



APPENDIX – AMERICAN BEAVER SPOTLIGHT

Oregon's State Wildlife Action Plan

North American Beaver Habitat Spotlight

Scientific Name: *Castor canadensis*

State Symbolic Species: State Mammal

Oregon Status: Stable, not listed (state or federal)

Oregon Ecoregions: Beaver are present in eight of Oregon's nine ecoregions—Coast Range, Willamette Valley, Klamath Mountains, West Cascades, East Cascades, Columbia Plateau, Blue Mountains, and Northern Basin and Range

Background: Oregon is the “beaver state”, with American beaver prominently pictured on the State flag, designated as the state mammal, and adopted as the Oregon State University mascot. Beaver are widely distributed across Oregon's ecoregions and present in all 15 major river basins (North Coast, South Coast, Lower Columbia, Willamette, Umpqua, Rogue, Hood, Deschutes, Klamath, Lakes Basin, John Day, Umatilla, Grande Ronde, Powder, Owyhee-Malheur). As semi-aquatic generalists, beaver are able to adapt to Oregon's urban, rural agricultural, private timber, and public range and forest lands where ample water and food resources exist. Beavers are territorial species and exhibit cyclical occupancy on the landscape due to life-stage changes (e.g. dispersing sub-adult migration) and/or changing habitat conditions (e.g., lack of persistent streamflow, reduced forage, resource competition with other beaver, wildlife, and/or livestock, etc.). Beavers rely on several Oregon State Wildlife Action Plan key habitats for their survival. When site conditions are favorable, beaver's ability to modify these habitats can maintain and expand key habitats and improve habitat conditions for co-occurring aquatic, riparian, floodplain, and/or wetland Species of Greatest Conservation Need. The following section provides a brief overview of beaver habitat (habitat for beaver), beaver-modified habitat (habitat by beaver), and beaver-related conservation recommendations for supporting Key Habitats and Species of Greatest Conservation Need (SGCN) that are consistent with Oregon Department of Fish and Wildlife's Action Plan for Beaver-Modified Landscapes (ODFW 2023) and Oregon's State Wildlife Action Plan (SWAP 2025).



Photo Credit: Wikipedia

What is Beaver Habitat?

American beavers are widely distributed across Oregon key habitats statewide, including [Flowing Water and Riparian](#), [Wetlands](#), and [Aspen Woodlands](#). Beaver habitat, or **habitat for beaver**, is the specific combination of water, food, cover, and space that beaver need to support their survival on the landscape through time. Beaver are semi-aquatic species that require still or slow-moving, perennial water at stable depths for cover, protection from predators, access to food resources, and food storage in the winter. Beaver live in rivers, creeks, streams, lakes, ponds, marshes, estuaries and even manmade water features such as roadside ditches, irrigation canals, and wastewater treatment ponds and wetlands that have adequate year-round water flow. Beavers are highly territorial and require adequate lateral and longitudinal habitat quality and stability to support their occupancy on the landscape. In rivers and stream networks, one beaver family unit (on average two adults, two sub-adults, and two kits) needs approximately 0.5 to 1.5 linear stream miles for ample space to survive, reproduce, and thrive. Beaver are most likely to use sites that have a stream gradient of less than 6 percent, canopy cover of 25-50 percent, and a bank-full width of 13-20 feet. Beavers are central place herbivore foragers, that are slow on land and prefer to gather food and building materials within 100 feet of their water source. They need sufficient early seral stage stream buffers

of deciduous and herbaceous riparian vegetation for food and foraging activities. Beavers eat the leaves, inner bark, and twigs of aspen, alder, birch, cottonwood, willow, poplar, and other deciduous trees. They also eat shrubs, ferns, cattails, water lilies, sedges, rushes, grasses, vines, blackberries, and agricultural crops. Beavers will eat western juniper and sagebrush in the High Desert and Sagebrush Steppe regions of Oregon where deciduous vegetation is sparse. Beaver habitat, **habitat for beaver**, supports the building blocks that beaver need to create beaver-modified habitats, or **habitat by beaver**. Habitat limitations for beaver — declining surface water availability, altered waterways, altered floodplain disturbance regimes, conversion and loss of wet meadow and wetland habitats, and altered riparian vegetation communities — are also primary limiting factors for many Oregon Species of Greatest Conservation Need.



