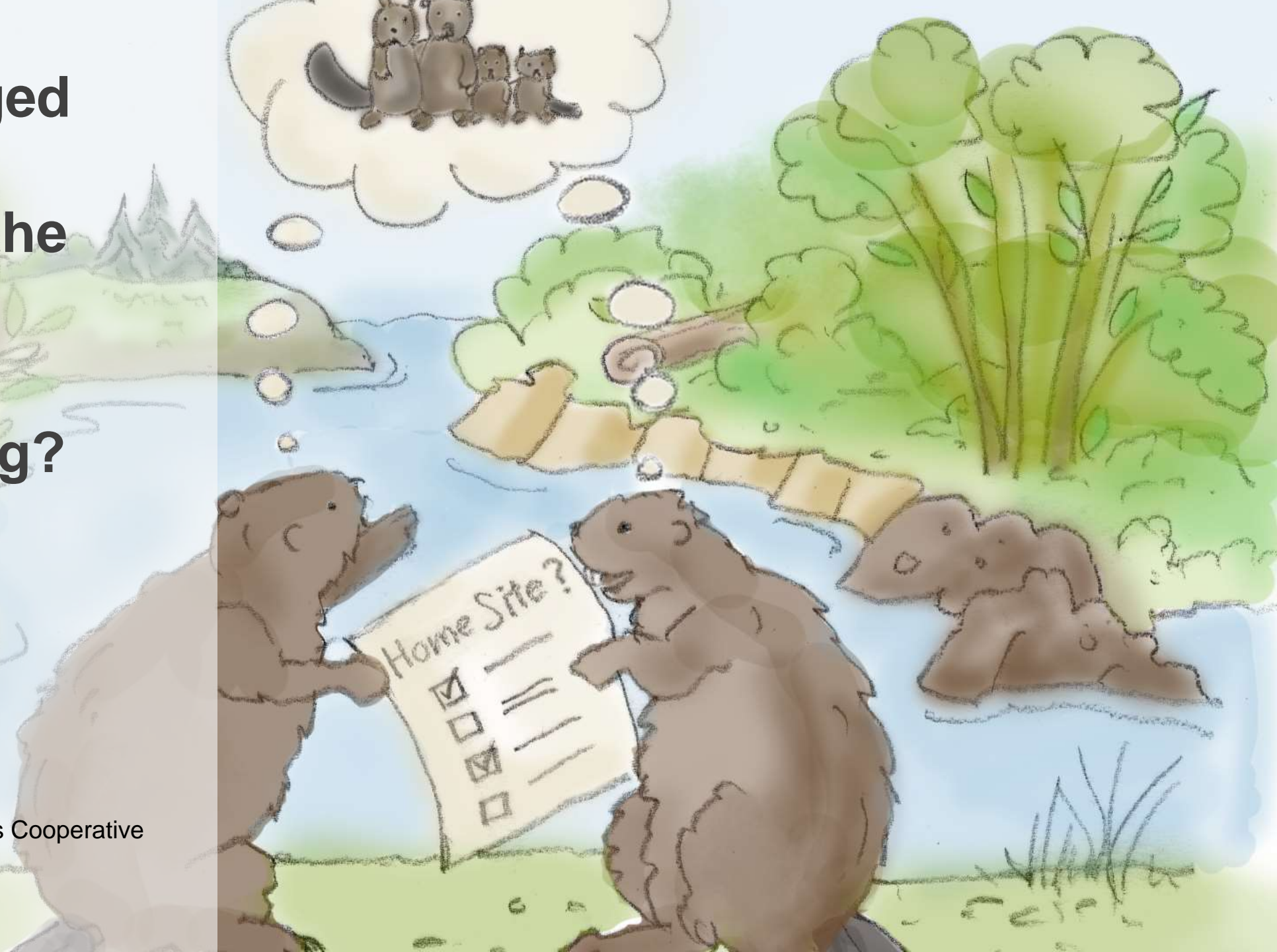


Beaver Managed Floodplains (BMFPs) and the “Beaver Part”

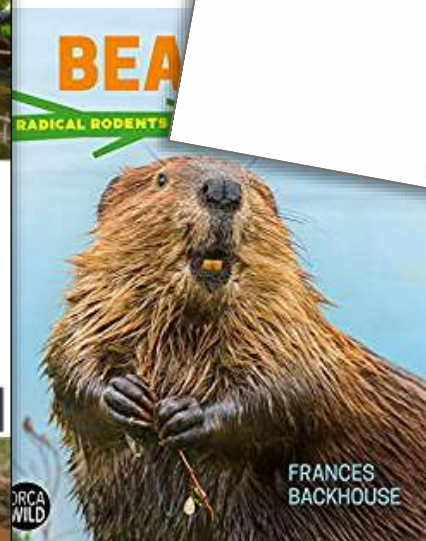
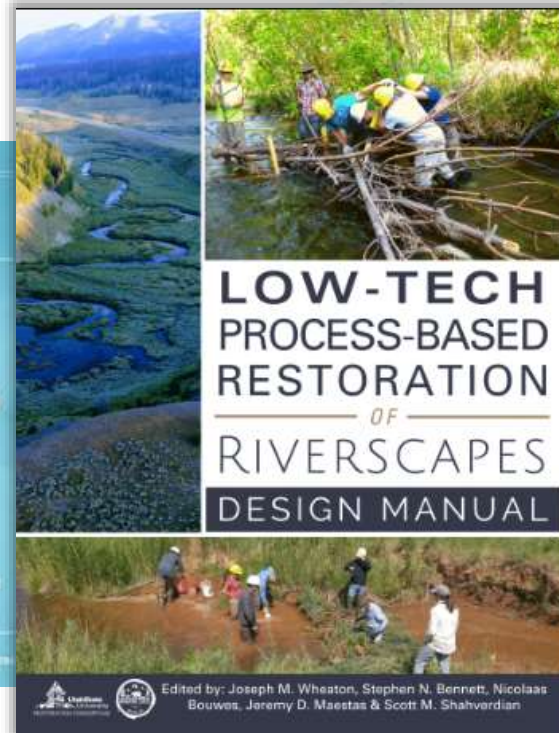
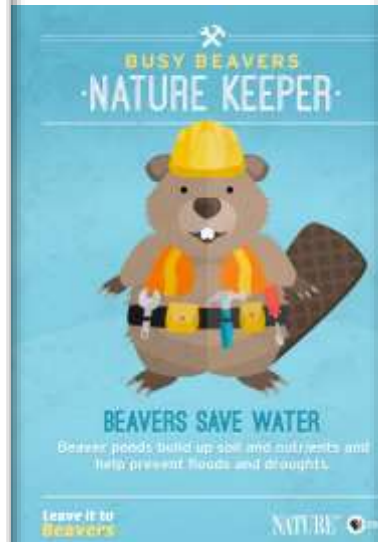
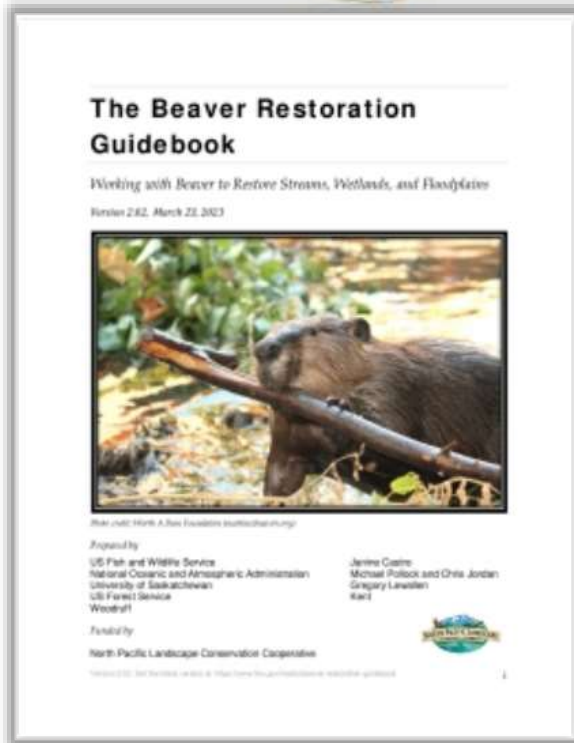
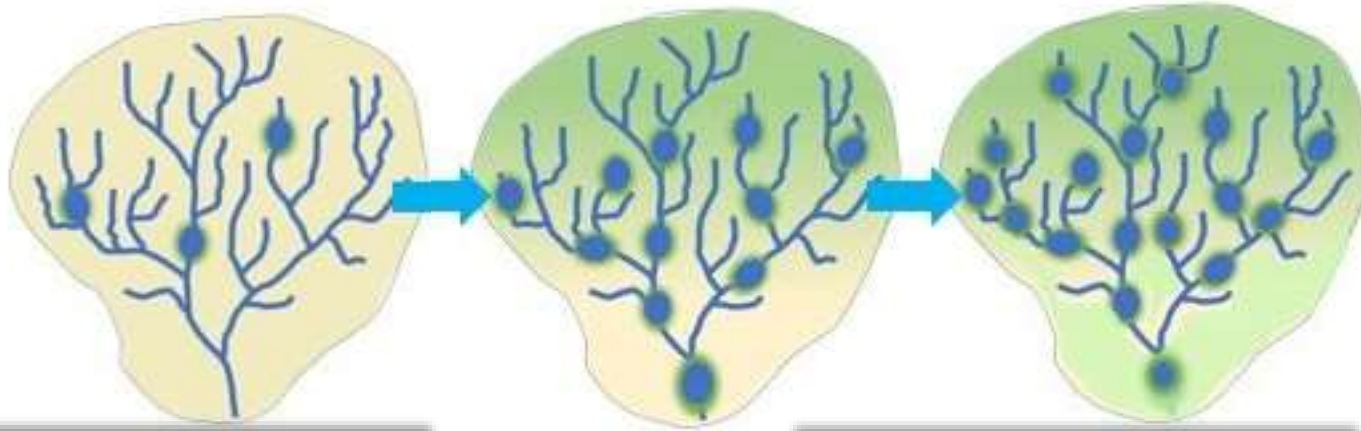
What’s Missing?



Reese Mercer
Western Beavers Cooperative



BEAVERS BACK ON THE LAND



TODAY'S TALK

- What's missing
- Why it matters
- Considering the beaver
- Beaver recovery at watershed scale
- Tools



BEAVER BACKGROUND

- Learning mode since 2016, and
 - Western Beavers Cooperative (2023)
 - Beaver Institute (2020) and Coexistence Working Group
 - Beaver Works Oregon (2019)
- Advocate and support for beavers and natural beaver recovery
- Mostly private lands focus
- Past 5 years monitoring 42 miles of beaver occupied streams:
 - Occupancy and forage monitoring
 - Beaver inventories
 - Tools: trail cameras, drones, hiking boots
 - Landowner conversations
- Beaver based restoration planning and support past 3 years:
 - Vegetation design and implementation
 - BDA design and consulting: design and implementation
 - Beaver conflict devices
- Launched Cooperative 2023 for shared learnings around BBR
- **Grateful** for the stream restoration work of WCs, SWCDs, NRCS, more...



REESE MERCER

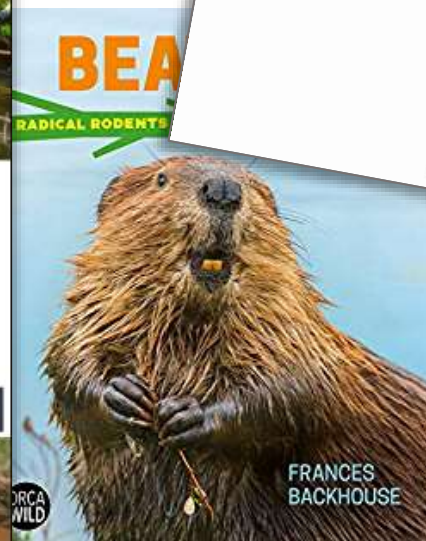
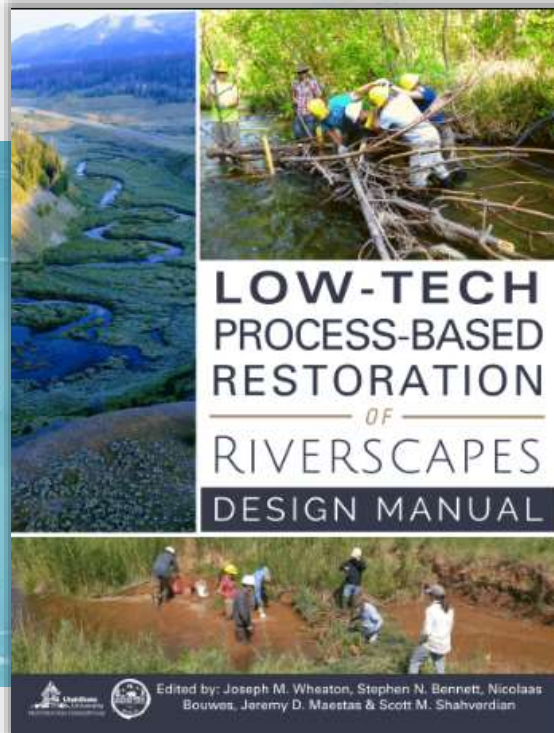
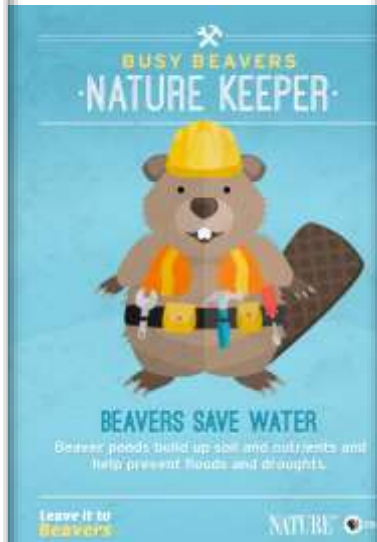
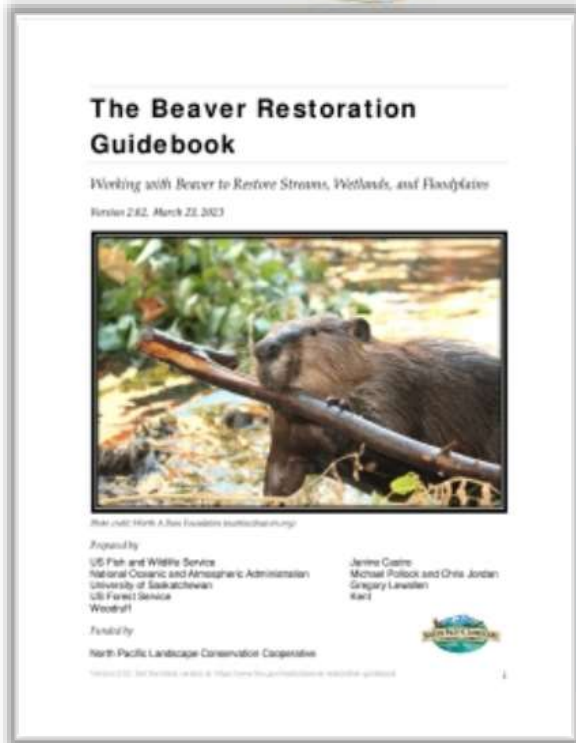
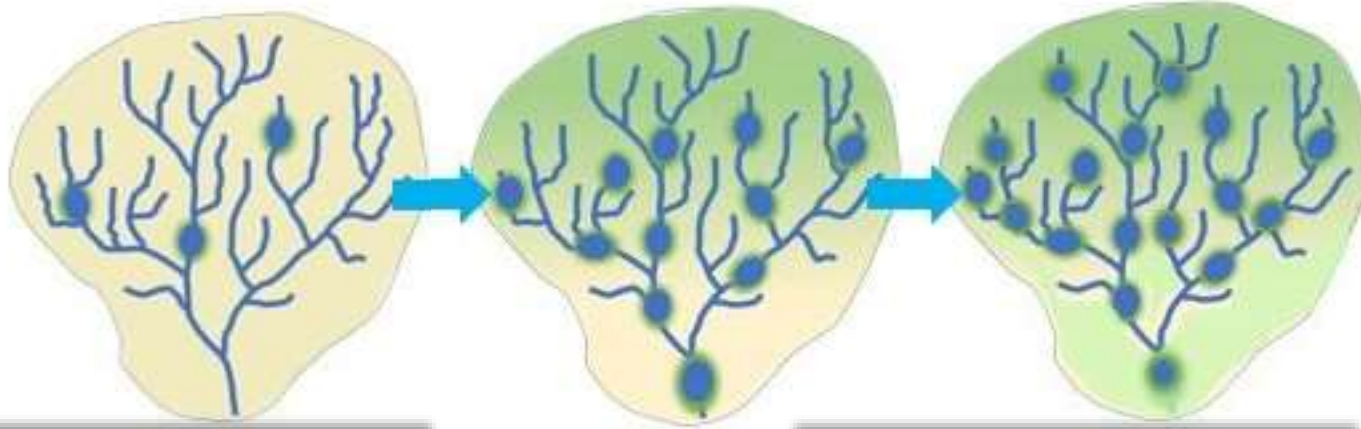


