May 20, 2020

Oregon Fish and Wildlife Commission
Oregon Department of Fish and Wildlife
4034 Fairview Industrial Drive SE
Salem, OR 97302

Dear Commissioners:

We, the undersigned, are writing in support of the following request that is before the Commission to amend OAR 635-050-0070 as it pertains to where beavers (*Castor canadensis*) may be trapped within the state:

> **Permanently close to commercial and recreational beaver trapping and hunting all National Forests, Bureau of Land Management lands, National Monuments, Federal Wildlife Refuges, National Parks, and National Grasslands in the state of Oregon.**

This request directly addresses goals and objectives of the 2016 Oregon Conservation Strategy, which were developed with input from Oregon Department of Fish and Wildlife.

We support this request based on several considerations. Oregon is called the Beaver State, for a reason. Prior to European arrival in North America, Oregon's streams and rivers may have harbored an estimated one million North American beaver (Guthrie and Sedell 1988). However, six decades of widespread beaver trapping, from the 1780s through the 1840s, had devastating effects on their population. "Beaver pelts became dominant in the Pacific Northwest fur trade around 1820" with production from trapping peaking in 1833 (ODFW 2005). As a result, beaver populations were "considerably reduced" between Fort Vancouver and northern California and "nearly extinct" in the lower portion of the Columbia (Rainbolt 1999). In eastern Oregon, beaver populations were similarly decimated as the Hudson's Bay Fur Company attempted to create a "fur desert," a strategy aimed at clearing beaver from broad areas south and east of the Columbia River to keep encroaching Euro-American trappers from coming west of the Continental Divide (Ott 2003). With the widespread loss of Oregon's beavers, there was a concurrent loss in beaver-associated riparian habitat and wetlands across the state. These effects were later exacerbated by the introduction of large herds of livestock on public lands, splash dams related to large-scale logging, and the conversion to farmland and urban areas along major valley bottoms.

National forests comprise nearly one-fourth of the state, yet in 1929 less than 4,000 beaver were estimated to reside on these lands (Bailey 1936). This population estimate represented less than one-half of one percent of the total number of beavers that may have been present in Oregon before the widespread trapping in the late 1700s and early 1800s, indicating little if any recovery nearly a century later. Given this lack of recovery on National Forest lands and other public lands, it is likely that Oregonians have generally been unaware of the impacts that widespread beaver loss has had on riparian areas and aquatic ecosystems for many of the state's streams, rivers, and wetlands and therefore, on its fish and wildlife. However, those impacts have been far reaching and both ecologically and economically devastating.

Beaver activity affects stream systems of all sizes and in a variety of ways. In many streams it is the assembly of a simple but robust instream feature, the beaver dam, that sets extraordinary changes in motion. These dams slow and store a portion of streamflow or surface water that is moving down the valley, thereby creating a pond that helps protect their lodges while increasing their aquatic and vegetative habitats. Dams will vary in lengths, heights, and widths depending upon topography and other site conditions, and their configuration may change over time. Some continue to increase in size as beavers add additional wood or sediment, whereas others periodically wash-out during high flows, only to be subsequently rebuilt or replaced with a dam in another location. Some dams only cause water to be backed-up within the banks of a channel whereas others spread water across floodplains. In nearly all instances water tables in the vicinity of a beaver dam will be elevated leading to changes in the riparian vegetative community.

In other streams, dams are not built due to river size or the existence of abundant water. In these cases, beavers will build their lodges in the banks and create a different set of benefits for fish. For example, Parish (2016) found that juvenile coho and other salmonid species used beaver bank lodges for summer rearing habitat. Coho salmon and other salmonids were also commonly observed utilizing other burrows and woody debris piles created by beavers, and summer rearing was strongly correlated with the volume of cover created by beavers.

Riparian areas are defined by the National Research Council (NRC 2002) as "areas that are transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota." In the western United States, it is in these areas that beaver dams are so effective at working their ecosystem magic for the benefit of plant communities, terrestrial wildlife, birds, amphibians, fish and other aquatic organisms. Where beaver dams occur, ponded water increases the availability of surface and subsurface moisture seasonally, over time, and along stream systems. These changes in turn allow for a wide range of plant types to grow in a given area, ranging from wetland to upland species, thereby creating compositionally diverse and structurally complex plant communities. This increase in diversity and complexity in riparian areas is particularly noticeable in arid land ecosystems, such as east of the Cascades in Oregon where water is normally in short supply. Thus, beaver are not simply "engineers" proficient at building dams, but instead are recognized as "ecosystem engineers" because of their capability, *via* their dams, to create riparian and aquatic systems that are biologically diverse and highly productive, as summarized by Wright (2009) and Johnston (2017).

