PARTNERING WITH BEAVER IN RIVER RESTORATION

Western Box Elder CRM Meeting
September 15, 2015

Elijah Portugal
Wally Macfarlane
Joe Wheaton

UtahState University
DEPARTMENT OF WATERSHED SCIENCES

Partnering with beaver in restoration

I. **Introduction and overview**

II. Beaver ecology & dam building basics

III. Management, conservation & restoration planning

IV. Living with beaver strategies

V. Grouse Creek Beaver Assisted Restoration Project

VI. Questions/Comments?

We offer 2-3 day workshops on beaver restoration

PARTNERING WITH BEAVER IN RESTORATION

RESTORATION WORKSHOP

UtahState University DEPARTMENT OF WATERSHED SCIENCES

ICRRR

Website: http://beaver.joewheaton.org/

Upcoming Workshop in October in Logan for the USFS:

Tons of other resources on the website:

Beaver Restoration Guidebook published by USFWS:

http://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Documents/BRG%20v.1.0%20final%20reduced.pdf

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Beaver as a restoration agent

We are here to learn a bit about beaver, restoration strategies using beaver and techniques to deal with nuisance behavior

- To do this, we need to:
  - Know a bit about beaver biology/ecology
  - Focus on their role as ecosystem engineers (dam building)
  - Understand where in the landscape such strategies makes sense

From http://thestickytongue.org/

From http://eol.org/data_objects/5898738

The hope is…

- Beaver can
  - Help us restore many of our degraded streams & rivers for less $ than traditional methods
  - Help to retain more water longer, higher up in watersheds (combat drought)
  - Potentially increase forage production by more water on the floodplain

From:
http://www.wildearthguardians.org/site/PageServer?pagename=priorities_wild_places_jemez_mountains_beavers

But lets not forget they can be pests!

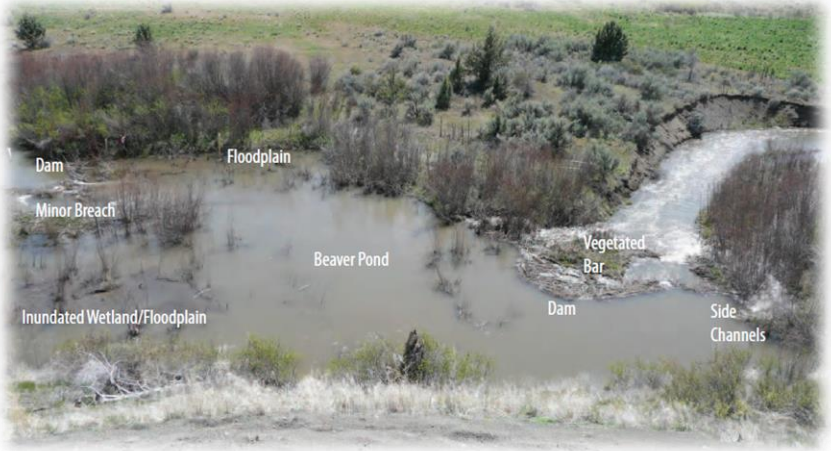
- In residential areas they can cause flooding…
- They often block culverts, which can flood roads
- They can chop down our ornamental landscape trees
- They can make a mess of irrigation diversions

II. BEAVER ECOLOGY & DAM BUILDING

I. **Bit of Beaver Biology**

II. Why do Beaver Build Dams?

III. Beaver Ecology -> Eco-geo-hydro feedbacks

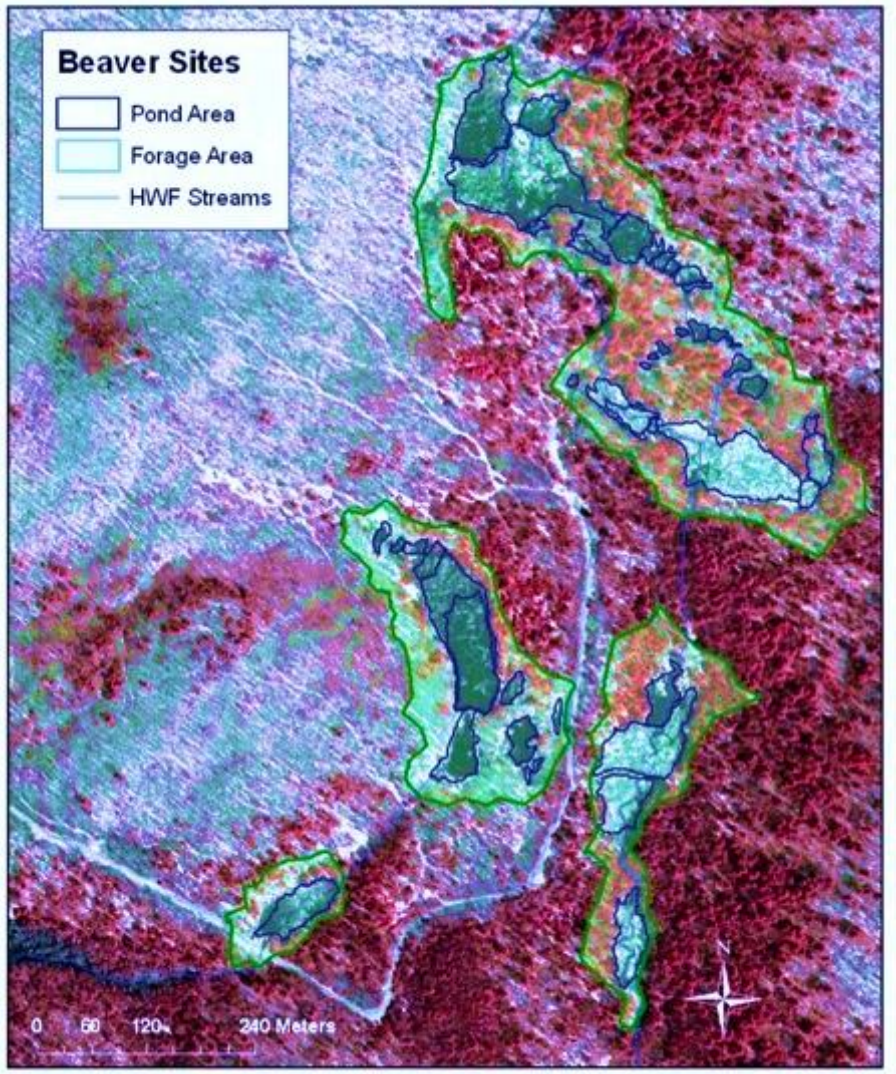


Bridge Creek © Wheaton

From: http://www.howstuffworks.com/beaver-dam.htm

THE COLONY

- Colony unit = 6–8 related individuals
- Avg. litters = 2–5 kits
- Young stay with parents at least 2 years
- Adults (>2 yrs) disperse to establish new lodge



A HABITAT GENERALIST, AND HIGHLY ADAPTABLE

- Lakes
- Rivers and streams
- Abandoned channels on floodplains
- Wetlands


Pierre Côtacute


California Academy of Sciences

Slide from John Stella

UtahState University
DEPARTMENT OF WATERSHED SCIENCES

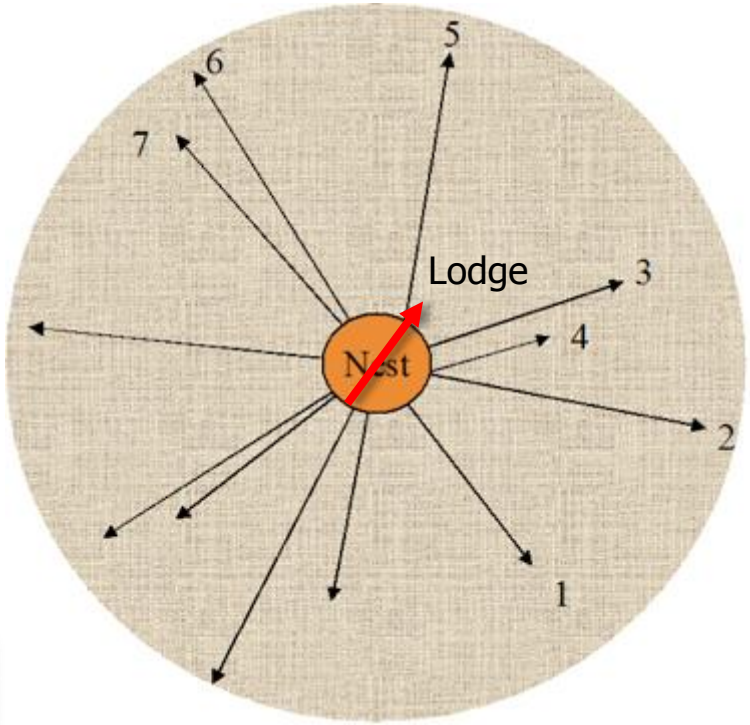
WHAT DO BEAVER EAT?

