

## Salmon threatened by disease and shifting boundaries

This documentary would follow the battle between the “protagonist hero” - salmon in the Pacific Northwest and the “antagonist villain” - the deadly microscopic parasite *Ceratonova shasta*. The battle of who will win is set in the context of a changing world. With climate change, we are already seeing that the **natural** boundaries that determine where species can exist and co-exist are shifting. For example, changes in the climate and rising temperatures and lower precipitation are leading to decreased snow pack, low water levels and high river temperatures. How will this affect the interplay between the deadly parasite and the salmon of the Pacific Northwest that are valued not just economically, but ecologically, spiritually, historically and culturally?

Salmon: how will salmon fair in these conditions? Will warmer temperatures mean more fish get stressed? just like humans will they be more vulnerable and therefore more likely to get sick? Will the timing of their migration change?

Parasite: Will the parasites thrive at higher temperatures? Will they flourish in numbers? Will there be a change in the season that their numbers peak?

But in the Pacific Northwest, there are also the **physical** boundaries of dams, and in Oregon there are more than 1000 dams on our rivers. These dams regulate river flow for flood prevention, provide hydroelectric power and water for irrigation and allow navigation on larger rivers. However, they have also impacted water quality, restricted fish passage and necessitated construction of hatcheries to augment free-ranging salmonids populations. On some rivers these dams are beginning to be removed, allowing natural fish passage, and in 2022 the largest dam removal project in the history of the world will occur on the Klamath River. But we don't know how removal of the dams and reintroduction of fish stocks to areas they haven't populated for decades will affect the interplay between pathogens and fish. And numerous stakeholders - fishermen, conservationists, power companies, tribes, state and federal agencies, and their lawyers - need answers to these questions.

To answer some of these questions, scientists are conducting research in the Klamath River and at the John L. Fryer Aquatic Animal Health Laboratory. Below are some examples of the research efforts and how they hope to answer some of the questions above.

Scientific Research is looking at the:

- **Who?** The fish species that are affected and how sensitive they are to disease and climate change effects.
- **What?** The problem of a deadly parasite killing large numbers of salmon. Will there be an increase threat of disease due to shifts in boundaries (climate change and dam removal?)
- **Where?** This interaction is playing out in the Klamath River, as well as other rivers in the Pacific NW
- **When?** When boundaries change: The future is now

The documentary will investigate how scientific research helps inform management and conservation decisions and look to the future as we prepare for both a changing climate and the biggest natural resource renovation project: dam removal in the Klamath river.