



April 28, 2017

**RE: SUPPORT: Senate Bill 3 A relating to suction dredge mining  
Testimony of Dr. Nathan Donley of the Center for Biological Diversity**

Honorable members of the House Committee on Energy and Environment:

This testimony is submitted on behalf of the Center for Biological Diversity (“Center”), a non-profit conservation group with an office in Portland and more than 1.2 million members and online activists dedicated to the protection of endangered species and their habitats. The Center and its members in Oregon are concerned about the harmful effects of suction dredging on water quality, fish populations, and the environment across the state.

I am a Senior Scientist with the Center’s Environmental Health program focusing on issues surrounding the increasing exposure of both people and wildlife to toxins. Before joining the Center, I worked as a scientific researcher in the Oregon Center for Research on Occupational and Environmental Toxicology, studying the links between exposure to environmental toxicants and cancer. I received a doctoral degree in cell and developmental biology from Oregon Health and Sciences University.

**Brief Overview of the Environmental Impacts of Suction Dredge Mining**

The environmental impacts of suction dredge mining are well known.<sup>1</sup> The most comprehensive environmental review of a statewide suction dredge mining program was conducted by the state of California in analyzing its suction dredge permitting system.<sup>2</sup> The California Department of Fish and Wildlife (“CDFW”) sought to analyze the impacts of approximately 3,650 individual miners operating suction dredges throughout the state.<sup>3</sup> The environmental review found that

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<sup>1</sup> Oregon Chapter of the American Fisheries Society, Effects of Suction of Suction Dredge Mining On Oregon Fishes and Aquatic Habitats (April 2013) available at <http://orafs.org/wp-content/uploads/2013/04/2013-ORAFS-Suction-Dredge-Mining-Impacts-FINAL1.pdf>; Effects of Suction of Suction Dredge Mining On Oregon Fishes and Aquatic Habitats, Supplemental Information (March 2015) (hereinafter “ORAFS: Suction Dredge Supp.”) available at <http://orafs.org/wp-content/uploads/2012/07/2015-ORAFS-Suction-Dredge-Mining-FINAL.pdf>

<sup>2</sup> The most comprehensive analysis of the overall impacts of suction dredge mining was performed by the California Department of Fish and Wildlife (“CDFW”) during its review of the California Suction Dredge Permitting Program pursuant to the California Environmental Quality Act (“CEQA”). California Department of Fish and Wildlife, Suction Dredge Permitting Program, Subsequent Environmental Impact Report (March 2012) (hereafter “SEIR”), available at <https://www.wildlife.ca.gov/Licensing/Suction-Dredge-Permits>

<sup>3</sup> For a fifteen year period ending in 2009 CDFW issued an average number of approximately 3,200 suction dredge mining permits to California residents and 450 to non-residents. SEIR at 1-1, available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=27390>.

suction dredge mining would have a range of potential environmental impacts including negative effects on biological resources, hazards and hazardous materials, cultural resources, hydrology and water quality, noise, recreation, aesthetics, and air quality.<sup>4</sup> Even after developing a program to minimize and avoid many impacts CDFW found that significant impacts to water quality, cultural and historic resources, biological resources, and noise could not be avoided if suction dredge mining was allowed to continue in California.<sup>5</sup>

### **Suction Dredge Mining has Significant and Unavoidable Impacts on Water Quality by Suspending Toxic Mercury and Heavy Metals**

One particularly pervasive impact of suction dredge mining is caused by the resuspension (dredging up) and discharge of mercury. Suction dredge mining overlaps with historic mercury deposits.<sup>6</sup> In one study over fifty six percent of suction dredge miners encounter mercury during dredging operations.<sup>7</sup> Areas targeted for gold often have mercury associated with them because gold and mercury are both heavy and travel together, often as amalgam.<sup>8</sup> The impacts are discussed in detail in the CDFW's peer-reviewed environmental analysis of water quality impacts.<sup>9</sup> Numerous other state and federal agencies, including the California State Lands Commission<sup>10</sup>, California State Water Resources Control Board,<sup>11</sup> the United States Geological Survey,<sup>12</sup> and Oregon Chapter of the American Fisheries Society<sup>13</sup> have also studied suction dredge mining and the mercury-based hazards imposed on human health and the environment.

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<sup>4</sup> SEIR at Appendix B, p. 34 of 115, available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=27416>.

<sup>5</sup> SEIR at ES-11 to ES-14 <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=27601&inline=1>.

<sup>6</sup> See discussion of historic gold mining practices and extensive use of mercury (SEIR at pp. 4.2-44, 46, 51-53 available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=27396>; United States Geological Survey, Mercury Contamination from Historic Gold Mining, Fact Sheet FS-061-00, (May 2000)(hereafter "USGS") at pp. 1-3 available at <http://ca.water.usgs.gov/mercury/fs06100.html>); discussion of suction dredge miners' targeting of locations wherein historic gold mining occurred and where mercury hotspots are present (SEIR at pp. 4.2-36; USGS at pp. 2-3); and discussion of the interconnection between suction dredge mining and mercury loading of watersheds and elevated mercury levels found in fish and humans (SEIR at pp. 4.2-51 to 4.2-53; USGS at pp. 1-5).