It has taken time for the scientific community to understand the significance of beavers at the landscape scale due to the separation in time between when trapping, Euro-American settlement, and scientific studies of streams began. In the years between trapping and settlement, streams and riparian systems underwent their first transformation as dams failed and were not repaired. They experienced a second transformation when land uses following settlement triggered widespread erosion and changes in vegetation. Then, decades to over a hundred years passed before the field of scientific inquiry of stream systems began. By that time, evidence of beavers as a defining influence on the landscape had faded. In the East, logging and agriculture had triggered erosion that buried the beaver-created wetlands beneath feet of sediment by the late 1700s to early 1800s. In the Southwest and Intermountain West, only spotty and rapidly changing evidence of beaver remained in the 1850s when the General Land Office surveys and expeditions arrived, and thus was considered of local rather than regional significance. Though they missed the regional significance at the time, their notes would later prove key to helping unravel the story of change (Fouty 2018).

Bailey's (1936) publication about mammals in Oregon identified some of the attributes beaver provide for riparian areas and aquatic ecosystems. His publication has been followed by field research related to beavers since at least the 1940s. Masters and PhD research in Oregon includes the following studies: food selection and utilization by beaver (Roemhildt 1940); fish occurrence in beaver ponds and other channel habitats (Duke 1982); beaver effects on stream, streamside habitat, and coho salmon fry populations (Bruner 1989); small mammal and amphibian communities in beaver-pond habitats (Suzuki 1992); beaver effects on channel morphology (Dent 1993); groundwater levels and stream temperatures adjacent to a beaver pond (Lowry 1993); sediment capture and retention in beaver ponds (Ringer 1994); groundwater tables adjacent to beaver ponds (Sharps 1996); distribution of beaver ponds and effects on plant communities (Perkins 2000); effects of beaver ponds and water temperature on Lahontan cutthroat trout (Talabere 2002); and beaver relocation for enhancing salmon habitat (Petro 2013).

In the second half of the 20th century, and particularly in the first two decades of the 21st century, there has been a major increase in "*Castor canadensis*" publications, with fully two-thirds of them occurring in the last 20 years (**Figure 1**). In addition to the sheer number of beaver-related studies, this literature covers a range of topics whose relative importance can be indexed by the occurrence of keywords in publications that also contain "*Castor canadensis*." Doing such a search of publications with "*Castor canadensis*" found they also included the following keywords: ecology (72% of the publications), fish (62%), habitat (60%), diversity (54%), and ecosystems (42%) (**Figure 2**). Thus, only in recent decades has the scientific community come to more fully understand the crucial effects beavers had as ecosystem engineers and keystone species, effects which may be recovered, at least in part, for many of the state's riparian areas and aquatic ecosystems with a change in the trapping regulations.

