

Importance of pre-treatment data to accompany management of *Elodea canadensis* and fisheries resources on the Copper River Delta

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Populations of *Elodea canadensis* occur in many waterbodies distributed across the Copper River Delta landscape in varying degrees of abundance. The Copper River Delta is the largest contiguous wetland complex in North America with an area of approximately 700,000 acres encompassing large lakes, glacial outwash ponds, shallow perched ponds, and a network of both connective and dammed sloughs. Habitat conditions vary among waterbodies due to differences in biotic and environmental variables. *E. canadensis* is present in waterbodies that serve as integral juvenile salmon rearing habitat as well as in closed systems. The fishing industry and local economy in and around Cordova are dependent on the health of the delta's aquatic ecosystem to support five species of Pacific salmon. These runs draw approximately 20 million dollars in annual revenue commercially in addition to personal, sport, and subsistence harvest and associated revenue. Current scientific literature lacks pointed investigation regarding salmonid use and growth, food web dynamics, and changes in the aquatic vegetation community within subarctic aquatic ecosystems harboring *Elodea spp.* Beginning in 2015, the Cordova Ranger District implemented a collaborative effort to gather empirical data on the macrophyte community, fish, aquatic macro-invertebrate assemblage, and water chemistry components of the ecosystem in both *E. canadensis* and native macrophyte beds among a suite of waterbodies prior to treatment of infested areas. Continued research will add to the statistical power in deriving inferences to address the ecological role of *Elodea canadensis* in management of Copper River Delta aquatic resources.

Importance of Pre-Treatment Data to Accompany Management of *Elodea canadensis* and Fisheries Resources on the Copper River Delta

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Revisiting Ongoing Research



Copper River Delta Infestation Scale

- Populations of *Elodea* occur among some waterbodies within a 700,000 acre delta area
- Variability exists in parameters of waterbodies where *Elodea* has established.
- The infested study areas are representative of many other ponds, lakes and river systems on the delta
- *Elodea* is present in juvenile salmon rearing habitat as well as closed systems

An aerial photograph showing a wide river winding through a vast, green wetland landscape. The river is light blue-green, and the surrounding land is a mix of dark green forest and lighter green marshy areas. In the top left corner, the red and white structure of a fishing boat is visible, suggesting the perspective is from the water. The sky is overcast with grey clouds.

Habitat and Industry

- The fishing industry surrounding Cordova generates approximately 20 million dollars commercially in addition to personal, sport, and subsistence harvest and associated annual revenue.
- 968,000 wild sockeye salmon commercial harvest in CRD district
- 365,000 wild coho salmon commercial harvest in CRD district

* ADFG data for May – July 2016 season, gill net

Sockeye

- Primary Food Source: Plankton
 - productivity affected by temperature, light, and chemical factors from decaying plant material



Coho

- Primary Food Source: Macroinvertebrates
 - potentially affected by changes in habitat structure



Concerns to Fisheries Resources

- Presence of Elodea altering food web resulting in changes in number of salmon and growth rates
 - Loss of biodiversity with increased structural homogeneity
 - Slowing of water velocity in spawning areas encouraging fine particle settlement
- Treatment of Elodea altering food web resulting in changes in number of salmon and growth rates
 - Input of decaying plant material

Food Web Component Assessments

- Water Chemistry
- Ecosystem Metabolism
- Macroinvertebrate Community
- Aquatic Vegetation Community
- Fish Use and growth



Water Chemistry Assessment

- Water samples for chem analysis collected at macroinvertebrate collection sites
- Water column profiles measured using YSI multi-meter
- Core sediment organic matter analyzed for ash-free-dry-mass (AFDM)
- Metabolism continuously recorded DO and temperature using miniDOT sondes placed

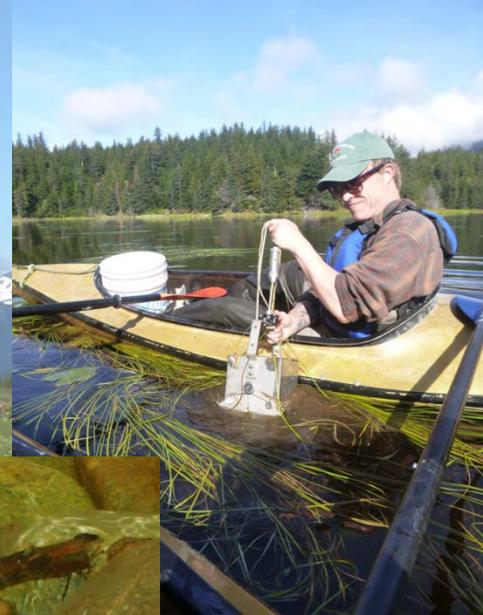


* In partnership with the University of Notre Dame

Macroinvertebrate Assessment

- Replicate Ekman grab samples for benthic invertebrates
- Replicate D-net sweeps for water column and epiphytic invertebrates
- Assignment of taxa into functional feeding and habitat groups

*In partnership with Loyola University of Chicago

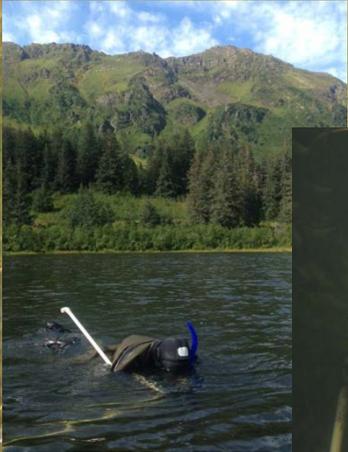


Fish Growth Assessment

- Systematic minnow trapping
- Captured Coho retained for PIT tagging, length and weight recorded
- Following season re-capture to include stomach content collection by gastric lavage



Aquatic Vegetation Assessment



- Monthly surveys estimated change in biomass of *Elodea* and the overall aquatic vegetation community composition throughout the growing season
- Abundance and distribution measured using percent cover of identified rooted taxa within 1m² plots centered on random points in ponds
- Changes in biomass and diversity assessed pre and post treatment within 1m² plots placed at regular intervals along randomly located transects.

Opportunity

- Define pathways of invasion and effects on environments; physical, chemical, nutrient, habitat.
- Gain a deeper understanding of food web processes throughout intermediate stages of change.
- Plan for scenarios that include range expansion of other adventive species under future climate conditions.

Collaborative Effort

- Pooled resources to acquire data
- Researchers interested in directing time and manpower to answer fundamental scientific questions.



Thanks

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University Investigators

Dr. Gordon Reeves -PNW Research Station, Oregon State University

Dr. Martin Berg – Loyola University of Chicago

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