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Risk Assessment

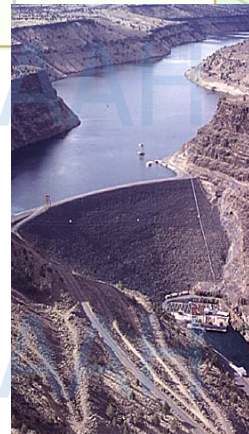
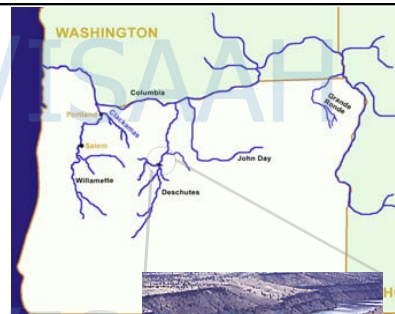
Introduction and Establishment of *Myxobolus cerebralis* in the Deschutes River Basin, Oregon, USA

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Christopher Zielinski, Harriet Lorz, & Jerri Bartholomew
Department of Microbiology
Oregon State University



Deschutes River Fish Passage Program

- Dams have blocked passage of anadromous fish into the upper Deschutes River for over 40 years
- Program goals
 - Increase salmon and steelhead populations by providing upriver habitat above dams
- Study objective
 - Assess the disease risk for resident fish from reintroduction of anadromous fish
 - *Myxobolus cerebralis*

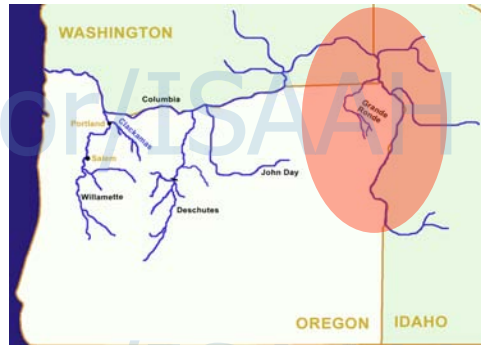


History of *Myxobolus cerebralis* in Oregon

Enzootic in tributaries of the upper Columbia River Basin

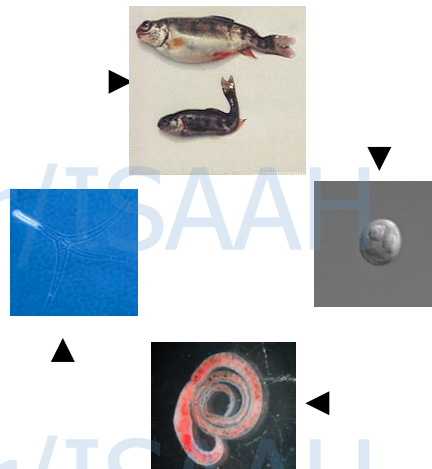
Introduction in the Deschutes River

- Since at least 1984 by infected stray adult salmonids
 - Primarily hatchery summer steelhead
 - To a lesser extent spring Chinook salmon



Risk Assessment Approach

1. **Hazard Assessment:** Determine if *M. cerebralis* is established in the lower DRB
2. **Release Assessment:** Examines ways the parasite could be introduced and moved within the basin.
3. **Exposure Assessment:** Explores the risk of establishment, proliferation, and spread of *M. cerebralis*
4. **Conclusion and Risk Management**



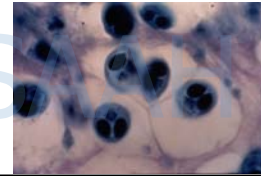
Hazard assessment: Is *M. cerebralis* established in the lower basin?

100 fry held in sentinel cages for 2 wks during late spring, fall (1995-2007)

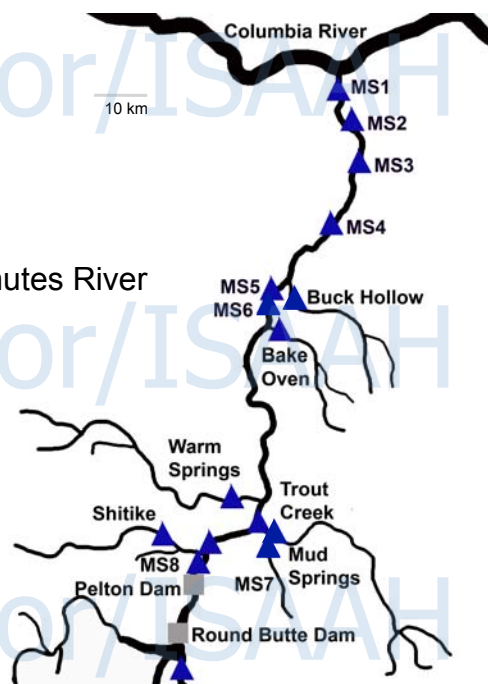
- Half the fish tested after 2 wks by PCR, QPCR

