REGULATION CONSIDERATIONS FOR SUCTION-DREDGE PLACER MINING

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we like it wild.

A COLLECTION OF THE NEW SCIENTIFIC AND OTHER FACTUAL INFORMATION FOR CONSIDERATION BY THE STATE OF WASHINGTON AS IT REFORMS ITS SUCTION-DREDGE PLACER MINING REGULATIONS.

IMAGE: The famed Rogue River in southwest Oregon was ground zero for suction-dredge mining prior to the Oregon legislature enacting regulations in 2017 (photo by Rolf Skar).

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Introduction

The following is a collection of the new scientific and other factual information for consideration by the State of Washington as it reforms its placer mining regulations. This report was made possible, in part, by a generous grant made by the Keta Legacy Foundation (formerly the Mountaineers Foundation).

The Washington Dep't of Fish and Wildlife (Department) is engaged in rulemaking pursuant to R.C.W. 77.55.091, the "small-scale prospecting and mining" statute. This law has the dual purposes of honoring the heritage of small-scale prospecting and mining, while complying with the federal Endangered Species Act (ESA) and Washington's fish protection objectives. As it seeks to achieve these purposes, the Department should be guided by the best-available science.

This paper is concerned primarily with modern practices of placer mining, in particular the popular method of motorized suction-dredge mining. Suction-dredge mining involves a motorized dredge mounted on floats and anchored in the stream. A suction hose, typically from 4 – 6" in diameter, is maneuvered along the streambed by a miner who operates in the water, often wearing diving equipment. The dredge nozzle powerfully sucks up the streambed gravels and silt down to bedrock, depositing it onto a sluice box mounted on floats. As the dredged material and water pass through the dredging system, the sluice separates the heavier gold from the other material. The remaining tailings are discharged directly back into the water from the other end of the sluice.

IMAGE: Several motorized suction-dredge mining machines (photo by Rogue Riverkeeper).

Suction-dredge mining is known by the Department to harm fish and their aquatic habitats. *See* WAC 220-660-300(2). Washington's most recent best-available science review of the impact of placer mining was the R-2 Consultants White Paper, December 2006. That paper found direct impacts including (1) mortality of early life history stages or eggs, and (2) lower productivity as a result of habitat modifications, and (3) indirect impacts including changes in food resources, and cumulative human disturbance. Significantly, it found a high likelihood of "take" of ESA-listed fish if suction-dredge mining occurs where fish are present.

As that and other studies have found, placer mining can harm fish in several different ways:

- **Geomorphic Effects**. Dredging directly removes the natural streambed, rearranges the material, and deposits it back into the stream as tailings. This destabilizes streambeds, simplifies aquatic habitat, and increases potential for streambed erosion.
- **Sediment**. Suction-dredge mining directly releases suspended sediment, a "pollutant" under the Clean Water Act, into the water column. Suspended sediment can be especially damaging to fish eggs, juvenile fish, and prey species. Sediment deposited as tailings can also smother eggs, fill pools, and have negative hydrologic impacts.
- **Entrainment**. Small fish and eggs sucked into suction dredges can be killed.
- **Mobilization of Toxins (e.g. Mercury)**. Science has advanced regarding (1) the ways that mercury mobilizes, (2) the presence of mercury in placer mining reaches in Washington, and (3) the effects of mercury exposure on life forms.
- **Cumulative Impacts**. More important than any of the individual factors, all of them, and outside events, interact and accumulate. The whole is more than the sum of the parts. A complete understanding of mining impacts requires analysis of these cumulative impacts.

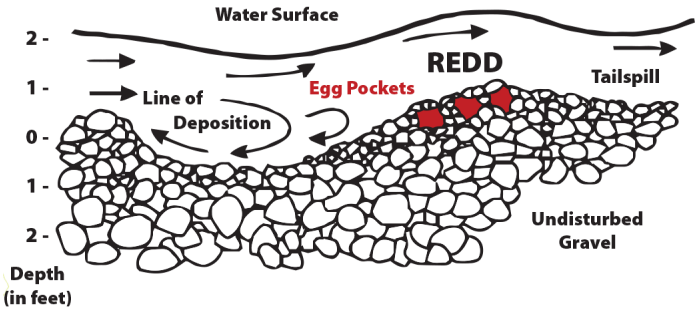


IMAGE: This diagram illustrates a typical salmon-spawning nest, or redd, in profile. Downstream flow forces water through the gravel and across the buried eggs; bringing oxygen to the eggs while moving waste away. If the gravel becomes covered in silt, or is disrupted or dislodged (such as by the vacuum of a suction-dredge machine), the eggs face future predation or direct mortality (diagram by Washington Department of Fish and Wildlife).