Photo: C. Demers, SUNY-ESF

- Spring/Summer: herbaceous plants, incl. aquatic and riparian forbs, grasses, grains and row crops
- Fall/Winter: tubers, bark and cambium of cached woody plants
- Woody plants comprise ~85% of winter diet; ~15% of summer diet

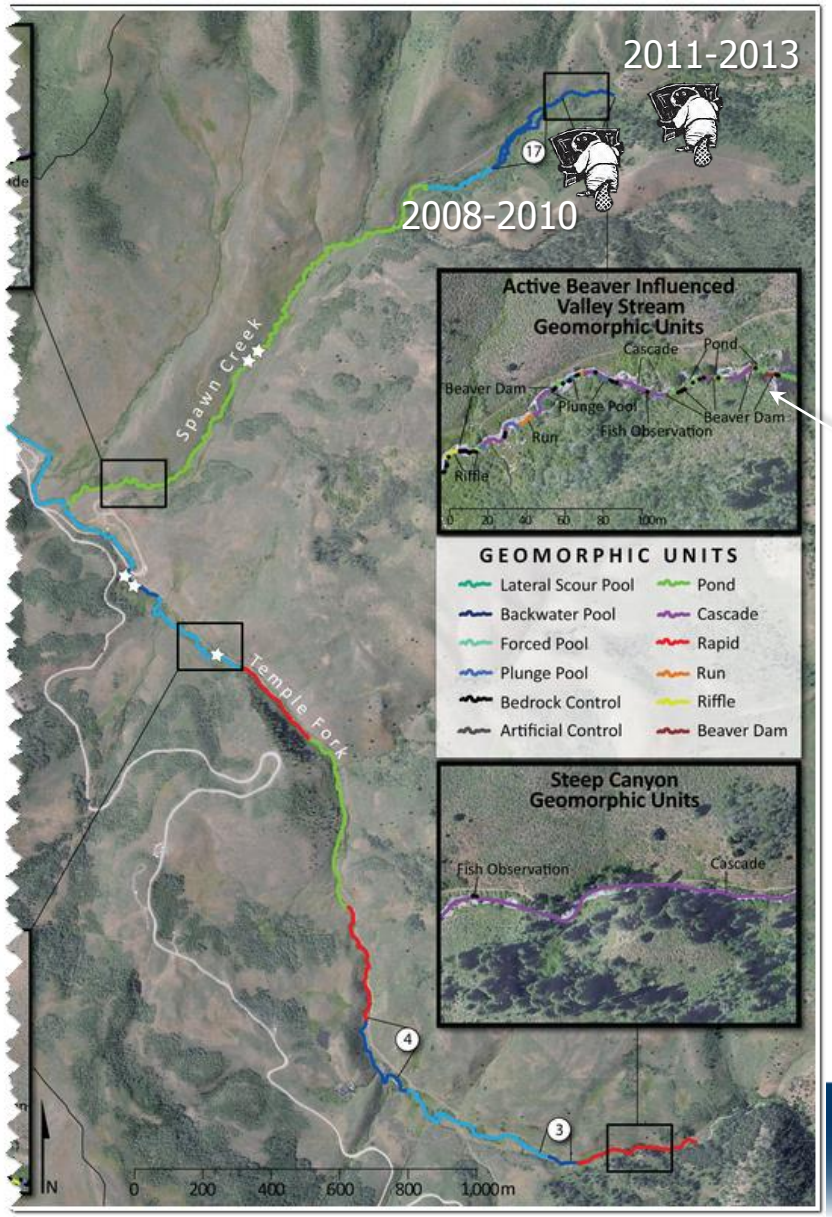
A CLASSIC 'CENTRAL PLACE' FORAGER

- Forage from lodge
- Preferences depend on what is available (aspen, willow, cottonwood, alder)
- 100m or less from water

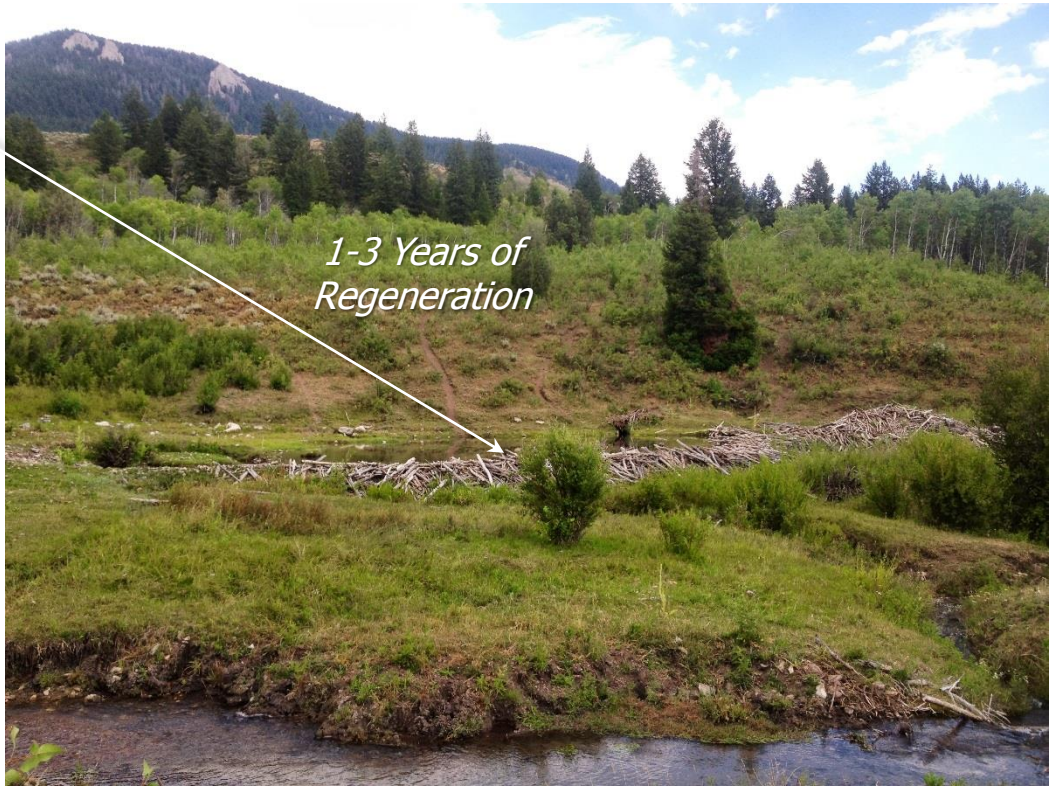


Nicola Plowes, ASU

BEAVER ARE LIKE ROTATIONAL CROP FARMERS



- They will *selectively* work an area hard for 2-3 years
- Then let it lay fallow and move upstream or downstream



1. BEAVER ECOLOGY & DAM BUILDING

I. Bit of Beaver Biology

II. Why do Beaver Build Dams?

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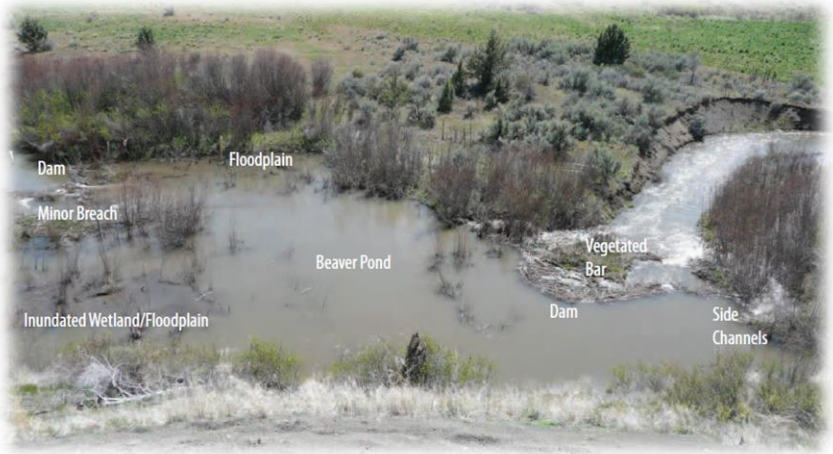
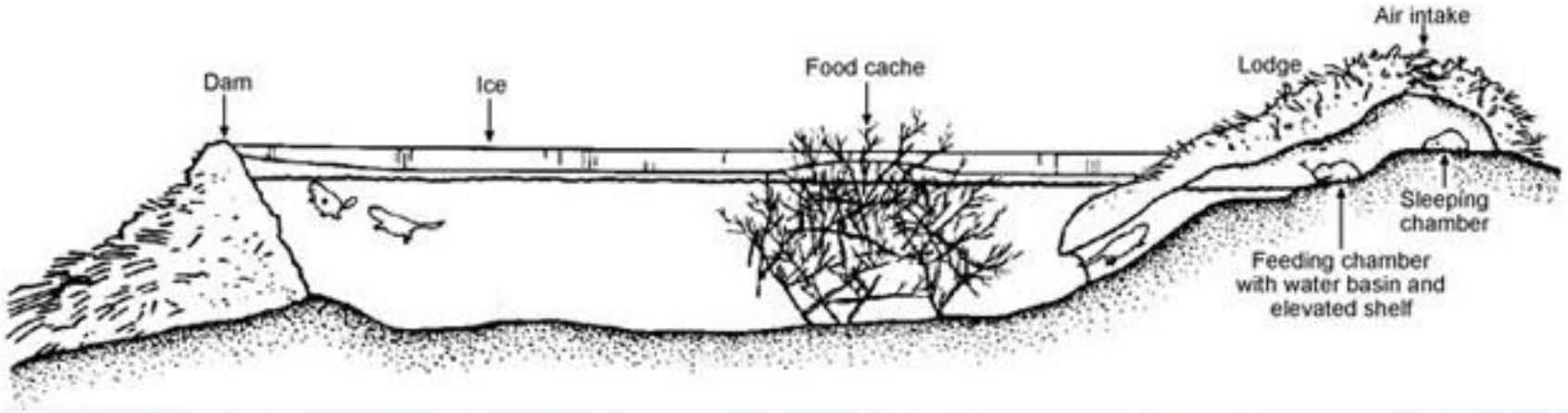


Bridge Creek © Wheaton

From: http://www.howstuffworks.com/beaver-dam.htm

SO WHY DO THEY BUILD DAMS?