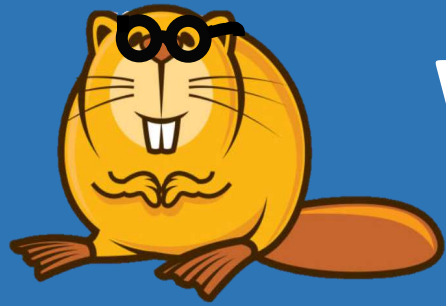
BEAVER SITE MONITORING

Since 2019
42 Stream Miles



BEAVERS BACK ON THE LAND





WHAT'S MISSING?

WHAT'S MISSING?

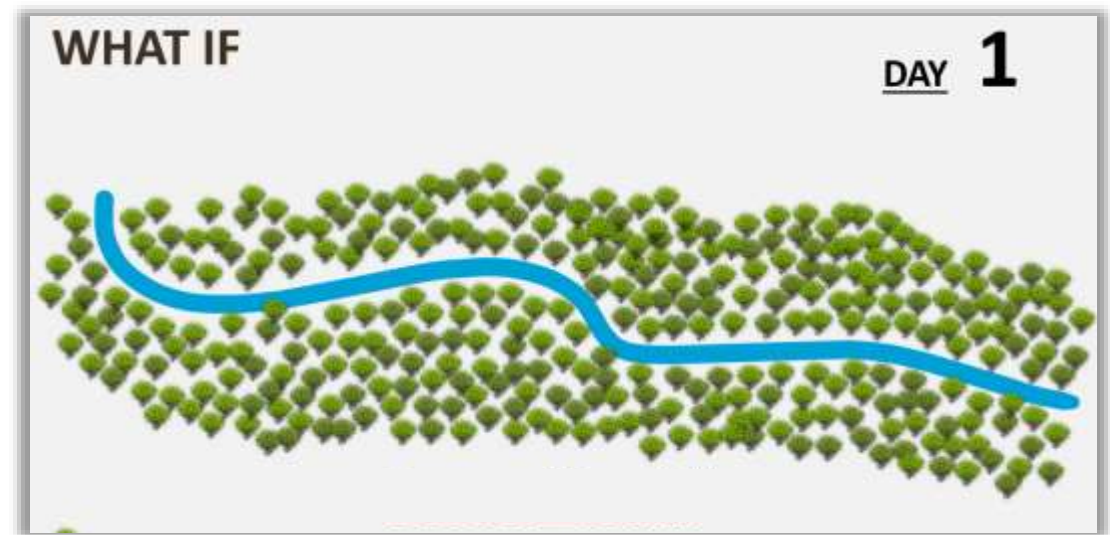
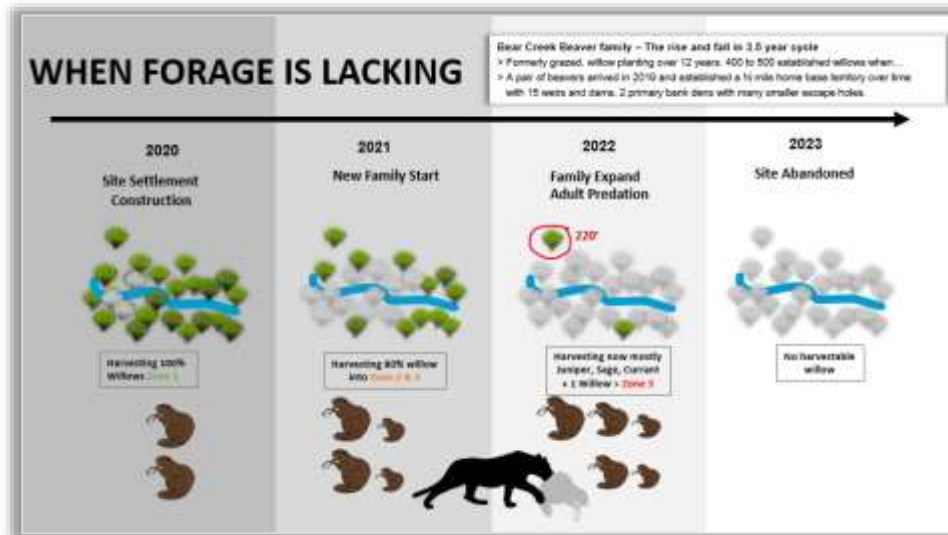
- A WELL-DEFINED GOAL FOR SITE SUCCESS



VERY DIFFERENT DESTINATIONS

EPHEMERAL

PERSISTENT



WHAT'S MISSING?

• BEAVERS GOTTA EAT



Incised stream

A stream comes back to life

Across the U.S. West, scientists and land managers are using beaver dam analogs (BDAs) to heal damaged streams, re-establish beaver populations, and aid wildlife. In some cases, researchers have seen positive changes in just 1 to 3 years.



Restored stream

BEAVERS DON'T EAT BDAs



Water table ↘

Adding dams

Beaver trapping and overgrazing have caused countless creeks to cut deep trenches and water tables to drop, drying floodplains. Installing BDAs can help.

Widening the trench

BDAs divert flows, causing streams to cut into banks, widening the incised channel, and creating a supply of sediment that helps raise the stream bed.

Beavers return

As BDAs trap sediment, the stream bed rebuilds and forces water onto the floodplain, recharging groundwater. Slower flows allow beavers to recolonize.

A complex haven

Re-established beavers raise water tables, irrigate new stands of willow and alder, and create a maze of pools and side channels for fish and wildlife.

Beaver Managed Floodplain

WHAT'S MISSING?

- **BIOLOGY AS FOUNDATION**



The stream evolution triangle: Integrating geology, hydrology, and biology

Janine M. Castro¹ | Colin R. Thorne²

¹US Fish and Wildlife Service, Vancouver,

University of
m, UK

Geography, University
ham NG7 2RD, UK,
@singham.ac.uk

al Sciences Research
and Number: EP/

Abstract

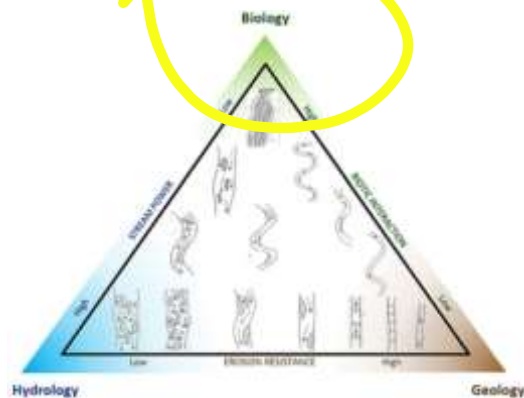
The foundations of river restoration science rest comfortably in the fields of geology, hydrology, and engineering, and yet, the impetus for many, if not most, stream restoration projects is biological recovery. Although Lane's stream balance equation from the mid-1950s captured the dynamic equilibrium between the amount of stream flow, the slope of the channel, and the amount and calibre of sediment, it completely ignored biology. Similarly, most of the stream classification systems used in river restoration design today do not explicitly include biology as a primary driver of stream form and process. To address this omission, we cast biology as an equal partner with geology and hydrology, forming a triumvirate that governs stream morphology and evolution. To represent this, we have created the stream evolution triangle, a conceptual model that explicitly accounts for the influences of geology, hydrology, and biology. Recognition of biology as a driver leads to improved understanding of reach-scale morphology and the dynamic response mechanisms responsible for stream evolution and adjustment following natural or anthropogenic disturbance, including stream restoration. Our aim in creating the stream evolution triangle is not to exclude or supersede existing stream classifications and evolutionary models but to provide a broader "thinking space" within which they can be framed and reconsidered, thus facilitating thought outside of the alluvial box.

KEYWORDS

channel evolution model (CEM), conceptual model, fluvial geomorphology, river restoration, stream evolution model (SEM), stream classification

Abstract 2019

The foundations of river restoration science rest comfortably in the fields of geology, hydrology, and engineering, and yet, the impetus for many, if not most, stream restoration projects is biological recovery. Although Lane's stream balance equation from the mid-1950s captured the dynamic equilibrium between the amount of stream flow, the slope of the channel, and the amount and calibre of sediment, it completely ignored biology. Similarly, most of the stream classification systems used in river restoration design today do not explicitly include biology as a primary driver of stream form and process. To address this omission, we cast biology as an equal partner with geology and hydrology, forming a triumvirate that governs stream morphology and evolution. To



1 | INTRODUCTION

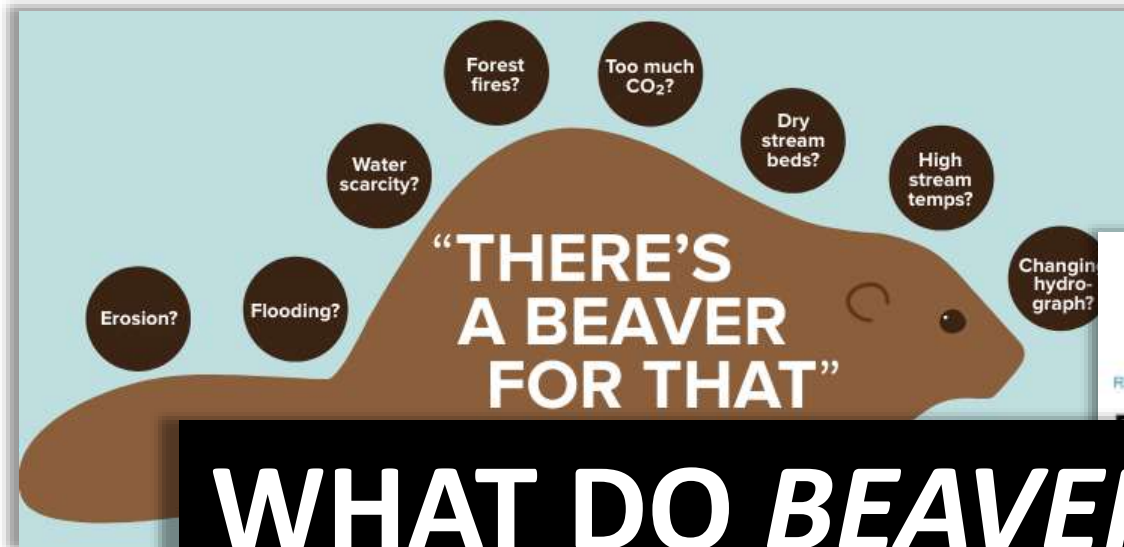
The stream evolution triangle (SET) is a conceptual model that blends long-established principles of fluvial geomorphology with results emerging from recent research revealing the high degree to which biological agents affect stream processes and systems (Atkinson, Allen, Davis, & Nickerson, 2016; McCluney et al., 2014). Conceptual models are useful when attempting to integrate information from natural science disciplines in order to understand complex systems (Fortuin, van

Koppen, & Leemans, 2011) and are consequently well-suited to fluvial systems. With the SET, we attempt to create a conceptual space inclusive enough to represent wide ranges of process drivers, stream forms, and evolutionary pathways but simple enough to allow for creative thinking and rapid evaluation of both established and new ideas (Jackson, Trebitz, & Cottingham, 2000).

In common with existing stream classifications (e.g., Leopold & Wolman, 1957; Montgomery & Buffington, 1993; Rosgen, 1996; Schumm, 1985 [Figure 1]) and evolution models (e.g., Cluer & Thorne,

WHAT'S MISSING?

- TALK OF THE CRITTER'S NEEDS



NRDC Donate

← See all News & Commentary

Expert Blog

Partnering with Beavers to Adapt to Climate Change

YouTube · Miistakis Institute

50+ views · 2 years ago

Putting Beavers to Work Project

NOAA FISHERIES

RESOURCES

Menu

[Are Beavers Nature's "Little Firefighters"?](#)

WHAT DO BEAVERS NEED FROM US?

<https://www.cbsnews.com/.../Local-News>

California aims to tap beavers, once viewed as a nuisance ...

Jul 24, 2023 — The state is also running pilot projects to **relocate beavers** to places where they can be more beneficial. The aim is to preserve more ...

BEAVER MAGIC

Mossy Earth ✓

290K views · 1 month ago

ully revitalise

Montana FWP (.gov)

<https://fwp.mt.gov/fwp/conservation/beaver> PDF

BEAVERS AND THEIR ROLE IN RIPARIAN ...

Jan 2, 2023 — Essentially, **partnering with beavers** for stream restoration involves assuming that the effort will be successful and therefore trying to ...

Upr

Donate

USU Researchers Are Using Beavers As Tools In Stream Restoration

Utah Public Radio | By Niall Clancy

Published April 9, 2019 at 10:31 AM MDT

WHAT'S MISSING?

• RELOCATION STATS (p.s. IT DOESN'T WORK)

Beaver removal for relocation is ineffective for "problem beaver" sites. The likelihood is low that a site will stay.

Beaver and stream restoration through relocation distracts energy and effort away from the root cause of beaver absence. Wildlife specialists largely agree, if a location's stream, habitat and human tolerance conditions satisfy What Beavers Need to Succeed – beavers will usually already be present. BeaverHOODs as an approach can provide these conditions, attracting beavers to a restoration site naturally, not forced – at nature's pace and timescale, not our own.

