



Washington Department of Fish and Wildlife

# BEAVER RELOCATION PERMIT PROGRAM

Status Update: 2019-2022

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## Introduction

### Background

The American beaver's (*Castor canadensis*, hereafter, beaver) role in the environment is expansive. Their damming activities have historically played a substantial role in maintaining the health of Washington's watersheds, providing ecological benefits to wildlife, fish, and humans. However, in human-occupied areas beavers' destruction of riparian trees and flooding often results in human-wildlife conflict which can lead to lethal removal of beavers from conflict situations. Relocating beavers involved in human-wildlife conflict into unoccupied habitat presents an opportunity to use beavers as a wetland restoration tool while simultaneously offering landowners a non-lethal option for human-beaver conflicts.

The Washington State Legislature recognized the potential benefits of beaver relocation and passed RCW 77.32.585 in 2012 directing Washington Department of Fish and Wildlife (WDFW) to permit the release of wild beaver to areas of Washington with the goal of deriving ecosystem benefits such as water storage, suspended sediment reduction, and improved fish habitat. In 2019, WDFW implemented a pilot program to issue beaver relocation permits that authorize beaver relocation. This program was the result of work with tribal co-managers, conservation organizations, and other state and federal agencies in the Washington Beaver Working Group to refine relocation and coexistence methods. The permit authorizes beaver relocation only in situations where beaver damage mitigation efforts have failed or are infeasible, where beavers are posing a public health and safety risk, or other irresolvable factors exist that preclude in-place management or tolerance. The pilot phase allows an evaluation period of the program before establishing a rule per RCW 34.05.313. The rule in development will establish criteria for issuing beaver relocation permits and develop provisions for beaver capture, housing, transport, release site selection, and other aspects of relocating beavers from human-wildlife conflict situations. During the pilot phase, the program's success will be measured by achieving the following goals:

- Safe and humane treatment of beavers.
- Beaver survival and establishment at release sites.
- Mitigating property damage caused by beavers and reduced beaver mortality.
- Efficient implementation for landowners, beaver relocation permittees, and WDFW staff.

## Ecosystem Functions of Beavers

Wetlands and riparian systems, whether beaver-occupied or not, have multi-scalar effects on wildlife and fish populations. However, not all wetlands are equal - complex, persistent wetlands offer the greatest benefit to the animal communities which utilize them. Freshwater habitats with increased complexity are linked to fish populations with greater diversity (Gorman and Karr, 1978) and persistence (Horan et al., 2000). Waterfowl populations, especially migratory species, are dependent on highly heterogeneous wetland habitat during migration and chick seasons. Mammal abundance (Nummi et al. 2019) and invertebrate persistence also increase with channel complexity (Mykrä et al. 2011). Introducing complexity and otherwise restoring riparian areas and wetlands through anthropogenic means is costly and arduous, making restoration through beaver relocation an attractive option. Beaver presence accomplishes the most influential aspects of restoration naturally. Beaver dams and lodges introduce structure with in-stream woody debris which positively increases aquatic productivity when compared to streams without beaver presence (Leidholt-Bruner et al. 1992, Snodgrass and Meffe 1998, Kemp et al., 2012). Beaver activity has been positively associated with salmon smolt survivorship in water bodies in Washington (Pollock et al. 2004), Alaska (Lang et al. 2006), and Oregon (Leidholt-Bruner et al., 2008).

While beaver relocation does not always lead to establishment or damming, relocation is an ecological tool with the potential to achieve many restoration goals simultaneously. Beaver dams increase surface water storage and recharge groundwater stores in the surrounding flood plain. Changes in soil chemistry, increased water availability, and beaver foraging preferences alter the abundance, local extent and diversity of both woody and herbaceous riparian vegetation (Cooke and Zack 2008). Stream water flows slowed by beaver activity allows streambed aggradation and increases water clarity. Over decades, beaver-occupied watersheds can evolve into anabranching networks of stream channels and ponds with surrounding vegetation dynamic in its age profile, species composition, and structure.

It is important to note that dam-building is not a universal behavior, and beavers will forgo dam construction if the site they occupy has sufficient water for refuge such as lakes or in areas with artificial structures already in place (MacCracken and Lebovitz 2005). Beavers will also abandon a colonized site if the landscape no longer provides adequate vegetation, adequate water supply, or in areas with high stream power (Petro et al. 2018, Dittbrenner et al, 2018, Suzuki and McComb 1998). In areas with flashy hydrology, beaver introduction is a poor restoration tactic as dams are typically washed out annually in those landscapes (Petro et al. 2018). In its current form, the primary objective of this program is reducing lethal removal of beaver through beaver relocation – so while permittees may have their own restoration goals, success is measured not through restoration milestones but through the survival of each individual beaver.

