Low-Tech Wet Meadow Restoration:

Reading the Landscape to Recognize Opportunities

July 22nd, 9am-10:30am PDT/10am-11:30am MDT

INTERMOUNTAIN WEST
JOINT VENTURE

USDA United States Department of Agriculture
Natural Resources Conservation Service

Co-presenters:

Shawn Conner, Restoration Ecologist, BIO-Logic, Inc., Montrose, CO

Jeremy Maestas, Ecologist, USDA-NRCS, Portland, OR

Hosted by Mandi Hirsch, Sagebrush Collaborative Conservation Specialist, Intermountain West Joint Venture, Lander, WY

WORKING LANDS FOR WILDLIFE

SRM Society for Range Management

Approved for 1.5 CEU's, email: hannah.nikonow@iwjv.org

Some pointers while you're waiting….

- This meeting is being recorded.
- The recording will be shared publicly on PartnersInTheSage.com and SageGrouseInitiative.org.
- All attendees are in listen-only mode.
- Watch for resources in the chat box.
- Submit questions to the panelists via the chat box at any time during the presentation. They will be answered at the end of the presentation, if time allows.
- For technical support, call Hannah @ (307) 431-9876

If your audio quality is poor, you can call in:

Number: (646) 558-8656

Meeting ID: 854 8419 0216#

Skip Participant ID by pressing "#" if you do not have it.

Meet your presenters and host

Mandi Hirsch
Intermountain West Joint Venture
Lander, WY

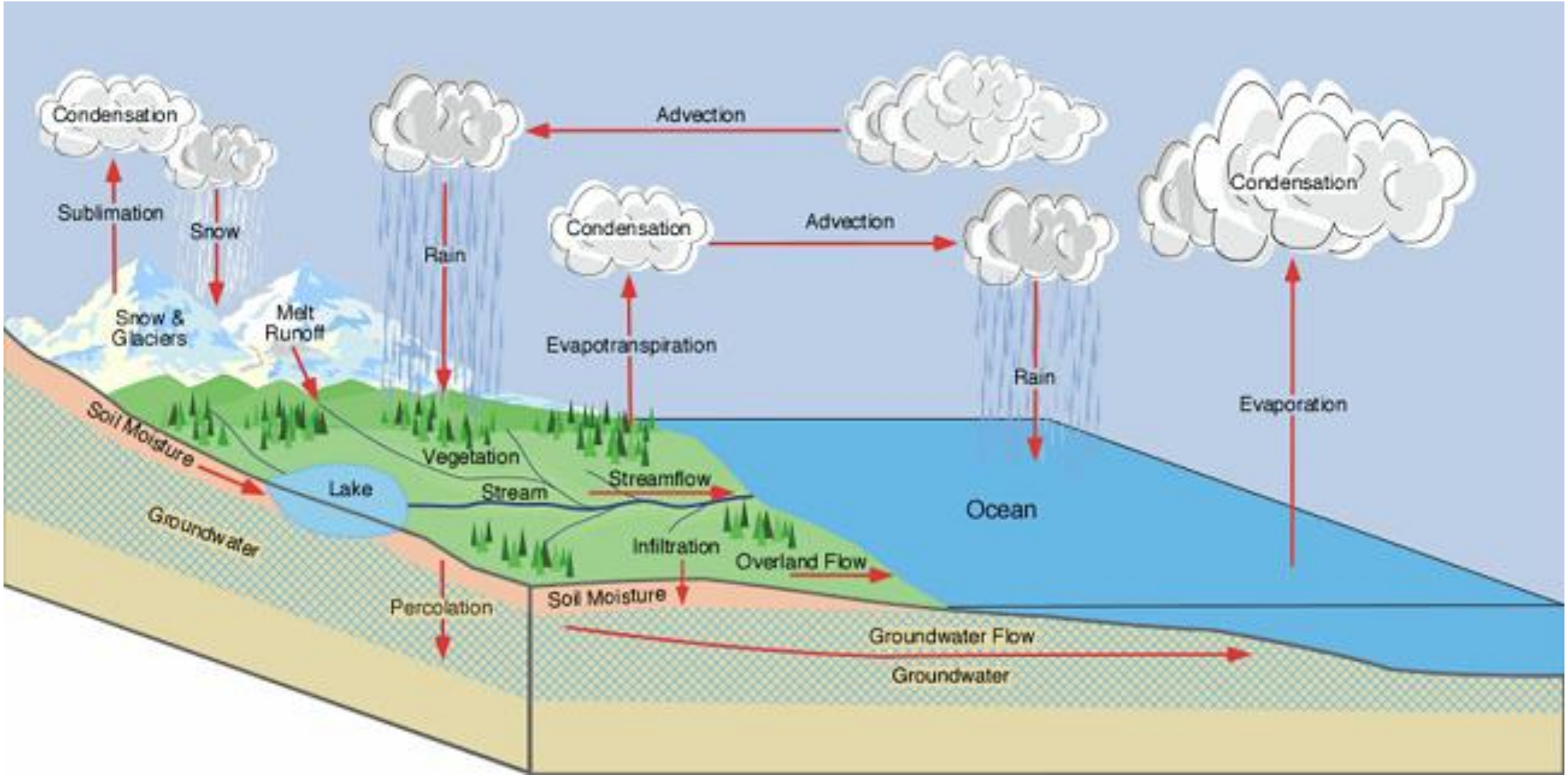
Shawn Conner
BIO-Logic, Inc
Montrose, CO

Jeremy Maestas
USDA-NRCS
West National Technology Support Center
Portland, OR

In the West, Water is Life

Photo by: MT Stockgrowers Assoc.

