

Salmon Restoration Projects

Use the information from this reading (or from the Tour of Salmon Restoration Projects Video) to fill out the Healthy Salmon Habitat Worksheet.

Coho salmon are an endangered population in the area that includes Westminster Woods. Many scientists and other people are working together to help coho salmon. Lots of projects have been done at Westminster Woods to help salmon.

Start of the Salmon Story

Dutch Bill Creek is part of a larger watershed - the Russian River watershed. There used to be lots of salmon living in this area. Since the 1800s, salmon populations on the west coast have been steadily declining. In the Russian River watershed, from 1975 to 1991, there was an 85% decrease in the number of smolts going to the ocean. The main reason the numbers of salmon went down was that their habitat was being degraded by humans. Turning the forests into farms and cities made the salmon habitat worse. So did deforestation - cutting down lots of trees.



Large Redwood Stump

The area of Westminster Woods was once logged. The large redwood stumps at the Woods is evidence of this. The North Pacific Coast Railroad was built through here in the 1870s. It carried out lumber (as well as carrying passengers).

Beginning of Restoration Projects: Dam Removal

In the 1990s, Dutch Bill Creek was named a "critically impaired waterway," and restoration projects were started in the area. Westminster Woods used to put a dam under its



Dam Used to Be Under Footbridge

footbridge in the summer. This created a swimming hole. One of the first restoration projects was taking out dams here, upstream at Alliance Redwoods camp, and further upstream at Camp Meeker.

Dams create problems for salmon. They block salmon from going further upstream (or at least make it much more difficult). They also change the shape of the stream and the way water moves through it. Dams create slow-moving, warm pools

of water that are ideal for predators of salmon. Higher water temperatures are also bad for salmon. Removing these dams was one of the first steps toward improving the stream habitat.

Reducing Erosion from Roads



Dirt Road

Another early restoration project was improving dirt and gravel roads. The goal is to reduce erosion. Dirt and bits of rock are called sediment. When water carries sediment downhill into creeks, it clogs up the clean gravel salmon need. Salmon eggs and alevin in the gravel may suffocate. Sediment also creates other problems. It clogs fishes' gills. It covers their food sources on the stream bottom. It shades out the sun needed for aquatic life.

Roads, especially old logging roads, are a major source of erosion. Many of the roads had in-slopes with culverts. That means the water flows to the uphill side of the road. Then it flows along a ditch. Eventually it goes through a culvert, or large pipe, under the road. The roads here were improved to

have out-slopes with dips to shed water. This means the road is tilted toward the downhill side. The water flows off the road. This slows water down, so it picks up less sediment.

Student Projects to Reduce Erosion

Another cause of erosion is trails or when people go off trails. Some students at Westminster Woods have done projects to reduce erosion from trails. They have lined trails with rocks. This encourages people to stay on the trail. They have covered unofficial, or "social," trails with sticks and duff. Then people don't walk there and plants can regrow. Students have also built check-dams, structures made of sticks and duff. Check-dams slow down water and trap sediment.



Check Dam beyond Rock-Lined Path

Finding Spawning Coho

Scientists looked for coho salmon in the Russian River watershed from 1991 to 2001. They found coho in only 2 out of the 39 creeks that used to have them. Coho were thought to be extinct from Dutch Bill Creek... until 2001, when a group of students with their naturalist

spotted spawning coho salmon. The naturalist videotaped the spawning salmon. This video evidence led to more restoration efforts here.

Captive Broodstock Program

The Russian River Coho Salmon Captive Broodstock Program was started in 2001. Scientists took about half the coho salmon they found in Dutch Bill and Green Valley creeks. They carefully bred the salmon. Then they released young salmon into streams. The goal is to build a self-sustaining population of coho salmon here. Three years after scientists captured salmon from Dutch Bill Creek, no more wild coho were found in Dutch Bill Creek. Luckily, their genetic information had been saved. The first release of hatchery-raised salmon was in 2004; the first release into Dutch Bill Creek was in 2006.