## Permitting

## Process

Beaver Relocation Permits issued by WDFW are available to anyone, regardless of background and experience, if they meet the conditions of the permit and agree to abide by the requirements of the permit program. All voluntary participants in the pilot program are adults who have passed a background check, have not violated RCW 77.15, completed the three-day program training, and completed an exam. Applying for a permit requires participants to submit a written relocation plan detailing their methods for each step of the relocation process, a statement of qualifications detailing their relevant experience, and state their willingness to comply with the requirements of the pilot program. Permittees must pass a background check and have access to an approved husbandry facility before captures or relocations can take place.

Other participants besides permittees can be approved to help with transportation of beavers with the goal of limiting the amount of time a beaver is kept in a trap and to reach more beavers overall. Permittees may work in collaboration with certified Wildlife Control Operators, licensed furbearer trappers, and other interested parties through a subpermittee agreement. Subpermittees are allowed to transport beavers to and from trapping sites, release sites, and the husbandry facility. Depending on the subpermittee's current license or certification, a subpermittee can perform many of the tasks of relocation without direct supervision, allowing permittees to utilize coworkers, volunteers or collaborators in their work. The selection and analysis of the release site, however, is always the duty of the permittee.

## Training

Before a permit is issued, participants in the program are required to complete a three-day training program focused on various aspects of the permit program. In 2022 the curriculum will be converted to an online, asynchronous course with the same topics as the in-person and live online trainings held in 2019, 2020 and 2021. The 2022 curriculum for this program was developed by WDFW in partnership with Molly Alves with the Tulalip Tribes, Julie Nelson with the Methow Beaver Project, and Elyssa Kerr with Beavers Northwest. Topics in the online training include husbandry facility requirements, trap setting and maintenance, veterinary recommendations for care, selection of a release site using the Beaver Intrinsic Potential Model and the Beaver Relocation Site Selection Tool, coexistence approaches, and rules and regulations pertinent to the program.

Permittees are required to participate in one day of in-person field training. This program is hosted on site of a beaver husbandry facility (a permittee's or tribal partner's) allowing participants to view approved husbandry facilities in person and ask questions about features of the facility, cleaning protocols, and intake procedures. The in-person field training demonstrates and allows hands-on practice of beaver handling, setting and placing traps, and site assessment. Permittees are required to complete the training once every three years.

## Husbandry Facilities

Permittees are required to have access to a husbandry facility which meets or exceeds the requirements of the program, subject to an annual inspection. Husbandry facilities must meet security, safety and cleaning protocols before facilities can be approved for housing beavers. Facilities must also minimize

the amount of human contact, noise exposure and other stressors to the animals. The majority of the permittees have relationships with federal hatcheries, allowing permittees to use raceways as temporary holding facilities. Some, however, have systems consisting of aluminum stock pools, modified dog runs, and kennels.

Husbandry facilities must contain water at a depth to allow beavers to float, and water must be changed weekly. Facilities must be partially shaded and include a shelter constructed of non-consumable materials, and the shelter must face the water to allow easy exit and entry. Permittees must feed fresh vegetation of a preferred species (aspen, cottonwood, alder or the like), and supplement these cuttings with commercially available rodent chow. Permittees are also required to observe beavers in the facility daily at a minimum.

Cleaning the facilities is a major concern. Vegetation is required to be changed out daily to avoid fouling the captivity area as well as keeping track of consumption while avoiding providing animals with materials to construct climbing areas. Lodges must be sanitized with a spray cleanser, and water must be drained. The facility must be allowed to completely dry between uses.

## Release Site Selection

Beaver relocation is not a panacea, nor should it be undertaken without careful consideration for the site, the watershed, and the beavers themselves. Spreading pathogens and invasive species is also a concern, and so permittees are educated on best practices to minimize spread and the program requires that relocation sites are located within the same watershed as the capture site unless an exception is granted. To help increase success of relocation, the pilot Beaver Relocation Permitting Program trains permittees to critically select and analyze each release site using the Beaver Intrinsic Potential model, a GIS site selection tool, and a release site field survey.