BEAVER RELOCATION : 3 REASONS WHY WE DON'T

1 It's bad for beavers



Because →

Family intact for relocation can be challenging, and families can be permanently separated in attempts to live trap and relocate a family to another site.

Beaver death from capture and captivity is not uncommon. Of 12 published report datasets:

- 7 in 12 report beaver loss during live-trapping.
- 5 in 12 report beaver loss during captivity.

Live traps are often old and antiquated, and when triggered are highly stressful and sometimes lethal to the target species. "Capture Myopathy" is a stress condition in mammals that can kill during handling.

Beavers are easily stressed by human handling. Wild beaver individuals are known to be quite shy, they easily stress, they will hide in captivity as much as they're allowed. You can imagine handling by a predator species - human - causes trauma for any wild non-human animal, and especially for beavers. Veterinary handling of an injured beaver patient is minimized to the extreme - more so than any other wildlife patient - when in care by veterinary specialists.

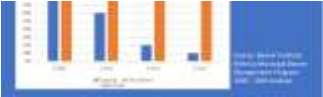
Disease spread
Beaver relocation is complicated by the risk of disease transmission between relocated beavers and resident beavers within a release watershed. Disease spread concerns from one beaver population to another include cryptosporidium, tularemia, plague, and hysteresis. These diseases can be deadly, and deaths by disease spread have been documented after relocations.

BEAVER RELOCATION : 3 REASONS WHY WE DON'T

2 It's ineffective



Here's how →



Beaver removal from a "problem site" is more expensive \$\$\$
The cost of regular removal at "problem beaver sites" exceeds the cost of infrastructure adaptation through mitigation solutions. How costs compare:

Annual Removal \$409
vs.
Infrastructure Adaptation \$229
= 78% more
expensive to remove beavers

Better, more permanent solutions exist
Better solutions often exist through infrastructure adaption and "living with beavers". Mitigation solutions like flow devices, culvert protectors or tree fencing can prevent blocked water from flooding things out and trees from felling. The materials are easy to source and install and allows beavers to stay in place - providing ecosystem benefits. Learn more: Beaverinstitute.org



BEAVER RELOCATION : 3 REASONS WHY WE DON'T

3 Unhappy Outcomes



Learn more →

Relocated beavers often disappear soon after release. Beavers released at a target release site remain only 33% of the time. What happens to the other 67% of beavers? Here are the different possible outcomes:

- + Predation by bear, mountain lion or others.
- + Conflicts with other nearby beavers who may already be present or passing through when a habitat reach.
- + Premature death caused by stressors of human capture, handling, and release.



Deaths reported from capture in **60%** of studies

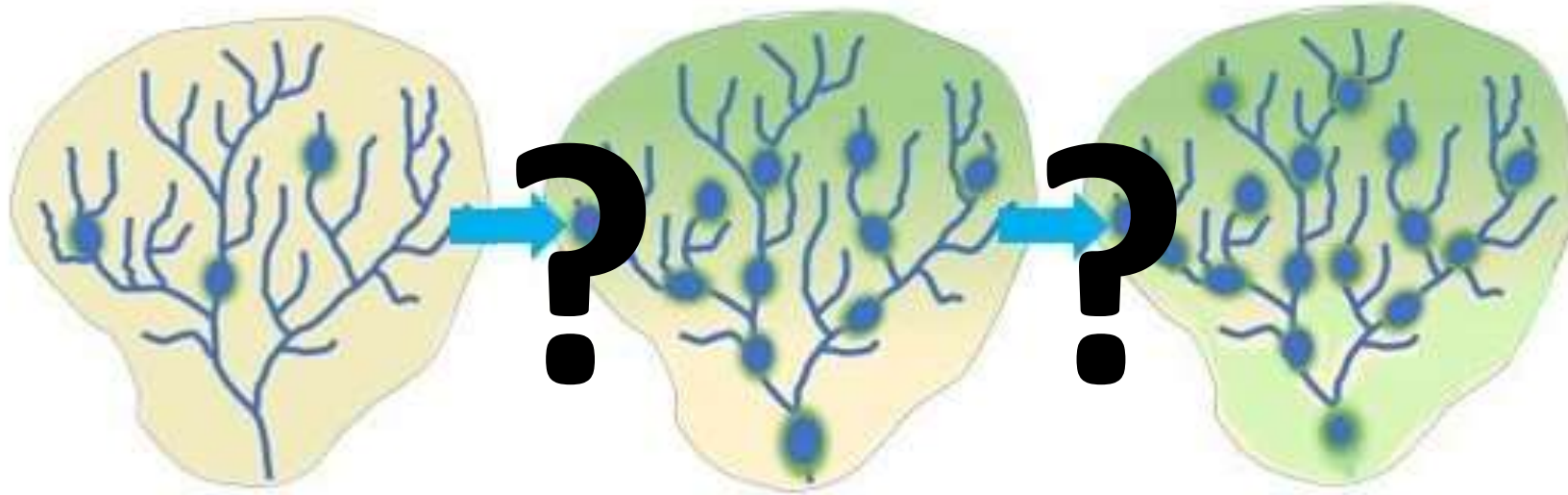
Deaths reported during captivity in **42%** of studies

Beavers stay at release site in only **33%** of studies

What happens to the other 67%?

WHAT'S MISSING?

A SOUND VISION FOR SCALING BEAVER RECOVERY





WHY IT MATTERS

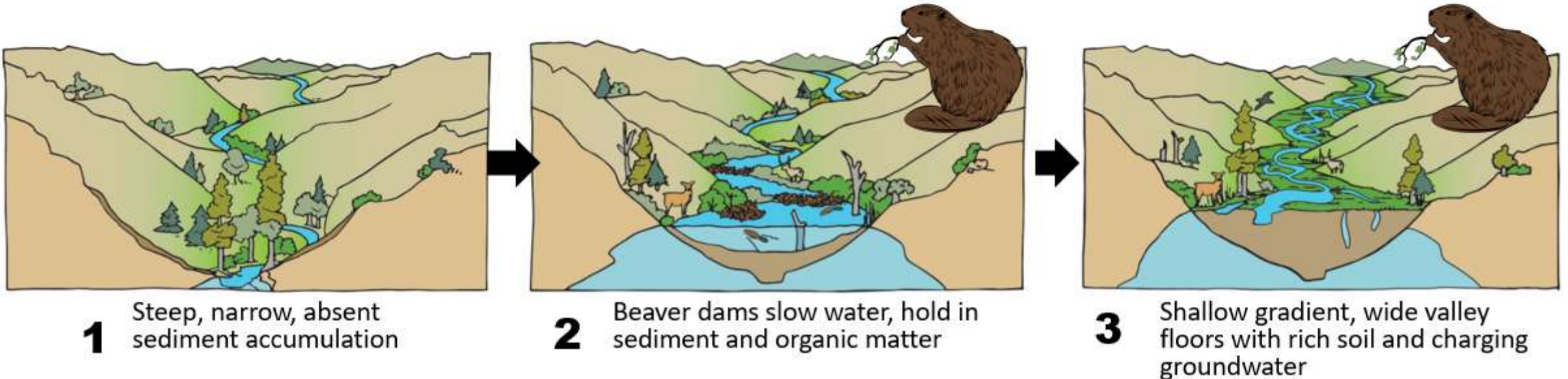
WHY IT MATTERS



Archaeologist finds ancient beaver teeth in eastern Oregon -- earliest record of the animal in North America - [Pacific Northwest News, 2011](#)

7 Million Years

The March of Time in a Beaver-occupied Stream Valley



WHY IT MATTERS

What's missing – is we talk about “partnering with the beaver”, **without much consideration for what the beaver actually needs to be a successful, thriving participant in all of this.**





CONSIDERING THE BEAVER

THE MOST BASIC NEEDS

- 1 **Fitness** - The ability to stay alive
- 2 **Forage** – Sufficient food source for survival and family rearing



THE GOAL / DESTINATION

‘Individual Fitness’ of the individual,
with capacity to reproduce and
successfully pass on their genes.

~

*Persistent occupancy of thriving
beaver with multigenerational
residency managing riverscapes
for the long term.*

FORAGE

1 FORAGE NEEDS AND PREFERENCES

- Will harvest for both eating and for building
Often – but not always - these are same things
- Will risk predation to harvest their favorites



Preferred

Aspen
Willow
Cottonwood
Maple

Aquatic veg:
Speedwell,
Cattails, Lilies,
Sedge



Seasonal, adaptive

Juniper, Conifer
Sage, Currant

For building only:

Alder
Sage

2 FROM HARVEST TO DIGESTION

- Only digest 33% of what's ingested. * Currier et al, 1960
- Considered "wasteful harvesters". Often cut trees and branches tangle in canopy, unable to access.



FORAGE

1 FORAGE NEEDS AND PREFERENCES

- Will harvest for both eating and for building
Often – but not always - these are same things
- Will risk predation to harvest their favorites



Preferred

Aspen
Willow
Cottonwood
Maple

Aquatic veg:
Speedwell,
Cattails, Lilies,
Sedge



Seasonal, adaptive

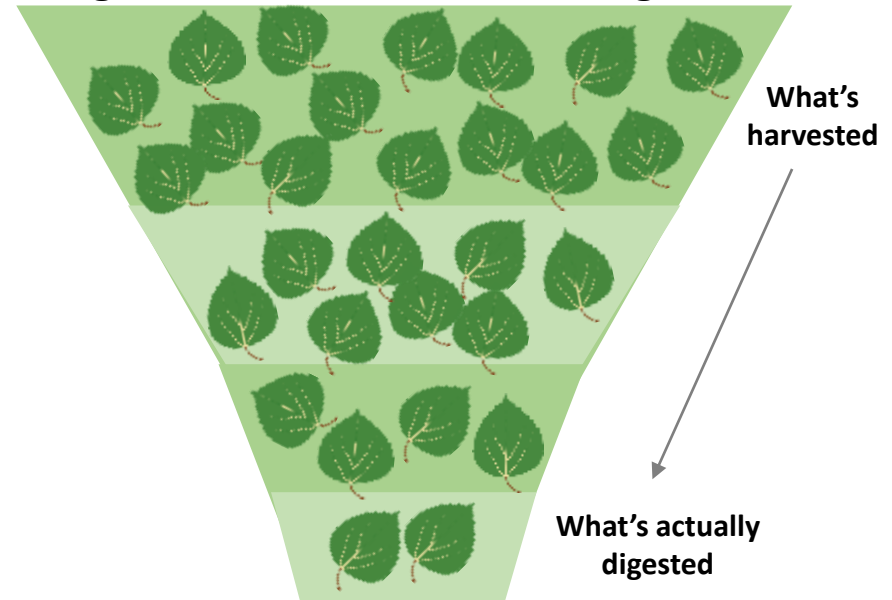
Juniper, Conifer
Sage, Currant

For building only:
Alder
Sage

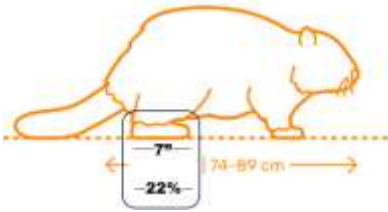
2 FROM HARVEST TO DIGESTION

- Only digest 33% of what's ingested. * Currier et al, 1960
- Considered "wasteful harvesters". Often cut trees and branches tangle in canopy, unable to access.

Progression from Harvest to Digestion



FITNESS AND PREDATION RISK



When is this guy most likely to be predated?

- ➔ In travel, and out of water:
- dispersing juveniles leaving home
 - displaced by water extremes: high flows or drought
 - harvesting too far from pond safety in search of preferred food
 - displaced by relocation

TOP LAND SPEED

7 MPH



50 MPH



35 MPH



35 MPH



HARVEST ZONES AND PREDATION RISK

“Harvest Benefit”
vs.
“Predation Risk”



HARVEST ZONES FOR PREFERRED FOOD



1 LOW

Within 30' return to escape cover



2 SOME RISK

Within 50' return to escape cover



3 HIGH RISK

Within 75' return to escape cover

ASPEN v. COTTONWOOD and WILLOW



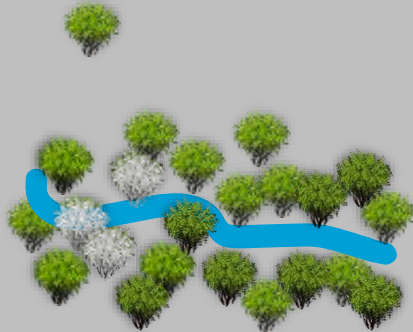
WHEN FORAGE IS LACKING

Bear Creek Beaver family – The rise and fall in 3.5 year cycle

- > Formerly grazed, willow planting over 12 years. 300 to 400 established willows when...
- > Beaver arrived 2019 and established a ½ mile home base territory over time with 15 weirs and dams, 2 primary bank dens with many smaller escape holes.