Image: A. Averett (ODFW)

What is Beaver-Modified Habitat?

Beaver are an ecosystem engineer that modify and create habitats that can also benefit many of Oregon's native fish and wildlife and SWAP species. Beaver-modified habitat, or **habitat by beaver**, is the habitat conditions beaver create when they alter their terrestrial and aquatic habitat to improve their fitness and survival. These habitat modifications are complex, context-dependent, and include: denning, creating canals and/or side-channels, altering riparian vegetation, importing woody and vegetative materials, and damming and ponding water. This suite of habitat modifications and their cumulative effects contribute to beaver-modified landscapes that may increase habitat complexity and connectivity, and provide shelter from predators, nesting and rearing areas, basking structures, overwintering habitat, migratory resting sites, refugia from episodic events (e.g., low flow, drought, or wildfire impacts), organic materials, and food resources for fish and wildlife.

- **Denning**—Depending on the type of water body and the geographic area they occupy, beavers construct bank burrows, bank dens, bank lodges, or conical lodges that provide shelter for resting and sleeping, grooming, eating, staying warm, and birthing and raising their young. Burrows, dens, and lodges consist of one or more underwater entrances, a feeding area, a dry nest den, and a source of fresh air. In Oregon, beavers typically build bank burrows/dens and/or bank lodges rather than open-water conical lodges. Bank dens are dug into the banks of streams and large ponds, and beavers may or may not build a lodge over them. Bank dens may also be located under stumps, rootwads, trees, logs or large woody debris piles, and/or man-made infrastructure (e.g., docks). Bank lodges and conical lodges consist of a mound of branches and logs plastered with mud. Bank lodges are built over bank dens or burrows, while conical lodges are built in open water and surrounded by water on all sides. Beavers may build and maintain multiple denning sites in their territory, but usually use only one den or lodge during the winter.
- **Creating canals, side-channels, and off-channel habitats**—Beavers excavate canals through soft soils within and adjacent to the waterways they occupy to increase their safety from predators, access new foraging sites, efficiently transport food and building materials, and connect and increase wetted areas. There are three main types of canals that they create—extension, connector, and benthic canals. Extension canals are built from river, pond, or wetland to the riparian area for foraging and material transport. Connector canals connect isolated water features (e.g. pond to wetland, stream channel to meadow) for safe travel routes and water level maintenance. Benthic canals are excavated at the bottom of a stream channel, pond, or wetland to improve access to dens/lodges and/or increase water depths during drought or freezing conditions.
- **Altering riparian communities through herbivory**—Beavers can change the composition and structure of vegetative communities through their foraging activities. Felled trees and shrubs reduce riparian canopy cover, allowing more sunlight to reach the ground, and shifting the community to an early seral stage of regeneration that promotes the growth of shade-intolerant herbaceous vegetation (flowers, grasses, sedges, shrubs, trees), changing habitat availability and food web dynamics. Beaver herbivory on standing trees contributes to a coppicing response in the vegetation that alters the growth form. Gnawed and felled trunks and stems regrow as secondary shoots that sprout from the base, altering the plant from an up-right growth form to a sprawling, bushy growth form. The increase of accessible palatable shoots may increase food availability for and competition with other riparian herbivores. In some situations, beaver herbivory may impact agricultural, timber, or landscaping vegetation or contribute to the spread of non-native, invasive plant species.
- **Importing woody and vegetative materials**—Beavers import a significant amount of woody and vegetative materials, energy, and organic matter from the riparian area into flowing water and wetland key habitats through their foraging, food processing (e.g. chew sticks), and/or dam-building behaviors. These materials provide food resources, habitat (e.g., basking sites), and shelter (e.g., overhead cover) for other aquatic and terrestrial species.
- **Damming and ponding water**—Beavers living on water bodies that maintain a constant water level and/or deep pools (mainstem rivers, low elevation reaches along large tributaries, lakes, ponds) do not build dams. In Oregon, the majority of beaver activity observations are not associated with beaver dams. Based on beaver behavior and published research in Oregon, beaver damming activities are most likely to occur in 3rd order or smaller tributaries and in those reaches where they need to increase water depths for protection from predators, to access to their food supply, and provide underwater entrances to their den. A family of beavers may build and maintain one or several dams in their territory. Dams are constructed and actively maintained with whatever materials are available—wood, stones and cobbles, mud, and plant parts. Dams vary in size from a small accumulation of woody material to structures 10 feet high and 165 feet wide. Beaver-built dams create and expand flowing water-riparian, wetland, and/or montane meadow key habitats. In some locations, flooding from beaver damming and ponding activities can impact human infrastructure and/or properties (e.g., culverts, roads, buildings, timber, agricultural crops) and require mitigation strategies to prevent or minimize damage. Permanent flooding by beaver may also negatively impact rare, sensitive, or culturally-important plant communities or habitats (e.g., palustrine wet meadows) that are adapted to infrequent or temporarily-flooded hydrologic regimes and require higher oxygen levels in the root zone (i.e., less anoxic conditions) for plant survival.