AQUATIC HABITAT IS CRITICAL TO THEIR SUCCESS

- Beaver more agile in water than on land; maximize time in the water
- Ponds provide cover from predators and foraging pathways
- Lodge includes underwater entrance, nest area above water

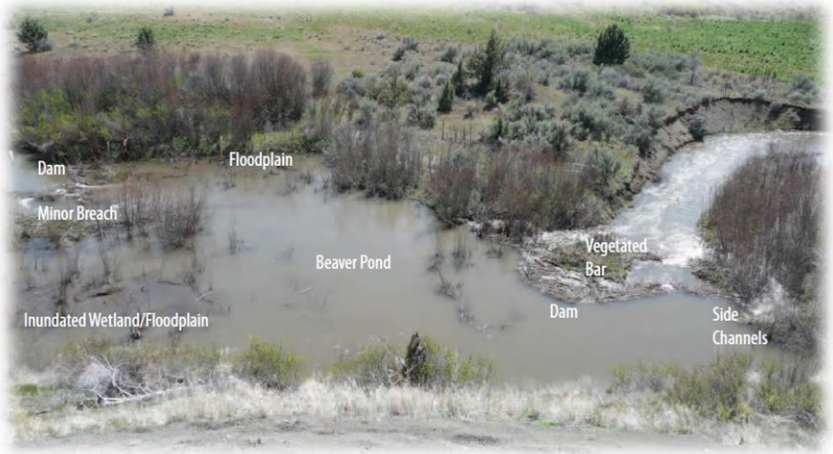
1. BEAVER ECOLOGY & DAM BUILDING

I. Welcome & Objectives

II. Bit of Beaver Biology

III. Why do Beaver Build Dams?

IV. Beaver Ecology -> Important feedbacks



Bridge Creek © Wheaton

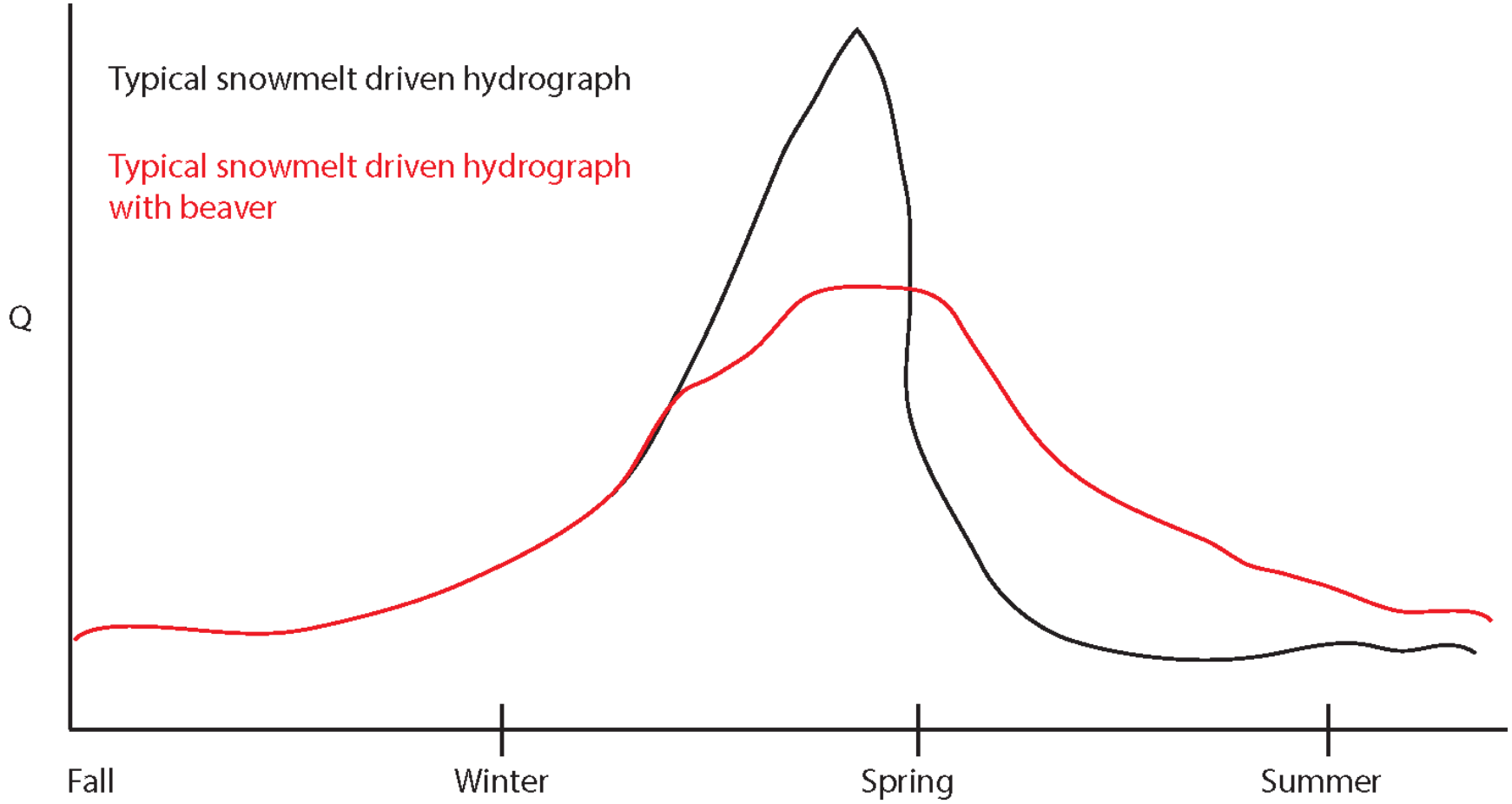
From: http://www.howstuffworks.com/beaver-dam.htm

BEAVER BLUR BOUNDARIES

In blurring boundaries between rivers, wetlands and uplands, they expand riparian zones!

BEAVER CHANGE HYDROLOGY

Beaver dams reduce the peak flow and spread out the tail of the annual hydrograph



PERCEIVED + IMPACTS OF DAM BUILDING

- Slow snowmelt runoff
- Create ponds, wetlands & critical habitat for fish, amphibians, small mammals, vegetation
- Increased groundwater recharge/ elevated water tables **-> Increased forage production**
- Increased Large Woody Debris
- Change timing, delivery and storage of water, sediment and nutrients

Bird et al. 2011:
http://www.wildearthguardians.org/site/DocServer/Beaver_and_Climate_Change_Final.pdf?docID=3482

TAKE AWAYS…

- Beaver need water and wood… not dams
- Where streams or rivers don't provide habitat they need, they build dams (ecosystem engineers)
- The impacts of their dam building are what have the biggest feedbacks on:
  - Hydrology (timing & magnitude)
  - Hydraulics (flow depth & velocity)
  - Water Quality (temp & chemistry)
  - Geomorphology (landforms left behind)
  - Habitat for a plethora of aquatic, riparian & upland biota (flora & fauna)

Management conservation & restoration planning

I. **Let's not forget, they are pests!**

II. Living with Beaver?

III. Restoration by Rodents?

IV. Where? Meet the BRAT

V. Take Homes…

In some places… they are a nuisance

- In residential areas they can cause flooding…
- They often block culverts, which can flood roads
- They can chop down our ornamental landscape trees
- They can make a mess of irrigation diversions

STUTLER & STUTLER

BEAVER BUSTERS

Dynamite doesn't work for long..