The statewide Beaver Intrinsic Potential model was developed through a contract with Dr. Ben Dittbrenner. This model utilizes stream gradient, bankfull width and valley width to calculate a score for each stream segment in the state. This model in combination with GIS layers showing agriculture areas, developed areas, and culvert sites to mitigate future conflict, as well as forage species and other relevant spatial datasets is made available through a webmap to permittees and at the request of any members of the public. Permittees are given training on the development of the Beaver Intrinsic Potential model and how to use these tools effectively when beginning the site selection process.

Before selecting a site for release, permittees are required to perform an on-site assessment in the field using a survey hosted on Esri's Survey123. Permittees are encouraged to assess the site multiple times throughout the year to assess conditions in different seasons before determining the site's suitability. The survey aids permittees in identifying major site characteristics incompatible with beaver release and assess the overall suitability using a 12-question scoring system. The site suitability index scoring system asks the user to quantify 12 site characteristics along a Likert Scale and combines these responses into a single numeric score for the site. In addition, the assessment must determine that social tolerance of beaver is acceptable, that risk of human-beaver conflict is low, and that the site is not already occupied by beavers before the site can be considered suitable for release. After releasing beaver at the site,

permittees are required to revisit three times to monitor the site and determine if beaver presence can be confirmed up to a year post-release.

To ensure landowners or land managers have authorized beaver relocation, permittees are required to complete landowner attestation forms before relocating beavers on private or public property. A formal agreement with a government or tribal land management agency is acceptable in lieu of a Landowner Attestation Form for releases on public or tribal land, and many permittees utilize this option.

## Reporting

Permittees are required to submit reports at the end of each relocation season, though most permittees submit reports periodically throughout the season as data is collected digitally. Permittees must submit five report components each season: daily observation logs for all beavers kept in husbandry facilities, individual beaver capture and release reports, site selection analyses, signed attestations from release site landowners or managers, and post-release site monitoring reports. To facilitate more accurate spatial data capture and to ease the reporting process, three of these reports are submitted through Esri's Survey123 in a digital format. Sites of released beavers and site assessments are viewable immediately after submission to other relocators through a shared web map. Landowner agreements and daily observation logs, which are often customized by individual groups with additional data collection requirements, are submitted through PDF.

To facilitate easy access to forms, video recordings of training lectures, training slide decks, most recent peer-reviewed literature on the topic of beaver relocation, and maps of the locations of invasive aquatic species and Chytrid fungus, all permittees are invited to access the Beaver Relocation Permittee Page after permit processing. Future goals for the page involve including a message board for permittees to allow crowd-sourced troubleshooting.

## Evaluation

### Permittees

Permits allow the permittee to relocate beavers from the date of approval to March 31<sup>st</sup> of the following year. The program has issued 33 total permits over the past three seasons, with many of these permits issued to the same permittee year after year. All permittees are either employees of an environmental business or employees/volunteers of one of six non-profits.