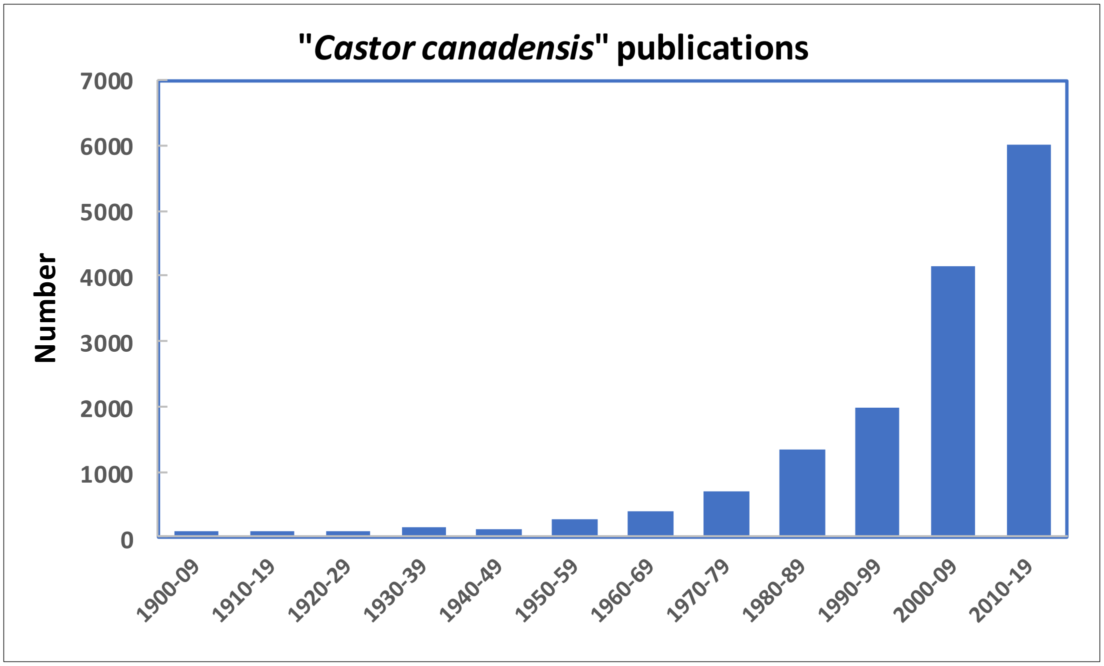

Figure 1. The number of publications containing "*Castor canadensis"* by 10-yr periods from 1900-2019 (n = 13,600). (Source: April 13, 2020 Google Scholar© search).

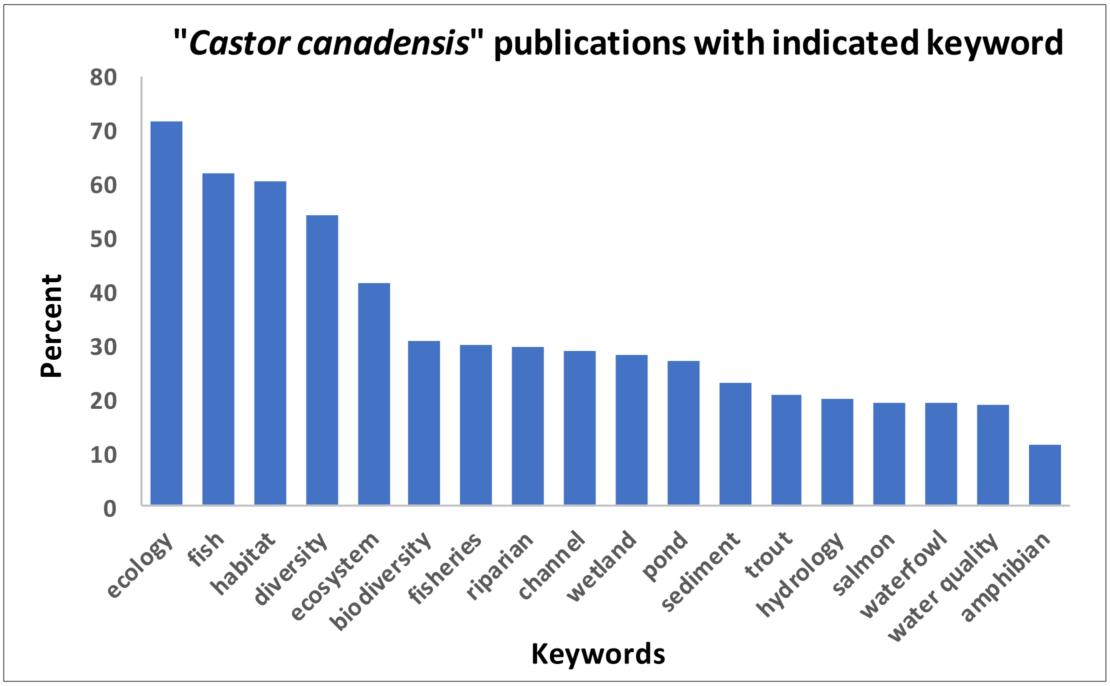

Figure 2. The percent of "*Castor canadensis*" publications that also contain the indicated keyword (n = 13,600). (Source: April 13 2020 Google Scholar© search).

From this increasing amount of "*Castor canadensis*" research and publications in recent decades, the scientific literature has confirmed that beaver dams, ponds, stream bank lodges, foraging, dispersal and other activities of this mammal can have a vast array of ecosystem benefits, such as:

Creating ponds and wetlands -- Beaver dams impound water, creating ponds of various sizes and dimensions. In low gradient environments, these ponds help create wetlands or expand existing ones. These effects were aptly demonstrated in Acadia National Park where beaver recolonization resulted in nearly a 90% increase in ponded wetlands (Cunningham et al. 2006).

Spreading water, storing groundwater, causing hyporheic flows -- Beaver dams often spread water onto adjacent floodplains, particularly during periods of high flow, enhancing the availability and storage of soil moisture on those landforms. Raised water tables adjacent to beaver ponds may also contribute to hyporheic flows (subsurface flow around and under a dam) and help to maintain base flows. In Yellowstone National Park, beaver dams were found to reduce late-summer water table declines by as much as 40 cm (16 inches) (Bilyeu et al. 2008).

