

It's curtains for these fish during pile driving in the river

Protecting the environment one fish at a time could be the motto for a bubble curtain device used during the pile driving for the Interstate 5 McKenzie and Willamette bridges replacement project.

A pile is a vertical support member for a bridge and supports the substructure. The bubble curtain is a ring of bubbles placed around the pile that dissolves the percussive waves created as the pile is hammered into the ground. About 170 piles will be driven during the project.



A bubble curtain is being used to protect fish during work on bridges on the McKenzie and Willamette rivers.

"The threat involved with driving steel pile is the percussion actually draws fish in," said Brian Bauman, Region 2 environmental coordinator. "When they get too close during a percussive wave, it explodes or compresses their swim bladder and you get mortality. This [bubble curtain] should reduce that to a point of insignificance."

The disastrous effects of percussive waves received attention in California when pile driving activities resulted in large fish kills. Subsequent research showed that the transmission of waves from steel pile driving in the water injured the fish swim bladders. This led to either death or an adverse impact to the fish behavior patterns.

The main components of a bubble curtain include a high-volume air compressor, primary feed line and an air distribution manifold. The air distribution manifold is placed so it surrounds the piling below the water surface. An effective bubble curtain system distributes air bubbles that surround the perimeter of a pile to the full depth of the column. The manifolds are adjusted to remove any gaps in the coverage area. Many small bubbles are preferable to a few larger bubbles.

In the Willamette and McKenzie rivers use, the bubble curtain is protecting state and federally listed Upper Willamette spring chinook and bull trout.

"It was in the term and condition of our biological opinion from the National Oceanic and Atmospheric Administration Fisheries section that we install and utilize these as a minimization measure," Bauman said. "We also consulted with U.S. Fish and Wildlife Service regarding bull trout in the McKenzie. If there are bull trout in the area, the bubble curtain will be beneficial to them as well as any other trout and nongame species."



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Bauman said this is the first time ODOT has used the bubble curtain technique to lessen the impacts of pile driving during a bridge project, and it won't be the last.

"We expect to see this term and condition more frequently on future projects," Bauman said.

The level of impact to fish habitats depends on the type of pile used (in this instance ODOT is using steel pile), the type and hardness of the bedrock and how easily it fractures, and the depth when the pile reaches resistance.

Driving pile requires a tremendous force and maintaining separation between the pile and the bubble curtain is a challenge. Several curtains were smashed or ripped to shreds during construction of the Willamette River work bridge.

"The contractor had to redesign until they got one that worked," Bauman said. "It hasn't been all smooth, but it has been a learning experience for me, the contractor and the ODOT inspectors on what to expect and what may not work."

The bubble curtain information ODOT is using is based on research from Frasier River Pile and Dredge LTD., a Canadian company that produced a document called "Bubble Curtain Systems for use during Marine Pile Driving." The report was in response to fish kills during pile driving in March 2000 off the coast of Vancouver, British Columbia.

"I don't know if anyone knows how effective the curtain will be in a rushing river circumstance," Bauman said. "It is the best management practice that we could possibly install that we know about."

"This is a relatively new development in our realm of things," he added. "A problem was identified and in a short amount of time a solution was developed. We are seeing it implemented and it is a great minimization technique."

The pile driving for the Willamette River work bridge is finished. The contractor will start driving pile for the work bridge spanning the McKenzie River on June 1.

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