Dredge Creek Coho & The Impact of Beavers

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Background

Dredge Creek runs through a U.S. Forest Service recreation area adjacent to a residential neighborhood. The creek heads near the Mendenhall Glacier Visitors' Center. From its headwaters to Dredge Lake is only about one mile. Downstream from Dredge Lake it runs only about a third of a mile before emptying into a small holding pond before joining the Mendenhall River. Dredge Creek features coho salmon, Dolly Varden char, and cutthroat trout.

Beaver dams exist throughout Dredge Creek's length. However, those dams have the potential for flooding trails. Below Dredge Lake, major trails are near the creek and the elevation of the trails is only slightly higher than the creek. This area is heavily used by hikers, and dog walkers. Above Dredge Lake much of the terrain is rugged, and the area sees fewer hikers.

For about five years the U.S. Forest Service has agreed to allow a volunteer group (the Beaver Patrol) to work in the recreation area. Additionally, a Boy Scout Weblos troop works with the Beaver Patrol, and the troop does most of the work in the creek above Dredge Lake. Except for months when ice limits beaver activity, the Beaver Patrol works in the area twice each week, and sometimes more. A goal of this partnership is to manage water levels to minimize trail flooding, while maintaining much of the habitat provided by the beavers. The Beaver Patrol has built; and maintained devices; to control water levels, even if beavers continue to add material to their dams. Where fish migration is encouraged, those devices are designed to allow fish to pass.

Statements in this article were based on over a dozen fisheries studies, and other articles, as well as my own observations.

Coho Benefits to the Ecosystem

Coho are food each fall for bears.

Coho eggs and carcasses also provide food for juvenile coho, other fish, some birds, and other animals. Below is a magpie looking over a coho carcass it had been sharing with a pair of ravens. The ravens were too camera shy to pose for their picture.

The decaying carcasses add nutrients to their watersheds which makes the streams more fertile for fish growth. Most of the adult coho's body mass is gained while they are in the ocean. In contrast to fish that gain all their size by feeding in freshwater, salmon returning from the ocean add to the total nutrients of their watersheds.

Dredge Creek Coho in 2013

During the past five years the Beaver Patrol has been in an excellent position to observe migrating coho salmon. In 2013 far more coho salmon returned to Dredge Creek than in at least the previous four years. There were about ten times as many coho in 2013 compared to 2012.

In October, silt from construction of a snow melt settling pond remained suspended in a pond that is a rearing habitat for coho. There was also concern that silt could run into the creek and reduce the survival of salmon eggs. Federal, state, and local agencies, as well as the contractor, responded quickly to address this issue.

Below the lake coho laid their eggs in three redds. Each of the redds was immediately above a beaver dam. Two were in the main channel and the third was about fifteen feet from the main channel. Unfortunately, someone decided to tear out beaver dams in this area. He destroyed the dams multiple times; and even dug the main channel deeper. His actions destroyed all three redds as all the water was drained away from the one redd he did not dig through.

While tearing out another beaver structure at Moose Lake the person probably responsible for destroying the redds was confronted by a Beaver Patrol regular. It was clear that he hated beavers; and did not appear to know the damage he was causing to the coho population.

Purpose of this Article
This article, about the relationship between beavers and coho, is targeted to people who use the Mendenhall Recreation Area. Hopefully, if more people appreciate the benefits of beavers to the Dredge Creek coho population, there may be less habitat damage in the future.

Coho Spawning Habitat
Without suitable spawning habitat a watershed cannot support coho salmon. A report (*Selection of Spawning Sites by Coho Salmon in Freshwater Creek, California,* by Kristin Mull), featured an analysis correlating stream habitat features most likely to be associated with coho spawning areas. The most significant factor was a low percentage of gravel less than 4mm. Too high a percentage of finer gravel reduced percolation necessary to provide oxygen to the eggs. She also observed that salmon and trout could dig redds when the rocks were less than 10% of the female fish's length. For coho it seems that would favor areas with rocks no more than about three inches.

Coho preferred locations near the tails of pools. The author felt that this created a hydraulic gradient resulting in upwelling and downwelling at the site of the redd. Coupled with gravel of the proper size this apparently aided percolation in the redd.

All 53 sites studied in Freshwater Creek had modest surface water velocity values between 0.19 and 0.69 meters per second. Within that range, coho showed no statistically significant preference for water velocity.

A second study, (*The Importance of Beaver Ponds to Coho Salmon Production in the Stillaguamish River Basin, Washington, USA* by Michael Pollock, George Pess and Timothy Beechie) studied 72 streams. Spawning areas were found to be at least one square meter. They also observed that they were almost always located in tail-outs of pools, riffles, and glides.

In Dredge Creek all three coho redds below Dredge Lake in 2013 were in tail-outs above beaver dams.

Summer Rearing and Winter Survival Habitats
Coho spend one to two years in fresh water before migrating to the ocean. This places great importance on habitats for rearing juvenile coho, and protecting them during winter. Colder water leads to slower juvenile coho growth, and coho in Alaska are more likely to spend more than one year in fresh water than in other states.

The Stillaguamish study said the amount of spawning habitat was rarely the factor most likely to limit coho population in a stream. Of the 72 streams studied, the coho population was most limited by a lack of spawning gravel in only one. This means that in most watersheds containing coho, a lack of habitat preferred by juvenile coho is more important than the availability of spawning gravel. A study (*Habitat Utilization by Juvenile Pacific Salmon in the Glacial Taku River, Southeast Alaska* by Murphy, Heifetz, Thedinga, Johnson, and Koski) said that there were 1-3 juvenile coho per 100 square meters in the Taku's river habitats, compared to 58-59 in beaver ponds and upland sloughs. The juvenile coho also grew significantly larger in the beaver ponds.

The Taku study concluded that beaver ponds accounted for 61% of total summer coho production potential in that system, although beaver ponds only covered about 2% of the American portion of the Taku watershed. A study by Leidholt and Bruner found that summer densities of juvenile coho salmon in beaver ponds were higher than in pools formed by wood or other obstructions.

Waterflow in Dredge Creek varies greatly with rainfall. This is typical for such a short stream. Beaver dams raise the water table near them. This helps maintain stream flows during dry periods. In the summer of 2013 the upper creek was nearly dry at times in some places, and below Dredge Lake there were a few days with little streamflow. In addition to maintaining the water table, the beaver dams added critical depth necessary for juvenile coho to survive.

Multiple studies stated that winter coho survival fell when water temperatures dropped below six degrees centigrade. This should make winter habitats relatively more important in Alaska, than in watersheds studied in other states. Studies indicated that beaver ponds tend to be 2-4 degrees centigrade warmer than other habitats. Coupled with lower water velocity this provides a favorable habitat for juvenile coho, especially in winter.

Obstructions to Migration

The first reaction for many viewing salmon in a stream with beavers is that the dams must be blocking salmon migration. Yet salmon have spawned upstream from several beaver dams in many watersheds for thousands of years. Often salmon may be seen mingling below a beaver dam until after a rain raises a stream's level.

One article commented that coho had no problem getting past beaver dams that were as high as two meters. Other articles observed no problems with coho getting past beaver dams. Steep steam banks allow beavers to build a much higher dam. Intuitively, it seems shallow water immediately downstream would make it more difficult for coho to jump over a beaver dam. Deeper water below an obstruction should enable coho to more easily jump over it. The higher the obstruction the deeper the takeoff pool should be. While the studies reviewed for this article did not cover this topic, the Beaver Patrol routinely clears material that would reduce the depth of areas below obstructions in Dredge Creek.

Many culverts restrict fish migration even if there are no beavers in the watershed. This is especially true if the outlet end is too high. The Beaver Patrol routinely checks one large culvert on Dredge Creek and clears any sticks and rocks that beavers sometimes place there.

Dredge Creek enters a holding pond before spilling into the Mendenhall River. Beaver control devices have been placed where water enters and exits the holding pond. The photo below shows a device being maintained near a footbridge where Dredge Creek enters into the holding pond. This permits fish migration even if beavers add material around bridge pilings; or the devices themselves.

The Beaver Patrol clears anything blocking the fish passage gates of the devices twice each week, except during the winter when beavers are less active.

Conclusions

Pools created by beaver dams provide tailout areas preferred by coho for spawning. Since the Beaver Patrol clears impediments to fish passage twice each week when Dredge Creek in not frozen, it is unlikely that spawning habitat will be a limiting factor to coho populations in Dredge Creek unless:

- people destroy redds after coho spawn
- construction causes sediment cover or otherwise degrade potential spawning habitat, or
- pollution degrades water quality.

Beaver ponds add summer coho rearing habitat in Dredge Creek. At least as important, by increasing water temperature and slowing stream velocity, beaver dams improve the winter survival of coho salmon in Dredge Creek.