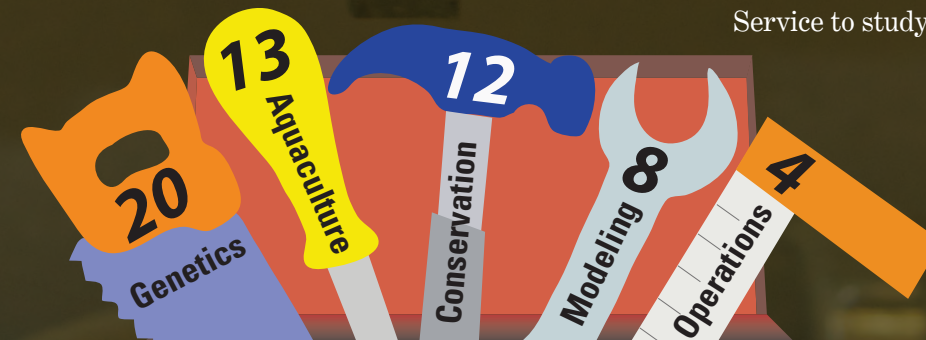


Yakama Nation & Service biologists release translocated adult Pacific lamprey. Photo: Yakama Indian Nation

stating, "It was an interesting unit and captured the students' attention;" and "the quality was excellent."

question with a larger goal in mind: developing efficient monitoring protocols that use genetics to assess how native trout move through culverts at restored road crossings. Using Passive Integrated Transponders coupled with a suite of genetic analyses, the researchers studied the response of cutthroat trout at three restoration study sites in Idaho and Montana, looking at individual fish movement and larger, population-level responses.

The results, published in the Canadian Journal of Fisheries and Aquatic Sciences, will help biologists and managers more cost-effectively determine if and when fish are using fish passage structures to enter newly accessible habitat. That, in turn, will guide decisions that could save money and maximize benefits for aquatic species in future fish passage projects.



Total technology tools we created and shared:

57