

# OCRF Grant Project Completion Report

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## *Oregon Department of Fish and Wildlife*

### *Introduction*

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#### **Project Name**

**# OCRF 2022-2-09**

**Geospatial Analysis and Modeling of Stream Temperature and Fish Habitat**

**in the Clackamas River Basin**

#### **Project Location\***

Clackamas River Basin, about 940 square miles

#### **Oregon Conservation Strategy Species \***

**List the Oregon Conservation Strategy Species and Oregon Conservation Strategy Opportunity Areas that the Project benefited.**

Coho salmon, spring Chinook salmon, chum salmon, winter steelhead, bull trout, Pacific lamprey, plus any OCS amphibian species resident in areas that depend upon cool waters during portions of their life stages.

Opportunity area: Clackamas River & Tributaries

#### **Project Statement\***

**Briefly describe what the project accomplished and the problem(s) it addressed. Make a clear and concise statement; avoid jargon and acronyms.**

*Character Limit: 1000*

Over the course of three years, a comprehensive stream temperature data gathering and analysis program was undertaken and completed. We deployed over 100 stream temperature data loggers basin-wide during the summers of 2021, 2022 and 2023. Additionally, data was provided by cooperating

agencies, companies and organizations extending back to 1990 to further define the statistical model. PSU researchers used spatial stream network to estimate reach scale stream temperature using available geospatial data such as elevation, land cover, and geology. The model results in high accuracy of predicting stream temperature with 93% variation explained by the model.

Upon completion of this analysis, results were presented at professional conferences (Ecological Society of America, American Geophysical Union, Society for Freshwater Science, and the American Fisheries Society) as well as Zoom presentations to professional practitioners and the public explaining how these results can be used for conservation efforts within the basin. An interactive website with a story map was created to communicate findings.

### **Summary of Goals\***

**Describe how project goals, objectives, and/or milestones were completed. Discuss any measurable and achieved benefits (# of volunteers engaged, acreage restored, retrofits, planning documents created, research results, etc.).**

The objective is to depict in the present day stream temperature, and to project the future stream temperature within the Clackamas River Basin using a combination of the spatial stream network model and representative climate change scenarios. The major milestones were all completed with thermal maps created depicting changes that are easily understandable to all relevant parties, from the public to researchers. Two peer-reviewed papers were published resulting from this study, and another study summarizing the future stream temperature is currently under review.

Krochta, M. and Chang, H. (2024) Scales of Connectivity within Stream Temperature Networks of the Clackamas River Basin, Oregon. *Annals of the American Association of Geographers* 114(8), 1653–1667. <https://doi.org/10.1080/24694452.2023.2289981>

Krochta, M. and Chang, H. (2024) Reviewing controls of wetland water temperature change across scales and typologies. *Progress in Physical Geography* <https://doi.org/10.1177/03091333241306653>

Krochta, M, Anlauf-Dunn, K, and Chang, H (in review) Climate-driven stream temperature changes and their effects on salmonid habitat in the Clackamas River Basin, Oregon.

This project was highlighted on Clackamas River Basin Council's website and presented about at council meetings: <https://clackamasriver.org/stream-temperatures-across-the-clackamas-river-basin/>

An interactive website was created to help facilitate communication of such findings: <https://arcg.is/OneiaT>

### **Lessons Learned\***

**Describe lessons learned and challenges faced during the grant performance period. Examples being delays, contractual issues, permitting, funding, changes to the project Scope of Work or amendments, etc. Character Limit: 3000**

All data acquisition, planning, analyses, and presentations went according to plan. There were no unexpected issues to be addressed.

## **Next Steps\***

**Describe any next steps for the project, if any. Character Limit: 5000**

This project was planned and budgeted to be completed once the OCRF funds were completely expended. All goals were met. In March, an indepth well-attended webinar was hosted by Clackamas River Basin Council to further share out findings and assess next steps – this is now posted to our YouTube Channel: <https://www.youtube.com/watch?v=gjrlx9ASLHk> Further work could continue if subsequent funding was provided, such as additional data gathering and analyses, to address new questions raised by this work. However, the results achieved will allow professional practitioners to more knowledgeably undertake future fish habitat restoration projects to maximum ecological uplift for the funding provided. In essence, by knowing how temperatures vary across the basin, and how they may change in the future (both a spatial and temporal understanding of these variations), will allow for projects to be placed to maximize their beneficial longevity. All data collected will be made available for future work by any and all interested in pursuing such work. This work can be expanded to include how changes in streamflow regimes, rain/snow events, upstream riparian restoration and future urban development potentially affect stream temperature. To explore these effects, more continuous data collection and modeling efforts are needed. Collaborating with other federal agencies, municipal practitioners, and land owners will be key to the successful outcome of such endeavors. The Clackamas Partnership plans to use this project’s findings to inform its developing Strategic Action Plan.