2020

Site Settlement
Construction

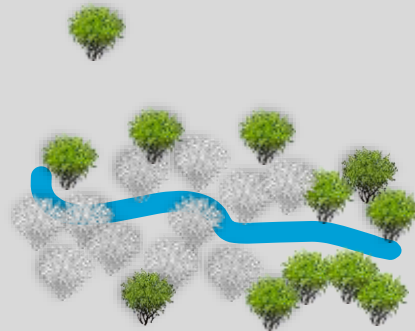


Harvesting 100%
Willows **Zone 1**



2021

New Family Start

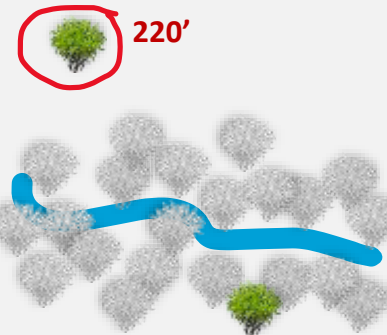


Harvesting 80% willow
into **Zone 2 & 3**

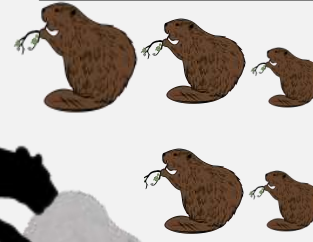


2022

Family Expand
Adult Predation

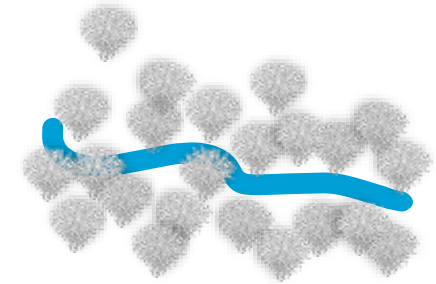


Harvesting now mostly
Juniper, Sage, Currant
+ 1 Willow > **Zone 3**



2023

Site Abandoned



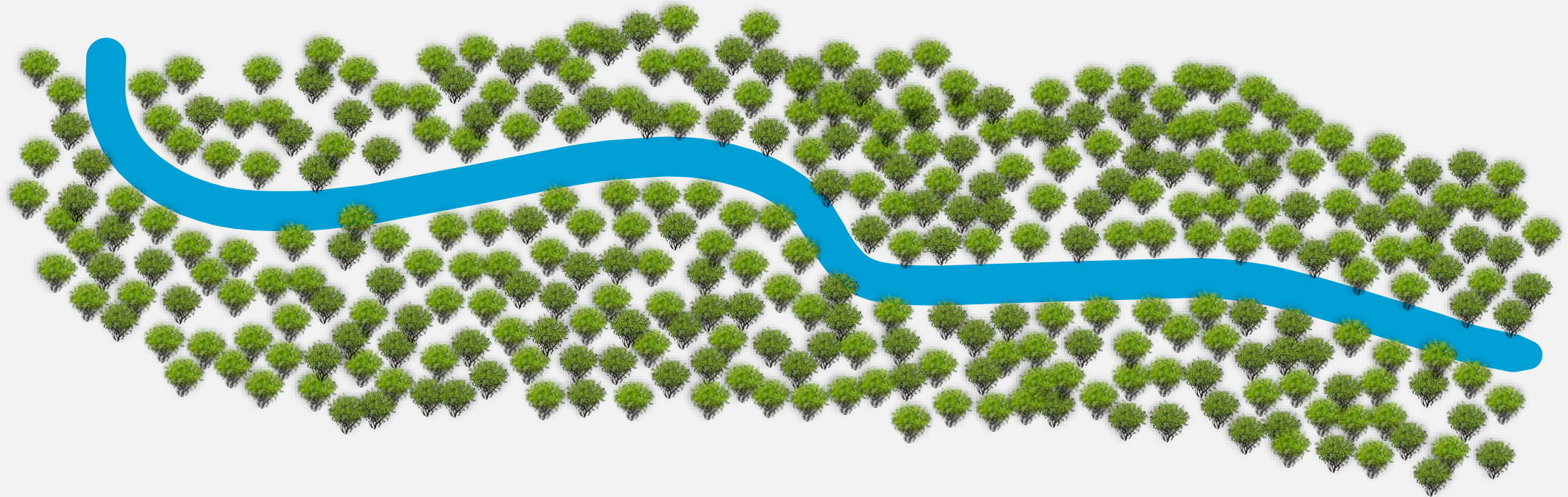
No harvestable
willow




EMPEMERAL

FULL-ON FORAGE AND ROTATIONAL GRAZING

DAY **1**



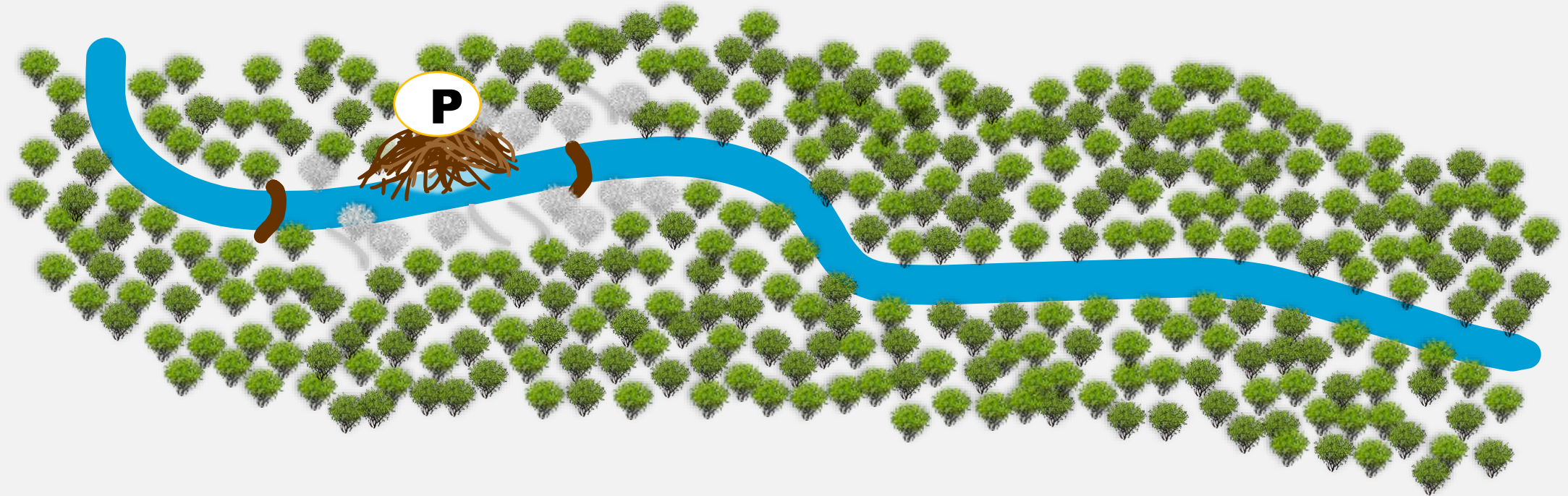
 = 30 willows

Beaver "Could"


< ½ Mile >


FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **1**



Beavers settle

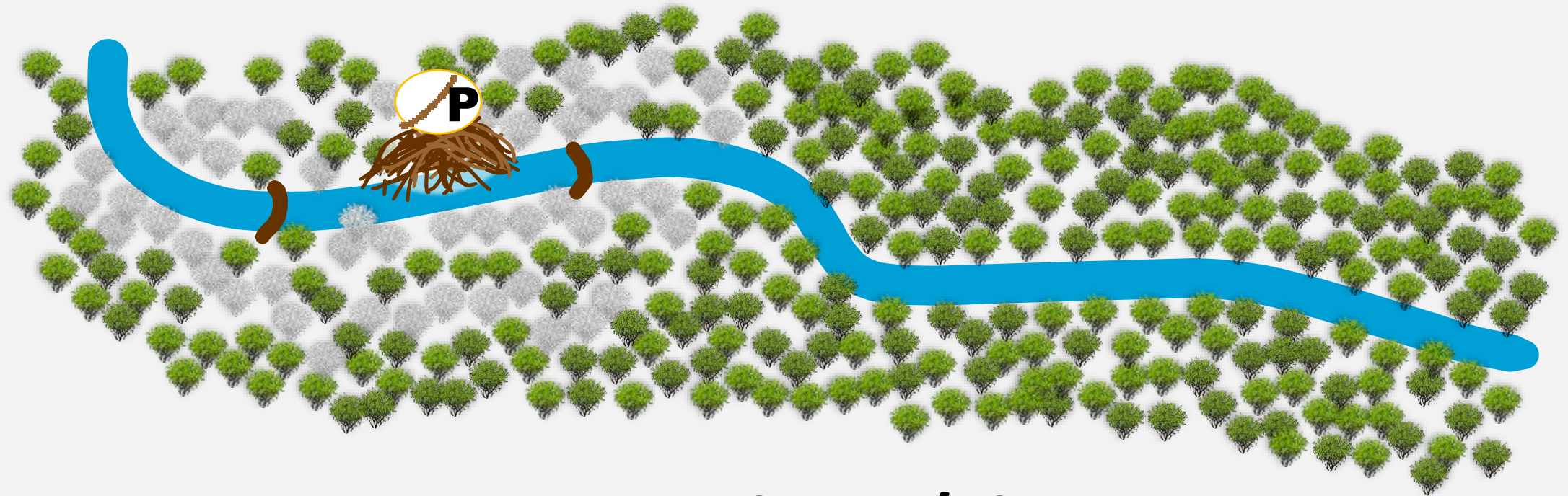
 = 30 willows

 = Primary Den


< ½ Mile >


FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **2**



Construct dams / den

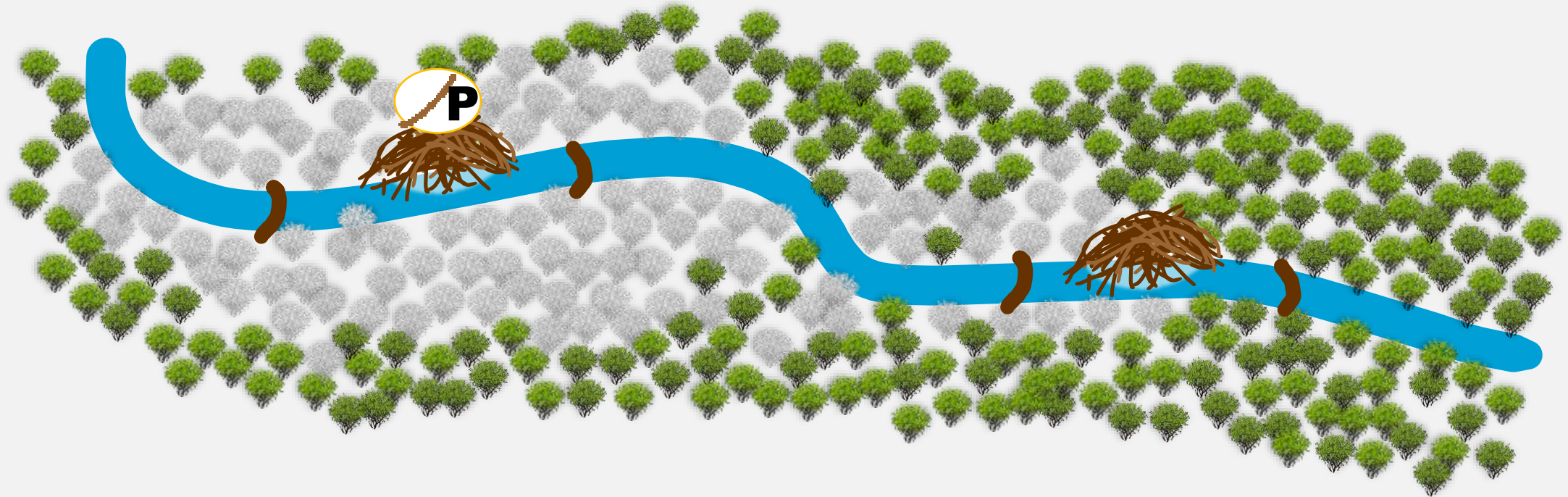
 = 30 willows


 = Primary Den

< ½ Mile >


FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **3**



 = 30 willows

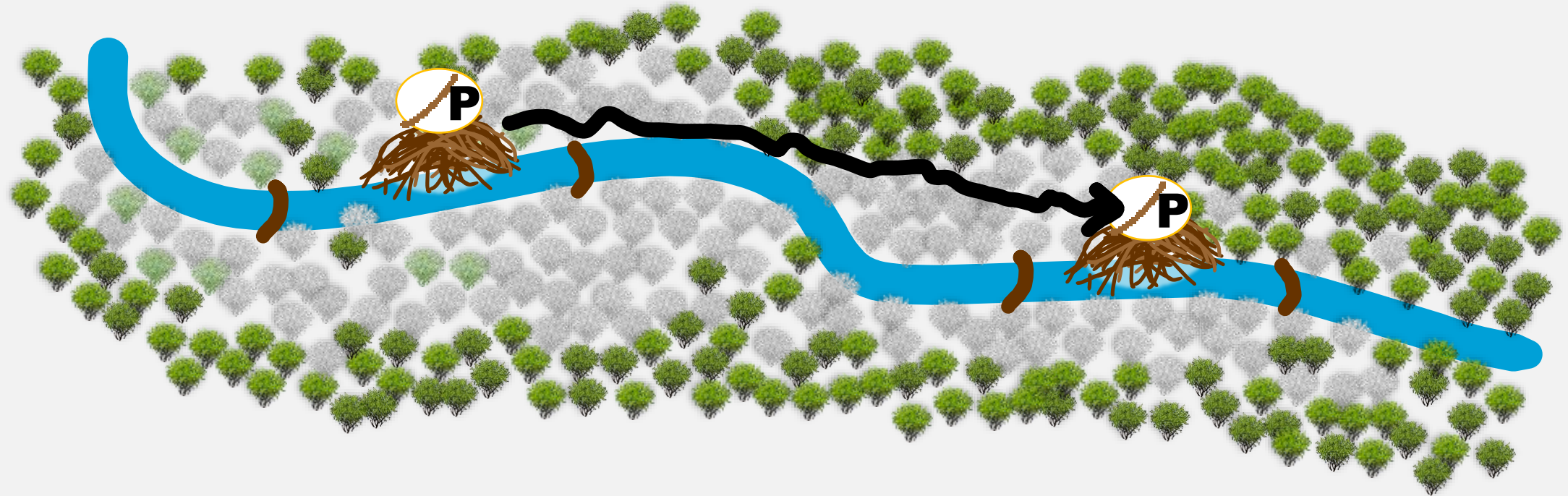
Upstream forage depleted

 = Primary Den


< ½ Mile >


FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **4**



Relocate downstream

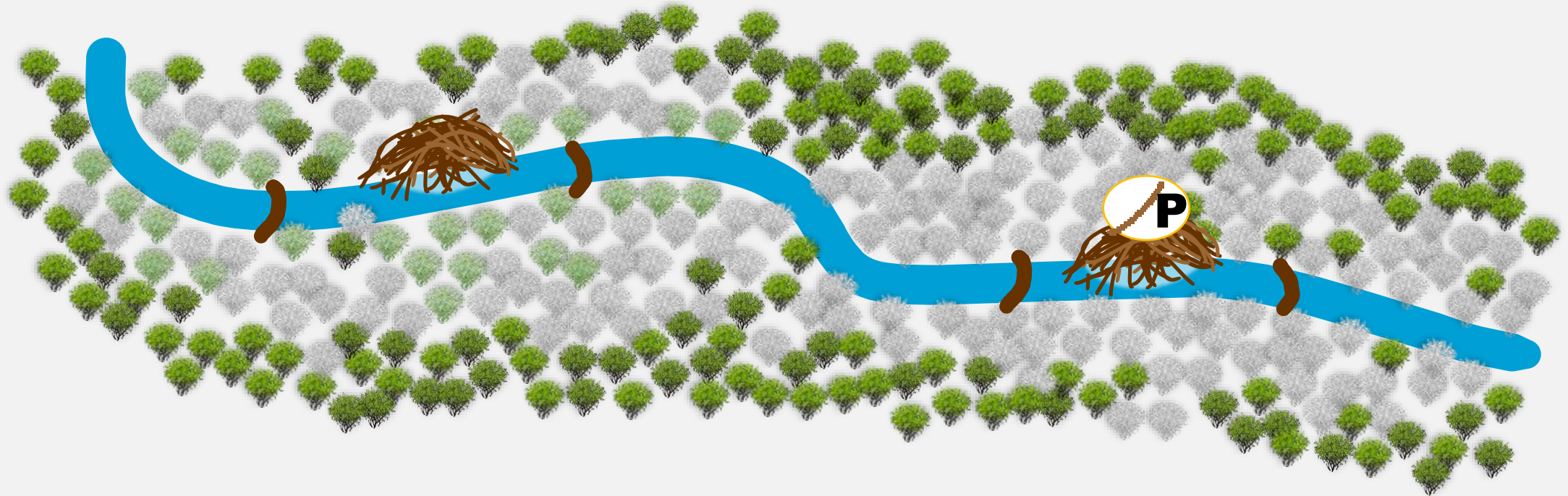
 = 30 willows


 = Primary Den

< ½ Mile >


FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **5**



 = 30 willows

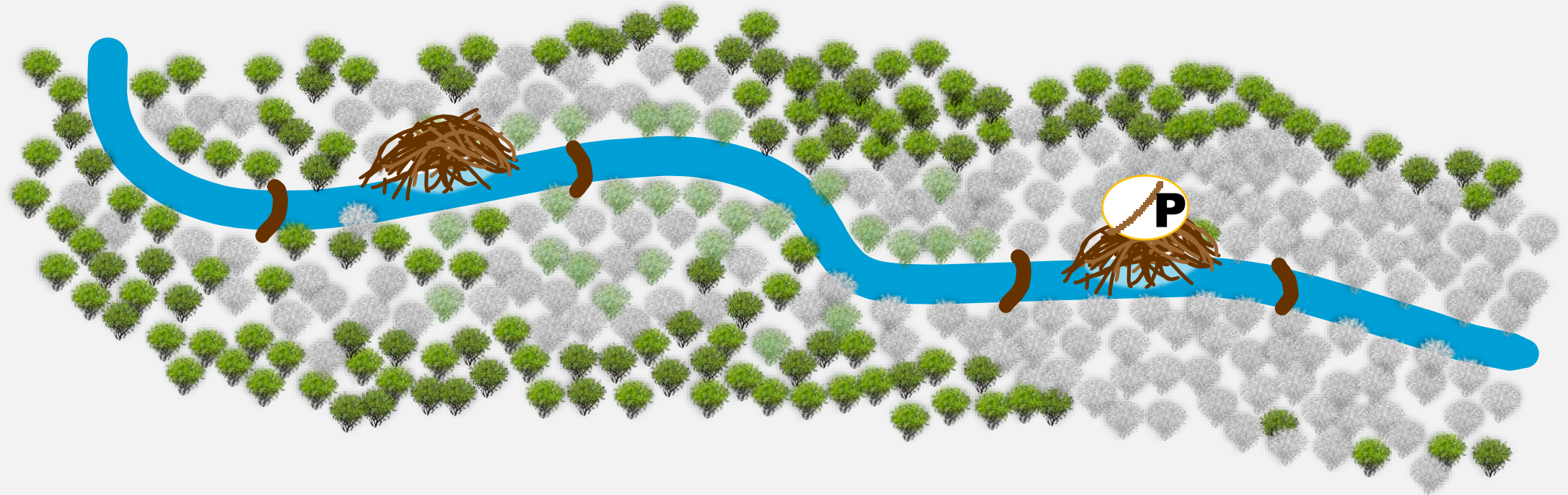
Upstream veg starts regrowth


 = Primary Den


< ½ Mile >

FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **6**



 = 30 willows

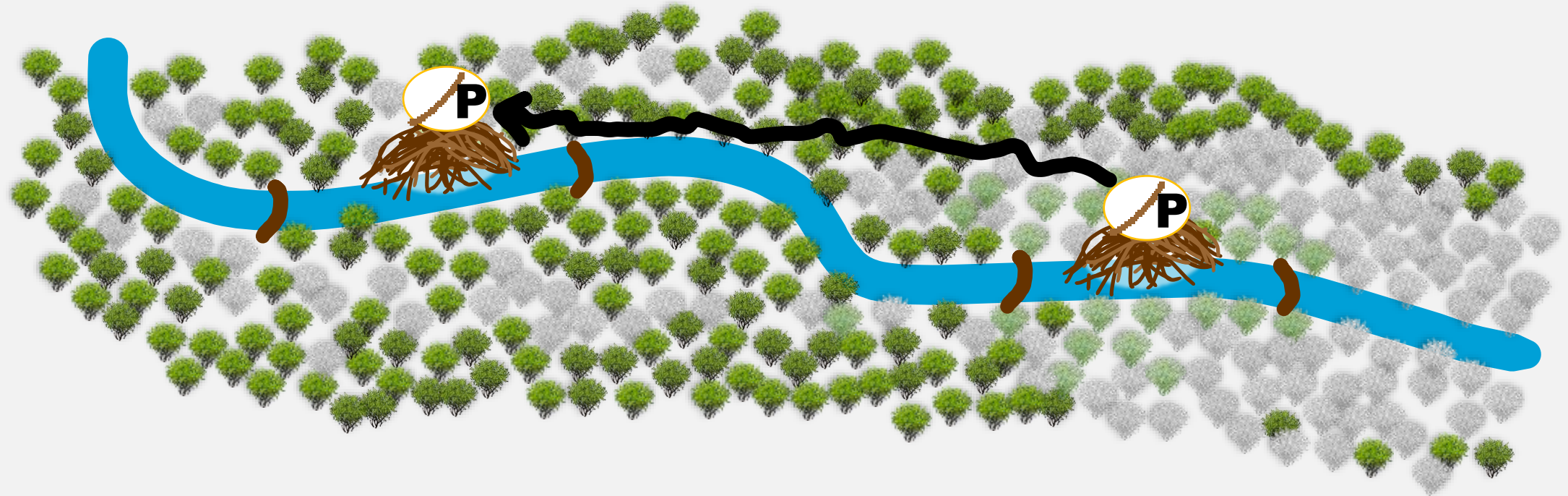
 = Primary Den

More regrowth upstream


< ½ Mile >


FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **7**



Relocate back upstream

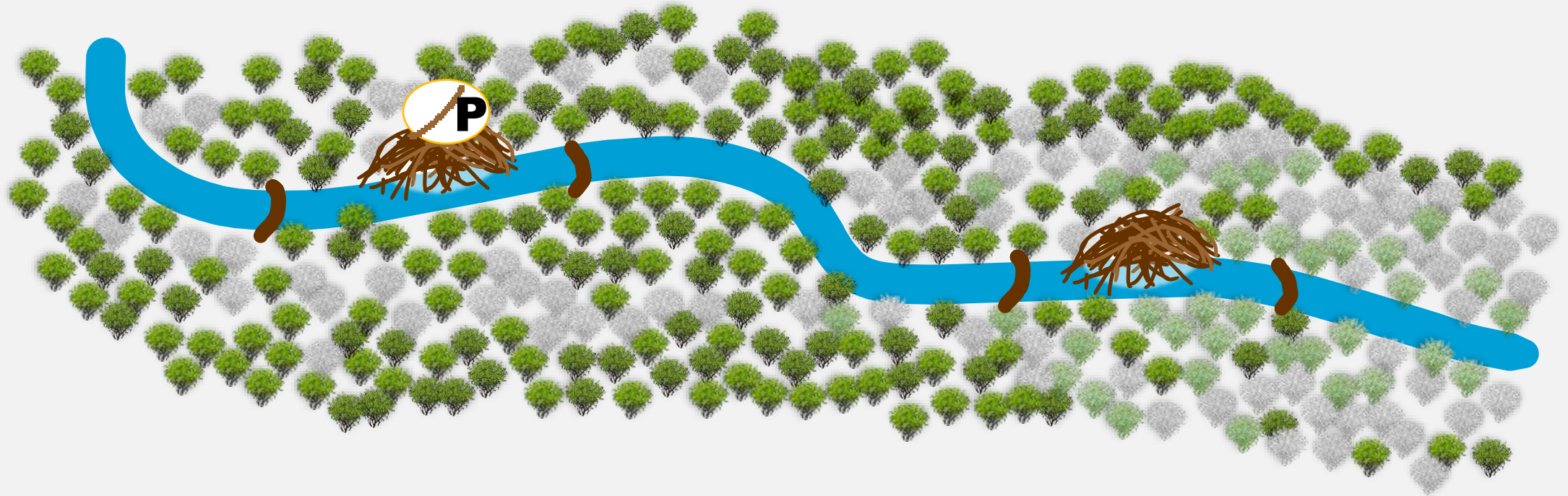
 = 30 willows


 = Primary Den


< ½ Mile >

FULL-ON FORAGE AND ROTATIONAL GRAZING

Year **8**



 = 30 willows

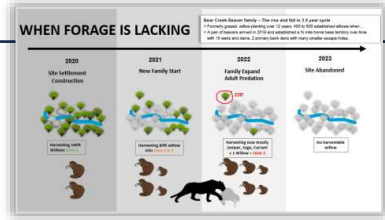
 = Primary Den

Rinse and repeat

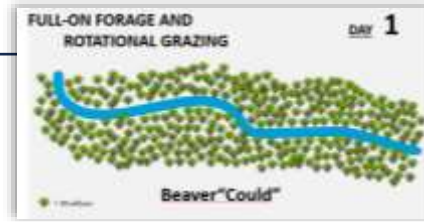
PERSISTENT

< ½ Mile >

SITE PERSISTENCE



EPHEMERAL



PERSISTENT

Total Beaver Food/Forage Each Year

Cumulative Beaver Forage

Yr1

Years

Yr8

Along 1/2 Mile Territorial Home Base

Cumulative Beaver Forage

Yr1

Years

Yr8

Along 1/2 Mile Territorial Home Base

New settlers

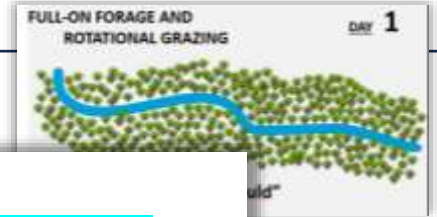
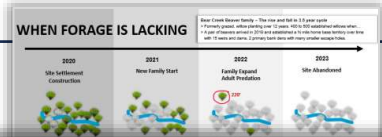
Willow regrowth

Willow Regrowth

Beaver Babies!

More Beaver Babies!

SITE PERSISTENCE



A colony requires a minimum area of almost 10 acres of willows to persist indefinitely.

This size of larder provides the beavers with enough food but also allows the willows to regenerate between beaver harvests.

- Ellen Wohl, Saving the Dammed



Yr1

Willow regrowth

Yr8

Years

Along 1/2 Mile Territorial Home Base

Cumulative Beaver Forage

Yr1

Willow growth

More Beaver Babies!

Yr8

Years

Along 1/2 Mile Territorial Home Base

PERSISTENT



PLANNING BEAVER VEG

HOW MUCH FORAGE?

Day 1 of occupancy for an average family of 5 to sustain long term site persistence?

A



One adult beaver harvests annually *:

- 1,000 lbs of forage
- 216 trees

216 trees
X
5 beavers

B

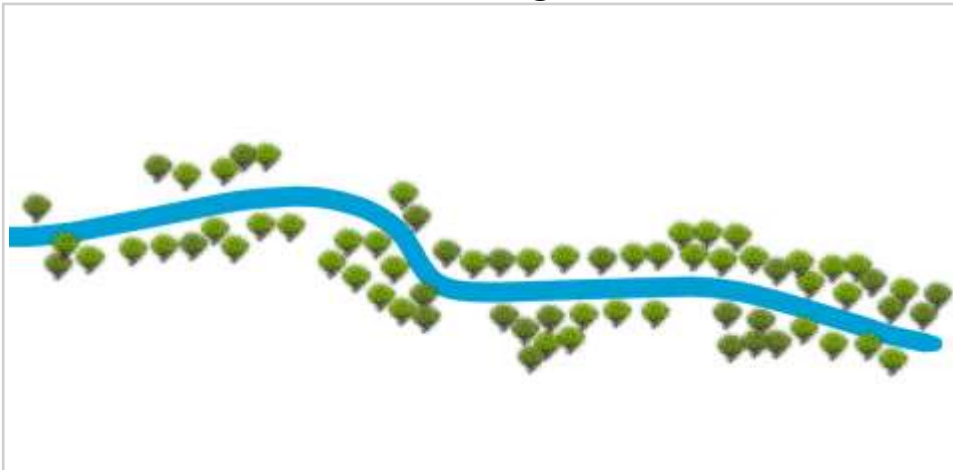
“If we use 1500 (2.1” diameter) trees per acre as a standard, and assume that one beaver will cut 216 trees per year on the average, **one acre will support one beaver for about 7 years.** “ *

* Read: A study of beaver colonies in Michigan. Journal of Mammalogy, Glenn Bradt, 1938



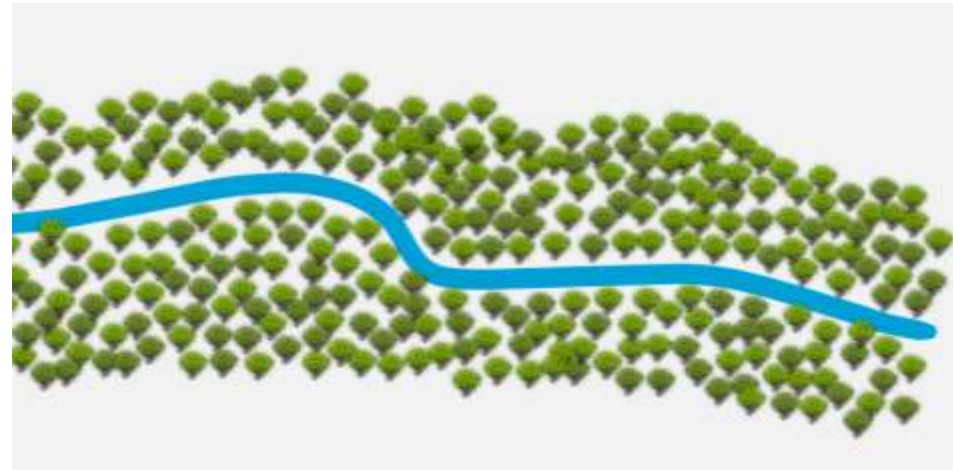
The BeaverHOOD Strategy encourages the establishment of 18,000 mature stems of suitable riparian plant species per ~half-mile reach: typically diverse willow species, aspen and cottonwood.

Not enough



½ Mile Territorial Home
Base/Reach

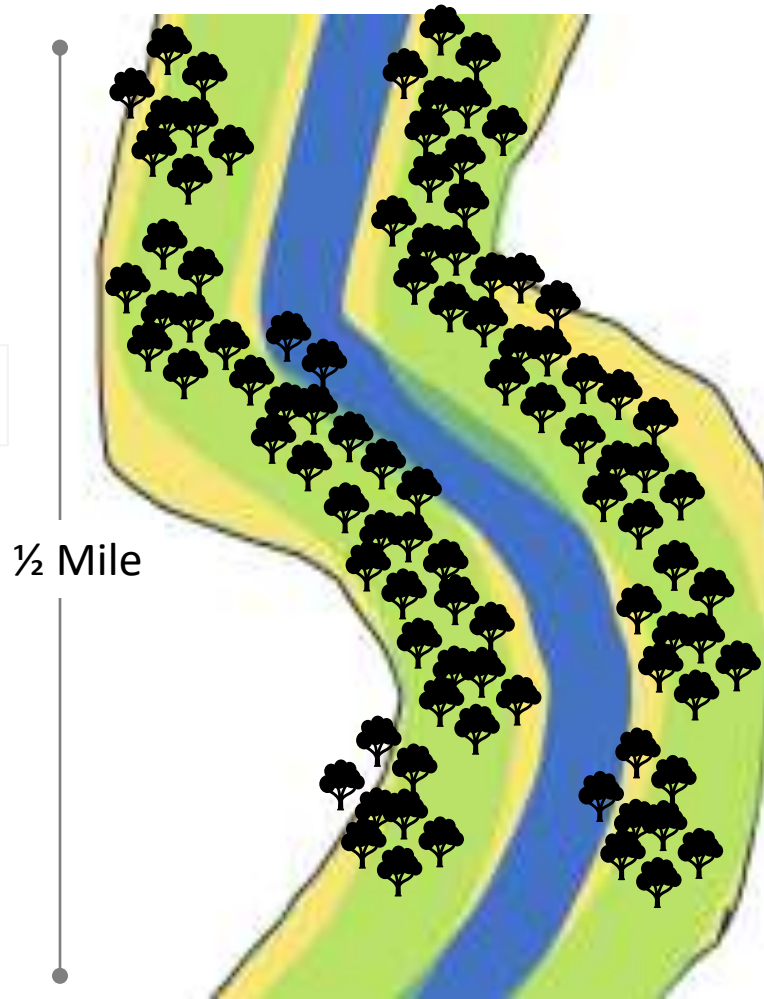
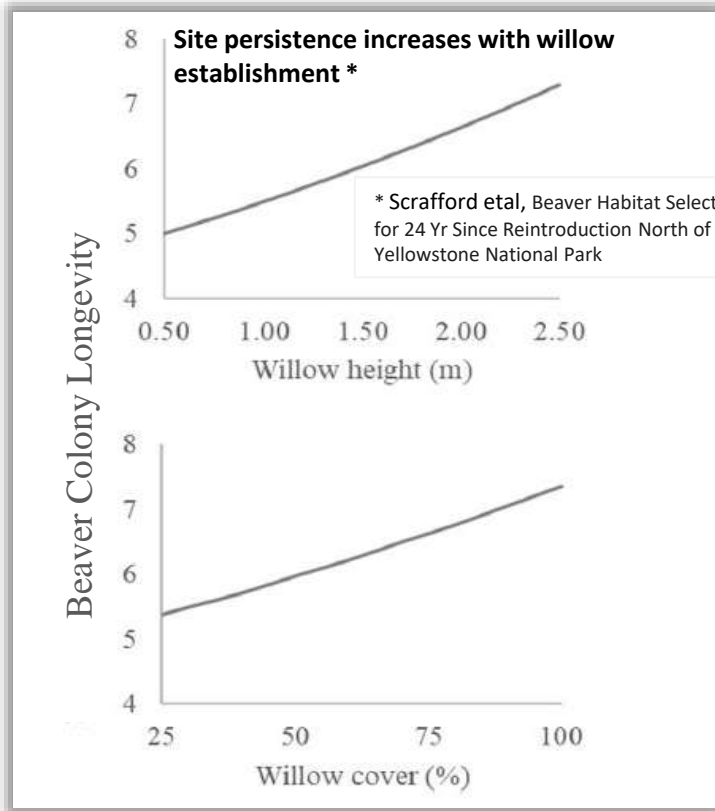
8,000 to 12,000+



½ Mile Territorial Home
Base/Reach

**Within 75'
stream safety
ideal**

'COVERAGE' AND SCOPING YOUR TREE ORDER



Beaver Favorites (eastern O.):

- Aspen (Potted)
- Cottonwood (Cuttings and Potted)
- Willows (Pacific, Peachleaf, Booth, MacKenzie, Drummond Cuttings and Potted)
- NOTE: Coyote willow seems least preferred willow (stem size too small)

Number of trees if spaced 15'
 10,520 At 100% coverage
 7,890 At 75% coverage

ASSESS EXISTING SITE FORAGE

For preferred species

- ✓ Willow, Cottonwood, Aspen (Eastern O.)
- × Not Alder, Not Dogwood, etc.

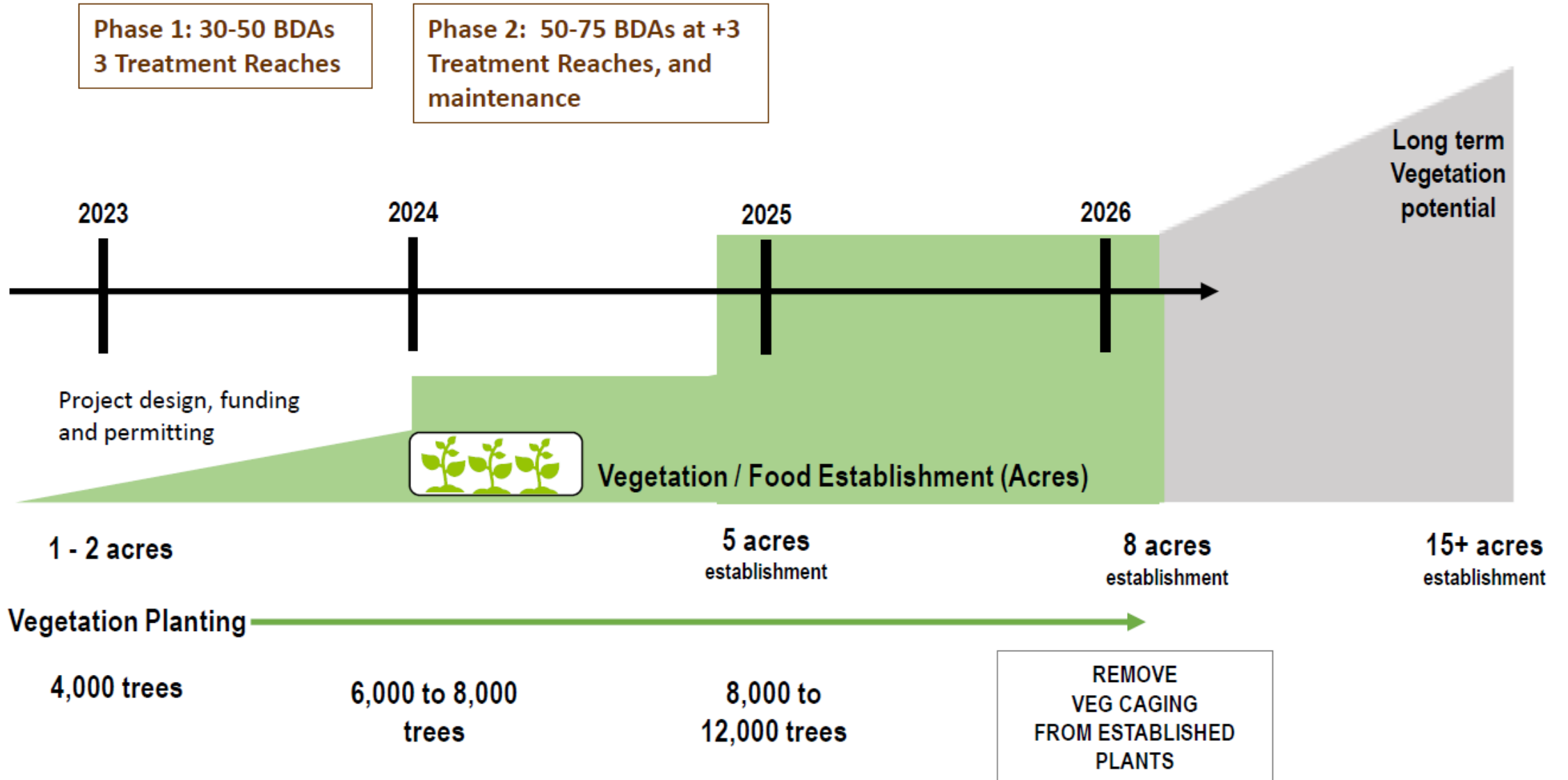
☐ Size and Age (reflects regrowth rate)

☐ Location

☐ Quantity

VEGETATION ASSESSMENT							
Section	On Map	ft ²	Small	Medium	Large	Clump area (Sq Ft)	Dead Stumps
Culvert to fence	A	72	2	5	1		
Barbed fence to old dam	B	143	45	11	1		
Old dam to nickpoint	C	71	5	15	6	120	
nickpoint to dam above den	D	233	36	21	9		
Dam above den to primary dam site 8	E	283	0	0	0		mostly 20-30 stumps of very dead, heavily chewed beaver veg in here
		802	88	52	17	120	
If average weight range per willow assuming 1 yr of growth				Total Count S/M/L		157	
			low	5	10	0.25	per square ft
			high	1	20	1	
			% of stem edible providing nutritional	75%	90%	33%	
			Weight low	18.5	130.0	38.5	
			Weight high	66.0	260.0	119.0	
<div style="text-align: right;"> RANGE OF TOTAL LBS/ 8/DAMMS PROVIDING CALORIC VALUE 206.0 445.0 </div>							

POST, OREGON – LEADING WITH BEAVER BIOLOGY




POST, OREGON – LEADING WITH BEAVER BIOLOGY

Phase 1

BDA'S REACH 8 WITH ZOIs – WORKSTAGE 2 ADD RIPARIAN VEGETATION



NEW: PLANTING GUIDANCE TO ENHANCE SURVIVAL




BEAVERHOODS – Planting the Seeds for Beaver Success

INTRODUCTION

This paper addresses riparian plantings on wadeable streams borne from nearly two decades of experience in planting projects on eastern Oregon landscapes.

Over the past decade, ONDA's riparian restoration strategy has developed to focus specifically on beaver as an "umbrella species"; addressing the factors limiting beavers' management of floodplains, by utilizing an in-house conceptual model referred to as "BeaverHOODs".



(Learn more at [BBNW Youtube Speaker Series 3/16/21](#))

This beaver-based prioritization strategy was adopted because of the inherent ecological resilience and productivity achievable only from self-sustaining nature-pogenic controls, or on actions that treat symptoms rather than root causes.


The strategy in 4 categories: BeaverHOODs helps a practitioner look at a riverscape "through a beaver's eyes": at the site's 1) hydrology, 2) vegetation, 3) morphology/topography and 4) cultural landscape.

Associated rules of thumb and guidance then help congeal these observations into a restoration design and set of expectations in an intentional and strategic way.

The Goal is to establish a "BeaverCould" - a 0.5 to 0.75-mile long reach where all four categories of the BeaverHOOD strategy (above) are addressed and beavers can then assume management by doing what they do to fulfill their own needs and drive for survival.

A lack of suitable woody riparian vegetation (size, species, location, density) is a frequently overlooked limiting factor preventing beaver long-term occupancy, and their ability to manage floodplains.

Understanding beavers as sentient creatures with their own agency, social structures, learned skills and preferences is essential.



Put your "beaver goggles" on and think like a beaver...

The BeaverHOOD Strategy encourages the establishment of 18,000 mature stems of suitable riparian plant species per ~half-mile reach; typically diverse willow species, aspen and cottonwood.

The guidance within this handout considers the intentional and repeatable suite of approaches which could meet these goals over short timelines utilizing low budget/tech tools.

Below you will find "prompts" for deeper discussions among restoration practitioners regarding just the vegetation portion of the BeaverHOOD Strategy: from "initial site assessments" to "post-implementation care".

Adapted from Jefferson Jacobs' (MS and Certified Riparian Restoration Professional) 2024 poster from River Restoration Northwest Symposium.

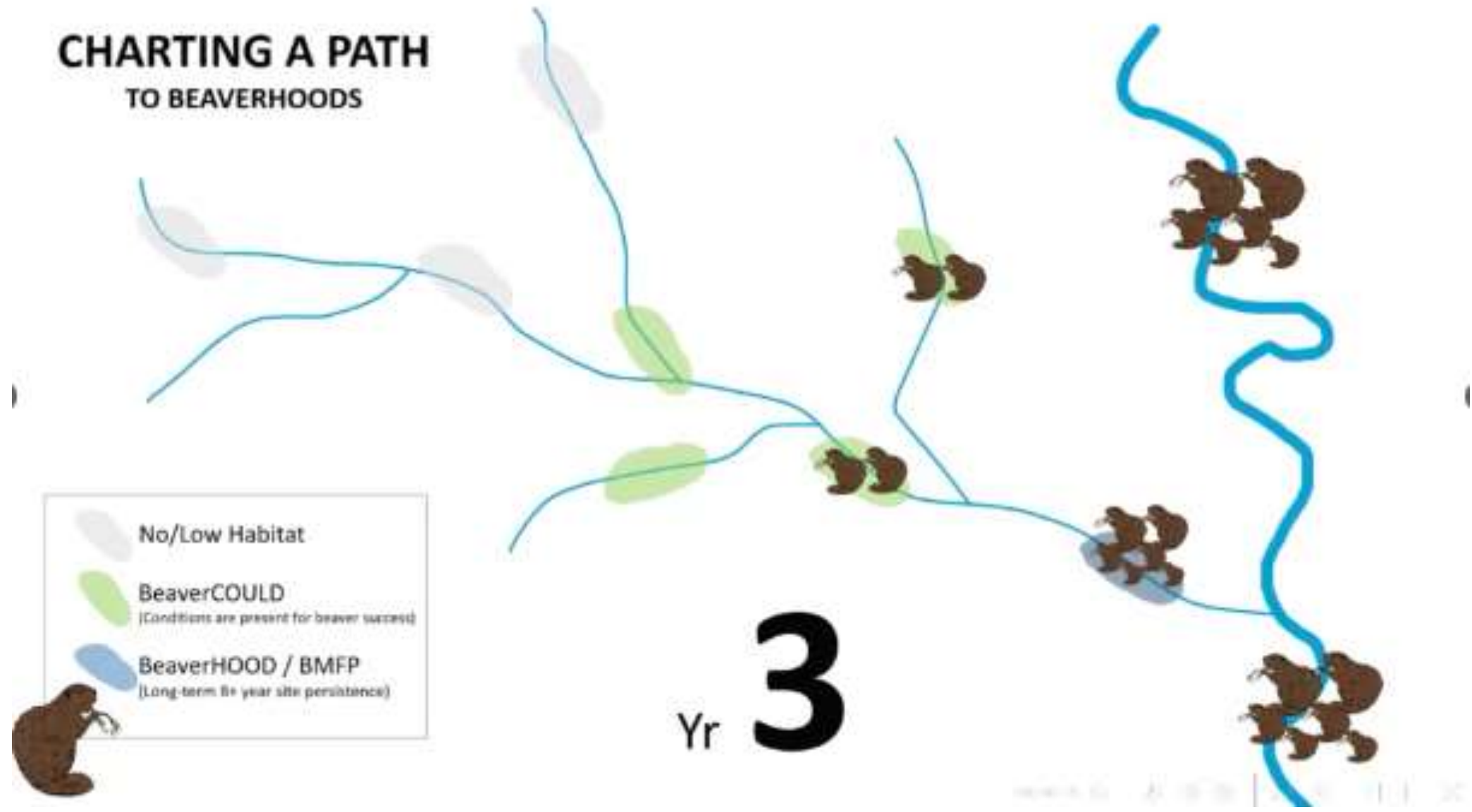
v.1





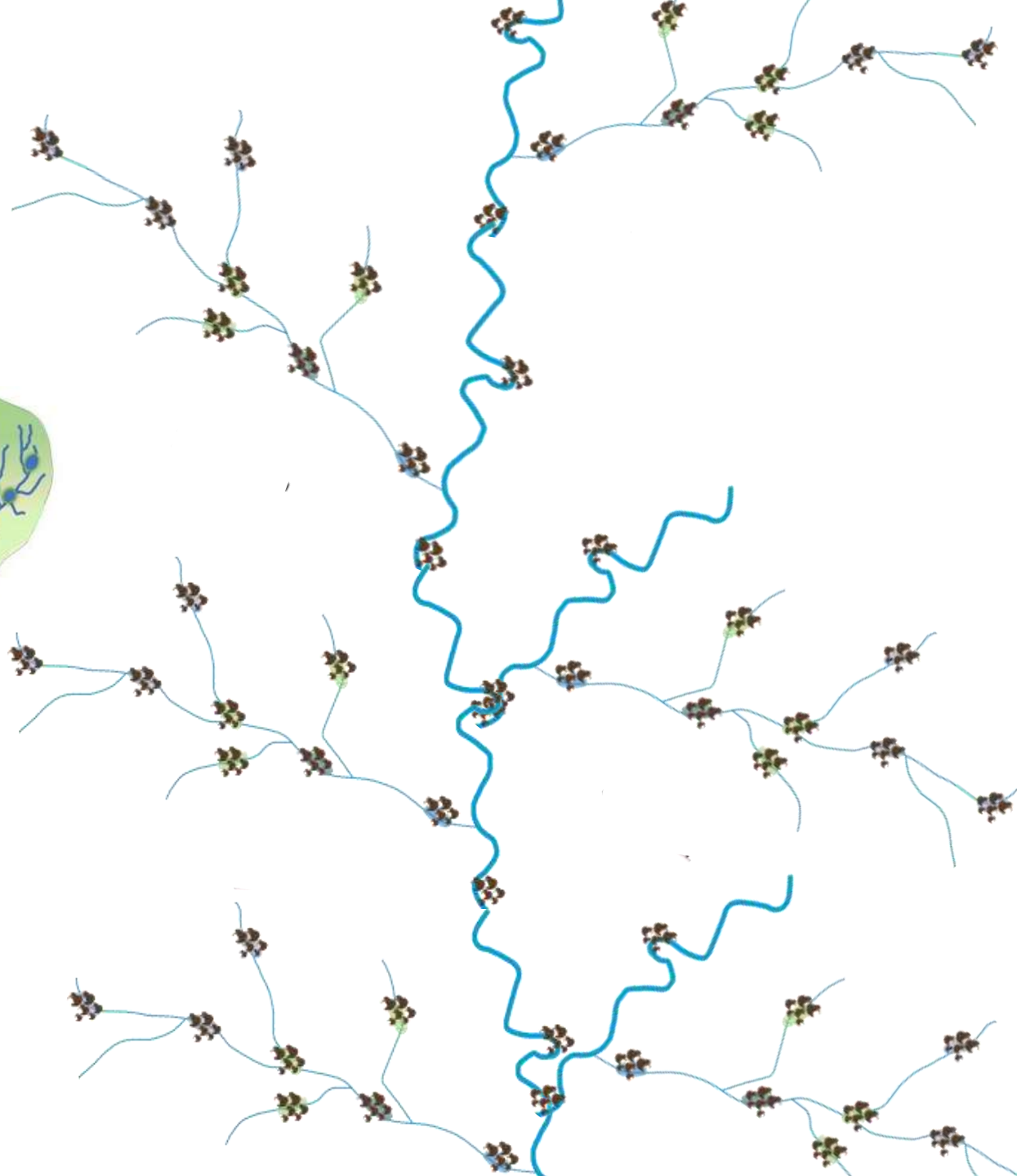
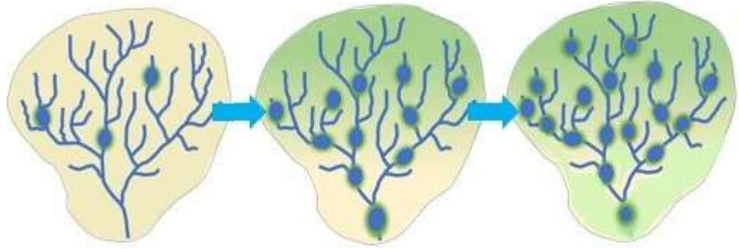
p.s. SCALING BMFP's

CHARTING A PATH TO BEAVERHOODS



Yr **3**

CONNECTING SUBBASINS TO SCALE

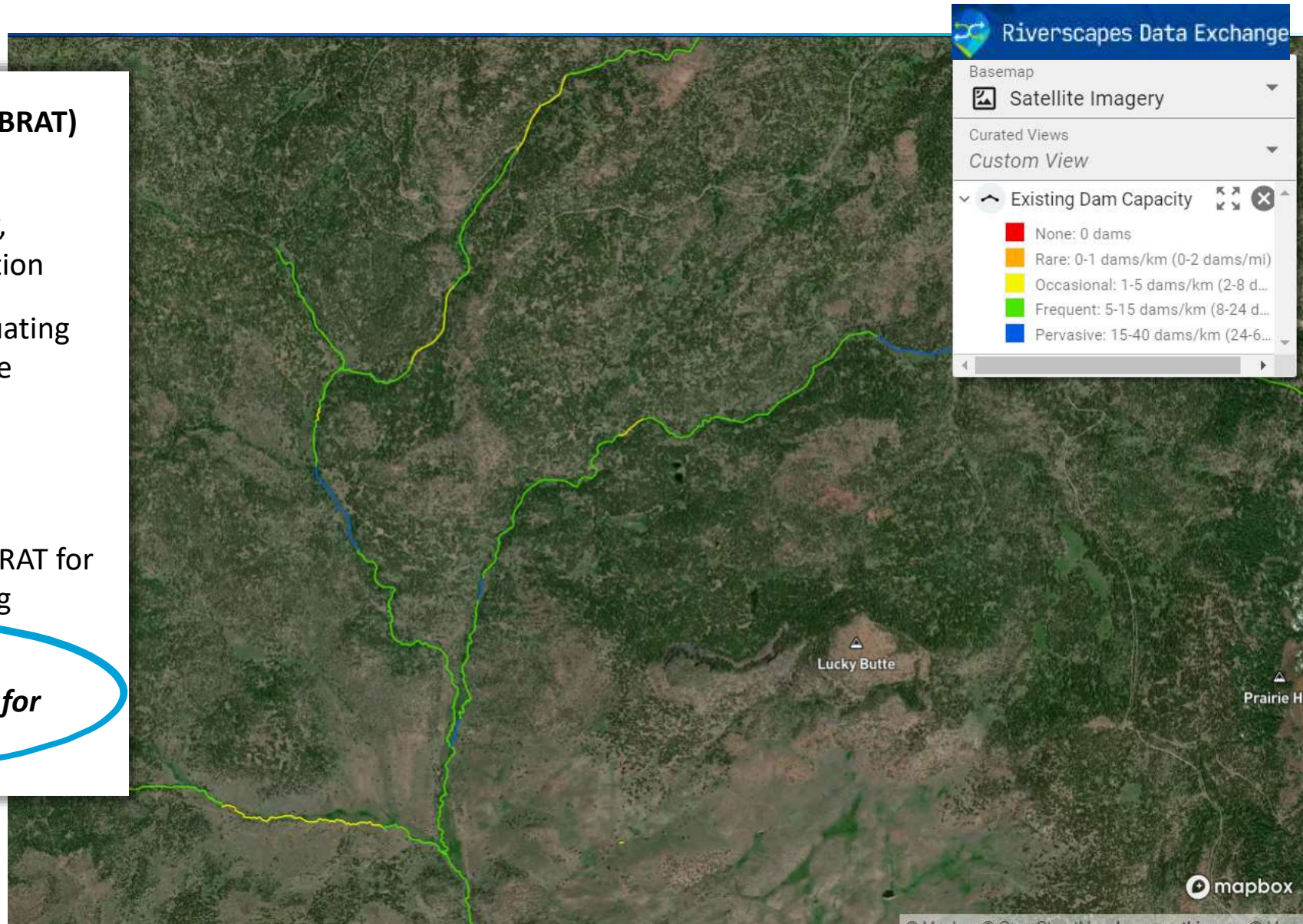


EVALUATING BMFP POTENTIAL AT SCALE

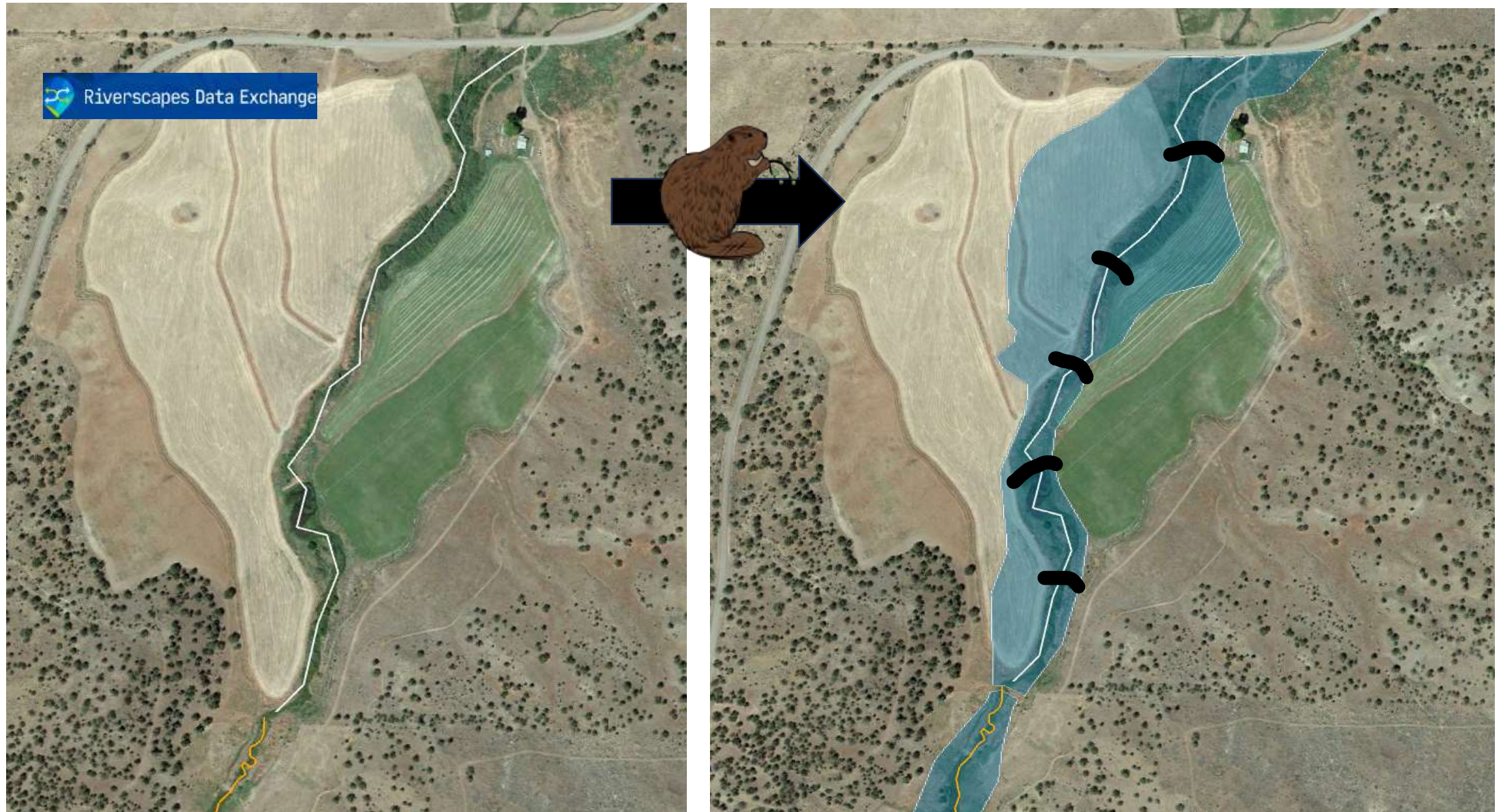
Riverscapes Data Exchange

Beaver Restoration Assessment Tool (BRAT) now Oregon wide (but 'uncalibrated')

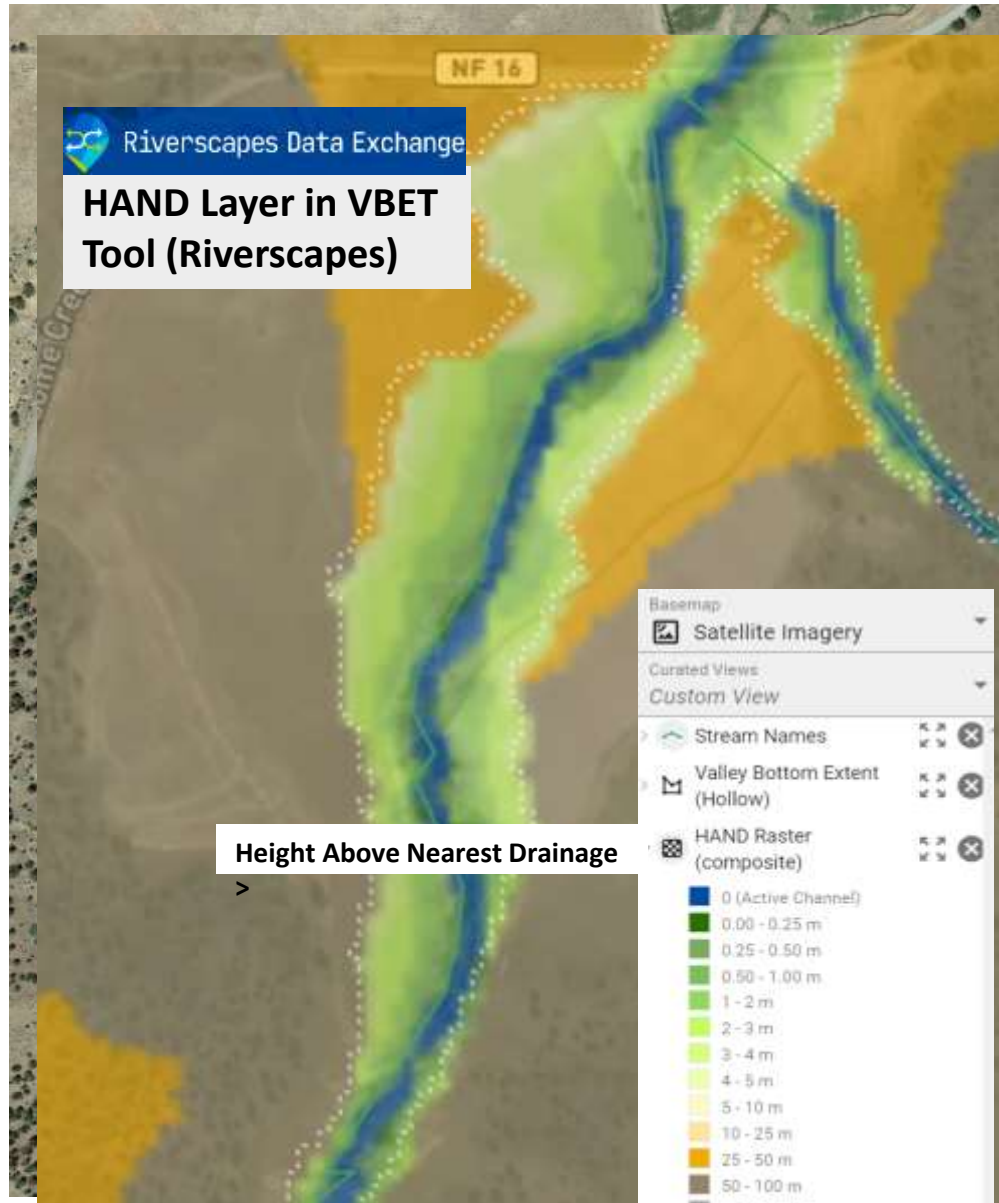
- Considers geomorphology, hydrology, infrastructure and (attempts) vegetation
- Imperfect, but best promise for evaluating at scale some of the conditions where beavers MIGHT succeed
- Free, easy to access, easy to use
<https://data.riverscapes.net/>
- Ground truthing needed to localize BRAT for refined results and fine scale planning
- Calibration and localization effort is underway through BEF. ***Get involved for your region!***

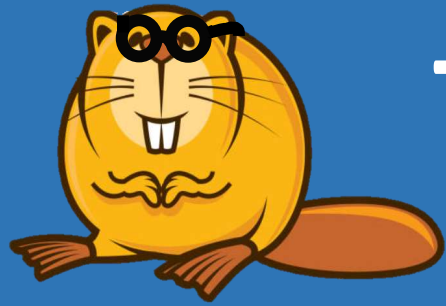


EVALUATING POTENTIAL FOR INUNDATION CONFLICT



EVALUATING POTENTIAL FOR INUNDATION CONFLICT





TOOLS

ADDITIONAL TOOLS

WESTERN BEAVERS DISCUSSION TEMPLATE:
BEAVER MANAGEMENT PLAN FOR _____ RANCH

The purpose of a Beaver Management Plan for Acme Ranch (Acme) will serve as: 1) a management resource for ranch operators/landowners to understand the capacity of the landscape to hold beavers and the potential benefits that their activities can bring to land health, 2) a decision-making tool for evaluating where beaver activities may conflict with operations and infrastructure, along with a range of barnyard based tools for response, and 3) a planning tool for land stewardship decisions and opportunities to support beaver re-establishment.

The written plan will include these areas:

Evaluation

- 1) Of existing beaver occupancy within 'home base territories' that are already established and by whom (family unit numbers, ages, and primary activities)
- 2) Beaver carrying capacity of the system - historical and potential for future
- 3) Identify and prioritize places to support long-term beaver occupancy through 'process-based' restoration approaches like vegetation BDA establishment

Decision Making: Challenges and Opportunities


- 4) Define different 'tolerance' levels of beaver occupancy at different locations along stream sections
- 5) Establish a Decision Framework so that where potential conflicts or opportunities exist, the ranch can evaluate and decide on:
 - a) Challenges: different options for "beaver cheater" type solutions where the potential for infrastructure conflicts exist
 - b) Opportunities: the potential for encouraging new beaver wetlands (Ref #3 above), and possible conservation easements or more may provide financial offset when production conflicts (like hay production, foraging) exist.

Monitoring

- 6) Establish a Year 1 baseline for hydrology (water retention seasonally, flow levels), geomorphology (sediment aggradation and erosion), vegetation volume (biomass, health, and expansion of preferred beaver forage)
- 7) Establish a monitoring protocol for measuring #6 above (over 5 to 10 year horizon)
- 8) Identify opportunities for deeper research/study to advance a body of knowledge around beaver/hydrology, vegetation, sediment and in Crooked River watershed and eastern Oregon basins at large.
- 9) Through this process, gain a better understanding of the riverscape's natural 'dynamism', its potential for floodplain connectivity and (if, where and how much can the 'streams be a stream' within the confines of productive livestock operations.)

BEAVERHOODS – Planting the Seeds for Beaver Success

By Adriaen Jacobs, MS and Darrell Rippey, PhD, Professor



INTRODUCTION

Developed over the past decade, "BeaverHOODs" is a conceptual model and riparian restoration strategy that addresses the factors limiting a return of beavers' management of floodplains on eastern Oregon landscapes.

This beaver-based prioritization strategy was adopted because of the inherent ecological resilience and productivity achievable only from self-sustaining nature-based solutions: as opposed to relying on anthropogenic controls, or on actions that treat symptoms rather than root causes.

In 4 Categories, BeaverHOODs helps a practitioner look at a riverscape "through a beaver's eyes": at the site's 1) hydrology, 2) vegetation, 3) morphology/topography, and 4) cultural landscape.

Associated rules of thumb and guidance then help congeal these observations into a restoration design and set of expectations in an intentional and strategic way.

THE GOAL
Is to establish a "Beaverhood" - a 0.5 to 0.75-mile long reach where all four categories of the BeaverHOOD Strategy (above) are addressed and beavers can therefore assume management by doing what beavers do in settling a

A lack of suitable woody riparian vegetation (size, species, location, density) is a frequently overlooked category limiting factor preventing beaver long-term occupancy, and their ability to manage floodplains.

Understanding beavers as sentient creatures with their own agency, social structure, learned skills and preferences is essential.

The BeaverHOOD Strategy encourages the establishment of 18,000 mature stems of suitable riparian plant species per -half-mile reach: typically diverse willow species, aspen and cottonwood.

The guidance within considers the intentional and repeatable suite of approaches which could meet these goals over short timelines utilizing low budget/tech tools.

Below you will find "prompts" for deeper discussions with restoration practitioners regarding just the vegetation portion of the BeaverHOOD Strategy: from "initial site assessments" to "post-implementation care".

For more detailed information on the rest of the BeaverHOODS model components and its implementation use the two QR codes.



Put your 'beaver goggles' on. Think like a beaver...

Get to know local families: size, habits, food source, kits/ juveniles, etc.



BEAVER CHEATERS



BARNYARD SOLUTIONS ★
 A series of do-it-yourself "how-to" information sheets for producers on adapting your infrastructure, redirecting beavers and keep the water moving where it should.

01 BEAVERS AT YOUR HEADGATE
 Beavers are damming up or above your diversion, a headache of a wet. Flooding water depressures the floor in flooding things out nearby.

To a beaver the POD probably looks like a natural pinch point – and a good place to anchor a new dam for ponding.

INVESTIGATE WHAT'S HAPPENING
 Check to see if there's a den site nearby (within 200' upstream), this could give you good information whether the beaver means to stay long term or not. When did they arrive? Late spring after flows subside.

WHAT TO DO
 Encourage the beavers to dam in another "easier spot" for them by creating a "Diversion Dam" with appearance of the headgate.

1) **Make the right thing easy** by providing the beaver with a "starter dam", basically diverting their activities away from the headgate and over to a better place for dam building for good establishment.

2) **Make the wrong thing hard** by removing existing dam debris over the course of a few repeated days with a rake, ice or shovel. In other words you'll want to help create a better place for dam building.

Get straight boards or juniper posts (4" wide, 5' long is the ideal shape) in between 30" to 150" upstream of the problem site, ideally at a spot with a shallow vs. steep gradient where the water can pool up temporarily and spread out for ponding. Move the materials from existing downstream dam upstream to this new anchor point.

MATERIALS YOU MIGHT USE
 Depending what you have available:
 • Untreated juniper or spruce
 • Cattle panels (ideally 4' square, no wires)
 • Hog rings or your favorite fence clip

WHAT NOT TO DO
 What's too long. Once beaver's established behavior is harder to change patterns.

WHAT TO EXPECT
 Within the first day of installation you should see dam building at the new den site.

WHY IT SHOULD WORK
 To make the work easier beavers look to dam at pinch points like Hick subdivisions.

The Fix Print ("Call before you dig")
 • Must be temporary remove materials after use
 • Potential fish passage considerations

Feeding the den site
 • Usually under a tree or large bush
 • Look for points sticks where they're chewed
 • Feeding bench or food cache nearby

WESTERN BEAVERS

THINK LIKE A BEAVER
 Beaver engineering – here's what makes beavers tick, why they might jump on your operation and how to put them there when they do.

DON'T PICK DAM SITES
 Beavers pick an almost obvious for safety – a 2.5' high pond gives them the room they need to escape from predators.

• Dam at pinch points. Take the path of least resistance – they'll look for deepening what once it stood.
 • Face towards & sun rarely, aware that they generally won't cause and depending what else it stood.
 • If there's already a dam nearby, aware that they generally won't cause and depending what else it stood.
 • In hydrology, for most dams through need to accommodate

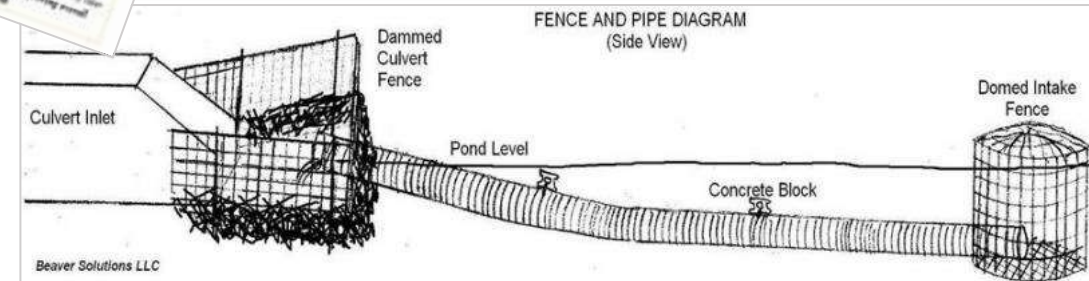
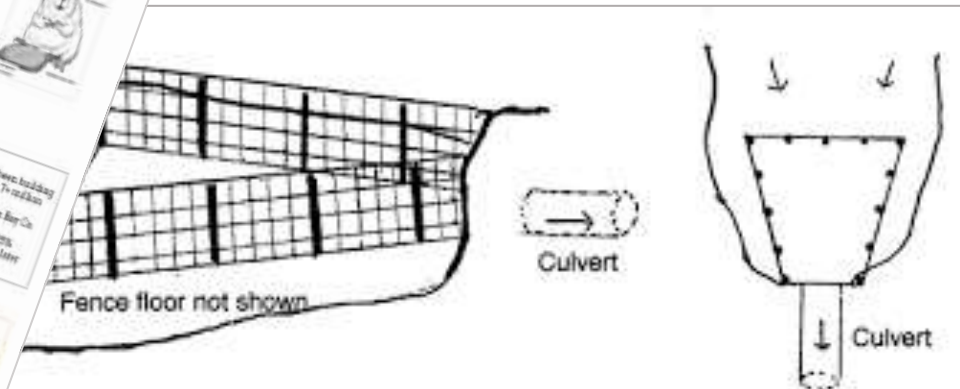
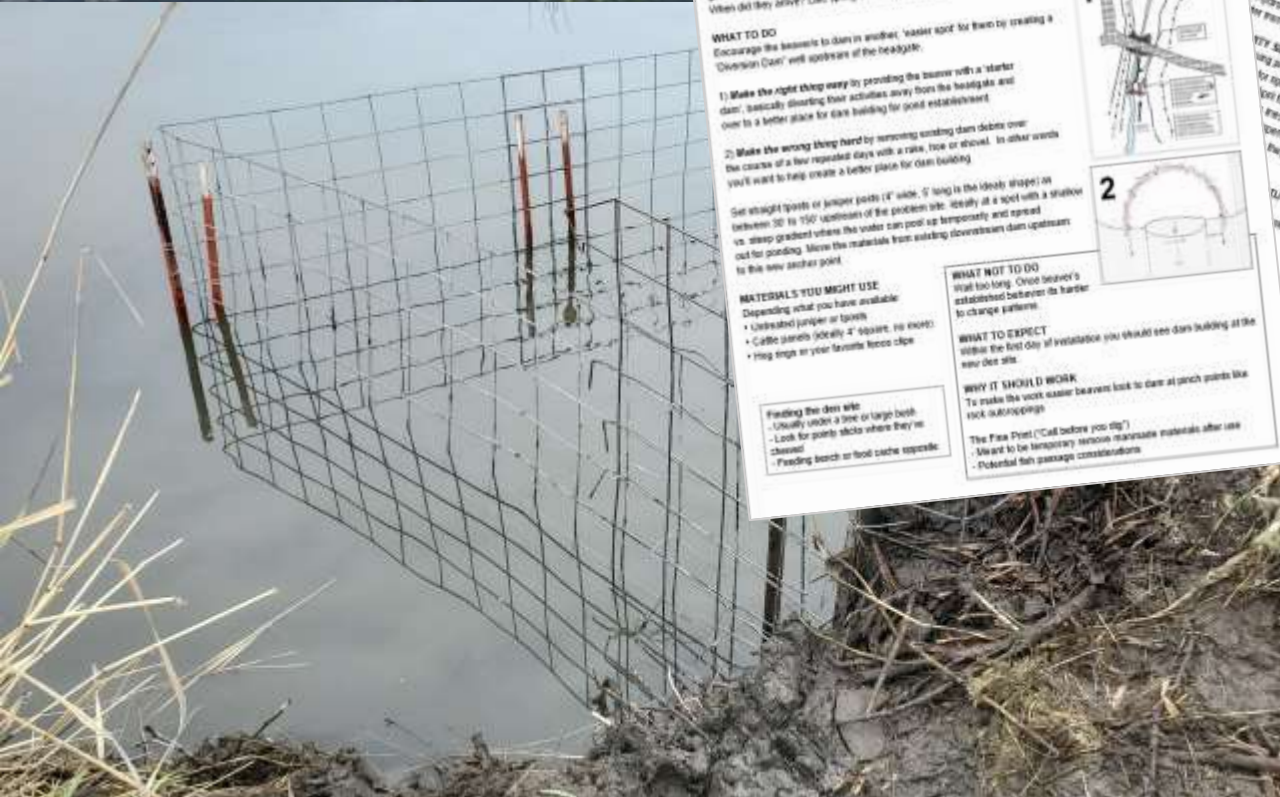
BEAVER SEASONS
 They generally usually leave spring for open water streams.
 • Run to May, if you're dealing with an established where fairly easy with there.
 • Opening beaver usually in Spring or Fall, deal with it they settle the site.

AVOID A SITUATION?
 If you're dealing with a dam and raising dams?

Did you know?
 • Beavers sometimes have been building dams for 100,000 years.
 • Wood used 200 by Sitka, Alaska.
 • Beaver ponding can increase forage by 100% to 250%.
 • Increase lake flows 45 days later.
 • 100% yield.

OF-11 alternatives
 • 45% flow water available for drinking
 • 45% flow water available for drinking
 • 45% flow water available for drinking
 • 45% flow water available for drinking

OF-11 alternatives
 • 45% flow water available for drinking
 • 45% flow water available for drinking
 • 45% flow water available for drinking
 • 45% flow water available for drinking



TAKEAWAYS, FOR BMFP SUCCESS . . .

- Set restoration goal for “long term site persistence” and “beaver success”.
- *Lead* with beaver biology
- Consider the beaver’s needs
- Learn where beavers are thriving, this should inform your planning.

Wear Beaver Goggles





QUESTIONS?

Eastern Oregon?

From Western Beavers consider:

- **Monthly BBR practitioner check-in**
- **Borrow our “Beaver Booth” kit for community events**
- **Interest in upcoming:**
 - 1) **Willow Workshop – June 20th**
 - 2) **‘Beaver Goggles’ Field Trip**
- **BRAT calibration (throughout Oregon) – contact JP at BEF**

Contact:

reese@westernbeavers.org

More at:

www.westernbeavers.org/connect2024