A North American Perspective on Beaver Restoration

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Beaver Conference: Restoring Beavers to the British Landscape

@rlmalison
Outline

• Context – comparing western North America to the UK

• Some current management strategies/updates from NA
  • Management Strategies
  • Use of BDAs

• Common concerns about reintroductions (related largely to beavers and fish)

• Importance of naturally functioning rivers & other factors influencing fish populations
Context

- Alaska alone is 6-7 times larger than the UK
  - 423m vs 60m acres
- Yukon Delta National Wildlife Refuge – 19.2m acres
- UK = 67.33m people, YDNWR = 25,000 people
Context

- UK public land = 8% of land
- Alaska = 62%, Montana = 30%, Oregon = 53%, Washington = 42%
- More potential conflict or need for collaboration in the UK
- Importance of landowner and stakeholder buy-in
Management strategies/updates from North America
Beaver management

- Beaver management varies state by state
- Legal status varies state by state
- Some states are trying to develop strong partnerships for beaver restoration projects
  - Stream incision
  - Mitigating climate change and wildfire
Beaver management in California

• CA Department of Fish and Wildlife
• Partnerships: California native tribes, NGOs, private landowners, and state and federal agencies
• Nature based solutions
• Need for additional staffing to truly support and manage this native keystone species
• Proactive leap towards bringing beavers back onto the landscape

A. Budget Request Summary

The California Department of Fish and Wildlife (Department) requests 5.0 permanent positions and $1.67 million California Environmental License Plate Fund in Fiscal Year (FY) 2022-23, and $1.44 million in FY 2023-24 and ongoing to fund and support the implementation of a beaver restoration program within the Department.
Develop dedicated staffing resources to:
- Revise beaver policies and guidelines
- Coordinate restoration efforts
- Proactively mitigate human-beaver conflict (integrated toolkit) & foster co-existence
- Relocating beavers into watersheds with partners
- Demonstrate the importance of beaver relocation and climate smart restoration
  - habitats are refugia to drought, wildfire, and climate change
  - Increased abundance of ecologically significant plants and wildlife species
  - Improve water quality and prolong flow during dry seasons
- Create a pathway for relocation in watersheds where beavers have been extirpated
- Beaver habitat suitability models to reduce the risk of human conflict and to sustain long-term beaver occupancy
- Public awareness for beaver conservation and management
**Figure 1** Comparison of riverscape feedback cycles with increased global temperature. Phase 1 indicates processes that are initiated by warming global temperatures and lead to either degradation or resilience. Phase 2 indicates processes that occur once riverscapes have already reached a degraded or resilient state. Left: Cycle of increasing riverscape degradation occurring without beaver or beaver mimicry. Right: Cycle of maintained riverscape resilience that can be achieved by partnering with beaver and utilizing beaver-based designs.
Beaver management in Washington

Living with wildlife

Preventing conflict

Despite an appreciation for beavers and our best intentions to live with them, beavers can become a problem if their eating habits, and dam or den building activity, flood or damage property.

Before beginning any beaver control action, assess the beaver problem fairly and objectively. Are beaver really causing damage or creating hardship requiring control action? The very presence of beavers is often seen as a problem when, in fact, the beavers are causing no harm. You should also determine the type of damage or problem the animals are causing, and then match the most appropriate and cost-effective controls to the situation.

Once you have decided to control beaver damage, you have three control options: prevention, beaver translocation, or lethal control.

To prevent conflicts or remedy existing problems:

Choose and place plants carefully.
Beaver management in Washington

**Legal Status**

Because beavers’ legal status, trapping restrictions, and other information change, contact your local wildlife office for updates.

The beaver is classified as a furbearer ([WAC 220-400-020](#)). A trapping license and open season are required to trap and harvest a beaver. Visit the [Furbearer trapping seasons and rules page](#) for more information.

It is unlawful to release a beaver anywhere within the state, other than on the property where it was legally trapped, without a permit to do so ([RCW 77.15.250](#), [WAC 220-450-010](#)). Click here for permitted beaver relocator information.

The owner, the owner’s immediate family, an employee, or a tenant of property may trap or kill a beaver on that property if the beaver is threatening human safety or causing property damage ([RCW 77.36.030](#)). In such cases, no special trapping permit is necessary for the use of live traps. However, a special trapping permit is required for the use of all traps other than live traps ([RCW 77.15.192](#), [77.15.194](#), [WAC 220-417-040](#)). There are no exceptions for emergencies and no provisions for verbal approval. All special trapping permit applications must be in writing on a form available from WDFW.

To remove or modify a beaver dam or install a water leveling or flow device, you must have a Hydraulic Project Approval (HPA)—a permit issued by WDFW for work that will use, obstruct, change, or divert the bed or flow of state waters ([RCW 77.55](#)). A permit application can be obtained from your [WDFW Regional Office](#) or from the [Hydraulic Project Approval (HPA)](#) web page. For additional information on beaver dam modifications, please contact your local [WDFW habitat biologist](#).

