PUTTING BEAVERS TO WORK FOR WATERSHED RESILIENCY AND RESTORATION

April 20, 2020

Understanding Beavers as a Natural Infrastructure Solution

Miistakis Institute

PUTTING BEAVERS TO WORK

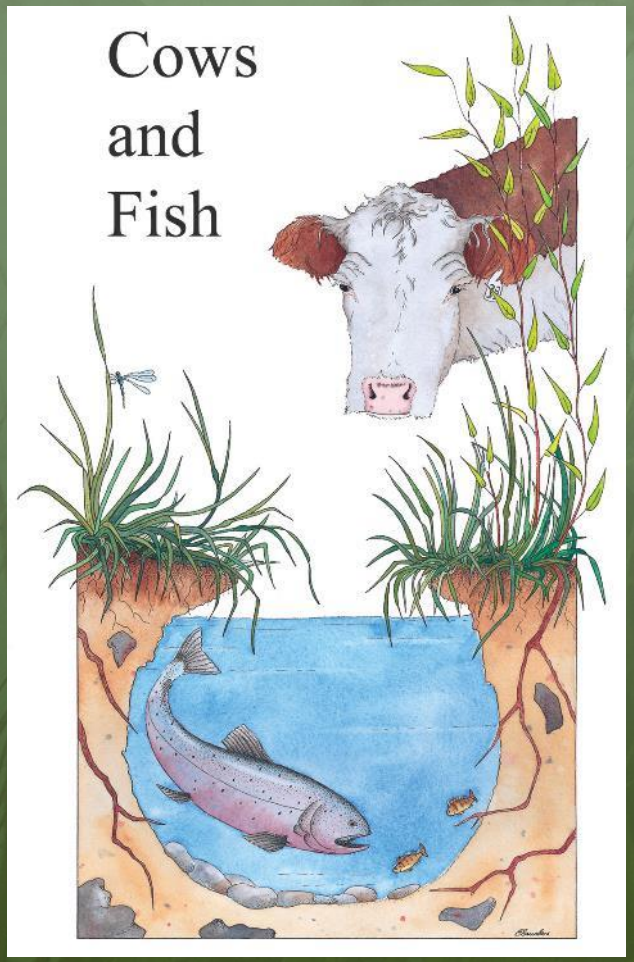
Norine Ambrose, Executive Director

Cows and Fish – Alberta Riparian Habitat Management Society

Holly Kinas, Conservation Analyst

Miistakis Institute

Cows and Fish



Cows and Fish (Alberta Riparian Habitat Management Society) is a non-profit, charitable society, working across Alberta, Canada.

Cows and Fish strives to foster a better understanding of how improvements in riparian management can enhance landscape health and productivity, for the benefit of all.

The Miistakis Institute

The Miistakis Institute is a non-profit, charitable, applied research institute affiliated with Mount Royal University in Calgary, Alberta, Canada

Our work –We study the landscape so we can help people conserve it. And we work to make innovative research accessible to communities and decision makers so they can make choices that promote healthy landscapes

Poll 1

Have you ever considered beavers as a natural infrastructure tool?

- Yes
- No

Poll 2

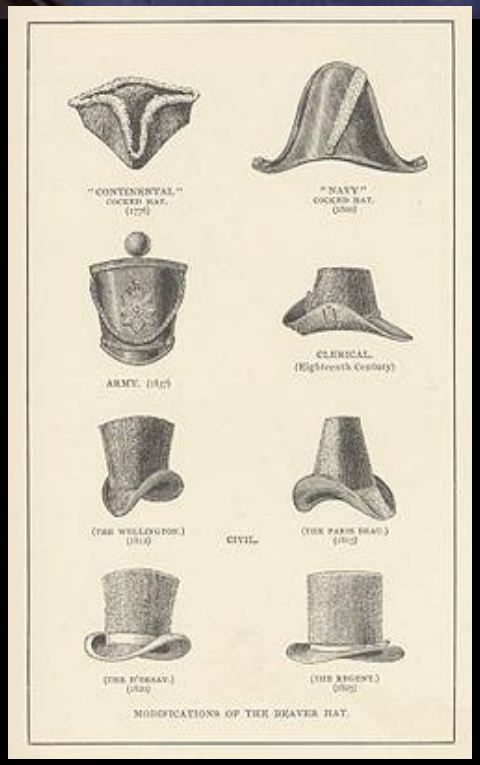
Please describe yourself. Are you primarily:

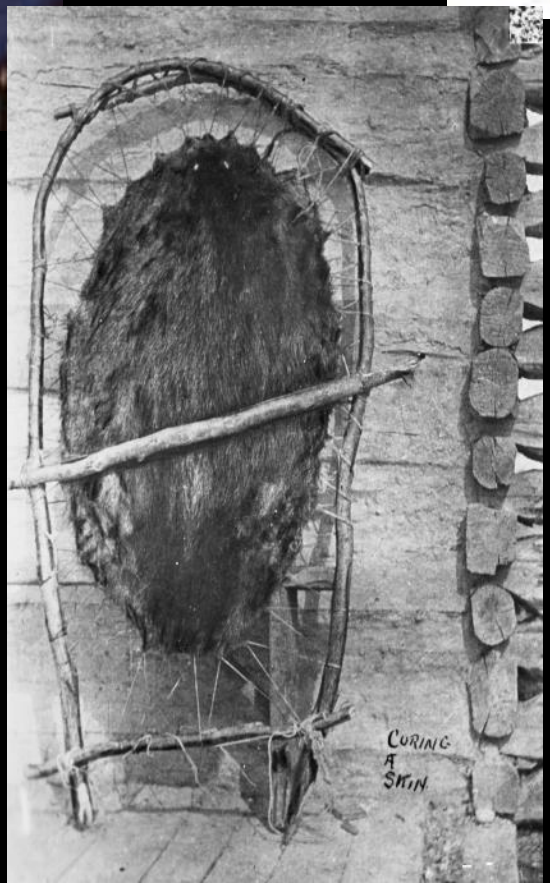
- Academic Researcher
- Municipal Government
- Provincial Government
- Federal Government
- First Nations
- Non-profit
- Business / Industry
- Landowner
- Other

Beaver Ecology & Linkages to Watershed Ecosystem Services

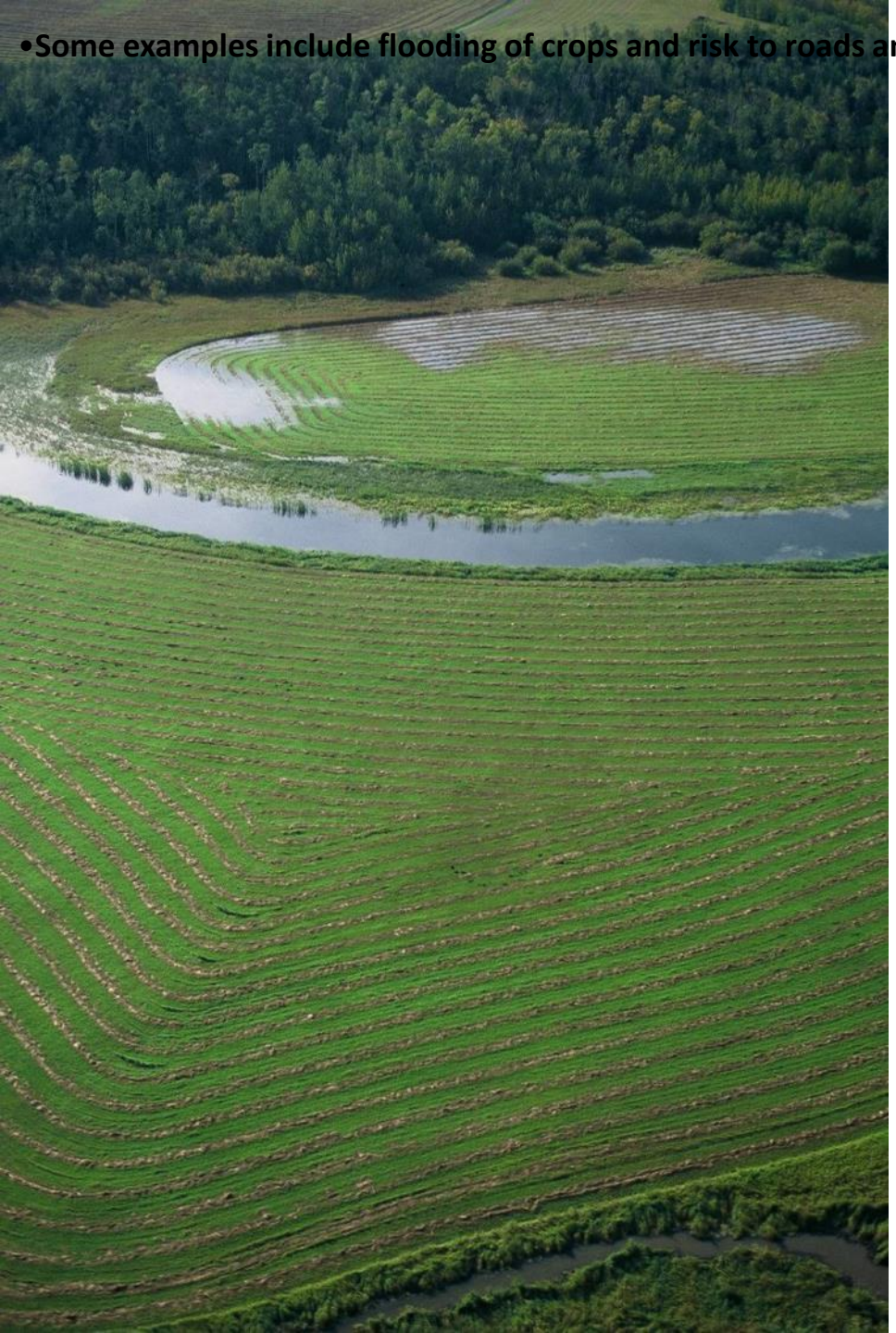
A Canadian Icon

- 709 Canadian place names
- 50 Alberta place names


"CONTINENTAL"
COCKED HAT.
(1775)
"NAVY"
COCKED HAT.
(1800)
ARMY. (1815)
CLERICAL.
(Eighteenth Century)
(THE WELLINGTON.)
(1815)
CIVIL.
(THE PARIS BEAU.)
(1815)
(THE D'ORSAY.)
(1825)
(THE REGENT.)
(1830)
MODIFICATIONS OF THE BEAVER HAT.


CURING A SKIN

•Some examples include flooding of crops and risk to roads and bridges….



Good Beaver, Bad Beaver?