**33** TOTAL PERMITS

9 PERMITS IN 2019-2020

13 PERMITS IN 2020-2021

11 PERMITS IN 2021-2022

# PERMIT ISSUANCE BY COUNTY



2019

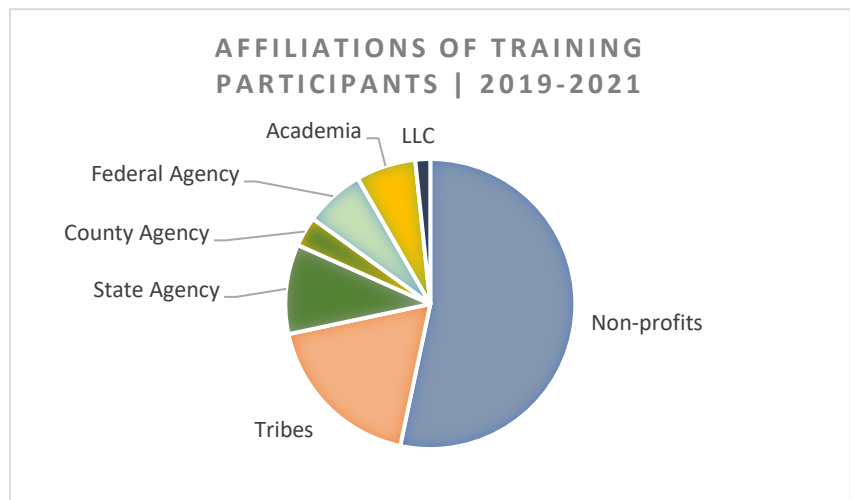


2020



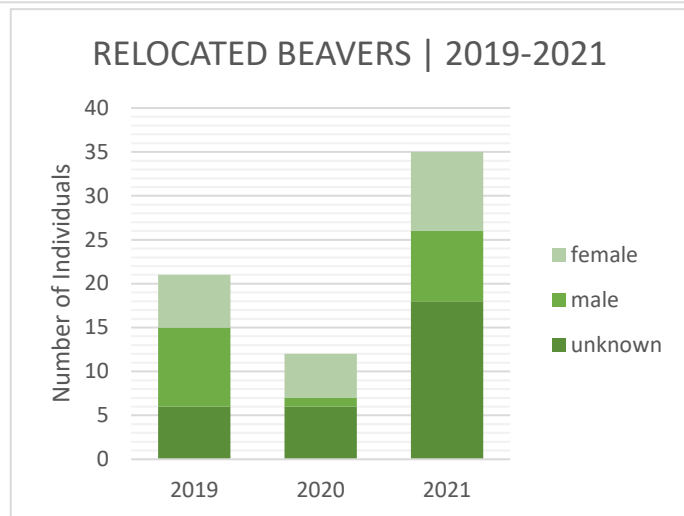
2021

In total over all three years (2019-2021), 66 total participants have attended the Beaver Relocation Permit Program Training. Participants attending the training who do not apply for permits outnumbered participants who do apply for permits, and in 2019 there were two non-permit-seeking participants for every one permit-seeking participant. Regardless of whether a participant is seeking a permit or not, the majority of participants are affiliated with non-profit organizations.



## Beavers

To date, permittees of the Beaver Relocation Permit Pilot Program have captured 71 beavers from human-wildlife conflict situations that would have otherwise been lethally removed and released 68 into new locations. The sex distribution of relocated beavers varies by year. The large proportion of beavers with unknown sex is due to the high proportion of captured kits. Permittees are coached to avoid sexing beavers, particularly juveniles, unless necessary since the process can be stressful. Generally, sexing is only required when permittees are



attempting to form male-female pairs among adult beavers in order to increase the likelihood of establishment at the release site.

On average, beavers are held in husbandry facilities for 4 days.

At the date of writing, all beaver relocations by permittees have taken place east of the Cascade Crest. Okanogan County and Chelan County account for 71% of all relocations across all three years, with 86% of these releases taking place on public lands.

## Beaver Illnesses and Mortalities

Permittees of the Beaver Relocation Permit Pilot Program are required to contact WDFW veterinarians when beavers present symptoms of illness or injuries. Over the past three years, permittees have contacted veterinarians in two instances: 1) beaver with a partially healed injury to a tail, assumed to be the result of a predator before the instance of trapping, and 2) a beaver showing signs of severe illness.

In the first instance, veterinarians recommended wound care if the wound showed signs of infection, but the beaver appeared to be healing well.

In the second instance, a beaver showed signs of listlessness immediately after trapping. The beaver was brought into captivity in the hopes of issuing care, but the beaver expired after the first night.

Two other mortality events have occurred: 1) a beaver was drowned in a trap when water levels unexpectedly rose in a dammed environment overnight, and 2) a beaver was caught in a hole in husbandry facility infrastructure. The training program now uses these two instances as examples in our training program to ensure mortalities do not recur from these same causes.

## Post-Release Monitoring

Though reduction of lethal removals is the primary goal of the WDFW permitting program, habitat restoration through beaver relocation is the target of most permittees. To monitor beaver establishment at release sites, permittees are required to revisit release sites one month after the release, the following fall, and the following spring to perform post release monitoring (this schedule is adjusted accordingly if the release takes place in the fall). Monitoring is reported through an online survey hosted in Survey123 since spring of 2020. During each monitoring survey, permittees are required to search a 4000 foot length of stream (or wetland) centered on the release site (2000 feet upstream and 2000 feet downstream of the release site) for sign of beaver presence. Permittees must record any observed beaver sign within this area, including dams, food caches, chews, scat, tracks, or the animal itself. Permittees may also conduct their own monitoring in addition to these surveys, either for beaver presence or for habitat alterations such as water temperature and flow or the effectiveness of artificial structures such as beaver dam analogs (BDAs) for wetland creation with or without beaver relocation.

