Crimson Tide in the Columbia River Estuary

Mapping the non-toxic outbreak of *Mesodinium rubrum*

Narrator: Late summer, 2012. Right on schedule, the blue waters of the Columbia River estuary turn crimson – the result of a yearly massive red-water bloom.

On the river, scientists from the Applied Physics Laboratory at the University of Washington are here to study the bloom.

Craig McNeil: When you drive over the Astoria bridge and you look down in the water, you see the water is red. As a scientist, I'm interested in why the water can turn red – why a bloom can persist and grow when there's very strong currents.

Narrator: For two days, the APL team put the Columbia's crimson tide under the microscope.

McNeil: We had a ship in the middle of the channel at anchor – the *Forerunner*. We had a plane in the air to give us the large spatial picture and we had the underwater vehicles flying up and down to get us detailed information on the currents, the phytoplankton distributions.

Trina Litchendorf: The vehicles navigate in the river using long base-line navigation. Prior to deployment, we deploy four acoustic transponders in the river and the vehicle communicates with us using acoustic modem packets and it transmits information on its latitude, longitude, speed, depth, and mission leg.

Narrator: On-board sensors measure pigments in the river, turbidity, and dissolved oxygen in the water.

McNeil: The phytoplankton is highly productive, produces lots of oxygen and removes carbon dioxide from the water. The oxygen production is really good for the water quality.

In fact, the red bloom being highly productive and producing oxygen mitigates the low oxygen coming in from the ocean and that's good because, for example, salmon need oxygen in the water to breathe.

Narrator: Probing the mysteries of the Columbia's crimson tides, APL partners with the Oregon-based Center for Coastal Margin Observation and Prediction. Earlier research established the non-toxic red blooms are the visible results of high concentrations of a micro-organism called *Mesodinium rubrum*.

McNeil: Our goal is to map and try to understand the spatial and temporal distribution of the red bloom.

When you put all that information together in numerical models and try to simulate the system that's the way forward to be able to understand the impact of these blooms on the ecology of the Columbia River.

This is APL The Applied Physics Laboratory at the University of Washington in Seattle.