

Aerial view of the Meade Coffeen Crossover Diversion in the Bighorn National Forest above Story Hatchery. This structure was designed to allow passage of trout up South Piney Creek. It was completed last spring. (WGFD photo)

JUST KEEP SWIMMING

TEN YEARS AGO, THE WYOMING GAME AND FISH DEPARTMENT FORMALIZED A PROGRAM TO IMPROVE THE ABILITY OF FISH TO MOVE WITHOUT BEING BLOCKED ALONG THE WAY.

By Nick Scribner and Christina Schmidt

People don't always associate catfish with long-distance journeys, but one channel catfish traveled an impressive 415 miles from northeast Wyoming to the Yellowstone River near Billings, Montana. Caught by an angler in mid-April 2011, the catfish was originally tagged by the Wyoming Game and Fish Department on June 27, 2007, below Kendrick Dam, located on Clear Creek in Sheridan County. It's the longest documented fish movement in the history of fish tagging in Wyoming.

Due to the absence of dams and sudden high flows triggered by thunderstorms, the Powder River drainage has registered other interesting fish travels. In June 2006, a channel catfish was tagged in Wyoming's Powder River near the mouth of Crazy Woman Creek. Five days later it was recaptured 25 miles upstream. Two shovelnose sturgeon tagged in Crazy Woman Creek in June 1984 were also recovered in Montana's Yellowstone River, one a month later near Rosebud and the other near Glendive.

These movements show that given the opportunity to move freely in river systems, fish will go long distances. Only three years after the Montana catfish was tagged, a new structure at Kendrick Dam was completed that now allows other fish to potentially begin their travels farther up Clear Creek.

Since the Kendrick Dam was constructed on lower Clear Creek in 1913, fish had been blocked from

traveling upstream. Completed by the Kendrick Cattle Company — a large ranching business owned by John B. Kendrick, a state senator from Sheridan County who would become Wyoming's ninth governor just one year later — the 135-foot long dam allowed an adjoining irrigation canal to carry much-needed water several miles to Kendrick's thirsty crops and cattle. However, its creation ended the ability of the creek's fish to access water above the dam. For almost a century, the dam was the endpoint of travel for any fish attempting to move upstream from the lower reaches of Clear Creek, the largest tributary of the 430-mile Powder River, which is considered the last major undammed prairie stream in the country.

But in April 2010, a fish passage project was completed by the Wyoming Game and Fish Department in cooperation with the current landowner, Pee Gee Ranch. Using a natural bend in the creek, a rock-lined bypass channel was dug below the dam, connecting to the other side. This 800-foot trench now allows fish, like the far-traveling catfish, to access 36 additional upstream miles of Clear Creek.

"Fish species can be lost over time if passage is cut off," said Game and Fish Sheridan Region Fisheries Supervisor Paul Mavrakis. "If a species is blocked from suitable spawning areas, the species may cease to exist in that particular stream. Clear Creek above Kendrick Dam is a good example of a species assemblage that was not nearly as diverse as it was before

TYPES OF FISH PASSAGE INFRASTRUCTURE

During the past 10 years, the fish passage program’s most common projects have addressed irrigation diversions and road crossings. The United States Geological Survey estimates more than 95 percent of water withdrawals in Wyoming are used for irrigation, so it’s no surprise that most fish passage projects in the state are associated with irrigation infrastructure.

Irrigation diversion structures in streams run the gamut using a variety of materials including concrete, rocks, telephone poles, old tires and other items. Water users

have proven resourceful in directing stream flows into their irrigation canals. As these structures work to divert flows, however, they can deter fish passage. They also require constant maintenance and can alter stream function — potentially leading to instability of the channel and causing additional maintenance needs or loss of the diversion.

Solutions to improve fish passage at irrigation diversions have included fish ladders, grouted rock ramps, rock weirs, engineered riffles, bypass channels and other variations of these structures. Each site is unique and

requires its own design in order to match the stream characteristics and meet water right demands and passage needs of fish.

The Encampment River is an example of where irrigation diversions have been modified and improved to open passage while reducing maintenance needs for water users. Over the past decade, eight projects have been completed, and two more will be completed this year, which will reconnect 75 miles of the Encampment River back to the North Platte River.



Fish Ladder

Fish enter a technical ladder at the base of a dam and exit upstream. Concrete pillars within the ladder provide calm water behind them — creating a place where fish can rest as they navigate the ladder to the other side of a dam.



Rock Ramp

Concrete is used to secure different sizes of rocks at specific distances. These structures are stable and improve passage by removing areas too steep for most fish to navigate, slowing water velocities and providing small resting pools.



Road crossings and culverts

Road crossings are another type of barrier the fish passage program continues to remove. The most common road crossing issue is with culverts that are too small and perched above the stream at their outlet. When a culvert is too small for the stream, it can act like a fire hose during higher flows, blocking passage and degrading stream stability. Replacing these small culverts with a larger structure is the best fix for such sites. Other common remedies include bridges, bottomless arch culverts, larger round culverts, and baffled culverts which have structures inside them to hold sediment.