- A common response to nuisance beaver dam building is to blow the dam up

- The dynamite is effective at breaching dam…

- But, the beaver are persistent, they can rebuild a dam in a night or two

Lethal trapping

- Lethal trapping is very common (and legal)
- Sometimes effective at temporarily alleviating problems IF all beaver are trapped out
- However, very hard to actually trap ALL beaver

Management, conservation & restoration

I. Let's not forget, they are pests!

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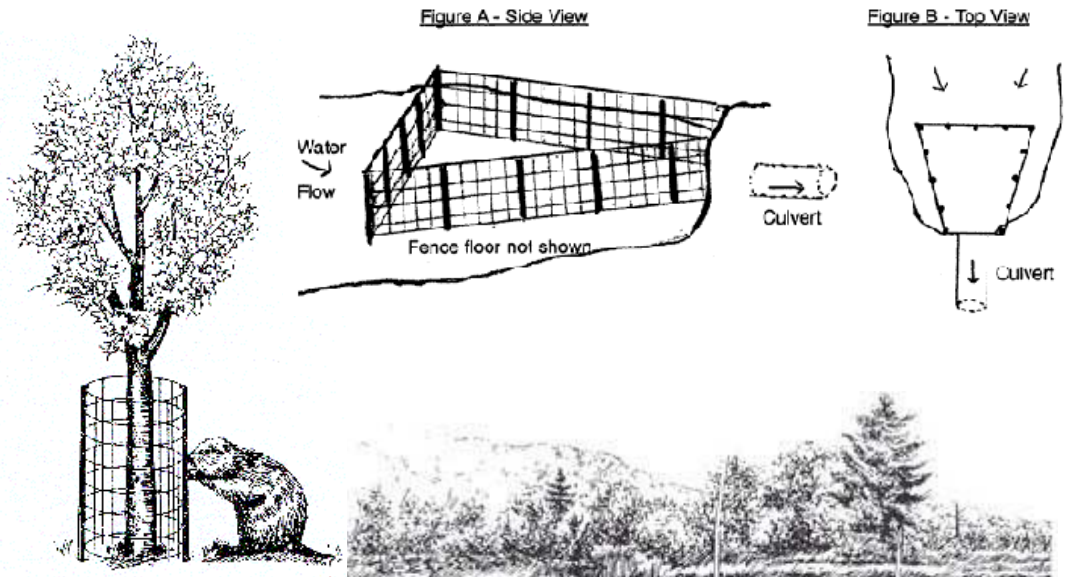
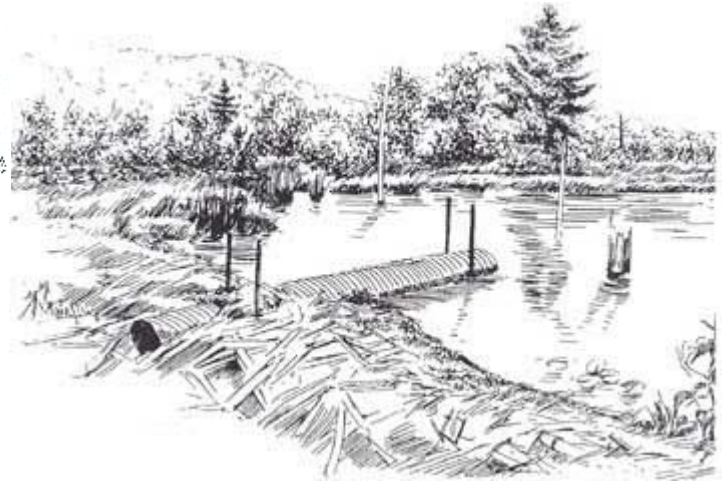
Living with beaver strategies…

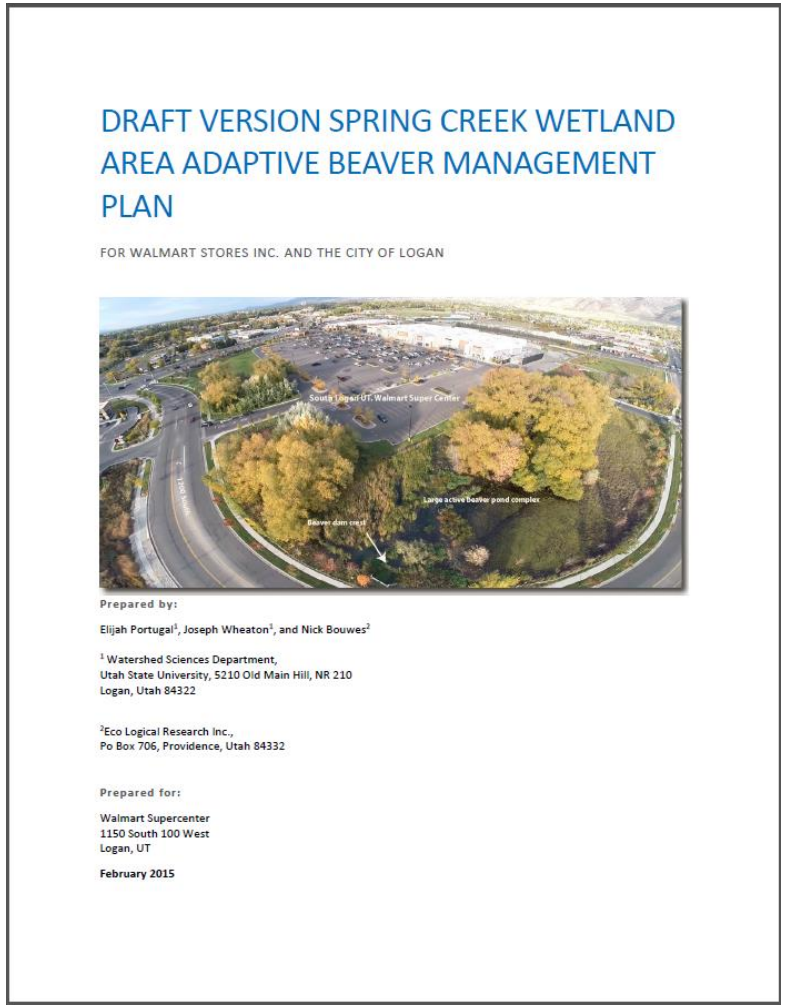
- Is problem real or perceived?
- If real:
  - ‘Beaver Deceivers’
  - ‘Pond Levelers’
  - ‘Caging’ trees
  - All require $$ and maintenance
- If those don’t work, live trap and relocation





Beaver Management Plans

- Balance the needs of landowners with the benefits that beaver provide
- Common sense solutions to beaver nuisance behavior
- Will develop a plan like this for Grouse Creek



DRAFT VERSION SPRING CREEK WETLAND AREA ADAPTIVE BEAVER MANAGEMENT PLAN

FOR WALMART STORES INC. AND THE CITY OF LOGAN

Prepared by:

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Prepared for:

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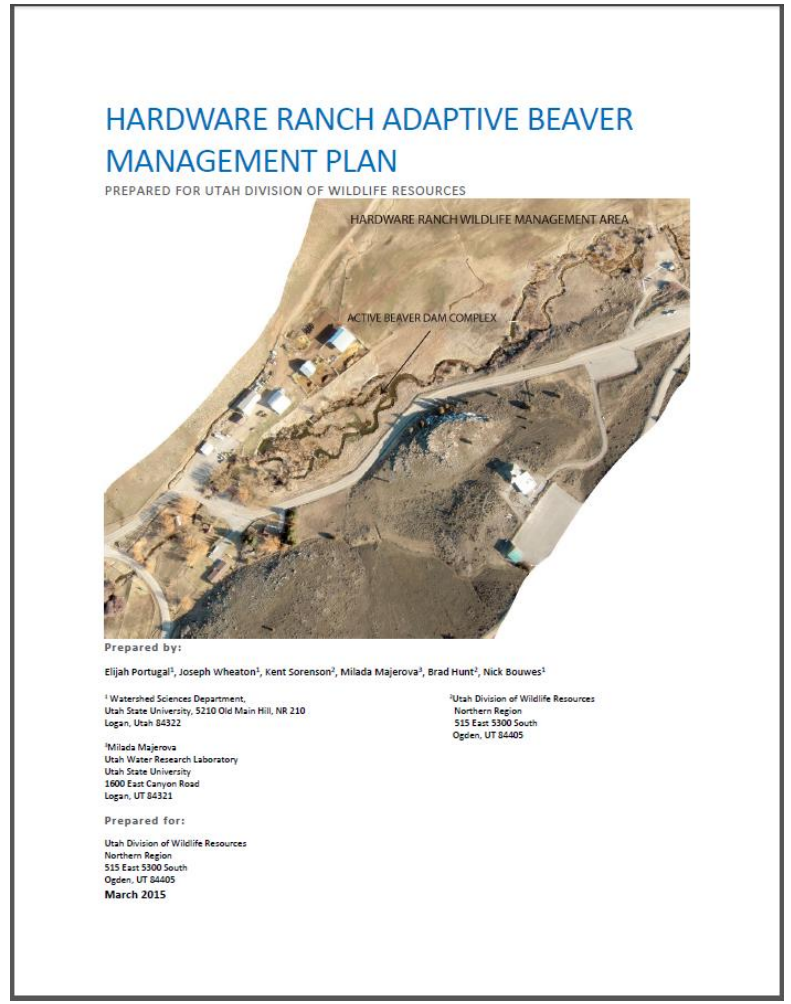
1150 South 100 West
Logan, UT