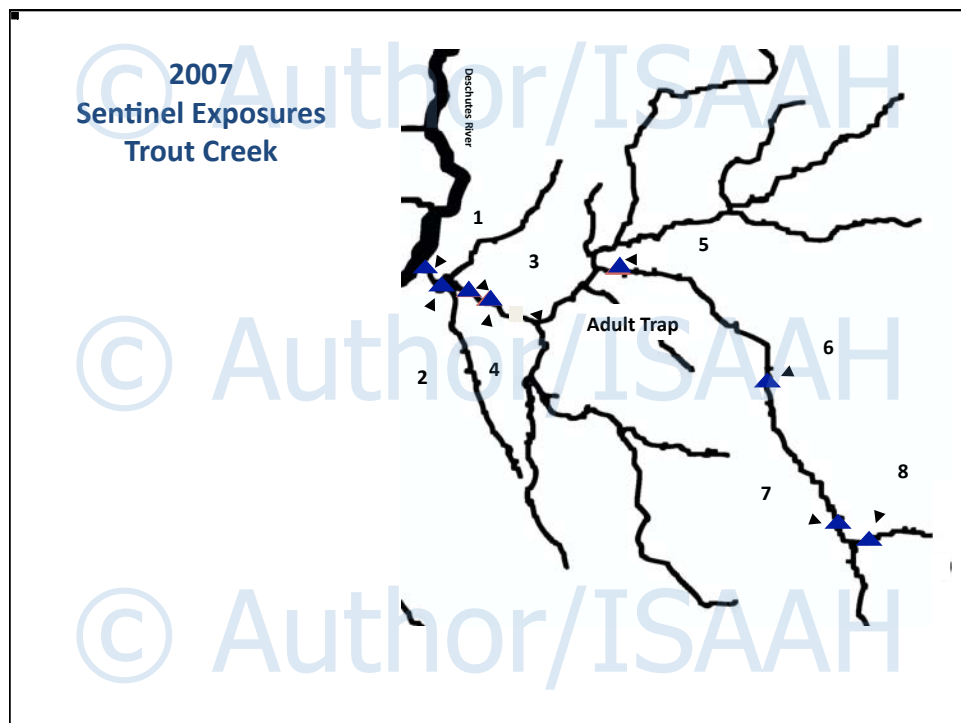
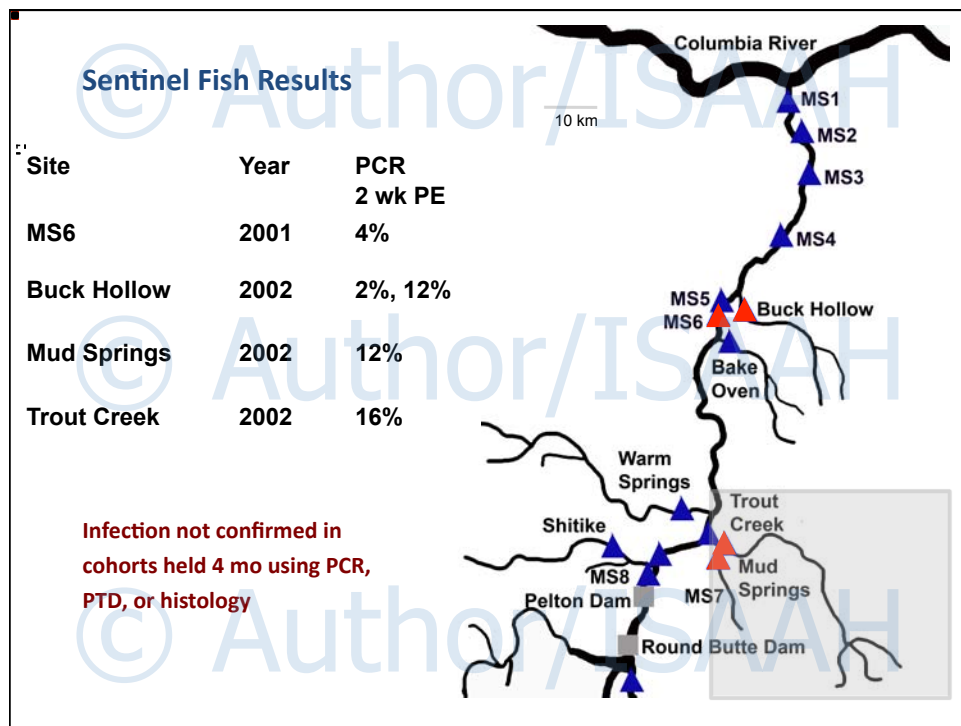