Remember the water cycle?



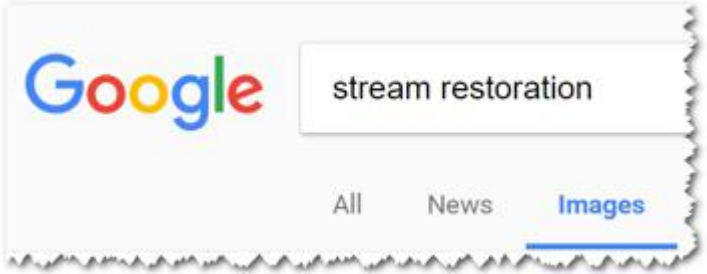
Shared Vision: This is about *Resiliency*

Soil Moisture
↓
Productivity
↓
Resiliency

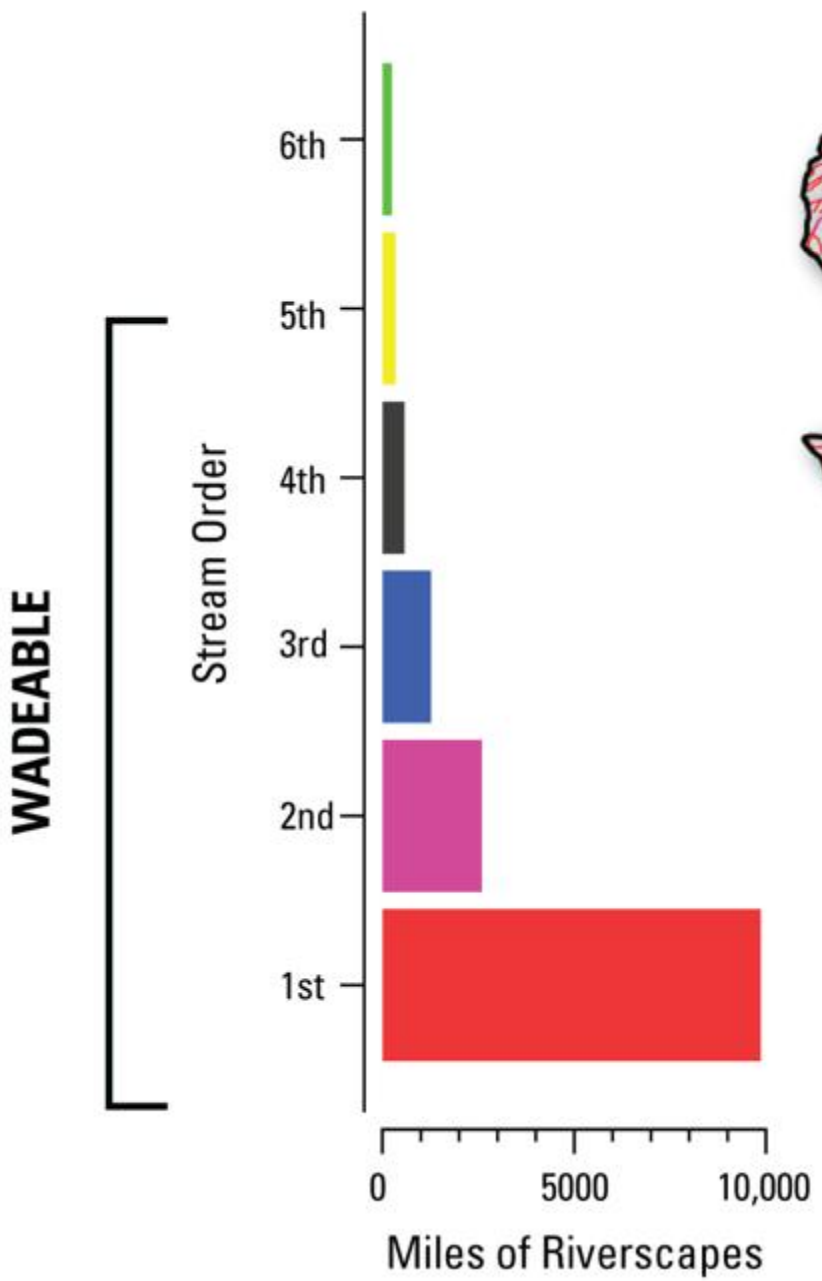
Resilience to drought, fire, flooding

We have lots of this

Traditional Restoration



We need scalable solutions



“Low-Tech” Restoration

“Let the system do the work”

Gunnison Basin Working Group

Attributes of Low-Tech

- Simple, cost-effective, efficiently scaled up
- Structures (if needed) are hand-crafted using locally-sourced, natural materials
- Incremental restoration, not quick fix
- Lets the system do the work (process-based)
- Allows broad audiences to participate



“Read the Landscape, Then Think like Water”

Bill's Trilogy

Hydrology

Timing
Frequency
Magnitude
Duration

Geomorphology

Landforms
Stream channel dimension
Stream power
Particle movement

Ecology

Species diversity
Growth forms
Community interactions

Local Hydrology

Timing, Frequency, Duration and Magnitude

- When does precipitation arrive?
- Spring fed system vs. snowmelt system
- What is “normal” storm intensity and duration?
- How quickly will the water run off? Infiltration and storage capacity of soils.

