

Beaver Strongholds

as building blocks to prioritize
beaver-based restoration
planning at scale.



REESE MERCER

- Beaver based restoration practitioner
- Beaver Corps Wetlands Professional
- Beaver Institute Board Director
- 5000+ hours in field research



Today's Talk

- BBR - State of Practice
- Aligning *our Goals* with Beaver Goals
- A Beaver Strongholds Approach – from the Pond View
- Watershed Inventory
- Building the Workplan
- Working the Plan



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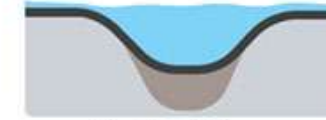
BEAVER BASED RESTORATION – STATE OF PRACTICE

A stream comes back to life

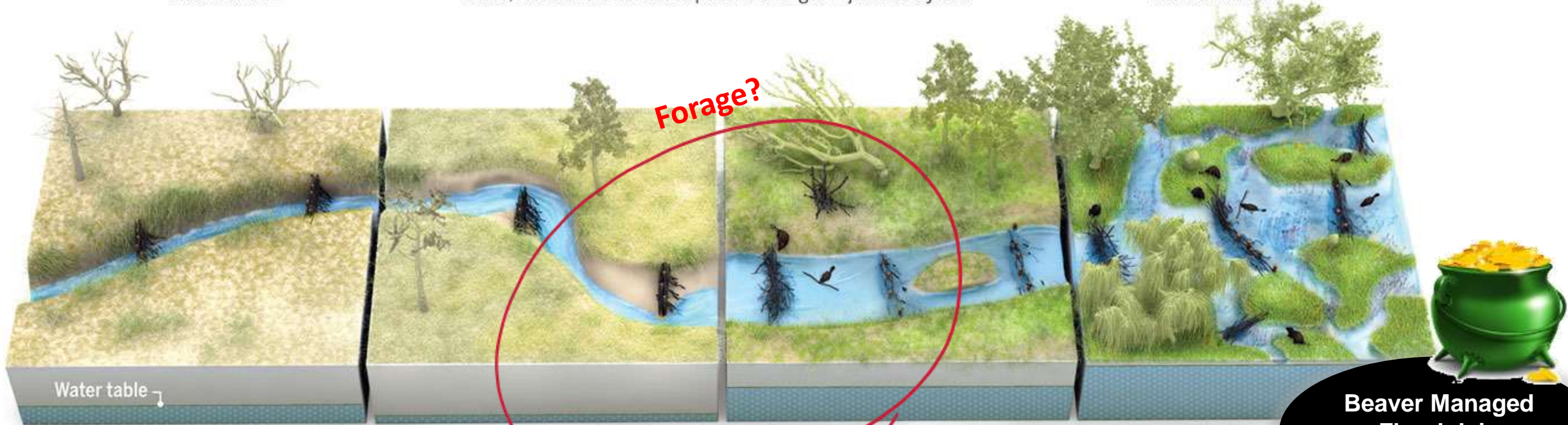
Across the U.S. West, scientists and land managers are using beaver dam analogs (BDAs) to heal damaged streams, re-establish beaver populations, and aid wildlife. In some cases, researchers have seen positive changes in just 1 to 3 years.



Incised stream



Restored stream



Forage?

Beaver Managed Floodplain (BMFP)

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.

(p.s. HOW MUCH FORAGE?)



Riparian Vegetation For Beaver Habitat Establishment

WHERE THRIVING BEAVER FAMILIES AND BEAVER MANAGED FLOODPLAINS IS A GOAL, HOW MUCH BEAVER FOOD IS NEEDED TO SUSTAIN LONG-TERM SITE PERSISTENCE?

As Western stream restoration agencies value of beaver-managed floodplains (B health and resilience. It's a good time to recovery in the West! With "long term pr restoration" (LTPBR) as a foundation, it added structure (like BDAs and PALs) to natural processes in a riverscape so systems themselves. But structure alone won't need for long term site persistence.

Beavers Need ALDT of Forage. In the of the West, we often see stream degrad beaver food and forage establishment is essential component of this work. With renewable and accessible food source



BEAVER FOOD AND FORAGE REQUIREMENTS - READING AND RESEARCH REPORTS

ARTICLE (Click to view)	CITATION
1. A study of beaver colonies in Michigan, Journal of Mammalogy, Glenn Bradt, 1938	"It's estimated that one acre of poplar will support an average colony of 5 animals for 1 to 2.5 years, depending on the stand of poplar and other factors." "If we use 1500 trees per acre as a standard, and assume that one beaver will cut 216 trees per year

Not enough

½ Mile Territorial Home Base/Reach

8,000 to 12,000+

Within 75' stream safety ideal

½ Mile Territorial Home Base/Reach

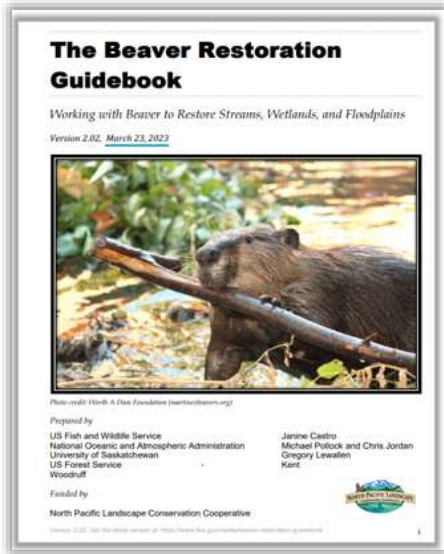
Beaver Food: February Chapter, pages 26-27, Dr. Ellen Wohl, CSM, 2019 (See also bibliography reading p. 152 related to that chapter.)

9. Beaver Carrying Capacity of Certain Streams in North Park, Colorado, Duncan MacDonald, 1956

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

This paper with helpful references to research on beaver forage needs (captive and wild), and measurements around how much ingestible food exists on Aspen of different stem sizes.

BEAVER BASED RESTORATION – STATE OF PRACTICE



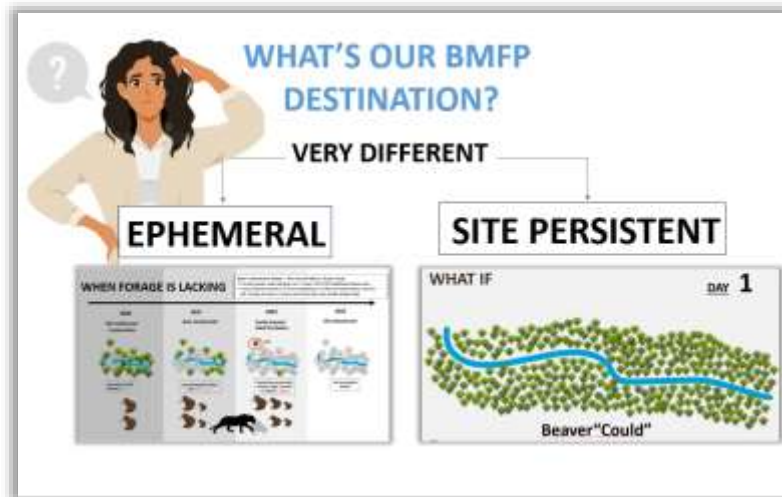
- Best available guidance (v. 2023) is still **structure forward** and **beaver relocation** heavy.

CONTENTS:

- * 36 pages on BDAs and Relocation
- * 2 pages on beaver habitat



- Planning is **top down**, **opportunistic** and “**Command and Control**” mindset.

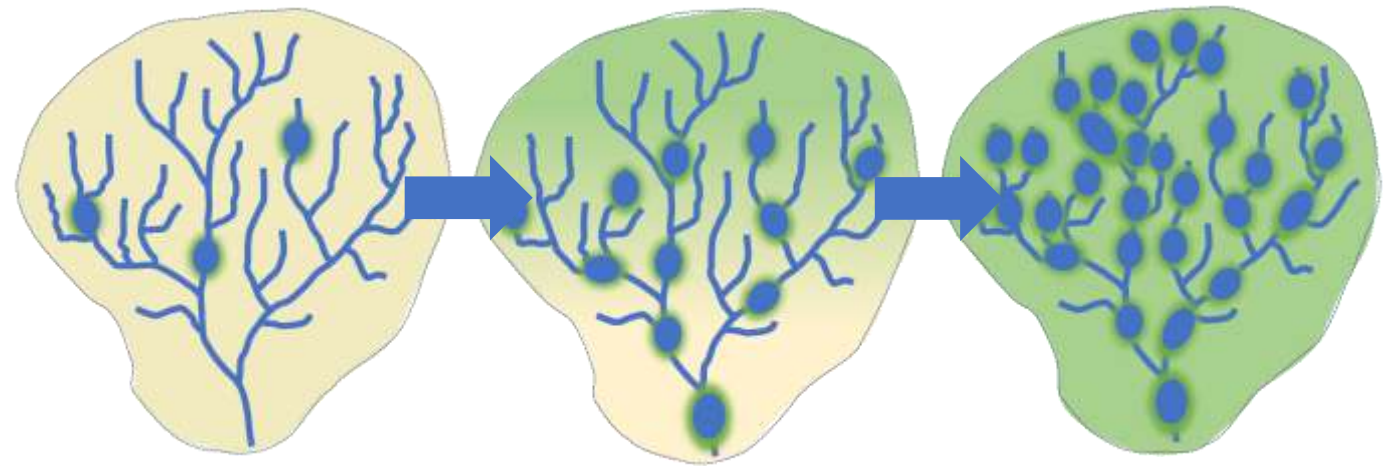


- Lack a clear Destination or Goal for what **quality, thriving beaver occupancy** (**Persistent BMFPs**) should look like.