Eighteen sites have been surveyed between 2019-2021. The likelihood of observing beaver sign near release sites a month after release is 60%.

One limitation of this dataset is the lack of repeat visit data and may not be an accurate portrayal of the success of permittee relocation without further data points. Repeat site analysis the following fall and again in the spring as is suggested by the reporting protocol is performed in only 42% of sites overall



since the program began. A future goal is to prompt beaver relocators to survey release sites through automated reminders.

## Preliminary GIS Analysis

Spatial analysis of 21 beaver relocation sites from the 2019 and 2020 field seasons show a 11% increase in surface water area within a one-mile radius of the documented release site one year later (Google Earth Engine, 2022). Permittees are not required to track or tag beavers for monitoring, so these results cannot be proven to be a direct result of the program. However, it is likely that the beaver activity seen in satellite imagery at documented release sites are from the beavers released there through the Beaver Relocation Permit Program. Increases in riparian buffer width, overall riparian buffer size, increase in canopy height, and total surface water are all positive changes seen through spatial analysis so far.

## Environmental DNA Research Project

WDFW is funding research at Washington State University with Dr. Piovio-Scott and Dr. Goldberg, and many beaver relocation permittees have chosen to contribute samples to this study. The objectives of the study focus on evaluating the effectiveness of using eDNA as a novel method to assess beaver presence at release sites versus more traditional, labor-intensive forms of tracking such as visual sign surveying and radio tracking. The study is also investigating whether beaver relocation can facilitate the transmission of aquatic pathogens and invasive species. This project is scheduled to conclude in August 2022 and results will be available at that time.

## Summary

*Safe and humane treatment of beavers.* – The permit program has outlined required conditions to ensure safe and humane treatment through working with WDFW veterinarians and other animal welfare experts to ensure the beavers are trapped, transported, and held in captivity safely. Strict protocol is in place and enforced to ensure facilities offer clean, comfortable, and low-stressor environments while animals are briefly held in captivity. WDFW staff continually work with permittees to identify new needs and ways to improve permittee education as the program evolves. Permittees are asked to evaluate and contribute suggestions on how to improve the program during the pilot phase.

*Beaver survival and establishment at release sites.* – Survival is difficult to monitor due to the program's preference for a minimally invasive program where tagging is not required. Some permittees, however, have determined beaver permanence is highly likely after repeated post-release surveying beyond the requirements of the program's release site monitoring protocol.

*Mitigating property damage caused by beavers and reduced beaver mortality.* – This program prioritizes coexistence as the best and first option when working with beaver conflict. Permittees are required to discuss options for in-place management before beginning plans for relocation. When coexistence is not possible, the program established criteria that only beavers involved in conflict and which are otherwise slated to be lethally removed are candidates for relocation, permittees are mitigating property damage with every relocation.

*Efficient implementation for landowners, beaver permittees, and WDFW staff* – The data from post-release site surveys, feedback from permittees, and the enthusiasm from both landowners and WDFW



biologists has shown this program is on its way to being efficient. A priority of the program is giving autonomy to permittees to select their own capture and release sites with appropriate training without extensive staff oversight. Requiring a single pre-season meeting with local staff to discuss the project with each permittee rather than approving each step of each relocation further streamlines the process. Further development could include the permittee education component, improving interactions between permittees through message boards/websites and automating the data processing aspect could improve this program even more.

## Future Directions

The Beaver Relocation Permit Pilot Program continues to evolve as new information is gathered to improve efficiency and effectiveness in reducing conflict removals, managing wildlife responsibly, and meeting multi-stakeholder interests. The overarching goal for this pilot is to migrate the permitting program into a permanent program through the development of a rule in upcoming agency rule-making. Additionally, future enhancements to the program could include:

- Identifying a funding source and payment for invited instructors during training sessions
- Developing incentives for landowners to allow relocated beavers to inhabit their property
- Developing relationships with federal and state hatcheries to support collaboration with permittees and encourage the use of hatchery facilities as seasonal husbandry facilities
- Developing more effective methods of supporting tribal co-managers in their relocation work
- Increasing promotion of coexistence methods including relocation throughout the state
- Improving collaboration and communication with trappers about relocation efforts and restoration areas
- Identifying cross-program priority areas for habitat restoration via beaver relocation and consider integrating beaver relocation into habitat improvement projects on WDFW-managed lands
- Working with beaver relocators to identify the effectiveness of BDAs when coupled with beaver relocation

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