Local Ecology

Species Diversity, Growth Forms, Community Interactions

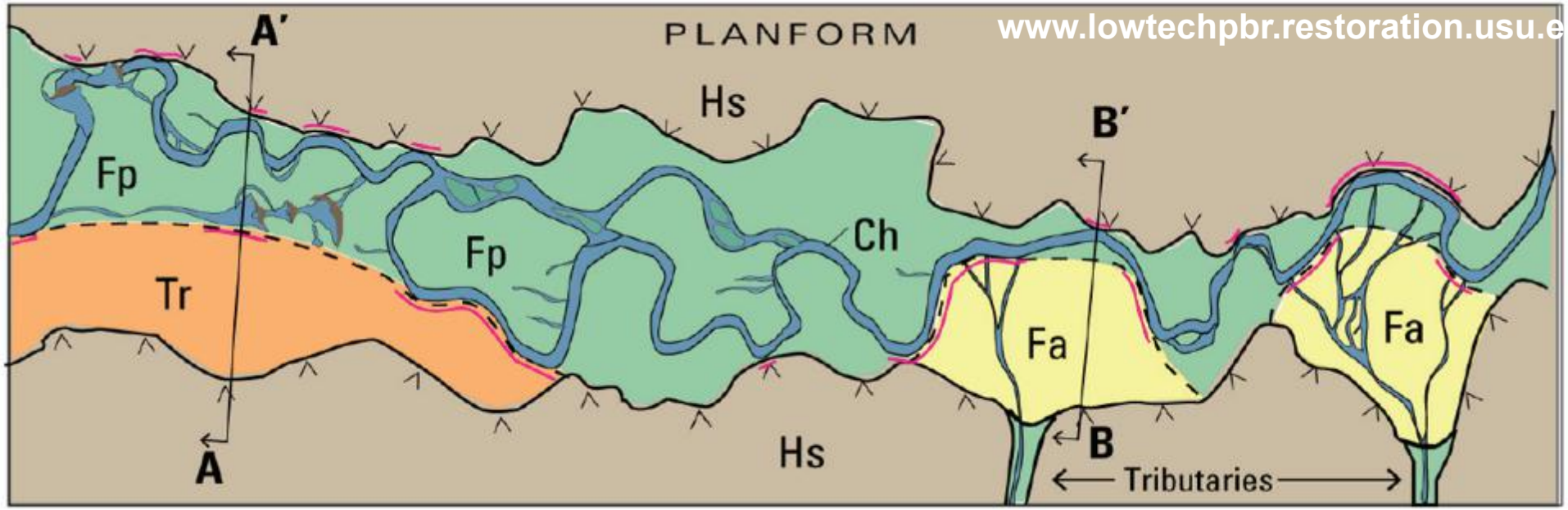
- Plant species are specific to amount of available moisture.
- Animal interactions: grazed pasture? Elk or wild horse activity?
- Historical plant or animal activity?
- Be observant of changes on the landscape that will give you clues.

Geomorphology

Landforms, Stream Channel Type, Stream Power , Particle Movement

- What are the relevant landforms? Floodplain, terrace, alluvial fan
- Does the system have a channel? Should it?
- What is sediment source? Fine grained silt? Sand and gravel?

What is the Valley Bottom?



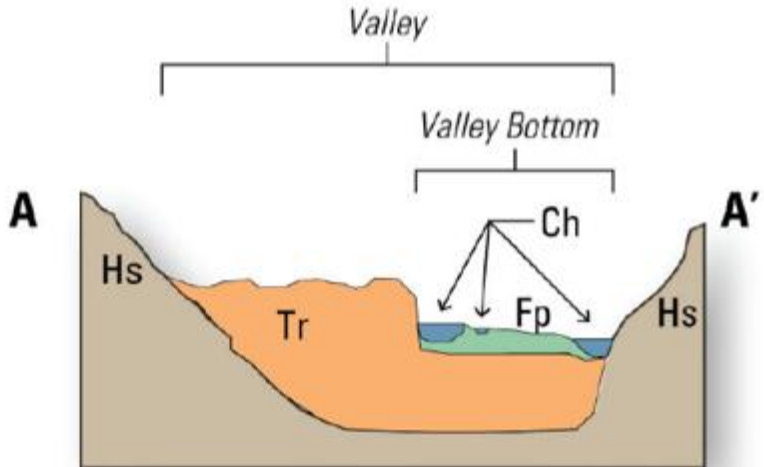
GEOMORPHIC UNIT KEY

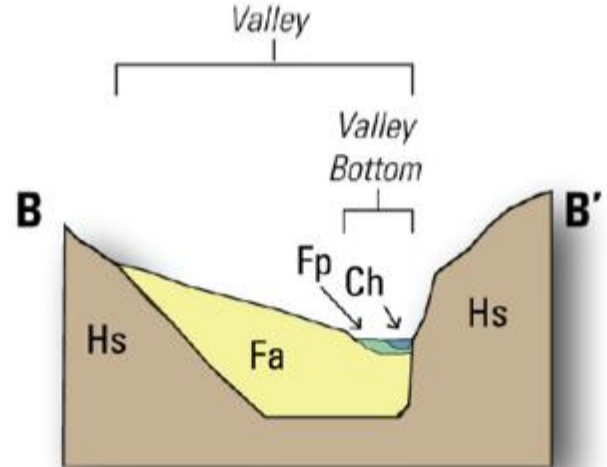
- Valley
  - Ch = Channels
  - Fp = Floodplain
  - Fa = Fan
  - Tr = Terrace
  - Hs = Hillslope
- Valley Bottom
- Riverscapes
- Former Valley Bottom

The valley bottom is comprised of areas that could plausibly flood in the contemporary flow regime.

