NCASI Fact Sheet

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Aquatic Biodiversity Responses to Wildfire in Oregon

Background

Wildfires change the structure and function of forests and may influence their ability to support biodiversity and cool, clean water. In 2020, multiple megafires spread through western Oregon and burned public and private forestland, often at high severity (Fig. 1). To understand the effects of these wildfires on aquatic ecosystems, NCASI, PNW Research Station, Weyerhaeuser Company, and numerous other partners sampled aquatic biodiversity across 25 watersheds.



Figure 1. Six watersheds (2021) completely within megafire boundaries (100% burned) showing the patchy distribution of fires near streams and how even high fire severity megafires may burn unequally.

Aquatic Ecosystem and Biodiversity Responses to Wildfire

In Year 1 following three different megafires, greater fire severity was associated with higher mortality in overstory riparian vegetation leading to increased light, dissolved organic matter concentrations (complex mix of organic molecules including carbon, nitrogen, and phosphorus), macroinvertebrate densities (invertebrate animals that you can see without a microscope), and fish densities. Greater fire severity also was related to reduced canopy cover, smaller diameter large wood, and less macroinvertebrate diversity (Coble et al. 2023).

Responses of At-Risk Species to Wildfire

We sampled using eDNA (environmental DNA) and electrofishing methods to identify the presence of at-risk species (those with elevated conservation status at global, federal, and/or state levels) across a gradient of fire severity and percent watershed burned. eDNA is DNA shed from all living organisms that can be sampled in the environment (i.e., stream, soil) and can detect less abundant or difficult to capture species that can be missed by traditional sampling methods.

We detected several at-risk species only in burned watersheds, and two at-risk species (Steelhead and Coastal Tailed Frogs) were detected in both burned and unburned watersheds indicating it may be important to restore or conserve burned watersheds for their role in at-risk species conservation (Fig. 2). For example, Chinook Salmon were detected in watersheds that were 75%, 87%, 100%, and 100% burned, and *Lampetra* spp., (likely Western Brook Lamprey) were detected in two burned watersheds (75% and 92% burned). Continued monitoring and analysis will provide additional information on aquatic biodiversity responses and recovery after high severity wildfires.

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		Species detection by: wildfire response		method		
	Species	Reference (unburned)	Burned watersheds	electro- fishing	eDNA	Conservation status**
	Western Ridged Mussel* Gonidea angulata			not detected	not detected	G3; under ESA status review; OR-S2
	Cascade Torrent Salamand Rhyacotriton cascadae	ler*		not detected	not detected	G3; under ESA status review; OR-S2
	Coastal Tailed Frog Ascaphus truei	\checkmark	\checkmark	14/25	7/25	G4; OR-S3
	Northern Red-legged Frog Rana aurora		\checkmark	9/25	3/25	G4; OR-S3
	Pacific Lamprey Entosphenus tridentatus		\checkmark	1/25	1/25	G4; OR-S1
of party	Western Brook Lamprey Lampetra richardsoni		\checkmark	1/25	2/25***	G4; OR-S4
Commun .	Steelhead/Rainbow Trout Oncorhynchus mykiss	\checkmark	\checkmark	10/25	17/25	G5; ESA Threatened OR-None
• union	Coho Salmon O. <i>kisutch</i>		\checkmark	1/25	2/25	G5; ESA Threatened; OR-S3
Content of the other	Chinook Salmon O. tshawytscha		\checkmark	2/25	4/25	G5; ESA Threatened; OR-None

*Not expected in 4th-order streams

**G3 and G4 status are global; OR-S1 = critically impaired; OR-S2 = imperiled; OR-S3 = vulnerable;

OR-S4 = apparently secure

***Detections are for Lampetra spp.

Figure 2. Results of at-risk species in the first summer after wildfire (2021) across a gradient of fire severities and ownerships showing detections across burned watersheds.

For Additional Information

Coble, A. A., Penaluna, B. E., Six, L. J., & Verschuyl, J. (2023). Fire severity influences large wood and stream ecosystem responses in western Oregon watersheds. Fire Ecology, 19(1), 1-21.

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- Penaluna, B.E., Coble, A. A., & Ellison, A. (2023). Effects of fire on stream ecosystem responses in western Oregon watersheds. Northwest Fire Science Consortium Research Brief. <u>https://nwfirescience.org/our-products/fire-effects-stream-ecosystem-responses-western-oregon-watersheds</u>

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