February 2015



HARDWARE RANCH ADAPTIVE BEAVER MANAGEMENT PLAN

PREPARED FOR UTAH DIVISION OF WILDLIFE RESOURCES

Prepared by:

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Prepared for:

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March 2015

MANAGEMENT, CONSERVATION & RESTORATION

I. Let's not forget, they are pests!

II. Living with Beaver?

III. Restoration by Rodents?

IV. Where? Meet the BRAT

V. Take Homes…

Biological condition of streams in the west

- Over half of wadeable streams in the west are in **fair** or **poor** condition

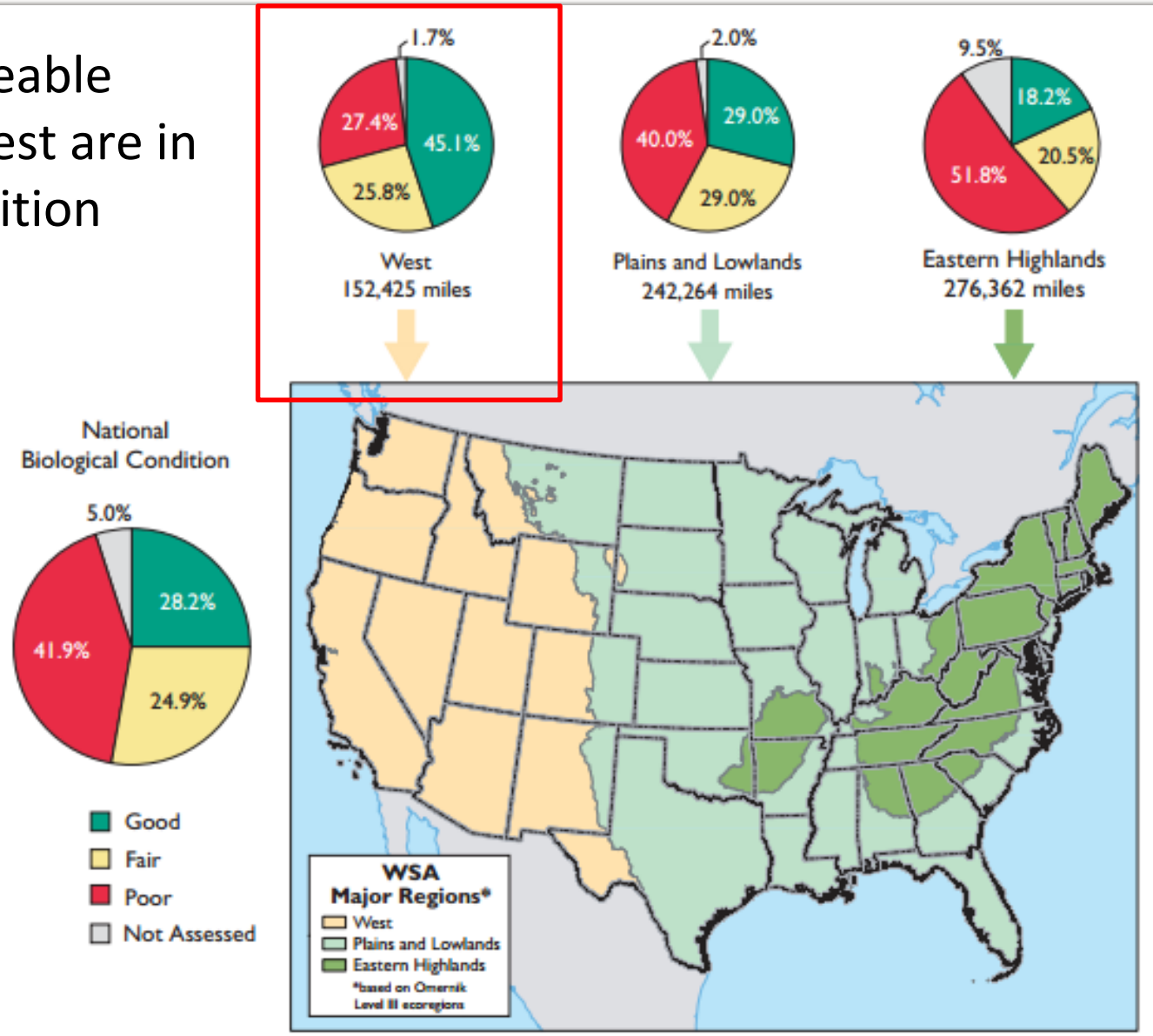

Figure ES-1. Biological condition of wadeable streams (U.S. EPA/WSA).

USEPA, 2006. Wadeable Streams Assessment, Office of Research & Development, Office of Water, United States Environmental Protection agency, Washington D.C., pp. 113.

Letting beaver do restoration is not new

- As early as 1930s, beaver used as conservation tool
- Logic is simple… just take nuisance beaver and relocate them where we want their ecosystem engineering expertise

Airborne Beavers Fight Floods

OUT in Idaho, the Department of Fish and Game is teaching eager beavers to yell "Geronimo!" These busy little creatures are being dropped by parachute to terrain where they can do their bit in the conservation battle.

Idaho state caretakers trap unwanted beavers which may be a nuisance in certain areas, round them up at central points and pack them in pairs in specially constructed wooden crates. After they are dropped, the boxes remain closed as long as there's some tension on the parachute shrouds but pull open as soon as the chute collapses on the ground. Then, out crawl Mama and Papa beaver, ready to start work.

After they're settled, the 40-pound, web-footed rodents multiply and become outpost agents of flood control and soil conservation. Fur supervisor John Smith reports that in carefully observed early operations, the beavers headed straight for water and started building a new dam within a couple of days.

However, one problem still remains to be solved—a question of ethics more than conservation. *Are these eager beavers bona fide members of the Caterpillar Club?* •

1. Boxed for travel, this beaver is placed in a crate designed by Scotty Heter, left. 2. Rubber bands pull the box apart when the chute hits the ground, freeing the animals. 3. Heading for water, the airborne beavers start working like beavers on their new dam.

147

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By JOEL MILLMAN

August 30, 2011

Clyde Woolery wants his beavers back.

Mr. Woolery's ranch on Beaver Creek outside Kinnear, Wyo., has been beaver-free for decades, but he could sure use their help now. A small beaver colony, he says, would engineer dams that raise the water table under his pastures, opening up drinking holes for his cattle.

The Beaver Solution Team live traps beavers on properties where they are causing damage and relocates them to areas where they can [illegible]

So the 64-year-old rancher put himself on a waiting list this year hoping state officials would bring him a beaver or two. Wyoming's Game and Fish Commission periodically plucks the rodents from drainage culverts.

It's a bit of a turnabout in these parts, where beavers have long been considered something of a nuisance—blamed for

npr

Beavers Offer Solution to Climate Change

by DAVID MALAKOFF

May 03, 2008 4:00 PM

Listen to the Story

All Things Considered

In the Southwest U.S., biologists are talking about returning beavers to rivers they once inhabited in order to fight droughts — which are expected to get worse as the globe warms. Beaver dams create great sponges that store lots of water.

Transcript

At least 6 types of ‘beaver’ restoration

I. Conservation / Promotion (leave them alone)
II. Accidental Restoration
III. Transplant to area with suitable capacity
IV. Restore riparian -> Followed by Transplant
V. Help beaver out – Beaver Dam Analogues
VI. Mimic Beaver

MANAGEMENT, CONSERVATION & RESTORATION

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Dam-building capacity modeling

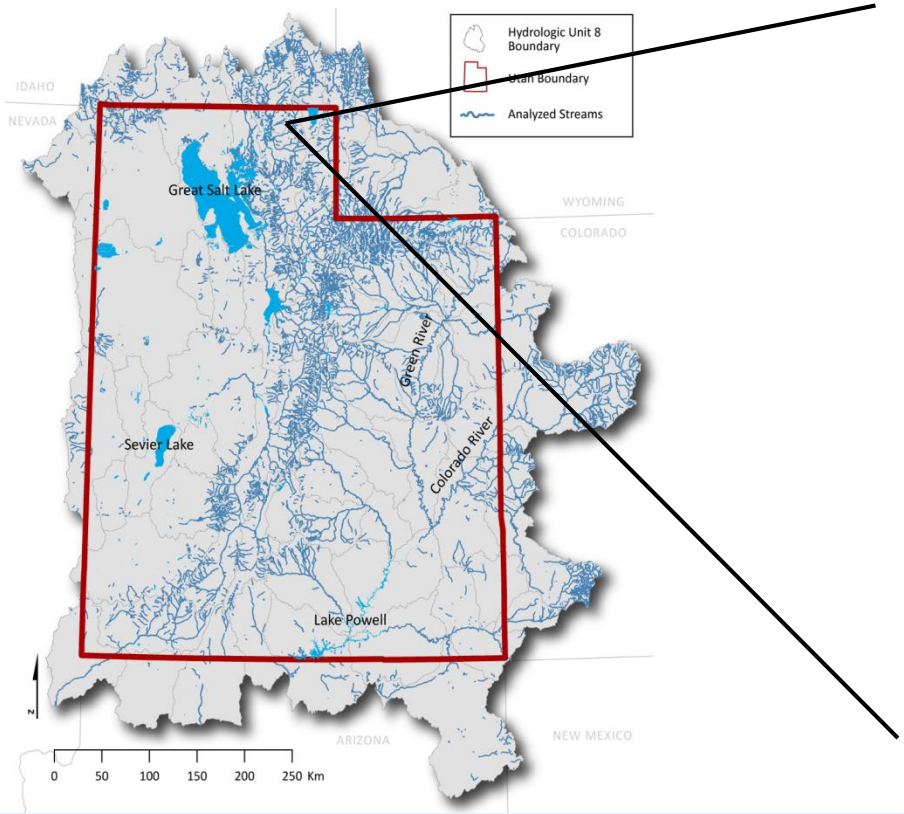
- **Beaver dams,** not beaver themselves, provide the positive feedbacks we seek

- While beaver can survive in a wide range of conditions, **where they build dams is more limited**

- Dam building activity varies dramatically according to **flow regime** & **availability of dam building materials**

BRAT: Beaver Dam Capacity Model

- Resolves **where** and at **what level** (within a drainage network) **beaver dams** can be built and sustained.