The Captive Broodstock Program is made up of a team of organizations and people. The salmon are bred and raised at the Warm Springs Fish Hatchery on Lake Sonoma. Westminster Woods also participates by allowing them to release salmon here. In the spring, smolts are put in a circular green tank that has creek water flowing through it. The smolts get used to the smell of Dutch Bill Creek. This is their chance to imprint on Dutch Bill Creek. Hopefully they will find their way back here as spawning adults. After about two weeks, the fish are released into the creek and head out to the ocean.



Students Help Put Salmon in Green Tank

Data Collection and Monitoring



Scientists Measure Salmon Caught with Electrofishing

As part of the efforts to bring back coho salmon, there's a lot of monitoring and data collection going on. The Russian River Salmon and Steelhead Monitoring Program does a lot of this monitoring. They send out scientists to the creeks and streams. The scientists count fish by walking along the creek and looking for spawning salmon. They snorkel to count fry. They trap (and then release) smolts headed to the ocean. They even use electrofishing - temporarily electrocuting fish in pools in order to measure and count them.

They also use antennas. One of the antennas is at Westminster Woods. It is partly hidden under rocks in the stream bed. Before young coho from the Warm Springs Fish Hatchery are released, they are implanted with a PIT tag. That stands for Passive Integrated Transponder. Each PIT tag has a unique number. It is used to track information about the individual fish. When they swim past antennas on their way to or from the ocean, the antennas detect tagged fish.

Water Storage Tanks

One of the challenges to salmon survival is low summer streamflow. In the summer, stream levels drop because it is not raining and because people use the water. Low stream levels lead to warmer water temperatures, disconnected pools, low dissolved oxygen levels, and even completely dry streambeds.



Water Storage Tanks

Westminster Woods used to take water from the creek in the summer to irrigate our fields. Then, in 2015, we gave up the right to do that. In exchange, we got new green water storage tanks. The tanks were built by the Russian River Coho Water Resources Partnership and other organizations. The green tanks get filled with water from our springs during the winter. Then the water is used in the summer to water the fields. The tanks can hold 175,000 gallons. This was estimated to be enough to meet our irrigation needs for 4 to 6 months. The Woods also got a new irrigation system and reduced the size of the grassy area on the Big Green Field. This project leaves water in the creek for salmon in the summer when they need it most.

In-Stream Structures

People used to think that clearing logs and stuff out of creeks made the habitat better. Actually, logs in the creek are important to salmon in multiple ways. They're so important that a big part of restoring the salmon habitat has been building in-stream structures. These structures are made of logs, boulders, and root wads. This work has been done by Gold Ridge RCD working with Dragonfly Stream Enhancement and Streamline Engineering.



In-Stream Structures

The structures create hiding places and shelter for salmon. Salmon can hide from predators near the structures. When the creek is high during winter rains, salmon can find spots in or around the structures where they won't be swept away.

The structures also change how water in the creek flows. When the creek is high, water flows over the structures. This digs out pools just past the structures. Young salmon need these deep, cool pools to survive the summer. The structures can also be designed to help create areas of clean gravel, which salmon need as a place to lay their eggs.

Trees Planted by Creek

One more restoration project has been planting trees and shrubs near the creek. Having trees and other plants near the stream is important to salmon for many reasons. Trees provide shade. It keeps the water cool, and cold water can hold more oxygen. Leaves that fall in the creek are food for creatures that salmon eat. Branches and trees that fall in the stream work similarly to in-stream structures. They provide hiding places for fish and help create pools. Plants growing near the stream help filter pollution out of water that flows over the land toward the stream. The roots anchor the soil and help prevent flood damage. The trees also help control erosion and prevent extra sediment from getting into the creek.



Tree Planted By Creek

As you can see, many different restoration projects have happened and are happening near Westminster Woods. Many organizations, scientists, and other people are working together to help salmon. Making the habitat better for salmon helps the whole forest be healthier.