Upper Labarge Creek in western Wyoming is an example of how correcting barriers at road crossings can improve fish movement. Barriers were removed at multiple locations — reconnecting Labarge Creek with nine tributaries. The final two crossings will be addressed this fall. Once complete, Colorado cutthroat trout and other species will be able to freely roam 55 miles of stream — double the distance that was previously available.



Bypass channel

A bypass channel goes around a dam and reconnects the stream on the other side. This provides a way for fish to swim upstream without hindrance.



Constructed Riffle

Large rock is used to build several small dams, called weirs, across a stream channel to build a riffle that is easy for fish to navigate. These structures are stable and require little maintenance. These differ from push-up dams that can produce a large dam that blocks fish and requires annual maintenance.



Kendrick Dam was put in. But fish started to use the new channel as soon as it was opened. I was surprised so many fish found it so quickly.”

At the time of the passage project’s planning and construction, Sheridan Region fish biologists with Game and Fish identified 20 fish species they expected would benefit from the Kendrick Dam bypass channel. Some of the fish they believed were completely lost upstream of the dam included channel catfish, sauger, goldeye, river carpsucker, flathead chub, Western silvery minnow, plains minnow, sturgeon chub and shovelnose sturgeon. Within three years of the project’s completion, 16 of the 20 species were documented upstream of the diversion. Now, only shovelnose sturgeon remain to be documented above the diversion.

The trench at Kendrick Dam is only one of at least 120 fish passage projects in Wyoming during the past 10 years. Although fish passage projects have taken place in the state periodically for decades, Game and Fish formalized the fish passage program statewide in 2009. Now in its 10th year, the program and its partners have reconnected or improved access to over 1,200 miles of stream for fish, which is farther than the distance between Casper and Los Angeles.

Opening a path

Fish need to move, and when barriers are absent or reduced, their long-distance travels can stretch into dozens or even hundreds of miles. The catfish that traveled more than 400 miles is just one example of a fish that went the distance when unhindered by dams or other barriers. In 2009, a study completed near Dubois documented at least 27 miles of travel by a Yellowstone cutthroat trout between April 22 and June 30. This occurred during a high snowmelt



year in streams that looked more like chocolate milk than water.

In simplest terms, fish passage allows the free movement of fish to access spawning areas and thermal refuge, escape predation and meet other life cycle needs by removing barriers or providing detours around barriers such as dams. Such detours can be created using fish ladders, grouted rock ramps or bypass channels such as the canal built at Kendrick Dam.

“These are win-win projects that benefit a broad range of user groups,” said Cory Toye, Wyoming water project director for Trout Unlimited. “But they can be complicated and expensive, requiring patience and creative thinking.”

Fish passage projects can also include installing screens to prevent fish from entering irrigation diversions where they can become stranded and die. If this was an occasional occurrence at a few spots on a stream, it would likely be a small concern. However, in some Wyoming watersheds there are streams where a diversion exists an average of every two miles. In such

Top: Aerial view of the Kendrick Dam fish bypass channel north of Arvada in Sheridan County. Located on Clear Creek, 7 stream miles from the Powder River, it was completed in April 2010. The project allows fish in the Powder River to access 36 additional miles of Clear Creek. **Above:** Construction crews set a bottomless concrete culvert in Labarge Creek in the Bridger-Teton National Forest in fall 2017. This structure replaced an undersized metal pipe that was blocking access to 3 miles of habitat upstream. (WGFD photos)

Wyoming Game and Fish Department personnel collect fish in Timber Creek near Meeteetse in spring 2018 to install Passive Integrated Transponder, PIT, tags. The PIT tags look like tiny pills that are placed inside the body cavity of fish and allow biologists to monitor their movements with the use of stationary antennas in the stream that will record the tag number as a fish swims by. (WGFD photo)



cases, a fish such as the Dubois Yellowstone cutthroat that traveled 27 stream miles may encounter a dozen or more diversions. Collectively, this can be death by a thousand cuts to the fishery, illustrating the need to address passage where possible.

Since the formal creation of Wyoming's fish passage program, millions of dollars have been invested in projects to rebuild decrepit infrastructure, reduce maintenance costs and reconnect streams, with results that ultimately benefit anglers, water users and the river ecosystem.