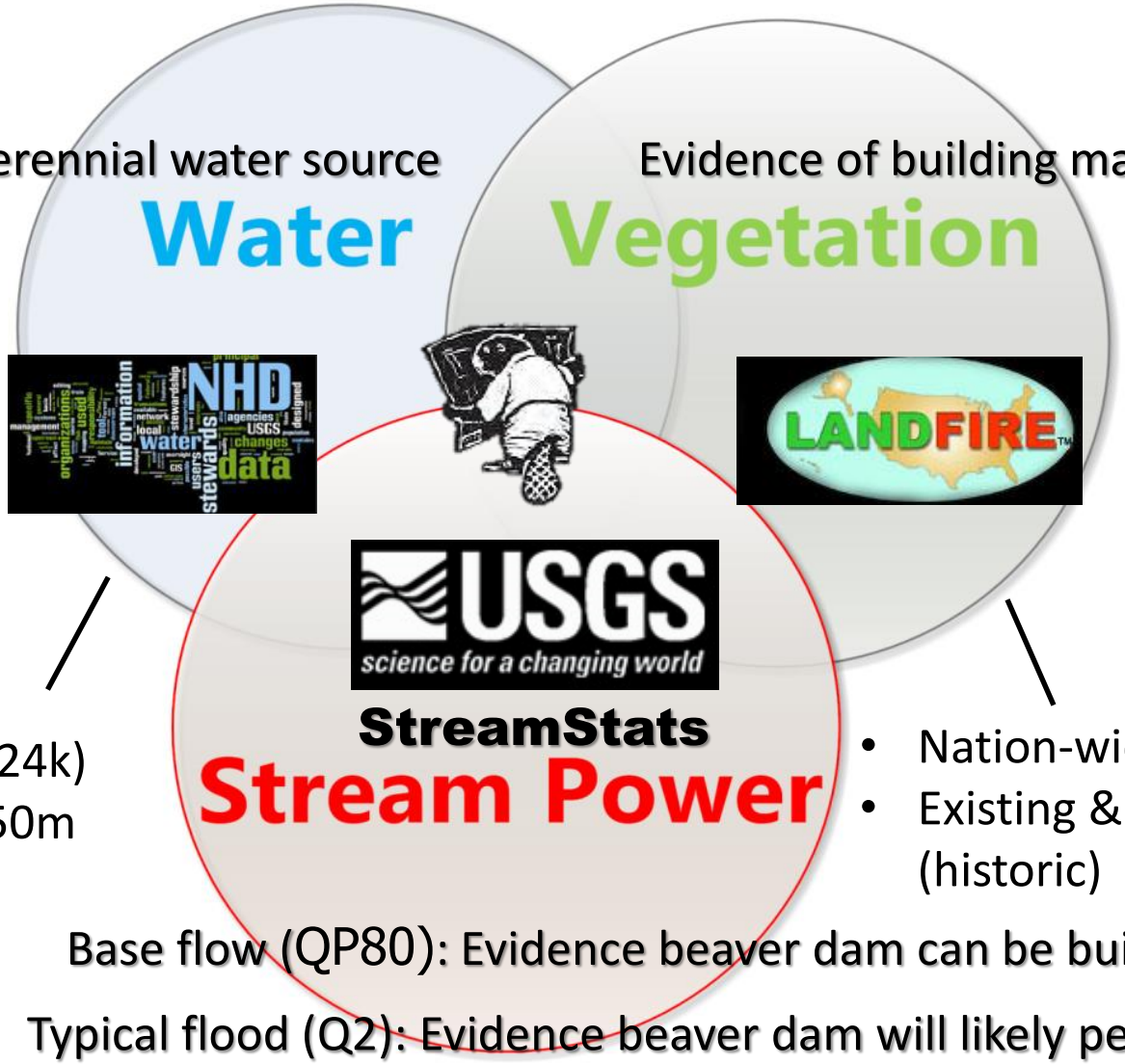


Two main components:

1. **Beaver dam capacity model**
2. Decision support and planning tools

http://brat.joewheaton.org

Model inputs, lines of evidence & data sources



- Nation-wide (24k)
- Subset into 250m reaches

- Nation-wide (30-m)
- Existing & potential (historic)