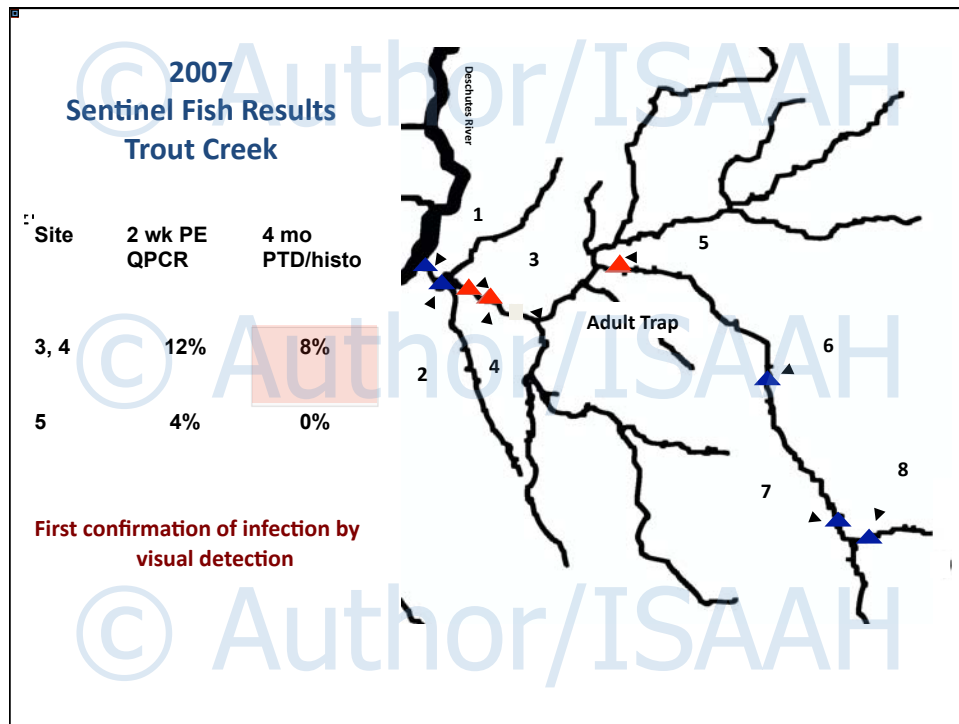
- Remaining fish from sites with positive results held 4 mo, then assayed by digest, histology



Sentinel Exposure Sites





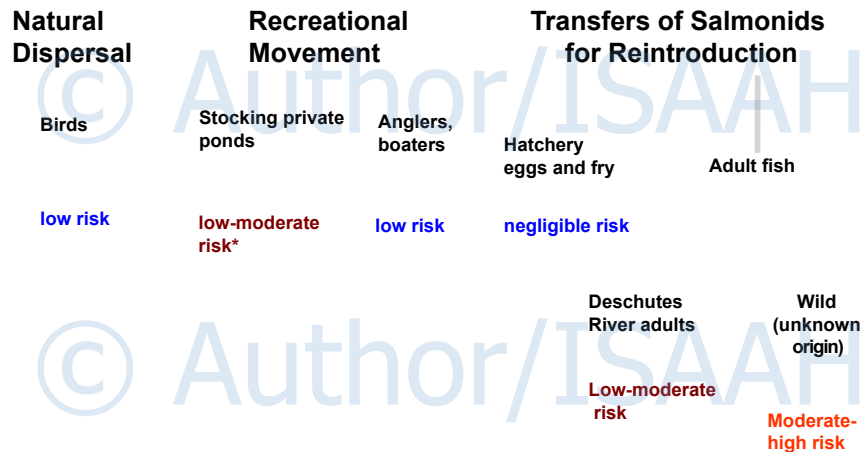


Hazard assessment

- **Establishment has occurred in Trout Creek**
 - Not wide spread and at a low level
- **Periodic establishment in other locations in lower DRB**
- **No evidence of infection in resident populations**
 - 150 summer steelhead smolts collected from Trout Creek in 2007 – negative

Release assessment: How is *M. cerebralis* most likely to be moved into the upper basin?

