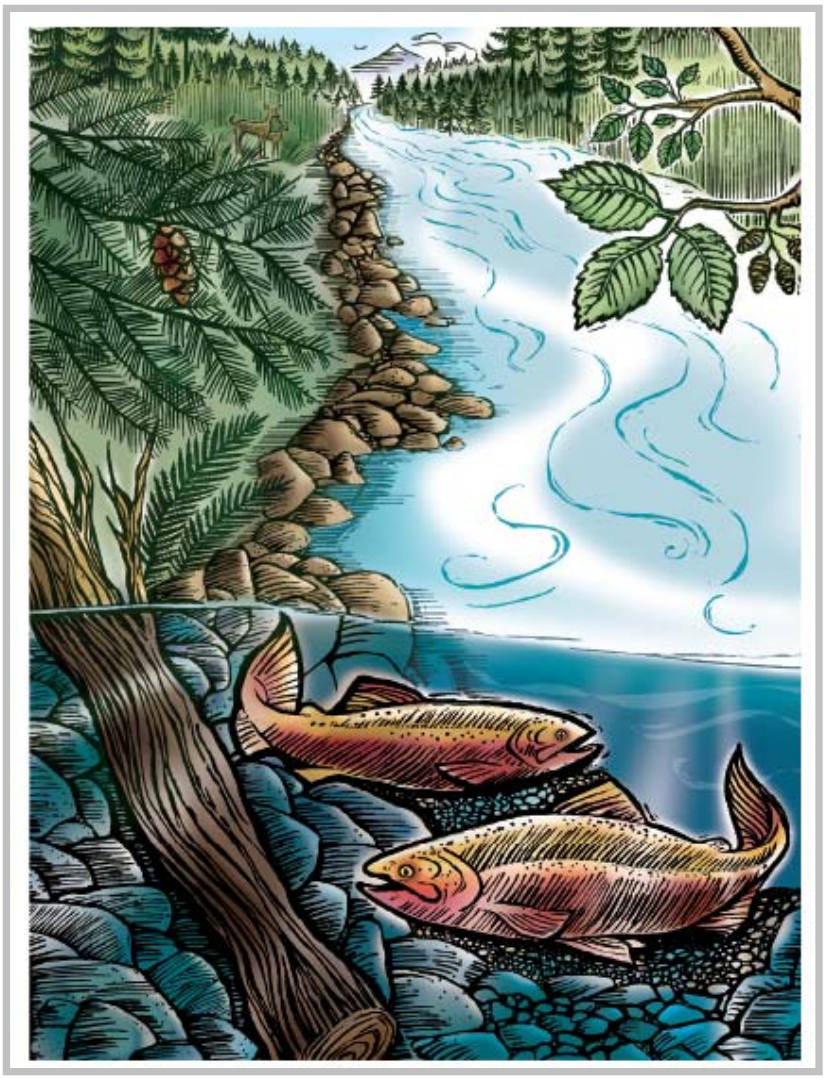

Cedar Creek Fish Habitat Survey

2015

June 2016

Burke Strobel, Fish Biologist

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

Summary

The Portland Water Bureau (the City) surveyed Cedar Creek in August, 2015, as part of the monitoring commitments associated with the City's Bull Run Water Supply Habitat Conservation Plan. The plan describes efforts to improve and monitor fish habitat throughout the Sandy River Basin in order to offset City impacts in the nearby Bull Run River related to water supply operations. Much of Cedar Creek was surveyed from immediately upstream of the Oregon Dept. Fish and Wildlife fish hatchery, approximately 1.5 miles upstream of the creek's mouth where it enters the Sandy River, to a point approximately 11.2 river miles upstream of the mouth. Several segments of the creek were not be surveyed because landowner permissions were not granted. This was the second year the City surveyed Cedar Creek. Additional surveys are planned for future years.