Base flow (QP80): Evidence beaver dam can be built

Typical flood (Q2): Evidence beaver dam will likely persist

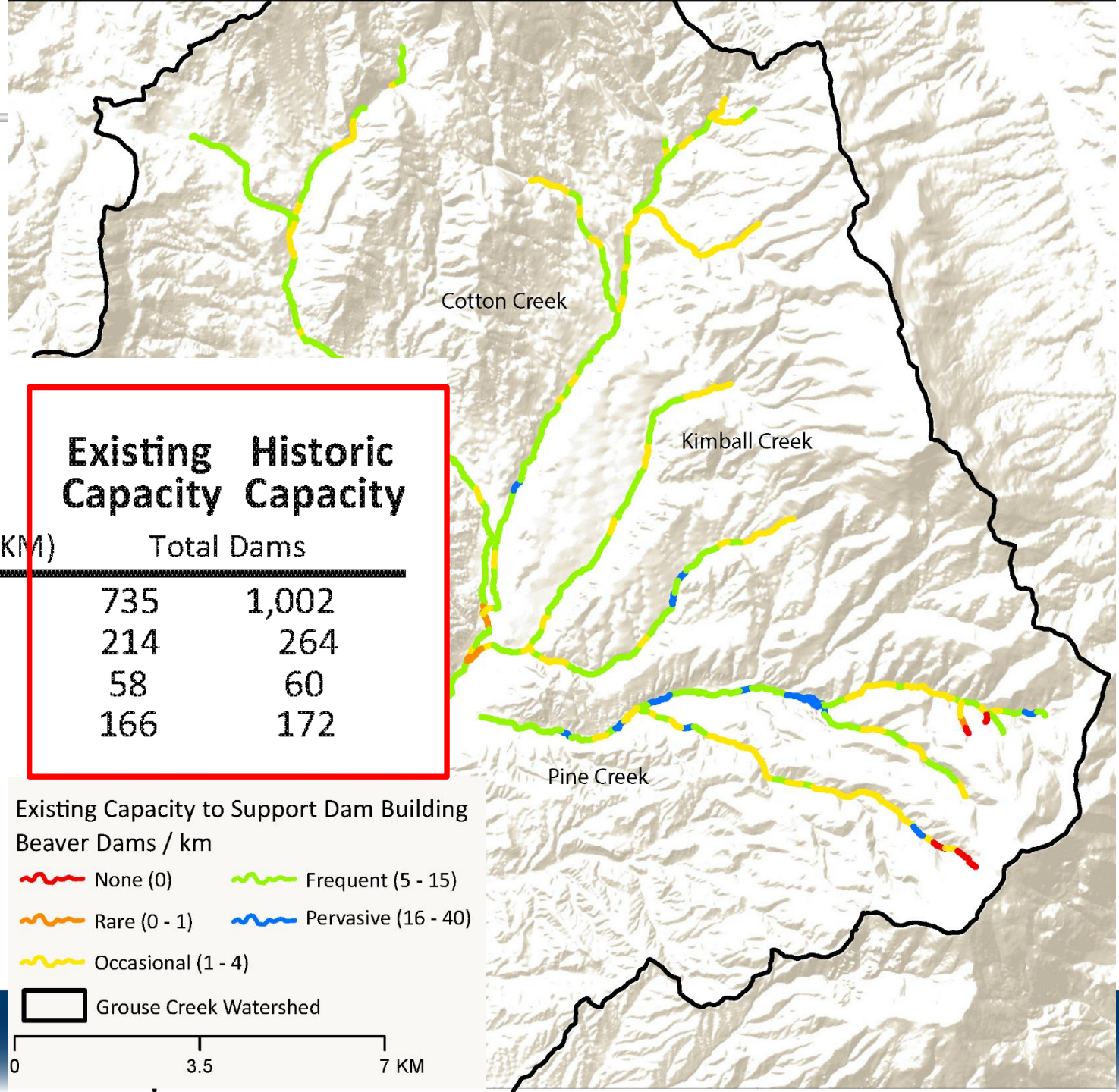
Beaver Restoration

Case Studies, Utah

Grouse Creek

Beaver Restoration Assessment Tool Summary

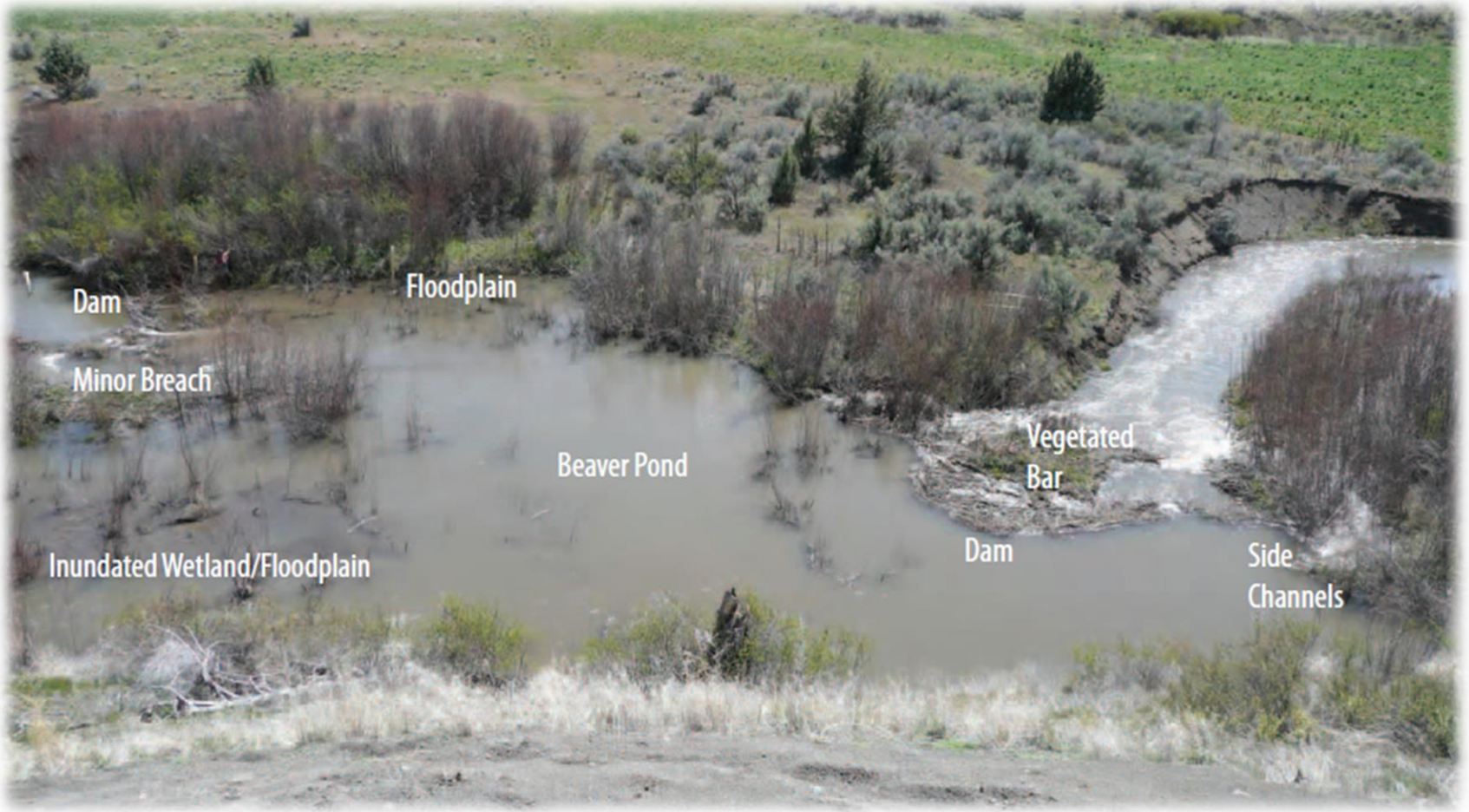
	Stream Length	Existing Capacity (Density)	Historic Capacity (Density)	Existing Capacity	Historic Capacity
	KM	Average Dam Density (Dams/KM)		Total Dams	
Entire Grouse	87.9	8.4	11.4	735	1,002
Pine Cr	25.4	8.1	10.1	214	264
Kimball Cr	7.0	7.9	8.4	58	60
Cotton	20.0	8.7	9.1	166	172



Beaver Restoration in Box Elder County

I. Beaver Restoration Case Studies

I. Grouse Creek



Beaver Restoration Case Studies, Utah

Raft River Range, Western Box Elder County

2 WRI-funded projects partnering with beaver

- Restore incised streams, floodplain connectivity ->
- Increase water storage and forage production for landowners

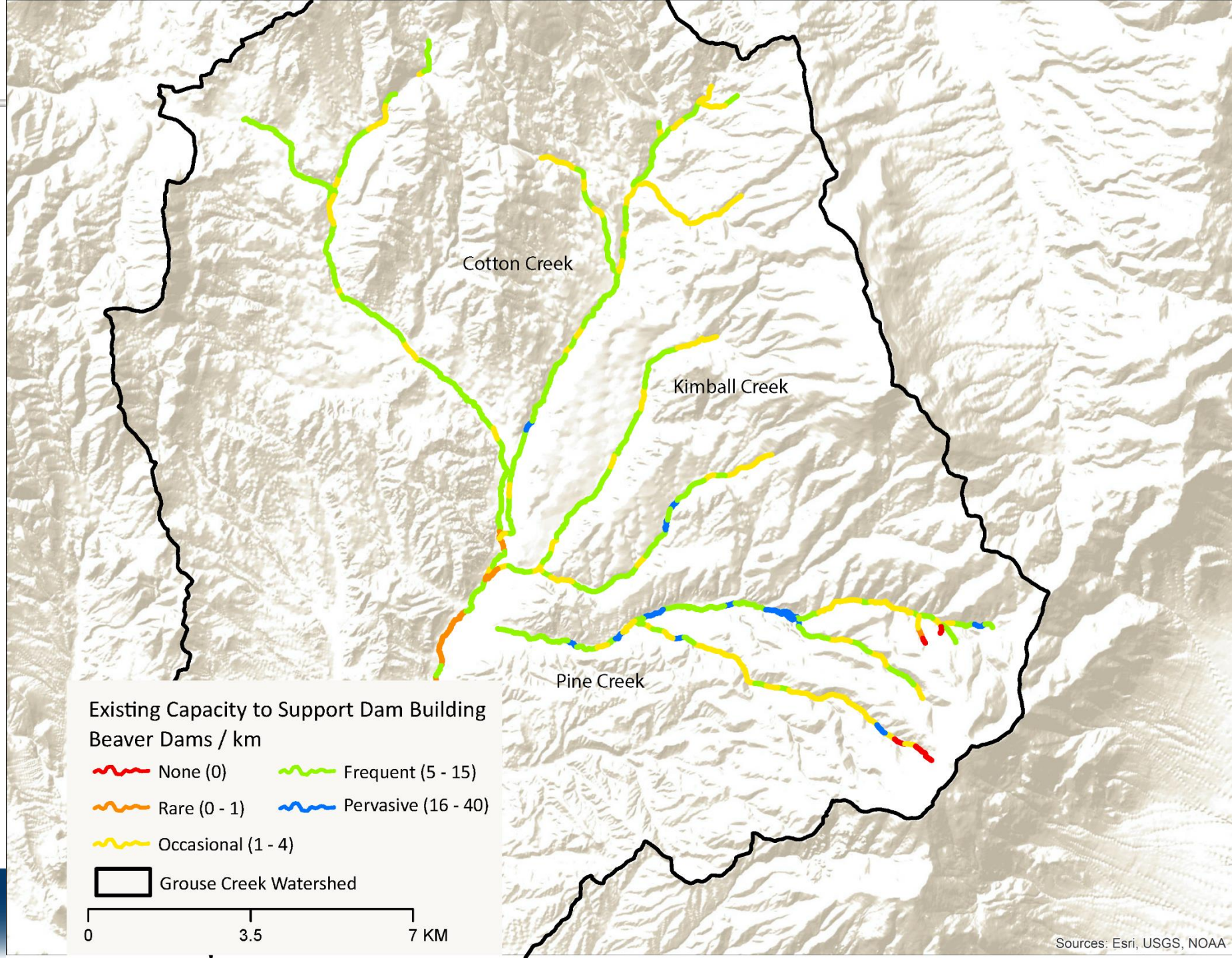
Beaver Restoration Case Studies, Utah

Grouse Creek

Partnering with beaver

- Restore incised streams, floodplain connectivity ->
- Increase water storage and forage production for landowners