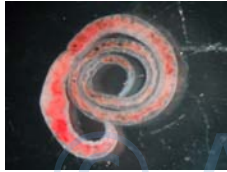
Introduction Routes into Upper Basin



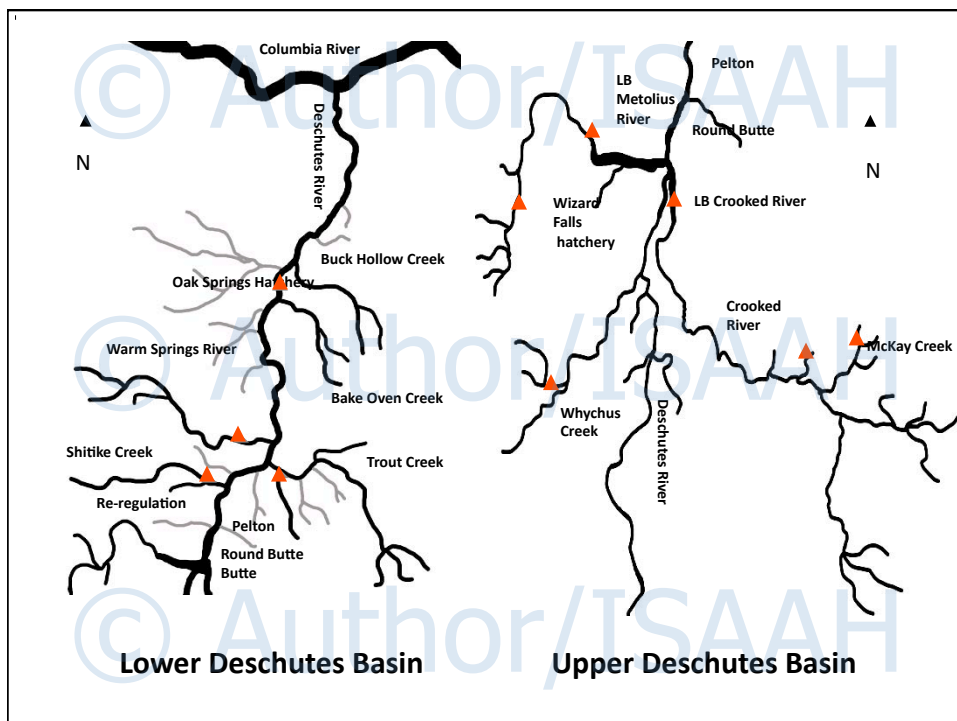
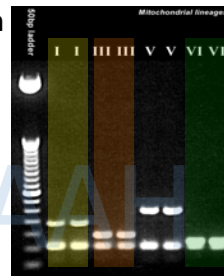
Release assessment

- Currently, overall risk of introduction for the upper basin is moderate
 - Could be lowered to low with
 - No passage of wild adults
 - Education of private pond owners
- Risk will increase if *M. cerebralis* becomes more widespread in the lower basin
 - Increased risk from transfer of native Deschutes River adults
 - Increased risk of bird and angler transfer

Exposure assessment: Risk for further establishment and spread to upper basin

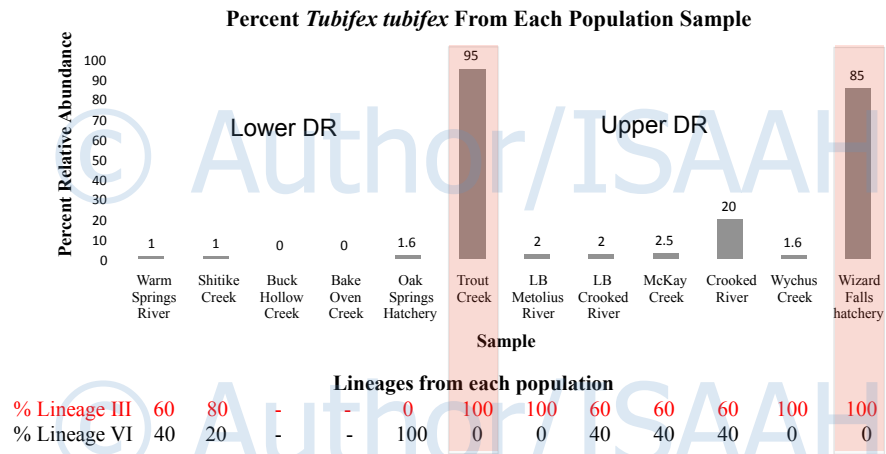


- Assessed
 - Relative abundance of *T. tubifex*
 - Proportion of highly susceptible lineage III worms
 - 60 worms per population



Relative Abundances of *Tubifex tubifex*

- At most sites, *T. tubifex* made up less than 2% of the population



Exposure Assessment

- If introduced, conditions are appropriate for the parasite to establish in both the upper and lower basin; however establishment may be limited:
 - T. tubifex* distribution is patchy
 - Relative abundance generally low
 - Presence of resistant lineages lowers the susceptibility of many populations
- Additionally,
 - Temperature characteristics of some tributaries not conducive to parasite proliferation
 - High summer water temperatures reach 20°C or higher
 - Other tributaries have year-round cool water below 10°C

Conclusions and Risk Management

- **Future introduction into the lower basin will almost certainly occur**
 - Infected stray steelhead and Chinook salmon
 - Very limited ability to control
- **Under current conditions the likelihood of introduction into the upper basin is low-moderate**
- **However, if establishment levels increase or the parasite becomes more broadly distributed in the lower basin, introduction risks will increase**
 - Recommend monitoring in Trout Creek and other high risk tributaries

Acknowledgements

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- Don Stevens for his many years of volunteer work

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