Typical beaver colony:

-2 adults

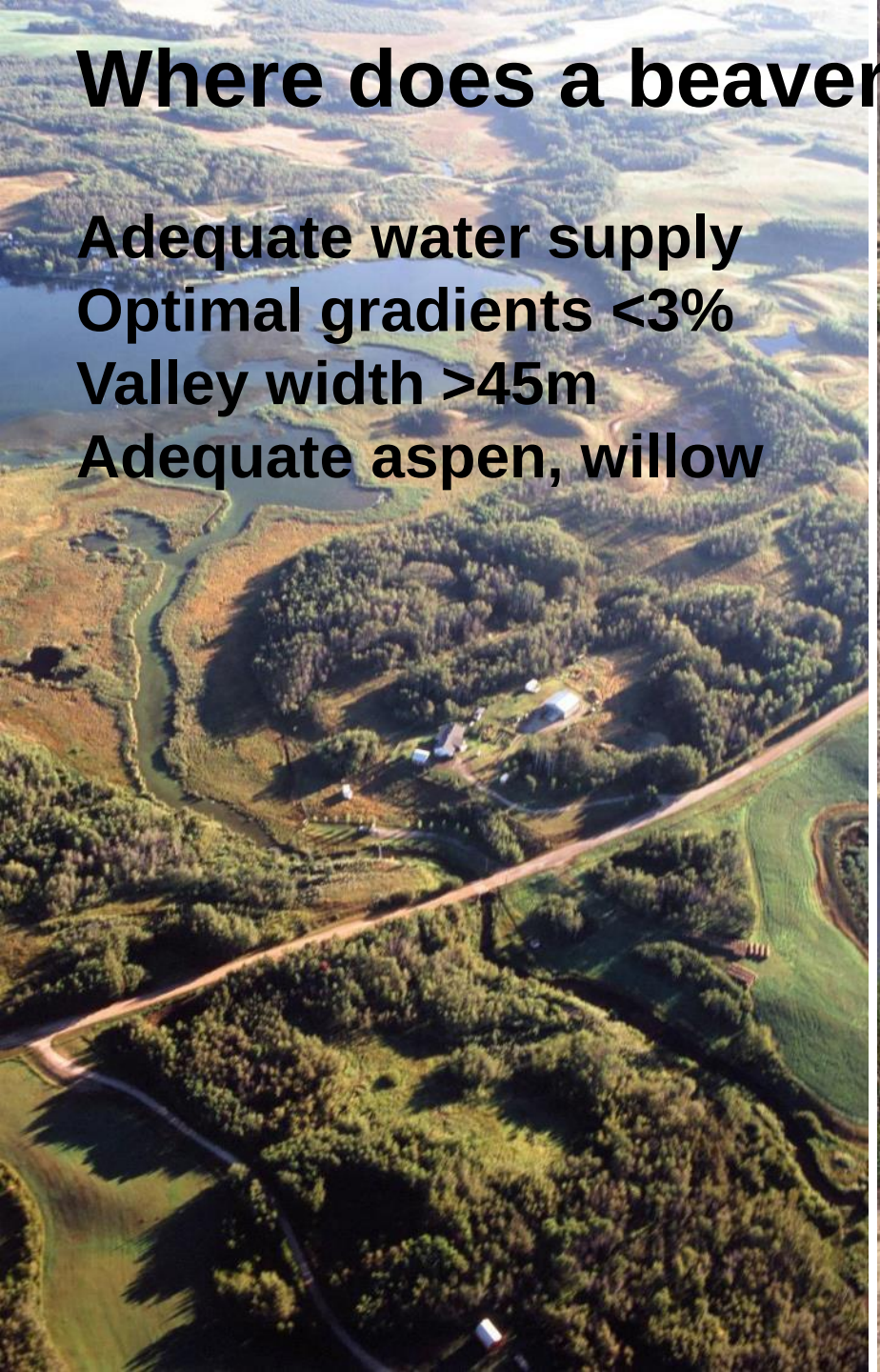
-2 young of the year

-2 two year olds

A Beaver's World

Where does a beaver like to live?

Adequate water supply
Optimal gradients <3%
Valley width >45m
Adequate aspen, willow




Annual fluctuation no more than 1.5m;
winter drawdown not more than 0.7m


A beaver cuts 0.6- 1.0 aspen/day
A colony would be supported by 0.4 ha (1.0 acre) of aspen for 1-2.5 years

Annual Diet- 53% wood

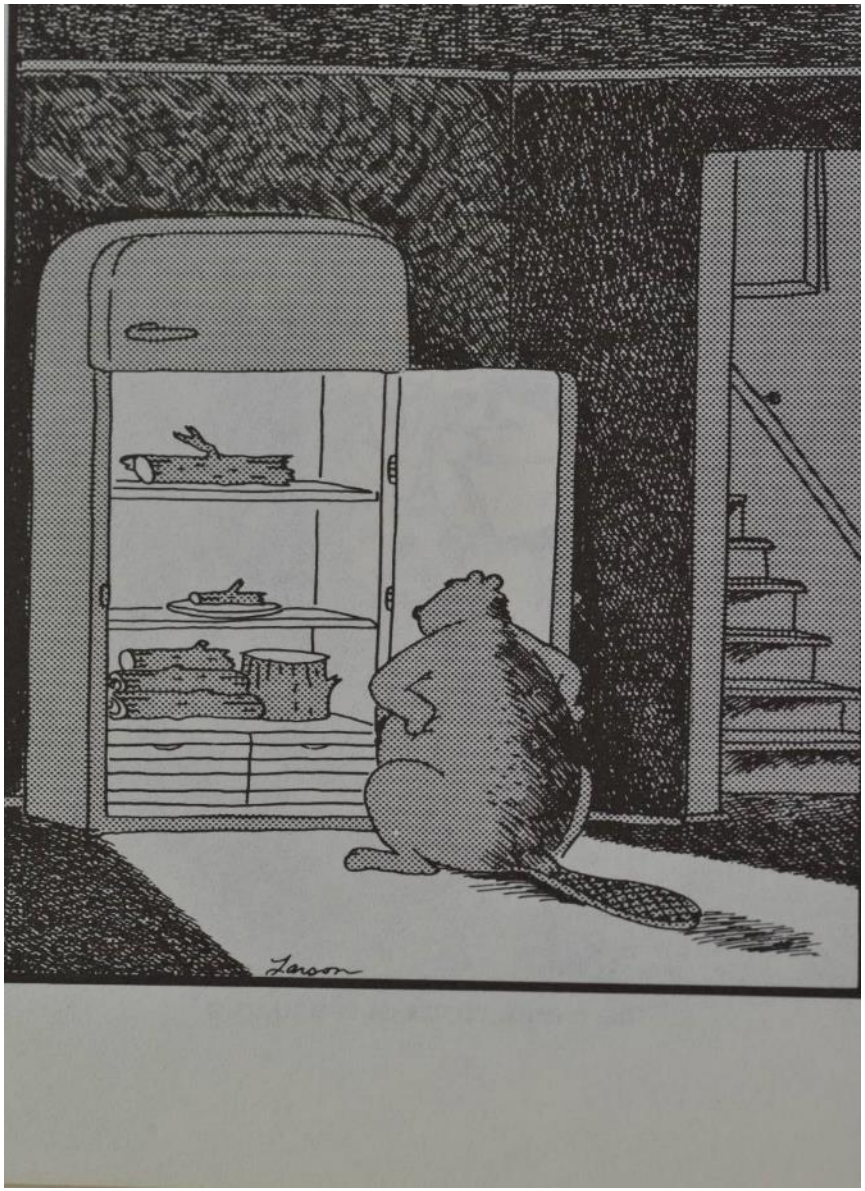
Seasonally:

Winter- 86%

Spring- 32%

Summer- 16%

Fall- 60%

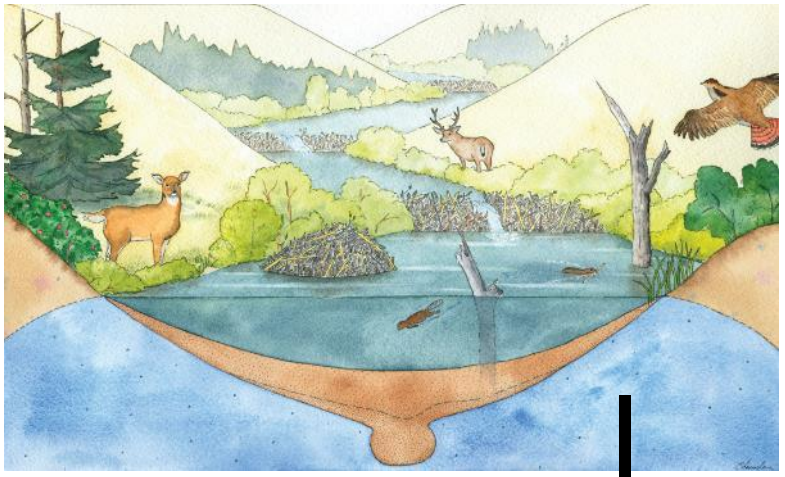


Beaver pond cycles

The March of Time in a Beaver-occupied Stream Valley

1

3



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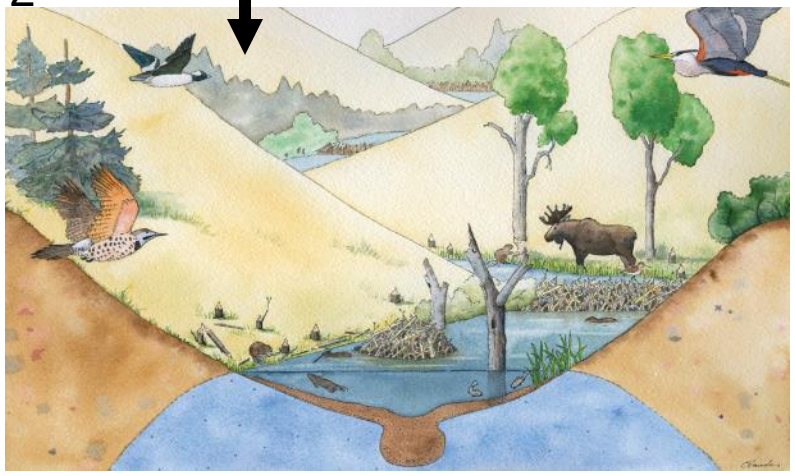


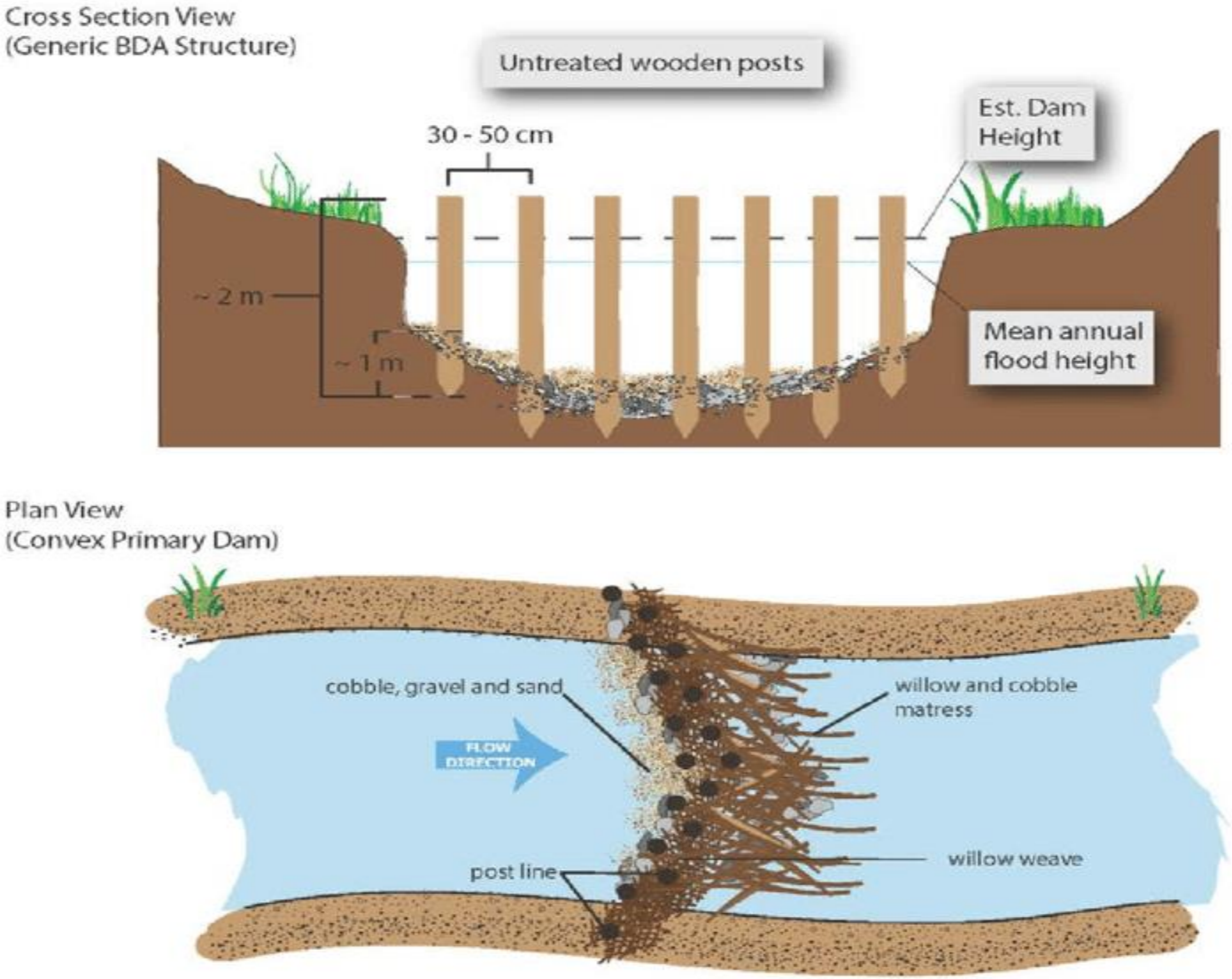
4

From 35 – to up to 6500 m³ of sediment stored in each pond (382 tandem dump trucks)