Building off of this information, new scientific evidence further indicates that placer mining, especially suction-dredge mining, causes harm to aquatic habitat and water quality in numerous ways. As the Oregon Chapter of the American Fisheries Society wrote in a 2017 White Paper:

> Although many of the studies on suction dredge mining dating to the later part of the twentieth century remain the foundation of the literature on suction dredge effects on stream environments, more current work has highlighted contaminant impacts related to the practice. Recent literature reviews (R2 Resource Consultants 2006; HWE 2009) and suction dredge regulatory planning documents (HWE 2011; CNF 2013; USFS 2015) summarize the earlier work and expand on contemporary investigations into how suction dredge operations may imperil aquatic organisms and human users who interact with mined environments. The expanding body of scientific knowledge on stream ecology provides the scientific community with a better understanding of aquatic organisms' habitat requirements. Additionally, the realization of the prevalence of mercury in streams that were historically mined creates a human health concern (Humphreys 2005; Fleck et al. 2011; Marvin-DiPasquale et al. 2011). As scientists develop a better understanding of mercury uptake and bioaccumulation through food webs, the risks of reintroducing previously buried mercury is becoming better understood.

> In sum, suction dredge mining may affect populations of salmon (Oncorhynchus spp.), steelhead (O. mykiss), lamprey, other fishes, and stream invertebrates; simplify aquatic habitats such that they have less capacity to support aquatic life; and increase fish, wildlife, and human exposure to toxic heavy metals.

Newly developed science draws attention to several themes that ought to be prominent as rules are developed:

- **Juvenile Fishes**. New information has been gathered regarding life history strategies of many of the relevant ESA-listed species, showing the importance of freshwater rearing habitat to fish populations.
- **Threatened and Endangered Species Recovery**. Unfortunately, the trend towards listing of additional species has continued. Five-year reviews of past ESA listings have re-affirmed listed species' imperiled status. Additional critical habitat has been designated. Recovery plans have continued to be developed. Restoration actions are proceeding on many different fronts.
- **Global Climate Change**. Best-available science conclusively shows that the global climate is rapidly changing on a warming trend, with corresponding major impacts on Washington waters and the species that depend on them.
- **Invasive Species.** Suction-dredge mining risks spread of invasive species. Current regulations are silent as to invasive species.

Best Practices for Regulating Placer Mining to Protect Threatened & Endangered Species

Washington's current approach to regulating suction-dredge mining falls short in several respects, but it does provide a good groundwork. The Department would be well served by focusing reform efforts on the following aspects of the current regulations:

- **Methods of Mining.** Some methods are more impactful than others. Washington law distinguishes between "small-scale prospecting and mining," defined to mean only four specific non-motorized methods: 1) pans, 2) non-motorized sluice boxes, 3) concentrators and 4) mini-rocker boxes, and other methods like suction-dredge mining. Application of this distinction allows greater regulation for more impactful methods, while also reducing the burden on recreational small-scale prospectors.
- **Critical Habitats** for ESA-listed species is unacknowledged by current regulations. Significant strides are being made in Washington towards locating and understanding the critical habitats for threatened and endangered fish.
- **Cumulative Impacts** are poorly addressed by current regulations. A comprehensive view is an essential supplement to case-specific and location-specific decisions.
- **Monitoring and Enforcement.** Anecdotally, the worst impacts from prospecting and mining come from operators who don't follow existing rules. With no permits, monitoring of specific placer operations is difficult, and monitoring of trends and cumulative impacts is impossible. The burden of enforcement falls entirely on under-funded Department staff and the law enforcement community.

IMAGE: The bull trout, a member of the Salmonidae family, is listed as threatened under the ESA. Their fall spawning, long egg incubation period, and inclination for juveniles to reside within the interstitial spaces of stream bed substrate, make bull trout particularly susceptible to direct impact by suction-dredge equipment (photo courtesy of Caddis Fly).

Recent Reform of Suction-dredge Mining in Nearby States

Recent reforms of placer-mining regulation in other nearby states are instructive of the general approach Washington ought to consider. Regulations of neighboring states contain the following basic elements:

1. Mining is presumptively prohibited (or prohibited outright) in designated ESA Critical Habitat or similar designation;
2. Where it is allowed, mining in Critical Habitat proceeds only after site-specific biological review and consultation;
3. National Pollutant Discharge Elimination System (NPDES) permitting under the Clean Water Act is implemented.