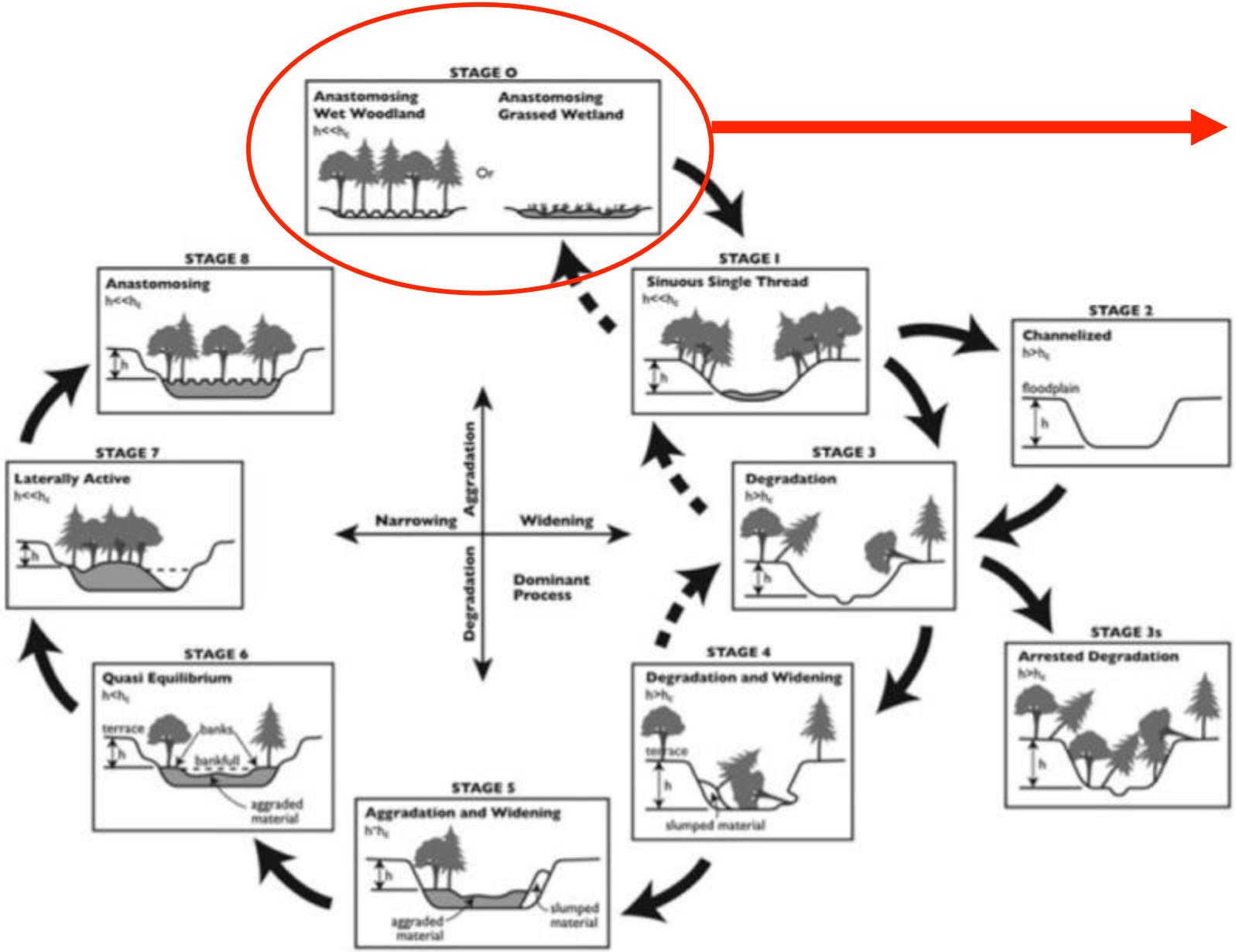
MARGIN TYPES

- Valley Margin
- Valley Bottom Margin
- Active Confining Margin





