



Presented by
the B.C. Wildlife Federation's
Conservation Stewardship Department

BEAVER-BASED RESTORATION

Mimicking Natural Processes to Restore Watershed Resilience

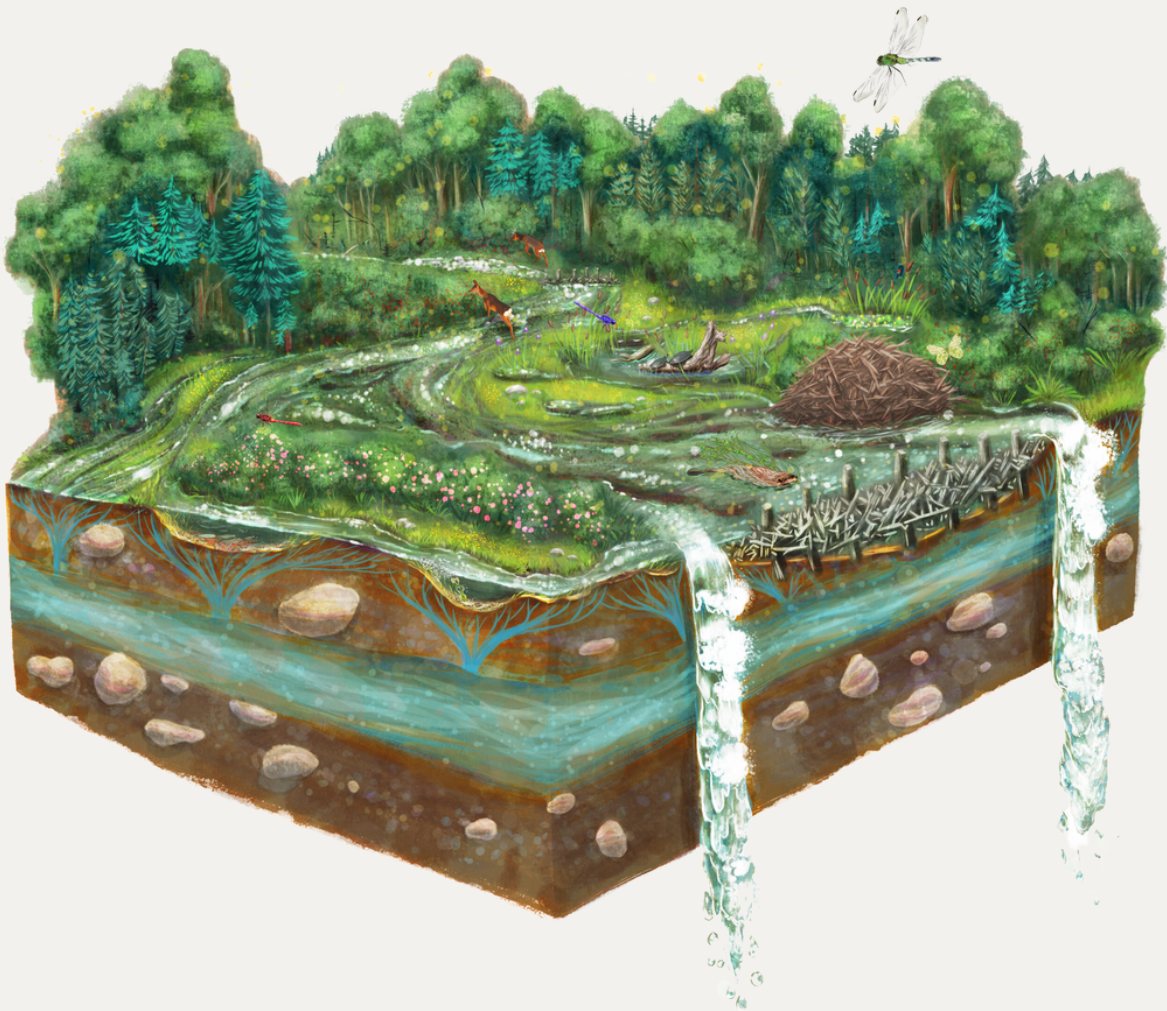


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Partnering with Beavers

Harnessing the natural water-retention capabilities of beaver dams offers an economical approach to wetland restoration and watershed resilience. By encouraging beavers to take over and improve upon BDAs, their expertise in dam building is utilized to enhance water retention. Beavers, known for their dam-building skills, effectively help to hold back water.

