Eel study looks at potential effects of sediment in streams in Siletz Basin

Tribal Aquatics Program examines eels' reactions to dirty water

By Diane Rodriquez

A study of whether sediment in streams affects lamprey eels in the Siletz River basin is being conducted by the Tribal Aquatics team.

Several things can affect how much suspended sediment, also called turbidity, can affect a stream, things like rotting leaves, land use practices in the area and weather events like storms and floods. The geology and surface soil of the area also have an effect, said Stan van de Wetering, Aquatics Program leader and biologist, who is directing the lamprey eel study.

"There are several dozen different soil types in the Siletz Basin," he said, defining soil as what is in the top three to six feet of the ground. Geology in the basin also is diverse.

He described the basin as having erodible (softer, sand-like and easier to break apart) and non-erodible (hard or granitic) rocks.

Soils often are washed into streams during rain events while rocks (erodible and non-erodible) often are supplied to streams during landslides. The soils often are immediately suspended in the water column whereas the rocks are worn over time and ground into smaller particles that later get suspended during high-flow events.

These eels are in a large container in a separate part of the fish hatchery.

The Aquatics Program has been working on measuring turbidity in Siletz streams for the past 12 years. Its work has focused on determining what portion of the suspended sediment is natural and what portion may be from human-caused activities. It now is taking that earlier work and using it to examine whether increases in turbidity affect lampreys, i.e., do they care?

Both studies are funded through a grant from the Environmental Protection Agency (EPA) and are part of a larger effort to examine what we call best management practices used by the Oregon departments of Forestry and Agriculture. The second study is a lab-based one and the current year is a "pilot" year.

"During the pilot year we'll work with the fish to determine if the tank configuration works properly, we'll examine the extent of variation between fish and we'll identify how many fish can be looked at simultaneously," said van de Wetering. "If the system works and the animals respond in any measurable way, we will carry out a second full study year."

Eels in lab at fish hatchery

Adult eels in fresh water don't eat during the winter and instead live off of stored fats as they burrow under rocks.

In the lab at the Tribe's Lhuuke Illahee Fish Hatchery for a five-month span (ending this month), eels have been on the control side of the experiment or the treatment side. Those on the control side do not spend any time in dirty water. Those on the treatment side spend five days every third week in dirty water. Approximately 16 eels are in each test group.

In addition to testing the eels' long-term response to suspended sediment, the study examines the eel's immediate response to increases in turbidity. One at a time, eels are placed in clean water in swim tubes, which initially tends to increase their anxiety. They remain in the swim tubes, which are covered to give them the "burrowing in the rocks" feeling, for a full day.

Eel heartbeats are represented by gill beats, which are measured periodically during this 24-hour period. At some point, dirty water is introduced into the tube. Gill beats are measured and the Aquatics team, which includes Dillon Blacketer and Issac Kentta, look for differences in the number of gill beats, which can indicate the level of stress an eel is experiencing.

Photos by Diane Rodriquez

The lab at the Lhuuke Illahee Fish Hatchery (above) has compartments that hold water with various levels of sediment in them. These two eels (right) are in a compartment with cleaner water.

The Tribe will examine whether hypothesized stress, from muddy water, can have an effect on the eels' ability to reproduce. Greater stress could lead to reduced fat stores (i.e., energy) and in turn could influence sperm motility and the ability of eggs to survive. Eels that are less stressed generally have more fat, leading to the possibility of better reproductive rates. Conversely, eels that are more stressed should be skinnier, which could reduce their ability to reproduce.

Studies of sperm and eggs from the "control" eels (those continually in clean water) and the "treatment" eels (those exposed to dirty water) can indicate how dirty water, with varying amounts of sediment or turbidity, does or does not affect eels. Then by looking at the turbidity monitoring data for streams in the Siletz Basin, scientists can see what locations can potentially be better for eel restoration efforts.

Results from the study, expected in the late summer of 2014, will be shared with the EPA, state of Oregon and other stakeholder partners, said van de Wetering, including commercial timber companies, watershed councils and agricultural land owners.

"The results hopefully will inform us as to what the best habitats are for adult lamprey and where our current land management activities are having positive, negative or no effects on lamprey survival, specific to suspended sediment," he said. "This could lead to an understanding of what areas should be protected for lamprey. In addition, our hope is it will inform us as to what habitats to restore for lamprey."

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A representative from the Oregon Coast Aquarium talks to Jordan Smith during Family Night at Siletz Valley School on Feb. 5. The event was sponsored by the Tribal CARE Program. Several Tribal and community programs also participated.