Two surveyors walked the stream channel in an upstream direction, estimating the dimensions of fish habitat types and counting pieces of wood in the stream channel in three distinct stream segments, consecutively named Cedar 2, Cedar 3, and Cedar 4. Wood pieces were counted because large wood in streams is important for creating high quality habitat for salmon and steelhead.

Cedar Creek's habitat was dominated by pools and large cobble riffles. The density of wood pieces in the stream channel varied widely throughout Cedar Creek and was one quarter to one half of what might be expected in a pristine stream of the same size.

These survey results will help describe the baseline fish habitat conditions in Cedar Creek. These baseline conditions will serve as a reference to compare with future improved habitat conditions for salmon and steelhead conditions in this constantly changing stream.

Background

The City surveys certain streams as a monitoring requirement associated with the City's obligations to restore fish habitat in the Sandy River basin, as detailed in its Bull Run Water Supply Habitat Conservation Plan (HCP). The HCP describes how the City will address the impacts of its Bull Run water supply operations on threatened and endangered fish species such as salmon and steelhead. The HCP was accepted by the National Marine Fisheries Service (NMFS) in 2008 and can be viewed at *http://www.portlandoregon.gov/water/46157*.

One of the habitat restoration measures in the City's HCP was to help fund the removal of barriers to passage into the creek by adult salmon and steelhead. Historically, Cedar Creek is believed to have supported large runs of coho salmon and steelhead. The construction of the ODFW Cedar Creek fish hatchery in the 1950s, however, blocked passage to 12—14 miles of the stream for spawning fish. ODFW and the City worked together to provide fish passage around those barriers in 2010. Salmon and steelhead have been recolonizing Cedar Creek ever since. Stream surveys will help biologists determine the quality of habitat that salmon and steelhead can now use in upper Cedar Creek.

Photo 1. Juvenile coho salmon can be seen in the shallows of Cedar Creek in the summer. They can be identified by their ladder-like parr marks (large marks on their sides) and the white edges and trailing tips of their dorsal fins (back fins) and anal fins (bottom, rear fins). Coho salmon and steelhead have been recolonizing Cedar Creek since 2010. Spawning coho can be seen in October and November. Steelhead spawn in March through May, but can be hard to spot because of the higher stream flows.

Purpose and Objectives

The purpose of the 2015 Cedar Creek fish habitat survey was to continue a record, begun in 2014, of fish habitat conditions and to lay the foundation for monitoring the effectiveness of future stream restoration efforts. Stream conditions can change from year to year. Monitoring over multiple years can capture this variability and provide a better understanding of what is "normal" in streams that are constantly changing. Comparing the range of conditions prior to fish habitat restoration efforts ("baseline conditions")

with the range of conditions after restoration efforts can help distinguish between year-to-year variation and changes brought about by the restoration efforts themselves.

The immediate objectives of the 2015 Cedar Creek fish habitat survey were to

- **count the number of large wood pieces in various categories**.
- **measure the relative quantity of various fish habitat types.**

Large wood in streams plays a crucial role in the creation of high-quality fish habitat. Wood can block the current, providing slow-water refuges, and provide cover to escape from predators. It can also scour pools, collect spawning gravel, and prevent nutrient sources like leaf debris and salmon carcasses from being washed away. Streams the size of Cedar Creek with pristine watersheds typically would have nearly 1,100 to 2,000 pieces of wood per mile, including pieces as small as seven feet in length and at least 4 inches in diameter. Large and small wood pieces together create messy complexes providing diverse habitat for fish.