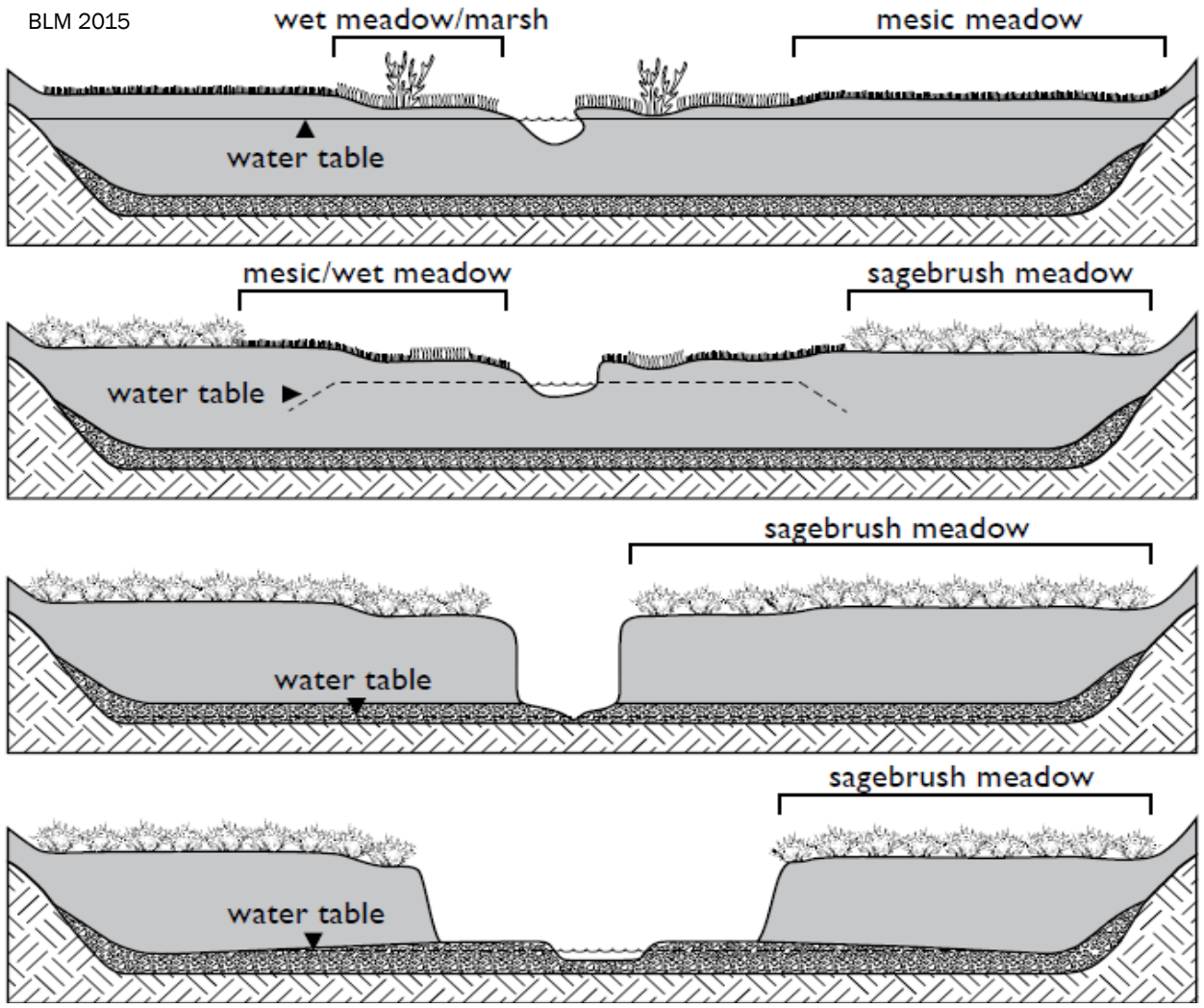
Stream Evolution Model

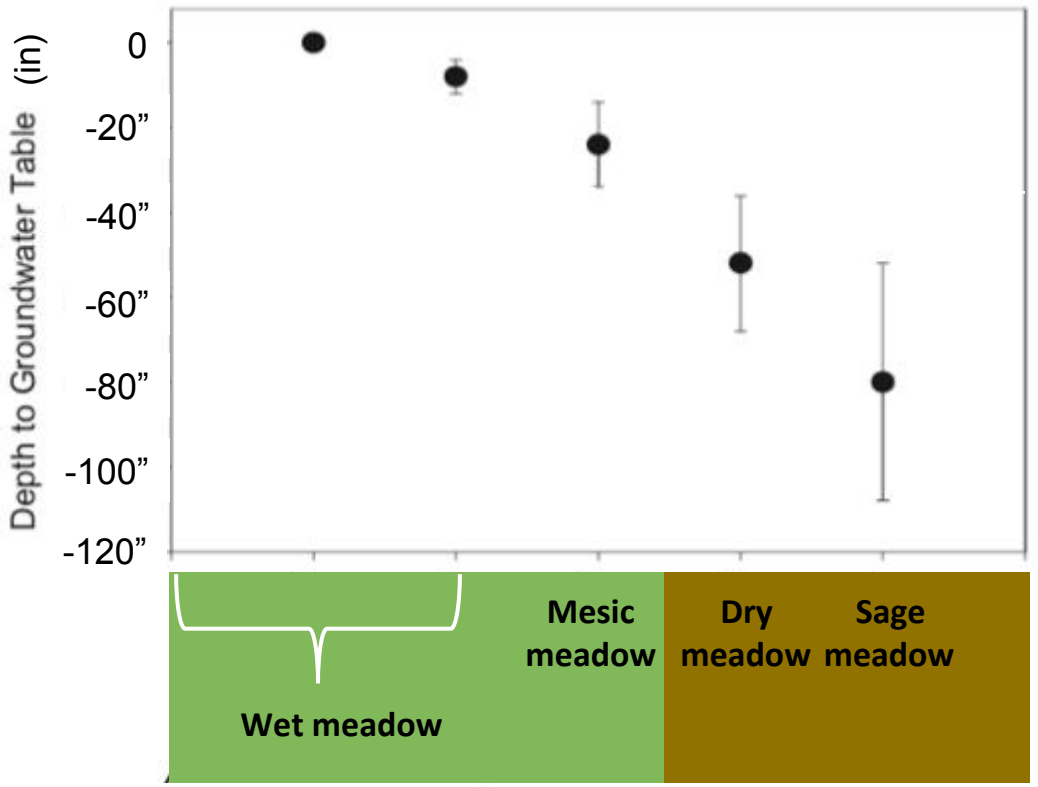


"Stage 0"