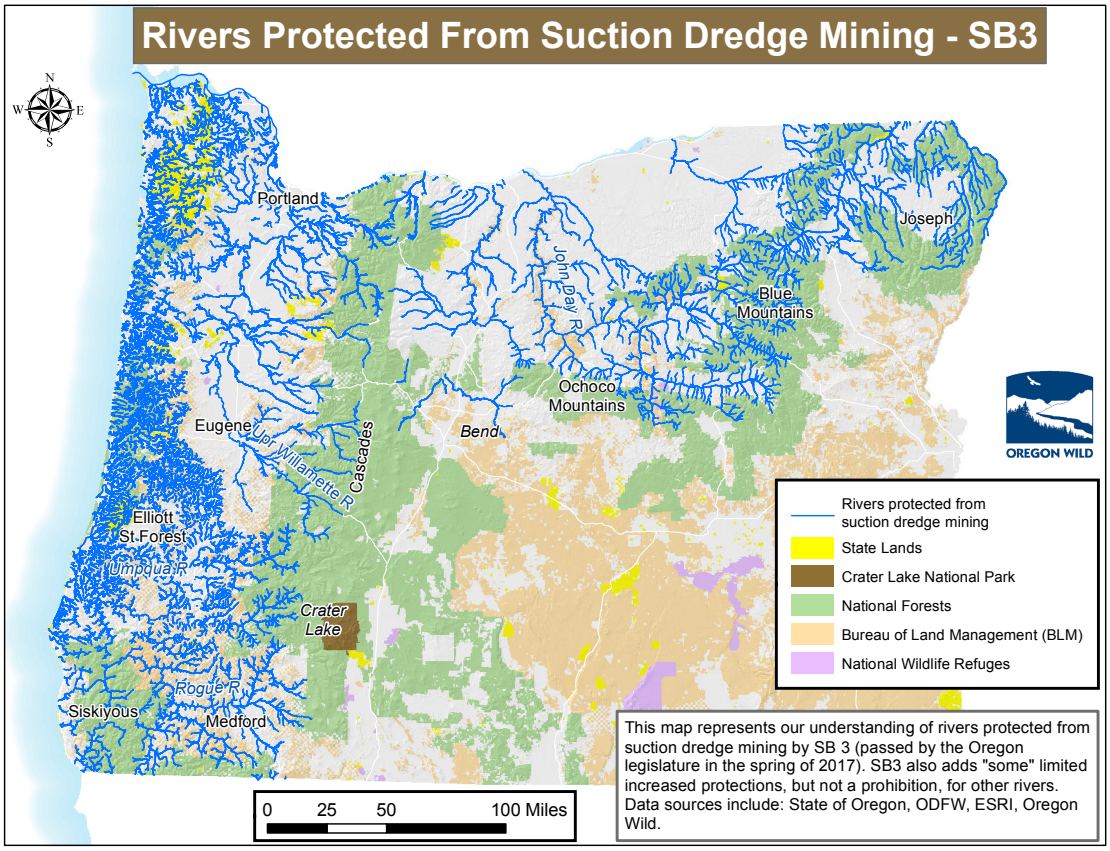
Idaho

Idaho implemented significant reforms in 2014. Because Idaho has not assumed Clean Water Act permitting authority, discharge permits for placer mining fell under the purview of the Environmental Protection Agency (EPA). The resulting general NPDES permit largely addresses the ESA issues in Idaho. As a Federal Agency, EPA engaged in ESA consultation regarding effects to ESA-listed species.

U.S. Environmental Protection Agency (EPA). 2014. Authorization to Discharge under the National Pollutant Discharge Elimination System for Small Suction-Dredge Placer Miners in Idaho. General Permit No.: IDG370000. Office of Water and Watersheds, Region 10, U.S. Environmental Protection Agency. March 5, 2014. 44 p.

U.S. Environmental Protection Agency (EPA). 2012. Biological Evaluation for Small Placer Miners in Idaho National Pollutant Discharge Elimination System (NPDES) General Permit. August 2012. Prepared by: US EPA Region 10, Office of Water and Watersheds, Office of Environmental Assessment. 81 p.

Oregon



In 2017, Oregon adopted legislative and administrative reforms, which replaced an earlier moratorium on suction-dredge mining. By statute, mining is prohibited in "Essential Salmonid Habitat," a state designation of waters important to anadromous species. Oregon also implements the Clean Water Act with a general permit.