"Biologists have long recognized the potential limitations imposed by manmade riverine structures on fish communities and have seen directly or indirectly the effects of fish loss to diversions," noted the 2008 proposal that outlined the need for a dedicated fish passage program in Wyoming. "However, only recently has there been widespread interest and ability to address fish passage issues. Wyoming has about



In fall 2017 near Dubois, Game and Fish personnel built two constructed riffles in Bear Creek at the Spence/Moriarty Wildlife Management Area to improve fish movement past an irrigation diversion. (WGFD photo)

SETTING A SCREEN

Fish screens are used to keep fish out of irrigation canals and are primarily in drainages where native or sensitive species live. Prior to installation, the Wyoming Game and Fish Department expends considerable effort to estimate how many fish are lost in an irrigation canal each year. These efforts, called entrainment studies, ensure screens

are placed where they provide the greatest benefit to the fish and the public. In most cases, a screen is placed in a canal downstream of a headgate. If a fish takes a wrong turn down the irrigation canal, it will encounter the screen and be diverted to the stream through a pipe or ditch as irrigation water continues down the canal. To date, there

are over 30 fish screens of various designs statewide, primarily in the western half of Wyoming. Though each site is unique, screens can keep 500 to more than 50,000 fish out of an irrigation canal. Screens keep fish in the stream where they are available for anglers and continue to sustain the fishery.



Cone

A cone screen gets its name from its shape. Water submerges the cone where it falls through the screen as debris and fish remain above the screen. Brushes periodically rotate to dislodge debris that becomes stuck. These can be placed directly in the stream in front of a headgate, so fish never enter an irrigation canal. Most other screen types cannot be placed directly in the stream.



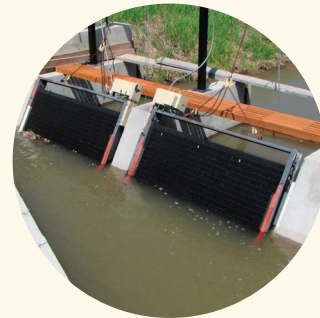
Farmer

A farmer screen is similar to the cone screen in that water falls through a horizontal screen and continues down the irrigation canal while fish are carried back to the stream by buried pipe. It is self-cleaning, requiring no moving parts or power source.



Drum

Drum screens can be operated by electricity or water via paddlewheels. They block fish from moving down the irrigation ditch and redirect them back upstream through the headgate or to a pipe that returns downstream of the diversion. As the drum rotates, flowing water washes away debris that becomes stuck on the screen.



Hydrolox/Belt

Like the drum, this screen blocks downstream fish movement in the canal and uses an electric-powered belt that moves horizontally or vertically to remove debris from the screen.

20,000 miles of perennial streams distributed among 14 major hydrologic basins and has 49 native fish species and 29 introduced fish species. For many fish species, long-term population viability depends on access and movement up and downstream."

With such a vast state, identifying the highest priority projects was a challenge. So, developing and populating a fish passage database became one of the program's first objectives. It entailed gathering data on road and stream crossings and irrigation diversion points from existing sources such as the State Engineer's Office and other entities, as well as visiting the sites to collect information on their conditions and observe potential barriers to fish. To date, there are nearly 1,300 sites in the database. Populating and developing the database into a workable tool to assist with prioritizing projects remains a program goal.

Native species, especially cutthroat, are a high priority, and projects that have the potential to positively impact those species can be of greatest importance. Identifying potential projects relies on a variety of factors such as land ownership, funding opportunities and balancing expected impact with anticipated costs.

Formalizing the fish passage program 10 years ago created a dedicated budget, two full-time personnel and a strategy for prioritizing these kinds of projects. With a budget and people solely dedicated to fish passage, Game and Fish has been able to dramatically increase the number of passage projects and miles of stream reconnected in the last decade. It has also created many opportunities for unique and mutually beneficial partnerships. Completing fish passage projects cannot happen without collaboration and backing of many entities such as government agencies, landowners, nonprofit organizations, irrigation districts and others. Funds from the Wyoming Wildlife Natural Resource Trust have been vital for many fish passage projects. Other prominent partners include

Trout Unlimited, U.S. Fish and Wildlife Service, USDA Natural Resources Conservation Service, local conservation districts and various water users.

"For fish passage projects, we need cooperative landowners, irrigators and cost-share partners. The more the better," said Travis Cundy, Sheridan Region aquatic habitat biologist. "We also need engineering assistance, which we get through paid consultants. Funding sources to pay for consultants are more limited than funding sources to pay for project implementation."

Landowner partnerships are critical. Many landowners contribute financially or in kind to projects that benefit fish passage as well as reduce long-term landowner costs associated with irrigation infrastructure.

"I think we've demonstrated really well how to develop and implement fish passage projects that improve the resiliency of the aquatic community while still meeting the needs of water users," said Toye. "Seeing fish passage make one of the 10 initiatives in former Governor Mead's Water Strategy of 2015 was a testament to the collective work completed across the state and continued need to address."

Kendrick Dam and other locations have shown that these projects work for fish. Humans have done a tremendous job of modifying streams and rivers to meet our needs without much thought to resulting impacts to the river ecosystem. But over the past 10 years, we've shown that we can create the openings to fulfill a fish's innate desire to move and meet its life cycle needs while still meeting ours.

— Nick Scribner is the Game and Fish fish passage coordinator based in Lander. He has worked on several fish passage projects throughout the state during the past 10 years.

— Christina Schmidt is the Game and Fish public information specialist in the Sheridan region. She is a regular contributor to Wyoming Wildlife.