Cluer & Throne (2013) DOI: 10.1002/rra.2631

The Channel Incision Problem





(adapted from Lord et al. 2011)

As water table drops, green groceries go away


Photo by: Lars Santana


Photo by: Bill Zeedyk

Channel incision, gully erosion, and headcuts

<u>Headcut</u> (aka, nickpoint)

- Abrupt change in elevation
- Waterfall and plunge-pool
- Leading edge of gully erosion

<u>Gully</u>

- Incised channel below headcut
- Disconnected from floodplain
- Down cut in areas with previously undefined or weaklv defined channels

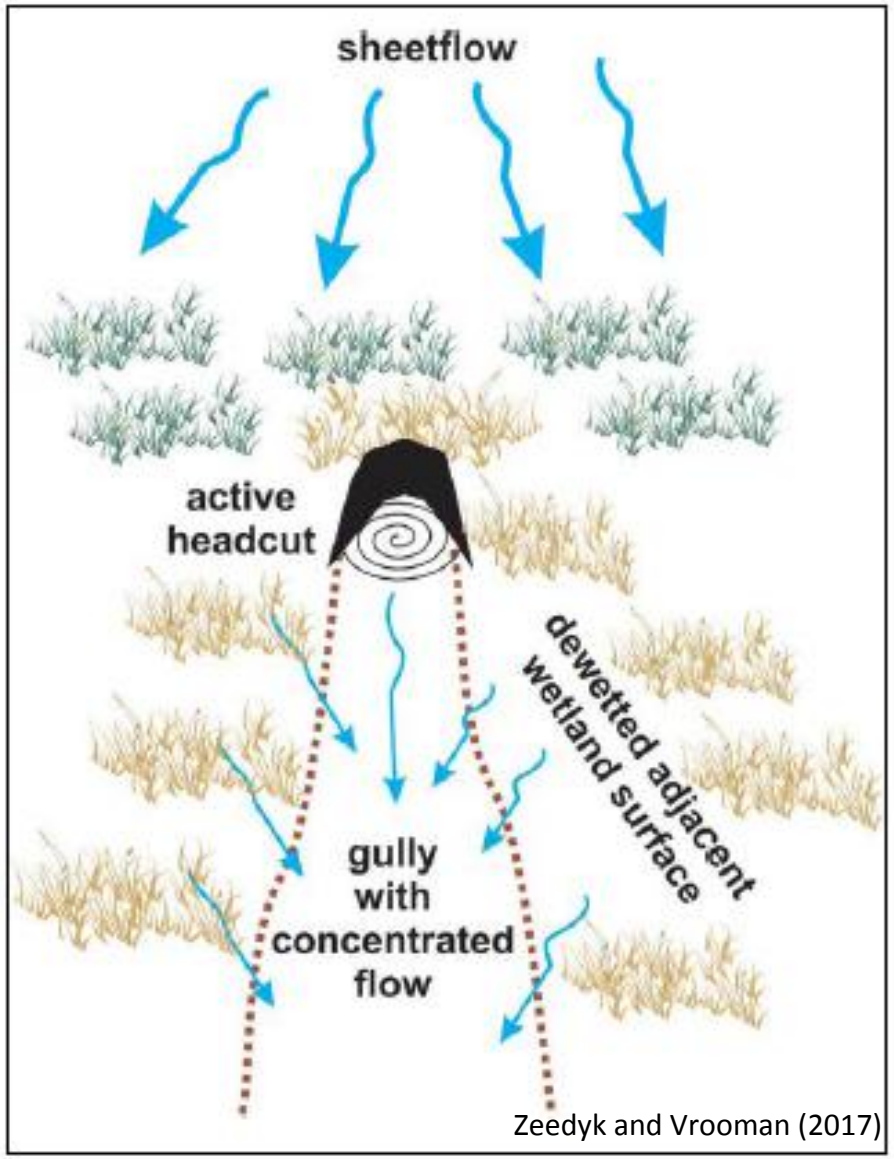
How does a headcut advance?

Being able to recognize headcuts in the field provides an opportunity to intervene to protect upstream riparian areas and meadows that have not yet been incised!