<sup>7</sup> SEIR Appendix F at pp. 10, 18 of pdf, available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=27419&inline=1>.

<sup>8</sup> Suction Dredge Mining Cases (Judicial Council Proceeding No. JCPRS4720), Declaration of Carrie Monohan, PH.D., In Support of Plaintiffs Karuk Tribe and Coalition's Opposition to Miners' Joint Motion for Injunction (May 29, 2015) at p. 5.

<sup>9</sup> SEIR at pp. 4.2-14, 15, 17, 33-54; California Department of Fish and Wildlife Report to the Legislature Regarding Instream Suction Dredge Mining under the Fish and Game Code (April 1, 2013) (hereafter "Legislative Report") at 37 of pdf [noting peer-review of mercury analysis], available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=63843&inline=1>.

<sup>10</sup> See e.g. Legislative Report at pp. 25-26 of pdf.

<sup>11</sup> Legislative Report at pp. 36-37 of pdf. See also, [http://www.waterboards.ca.gov/water\\_issues/programs/cwa401/suction\\_dredge.shtml](http://www.waterboards.ca.gov/water_issues/programs/cwa401/suction_dredge.shtml), wherein the State Water Resources Control Board has posted documents on the fate and transport of mercury due to suction dredge mining, including letters, studies, and the comments of the peer-reviewers on the SEIR.

<sup>12</sup> USGS at pp. 1-5.

<sup>13</sup> ORAFS: Suction Dredge Supp. at p. 2.

The California State Water Resources Control Board has succinctly described how suction dredge mining results in the contamination of waterways with toxic mercury and the subsequent impacts on human health:

The resuspension and discharge of mercury is a potent neurotoxin that is harmful to both humans and wildlife. Mercury builds up in the bodies of fish that live in waters with even small amounts of mercury; and in the bodies of humans who eat contaminated fish. Because much of our state’s in-stream mercury is a result of historic gold mining activities, recreational suction dredging activities specifically target these locations and resuspend mercury from many known and unknown ‘hotspots.’

Recreational suction dredging as a whole has a disproportionately greater effect on mercury resuspension when compared to other natural events or human activities. Suction dredging operators often target deep sediments, resulting in the mobilization of mercury that may not be mobilized by typical inter high-flow events. This leads to substantially increased mercury loading in the downstream water body. According to the peer-reviewed findings..., a single 4-inch dredge could discharge up to 10 percent of an entire watershed’s mercury loading during a dry year. Additionally, recreational suction dredging occurs in the summer months when water temperatures are higher and oxygen levels are lower. These conditions are conducive to increased rates of methylation of mercury; the process by which elemental mercury binds with organic molecules and becomes more readily absorbed by living tissue and significantly more toxic to humans and wildlife.<sup>14</sup>

The mercury levels in fish taken from streams and rivers where historic mining occurred, and where suction dredge mining occurs in modern day, are generally above critical threshold levels under state regulations for toxics and human health.<sup>15</sup> The levels are so high that they pose human health risks.<sup>16</sup> Fish consumption warnings are common for fish taken from rivers and streams where legacy mining occurred and where modern day suction dredge mining occurs and threatens water quality.<sup>17</sup>

While some mercury may be recovered during the mining process some of it becomes atomized or “floured,” broken into a million tiny bits, by the actions of the dredge suction equipment and then discharged from the dredge into the river in a more biologically available form which can be readily methylated, thereby contaminating the downstream aquatic and terrestrial foodwebs.<sup>18</sup>

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<sup>14</sup> Legislative Report at p. 36-37 of pdf.

<sup>15</sup> SEIR at pp. 4.2-51, 53; USGS p. 5.

<sup>16</sup> USGS p. 5.

<sup>17</sup> SEIR at pp. 4.2-53; USGS at p. 5.

<sup>18</sup> Marvin-DiPasquale, M., Agee, J.L., Kakouros, E., Kieu, L.H., Fleck, J.A., and Alpers, C.N., 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 2: Laboratory Experiments: U.S. Geological Survey Open-File Report 2010–1325B, 54 p.