Examples of Species of Greatest Conservation Need That Co-Occur with Beaver

Depending on eco-regional and specific site-conditions, beaver can co-occur with many Oregon Species of Greatest Conservation Need (SGCN). This section provides a few examples of SGCN species that are most likely to co-occur in beaver habitat, including beaver-modified habitats, in Oregon. The following focuses on non-fish SGCN species and their limiting factor considerations that should be accounted for in the planning, design, and implementation of beaver-based conservation, restoration, and/or coexistence activities. Beaver-based (also referred to as beaver-related or beaver-mimicry) activities are human interventions to conserve or restore habitats and natural processes, and/or install coexistence solutions (e.g., beaver exclusion fencing, pond levelers, culvert exclusion devices, etc.). Page 5 provides actions and best management practice resources for minimizing impacts to SGCN and their habitats during beaver-based restoration activities.

Amphibians

Oregon Spotted Frog (*Rana pretiosa*)

Status: ESA Threatened (Federal); State Sensitive (Oregon)

Ecoregions: East Cascades, West Cascades

Co-occurrence with Beaver: Oregon Spotted Frog may co-occur with beaver in permanent ponds, marshes, and wet meadows.

Limiting Factor Considerations: Oregon Spotted Frogs have high fidelity to egg-laying sites and are sensitive to invasive species (e.g., bullfrogs, non-native fish), reduced hydrology, livestock grazing impacts, and siltation.



Birds

Willow Flycatcher (*Empidonax traillii*)

Status: ESA Species of Concern (Federal); State Sensitive (Oregon)

Ecoregions: Northern Basin and Range, Willamette Valley

Co-occurrence with Beaver: Willow Flycatchers may co-occur with beaver where the riparian zone and montane meadows include a dense, continuous, or near continuous shrub and early seral stage vegetation community, especially willow species.

Limiting Factor Considerations: Willow Flycatchers are impacted by the loss and degradation of riparian shrub habitat due to land conversion, altered hydrology, and invasive plant species encroachment. They are also sensitive to brood parasitism by Brown-headed cowbirds; low intensity, seasonal grazing and/or maintaining high grass heights can discourage cowbird occupancy in riparian areas.



Invertebrates

Western Ridged Mussel (*Gonidea angulata*)

Status: In Review for ESA Listing (Federal); State Sensitive (Oregon)

Ecoregions: Blue Mountains, Klamath Mountains, Willamette Valley, Coast Range,

Co-occurrence with Beaver: Western Ridged Mussel may co-occur with beaver in low to mid-elevation creeks, streams, rivers, and lakes. They occur in shallow water, with constant flow and low shear stress, in well-oxygenated gravel to firm mud substrates, and tend to be abundant in areas with sand and gravel bars.