Streams the size of Cedar Creek can have a variety of fish habitat types including pools, pool tailouts, large- and small- cobble riffles, glides, backwater pools, and beaver ponds. Pools are slower and deeper than surrounding habitat types, providing refuge to fish from swift currents. Pool tails, as defined for this survey, are shallow, downstream portions of pools with smooth flow and gravel substrate. Riffles are relatively shallow with swift, turbulent flows. Large-cobble riffles form in relatively high gradient streams and have streambeds made mostly of rocks that are softball size or larger, including boulders. Small-cobble riffles occur in relatively low gradient streams, with streambeds made mostly of rocks that are softball size or smaller. Glides are uniformly shallow with smooth water surfaces. Pool tails, small-cobble riffles, and glides frequently contain gravel patches that can be used by spawning salmon. Backwater pools have the depth and velocity qualities of other pools, but are located adjacent to the main channel. They are often eddies behind large obstructions along the stream edge. Beaver ponds are dam pools created by beaver activity, and often are transitory, washing out in some years and being rebuilt in others. Beaver ponds in particular provide valuable habitat for young coho salmon during the winter months.

Photo 2. Typical pool in Cedar Creek, formed where high winter flows scoured under a piece of large wood

Photo 3. Typical fish habitats in Cedar Creek, with a large-cobble riffle in the foreground and a pool in the background

Study Area

Cedar Creek flows from its headwaters on McIntyre Ridge in the Mt. Hood National Forest to the southwest of Mt. Hood at an elevation of about 3,800 feet to where it enters the Sandy River at an elevation of about 178 feet. For most of its length, the stream flows through a v-shaped valley with a relatively flat valley floor between 100 and 500 feet wide. In many locations the stream channel divides into multiple channels across the valley floor.

The majority of property ownership in the Cedar Creek watershed is privately owned (86%), of which 25% is private timber land. The remainder belongs to local government (3%), state government (1%), and federal government (11%, see Figure 1).

The surveyed portion of Cedar Creek was divided into three sections. The lowest section, called Cedar 2, is 3.4 miles long, from the fish hatchery upstream to the confluence with Beaver Creek. The middle section, called Cedar 3 extends for 5.3 miles from the Beaver Creek confluence to the confluence of an unnamed creek on private timber land. The upper section, Cedar 4, encompasses the remaining 4.5 miles of the creek, approximately one mile of which was surveyed in 2015.

Various fish can be found in Cedar Creek. Coho salmon and steelhead have had access to Cedar Creek upstream of the fish hatchery since 2010. There is no clear natural barrier to their upstream migration until near the headwaters of the stream. Resident cutthroat trout, rainbow trout and sculpin are believed to occupy the entire surveyed portion of the creek as well as much of the stream upstream. Adult Pacific lamprey and pumpkinseed sunfish also occur in the downstream portion of Cedar Creek. Pumpkinseed sunfish, which are an introduced fish species, probably originate from private ponds along the stream channel.