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Oregon Chapter of the American Fisheries Society, 2017. Suction Dredge Mining Impacts on Oregon's Fishes, Aquatic Habitats, and Human Health. www.orafs.org.

ORAFS 2015. Effects of Suction Dredge Mining on Oregon Fishes and Aquatic Habitats. www.orafs.org.

California

California legislatively banned suction-dredge mining in 2013, having been politically unable to develop a workable regulatory regime.

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HWE [Horizon Water and Environment]. 2009. Suction Dredge Permitting Program. Literature review on the impacts of suction dredge mining in California. http://www.dfg.ca.gov/suctiondredge/.

HWE [Horizon Water and Environment]. 2011. Suction Dredge Permitting Program-Draft Subsequent Environmental Impact Report. (HWE 09.005) Oakland, CA. http://www.dfg.ca.gov/suctiondredge/.

SWRCB [California State Water Resources Control Board]. 2017. Draft staff report, including substitute environmental documentation for Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions. http://www.waterboards.ca.gov/water_issues/programs/mercury/.

New Science Regarding Mercury Pollution

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Bettaso, J.B, and D.H. Goodman. 2010. A comparison of mercury contamination in mussel and ammocoete filter feeders. *J Fish Wild Man* 12:142–145.

Brigham, M.E., D.A. Wentz, G.R. Aiken, D.P. Krabbenhoft. 2009. Mercury cycling in stream ecosystems. 1. Water column chemistry and transport. *Environ. Sci. Technol.* 43, 2720–2725.

Dillon. T., N. Beckvar and J. Kern. 2010. Residue-based mercury dose-response in fish: an analysis using lethality-equivalent test endpoints. *Environmental Toxicology and Chemistry* 29(11): 2559–2565.

Domagalski, J., M.S. Majewski, C.N. Alpers, C.S. Eckley, CA. Eagles-Smith, L. Schenk, S. Wherry. 2016. Comparison of mercury mass loading in streams to atmospheric deposition in watersheds of Western North America: Evidence for non- atmospheric mercury sources. *Sci. Total Environ.* 568 (638-650).

Donovan, P.M., J.D. Blum, M.B. Singer, M. Marvin-DiPasquale, M.T.K. Tsui. 2016. Methylmercury degradation and exposure pathways in streams and wetlands impacted by historical mining: *Science of The Total Environment.* 568(1192– 1203).

Fleck, J.A., C.N. Alpers, M. Marvin-DiPasquale, R.L. Hothem, S.A. Wright, K. Ellett, E. Beaulieu, J.L. Agee, E. Kakouros, L.H. Kieu, D.D. Eberl, A.E. Blum, and J.T. May. 2011. The effects of sediment and mercury mobilization in the South Yuba River and Humbug Creek confluence area, Nevada County, California:

Concentrations, speciation and environmental fate – Part 1: Field Characterization: U.S. Geological Survey Open-File Report 2010-1325A, 104 p.

Henery, R.E., T.R. Sommer, C.R. Goldman. 2010. Growth and methylmercury accumulation in juvenile Chinook Salmon in the Sacramento River and its floodplain, the yolo bypass. *Trans. Am. Fish. Soc*. 139, 550–563.

Johnson, A., M. Friese, and K. Carmack. Mercury Levels in Gold Mining Reaches on Seven Washington Rivers and Creeks. Environmental Assessment Program, Washington Dep't of Ecology. Available at: www.ecy.wa.gov/biblio/1103003.html and data available at www.ecy.wa.gov/eim/index.htm, search User Study ID AJOH0059.

This study shows sampled mercury levels in water, sediment, fish, and invertebrates for seven of the primary Washington place mining areas. Of particular concern, caddisflies from upper Peshastin "showed evidence of significant mercury contamination," while several sources showed evidence of mercury concentrations in the Similkameen. While none exceeded known standards, the Sultan River, Swauk Creek, and Williams Creek had some of the highest mercury concentrations.

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Linley, T., E. Krogstad, R. Mueller, G. Gill, and B. Lasorsa. 2016. Mercury concentrations in Pacific Lamprey (Entosphenus tridentatus) and sediments in the Columbia River Basin. *Environmental Toxicology and Chemistry,* Vol. 35, No. 10, pp. 2571–2576.

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For more information about the impacts of suction-dredge mining on aquatic resources, contact Gabe Scott, Cascadia Wildlands at POB 10455, Eugene, OR 97440; 541-434-1463; gscott@cascwild.org; http://www.cascwild.org.

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