Limiting Factor Considerations: Western Ridged Mussels are cryptic, sedentary, and have limited mobility where they occur in Oregon waterways. They are impacted by altered hydrology and flow connectivity, declining water quality (contaminants and sedimentation), increasing water temperatures, habitat destruction and modification, instream construction activities for habitat restoration and/or transportation, loss of fish host, disease, predation, and invasive species.



Examples of Species of Greatest Conservation Need That Co-Occur with Beaver (continued)

Reptiles

Northwestern Pond Turtle (*Actinemys marmorata*)

Status: ESA Species of Concern (Federal); State Sensitive (Oregon)

Ecoregions: Coast Range, Willamette Valley, East Cascades, West Cascades, Klamath Mountains

Co-occurrence with Beaver: Northwestern Pond Turtle may co-occur with beaver in ponds, marshes, streams, rivers, and lakes, and use beaver imported wood as basking structures.



Limiting Factor Considerations: Northwestern pond turtles are vulnerable to habitat loss and disturbance to current and potential nesting sites. Predation by non-native bullfrogs, fish, and competition with invasive turtles are also survival risk factors.

Beaver-Related Actions in Native Fish Conservation and Recovery Plans

Beaver are present in Oregon's 15 major river basins and co-occur with many native fish, including state and federally listed species. Beaver-modified habitats such as canals, side-channels, and beaver ponds can provide critical rearing and overwintering refugia for juvenile fish. Habitat limiting factors for beaver — altered hydrology, degraded riparian vegetative communities, and altered floodplain processes and functions — are also primary limiting factors for Oregon's native fish species. As a result, protection and restoration of riparian-floodplain vegetative communities and beaver-modified habitats are strategies identified in six Oregon conservation and recovery plans for migratory salmonids (Coho, Chinook, steelhead, chum) and the statewide conservation plan for lampreys (Pacific, Western River, Western Brook). Beaver-related actions are also identified in federal recovery plans for Oregon Chub (delisted due to recovery), Snake River spring/summer Chinook and steelhead, and recovery unit implementation plans for bull trout. A complete list of state and federal plans for Oregon native fish species is available on [ODFW's Native Fish Conservation and Recovery Plan website](#). Consult with your [local ODFW District Fish Biologist, Fish Habitat Biologist, and Recovery Plan Implementation Coordinator](#) for more information on these plans and the associated fish conservation actions and beaver-related considerations that apply to your project area.



Photo: K. Munsel (ODFW)

Beaver-Related Actions for Oregon's Key Habitats & Species of Greatest Conservation Need

The following actions support the objectives of Oregon's State Wildlife Action Plan to maintain and restore key habitats, watershed processes and functions, and/or altered disturbance regimes. Additional tips and resources are provided to help restoration practitioners, land managers, and private landowners establish site-appropriate expectations and minimize impacts to Oregon Species of Greatest Conservation Need (SGCN) when conducting beaver-based restoration activities.

Conservation Actions for Maintaining and Restoring Habitat for Beaver and by Beaver:

- ☐ Evaluate American beaver presence, activity, and/or proximity to your site through beaver activity surveys or camera trapping methods.
- ☐ Support and encourage beaver occupancy and their dam-building activities, where possible, to restore floodplain-riparian processes and function.
- ☐ Manage beaver populations to contribute to wetland creation and maintenance, when compatible with existing land uses.
- ☐ Work with municipalities, working lands, private land owners, and state and federal agencies to implement co-existence strategies that reduce the likelihood of beaver damage and maintain beaver on the landscape.