Trapping sediment -- The slow-water environments associated with beaver ponds make them extremely effective at trapping sediments of all sizes, thus helping to maintain high water quality (Ringer 1994, Fouty 2003, Rosell et al. 2005, Demmer and Beschta 2008).

Growing a diversity of plants, storing carbon -- Riparian areas adjacent to beaver ponds contain a diversity of plant species because of the soil moisture gradients that commonly occur. These plant communities effectively remove and sequester carbon, both above-ground (stems of woody plants) and below-ground (root systems and the organic carbon in soils). The potential importance of carbon sequestration was illustrated by results from a study in Rocky Mountain National Park where valley-bottom carbon storage declined by two-thirds following the removal of beaver, from 23% of the total landscape carbon storage to only 8% as wetlands were lost and meadows dried up (Wohl 2013).

Sustaining salmon and other aquatic species -- Broad, deep pools provide critical habitat for anadromous fish, such as young coho salmon in Oregon's coastal streams (Bruner 1989, ODFW 2005, Romer et al. 2008, Strickland et al. 2018), as well as resident fish species, such as Lahontan cutthroat trout and bull trout in the relatively arid portions of the state (Talabere 2002). An extensive loss of beaver ponds along Washington's Stillaguamish River was found to be the primary factor contributing to an 86% reduction in overall smolt production potential for coho salmon (Pollock et al. 2004). In Oregon's John Day River, an increase in beaver dam density in one tributary lead to a 175% increase in juvenile steelhead production (Bouwes et al. 2016). Along with fish, amphibians, and aquatic invertebrates also benefit from the habitat created in beaver-influenced stream reaches.

Providing habitat for terrestrial wildlife -- Moisture gradients and abundant water are major factors in the diverse structure and composition of plants found in beaver-created ecosystems. Various deciduous tree species (e.g., aspen, willow, cottonwood) grow well in these moist environments. In turn, these species along with their understories of shrubs, forbs, and graminoids provide important physical habitat and food resources for a wide range of wildlife species, including pollinators, small mammals, bears, ungulates, and others. In Oregon and Washington, 95 of 147 mammal species (65%) utilize riparian areas (Kauffman et al. 2001).

Benefiting birds -- Some of the most important beneficiaries of having beavers present are birds. Ducks and migratory birds utilize beaver ponds and wetlands while songbirds commonly use willows, irrigated by elevated water tables, for nesting and perch sites as well as adjacent habitats with their variety of food resources. In northern Colorado 82% of breeding birds use riparian areas and in the southwestern US more than 75% of all bird species nest in riparian areas (Knopf 1985). Wyoming streams with beaver had 75 times more waterfowl than streams without beaver (McKinstry et al. 2007).

Moderating the effects of climate change -- Less snowfall, earlier springtime melt, lower summer flows, and increasing annual temperatures are becoming a prevalent signature of climate change in the American West (Abatzoglou et al. 2011, 2014). Such changes bring with them rising concerns about increased droughts and wildfires and their economic impacts on agricultural communities and ecological impacts to fish and wildlife. Beaver dams, ponds and associated wetlands can locally help maintain moisture-loving plant communities, as well as the terrestrial wildlife and avian species dependent upon them. Such areas also provide refugia during wildfires (Fairfax 2019). Thus, beaver provide a vital ecosystem buffer to many of the adverse effects of a changing climate.

The science today is abundantly clear, beavers have a fundamental role in sustaining productive riparian/aquatic and wetland ecosystems. Beavers can provide major benefits for supporting diverse plant communities, a large number of terrestrial and avian wildlife species, and fisheries and other instream organisms, while also helping to mitigate the effects of climate change and wildfires. Because of these critical ecosystem benefits, we urge the Commission to favorably consider the proposal to amend OAR 635-050-0070.