The presence of beaver colonies in a stream system aids in retaining more water on land throughout the year, augments summer stream flows, and enhances resilience to drought, flood, and fire.

Partnering with beavers for watershed management reduces the need for municipal, regional, and provincial services. Beaver-based restoration proves to be more efficient, cost-effective, and sustainable than traditional built infrastructure.



Artwork by Chenoa Gao

Benefits of Beavers to the Environment



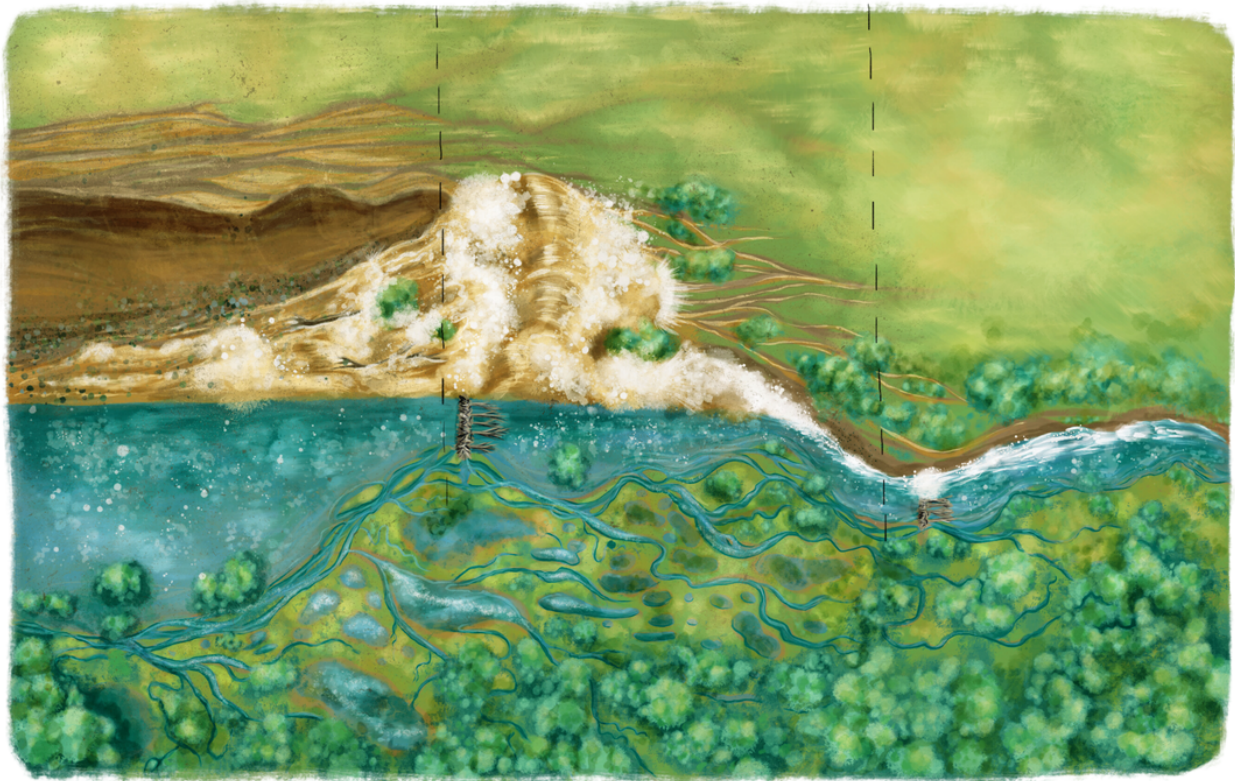
Beavers have been shaping our riverscapes for over one million years. They are often referred to as "ecosystem engineers" for their ability to create and expand habitats with the construction of dams. So many species rely on habitats created by beavers that they are considered a "keystone species," integral to the healthy functioning of ecosystems in which they are native to. This includes almost all of Canada and the U.S.

Beaver dams impound water, which activates floodplains and helps recharge groundwater stores.

Dams promote a diverse range of flow conditions and water depths. This variety of habitat allows many species to flourish, as there are areas to rest, forage, and reproduce.