Conservation Actions for Beaver-Based Restoration Activities:

- ☐ The majority of beaver-based restoration in Oregon aims to address limiting factors for native salmonids. However, restoration activities may affect other Species of Greatest Conservation Need (SGCN) and their unique habitat requirements at a site (including upstream and/or downstream). Assess the site for SGCN and incorporate the following applicable Best Management Practices (BMPs) into your project planning, design, implementation, and if possible, pre- and post-project monitoring activities to minimize adverse impacts to all sensitive species in your project area.
 - [Guidance for Conserving Oregon's Native Turtles including Best Management Practices](#) (ODFW 2015)
 - [Conserving the Gems of Our Waters: Best Management Practices for Protecting Native Western Freshwater Mussels During Aquatic and Riparian Restoration, Construction, and Land Management Projects and Activities](#) (Blevins et al. 2017)
 - [Best Management Guidelines for Native Lampreys During In-water Work](#) (Lamprey Technical Workgroup 2020)
 - [Wildlife in Managed Forests: Forest Amphibians](#) (Cafferata Coe et al. 2021)
 - Coordinate with [your local ODFW District Wildlife and Habitat Biologists](#) to help identify Oregon SGCN present at your site and additional site-appropriate BMP's to avoid or minimize impacts from beaver-related restoration and/or coexistence activities.
- ☐ Implement water conservation actions, where possible, to increase instream flows (quantity, timing, and duration) and improve water quality.
 - [Threat-Based Land Management for Creeks, Streams and Rivers: A Manager's Guide for Understanding and Managing Flowing Waters in Sagebrush Ecosystems of the Pacific Northwest](#) (Renner et al. 2023)
- ☐ Protect and restore native riparian vegetation buffers to promote diverse composition and structure.
- ☐ Minimize disturbance (e.g., ground disturbance, vegetation removal, equipment transport, human foot traffic) and protect nesting and egg laying areas (e.g., amphibians, reptiles, birds), especially for species that return to the same breeding sites and/or have limited ability to disperse to new areas.
- ☐ Control invasive animal and plant species, using site-appropriate methods, at priority sites. Minimize the spread or concentration of invasive species from restoration actions. For example, human-built, beaver-mimicry damming and ponding activities may concentrate non-native species (e.g., bull frogs, common snapping turtles, brook trout, smallmouth bass), increase predation and competition, and consequently, reduce survival for Oregon SGCN.
- ☐ Apply decontamination best practices to field gear (e.g., waders, boots, nets, buckets, equipment, vehicles, etc.) to prevent the spread of invasive plant and animal species between waterways and restoration sites.
- ☐ Implement grazing management strategies to protect sensitive water sources (seeps, springs, wetlands, wet meadows, marshes, creeks, streams), nesting, denning, and breeding areas, and promote site-capable, native riparian and upland (e.g., aspen woodlands) vegetation recovery.
- ☐ Coordinate with [ODFW Fish Passage](#) and [District Fish Biologist](#) staff on appropriate approvals for instream, beaver-mimicry (e.g., beaver dam analogs, small and/or large wood structures) and/or coexistence (e.g., pond levelers, culvert exclusion devices) structures. Instream, channel spanning structures must provide fish passage for any/all native migratory fish species (i.e., not just salmonids), over their life-cycle, that are present in the river system where the restoration is taking place.