Downstream of each pond:

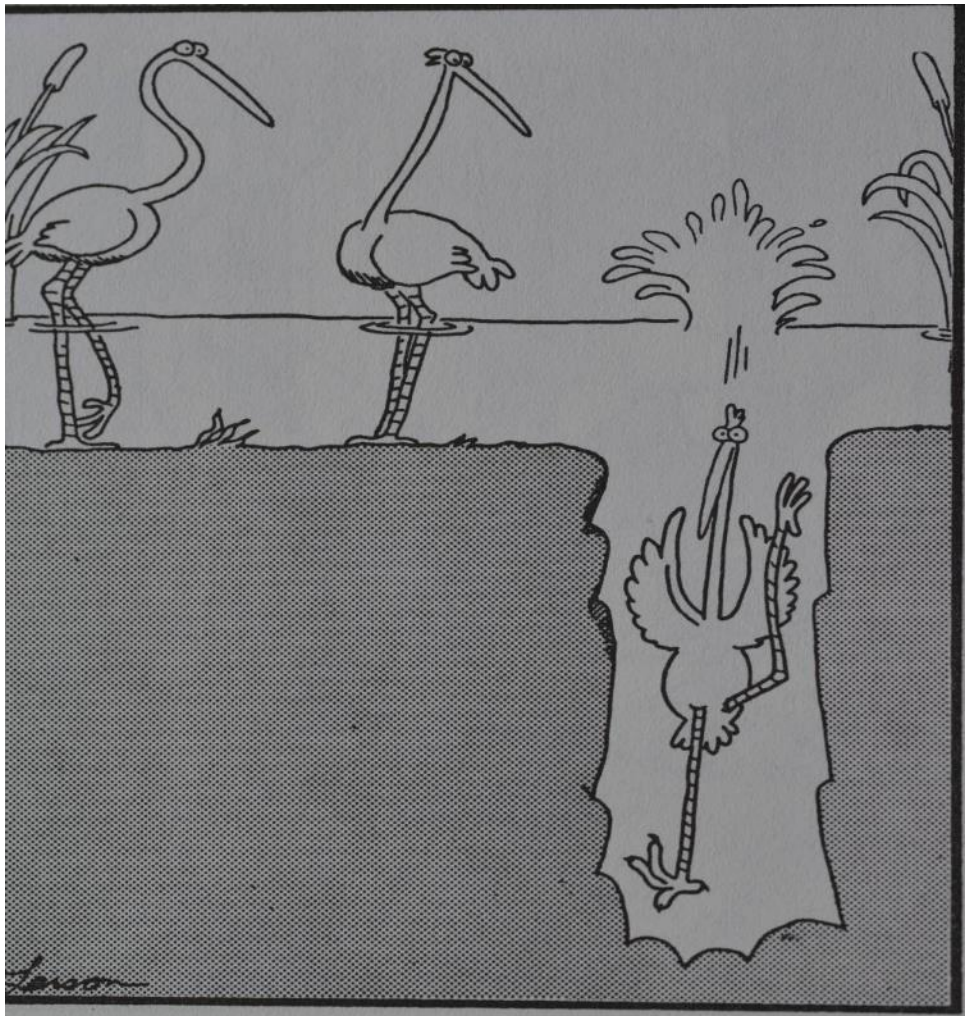
-50-75% less suspended solids
-20-60% less phosphorus
-20-25% less nitrogen (1000X of amount in riffles)
-up to 23% carbon sequestered
-reduced fecal coliforms

Restoration of Incised Streams using Beaver Dam Analogues (BDAs)



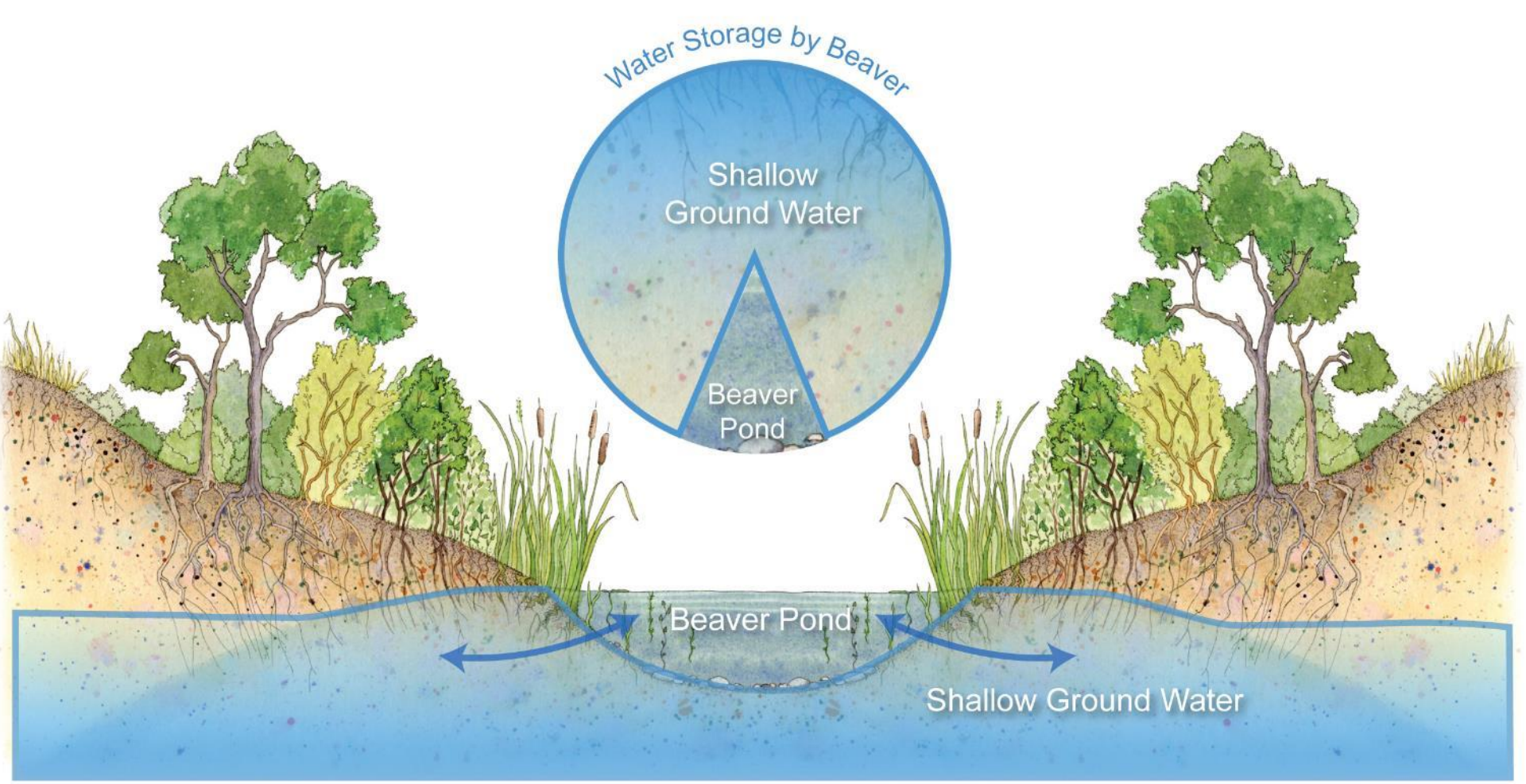
Source: Shahverdian, Scott & Wheaton, Joseph. (2017). Birch Creek Restoration Design Report

Beaver canals

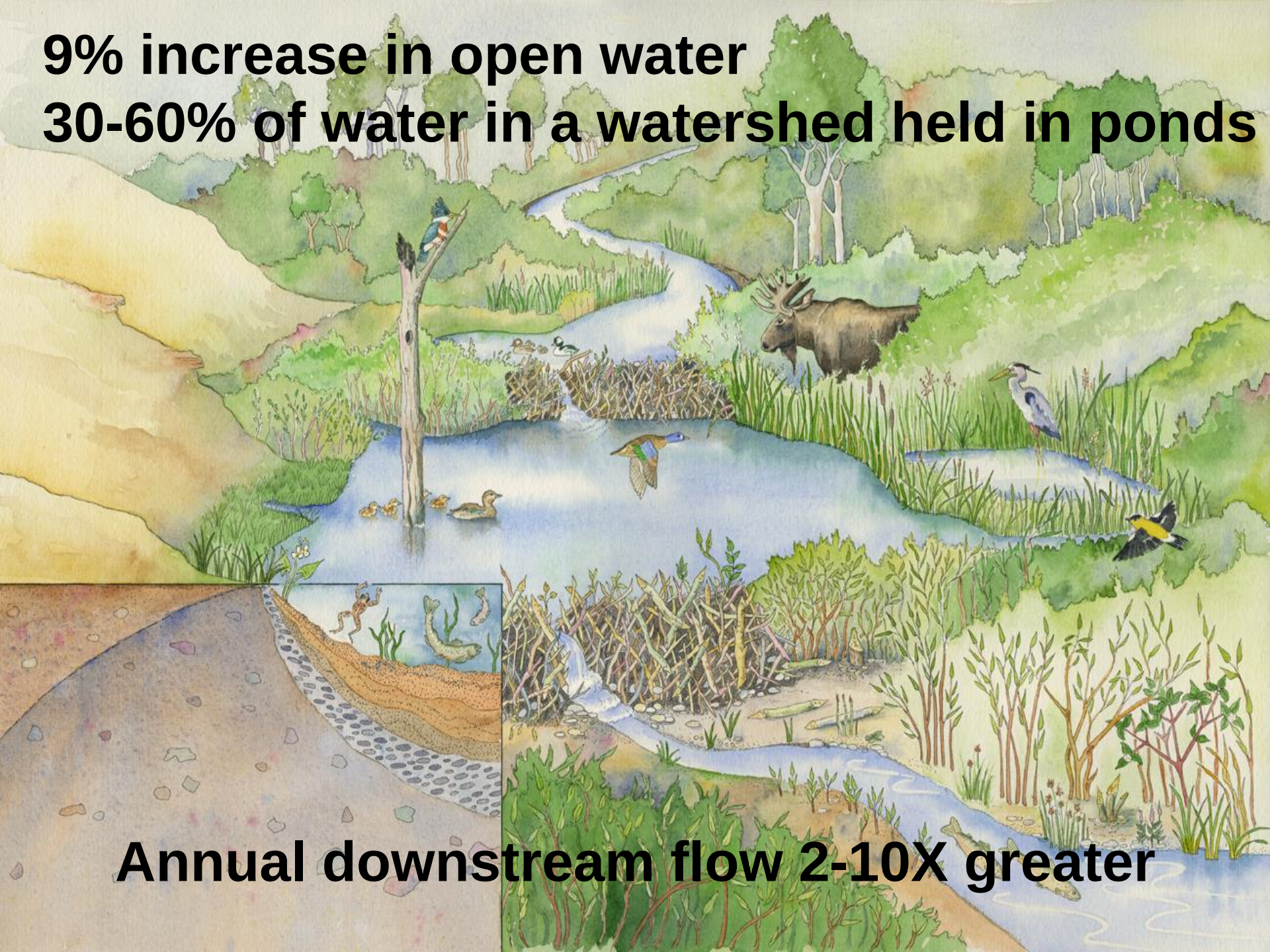


Enhanced water storage

Ground water storage - 100s of meters laterally and 300-600 m downstream



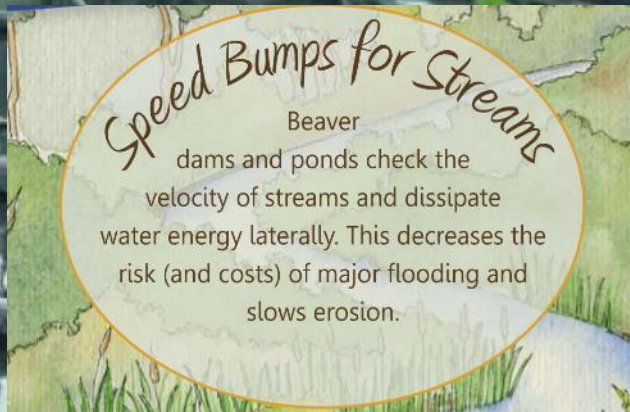
Ground water storage exceeds surface dam storage 5 - 10X

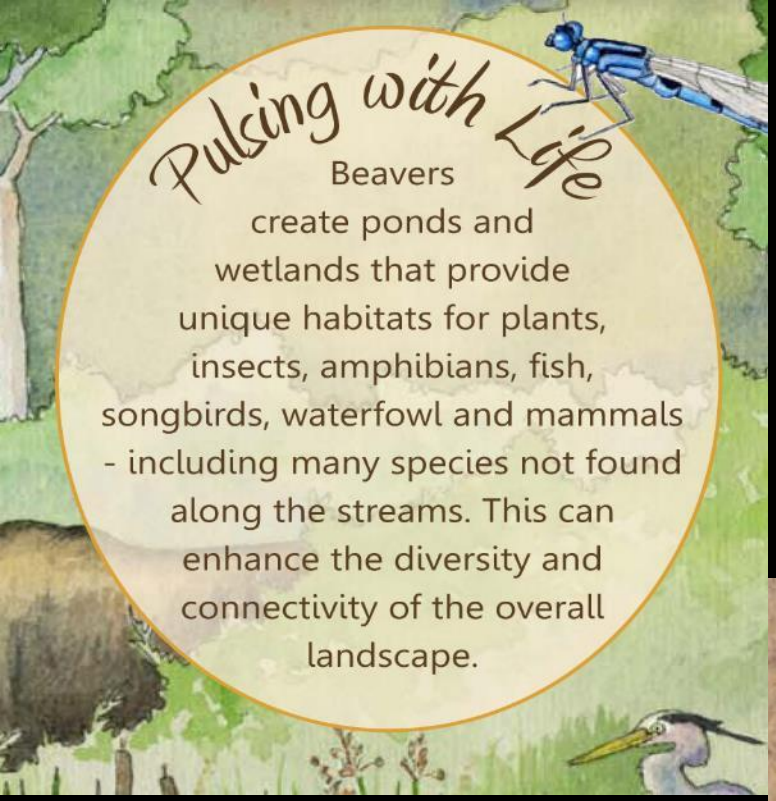

9% increase in open water
30-60% of water in a watershed held in ponds
Annual downstream flow 2-10X greater

A high roughness coefficient dampens velocity and discharge

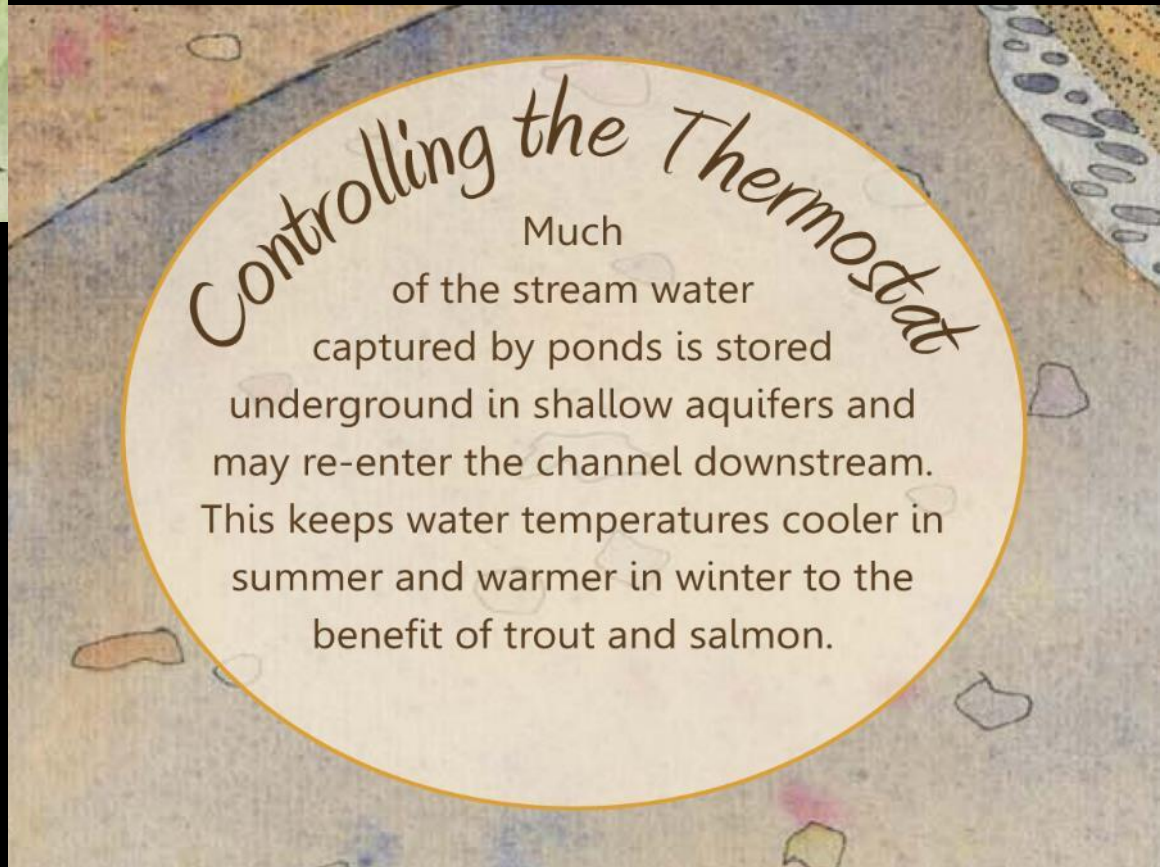
A 5.3% reduction in peak flows

As pond numbers increase so does potential for flood reduction





Biodiversity impacts are invaluable



Summary of Beaver Basics:

1. Modify channel geomorphology and hydrology
2. Increase retention of sediment and organic material
3. Create and maintain wetlands
4. Modify nutrient cycling
5. Modify and increase riparian zone
6. Influence water quality downstream
7. Modify habitat

Beaver ponds:

-impound water

-raise water tables

-increase soil/water interface

-increase duration of water contact

-increase overbank flooding

-increase time water spends in floodplain

-network of dams, ponds, canals spread water across valley

Retention- Detention- Storage- Slow release

http://cowsandfish.org/publications/documents/BeaverOurWatershedPartnerWEB.pdf

Beavers in Our Landscape

A workshop on understanding and living with beavers

Please join us to share your knowledge and experiences, developed for Alberta natural resource managers, municipalities, landowners and others!

Whether you love them, hate them, want to understand them, think you need them, or want to learn how to live with them, you will find this workshop useful. Topics include:

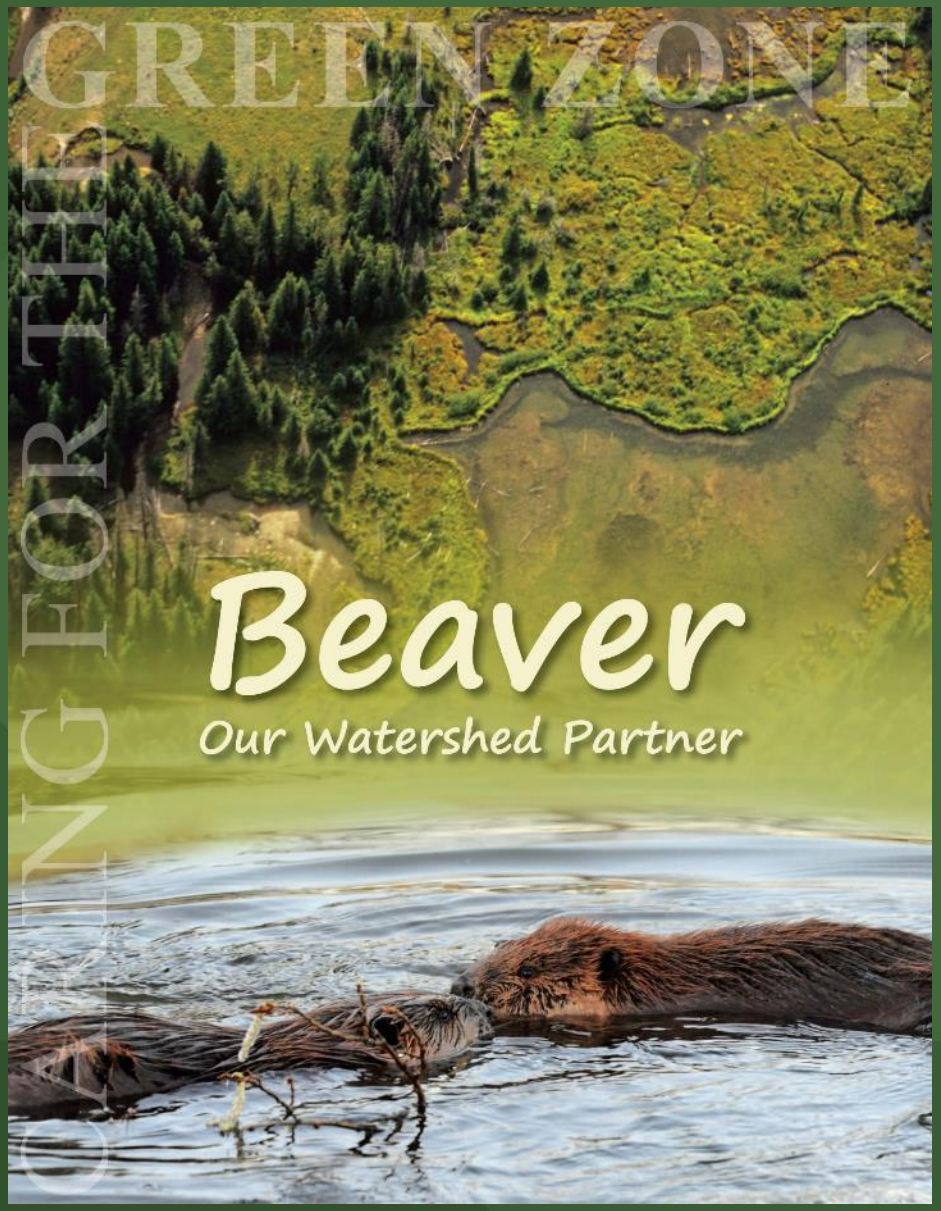
- **Beaver basics** - Ecology, natural history, watershed connections
- **Beaver challenges** - Issues, management, options and alternatives
- **Beaver case studies** - How others are dealing and living with beavers
- **Beaver banter** - Round table discussion on beaver messages, messaging, management issues, management options, information needs
- **Beaver next steps** - Awareness messages, tool development, beaver role in watersheds, reintroductions and future management

An integral part of the workshop will be discussion about challenges, concerns and values.

March 2, 2017 from 10:00 AM to 2:30 PM
Goodridge Hall (3 miles west on TWP 624 from Highway 881)
Lunch and refreshments will be provided
To attend this FREE workshop please call LARA at 780-826-7260 or email sustainag.lara@mcsnet.ca

Workshop Partners: Cows and Fish; LARA; Beaver River Watershed Alliance

Supported by: Miistakis Institute; Alberta Government; The Calgary Foundation; Watershed Resiliency and Restoration Program & Alberta Environment and Parks



Putting Beaver to Work Collaborative

History

- Citizen science reintroduction project – 2012
- Realized the potential for beavers to address our watershed challenges
- People want to **coexist** and realize the benefits of beaver on the landscape
- Authored report on use of beavers for watershed restoration in the USA

Goals

- Encourage coexistence of humans and beavers
  - Maintain beavers on the landscape
    - Benefit from enhanced watershed resiliency and restoration across the landscape
- Decrease conflict, foster social tolerance, heighten understanding of beavers benefits to our watershed

Beavers and Natural Infrastructure

Beaver

Beaver

Beaver Dam

(natural infrastructure)

Beaver

Beaver Dam

(natural infrastructure)

Wetland created

(natural infrastructure)

Beaver

Beaver Dam

(natural infrastructure)

Wetland created

(natural infrastructure)

Water storage

(ecological function)

Beaver

Beaver Dam

(natural infrastructure)

Wetland created

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Water storage

(ecological function)

Flood and drought mitigation

(ecosystem service)

Beaver

Beaver Dam

(natural infrastructure)

Wetland created

(natural infrastructure)

Water storage

(ecological function)

Flood and drought mitigation

(ecosystem service)

Enhanced climate resiliency

(outcome)

How are we putting beavers to work for watershed resiliency?

Alberta Beaver Survey (2016)

- Determine Albertans level of knowledge and perceptions about beavers, their habitat and management in Alberta

Top 5 Findings

1. There is support for coexistence with beavers in Alberta

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Top 5 Findings

1. There is support for coexistence with beavers in Alberta
2. There is a clear need to address damage caused by beavers
3. Benefits are being realized but there is need for more information regarding the benefits afforded by beavers
4. There is a need for better understanding of the roles and responsibilities of beaver management
5. There is desire for enhanced education on the ecology of beavers, including their impacts on fish species and habitat, and coexistence methods

Outcome of Survey Results

- Refinement of topics covered for future work including:
  - webinars
  - in-person workshops
  - Symposiums
- Creation of targeted awareness materials

Creation of Awareness Materials

BEAVER COEXISTENCE TOOLS

Beavers are an integral part of the landscape and provide numerous watershed benefits such as: enhanced groundwater storage, reduction of stream velocity and temperature, sediment capture, and habitat creation to name a few. Along with the benefits they provide, beavers are also known for the challenges they can pose, such as flooding and tree felling. This fact sheet is intended to provide a broad summary of solutions that can help mitigate these issues and foster an environment of human-wildlife coexistence.

BARRIERS

Culvert Protector

(beaver deceiver, exclusion fencing)

- Prevent plugged culverts that can cause flooding of roads and other areas
- Installed on the upstream side of the culvert.
- Shape of the exclosure limits the feeling of water movement and there is less desire to plug the culvert.
- Limits the access to the culvert opening and the fencing cannot be plugged easily.

Tree Wrapping

(tree wiring, exclusion fencing)

- Prevent tree cutting or felling
- Wire around the base of the tree prevents the beaver from accessing the tree to cut it.

REGULATE WATER LEVELS

Pond Leveller

(beaver baffler)

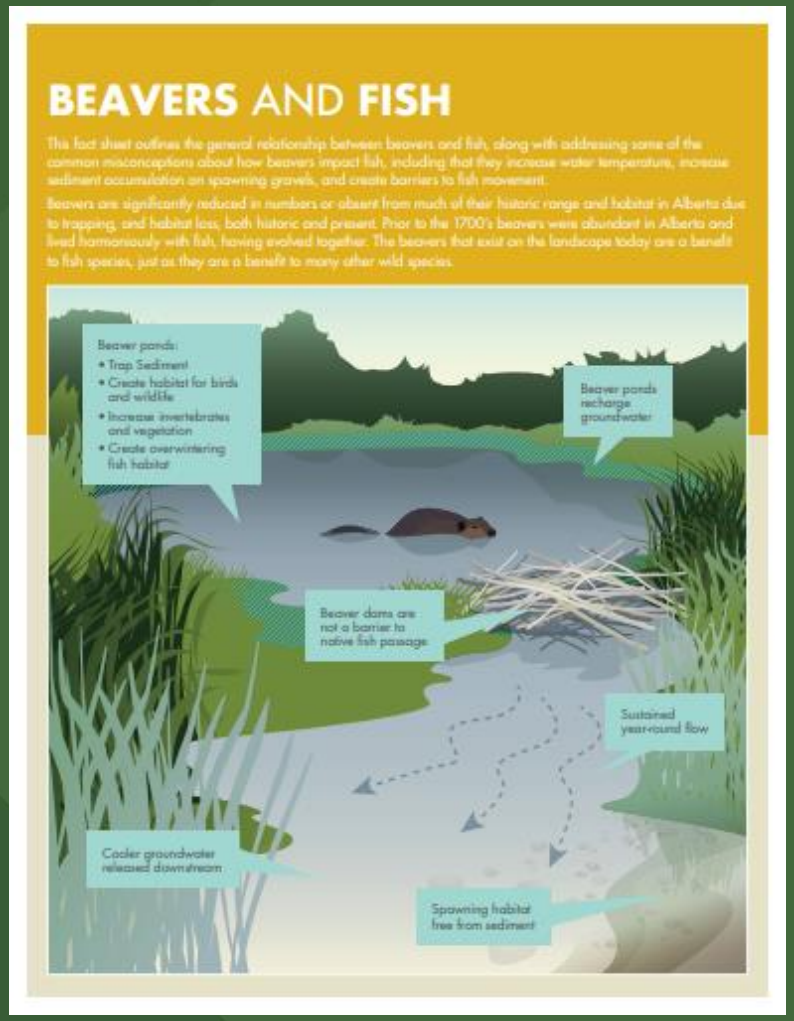
- Allows the user to set the pond water level to a height that is tolerable and/or minimizes flooding of areas of concern.
- Moving the intake of the leveller pipe upstream and under water relocates the sound of running water, the trigger that alerts beaver to plug the leak. Silent leaks are not detected or repaired; beaver only react to the noisy ones. Designs can vary greatly.

HABITAT MANAGEMENT

Beaver Dam Analogue

(beaver mimicry, dam mimicry, surrogate dam, artificial dam)

- Encourage beaver to reestablish in areas where they have been extirpated or away from areas of human conflict.
- The man-made dam structure constricts water flow, encourages vegetation regrowth, and provides a positive signal to encourage beaver to build there.



BEAVERS AND FISH

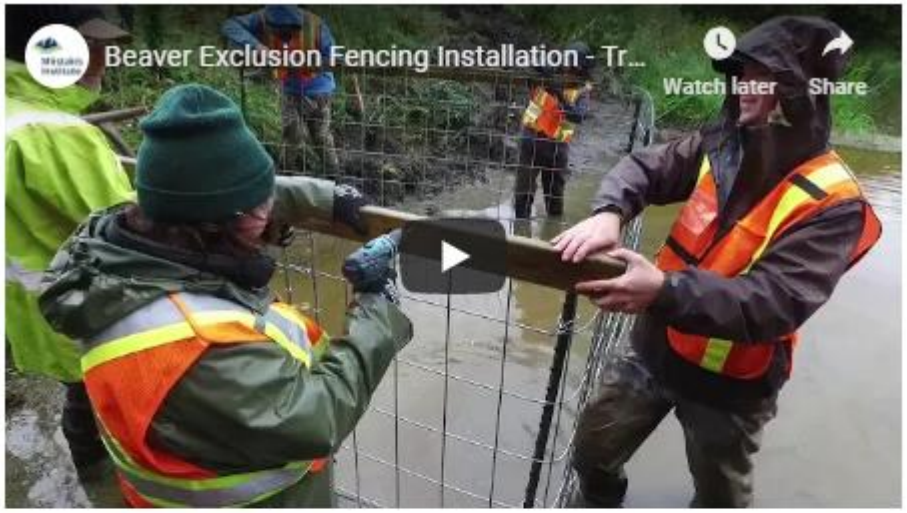
This fact sheet outlines the general relationship between beavers and fish, along with addressing some of the common misconceptions about how beavers impact fish, including that they increase water temperature, increase sediment accumulation on spawning gravels, and create barriers to fish movement.

Beavers are significantly reduced in numbers or absent from much of their historic range and habitat in Alberta due to trapping, and habitat loss, both historic and present. Prior to the 1700's beavers were abundant in Alberta and lived harmoniously with fish, having evolved together. The beavers that exist on the landscape today are a benefit to fish species, just as they are a benefit to many other wild species.

Creation of Awareness Materials

Coexisting with Beavers Part 1: Municipal District of Foothills

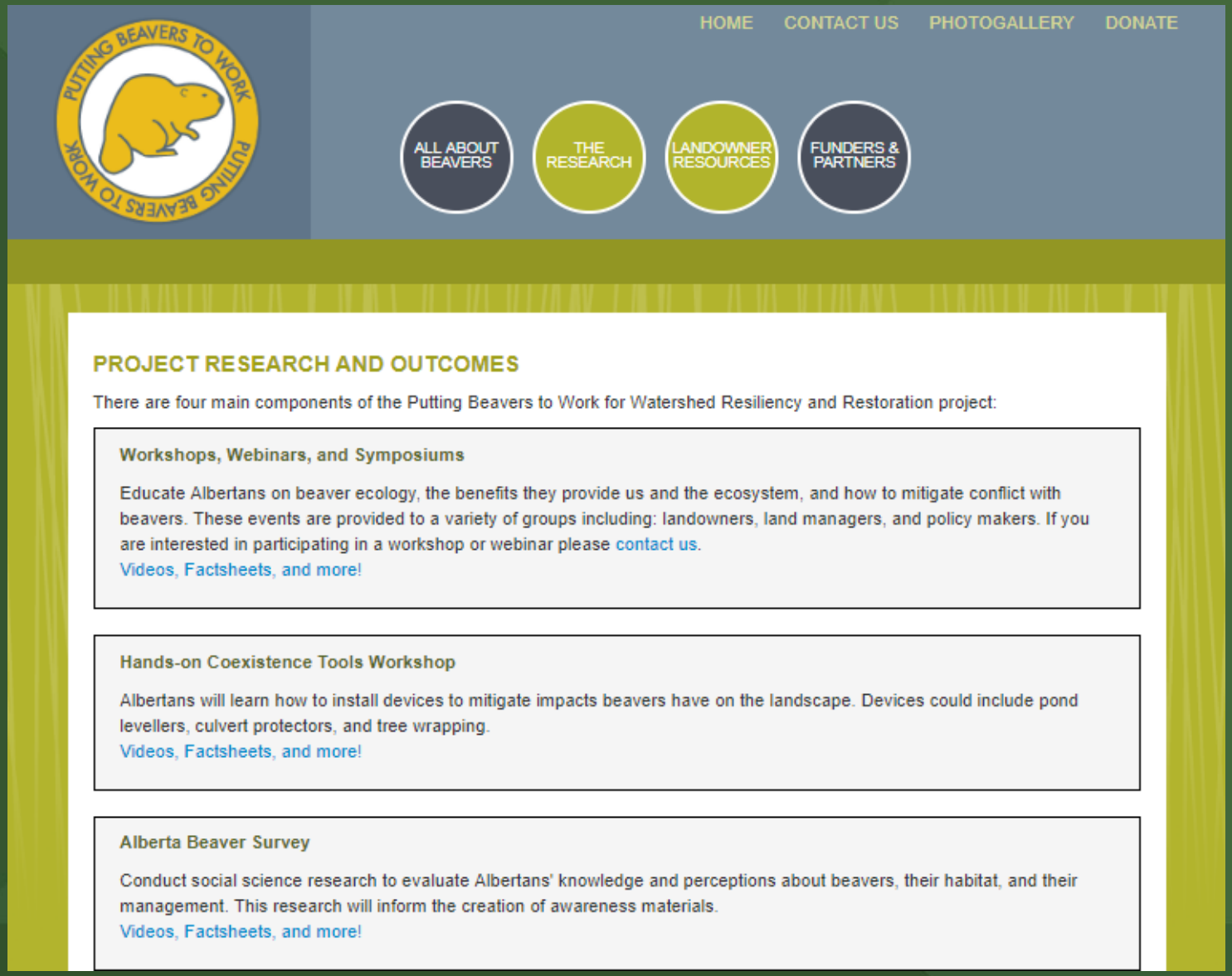
Beaver Exclusion Fencing Installation - Training Session



Coexisting with Beavers Part 2: Tofield

Beaver Pond Leveller Installation - Training Session

www.rockies.ca/beavers



SAVE THE DATE **OCTOBER 23-24** 2019

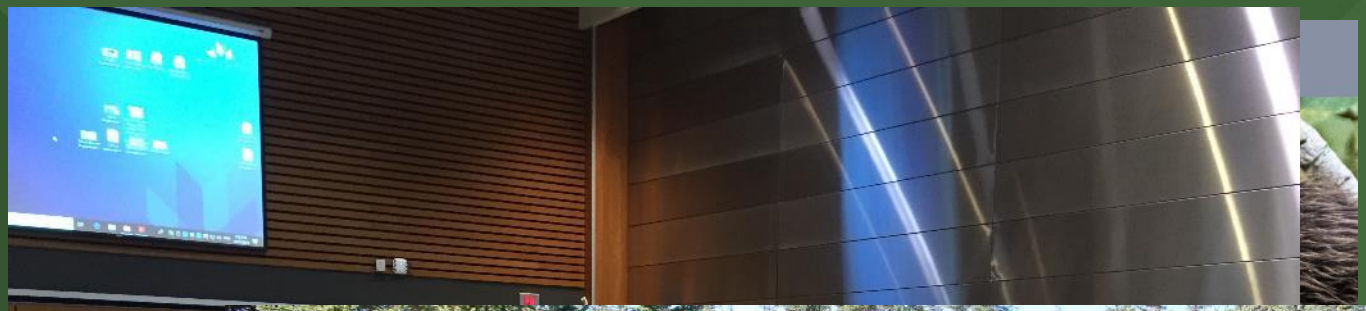
PUTTING BEAVERS TO WORK FOR WATERSHED RESILIENCY AND RESTORATION

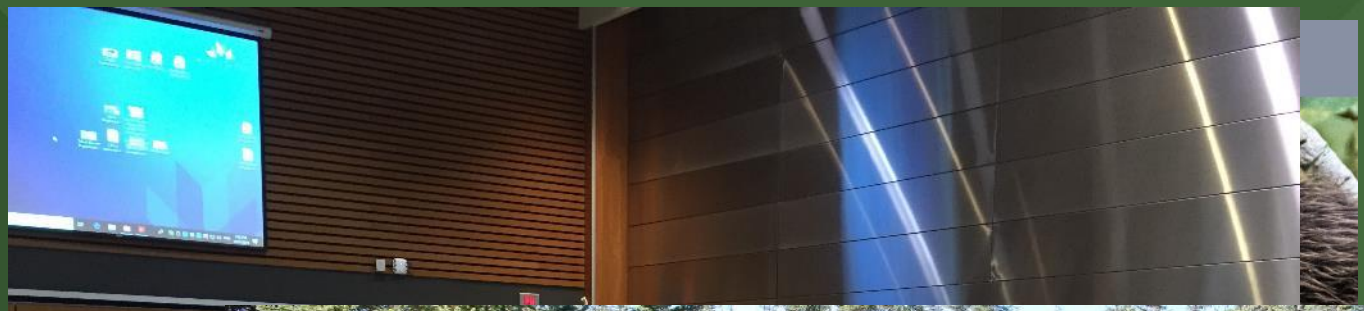
SYMPOSIUM

PHOTO BY TONY LEPRIEUR

Miistakis Institute

PUTTING BEAVERS TO WORK





Evaluation

- **Attendees increased their knowledge on beaver ecology and management**
- **87% interested in attending another beaver symposium**

Creation of a Community of Practice

- Website (www.rockies.ca/beavers)
- Mailing list
- Social media outreach
- Available to respond to requests or connect other beaver practitioners with each other
  - Discussions on: pond leveller advice, matchmaking, orphan beaver relocation tracking
- On-going Work: tracking lessons learned through a knowledge transfer template, sharing input from practitioners

Case Studies

The Lands Council,"Beaver Solution"
Eastern Washington, USA

- Background: The 2006 Columbia River Basin Water Management Program (Bill 2860) calls for 3 million acre feet of added water storage to meet demand (3.7 billion m3)
- **"Beaver Solution" goals:**
  - **Phase 1:**

    Develop water storage estimates and identify suitable beaver habitat in 12 Counties in Eastern Washington

The Lands Council,"Beaver Solution"
Eastern Washington, USA

- Phase 1 Results:
  - Each beaver dam has potential to store 17.5 to 35 acre-feet of water (22,000-43,000m3)
  - 9,828 stream miles met physical criteria for beaver, 70% of which have sufficient vegetation
  - Estimate that restoration would add 2.0 - 4.0 million ac/ft of water (surface and ground water) (2.5-5 billion m3)

The Beaver Solution

THE LANDS COUNCIL

The Lands Council,"Beaver Solution"
Eastern Washington, USA

- In 2012 Washington State approved "The Beaver Bill" (House Bill 2349)

- The bill allows 'nuisance' beavers to be live-trapped and relocated to suitable reintroduction sites.

http://www.rockies.ca/beavers/about.php

https://www.youtube.com/watch?v=wl5AjJd00cM

https://landscouncil.org/beaver

Municipal Wildlife Coexistence Policy
Belleville, Ontario

- Previously, no policy in place
- Wildlife coexistence policy seeks to mitigate conflict by first considering alternatives to killing, such as pond levellers

Municipal Beaver Management Plan
Port Moody, British Columbia

- Promotes co-existence, outlines best practices, and addresses risks and liabilities associated with flooding, property damage, ecological impacts, and human health and safety.
- Addresses compliance with all provincial and federal regulations related to wildlife and fish passage.

Source: https://www.portmoody.ca/en/news/port-moody-s-new-beaver-management-plan-focuses-on-co-existence-while-addressing-risks.aspx

Fish Lyft, Salmon Passage Pond Leveller
Port Moody, British Columbia

- Installed to mitigate flooding
- Working fish ladder that is modular and scalable
- Worked flawlessly even in low water
- Used by:
  - Chum salmon
  - Coho salmon
  - Cutthroat trout

Source: Humane Solutions Inc.

Fish Lyft, Salmon Passage Pond Leveller

Port Moody, British Columbia

https://humanesolutions.ca/innovations/ (0:39-1:10)

Source: Humane Solutions Inc.

Alberta Case Studies: Co-existence Tools

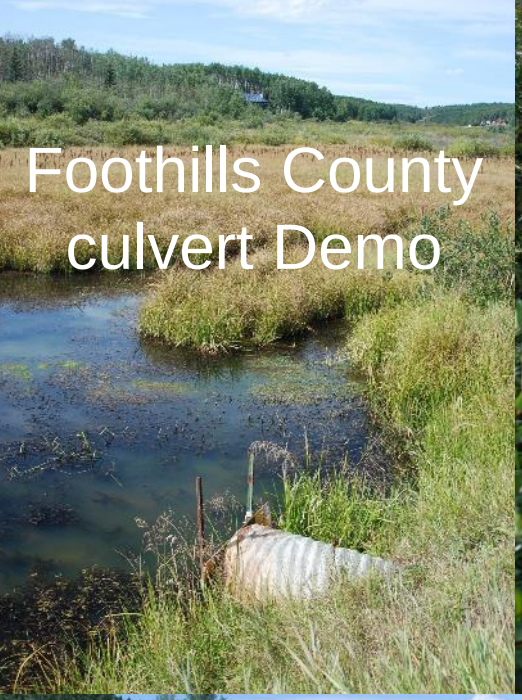
Demonstration Sites – Coexistence Options

- Create beaver demonstration sites and host site tours to share beaver coexistence approaches and tools
- Track health of demo sites through riparian health assessments

Cross Conservation Area Beaver Reintroduction and Citizen Science Project

- 2012 beaver reintroduction project
- Citizen Science monitoring component

Foothills County culvert Demo



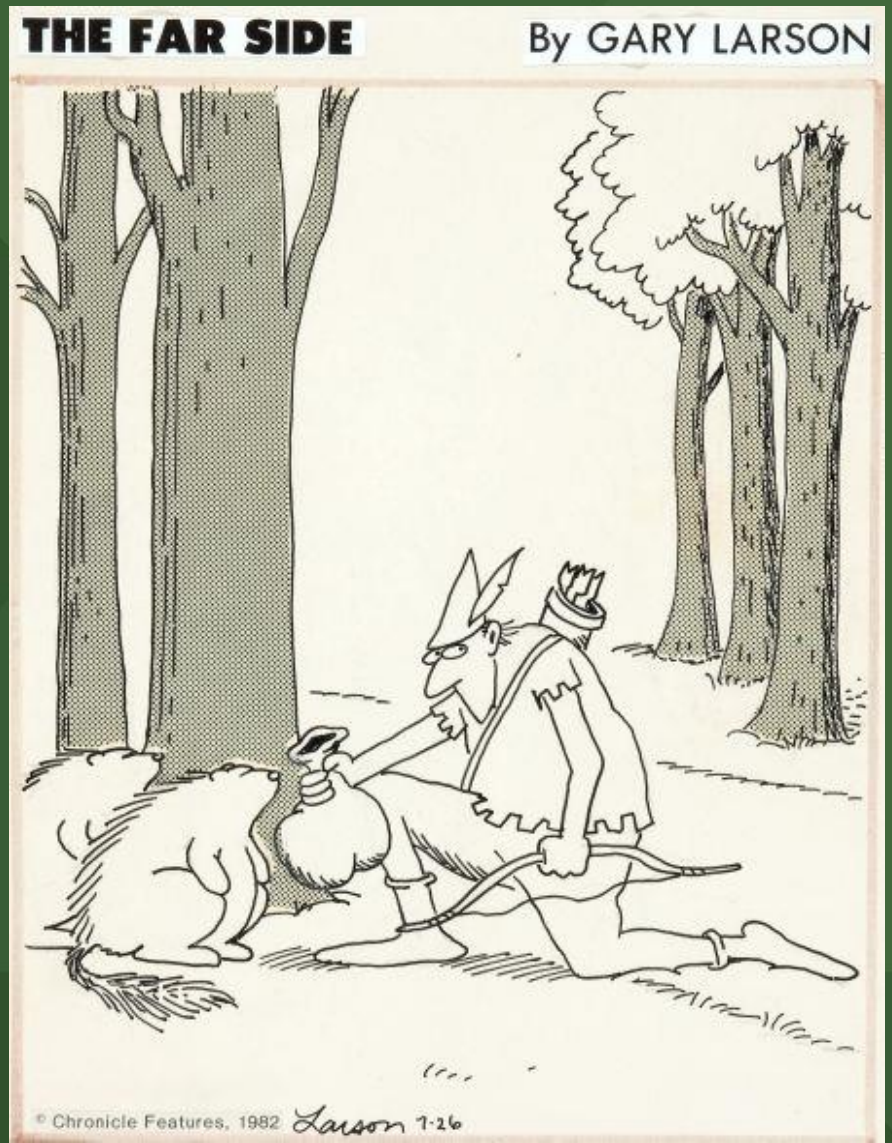
Culvert Protectors
Foothills County, Alberta

https://www.rockies.ca/beavers/landowners.php

(9:40-12:30)

Source: Humane Solutions Inc.

Robin Hood bribes beaver to spare Sherwood Forest



Pierre Bolduc – feeding station

Beaver County's Beaver Management Project

"Mitigating Human-Beaver Conflict through Adaptive Management"
Research Project

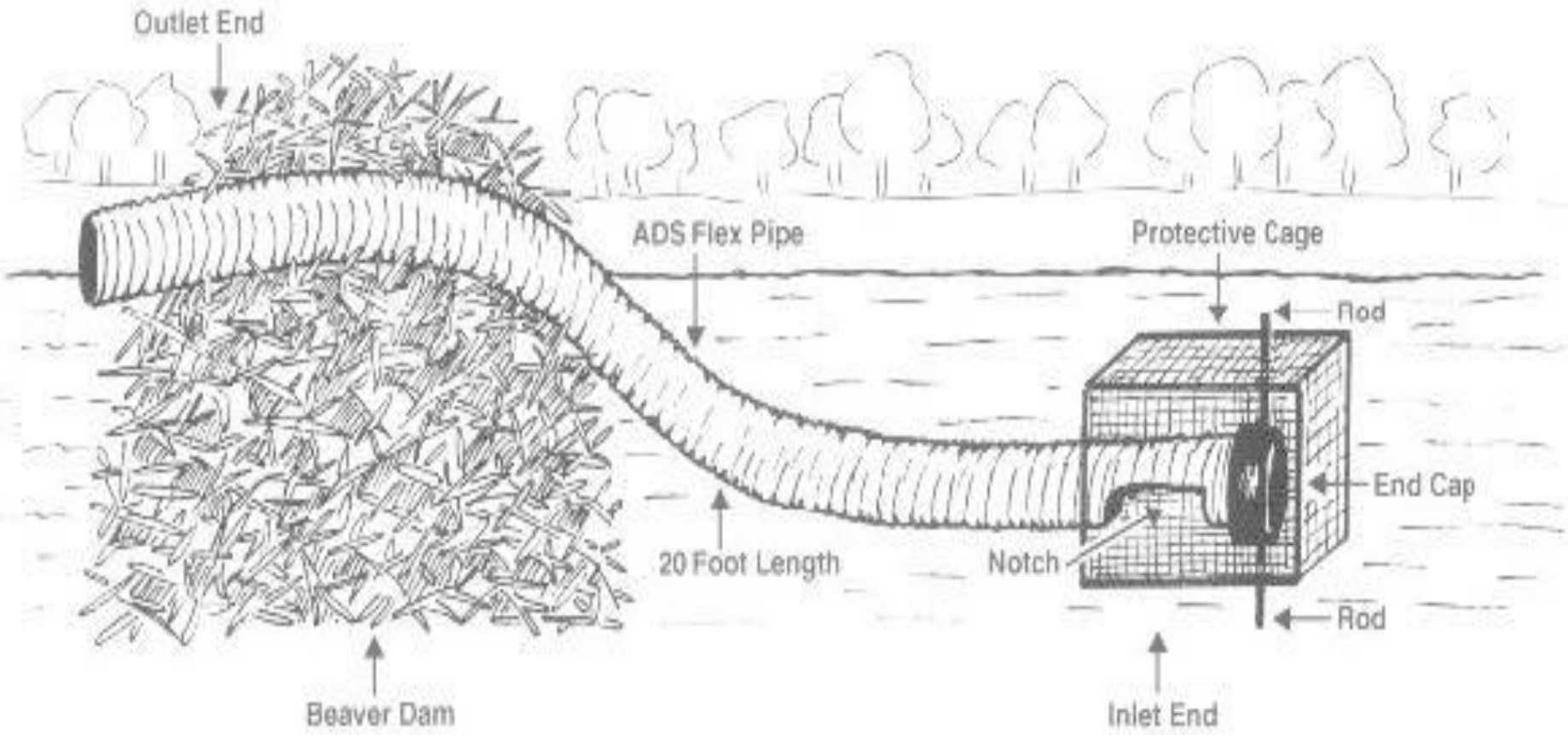
UNIVERSITY OF ALBERTA

BEAVER COUNTY


BEAVER
COUNTY
05/22/2014 13:24


07/22/2014 10:29

Flex Pipe Installation



BEAVER COUNTY

Problem Culvert Location
August 2014 Installation

Project results:
https://www.beaver.ab.ca/departments/agricultural-services/beaver-management-project

Cost-Benefit Analysis

For 14 devices installed, over 3 years

- The savings in management costs -> **net benefit of $64,632.34.**

- Including wetland valuation (replacement value for wetland loss) - > **net benefit of $384,312.53**

- Minimum expense for pond leveller installation was $756.33 including materials, prep, installation labour, and transportation. The highest cost was $1605.55. **Average cost is $1024.85**.

- Maintenance and monitoring costs are also quite low after the device has been installed, and the team is continuing to monitor all costs associated with the pond levellers so the analysis can extend over more years.

Cost-Benefit Analysis

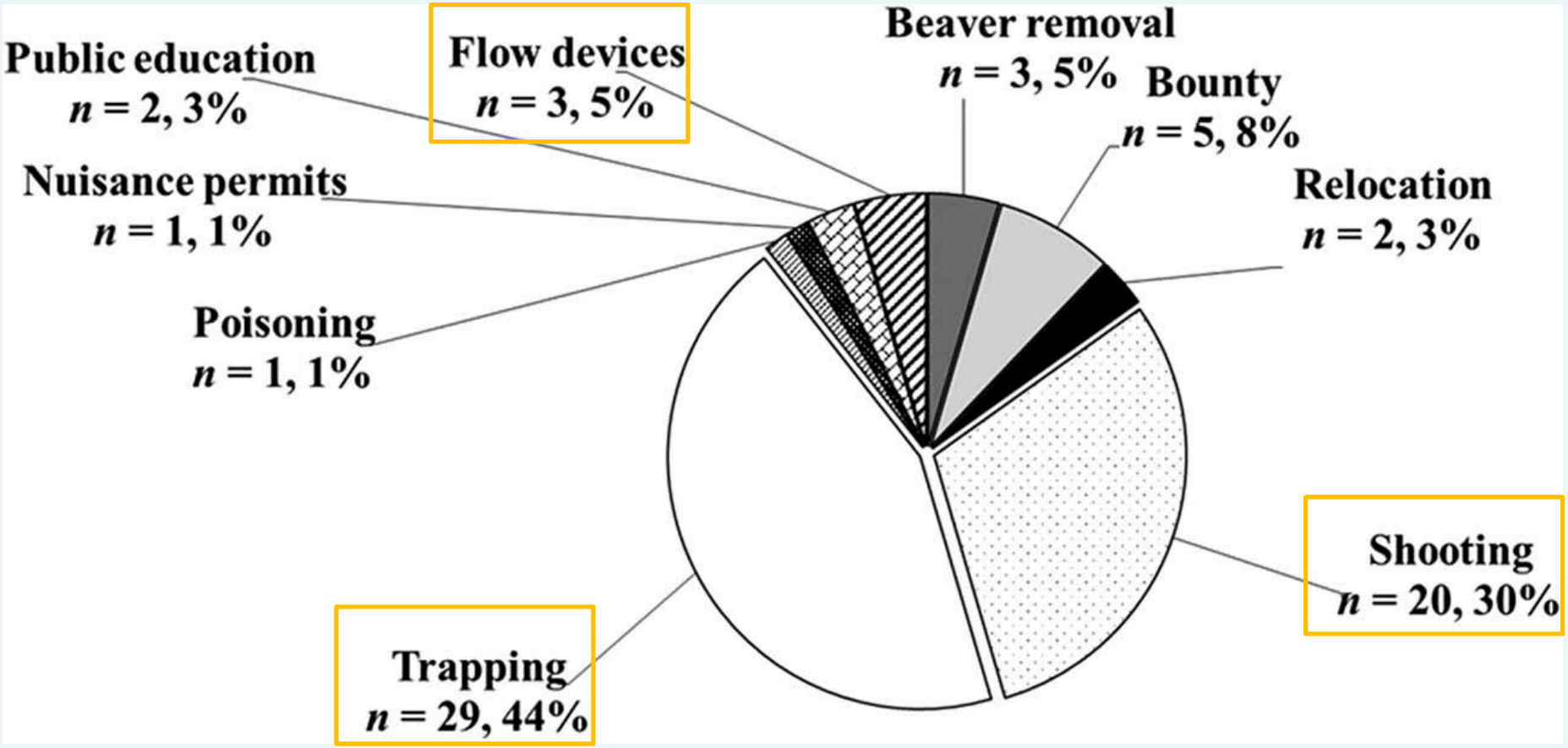
For 12 devices installed, over 3 years In Cooking Lake Blackfoot Provincial Recreation Area (Hood *et al.* 2018)

Costs of installation of pond levelers/management	Total
Number of pond levelers	12
Start-up materials	$1,672
Pond-leveler installations	$10,792
Average monitoring and mapping	$4,620
Cumulative costs for pond levelers	$16,496
Average annual park management expenses	$100,926

- **Annual maintenance costs were estimated to be $128 per site, per year**

Methods Used by 48 Municipalities and 4 Alberta Parks Districts for Beaver Management

(Hood *et al.* 2018)



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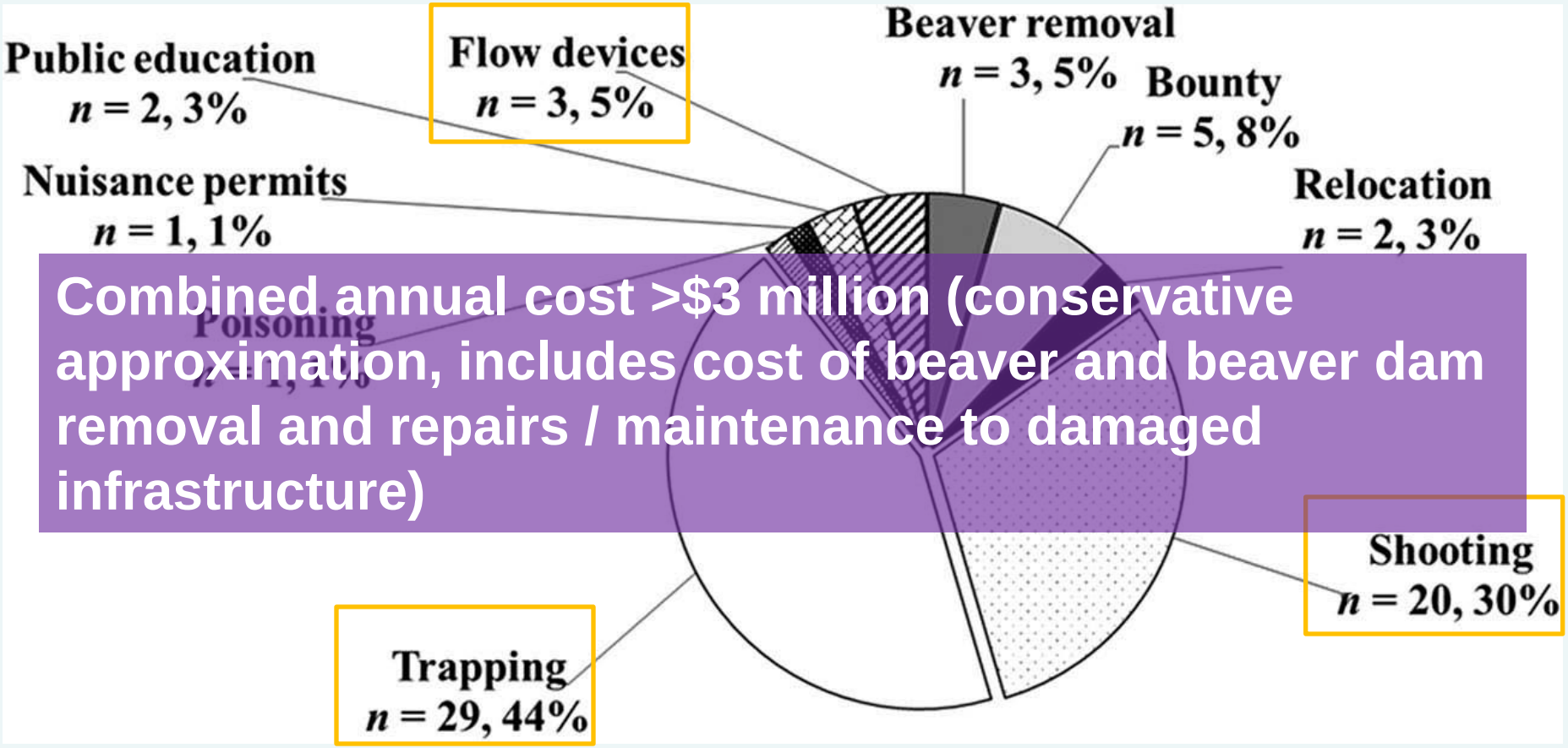
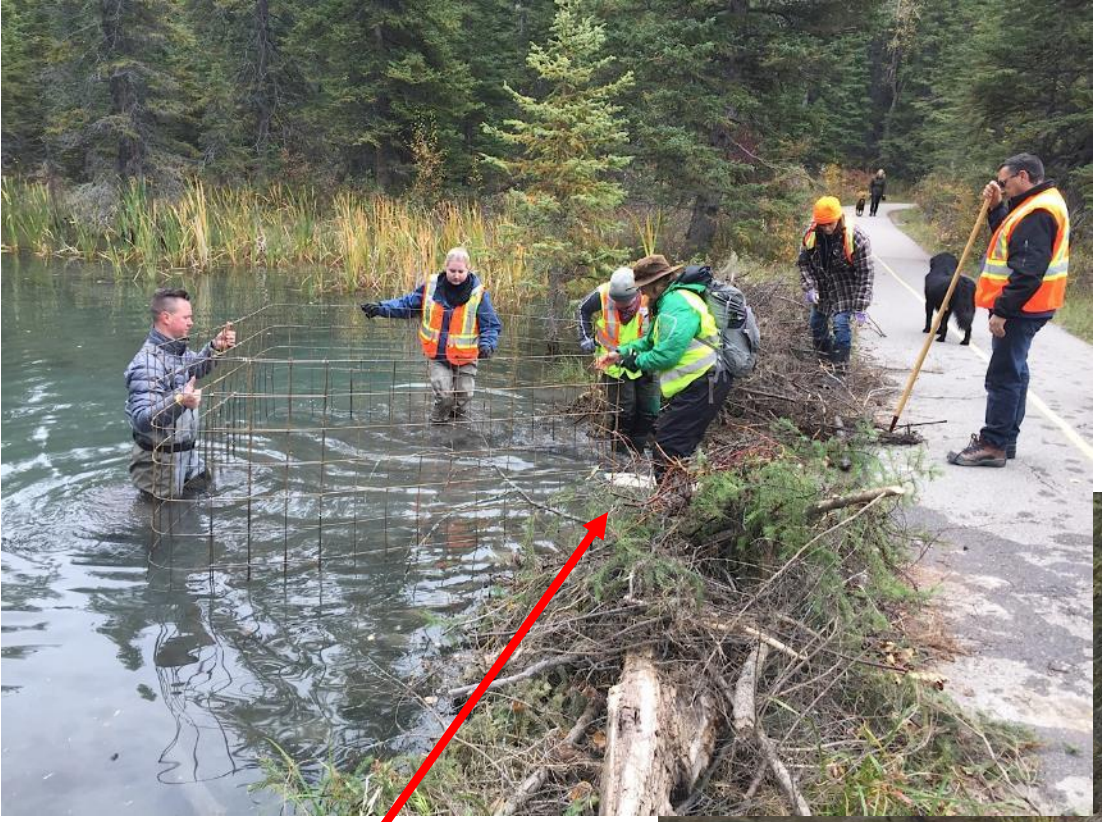


Combined annual cost >$3 million (conservative approximation, includes cost of beaver and beaver dam removal and repairs / maintenance to damaged infrastructure)

City of Calgary Beaver Exclusion Fence



Culvert


Before


After


Foothills County
Sept 2016
Combo device

Lac Ste Anne County, Weller exclusion demo Sept 2017

Lac Ste Anne County, Weller exclusion demo Sept 2017

Photos by Lorraine Taylor, Lac Ste Anne County, March 10, 2018

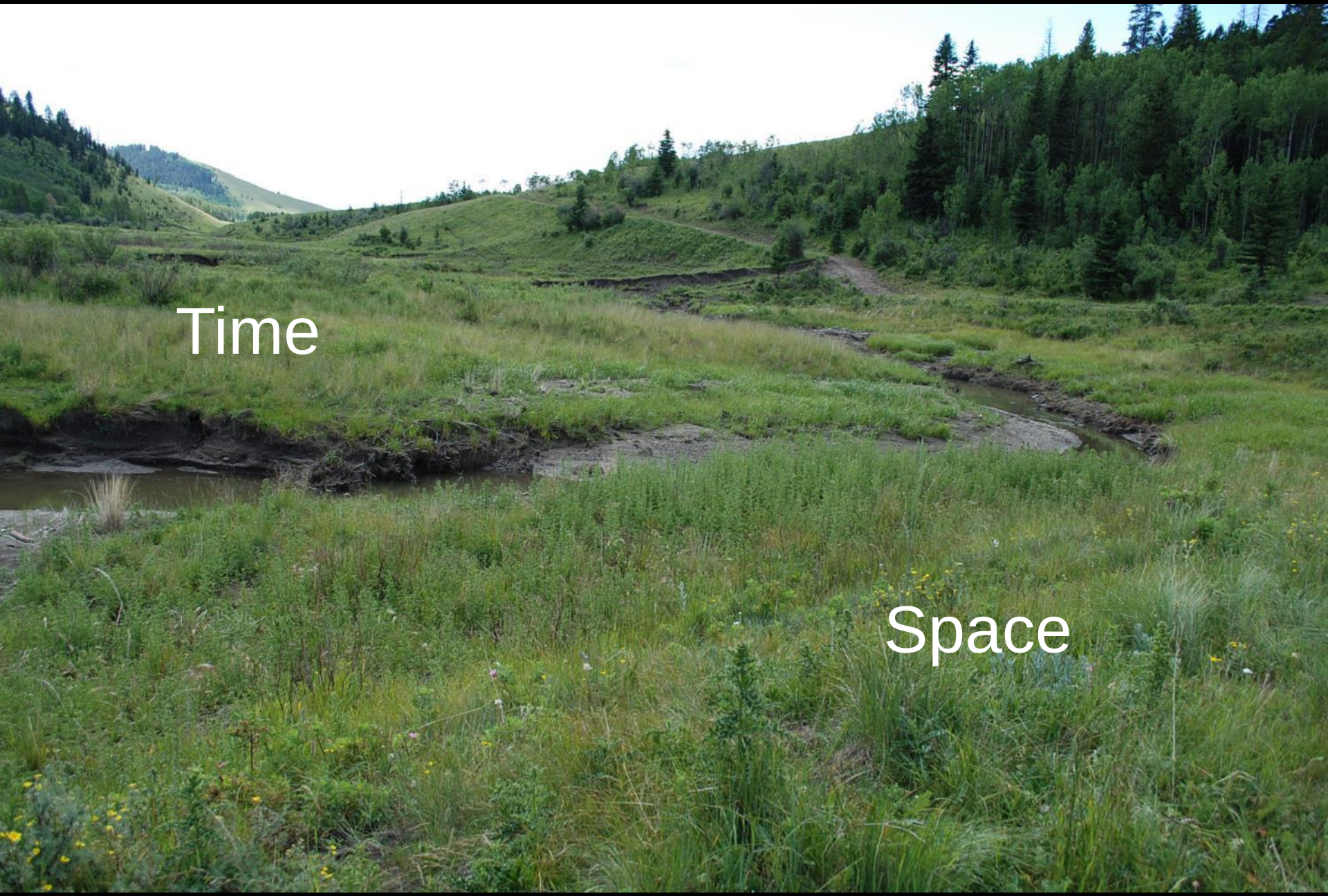
Lac Ste Anne County, Plummer pond leveller demo Sept 2017

Beating the Beaver at its Own Busy Nature

- **Landowners leading the way**

Not completely maintenance-free…

Beavers don’t sign onto the projects …
Starland County – Michichi Creek
2017


Time
Space

Think like a watershed

Poll 3

Have you learned new information that you will share with others or that you will use to help implement beaver co-existence, as a result of this webinar?

- No
- Maybe
- Definitely

Thank you to our funders!

Questions???

Miistakis Institute

PUTTING BEAVERS TO WORK

www.rockies.ca/beavers

Norine Ambrose, Executive Director
Cows and Fish – Alberta Riparian Habitat Management Society
nambrose@cowsandfish.org
(403) 381-5538

Holly Kinas, Conservation Analyst
Miistakis Institute
holly@rockies.ca
403-440-8444