Flow

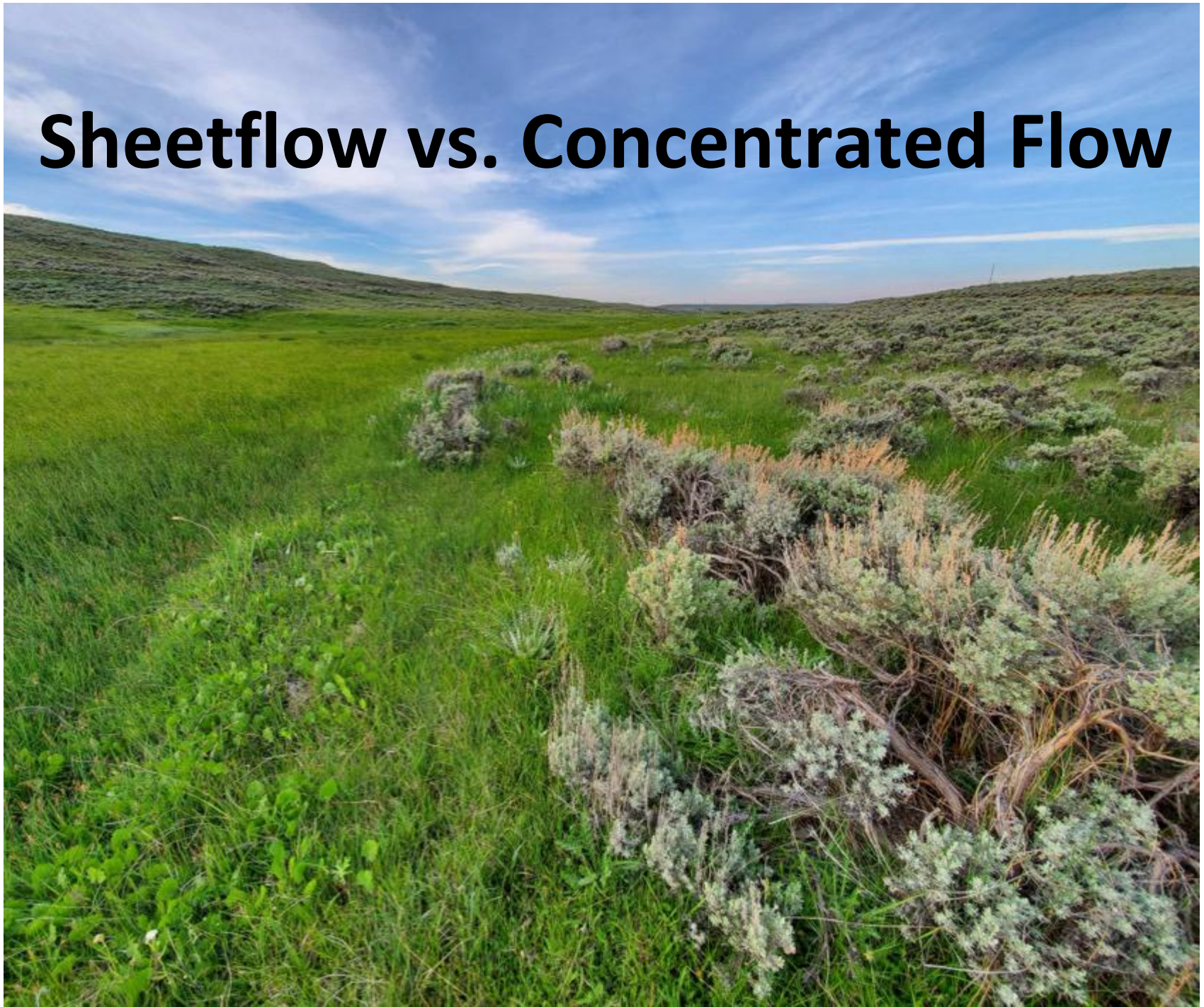

Flow

Sheetflow vs. Concentrated Flow



Zeedyk and Vrooman (2017)

Sheetflow vs. Concentrated Flow



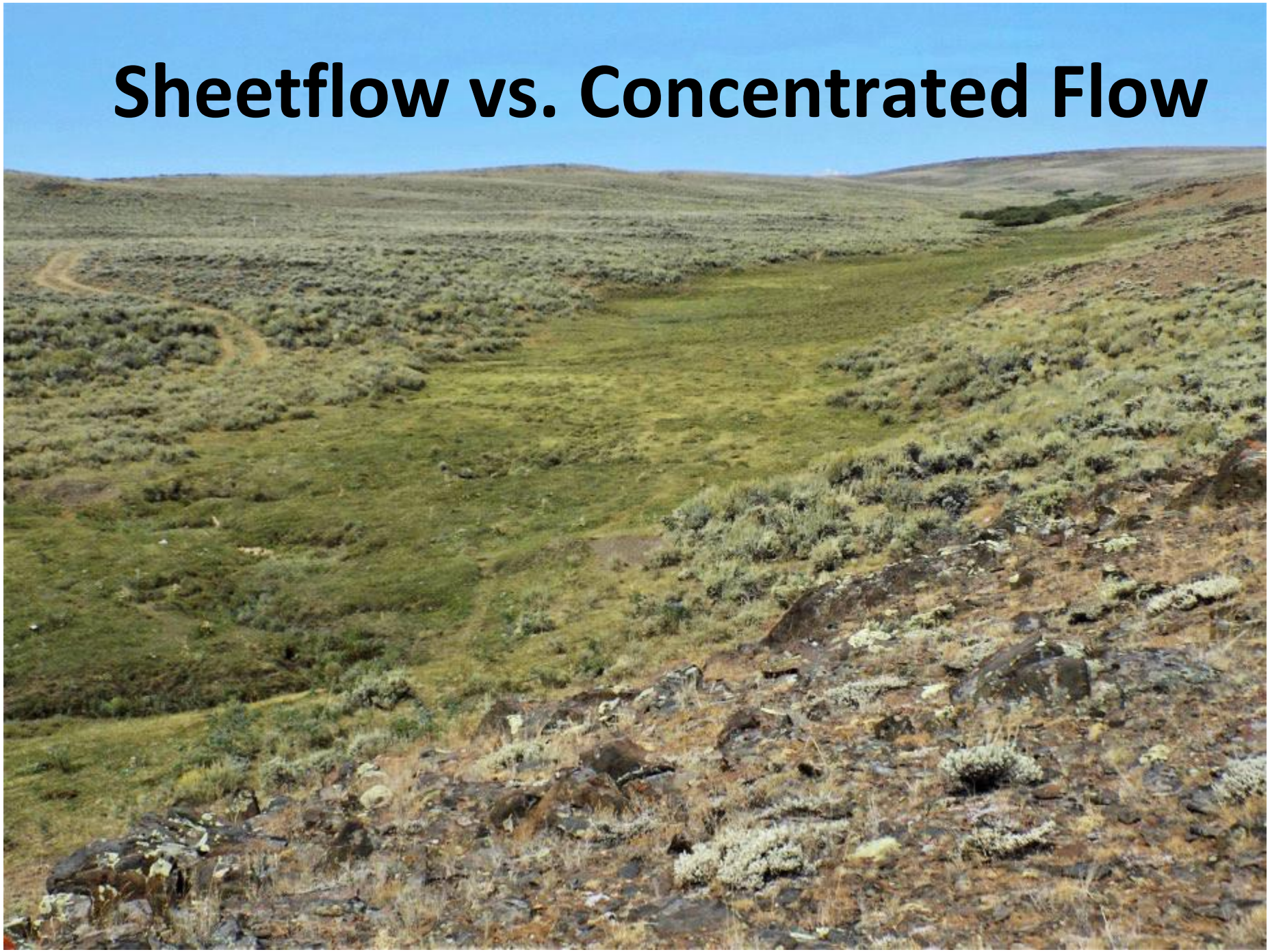
- Many wet meadow systems <u>should not</u> have a channel.
- Surface water historically flowed across the entire surface.
- <u>Water that is shallow and spread out</u> :