References and Additional Resources

- Baker, B. W., Ducharme, H. C., Mitchell, D. C., Stanley, T. R., & Peinetti, H. R. 2005. Interaction of beaver and elk herbivory reduces standing crop of willow. *Ecological Applications*, 15(1), 110-118. <https://doi.org/10.1890/03-5237>
- Baker, B. W., and E. P. Hill. 2003. Beaver (*Castor canadensis*). Pages 288–310 in G. A. Feldhamer, B. C. Thompson, and J. A. Chapman, editors. *Wild mammals of North America: biology, management, and conservation*. Second edition. Johns Hopkins University Press, Baltimore, Maryland, USA.
- Blevins, E., McMullen, L., Jepsen, S., Blackburn, M., Code, A., & Black, S. H. 2017. Conserving the Gems of Our Waters: Best Management Practices for Protecting Native Western Freshwater Mussels During Aquatic and Riparian Restoration, Construction, and Land Management Projects and Activities. 108 pp. Portland, OR: The Xerces Society for Invertebrate Conservation. Available online at www.xerces.org
- Brazier, R. E., Puttock, A., Graham, H. A., Auster, R. E., Davies, K. H., & Brown, C. M. 2021. Beaver: Nature's ecosystem engineers. *Wiley Interdisciplinary Reviews: Water*, 8(1), <https://doi.org/10.1002/wat2.1494>
- Cafferata Coe, F., Garcia, T., Olson, D., & Woodward, J. 2021. *Wildlife in Managed Forests: Forest Amphibians*. Prepared for the Oregon Forest Resources Institute. Available from: <https://oregonforests.org/media/520>
- Gibson, P. P., & Olden, J. D. 2014. Ecology, management, and conservation implications of North American beaver (*Castor canadensis*) in dryland streams. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 24(3), 391-409. <https://doi.org/10.1002/aqc.2432>
- Grudzinski, B. P., Cummins, H. and Vang, T.K. 2020. Beaver canals and their environmental effects. *Progress in Physical Geography: Earth and Environment*, 44(2), 189-211. <https://doi.org/10.1177/0309133319873116>
- Grudzinski, B. P., Fritz, K., Golden, H. E., Newcomer-Johnson, T. A., Rech, J. A., Levy, J., & Maurer, K. 2022. A global review of beaver dam impacts: Stream conservation implications across biomes. *Global Ecology and Conservation*, 37, [e02163](https://doi.org/10.1016/j.geco.2022.e02163)
- Lamprey Technical Workgroup. 2020. Best management guidelines for native lampreys during in-water work. Original Version 1.0, May 4, 2020. 26 pp. + Appendices. Available from: <https://www.pacificlamprey.org/wp-content/uploads/2022/10/BMGs-for-Native-Lampres-During-In-Water-Work-Final-Updated-2022-2.pdf>
- Larsen, A., Larsen, J. R., & Lane, S. N. 2021. Dam builders and their works: Beaver influences on the structure and function of river corridor hydrology, geomorphology, biogeochemistry and ecosystems. *Earth-Science Reviews*, 218, [103623](https://doi.org/10.1016/j.earscirev.2021.103623).
- Lesica, P. and Miles, S. 2004. Beavers indirectly enhance the growth of Russian olive and tamarisk along eastern Montana rivers. *Western North American Naturalist*, 93-100. <https://www.jstor.org/stable/41717346>
- Naiman, R. J., Johnston, C. A., & Kelley, J. C. 1988. Alteration of North American streams by beaver. *BioScience*, 38(11), 753-762. <https://www.jstor.org/stable/1310784>
- Nash, C.S., Grant, G.E., Charnley, S., Dunham, J.B., Gosnell, H., Hausner, M.B., Pilliod, D.S. and Taylor, J.D., 2021. Great expectations: Deconstructing the process pathways underlying beaver-related restoration. *BioScience*, 71(3), pp.249-267. <https://doi.org/10.1093/biosci/biaa165>
- Oregon State Wildlife Action Plan. 2025. Oregon Department of Fish and Wildlife, Salem, Oregon. <https://dfw.state.or.us/SWAP-Revision/> **Note:** See the *Flowing Water and Riparian, Wetlands, Aspen Woodlands, and Disruption of Disturbance Regimes* sections of the SWAP for more information on these habitats and associated beaver-related conservation actions.
- Oregon Department of Fish and Wildlife (ODFW). *In revision*. Living with Beaver. Oregon Department of Fish and Wildlife, Salem, Oregon.
- ODFW. 2023. 3-Year Action Plan for Beaver-Modified Landscapes. Oregon Department of Fish and Wildlife, Salem, Oregon. Available at: https://www.dfw.state.or.us/wildlife/living_with/docs/ODFW_3YBeaverModLandscapesActionPlan_Final_20230616.pdf
- Oregon Fish and Wildlife Commission Beaver Management Work Group. 2022. Recommendations for Beaver Management on Federal Lands from the Oregon Fish and Wildlife Commission Beaver Management Work Group to the Oregon Fish and Wildlife Commission. Prepared by Kearns and West for the Oregon Fish and Wildlife Commission, Salem, Oregon. Available at: https://www.dfw.state.or.us/agency/commission/minutes/22/05_May/Beaver%20Management%20Work%20Group%20Recommendations%20-%20Final%204-29-22.pdf
- ODFW. 2007. Oregon Coast Coho Conservation Plan for the State of Oregon: prepared by Oregon Department of Fish and Wildlife in Partnership with State and Federal Natural Resource Agencies, Salem, Oregon, 3/16/2007. Available from https://www.dfw.state.or.us/fish/CRP/coastal_coho_conservation_plan.asp
- ODFW. 2010. Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment, (Appendix A of NMFS 2009). Carmichael, R. W. and B. J. Taylor, eds. Oregon Department of Fish and Wildlife, La Grande, Oregon, 2/5/2010. Available from https://www.dfw.state.or.us/fish/CRP/mid_columbia_river_plan.asp
- ODFW. 2010. Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead. Oregon Department of Fish and Wildlife, Salem, OR, 8/6/2010. Available from https://www.dfw.state.or.us/fish/CRP/lower_columbia_plan.asp
- Oregon Department of Fish and Wildlife and National Marine Fisheries Service. 2011. Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead. Oregon Department of Fish and Wildlife, Corvallis, Oregon, 8/5/2011. Available from https://www.dfw.state.or.us/fish/CRP/upper_willamette_river_plan.asp
- ODFW. 2014. Coastal Multi-Species Conservation and Management Plan. Oregon Department of Fish and Wildlife, Salem, Oregon, 6/6/2014. Available from https://www.dfw.state.or.us/fish/CRP/coastal_multispecies.asp
- ODFW. 2015. Guidance for Conserving Oregon's Native Turtles including Best Management Practices. Oregon Department of Fish and Wildlife. 99 pp. Available from https://www.dfw.state.or.us/wildlife/living_with/docs/ODFW_Turtle_BMPs_March_2015.pdf
- ODFW. 2021. Rogue-South Coast Multi-Species Conservation and Management Plan. Oregon Department of Fish and Wildlife, Salem, Oregon, 12/17, 2021. Available from https://www.dfw.state.or.us/fish/crp/docs/rogue_south_coast_multispecies/RSP_main_final.pdf