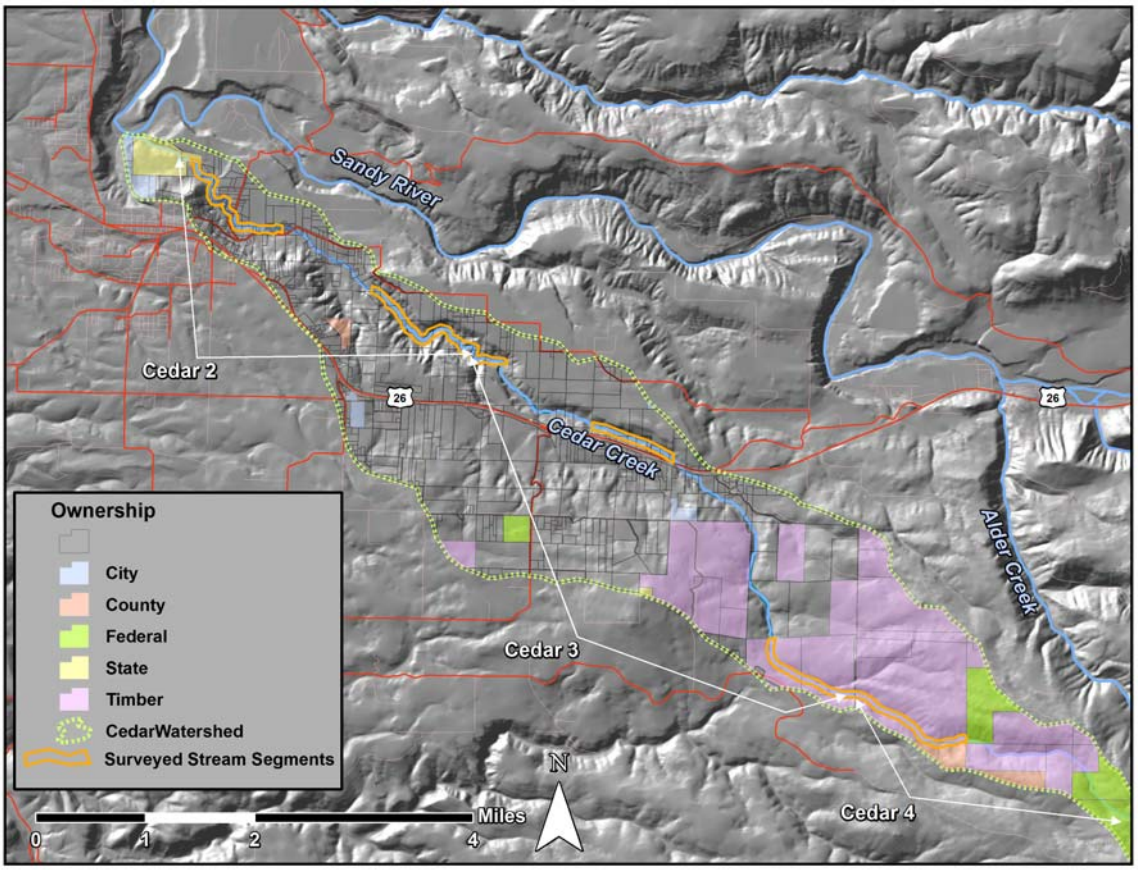

Figure 1. Map of the portion of Cedar Creek surveyed in 2015.

Results of the Survey and Conclusions

Large Wood

The density of wood pieces in Cedar Creek varied widely, depending on location along the length of the stream. Cedar 2 had the lowest amount of wood, at 263 pieces per mile. Cedar 3 had about 303 pieces per mile. Cedar 4 had the highest quantities of wood, with 918 pieces per mile. These quantities are similar to what was observed in 2014 and are roughly one quarter to one half of what might be expected in a pristine stream of the same size. Wood quantities were lower in Cedar 3 in 2015 than in 2014 because parts of the stream that happen to have the largest number of wood pieces in 2014 could not be surveyed in 2015.

Another way of describing the amount of wood in a stream channel is by summarizing it in terms of "Wood Pieces per Channel Width". This method of describing wood density is a way that allows streams of various widths to be more easily compared. Channel width refers to the average stream width in the highest-flow month of the year. One channel width in Cedar 2, for instance, is about 45 feet. So this measure is the same as saying

"wood pieces per 45-foot length of channel". Narrower streams tend to have more wood, but also a shorter channel width. The result is a similar measure of "wood per channel width", all else being equal. Figure 2 shows the distribution of wood pieces along the length of Cedar Creek surveyed in 2015, expressed using this measure. The average numbers of pieces of wood per channel width for Cedar 2, Cedar 3, and Cedar 4 were 2.2, 2.0, and 4.5, respectively.