- Collaboration with UDWR, Utah State University, Tanners
- Multi-year project



Beaver Restoration Case Studies, Utah

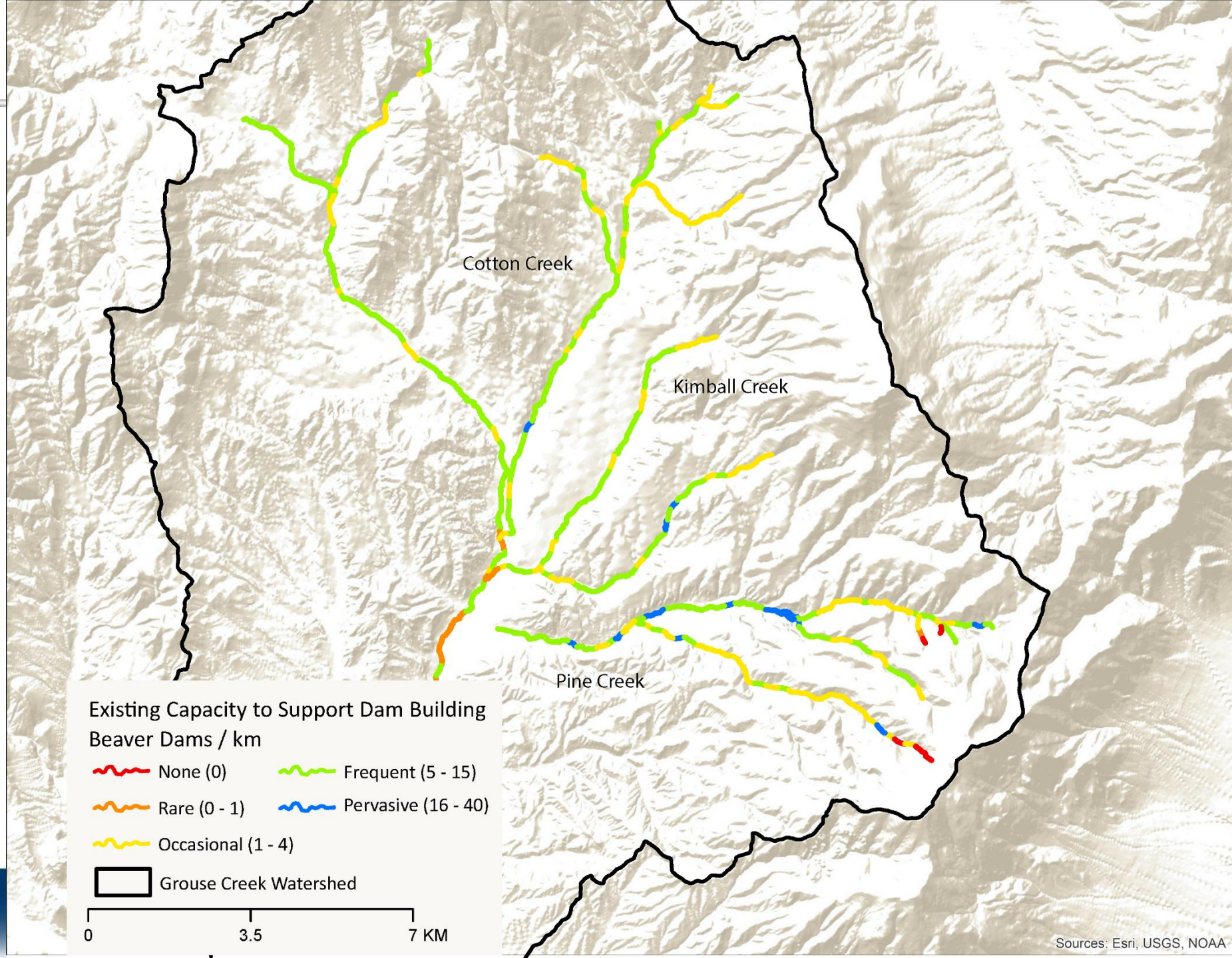
Grouse Creek

Phase 1 – Fall 2015

- Permitting
- Establish gauging network
- Work with Eric Thacker to coordinate monitoring efforts
- Develop longer-term study design

Phase 2 – Spring 2016

- Build BDAs
- Build starter lodges
- Develop beaver management plan
- Relocate beaver
- Continue monitoring



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FHC THE FLUVIAL HABITATS CENTER

EcoLogical Research Lab

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- Nick Bouwes (ELR/USU)
- Michael Pollock (NOAA)
- Mary O'Brien (GCT)
- Scott Shahverdian (USU)
- Nate Hough-Snee (USU/ETAL)
- Martha Jensen (USU/ETAL)
- Kenny DeMeurichy (USU/ETAL)
- Ian Tottenahm (ODFW)
- Brett Roper (USFS/USU)
- John Shivik (USFS/UDWR)
- Kent Sorenson (UDWR)
- Jordan Gilbert (USU/ETAL)
- Chris Jordan (NOAA)
- Carol Volk (SFR)
- Nick Weber (ELR)
- Ryan Lokteff (USU/ETAL)
- CHaMP Field Crews
- Tim Beechie (NOAA)
- Jordan Burningham (USU/ETAL)
- Chris Smith (USU/ETAL)
- And many others…

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U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

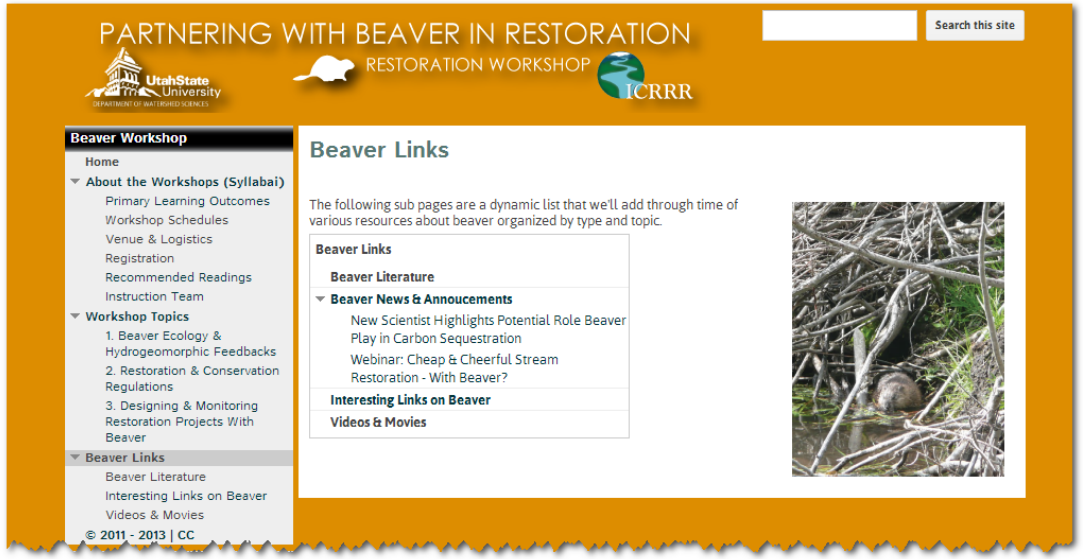
UTAH DNR WILDLIFE RESOURCES

Grand Canyon Trust DEDICATED TO THE CONSERVATION OF THE COLORADO PLATEAU

The WALTON FAMILY FOUNDATION

WANT TO LEARN MORE? Questions???

- Visit http://beaver.joewheaton.org



USFS Beaver Workshop in Logan: October, 2015

BEAVER RESTORATION ASSESSMENT TOOL
UtahStateUniversity
ECOGEOMORPHOLOGY & TOPOGRAPHIC ANALYSIS LABORATORY
BRAT

For more information on BRAT, visit:
http://brat.joewheaton.org

Beaver Restoration Case Studies, Utah

Lower San Rafael River

Large-scale collaborative pilot

- Restore incised stream, floodplain connectivity ->
- Increase habitat quality for endangered fish

Beaver Restoration Case Studies, (Close to Utah…)

Birch Creek, ID Bear River Range

Partnering with beaver

- Restore perennial flow increase floodplain connectivity ->
- Increase water storage and forage production for landowners

BEAVER IMPACTS ON FISH?

Table 3 Citation of negative impacts of beaver activity on fish populations and the percentage of citations based on quantitative analysis or speculation. Different impacts are expressed as the number of times they are cited in 108 literature sources and as a percentage of the total number of citations.

Negative impacts	Number	% of total citations	Data driven (%)	Speculative (%)
Barriers to fish movement	51	42.9	21.6	78.4
Reduced spawning habitat	20	16.8	40.0	60.0
Altered temperature regime	11	9.2	9.1	90.9
Reduced oxygen levels	12	10.1	50.0	50.0
Reduced habitat quality	2	1.7	0	100
Altered flow regimes	4	3.4	75.0	25.0
Loss of cover	5	4.2	0	100
Reduced productivity	9	7.6	33.3	66.7
Retarded growth	2	1.7	50.0	50.0
Abandonment of beaver settlements	1	0.8	100	0
Reduced water quality	2	1.7	50.0	50.0
Total	119	100	28.6	71.4

Kemp et al. 2012