LIMITS OUR PERSPECTIVES AND APPROACH TO BEAVER BASED RESTORATION,

and...

LIMITS THE
POTENTIAL FOR
BEAVER
RECOLONIZATION
OUTCOMES





GOALS ALIGNMENT

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

~

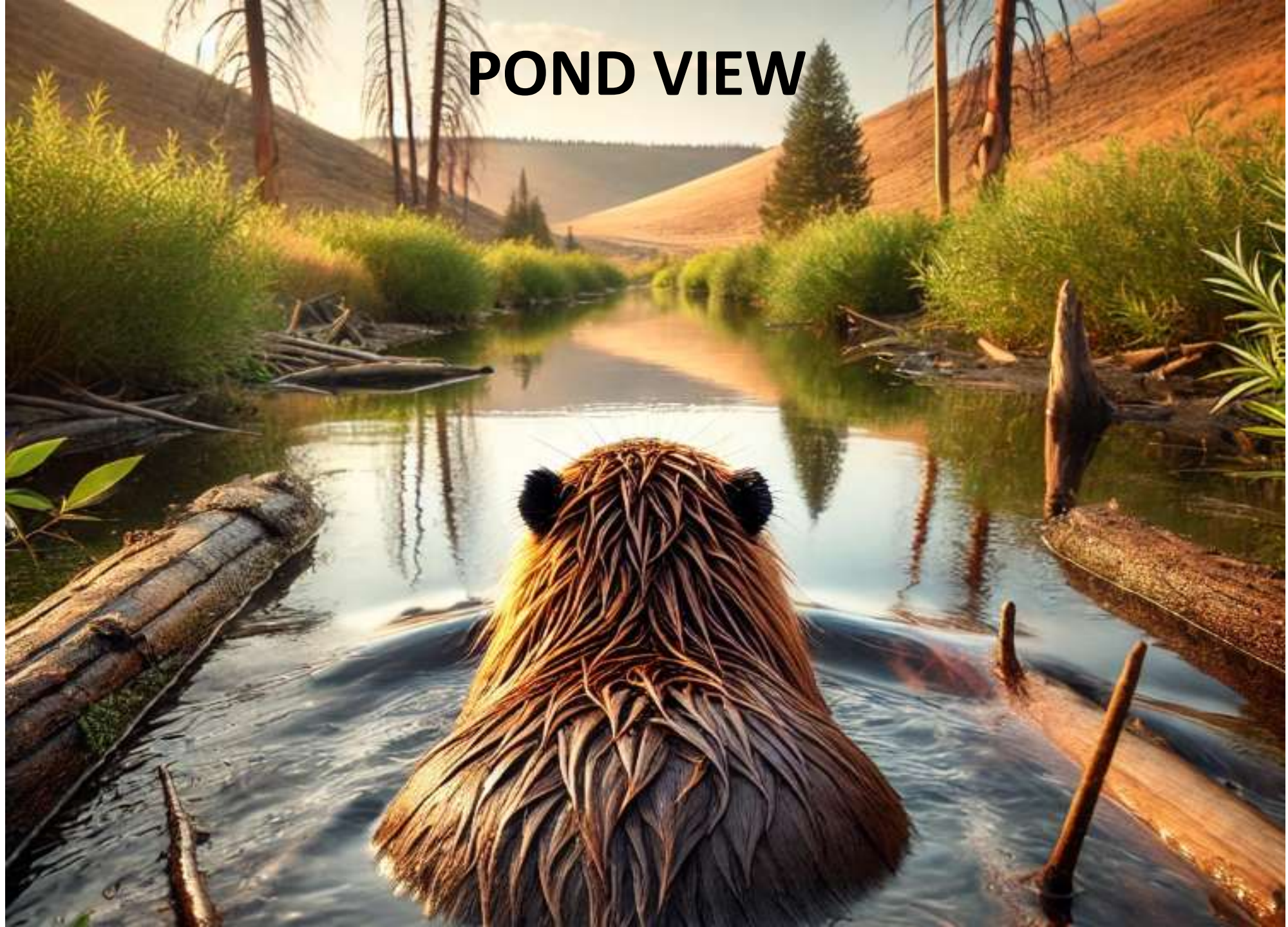
Individual Fitness with
capacity to reproduce and
successfully pass on genes.



ULTIMATELY: BEAVERS ARE IN THE DRIVER'S SEAT



POND VIEW





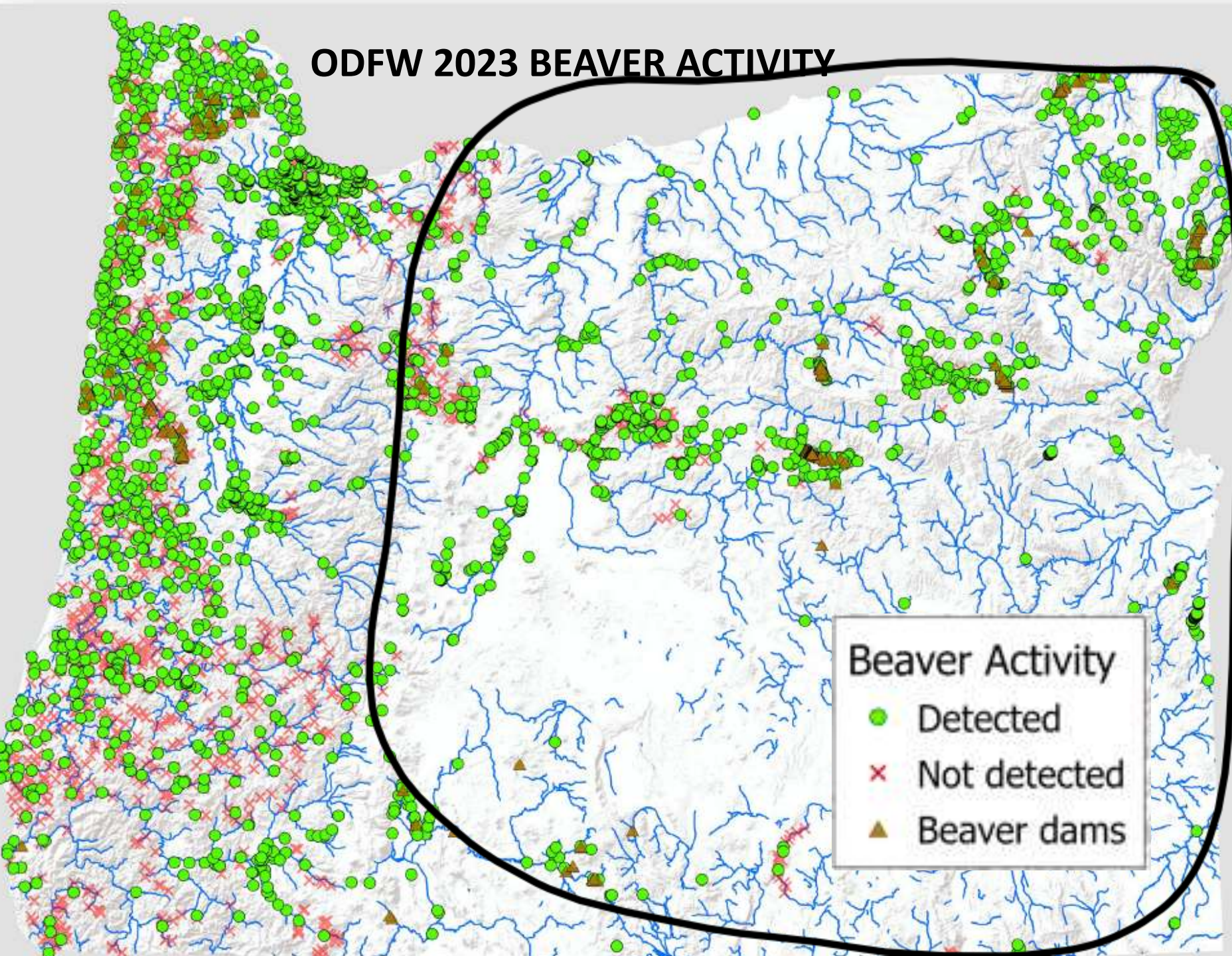
**“From the Pond View”
Assessment and Action
Plan**

2025-26






**With existing beaver
populations  as
the foundation for
planning.**

ODFW 2023 BEAVER ACTIVITY



Beaver Activity

- Detected
- × Not detected
- ▲ Beaver dams

-  Very widely distributed
-  Vast majority of observations not associated with dams
-  Data gaps = future survey opportunities

EASTERN OREGON

Site occupancy is mostly ephemeral, not persistent.

Beavers pass through but often don't stick.

THE APPROACH



“From the Pond View” Assessment and Action Plan

*With current beaver populations
and habitat needs as the
foundation for planning.*

=

Existing, *Persistent* Beaver Occupancy (with “Dispersers”)



+

Habitat Connectivity



Ecosystem Health and Sustainability
A SCIENTIFIC PAPER JOURNAL

RESEARCH ARTICLE

Stepping Stone Strategy: A Cost-Effective Way to Address Habitat Fragmentation of Endangered Wildlife in Montane Forest

Haochen Wang^{1,2,3}, Ying Gao^{1,4}, Yaping Li^{1,5}, Na Li^{1,6}, Cyril C. Grueter^{2,4}, Haining Xu¹, Zhipeng Huang^{1,7,8}, Liangwei Cui^{1,9}, and Wen Xiao^{1,10}

Institute of Eastern Himalaya Biodiversity Research, East University, Dali, Yunnan 673003, China; ²Research Center of Natural History and Culture, Qing Normal University, Qinghai 810008, China; ³Collaborative Innovation Center for Biodiversity and Conservation in the Three Parallel Rivers Region of China, East University, Dali, Yunnan 673003, China; ⁴Faculty of Biodiversity Conservation and Utilization, Southwest Forestry University, Kunming, Yunnan 650224, China; ⁵International Centre of Biodiversity and Protected Areas, East University, Dali, Yunnan 673003, China; ⁶School of Human Sciences, The University of Western Australia, Perth, Western Australia, Australia; ⁷Bureau of Tropical National Nature Reserve, Kunming, Dali, Yunnan 673003, China; ⁸...

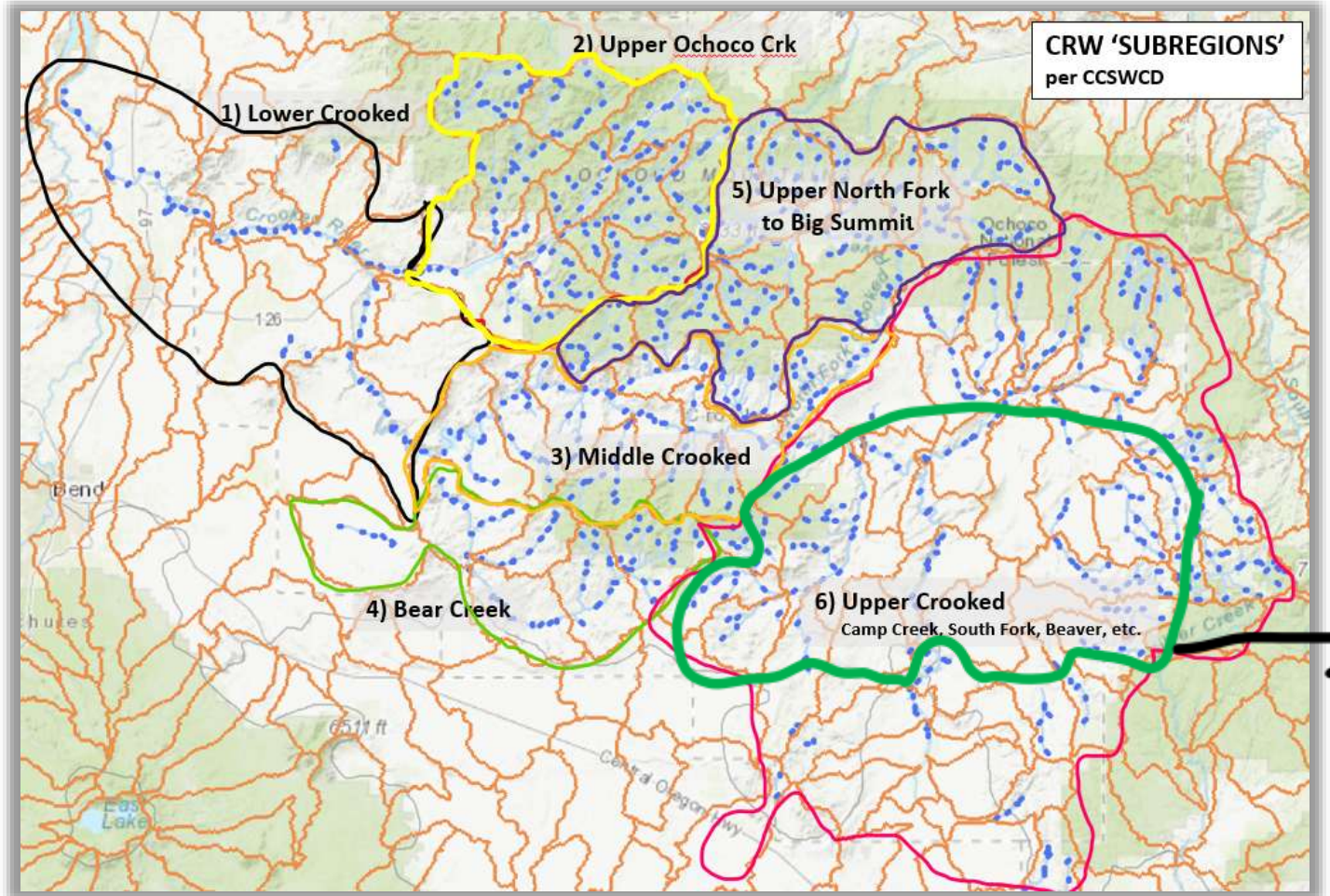
Submitted: 30 August 2022
Received: 27 April 2023
Published: 9 April 2023

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Beaver Stronghold

Weak connectivity Strong connectivity Small protected area

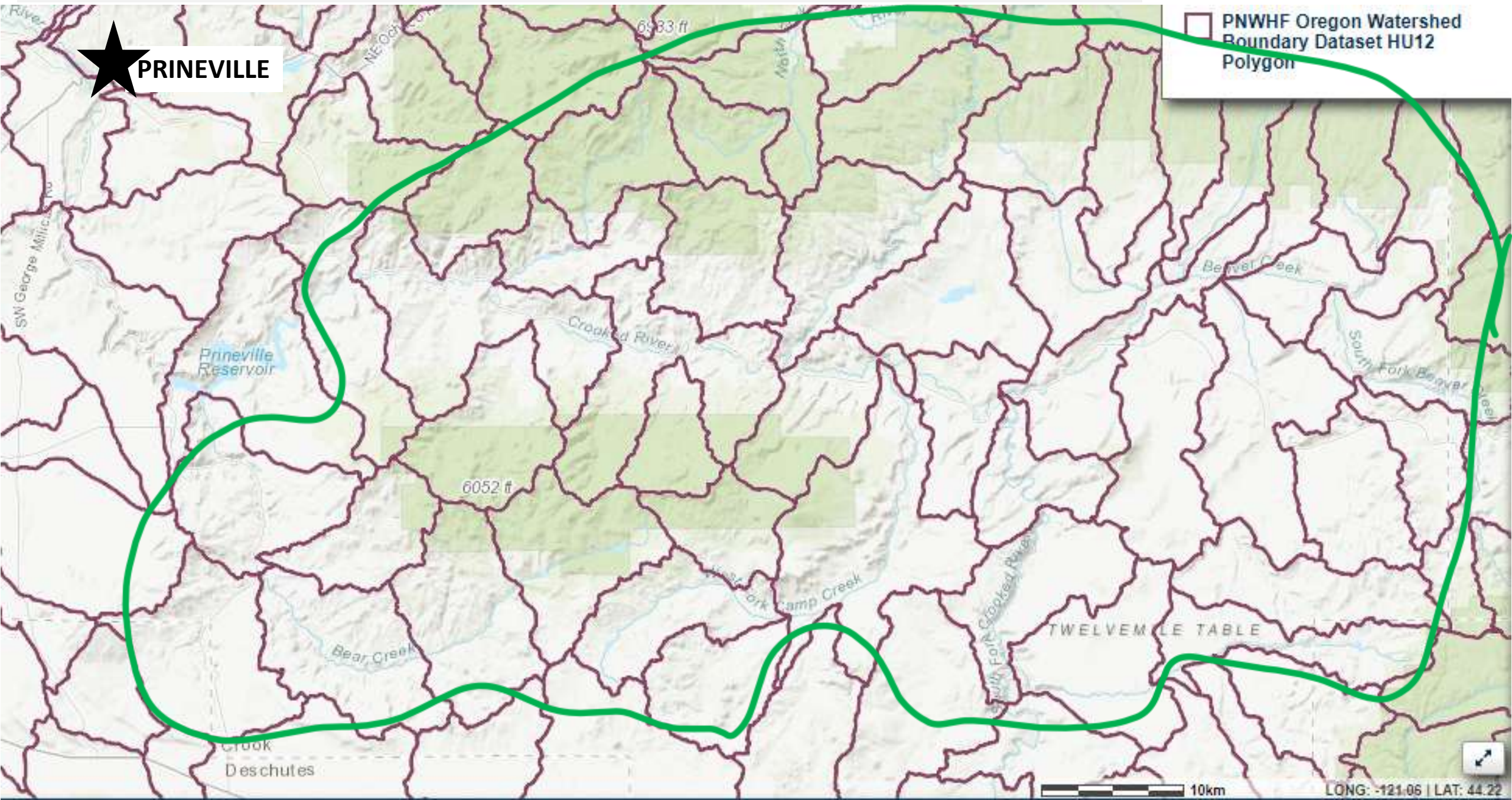
APPLIED IN THE CROOKED RIVER WATERSHED



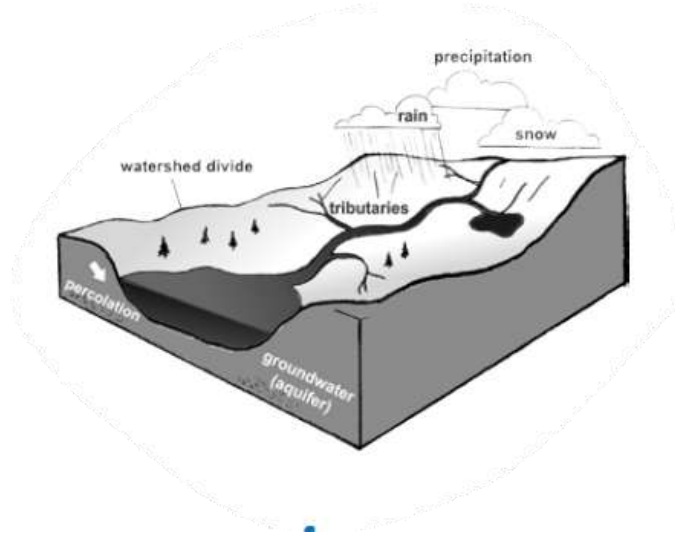
Crooked River Watershed:

- 3 HUC8s
- 4,500 Sq Miles (3 Million Acres)
- 10,000+ Stream Miles

PLANNING BLOCKS AT HUC12 SUBWATERSHED UNIT SCALE



TAKE INVENTORY



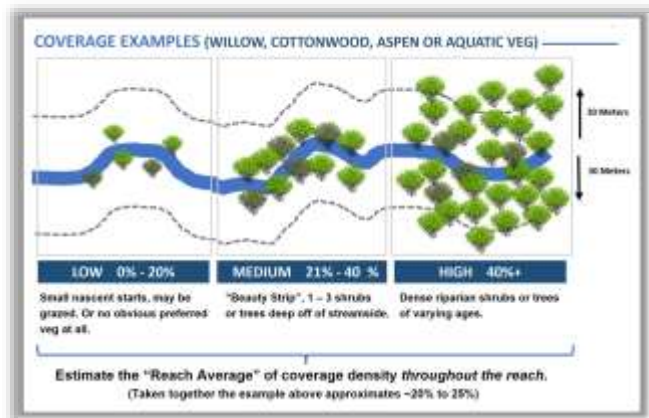
1. Riverscape shape, geology, hydrology and infrastructure

- Geomorphology/hydrology
- Stream power
- Infrastructure conflict potential
- Availability of dam building materials

Beaver Activity Evaluation		
Key Activities Fall Season	Count/ Amount	Quality
1. Dens		
2. Forage Activity		
3. Feeding Benches		
4. Food Cache		
5. Scent Mounds		
6. Dam Counts & Maintenance		
REACH SCORE	XX	

2. Assess the quality and intent of existing beaver occupancy.

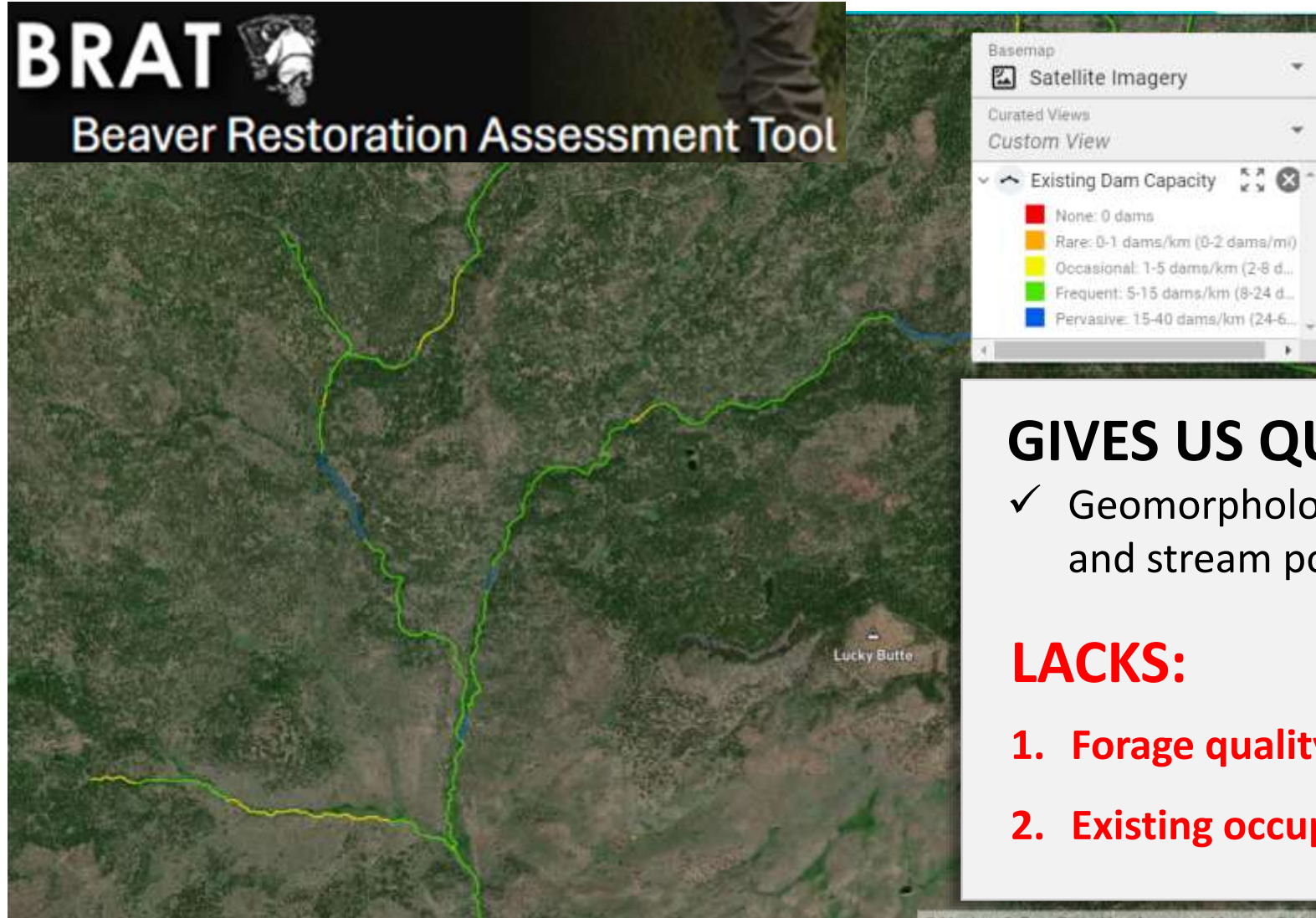
(Just presence/absence isn't enough.)



3. Chart existing forage availability ('coverage' of preferred vegetation).

1. Riverscape shape, geology, hydrology and infrastructure

BRAT Beaver Restoration Assessment Tool



GIVES US QUICK:

- ✓ Geomorphology, infrastructure pinch points and stream power

LACKS:

1. Forage quality and abundance
2. Existing occupancy: *Distribution and Intent*

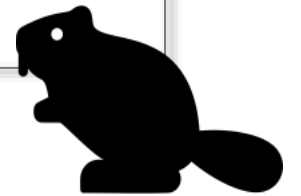
2. Assess Quality and Occupancy of Existing Beaver Occupancy

QUALITY AND INTENSITY OF THESE 6 KEY ACTIVITIES

1. Den/Lodge building
2. Quantity of felled trees/harvest branches
3. Food caching (Fall mostly)
4. Scent Mounds
5. Feeding benches
6. Dam building and maintenance

WHAT IS SITE 'OCCUPANCY INTENT'? AND WHY DO WE CARE?

That **beavers themselves consider** the site worthwhile to 'invest in' settlement, long term occupancy with dam building, den expansion, and family building.



CLOSER LOOK



* Use for Fall surveying

* Outcome/scoring provides an idea of occupancy robustness, but NOT a conclusion. Higher Scores suggest more permanent occupancy intention, and warrant/trigger further on-site NonInvasive study over time with habitat observations and trail cams.


2. Assess Quality and Occupancy of Existing Beaver Occupancy

	PRIMARY ACTIVITIES	Description/Quick Notes	Qualify/ Quality
1	Den/Lodge 1	A primary living space for more than one present which is actively maintained, the needed, and rotationally.	Size 10'-15' Size 16'-20'+
	Den/Lodge 2		Size 10'-15' Size 16'-20'+
2	Fresh Chew Sticks/ Harvested Branches / Felled trees	Fresh sign of naked sticks/branches. Count FRESH sticks within 10M streamside.	Quantity 15-30 signs Quantity 30+ signs
3	Fresh Food Cache 1	Appearance of 'clean' (no sticks/cuttings secured and usually close to the pond)	Med (30-75 cuttings) Large (75+ cuttings)
	Fresh Food Cache 2		Med (30-75 cuttings) Large (75+ cuttings)
4	Scent Mounts	Mudded, and debris (grass) can range small to very large visible sheen or distinct spots and note the size.	- Medium (11"-15" wide, 2"-5" height) - Large (15"+ wide, 5"+ height)
5	Fresh Feeding Benches	Favorite spots for feeding many of these close to pond residence/pond. Count All	
6	+ Dam Count and current Maintenance		


Oregon Beaver Sign and BRAT Form 2025 !

Beaver Activity


Take note of key beaver sign as you walk along your reach. Selecting "Yes" for a sign here will add it to your **Observations Panel**, which will stay pinned at the top of the form for easy access.




Are there beaver dams?
 Yes No




Are there dens and lodges?
What are dens and lodges?
 Yes No



Are there fresh chew sticks, harvested branches, or felled trees?
What do I look for?
 Yes No



Are there food caches?
What do I look for?
 Yes No



Are there fresh feeding benches?
What do I look for?
 Yes No

4 of 7

Low Activity Site ~ 10 minutes

High Activity Site ~ 30 minutes

KEY BEAVER SIGNS > DEN PRESENCE, FREQUENCY AND SIZE



Source: Gilliam SWCD

Look for a mass of sticks and mud, often constructed nestled within the root system of a large shrub or tree.

KEY BEAVER SIGNS > FORAGING AND FEEDING DEBRIS



KEY BEAVER SIGNS > SCENT MOUNDS



Look for a mass of mud and sticks, adjacent to stream. Look for oils and sometimes a strong odor.

KEY BEAVER SIGNS > FOOD CACHE/S



Look for a mass of young, and still barked and leafed sticks instream just outside of living quarters.

KEY BEAVER SIGNS > FEEDING & GROOMING BENCH/ES



Look for fresh forage debris (sticks, grasses)

KEY BEAVER SIGNS > DAM REPAIR / MAINTENANCE



Look for mudding, grasses and bright sticks at crest of the dam, upstream side.

SCORING BEAVER SIGNS

				** SCORING **		
				LOW	MED	HIGH
OCCUPANCY INTENT: Net New to BRAT Survey form (vs. already existing)	1 Den site/s (lodge or bank den)	A) Yes, but there's no current activity		5	5	5
		activity.	OR			
		Score for each Den.		10	10	10
		If current activity, Size Small		5		
		If current activity, Size Med			10	
		If current activity, Size Large				15
	2 Fresh chewed sticks/trees/aqua	Yes, low amounts (Quantity < 15 in reach)		5		
	(nearby sticks, grasses, aquatic ve	Yes, med amounts (15-30 floating sticks, grasses, etc)			10	
	yes/no	Yes, high amounts (30+ floating sticks, grasses, etc)				15
	3 Food cache/s (award pts for eac	Small, <30 cuttings		5		
yes/no	Med, 30-75 cuttings			10		
	Large, 75+ cuttings				15	
	IMPT: If strong aquatic veg source in pond (ex. cattails), how to adapt this?					
4 Scent mounds, if so, average siz	Small		5			
yes/no	Med			10		
	Large				15	
5 Fresh feeding benches	Quantity 1-2		5			
yes/no	Quantity 2-4			10		
	Quantity 5+				15	
6 Dam Count (Breached or intact)	Quantity 1-2		10			
(Do not count dams older than 2 y	Quantity 3-5			15		
	Quantity 6+				20	
	+ FOR DAM/S CURRENTLY MAINTAINED - 5 ADDITIONAL POINTS FOR EACH DAM (U					
			10	20	20	
			55	95	125	

2. Assess Quality and Occupancy of Existing Beaver Occupancy

SCORING THE 6 SIGNS FOR OCCUPANCY INTENT



Low, ephemeral, transitory. Beavers may be present for a matter of days to 1-2 weeks during exploration and dispersal, but haven't show interest to adapt the site into a more permanent residence.



More 'robust' occupancy, possible solo beaver or a new pair. Site Occupancy where one or possibly two paired Beavers are considering more permanent occupancy and family building in the season ahead, but not there yet. There may be a handful of smaller "scout dams" present, along with refuge holes and the beginnings of a den/lodge.

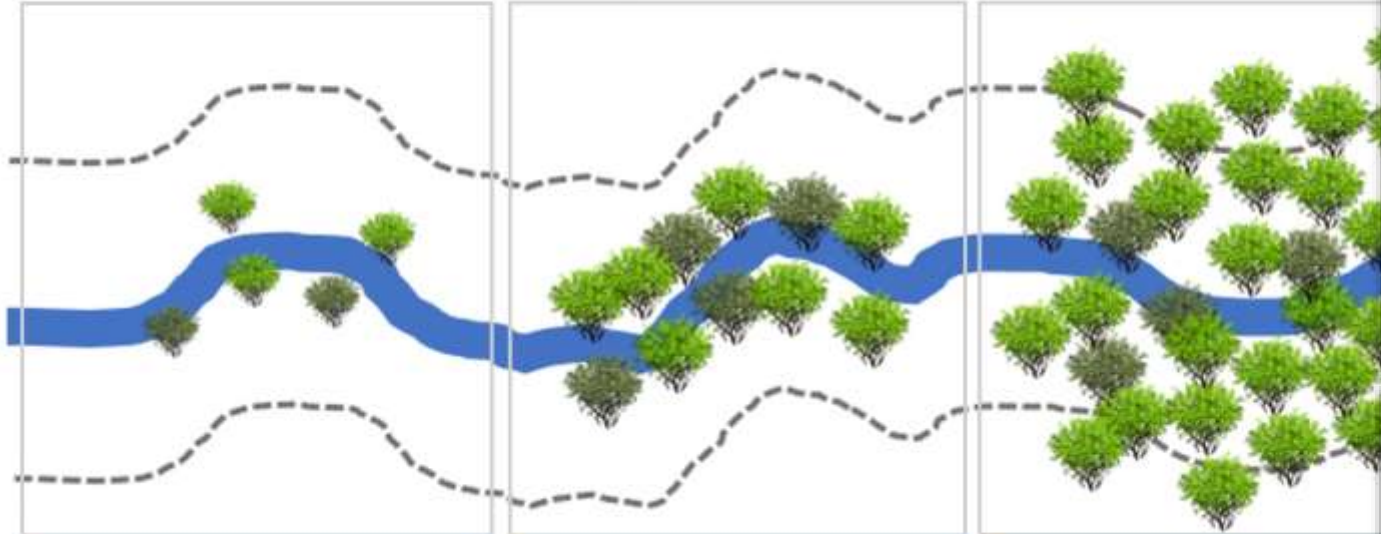


Definitely settled and Thriving. With young or in planning. Beavers are clearly settled in with much fresh harvesting and feeding benches, adding dams or expanding existing dams, and enlarging resident den/lodge(s).



3. Forage Quality and Abundance/Coverage

COVERAGE EXAMPLES (WILLOW, COTTONWOOD, ASPEN OR AQUATIC VEG)



LOW 0% - 20%

Small nascent starts, may be grazed. Or no obvious preferred veg at all.

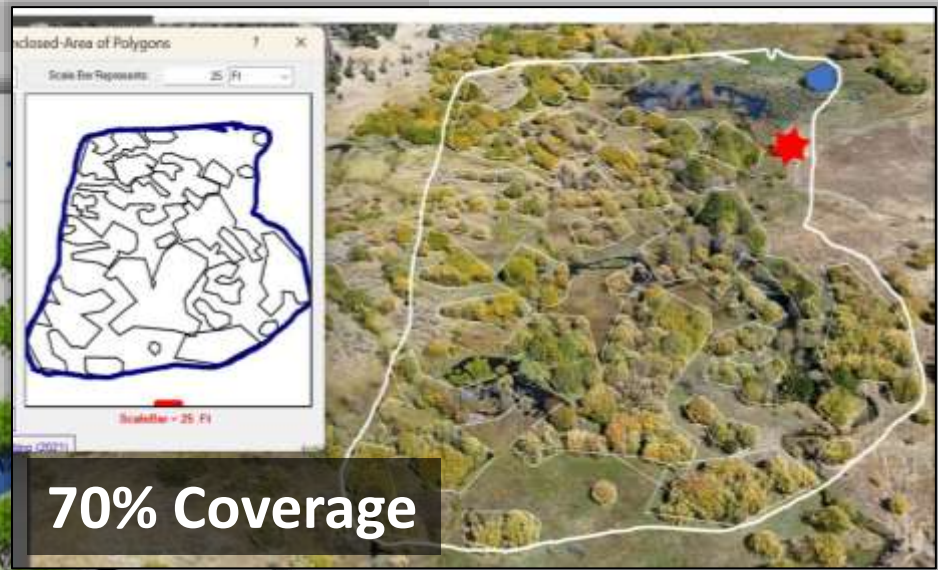
MEDIUM 21% - 40 %

“Beauty Strip”, 1 – 3 shrubs or trees deep off of streamside.

HIGH 40%+

Dense riparian shrubs or trees of varying ages.

Estimate the “Reach Average” of coverage density *throughout the reach*
 (Taken together the example above approximates ~20% to 25%)



70% Coverage



5% Coverage

+SCORING VEG COVERAGE

				** SCORING **		
FIELD VALUES				LOW	MED	HIGH
OCCUPANCY INTENT: Net New to BRAT Survey form (vs. already existing)	1 Den site/s (lodge or bank den)	A) Yes, but there's no current activity		5	5	5
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3 Food cache/s (award pts for eac	yes/no	Small, <30 cuttings	5			
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		Large, 75+ cuttings			15	
IMPT: If strong aquatic veg source in pond (ex. cattails), how to adapt this?						
4 Scent mounds, if so, average siz	yes/no	Small	5			
		Med		10		
		Large			15	
5 Fresh feeding benches	yes/no	Quantity 1-2	5			
		Quantity 2-4		10		
		Quantity 5+			15	
6 Dam Count (Breached or intact)		Quantity 1-2	10			
	(Do not count dams older than 2 y	Quantity 3-5		15		
		Quantity 6+			20	
+ FOR DAM/S CURRENTLY MAINTAINED - 5 ADDITIONAL POINTS FOR EACH DAM (U				10	20	20
BEAVER OCCUPANCY INTENT/SCORE				55	95	125
7 + Coverage - Forage availability (of preferred veg species, or abundant aquatic [ex cattails, see Hay Creek])		Low (0% to 20%)	-20			
		Med (Beauty Strip 21% to 50%)		0		
		High (coverage 50%+)			30	
	PERSISTENCE POTENTIAL *				35	95

2 & 3

Equals: The "Persistence Potential" of a Beaver Occupied Site



Low, ephemeral, transitory. Beavers may be present for a matter of days to 1-2 weeks during exploration and dispersal, but haven't show interest to adapt the site into a more permanent residence.



More 'robust' occupancy, possible solo beaver or a new pair. Site Occupancy where one or possibly two paired Beavers are considering more permanent occupancy and family building in the season ahead, but not there yet. There may be a handful of smaller "scout dams" present, along with refuge holes and the beginnings of a den/lodge.

HIGH OCCUPANCY INTENTION



Definitely settled and Thriving. With young on site, Beavers are clearly settled in with much foraging and feeding benches, adding dams or expanding existing dams, and enlarging resident den/lodge(s).

+ HIGH FORAGE COVERAGE (50+%)



SAMPLE SET CRW + OTHER FALL 2024



BUILDING THE WORKPLAN

STACKING THE LAYERS



- ✓ Geomorphology and stream power
- ✓ Infrastructure: (culverts, roads, irrigation infrastructure) and support
- ✓ Existing Site Occupancy Intent (Beaver Activity / Occupancy Assessment) Cross-reference datasets with:
 - a) Most Current ODFW Activity data (ABAS Protocol)
 - b) Remote satellite imagery, and
 - c) Conversations with the locals.
- ✓ Forage Quality and Abundance Coverage
- Prioritize landowner interest in beavers and restoration



“From the Pond View” Assessment and (Connectivity) Action Plan




2025-26

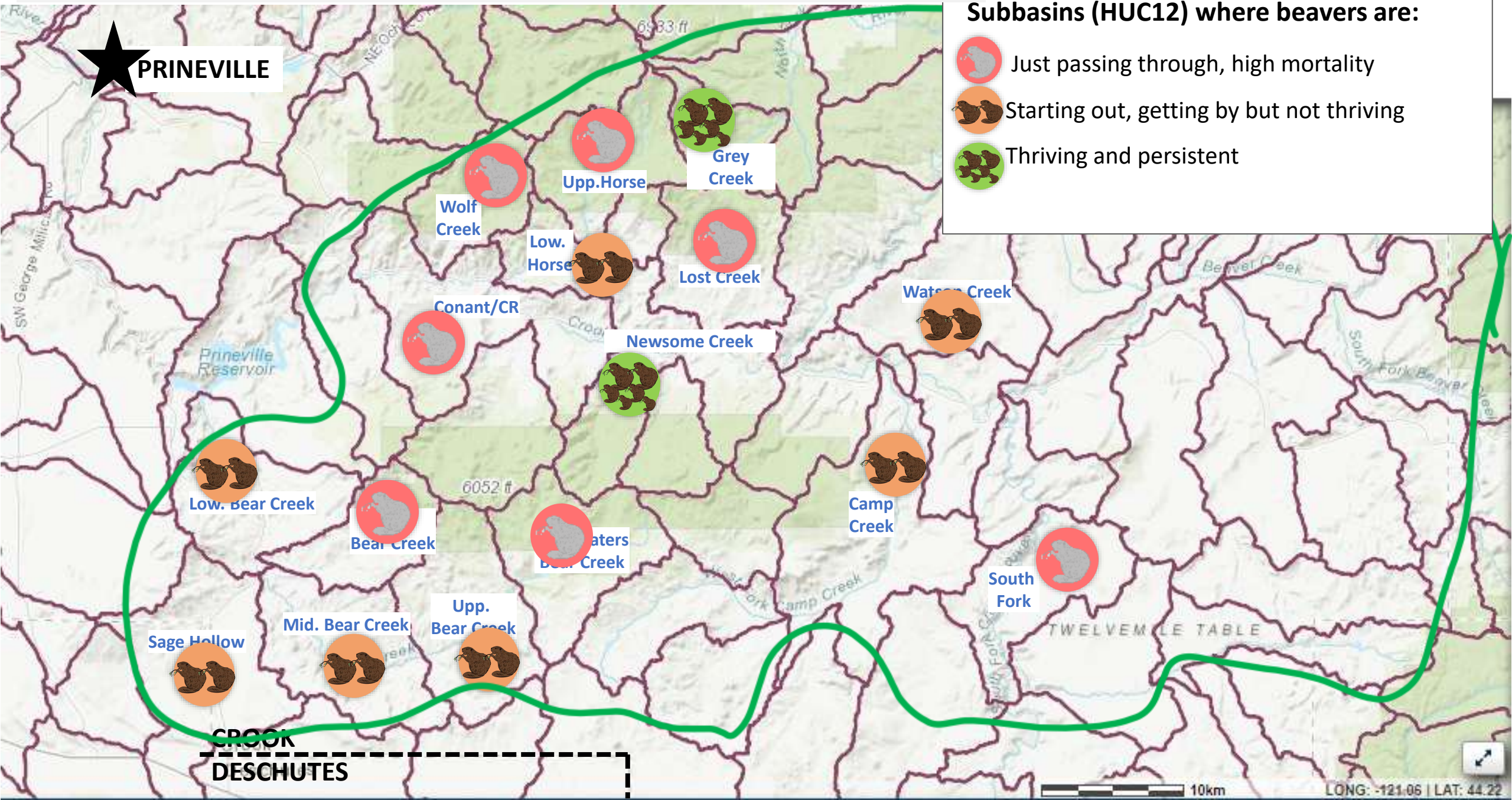


MAPPING BEAVER OCCUPANCY – UPPER CROOKED

★ PRINEVILLE

Subbasins (HUC12) where beavers are:

-  Just passing through, high mortality
-  Starting out, getting by but not thriving
-  Thriving and persistent



CROOK
DESCHUTES

10km

LONG: -121.06 | LAT: 44.22




MAPPING BEAVER OCCUPANCY – UPPER CROOKED

★ PRINEVILLE

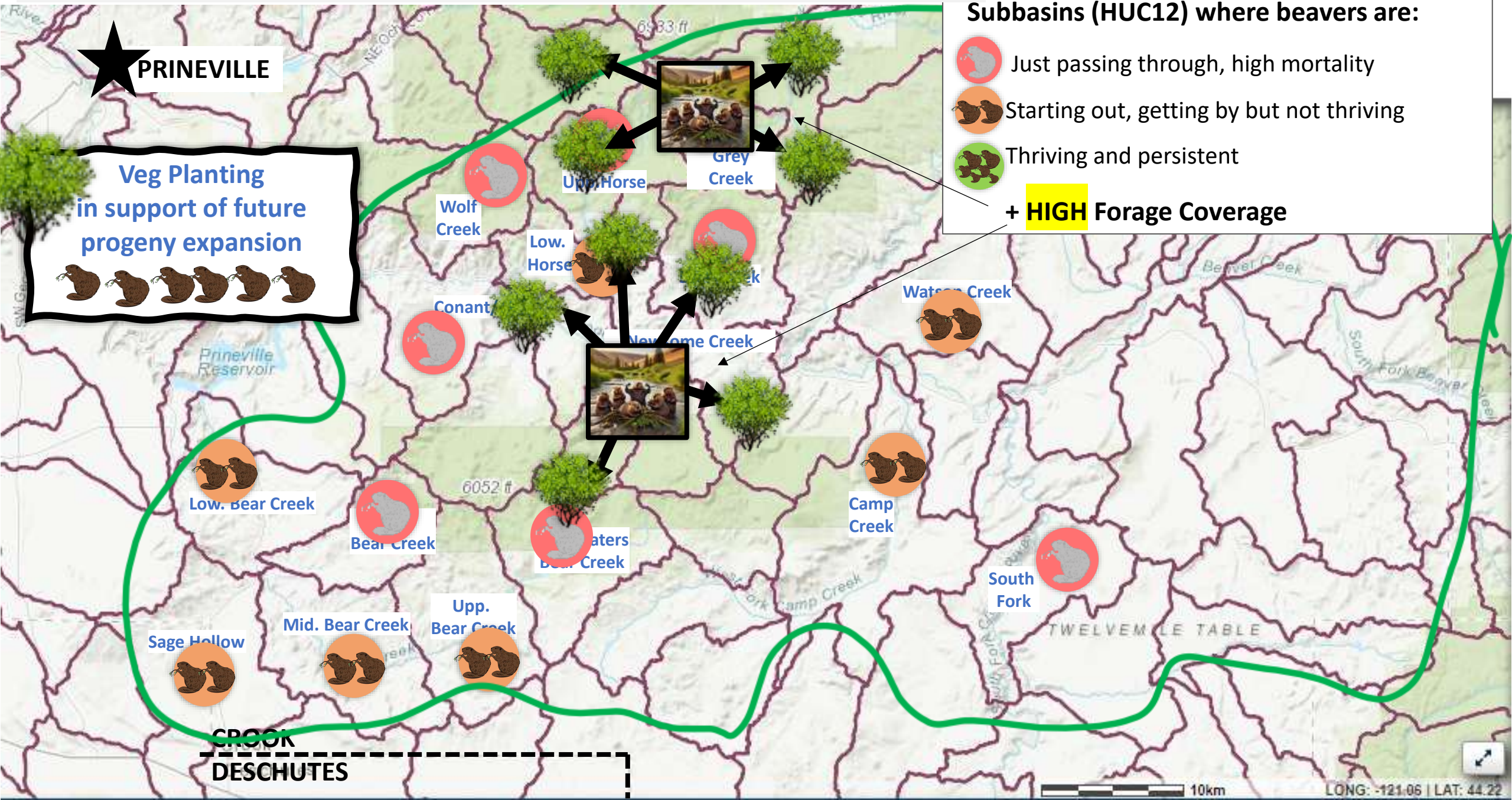
Veg Planting
in support of future
progeny expansion



Subbasins (HUC12) where beavers are:

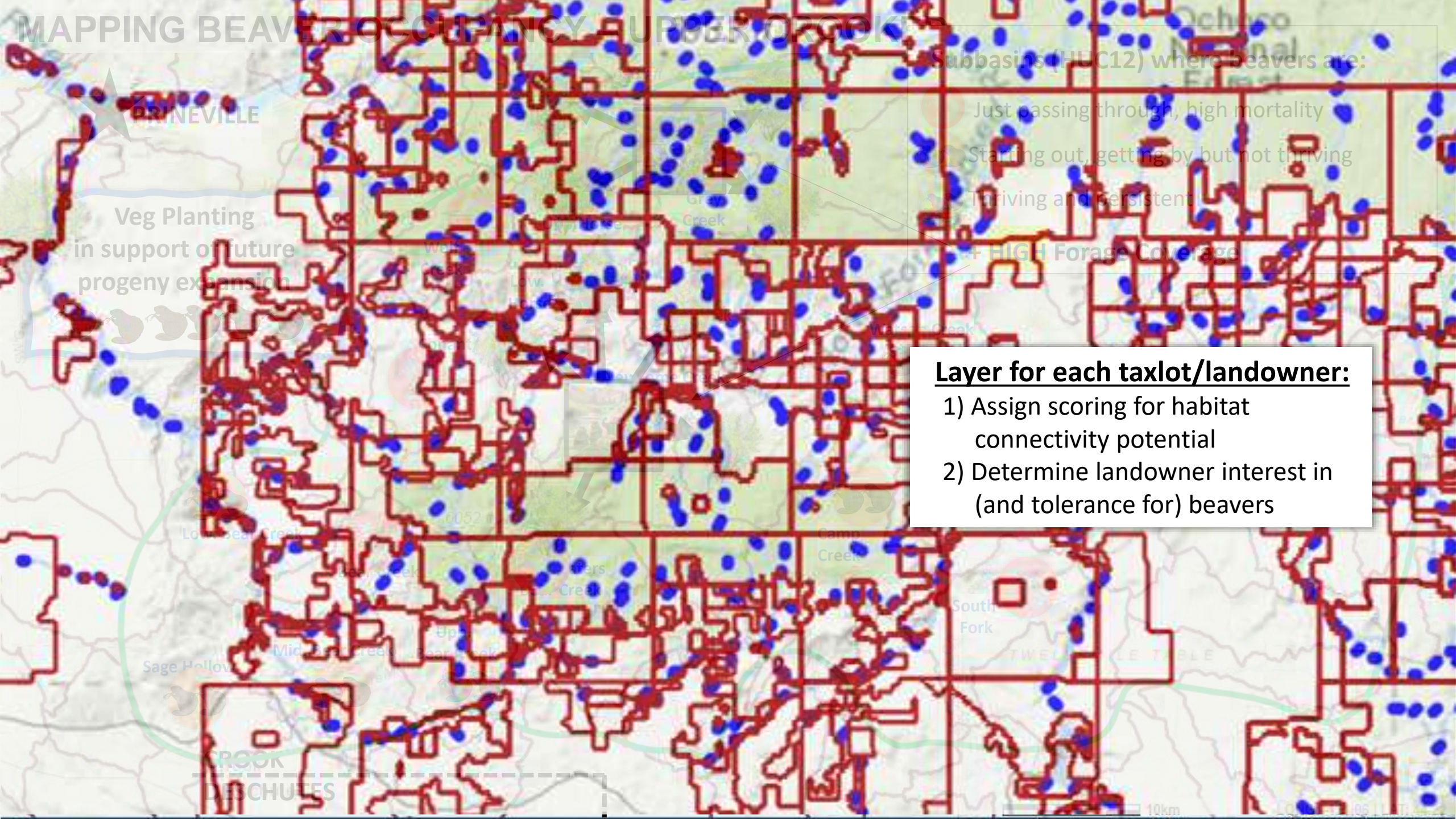
-  Just passing through, high mortality
-  Starting out, getting by but not thriving
-  Thriving and persistent

+ **HIGH** Forage Coverage





MAPPING BEAVER OCCUPANCY UPPER CROOK



Subbasins (HUC12) where beavers are:

- Just passing through, high mortality
- Starting out, getting by but not thriving
- Thriving and persistent

+ HIGH Forage Coverage

Layer for each taxlot/landowner:

- 1) Assign scoring for habitat connectivity potential
- 2) Determine landowner interest in (and tolerance for) beavers

WORKING THE PLAN



Early

- **Partner** and **community outreach** around the Action Plan, with vision boards and interactive mapping
- Landowner outreach **according to *highest connectivity potential***
- As needed, address beaver conflicts with mitigation services.

Ongoing

- **Fund and implement** according to strengthen Strongholds and dispersing progeny success.
- **Annual BS monitoring** with ABAS protocol, remote sensing/drone, on-site visits, and noninvasive camera trapping
- **Regularly Update and Adapt** the Workplan (as a living document)

WORKING THE PLAN



SPRING 2025

What's Happening.

Planning around the watershed is underway as we're looking to better understand beavers in the drainage, how their activities can be compatible with landowner goals, and how agencies can support landowner operations and interests around beavers.

LANDOWNER SUPPORT FOR THE CROOKED RIVER WATERSHED



Activities underway:

- Beaver Dam Analogues and keeping water on the land longer
- Forage gains through increased irrigation
- 'Beaver cheater' devices to address beaver problems
- Beaver Management Planning

To learn more, reach out:

Reese Mercer
541-362-1024
www.westernbeavers.org/crw

BEAR CREEK, PRINEVILLE – JULY

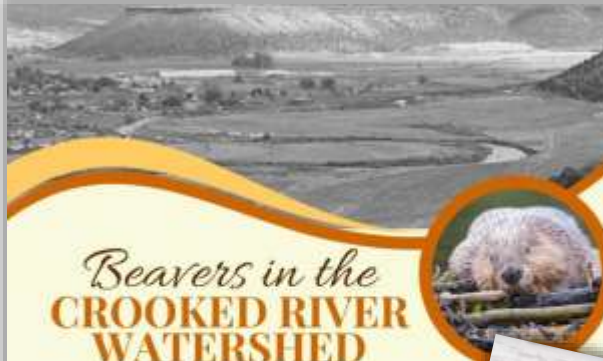
2014 – Before Beavers	2018 – Large Beaver Family
	

CROOKED RIVER WATERSHED COOPERATIVE
Est. 1964

Working to promote stewardship of the Crooked River Watershed and its resources.

WESTERN BEAVERS COOPERATIVE


Connecting ideas and people with beaver-focused resources, technical advice and support in Eastern Oregon.




Beavers in the CROOKED RIVER WATERSHED

Join us for an exciting presentation by Reese Mercer (Western Beaver Cooperative) and Lanny Carter (Bonnieview Ranch) and learn about the history of beavers in the region, restoration efforts, and current efforts to support both beavers and landowners.

Nov. 6, 2024 | 6pm
Bowman Museum
146 N. Main St. Prineville, OR





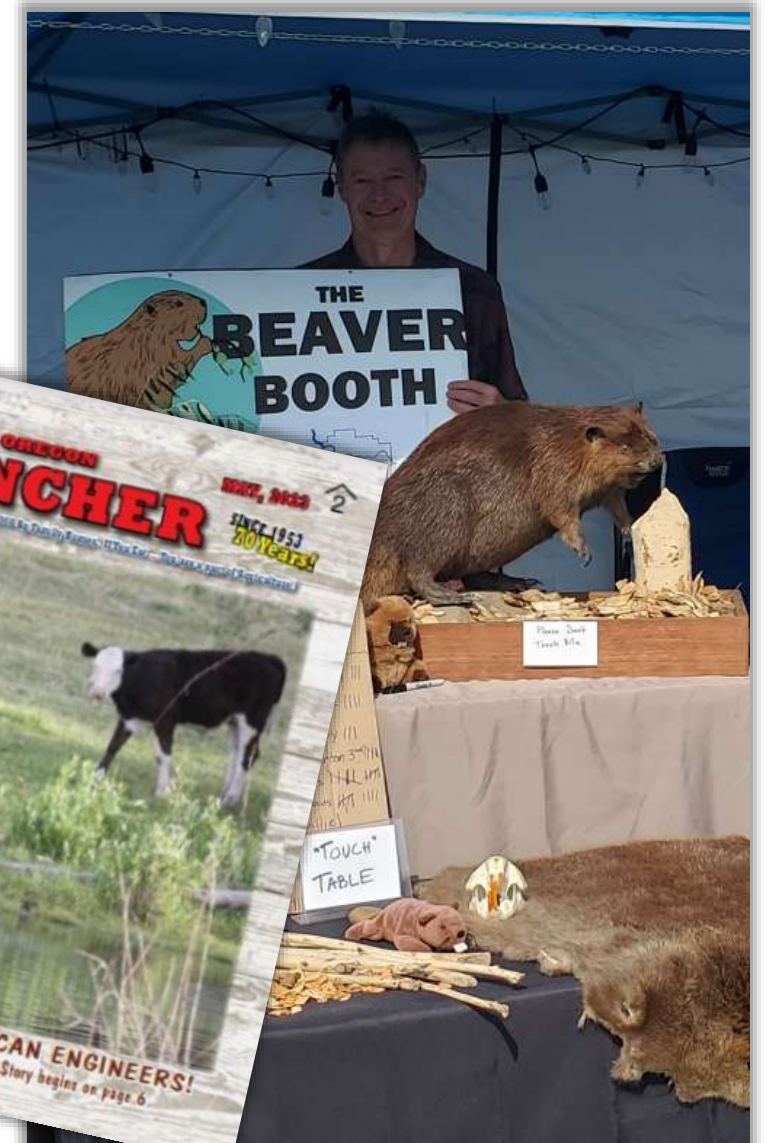
CENTRAL OREGON RANCHER

NOV. 2024

SINCE 1953 70 YEARS

BEAVERS ARE AMERICAN ENGINEERS!
Story begins on page 6

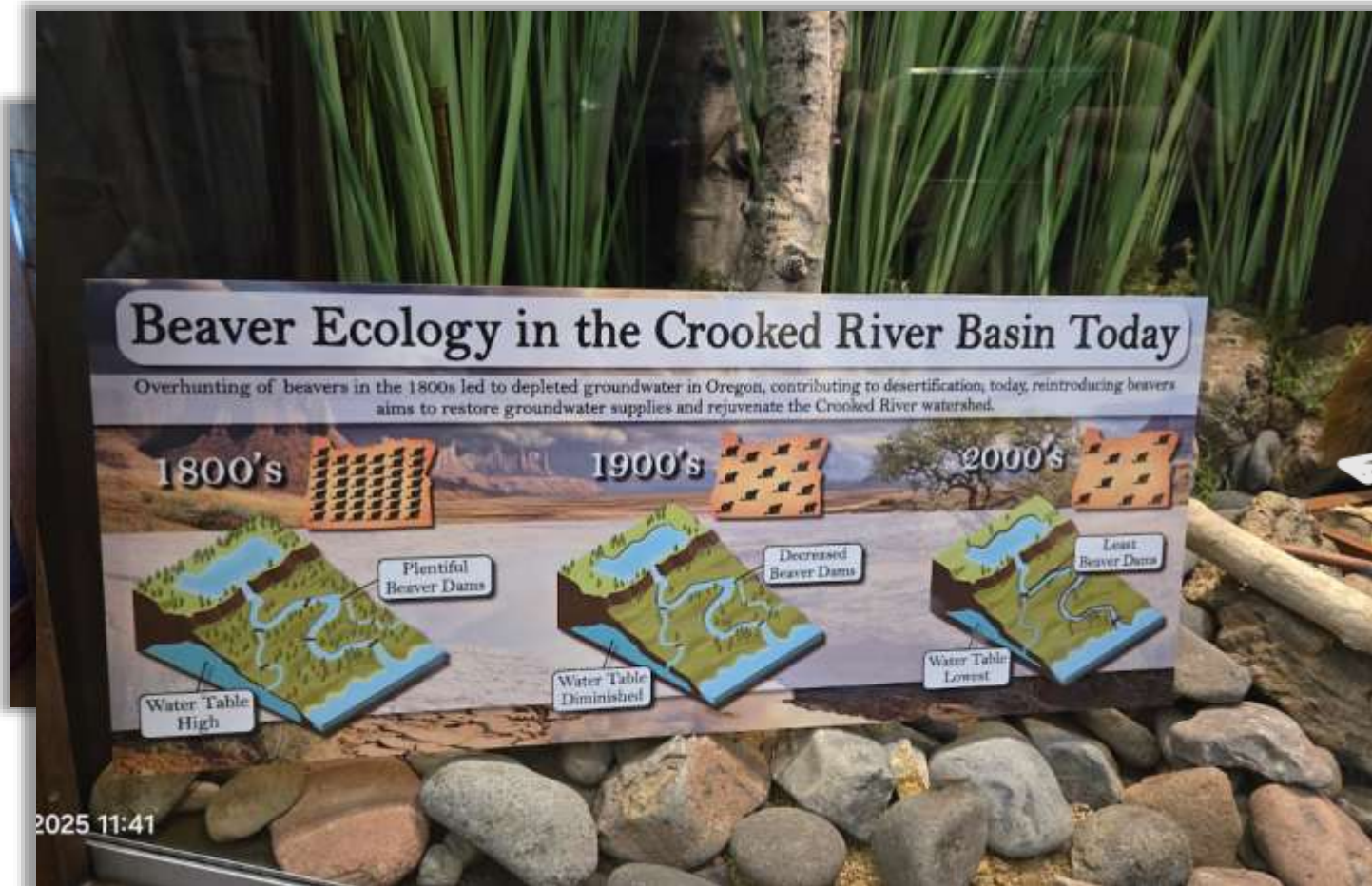
"TOUCH" TABLE



WORKING THE PLAN

COMMUNITY ENGAGEMENT

CROOK COUNTY, OREGON (BOWMAN MUSEUM NEW EXHIBIT)



WORKING THE PLAN



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





TAKEAWAYS

- Consider ‘the pond view’ in your planning with Beaver Strongholds as a foundation
- *Our job* is to defend and support these Strongholds connecting habitat for progeny expansion
- Get to know better your local beavers



THANK YOU

Contact:
reese@westernbeavers.org

More at:
www.westernbeavers.org/connect2025