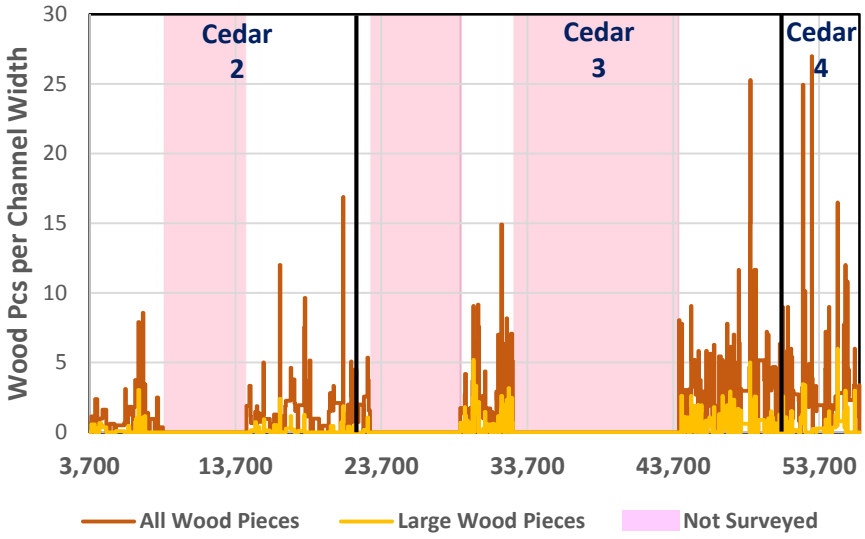

Figure 2. Longitudinal distribution of large and small wood pieces in Cedar Creek.

Habitat Types

The majority of fish habitat in all surveyed sections of Cedar Creek in 2015 was made up of pools, large-cobble riffles, and small cobble riffles. The frequency and length of small-cobble riffles decreased in an upstream direction. The proportion of pool habitat was highest in Cedar 3, where larger accumulations of large wood scoured pools in places that otherwise would be small cobble riffles. The steeper stream channel in Cedar 4 resulted in a significant increase in the amount of large-cobble riffles. Although the amount of wood was also higher in Cedar 4, the relatively large streambed substrate makes the scouring of pools more difficult. Relative quantities of habitat types for Cedar 2, 3, and 4 are summarized in Figure 4. The amount of small-cobble riffles had decreased from 2014 to 2015, especially in Cedar 3. Part of this change could be attributed to winter flows moving small gravels and cobbles to convert small-cobble riffles into pool habitat and large-cobble riffle habitat. Most of this shift is probably due to the fact that some stream segments could not be surveyed in Cedar 2 in 2014 that were surveyed in 2015, whereas some stream segments surveyed in Cedar 3 in 2014 could not be surveyed in 2015.

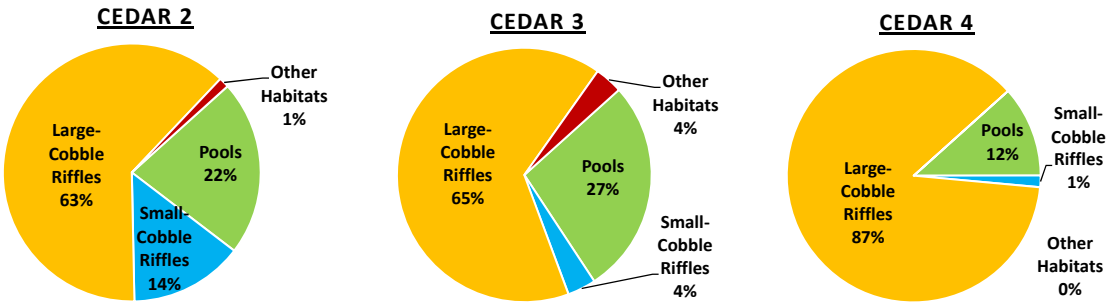

Figure 4. Relative amounts of habitat types (by surface area) in Cedar 2 (left), Cedar 3 (middle), and Cedar 4 (right)

The amount of wood and relative proportions of fish habitat types can change from year to year in streams like Cedar Creek. Winter storms, for instance, can blow trees over, which may in turn scour new pools or introduce gravel into the stream. Floods can wash away large debris jams, or create new ones. Beavers can dam and inundate stream channels in certain years. Repeating surveys over several years allows us to describe streams in terms of ranges of habitat conditions, rather than in terms of static states. The Portland Water Bureau intends to duplicate the 2014 and 2015 Cedar Creek survey efforts in future years in order to describe the shifting of fish habitat over time as salmon and steelhead recolonize this dynamic stream.

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET