



Beavers = Water

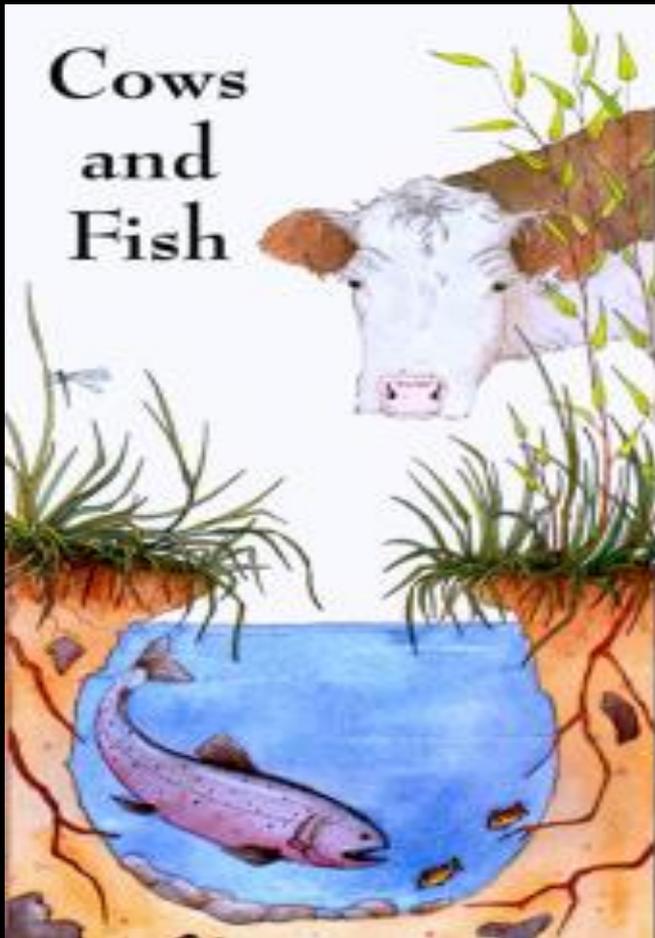
The Role of Beavers in Wetland Management



NSWA Forum

Sept 22, 2022

Photo: Myrna Pearman



Our Vision

Healthy, functioning riparian areas for the benefit of all

Our Mission

To promote healthy landscapes by fostering riparian stewardship

“Working with producers and communities on riparian awareness”





CARING FOR THE GREEN ZONE

*Riparian Areas
and
Grazing Management*

CARING FOR THE GREEN ZONE



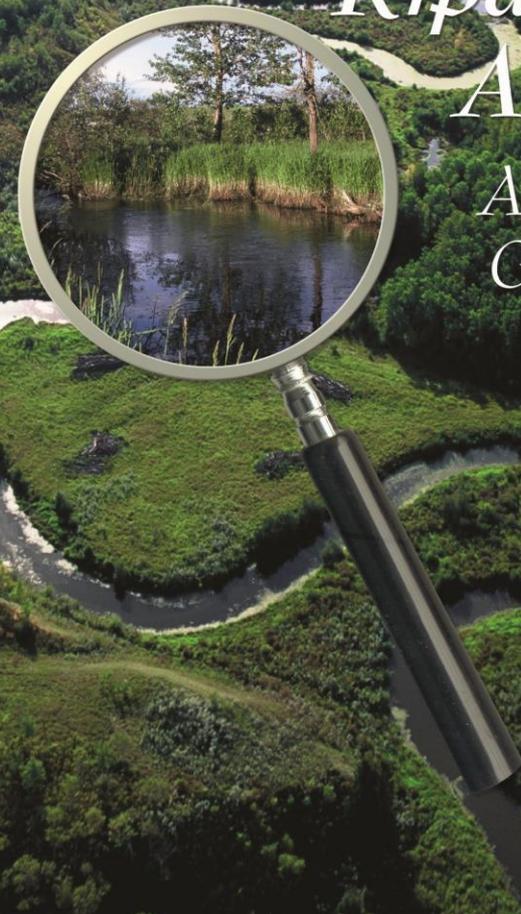
Third Edition

CARING FOR THE GREEN ZONE

*Riparian
Areas*

*A User's
Guide to
Health*

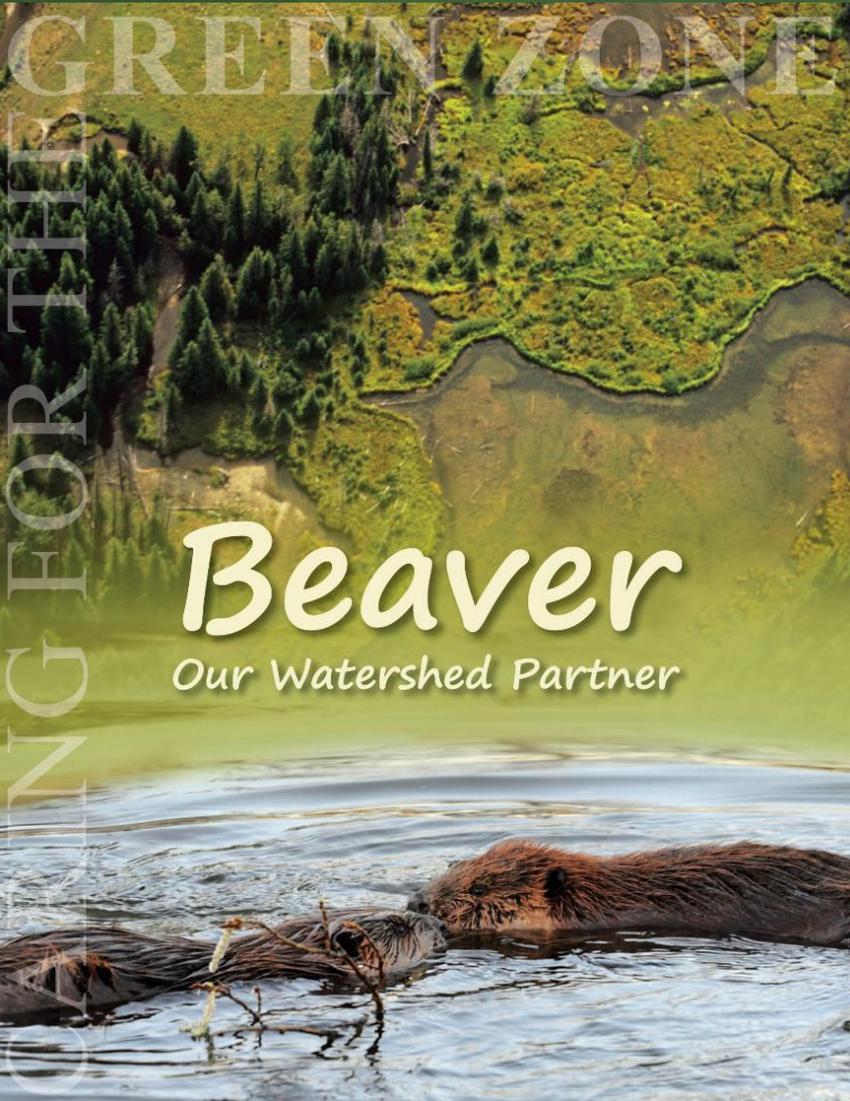
CARING FOR THE GREEN ZONE



Awareness Materials:

www.rockies.ca/beavers

www.cowsandfish.org



A Pond of Gold

Storing Water, Naturally

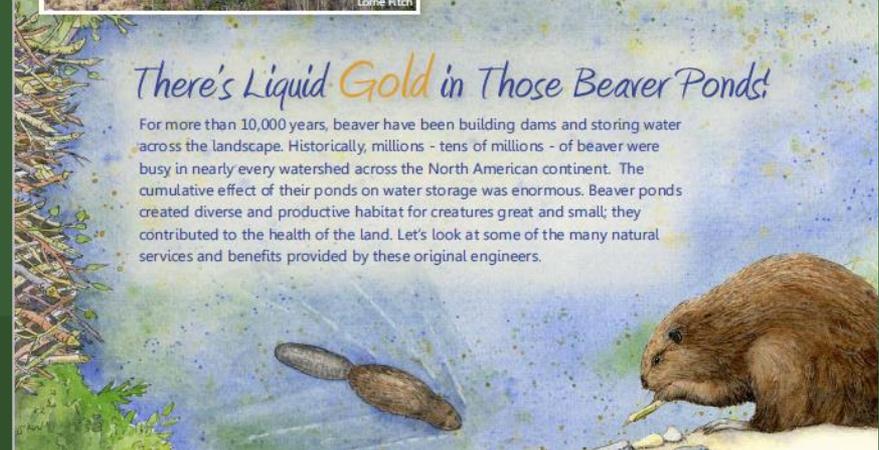


Water ... we can't live without it. No substitute exists for this precious and beautiful resource, which has usually been scarce in the Rocky Mountain West. In the future, the flow of water may decline as our climate becomes warmer and drier. The amount of snowpack in the mountains will be less, melting and runoff will occur earlier in the spring, and stream flow will diminish earlier in summer. By late summer when we need water the most, it may be in short supply.

Many people believe that water will be the new gold of the future. As the reality of climate change becomes ever more apparent, we will need to catch and store water more effectively. We've given water lots of advice, in the form of expensive dams and big reservoirs but is that always the best solution? Likely not. Have we overlooked a natural ally in our efforts to conserve and manage water? Yes, consider the beaver!

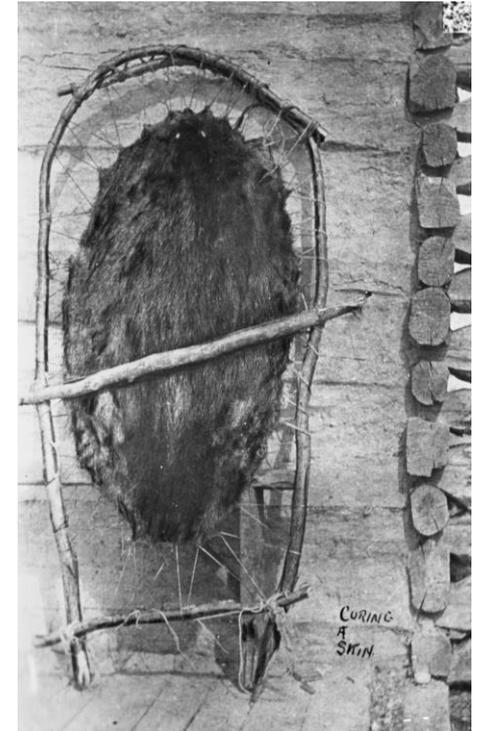
There's Liquid Gold in Those Beaver Ponds!

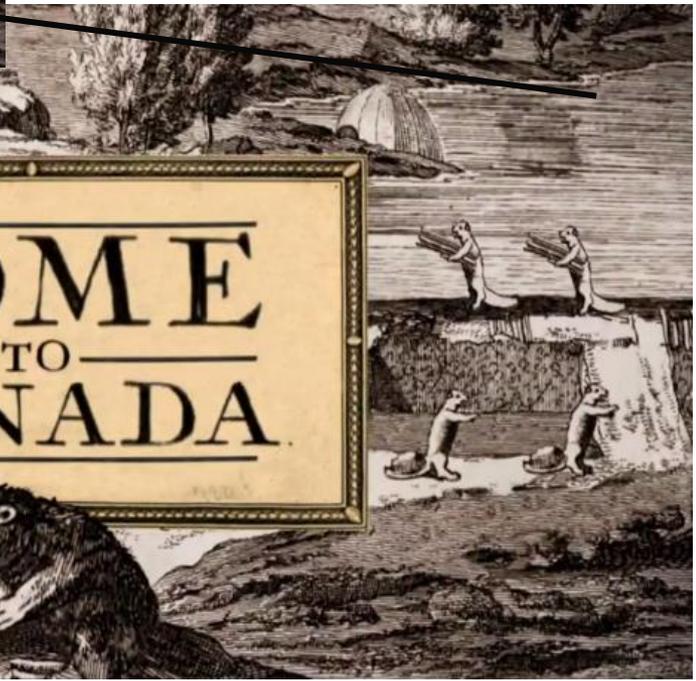
For more than 10,000 years, beaver have been building dams and storing water across the landscape. Historically, millions - tens of millions - of beaver were busy in nearly every watershed across the North American continent. The cumulative effect of their ponds on water storage was enormous. Beaver ponds created diverse and productive habitat for creatures great and small; they contributed to the health of the land. Let's look at some of the many natural services and benefits provided by these original engineers.



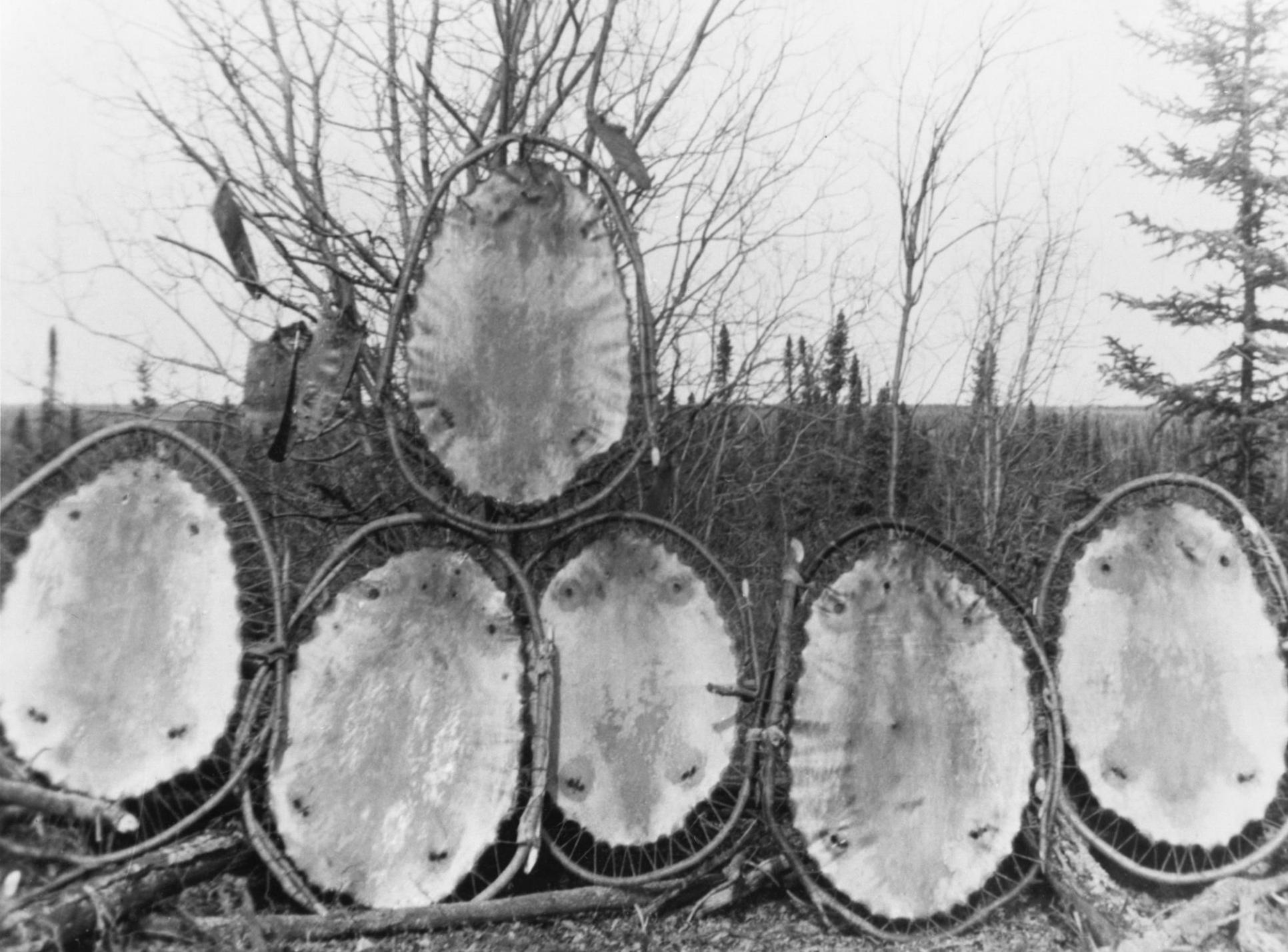
A Canadian Icon

- 709 Canadian place names
- 50 Alberta place names

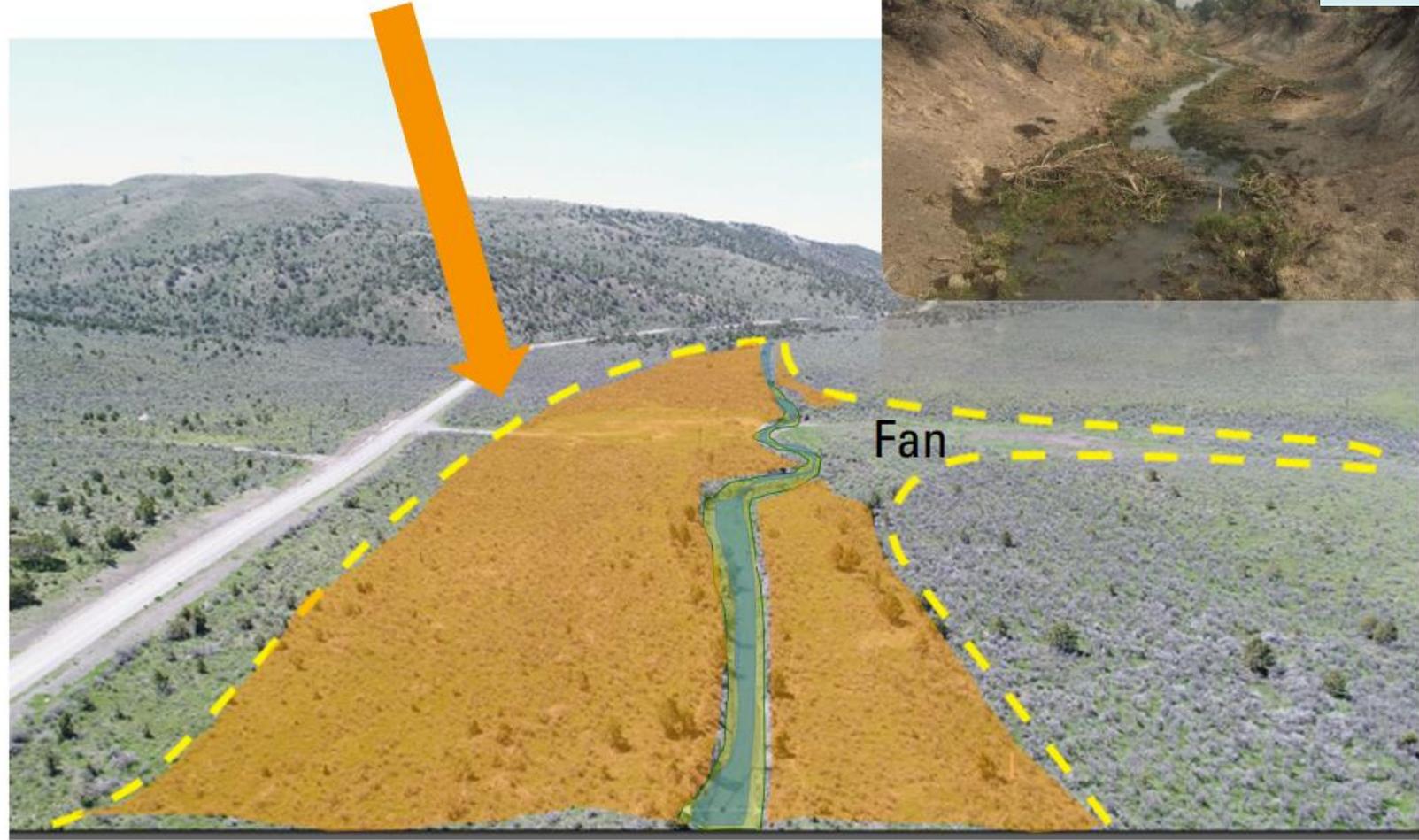




Imagery source: <http://watch.cbc.ca/the-nature-of-things/season-52/episode15>



What's been lost



Fan

-  Valley bottom
-  Active channel
-  Active floodplain
-  Inactive floodplain



<http://leaderpost.com>



THE BEAVER WHISPERERS



The beaver's new brand: eco-saviour

ERIN ANDERSEN

The Globe and Mail

Published Friday, Feb. 18, 2011 7:24PM EST

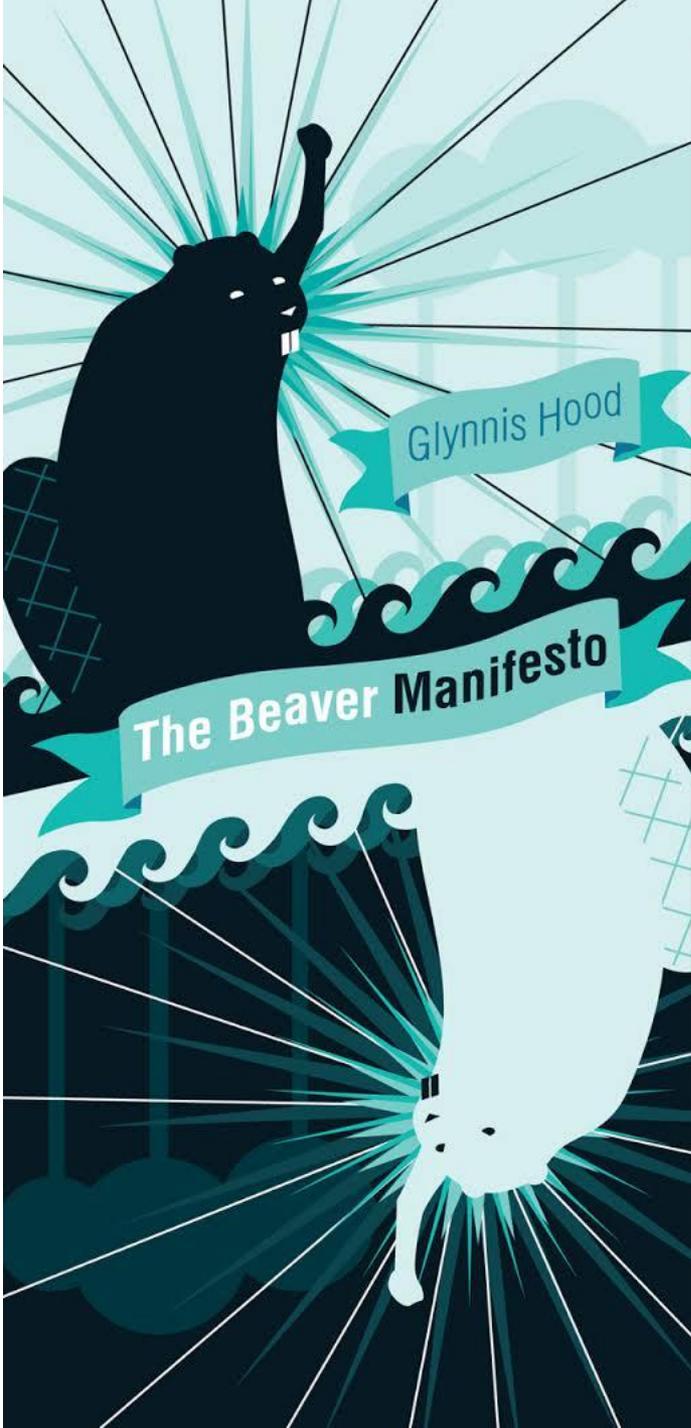
Last updated Thursday, Aug. 23, 2012 5:00PM EDT



thestar.com

Beavers may offer environmental second chance

Beavers have ability to preserve water resources, mitigate drought and boost biodiversity. By helping them, we help ourselves, professor says.



Glynnis Hood

The Beaver Manifesto

Good Beaver, Bad Beaver?

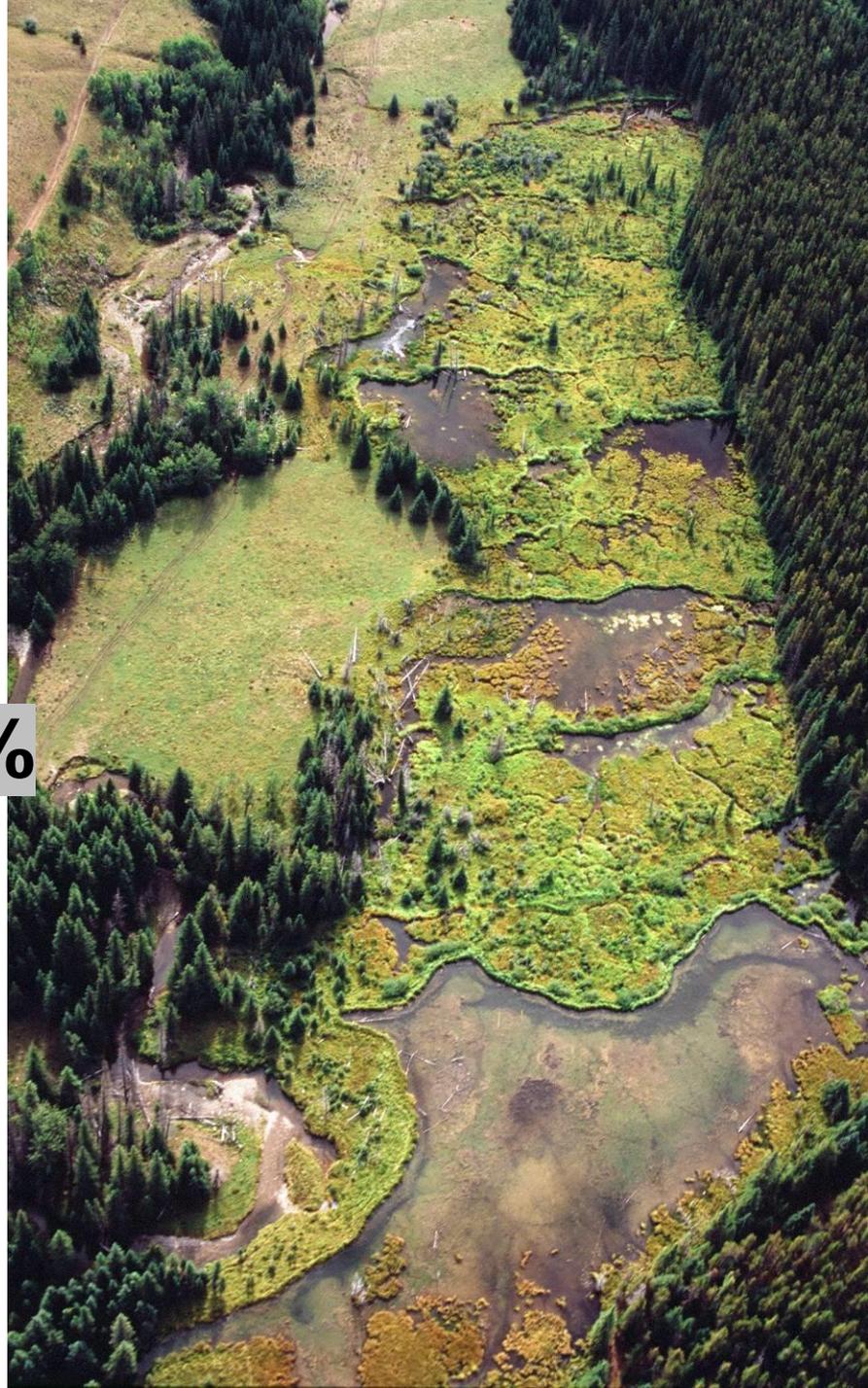


FEAR THE BEAVER



Where does a beaver like to live?

- ✓ Adequate water supply
- ✓ Optimal gradients $<3\%$
- ✓ Valley width $>45\text{m}$
- ✓ Adequate aspen, willow



What do beavers like to do?

- ✓ Impound water for safety and access to food
- ✓ Cut trees for food, dam and lodge building

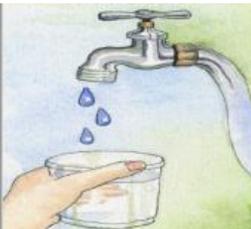
Their survival depends on it



Photo: Myrna Pearman



Putting Beavers to Work on Bragg Creek



Life is all about water – a substance more precious than gold and likely scarcer as we move into a warmer, drier future. With their ponds serving as natural reservoirs, beaver can help us, but only if we accommodate their activity in more places.



The beaver is quite a package they swim like a fish, cut like a chain saw, & move material like a front-end loader.

Beavers played a key role shaping Canada. For over 10,000 years these watershed engineers have been building dams and storing water. The sight, but especially the sound of running water puts beavers into dam-building mode. Dams hold water to create a safe depth for their lodge, food caches, and easier access to supplies. Prominent front teeth, which grow throughout their life, are harder on the front surface to ensure wear maintains a sharp edge to cut through wood and peel bark for eating.

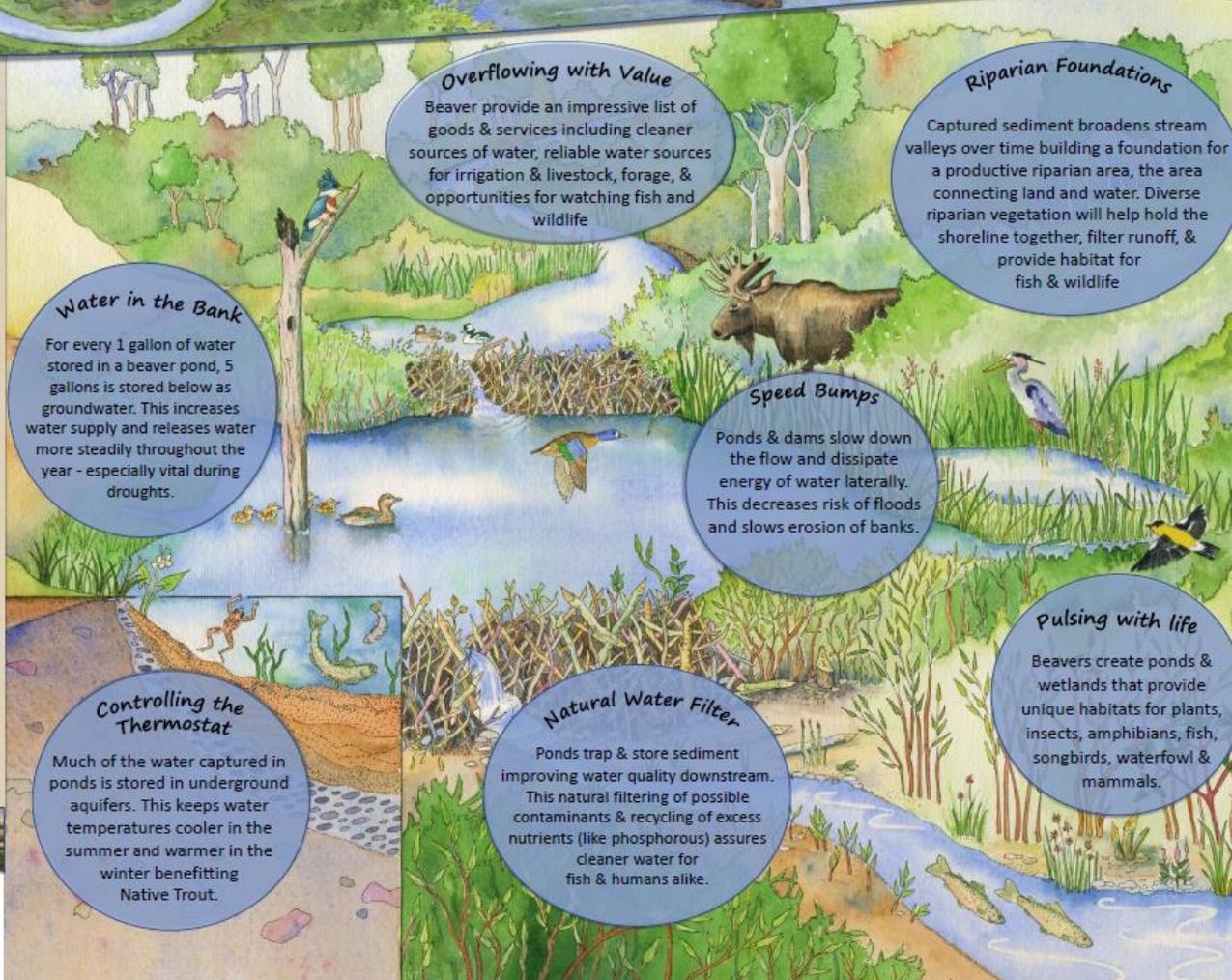


In the 1800s, European fashion prized beaver pelts for hats. With the virtual elimination of European beaver, the search for pelts shifted to North America. Excessive trapping eliminated beaver from most areas in Canada by the early 1900s. In some areas, especially the grasslands, beaver populations have never fully recovered. Without beavers and with increased intensity of land-use, streams cut downward and some dried up, water tables dropped, woody vegetation disappeared, and wildlife declined. The impacts on us have been considerable – including uncertain water supply, higher costs for water treatment, and increased likelihood of erosion and flooding.



Grey Owl (Archie Belaney) was one of the first to reintroduce beaver

To learn more visit: www.rockies.ca/beavers/



Overflowing with Value
Beaver provide an impressive list of goods & services including cleaner sources of water, reliable water sources for irrigation & livestock, forage, & opportunities for watching fish and wildlife

Riparian Foundations
Captured sediment broadens stream valleys over time building a foundation for a productive riparian area, the area connecting land and water. Diverse riparian vegetation will help hold the shoreline together, filter runoff, & provide habitat for fish & wildlife

Water in the Bank
For every 1 gallon of water stored in a beaver pond, 5 gallons is stored below as groundwater. This increases water supply and releases water more steadily throughout the year – especially vital during droughts.

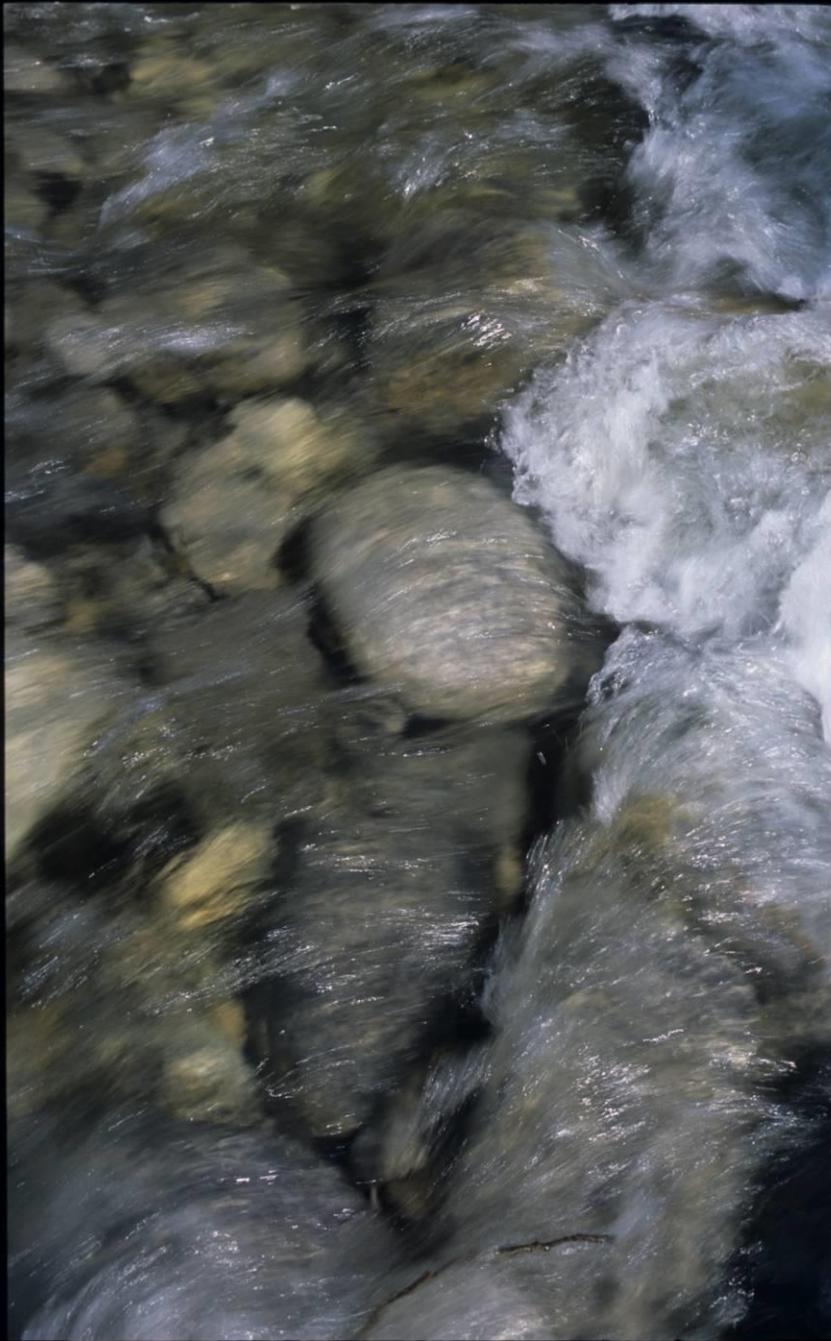
Speed Bumps
Ponds & dams slow down the flow and dissipate energy of water laterally. This decreases risk of floods and slows erosion of banks.

Pulsing with life
Beavers create ponds & wetlands that provide unique habitats for plants, insects, amphibians, fish, songbirds, waterfowl & mammals.

Controlling the Thermostat
Much of the water captured in ponds is stored in underground aquifers. This keeps water temperatures cooler in the summer and warmer in the winter benefitting Native Trout.

Natural Water Filter
Ponds trap & store sediment improving water quality downstream. This natural filtering of possible contaminants & recycling of excess nutrients (like phosphorous) assures cleaner water for fish & humans alike.







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





Beaver pond cycles



Rights Available from CartoonStock.com

"We were too busy."

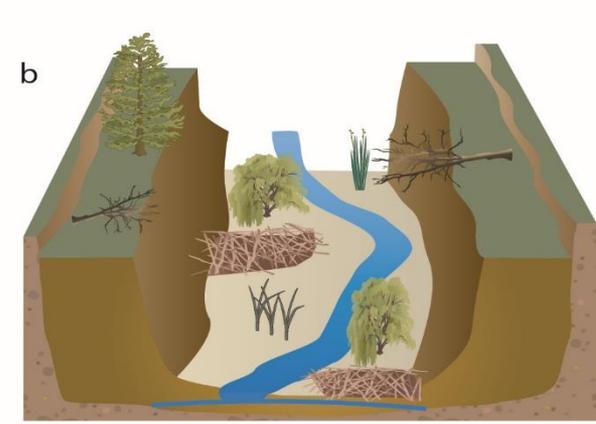
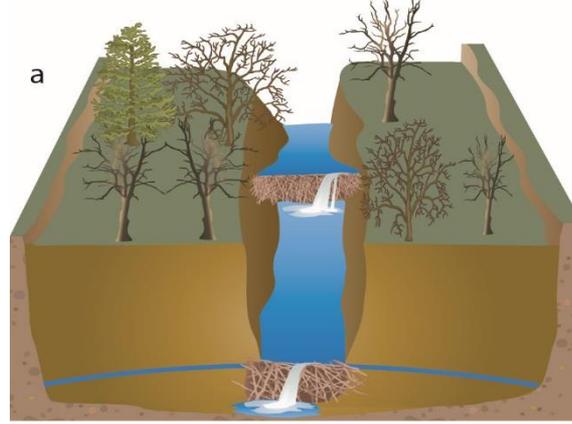




Building Riparian Foundations

Sediment captured by beaver ponds broadens stream valleys over time with rich deposits of soil to build diverse and productive riparian zones, wetlands, and meadows. Water tables become higher which creates and maintains a diverse mosaic of vegetation, particularly willows that protect and stabilize stream banks.

Stream incisement and restoration sequence

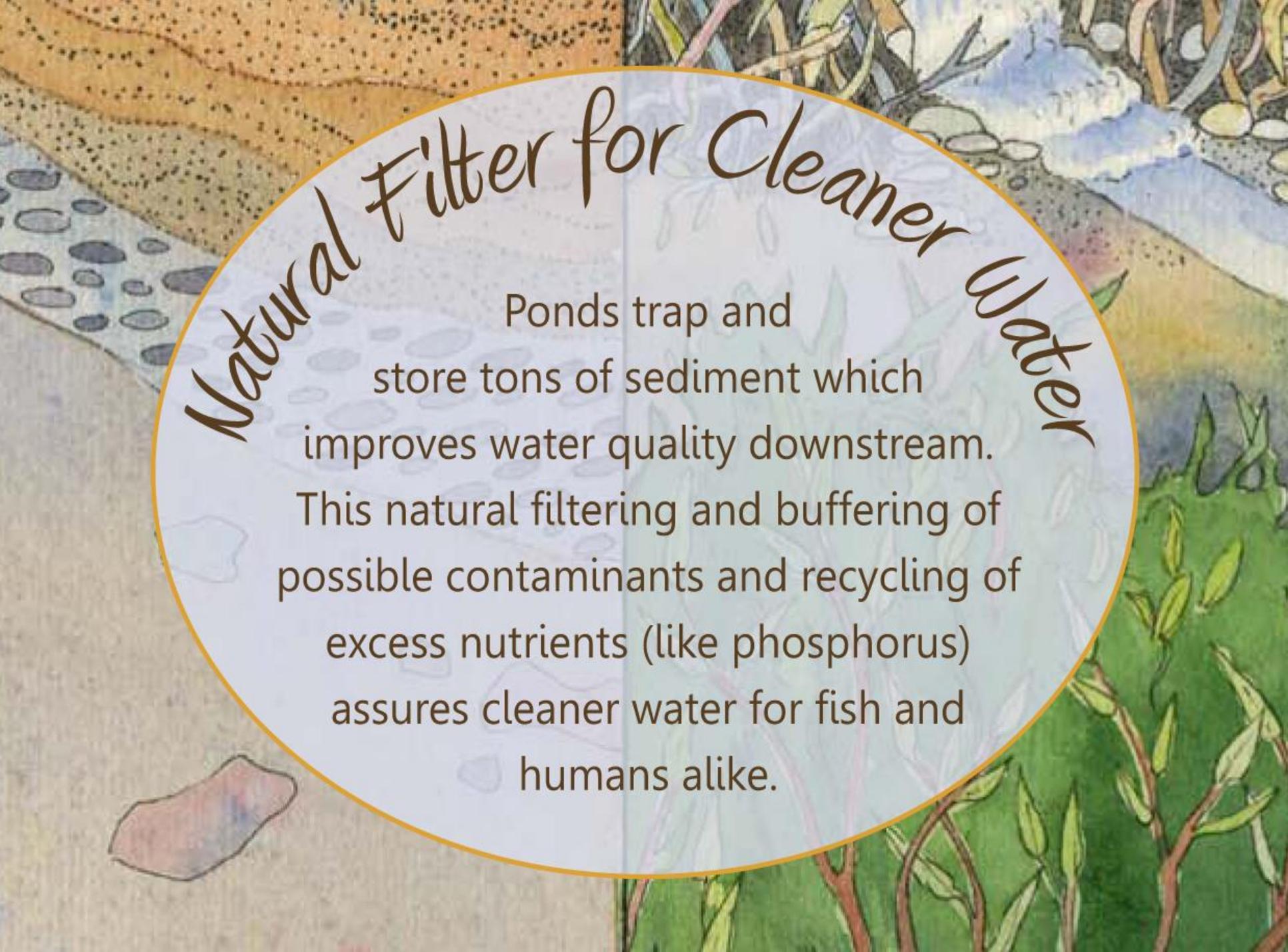


Beavers gone



Beavers restored



The background of the image is a detailed illustration of a water filtration system. It shows a cross-section of a stream or pond with various layers of sediment and biological growth. At the top, there's a layer of brown, porous material. Below that, a layer of blue and grey pebbles. Further down, there's a layer of green, fibrous material, possibly algae or plant matter. At the bottom, there's a layer of brown, sandy sediment. The water is depicted as a light blue, bubbly stream flowing through these layers. A large, semi-transparent circular area with a yellow border is overlaid on the center of the image, containing text.

Natural Filter for Cleaner Water

Ponds trap and store tons of sediment which improves water quality downstream. This natural filtering and buffering of possible contaminants and recycling of excess nutrients (like phosphorus) assures cleaner water for fish and humans alike.

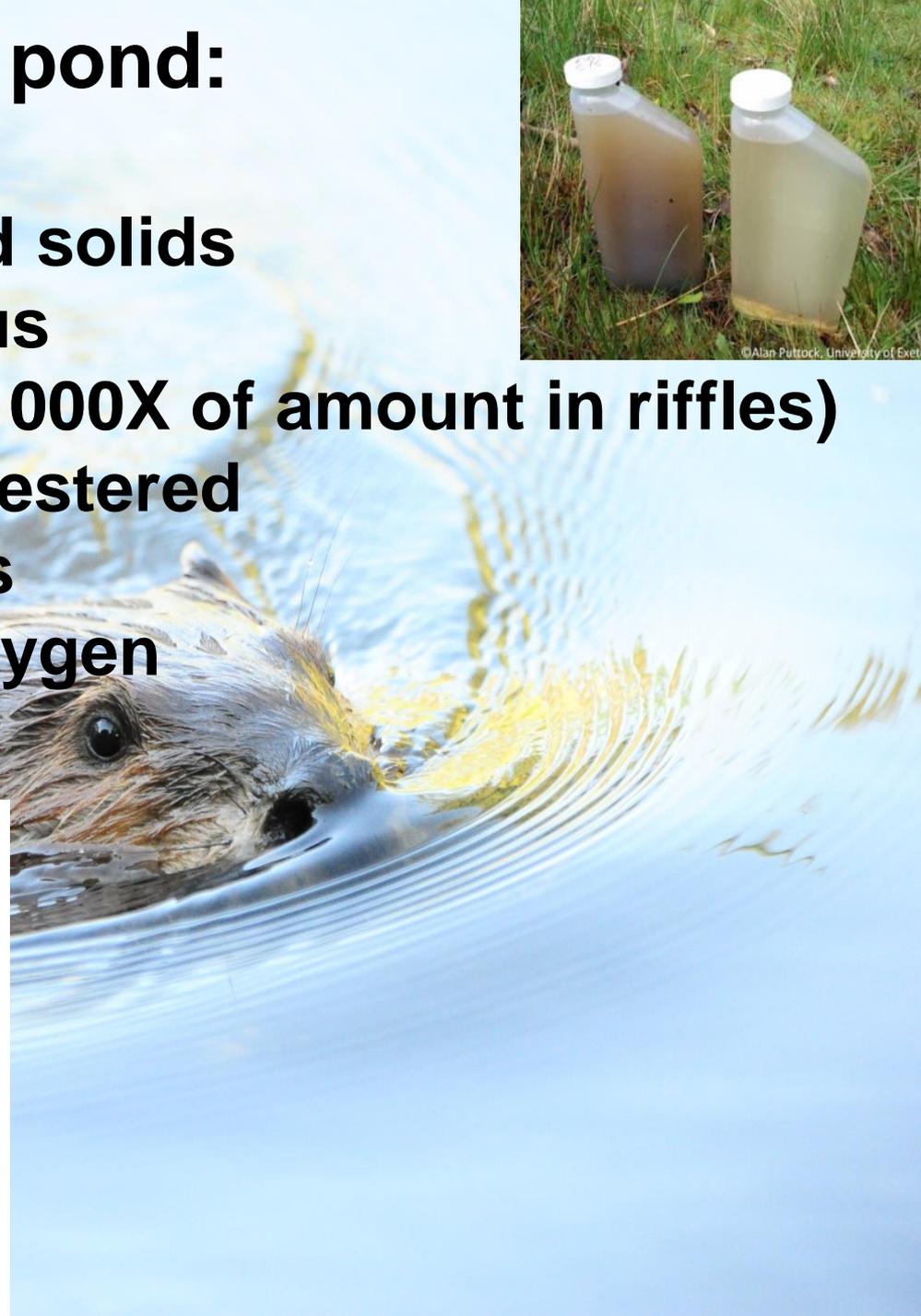
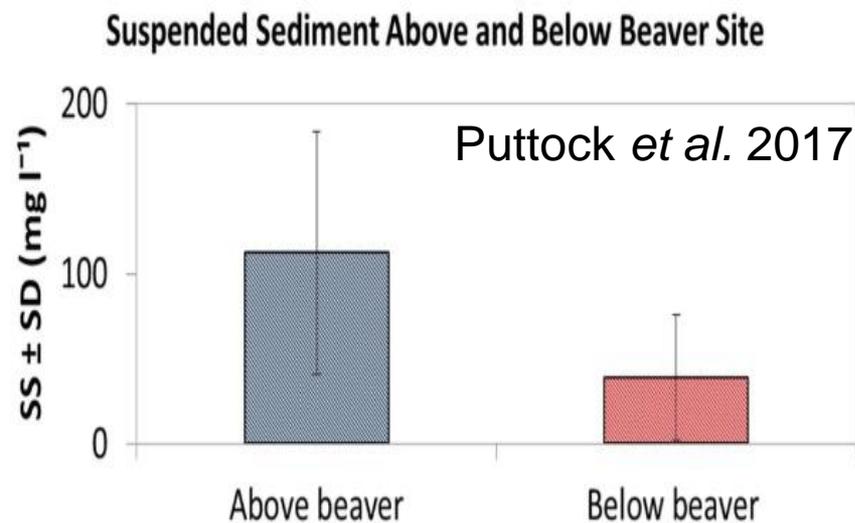


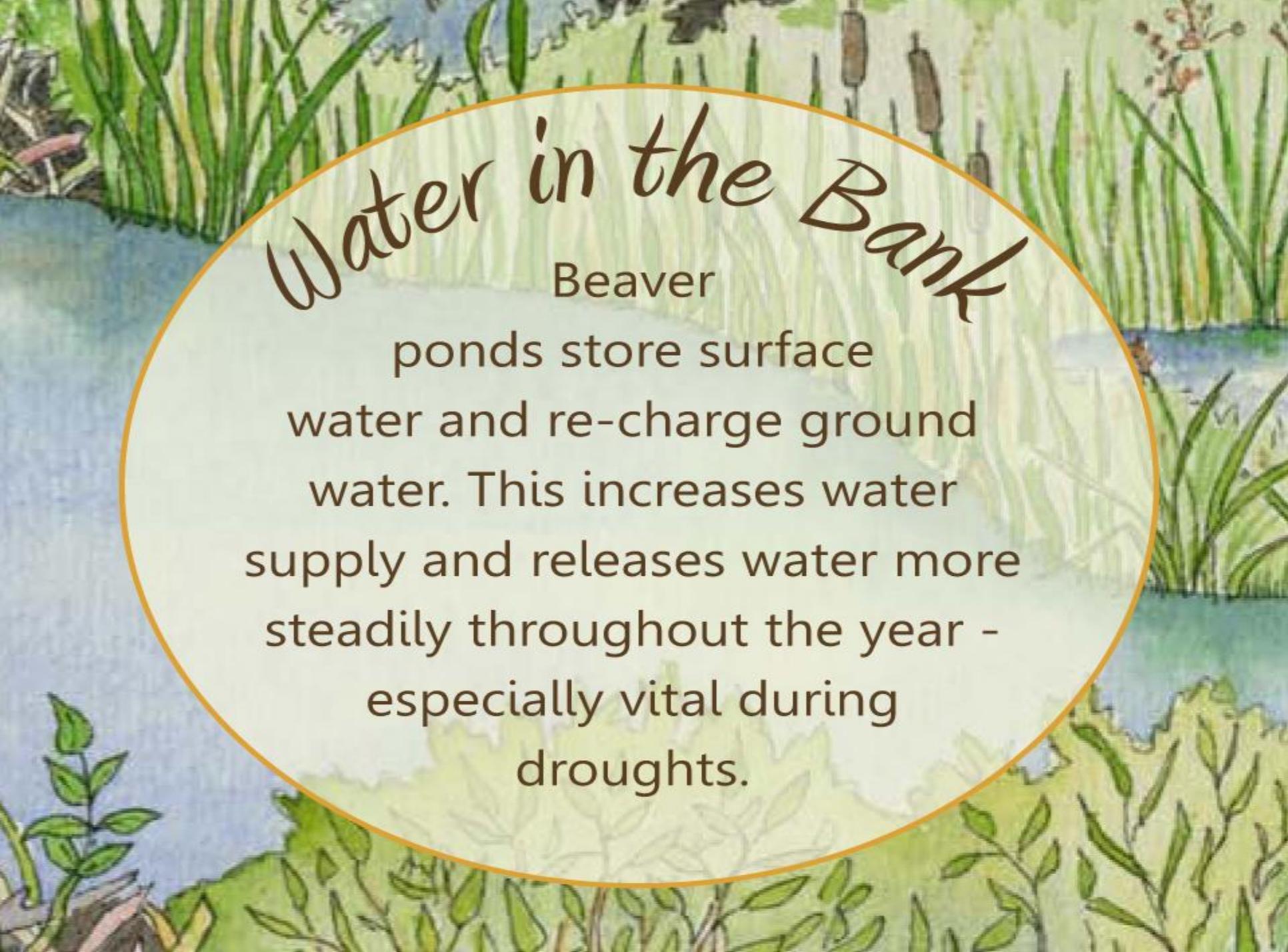
35 - 6500 m³ of sediment stored in each pond



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
- increased dissolved oxygen

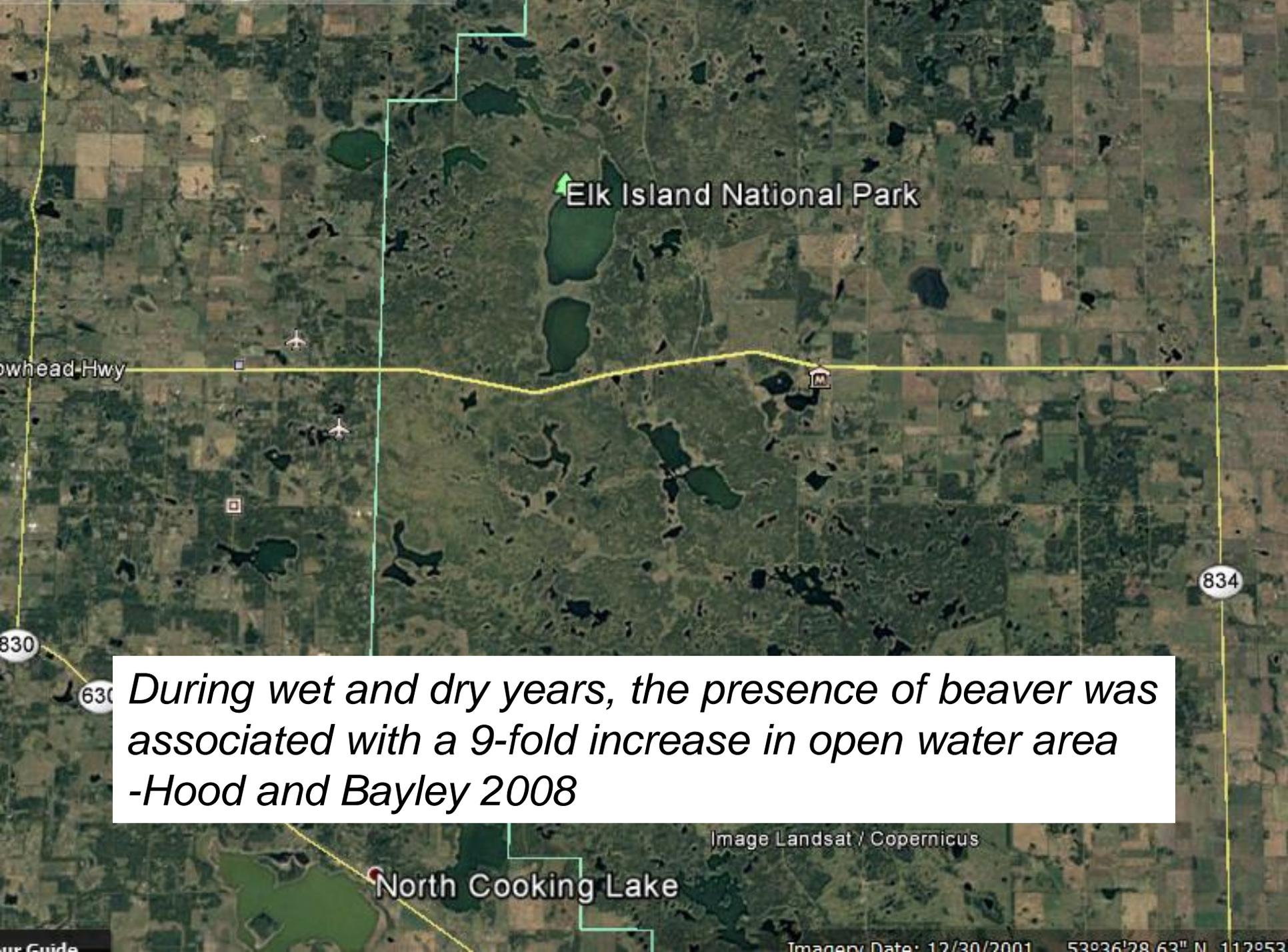




Water in the Bank

Beaver

ponds store surface water and re-charge ground water. This increases water supply and releases water more steadily throughout the year - especially vital during droughts.



Elk Island National Park

Hoodhead Hwy

834

830

630

During wet and dry years, the presence of beaver was associated with a 9-fold increase in open water area -Hood and Bayley 2008

Image Landsat / Copernicus

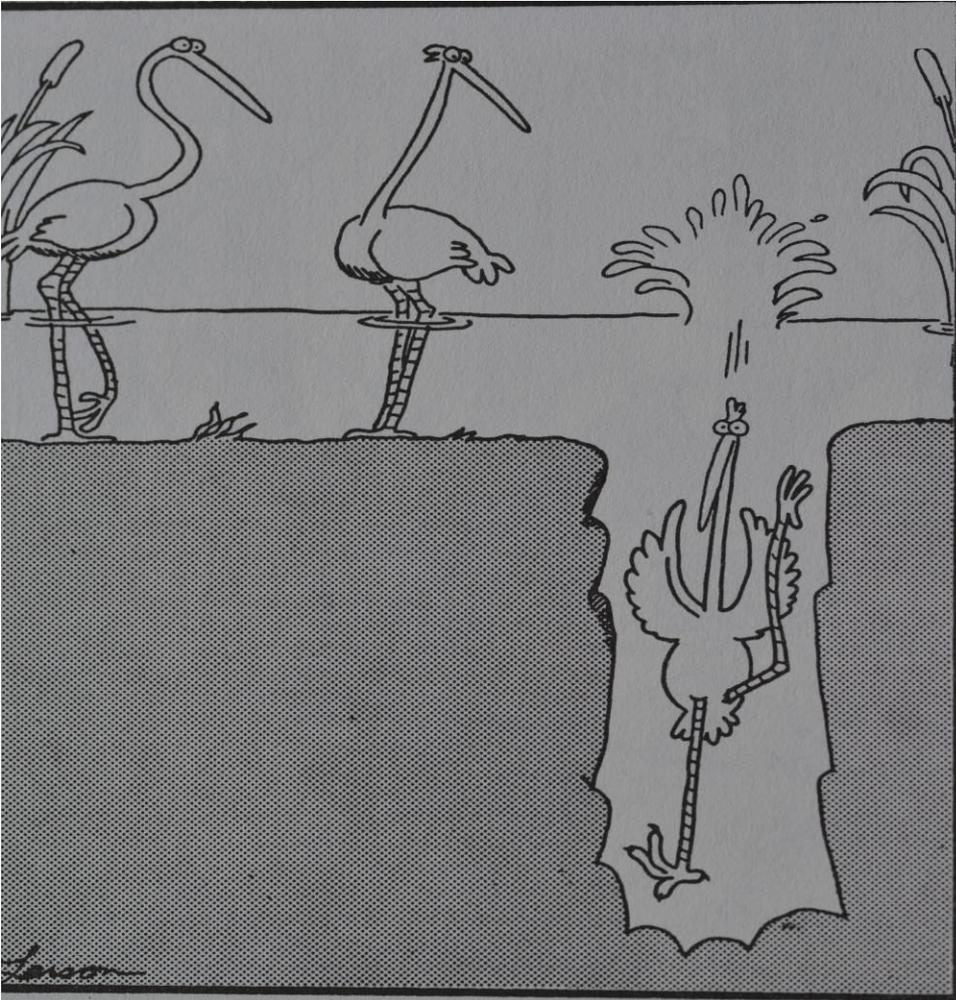
North Cooking Lake

Imagery Date: 12/30/2001

53936'28.63" N 112953

our Guide

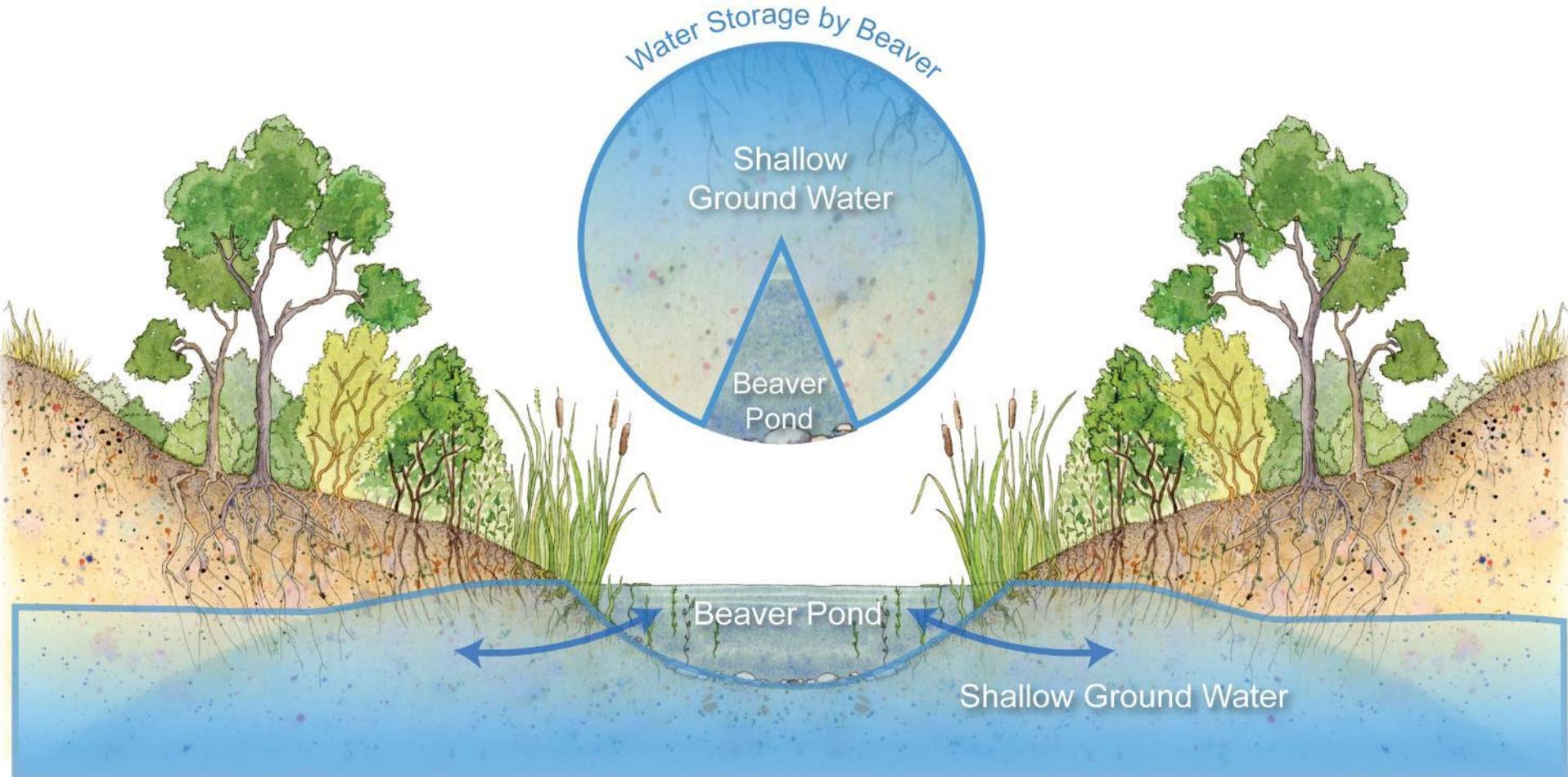
Beaver canals



Enhanced water storage

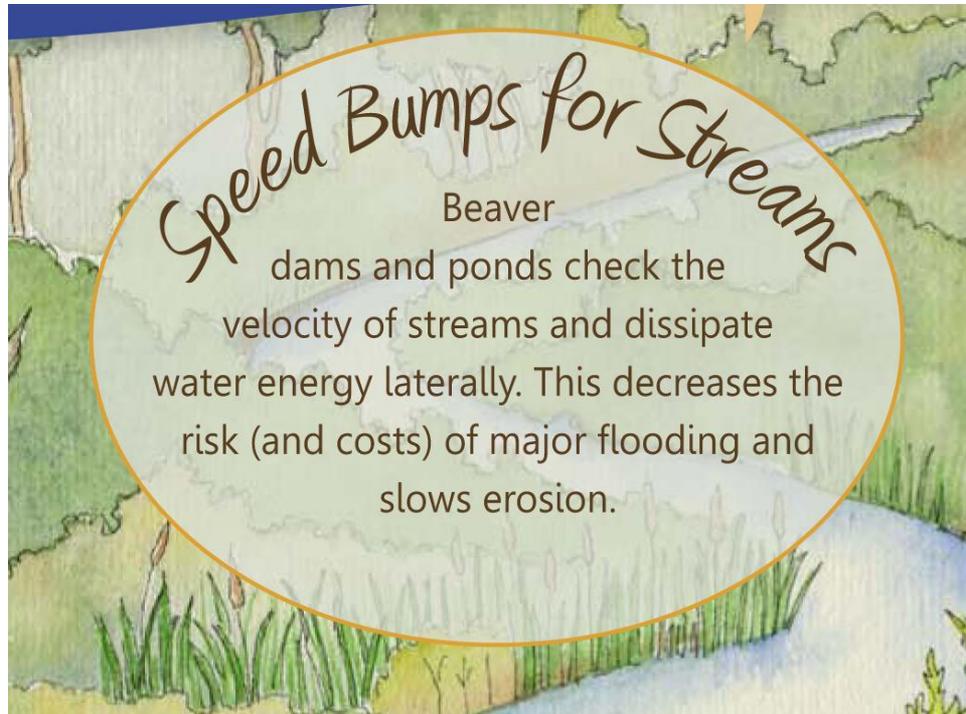


Water Storage by Beaver



Ground water storage is 5-10X more than the amount of surface water stored.

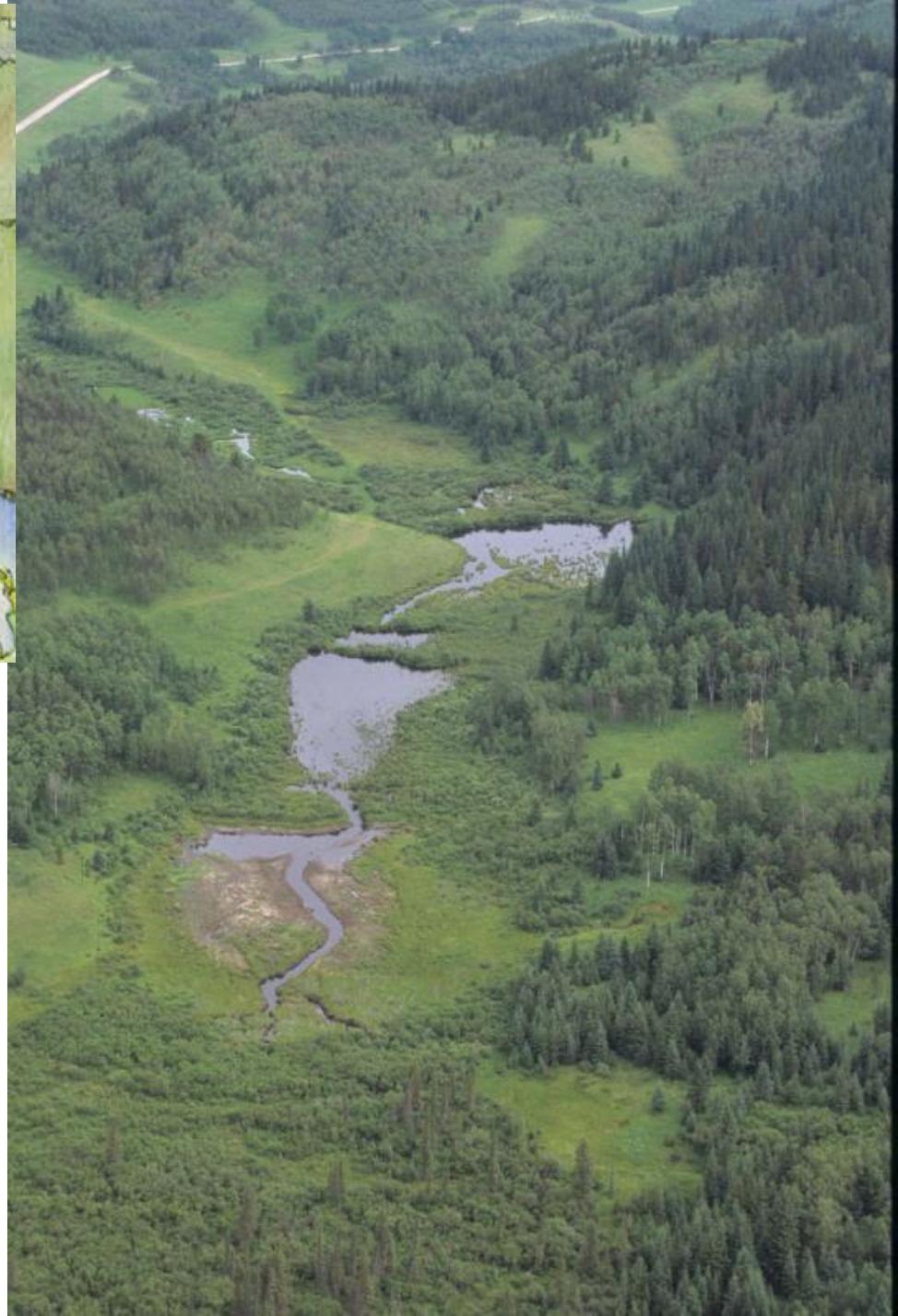
Annual downstream flow 2-10X greater.



Speed Bumps for Streams

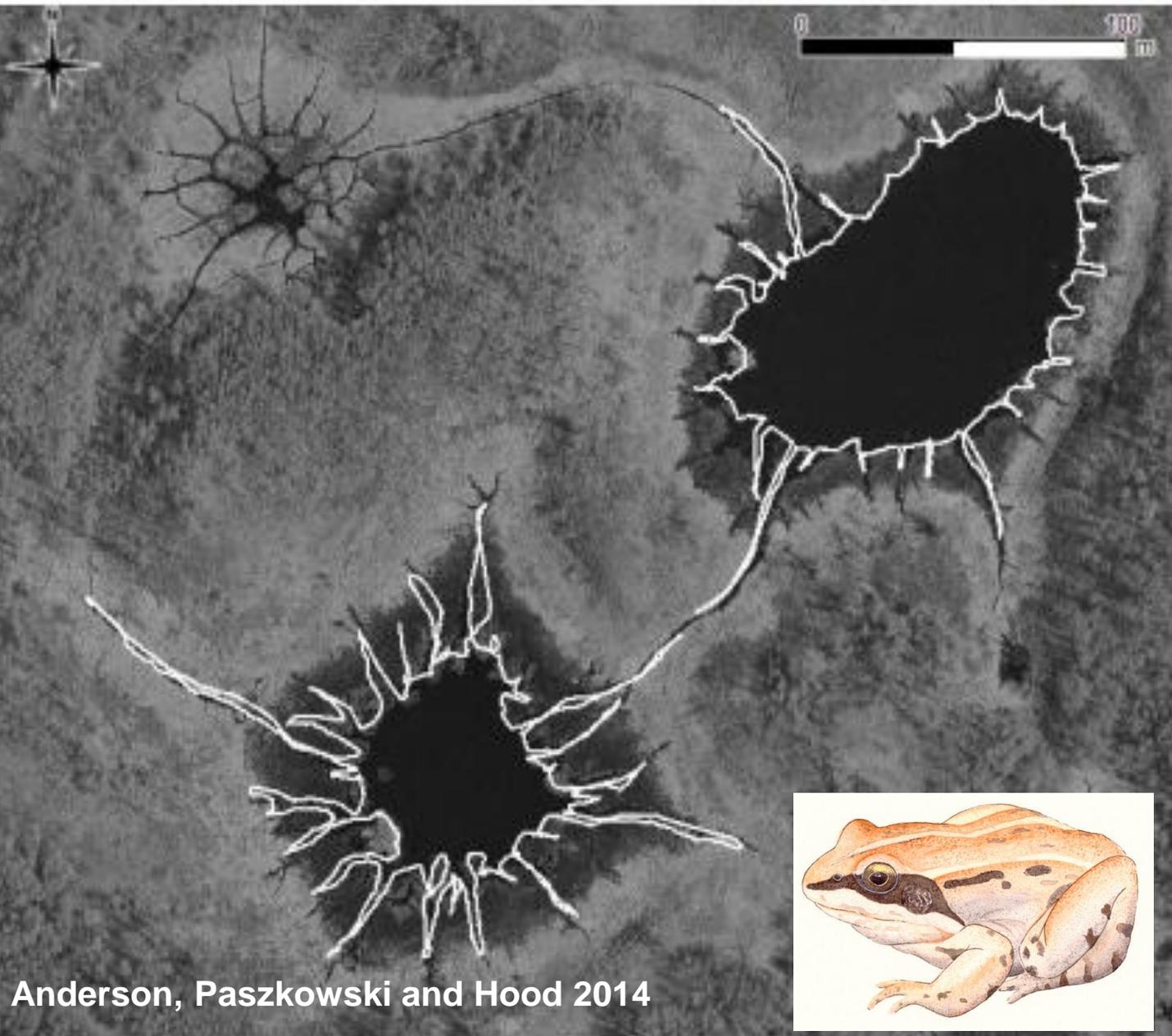
Beaver dams and ponds check the velocity of streams and dissipate water energy laterally. This decreases the risk (and costs) of major flooding and slows erosion.

- Decrease stream velocity
- Decrease stream power
- Spread water out over a larger area
- Increase amount of absorption
- Dampen flood peaks
- Redirect flood flows through other pathways



Pulsing with Life

Beavers create ponds and wetlands that provide unique habitats for plants, insects, amphibians, fish, songbirds, waterfowl and mammals - including many species not found along the streams. This can enhance the diversity and connectivity of the overall landscape.



Anderson, Paszkowski and Hood 2014



Beaver Dams and Wildfires

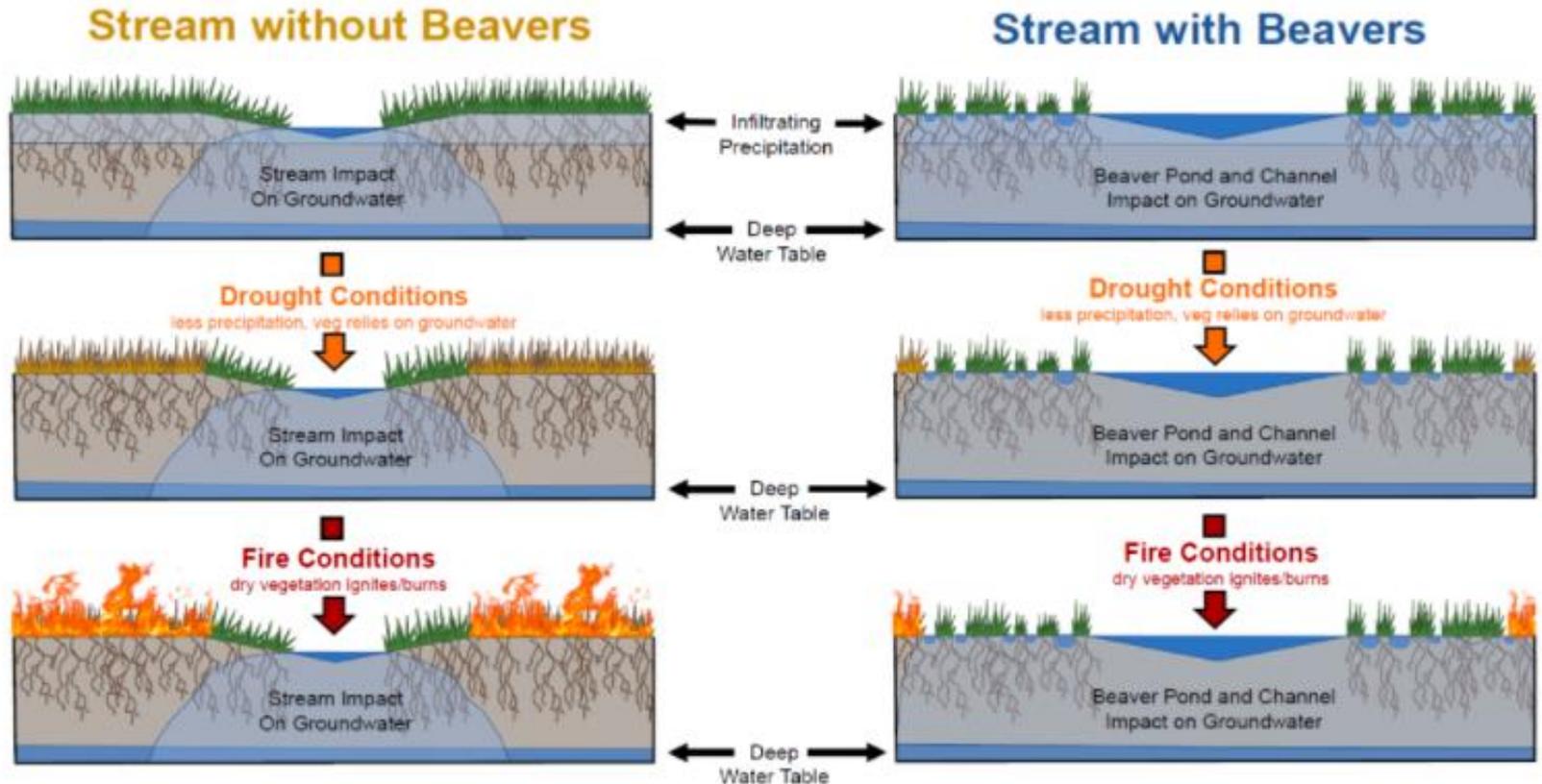


Figure from Fairfax, E. and Whittle, A. (2020), Smokey the Beaver: beaver-dammed riparian corridors stay green during wildfire throughout the western USA. *Ecol Appl*. Accepted Author Manuscript. doi:10.1002/eap.2225

Source: <https://emilyfairfaxscience.com/research/firebeavers/>

A) California: Fire
Beaver-Dammed Creek

Undammed Creek



Source: <https://emilyfairfaxscience.com/research/firebeavers/>

B) Oregon: Before Fire



C) Oregon: Fire

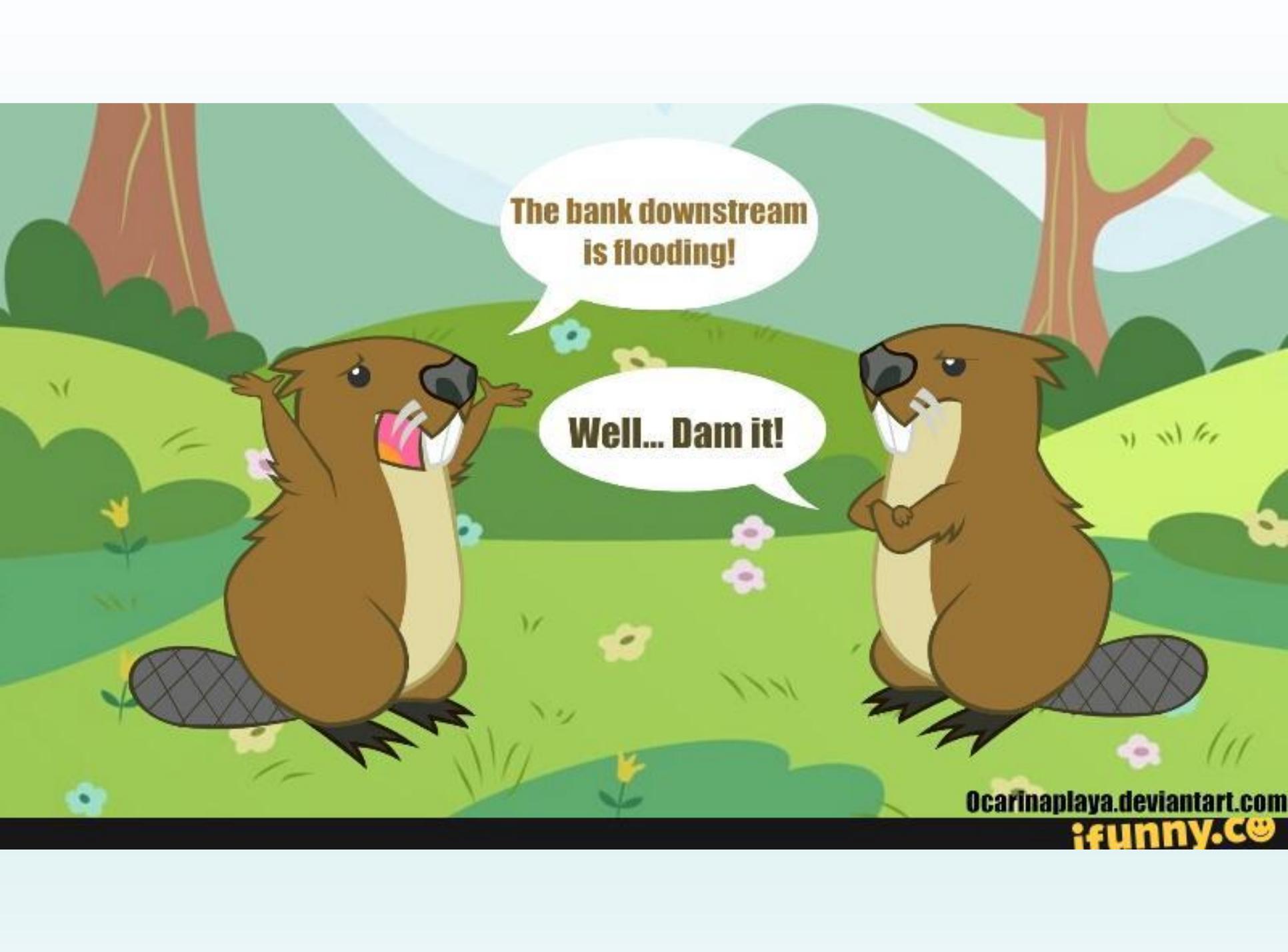


Beaver ponds:

- 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



**The bank downstream
is flooding!**

Well... Dam it!





Beaver Management Options

Technique/Strategy	Examples
Barriers	culvert exclusion, tree wrapping
Community/Watershed Involvement	education, research, demonstration, infrastructure planning, open dialogue
Deterrents	dam removal, 'big bangs'
Habitat Management	alternative food supplies, riparian pastures, off-site watering, audio clues
Population Management	Lethal removal, live trap, relocation (with special permit and process)
Regulate Water Levels	pond leveller, combo (fence-pipe)
Repellents	scent markers, natural repellents, chemical repellents

An Overview of Beaver Management for Agricultural Producers

Fact Sheet includes Overview of a variety of: Decision Criteria, Agricultural Concerns and Values, Term of Solution, Advantages/Considerations, Disadvantages/Consequences, Relative Costs (Money/Time), Agricultural Effects, Ecological Effects, Predicted Management Effectiveness

<https://cowsandfish.org/wp-content/uploads/Beaver-Matrix-FINAL.pdf>

Beaver coexistence tools and strategies are designed to:

prevent problems associated with beaver activity

present an alternative to managing beaver conflict

be more efficient and cost-effective compared to expensive annual beaver population control, repeated road maintenance and repairs, damage to infrastructure due to flooding, and loss of trees

maintain beavers and their ponds on the landscape for the economic, environmental, social and cultural values they provide

Examples - pond levellers, culvert protectors, tree wrapping, planning, etc

Adapted from: [MIR BeaverCostBenefit FactSheet AUG2020 FINAL ART-WEB.pdf](#)
([rockies.ca](#))

“Let ‘em have the creek”





Foothills County culvert Demo



Foothills County AB installed two beaver-proof culverts at a site in 2012, costing \$35,000 but requiring no further maintenance. Installation costs recouped, now saving \$5,000-\$10,000 annually.
(Oel & Gallant, 2019)
[MIR BeaverCostBenefit FactSheet AUG2020 FINAL ART-WEB.pdf \(rockies.ca\)](#)



Barriers

Beaver Proof Culvert, Beaver Pipe & Fence |
Beaver Solutions

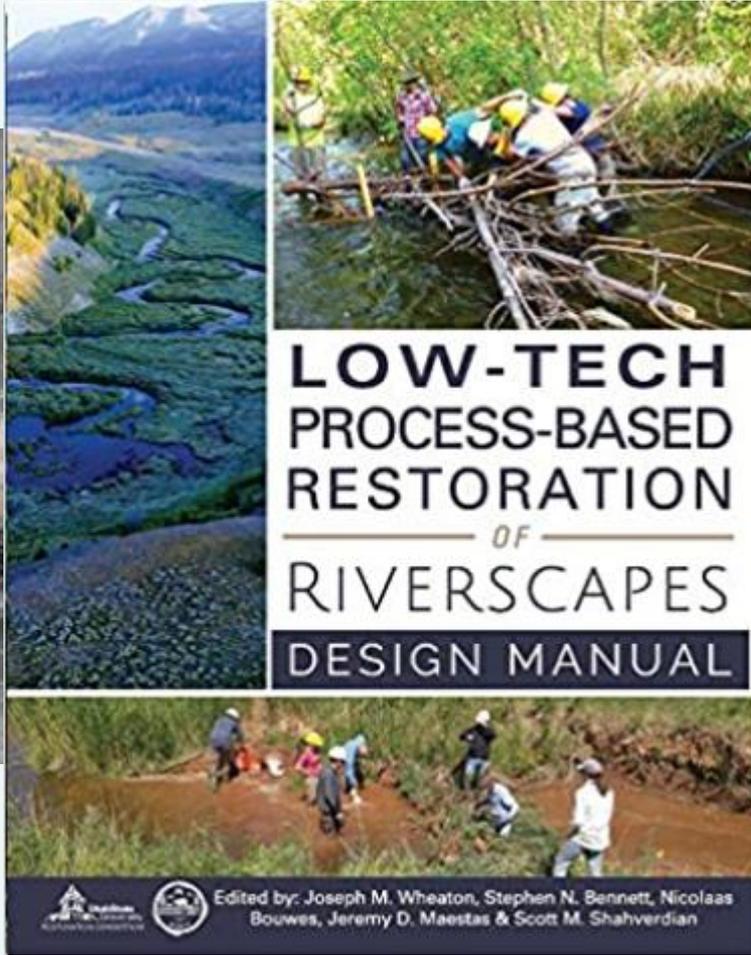


Lac Ste.
Anne County

August 2019



Beaver Dam Analogs





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

Costs of installation of pond levellers/ management	Total
Number of pond levellers	12
Start-up materials	\$ 1,672
Pond-leveller installations	\$ 10,792
Average monitoring and mapping	\$ 4,620
<u>Cumulative monitoring for pond levellers</u>	<u>\$ 16,496</u>
<u>Average annual park management expenses (before)</u>	<u>\$100,926</u>

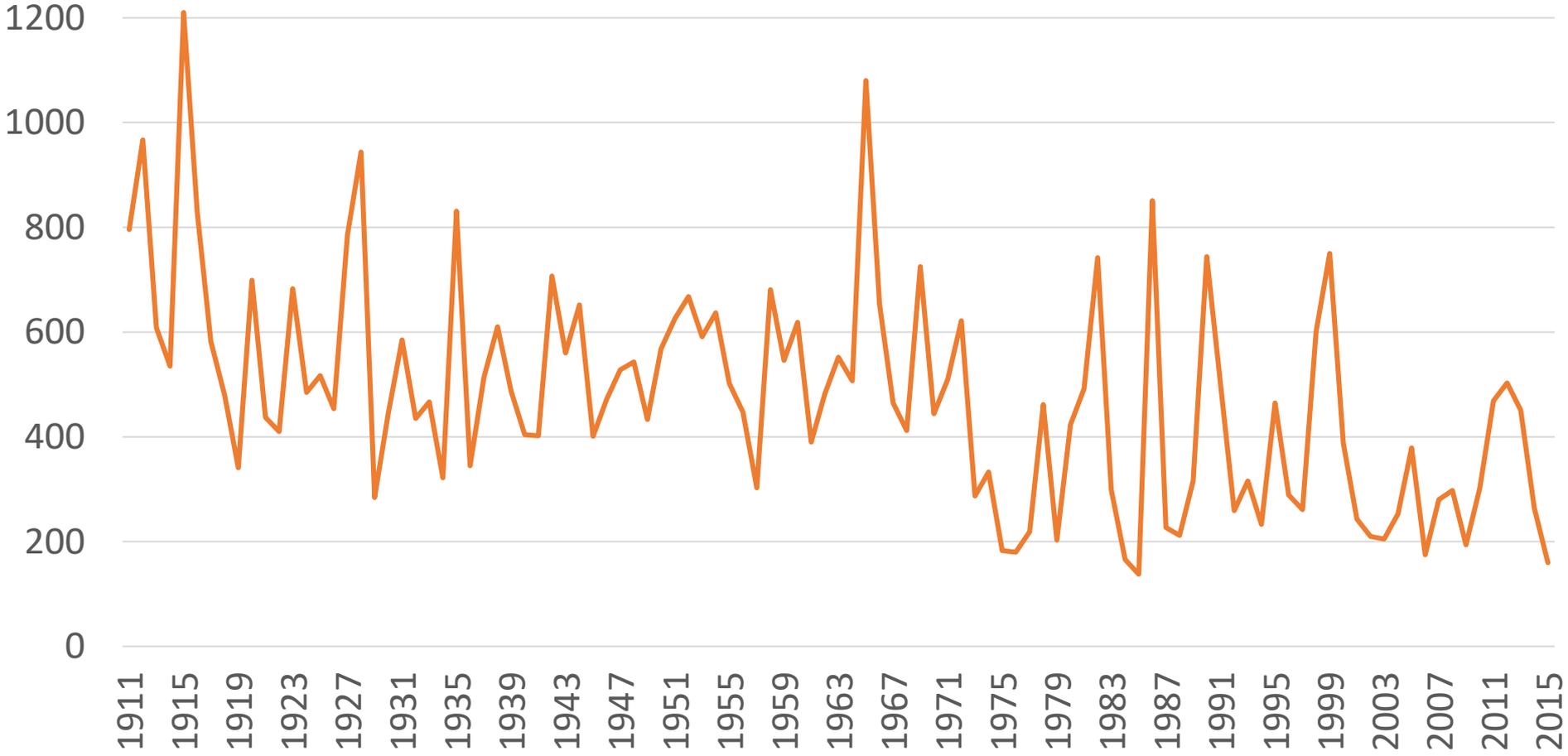
(Modified from Hood et al. 2018. Emphasis added)

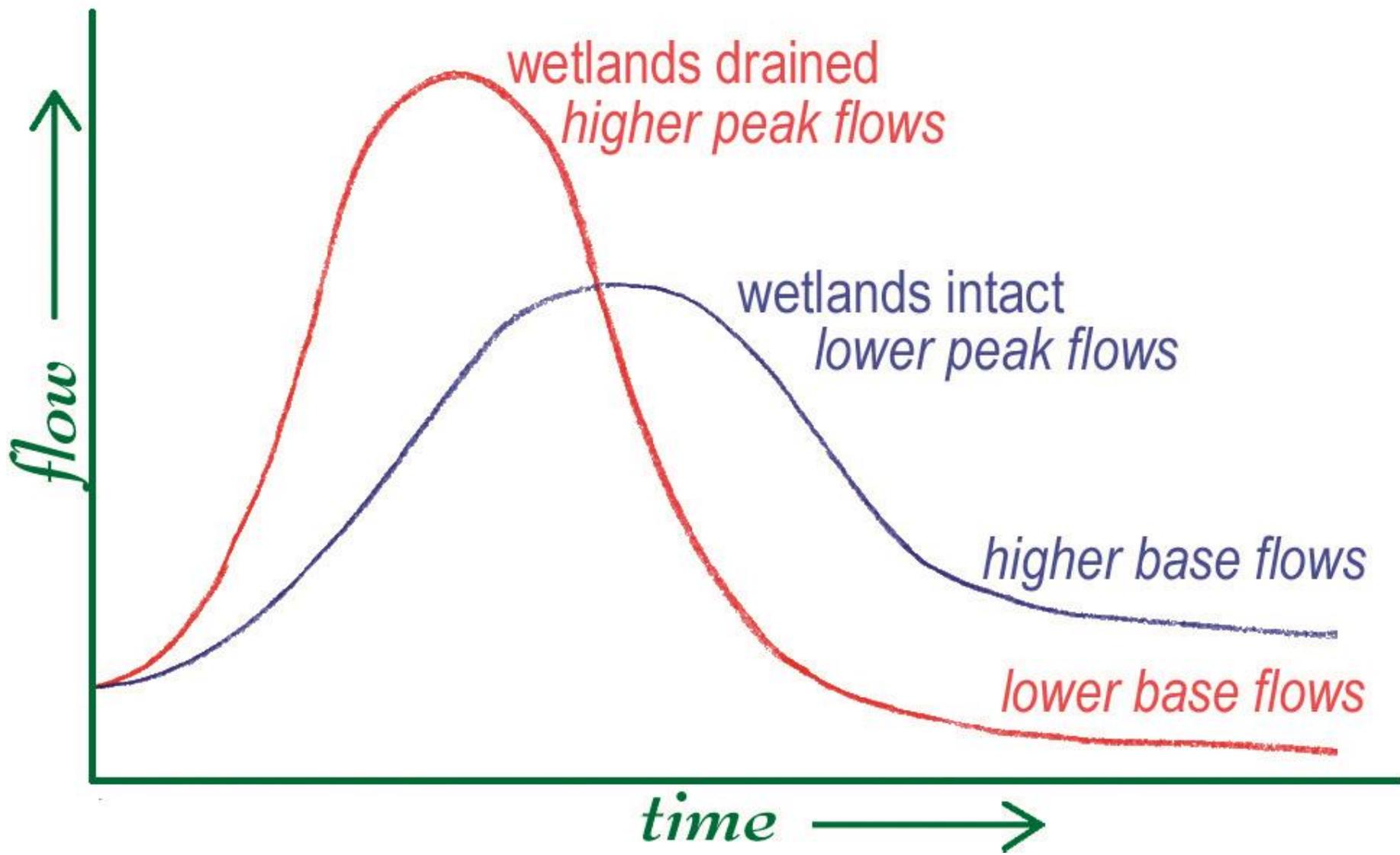
- **Annual maintenance costs were estimated to be \$128 per site, per year**



Adaptation to climate change/ Increased variability

Monthly Mean Max Flow (m³/s) (July), North Saskatchewan River, Edmonton





wetlands drained
higher peak flows

wetlands intact
lower peak flows

higher base flows

lower base flows

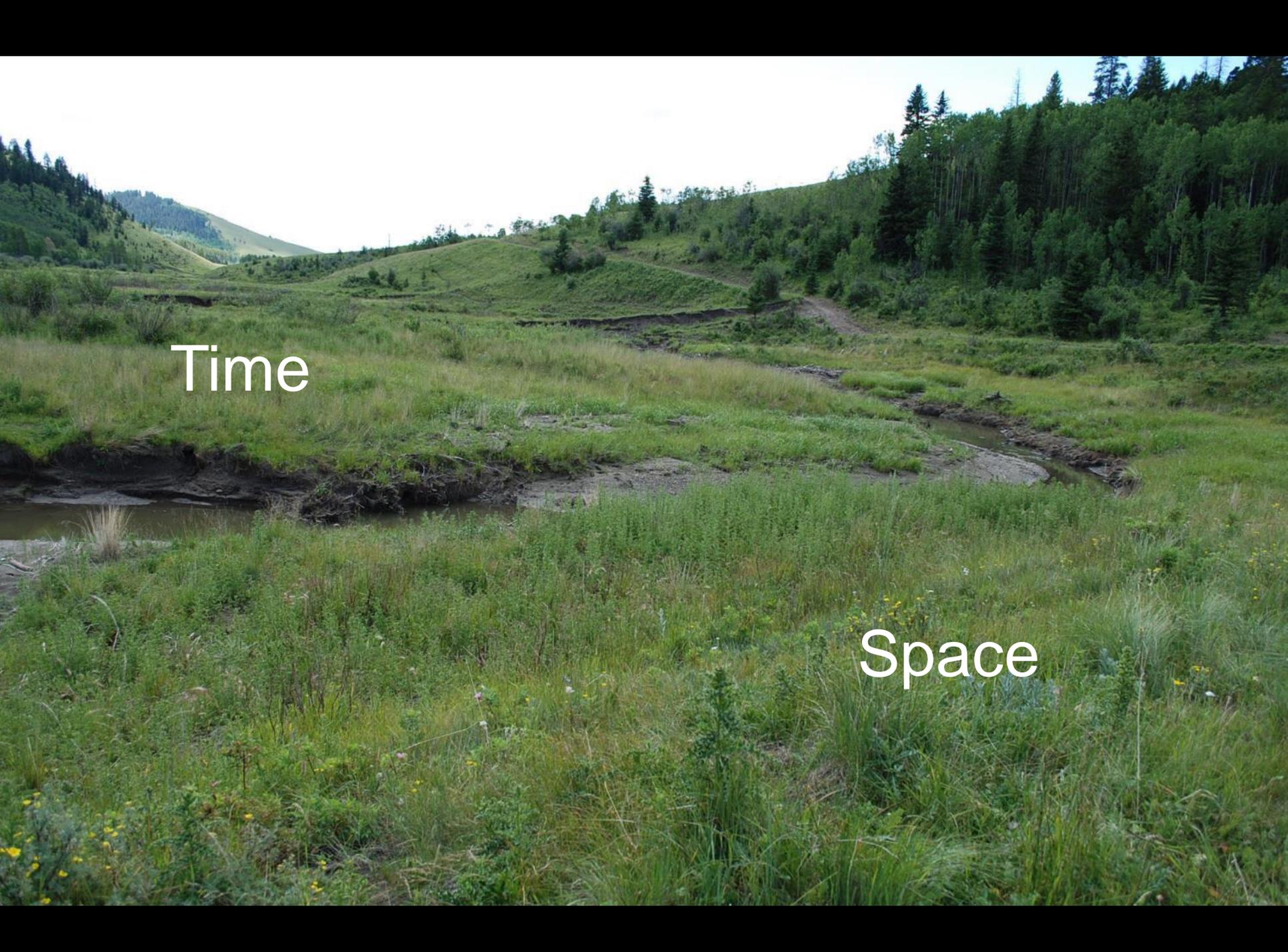
flow ↑

time →







A landscape photograph showing a river valley. The foreground is filled with tall green grasses and wildflowers. A river flows through the middle ground, with a sandy bank on the left. The background features rolling green hills and a dense forest of evergreen trees on the right. The sky is bright and clear.

Time

Space





Alberta Riparian Habitat Management Society

Thanks to our **Current Funders and Beaver Collaborative Partners**



Watershed Restoration and Resiliency Program

Cows and Fish



<http://www.rockies.ca/beavers/>



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Institute



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Alberta Agriculture and Forestry
Alberta Environment and Parks



Canadian
Cattle
Association

*Producers, municipalities and
community groups in Alberta*

Want to learn more?

cowsandfish.org &
www.rockies.ca/beavers

Join our Community of Practice:

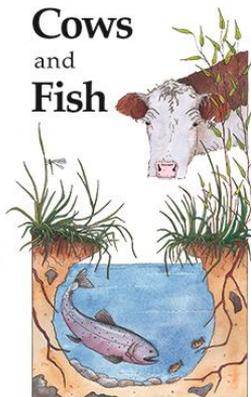
- Beaver mailing list: holly@rockies.ca
- Map of Tools: post your sites to help tracking lessons learned through a knowledge transfer template, sharing input from practitioners

<https://www.rockies.ca/beavers/map.php>



**Miistakis
Institute**

**Cows
and
Fish**



Want to learn more?

Beavers in our landscape

**Understanding and living with beavers Workshop
or webinar**

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 online workshop useful. Topics include:

- ▶ **Beaver basics:** ecology, natural history, watershed connections
- ▶ **Beaver challenges:** issues and human-beaver conflicts
- ▶ **Beaver solutions:** management, co-existence options and alternatives
- ▶ **Beaver case studies:** how others are dealing and living with beavers

Join us to learn more about living with beavers, ask questions and share your knowledge and experiences. Developed for Alberta natural resource managers, municipalities, landowners and others!



Contact us: www.cowsandfish.org

- publications / factsheets
- riparian health assessment
- community stewardship ideas
- digital stories / videos / podcasts
- donations

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Check our website for staff in Airdrie, Calgary and Lethbridge