The Impact of Beavers on Climate Resilience

Beavers are becoming increasingly known as climate heroes for their ability to mitigate the severity of climate-driven events such as floods, droughts, and fires. Beavers help mitigate flooding by storing water in the landscape, which enables excess water to spill onto the floodplain rather than eroding the streambed. In terms of fire mitigation, beavers contribute by storing more surface and groundwater on the landscape, which keeps vegetation greener and less prone to fire. Regarding drought mitigation, beaver dams gradually release stored water throughout the seasons, thereby augmenting summer low flows that would otherwise lead to droughts.



After flood

During

Before

Schematic demonstrating how beaver dams and beaver dam analogues mitigate flood impacts: Instream structures slow down, spread out, and sink floodwaters, thereby limiting erosion and degradation

A Brief History of the Beaver

Before European colonization, beavers occupied most rivers in North America. Early colonial settlers wrote tales detailing their difficulties travelling through the dam-laden river systems.

The fur trade in the 18th and 19th century prompted the persecution of beavers and led to drastic population declines.

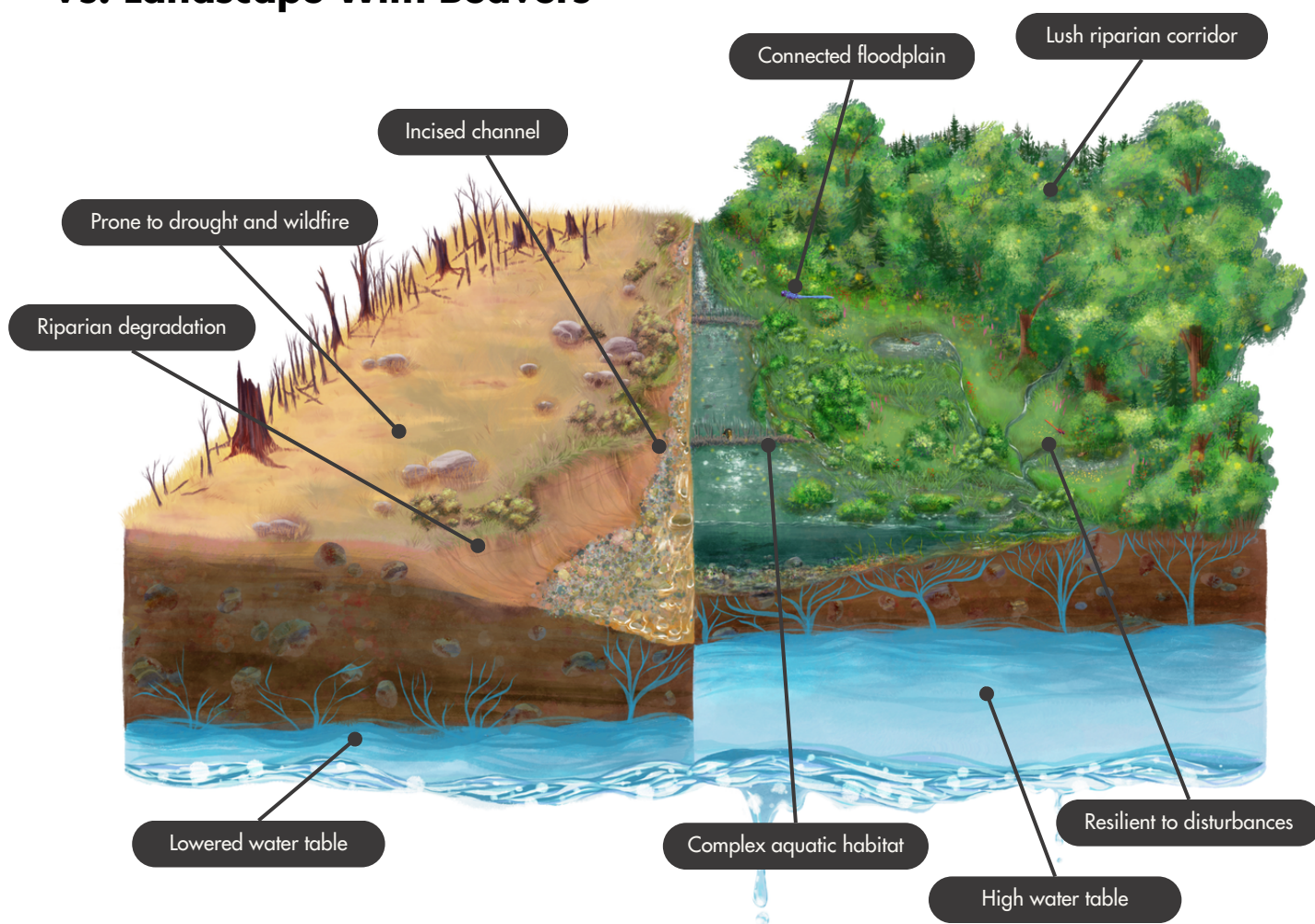
By the 20th century beavers were extirpated in many areas of their native range.