References and Additional Resources, continued

Petro, V. and J. Stevenson. 2020. American beaver activity survey protocol for the Pacific Northwest. Version 3.0. Oregon State University, Corvallis, Oregon. 23pp.

Renner, D., Cupples, J., Austin, J., Barnes, T., Boyd, C., Johnson, D., Schroeder, V., & Tyson, A. 2023. *Threat-based Management for Creeks, Streams and Rivers: A Manager's Guide for Understanding and Managing Flowing Waters in Sagebrush Ecosystems of the Pacific Northwest*. Oregon State University Extension Service, publication PNW 773. Available from: <https://extension.oregonstate.edu/catalog/pub/pnw-773-threat-based-management-creeks-streams-rivers>

Rosell, F., Bozser, O., Collen, P., & Parker, H. 2005. Ecological impact of beavers *Castor fiber* and *Castor canadensis* and their ability to modify ecosystems. *Mammal review*, 35(3&4), 248-276. <https://doi.org/10.1111/j.1365-2907.2005.00067.x>

Rosell, F. and R. Campbell-Palmer. 2022. Chapter 4 Habitat Use and Constructions, in *Beavers: Ecology, Behaviour, Conservation, and Management*. Oxford University Press, 17 February 2022 (online). <https://doi.org/10.1093/oso/9780198835042.001.0001>

Xerces Society for Invertebrate Conservation. 2020. Petition to List the Western Ridged Mussel *Gonidea angulata* (Lea, 1838) as an Endangered Species Under the U.S. Endangered Species Act. Prepared by Emilie Blevins, Sarina Jepsen, and Sharon Selvaggio, submitted on August 18, 2020 to the U.S. Department of Interior. Xerces Society, Portland, Oregon. <https://xerces.org/sites/default/files/publications/20-023.pdf>