Put in simpler terms, when there is liquid elemental mercury spilled on the floor in a building, the last thing that one should do is clean it up with a vacuum, because as it goes through the vacuum it volatilizes the mercury into a gaseous form and/or powder form, distributing it in the air and causing a much greater toxic hazard, even though it appears that most of the liquid elemental mercury that was on the floor is now in the vacuum bag.<sup>19</sup>

Suction dredges may amount to as much as 70% of the annual mercury load in mine impacted rivers.<sup>20</sup> Time of year is an important factor: storms move sediment contaminated with mercury during the winter when biological activities that methylate mercury are slow, whereas suction dredge miners operate in the summer, dispersing mercury contaminated sediment during the most biologically active time of year, when methylation is likely to occur. Once the silts and clays that are contaminated with mercury are liberated by the dredge they can stay in suspension for a very long time and can travel great distances. Once mobilized, they can re-deposit in downstream reaches or reservoirs where the particulate bound mercury can be methylated and incorporated into the aquatic foodchain.<sup>21</sup>

Seemingly low levels of mercury in sediment and water can lead to dangerously high levels in fish that people eat.<sup>22</sup> The negative health effects of eating mercury-contaminated fish are profound and include brain, nervous system, kidney, and immune system damage. Mercury exposure can cause developmental delays in children, making women of childbearing age, pregnant women and children under 17 particularly high-risk populations.

Suction dredging also results in significant impacts to water quality from the resuspension and discharge of sediment and other trace metals such as copper, lead, silver and zinc that negatively affect the food web and drinking water supplies.<sup>23</sup>

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<http://pubs.usgs.gov/of/2010/1325B/>

<sup>19</sup> USEPA. 2014. What to do if a compact fluorescent light bulb breaks in your Home. (<http://www2.epa.gov/sites/production/files/documents/cflcleanup20120329.pdf>)

<sup>20</sup> Fleck J.A., C.N. Alpers, M. Marvin-DiPasquale, R.L. Hothen, S.A. Wright, K.Ellett, E. Beaulieu, J.L. Agee, E. Kakouros, L.H. Kieu, D.Eberl, A.E. Blum, and J.T. May. 2010. 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. Open File Report 2010-1325A

<sup>21</sup> Suction Dredge Mining Cases (Judicial Council Proceeding No. JCPRS4720), Declaration of Carrie Monohan, PH.D., In Support of Plaintiffs Karuk Tribe and Coalition's Opposition to Miners' Joint Motion for Injunction (May 29, 2015) at p. 14.

<sup>22</sup> Suction Dredge Mining Cases (Judicial Council Proceeding No. JCPRS4720), Declaration of Carrie Monohan, PH.D., In Support of Plaintiffs Karuk Tribe and Coalition's Opposition to Miners' Joint Motion for Injunction (May 29, 2015) at p. 5.

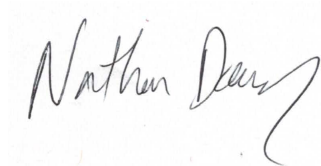
<sup>23</sup> SEIR at pp. 4.2-54 to 4.2-59.

## Mercury From Suction Dredge Mining Is a Pollutant of Concern in Oregon

Mercury from historic mining, including gold mining, has contaminated streams, rivers, reservoirs, fish, and the food web in Oregon.<sup>24</sup> Suction dredge mining can increase the toxicity of historic mercury embedded in rivers and streams.<sup>25</sup> The Oregon Health Authority currently has public health advisories on at least 15 waterbodies in Oregon due to mercury pollution and a statewide advisory on the consumption of bass due to mercury contamination.<sup>26</sup> Over 35 water bodies in Oregon are listed as “impaired” under the Clean Water Act because of mercury pollution.<sup>27</sup> When mercury is resuspended and mobilized in fine and suspended sediment lost from a suction dredge research has found that it can be “more than ten times higher than that needed to classify it as a hazardous waste.”<sup>28</sup>

We urge the committee to vote yes on Senate Bill 3 A.

Thank you for your consideration,



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<sup>24</sup> Ambers R. K. R., B. N. Hygelund, Contamination of two Oregon reservoirs by cinnabar mining and mercury amalgamation. 2001. Environmental Geology, Vol. 40, Num. 6, Page 699, available at <http://link.springer.com/article/10.1007%2Fs002540000173>; Gray J.E., M. E. Hines, D. P. Krabbenhoft, B. Thoms. 2012. Methylation of Hg downstream from the Bonanza Hg mine, Oregon, Applied Geochemistry, Vol. 27, Issue 1, January 2012, Pages 106–114, available at <http://www.sciencedirect.com/science/article/pii/S0883292711004094>

<sup>25</sup> Legislative Report at p. 36-37 of pdf.

<sup>26</sup> Oregon Health Authority, Fish Advisories and Consumption Guidelines, available at <http://public.health.oregon.gov/HealthyEnvironments/Recreation/FishConsumption/Pages/fishadvisories.aspx>

<sup>27</sup> Oregon Department of Environmental Quality, Water Quality Assessment - Oregon's 2012 Integrated Report Assessment Database and 303(d) List, data available at <http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp#db>

<sup>28</sup> California State Water Resources Control Board, Staff Report: Mercury Losses and Recovery During a Suction Dredge Test In the South Fork of the American River, at p 8 of 12 available at [http://www.waterboards.ca.gov/publications\\_forms/publications/general/docs/mercurystaffreport2005.pdf](http://www.waterboards.ca.gov/publications_forms/publications/general/docs/mercurystaffreport2005.pdf)