This rapid loss of beavers from valley-bottoms was coupled with the expansion and development of human settlements within highly productive floodplain areas.

Human-made dams and berms were constructed to control water courses. However, this human manipulation of river systems, combined with the absence of beaver influence, disrupted the natural ecosystem equilibrium. This led to more degraded habitats that were less resilient to disturbances.

Streams became disconnected from their floodplains, and landscapes were not able to retain as much water which led to heightened flood, drought, and erosion events.

Landscape Without Beavers Vs. Landscape With Beavers



Basics of Beaver-Based Restoration

Beaver-based restoration is a type of low-tech process-based restoration (LTPBR). LTPBR is an approach to stream restoration that uses simple, temporary instream structures to mimic natural systems and initiate or enhance specific processes that regulate healthy ecosystems. Beaver-based restoration intends to bring back the ecological benefits of beaver dams to degraded streams that lack dam-building beavers.

Beaver-based restoration can involve multiple approaches:

- Construction of Beaver Dam Analogues (BDAs)
- Relocation of beaver to project sites
- Restoration of riparian vegetation to encourage beaver establishment and dam-building

What Are Beaver Dam Analogues?

Beaver Dam Analogues (BDAs) are human-made structures designed to mimic the form and function of natural beaver dams. There are many different designs for BDAs, but they all can be constructed by hand using locally sourced, natural materials. A common BDA design involves pounding untreated wooden posts into the streambed, weaving woody vegetation through the posts, and packing the dam with vegetation, sediment, and cobbles to effectively hold back water. Beavers tend to build multiple dams within one area, therefore multiple BDAs are typically constructed at one project site – all of these structures are referred to as a complex. Having a complex of BDAs not only mimics natural systems, but the redundancy provides increased resilience, as less importance is placed on an individual structure.



Benefits of Low-Tech Process-Based Restoration and Beaver-Based Restoration:

- Low cost compared to traditional stream restoration approaches
- Low tech – does not require the use of heavy machinery
- Self-sustaining – initiates a cascade of ecological processes that allows the system to recover on its own. If beavers establish, they will often improve upon structures and expand and build new structures

Beaver-Based Restoration in BC

Given the scale of degradation across our watersheds and the low-cost, high-impact outcomes, there is significant interest in beaver-based restoration in the province.

A few groups have already constructed BDAs in BC but it is still a relatively new restoration approach with some regulatory and practical nuances for implementation.

For this reason, BCWF aims to connect practitioners interested or actively pursuing beaver-based restoration to share resources and advice, to celebrate successes and learn from setbacks, all to ensure we are working together to advance the practice of beaver-based restoration.

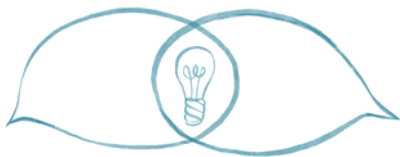
There are 4 main pillars to this approach



Navigating the regulatory regime through which this new restoration approach will be implemented.



Ensuring data is collected to effectively monitor project sites and inform adaptive management strategies to promote project success.



COLLABORATION

Creating and connecting a network of practitioners to learn from and collaborate with each other.



IMPLEMENTATION

Providing support, both in-kind and financial, to practitioners through the various stages of assessment, design, construction, and monitoring of projects

Living Among Beavers in BC

While there are many ecological benefits to beavers on the landscape, living with beavers is not always easy. Perceptions of beavers vary, with many considering them a nuisance due to potential flooding, tree damage, or culvert blockages. However, simple solutions exist for coexisting with these natural engineers.

Unwanted Flooding

Pond levelers or other devices can be installed to regulate water levels in a beaver pond. This often involves installing a large diameter, flexible drainage pipe through the dam. The intake of this pipe should be fenced and placed in the deepest part of the beaver pond to prevent beavers from plugging the intake.

Blocking Culverts

Culverts create a pinch-point for water flow, and beavers often build dams at these points because a small dam can create a large pond upstream. Fencing around the culvert, usually in a trapezoidal shape, stops beavers from blocking it.