In emergency situations (when an immediate threat to property or life exists), verbal approval from WDFW can be obtained for work necessary to solve the problem. A 24-hour hotline 360-902-2537 is available for emergency calls during nonworking hours. During normal hours, contact your nearest [WDFW Regional Office](#).
Estimating widespread beaver dam loss: Habitat decline and surface storage loss at a regional scale

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Abstract
The loss of beaver populations has commonly been accompanied by the failure of beaver dams, leading to stream incision, water table lowering, and the eventual transition from a beaver meadow to a drier riparian corridor. Widespread decline in North American beaver populations (Castor canadensis) has been documented from pre-European settlement to the current day, representing an estimated 80% to 98% loss of historical populations. While individual case studies have investigated the ecosystem impacts of local beaver population loss, few studies have quantified large-scale changes associated with widespread population decline. Here, we use the Beaver Restoration Assessment Tool to model landscape-scale habitat suitability and beaver dam capacity in Colorado, USA, in order to determine whether a widespread loss in beaver population corresponds to a similar scale decline in the capacity to sustain beaver-related ecosystem processes.
Beaver Dam Analogs

Pollock et al. 2014

Bouwes et al. 2016
Beaver Dam Analogs

- Very popular restoration tool in western USA
- Low cost, ease of installation, ecosystem benefits
- May help beavers come back
- One watershed group in Montana installed over 200 BDAs last summer alone
- Entire Montana Conservation Corps Crew will be installing BDAs all summer 2023

But there are little data on the systems level effects of the BDAs
Study of BDA Complexes on Three Tributaries
Sampled control and BDA sites in 2021 & 2022
Common Concerns about Beaver Reintroductions (related to fish)
Concern: Disruption of fish migration and fish recruitment

• There are positive benefits for many species that would boost recruitment
• Dams do not completely block movement
  • Specific systems and species need to be considered
• Ask if spawning and recruitment is compromised at the scale that habitat is modified?
Concern: Beavers cause secondary blockages by forming debris dams

- Wood in streams is important
- Beavers can help bring more wood into streams
Concern: Need for more robust studies of fish migration and movement

• Dams and BDAs most often aren’t impassable barriers, but they often modify movements
• Many dams regularly overtop with high flow and rain events and/or break
• Studies using telemetry, pit tags or other methods, over a range and number of dam types on multiple species, paired with hydrological/flow data
• A greater understanding of how changes in the seasonality or degree of fish movement is modified by beaver dams would be useful, as well as actual long-term studies documenting whether these changes modify population dynamics or productivity of different fish species
Concern: Studies on the impact of beavers on fish and fisheries should cover areas where beavers are active, not just where dams have been constructed

- Largest effects will be where there are dams
- Unsurprisingly, beavers do not build dams on the main river channel (stream power)
- More dams are located on tributaries or off channel habitat (Malison & Halley, 2020; Malison et al., 2014, 2015)
- Interesting differences between *C. canadensis* and *C. fiber*
  - More bank burrows by *C. fiber* and less dams in general
Concern: Dams will cause fine sediment to build up

- Could lose some spawning area at smaller scales
- Fine sediments could accumulate contaminants
  - This is a function of the surrounding land use (Ahearn et al., 2005; Zheng et al., 2020)
  - Beaver dams and ponds can improve water quality by retaining nitrogen and phosphorous (Devito et al., 1989; Lazar et al., 2015; Naiman et al., 1994; Puttock et al., 2017; Rosell et al., 2005; T.J. et al., 1987)

Bylak & Kukula 2022
Concern: Waterlogging of adjacent land

• The “waterlogging” of adjacent land, otherwise known as increasing floodplain connectivity, has many ecosystem level benefits (Gorczyca et al., 2018; Hood & Bayley, 2008; Hood & Larson, 2015; Majerova et al., 2015; Pollock et al., 2014; Puttock et al., 2017; Westbrook et al., 2006).
Concern: Increased temperatures

• Some beaver ponds are warmer (Weber et al. 2017, Majerova et al. 2015, 2020).
  • Could increase productivity
  • Could change the community if too warm for intolerant species
  • Could reduce resilience to climate change

• But other ponds are not warmer, it depends on groundwater inputs (Malison et al. 2015)

• They can also provide cool water refugia at depth compared to surrounding habitats (Weber et al., 2017)
Concern: damage to trees

- If healthy riparian buffers were present, then the presence of beavers would not immediately remove all trees.
- Specific tree species can be planted that are well adapted to beaver foraging, which would have greater capacity to provide both a buffer and beaver forage.
- Specific trees can be protected – more expensive
- The addition of wood to stream systems provides important structure and habitat for fish, also influence form and function of the stream

Concern: damage to banks and other infrastructure
Concern: stakeholder conflicts and management costs

• Many concerns, one of which could be the reduced agricultural production near the river
  • Use of mitigation measures to find common ground
  • The presence of riparian buffers and more natural stream function is very beneficial for the system
  • Increasing understanding of the natural processes occur in rivers is important
  • Undertaking restoration that supports the function of the system is key
The importance of naturally functioning rivers
~800 cfs

Direction of flow

Whited 2003
~4300 cfs
~7900 cfs
~11,500 cfs

Direction of flow

Whited 2003
~20,000 cfs
Habitat Complexity - SHM
River channel and Floodplain Habitat Change

Stanford et al. 2005
Whited et al. 2007 Ecology
Aquatic Macroinvertebrates

- Mayflies (Ephemeroptera)
- Stoneflies (Plecoptera)
- Caddisflies (Trichoptera)

Anderson 2008

Unique taxa:
- Ephemeroptera
- Plecoptera
- Trichoptera
- Coleoptera
- Odonata
- Gastropoda

Lateral habitats vs. Main channel

NABS (www.benthos.org)
Flooding

Large wood

Riparian vegetation
All within the context of human activities
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Questions?

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