

## Placing Half Log Structures in Reservoir Drawdown Zones to Help Endangered Fish

*Constructing onsite habitat structures in reservoir drawdown zones for endangered fish*

### Bottom Line

This research project developed inexpensive habitat structures that provided immediate habitat benefits in a section of a tributary that flows through a reservoir drawdown zone, as well as recommending design improvements for durability in certain applications.

**Better, Faster, Cheaper**  
Meeting Endangered Species Act requirements for fish and fish habitat within the migratory corridor of Reclamation reservoirs can be done in an inexpensive manner without changing operations in some cases.

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### Problem

Migratory fishes that inhabit reservoirs, including the Endangered Species Act-listed bull trout, often travel through portions of tributaries that flow through drawdown zones in reservoirs.



*Bull trout. Source: Western Native Trout Initiative through the U.S. Fish and Wildlife Service (<http://westernnativetrout.org>).*

Drawdown zones provide “lake” or “river” habitat, depending on seasonal water operations. Finding an appropriate mechanism for improving habitat in a drawdown zone is difficult because of the dynamic nature of the interface between a tributary and a reservoir. (The interface between a tributary and reservoir may be referred to as a drawdown or transition zone, delta, or varial zone.)



*Habitat structure in Trail Creek, a tributary to Deadwood Reservoir, Valley County, Idaho. Initial placement (left) and 1 year later (right).*

These areas often lack complex habitat because of the characteristic fluctuations in reservoir levels. Traditional habitat improvements (boulder or large woody debris placement, construction of plunge pools, or planting of riparian vegetation) often become buried as sediment is deposited and re-distributed within this area.

### Solution

This Reclamation Science and Technology Program research project started in 2008 to develop and test a method to improve habitat diversity for migratory fishes within drawdown zones. Work included:

- Exploring design options for habitat structures to be placed in stream-like habitat within a drawdown zone of a reservoir

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- Deploying prototype structures in a variety of drawdown zone habitats
- Evaluating effectiveness of the structures after 1 year of deployment
- Providing recommendations for future implementation

Prototype log structures were developed consisting of two “feet” and a “deck” that was secured to the top of each foot. To evaluate the most durable and functional design, each structure varied slightly.

Each structure needed to be:

- Inexpensive and installed by a two-person crew with the use of tools that could be carried up to a half mile over rough terrain. Excluding the initial investment of tools, the cost of installing each structure equaled approximately \$180.00 in parts and 4 to 6 hours of staff time for two people.
- Constructed with logs found near the study site and be no larger than what a crew of two people could safely move. (The U.S. Forest Service required the use of dead trees. However, live wood may prove more durable.)
- Assembled on the shore at the study site then pushed or carried into the channel and anchored in place.
- Durable enough to withstand complete inundation for most of the year and maintain its functionality during low water when the habitat returned to stream-like conditions.

## Application and Results

In 2009, six structures were placed: three in the Deadwood Reservoir on the Deadwood River and three in the Arrowrock Reservoir on the Middle Fork of the Boise River, both in Idaho. Study locations were selected to evaluate structures in a variety of habitat conditions (sandy and cobble substrate, shallow and deep water, and a small and large tributary).

The structures’ performance was analyzed by comparing water velocities and depths at the location of each structure (quantitative) and durability between designs (qualitative). The maximum inundation depth for each structure was also recorded by comparing the elevation at the installed structure to the full pool elevation.

Four of the six habitat structures remained intact after 1 year; however, only two remained in the wetted channel and were functional. (The deposition of sand and fine sediment within the delta causes the channel to change course year to year; two structures became buried in sediment.)

The initial evaluation demonstrated that each structure provided some type of cover including one or more of the following: overhead, shading, velocity, or depth. Initial results varied depending on water velocity and attributes of the existing channel.



Picture of habitat structure in Middle Fork of the Boise River, Idaho. Initial placement (top) and 1 year later (bottom).

***“The instillation of fabricated habitat structures in a reservoir’s drawdown zone can improve fish habitat at a minimum expense. The methods used in this study would work best in habitats with a well-defined channel and low amounts of sediment.”***

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## Future Plans

Based on the results of this pilot study, these inexpensive log structures do improve habitat conditions and, in some situations, are durable enough to remain functional for 1 or more years. However, further testing is recommended before wide-scale implementation. Additional testing should include:

- Increased anchor size
- Orientation within the channel
- Use of synthetic material instead of wood

## More Information

[www.usbr.gov/research/projects/detail.cfm?id=5149](http://www.usbr.gov/research/projects/detail.cfm?id=5149)