Sincerely,

Robert L. Beschta, PhD
Professor Emeritus
Dept. Forest Ecosystems & Society
Oregon State University
Corvallis, OR

Gordon H. Reeves, PhD
Emeritus Fish Ecologist
PNW Research Station
Corvallis, OR

Suzanne C. Fouty, PhD
Hydrologist/Soils Specialist (retired)
USDA Forest Service
Baker City, OR

Robert M. Hughes, PhD
Senior Research Scientist
Amnis Opes Institute
Corvallis, OR

Casey Justice, MS
Fishery Scientist
Fishery Science Department
Columbia River Inter-Tribal Fish Comm.
Portland, OR

Ian R. Waite, PhD
Aquatic Ecologist
US Geological Survey
Portland, OR

Guillermo R. Giannico, PhD
Associate Professor
Extension Fisheries Specialist
Dept. Fisheries & Wildlife
Oregon State University
Corvallis, OR

Catherine de Riveria, PhD
Professor
Environmental Science & Management
Portland State University
Portland, OR

J. Boone Kauffman, PhD
Professor (retired)
Dept. Fisheries & Wildlife
Oregon State University
Corvallis, OR

Stanley V. Gregory, PhD
Professor Emeritus
Dept. Fisheries & Wildlife
Oregon State University
Corvallis, OR

Patricia McDowell, PhD
Professor
Dept. Geography & Environ. Studies Prog.
University of Oregon
Eugene, OR

Ray Temple
Program Director (retired)
Freshwater Fish Natural Production
Oregon Dept. Fish & Wildlife
Currently, Conservation Chair
Salem Audubon Society
Salem, OR

Paul C. Katen, Ph.D.
Water Quality Monitoring & Board Pres.
Salmon Drift Creek Watershed Council
Lincoln City, OR

Dale A. McCullough, PhD
Senior Fishery Scientist (retired)
Fishery Science Department
Columbia River Inter-Tribal Fish Com.
Beaverton, OR

Jeffrey M. Dambacher, PhD
Research Biologist
Aquatic Inventories Project
Oregon Dept. Fish & Wildlife (1989-2002)
Currently, Senior Research Scientist
Commonwealth Scient. & Indust. Res. Org.
Hobart, Tasmania, Australia

William Pearcy, PhD
Professor Emeritus
Coll. of Earth, Oceans, & Atmos. Sci.
Oregon State University
Corvallis, OR

Ernie Niemi, MCRP
Senior Economist
Natural Resources Economics, Inc.
Eugene, OR

Jan Hodder, PhD
Senior Lecturer (retired)
Institute of Marine Biology
University of Oregon
Eugene, OR

Hans D. Radtke, PhD
Natural Resource Economist
Yachats, OR

Luke E. Painter, PhD
Instructor
Dept. Fisheries & Wildlife
Oregon State University
Corvallis, OR

Mathew J. Kaylor, PhD
Postdoctoral Scholar
Dept. of Fisheries and Wildlife
Oregon State University
Corvallis, OR

Martin Bray, MS
Wildlife Biologist (retired)
USDA Forest Service
USDI Fish and Wildlife Service
Waldport, OR

Robert J. Danehy, PhD
Aquatic Ecologist
Catchment Aquatic Ecology
Eugene, OR

William Ripple, PhD
Distinguished Professor of Ecology
Dept. Forest Ecosystems & Society
Oregon State University
Corvallis, OR

David Mildrexler, PhD
Systems Ecologist
Eastern Oregon Legacy Lands
Joseph, OR

Jennifer Gervais, PhD
Wildlife Ecologist
Oregon Wildlife Institute
Corvallis, OR

Yangdong Pan, PhD
Professor
Environ. Science & Management
School of the Environment
Portland State University
Portland, OR

Matt Orr, PhD
Assistant Professor
Biology
Cascades Campus
Oregon State University
Bend, OR

Michael S. Parker, PhD
Professor of Biology
Southern Oregon University
Ashland, OR

Roger Sabbadini, PhD
Emeritus Distinguished Professor
Biology
San Diego State University
Bend, OR

Matthew Sloat, PhD
Science Director
Wild Salmon Center
Portland, OR

Paul Robertson, MSc
Environmental Scientist | Owner
Robertson Environmental LLC
Lincoln City, OR

Laura Brophy, MS
Director, Estuary Technical Group
Institute for Applied Ecology
Corvallis, OR

Esther Lev
Wetland Ecologist
Director (retired)
The Wetland Conservancy
Portland, OR

Steven L. Johnson, MS
Fisheries Research Biologist (retired)
Oregon Department of Fish and Wildlife
Newport, OR

Steve Trask
Senior Fish Biologist
Trask Consulting, Inc.
BioSurveys, LLC
Alsea, OR

Jeff Uebel
Fisheries Biologist (retired)
Siuslaw National Forest
USDA Forest Service
Corvallis, OR

Ken Carloni, PhD
Associate Professor (retired)
Biology/Natural Resources
Umpqua Community College
Roseburg, OR

Dan Rosenberg, PhD
Co-Director
Oregon Wildlife Institute
Corvallis, OR

Affiliations provided for informational purposes and indicate the credentials of the cosigners.

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