Tree Damage

Valued trees can be protected by wrapping the base in wire mesh. For larger areas requiring protection, exclusion fencing works well, provided its base is flush with the ground. It's important to ensure the fence is tall enough (at least 1 meter) to prevent beavers from climbing over it, especially when snow accumulates. While some resources suggest applying texture repellents like a sand-paint mixture to tree trunks, this approach is generally less effective than wrapping.



Beaver Co-Existence Strategies

Although implementing these strategies involves investing time and money, coexisting with beavers is often found to be less expensive than removing them. This is because often, even if a beaver or beaver family is removed from an area, new beavers are likely to move in.



10,000 WETLANDS

USING BEAVER-BASED RESTORATION TO ENHANCE WATERSHED RESILIENCE

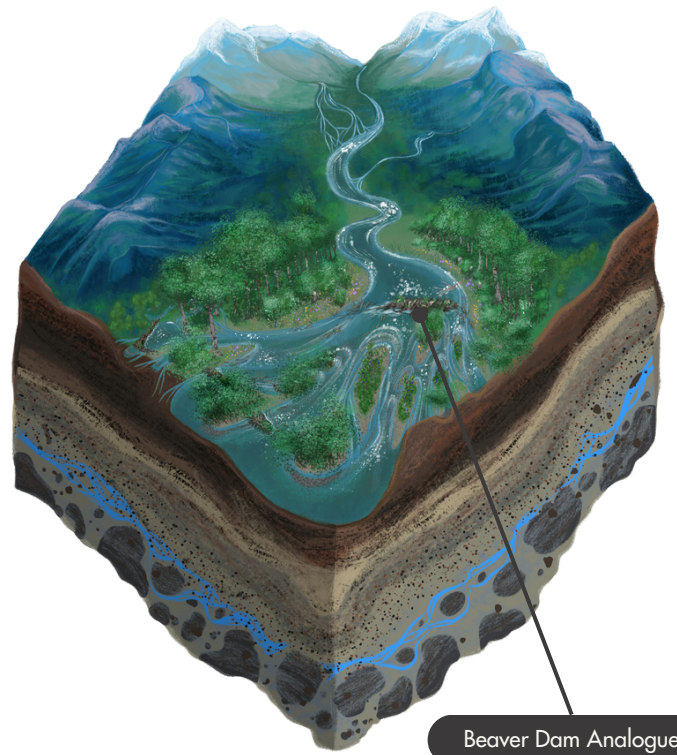
In early 2023, the B.C. Wildlife Federation launched 10,000 Wetlands, an ambitious project focused on beaver-based restoration. The 10,000 Wetlands project is designed to address environmental challenges in a changing climate by installing 100 Beaver Dam Analogues (BDAs) across the province. By partnering with First Nations, environmental NGOs, and government entities our overall aim is to kickstart the creation and restoration of over 10,000 wetlands province-wide by mimicking and promoting beaver establishment. The BCWF's 10,000 Wetlands project is a significant step forward in the Federation's overall efforts to restore and enhance wetland ecosystems, promote biodiversity, and improve watershed resilience through nature-based solutions.

Laying the Groundwork for Beaver-Based Restoration

Under the leadership of the BCWF's Beaver Restoration Assessment Lead, Jennifer Rogers, extensive site assessments were conducted throughout 2023 to identify potential sites where BDAs could be built to mimic the ecological functions of natural beaver dams.

In total, 61 potential sites were evaluated for BDA implementation and 8 sites have been selected as priorities for this project. This work was done in collaboration with 11 First Nations communities and 9 other organizations, including nonprofits, academic institutions, and government entities.

In 2024, we aim to construct up to 77 BDAs at priority sites and continue conducting field assessment to identify opportunities for 2025.



Schematic demonstrating the effects of BDAs on waterways and land

Resources

Low-Tech Process-Based Restoration Design Manual

This design manual offers guidelines for using low-tech tools to kickstart process-based restoration projects.

US FWS | Beaver Restoration Guidebook

This guidebook provides a background on beaver ecology, benefits of beaver-based restoration, and project examples.

Cows & Fish | Beaver Our Watershed Partner

This Cows and Fish publication entails general beaver information and coexistence strategies.

King County | Manual

This document provides resources for planning when designing restoration projects with beavers in mind.

Partners



POLIS Project on Ecological Governance

watersustainabilityproject



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Funders