 - moves slower,

 - has time to infiltrate,

 - and has minimal erosive force.

Sheetflow vs. Concentrated Flow



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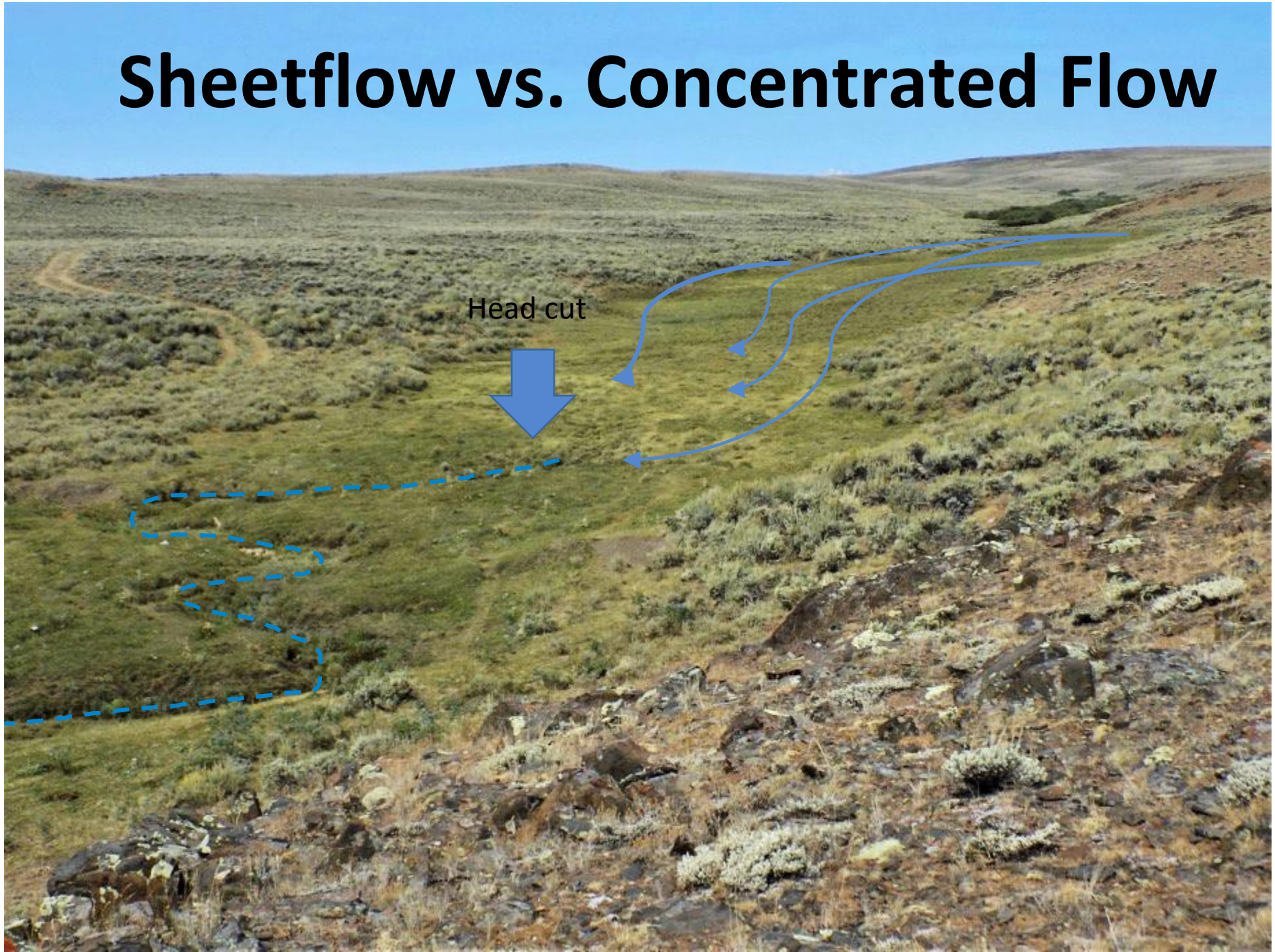

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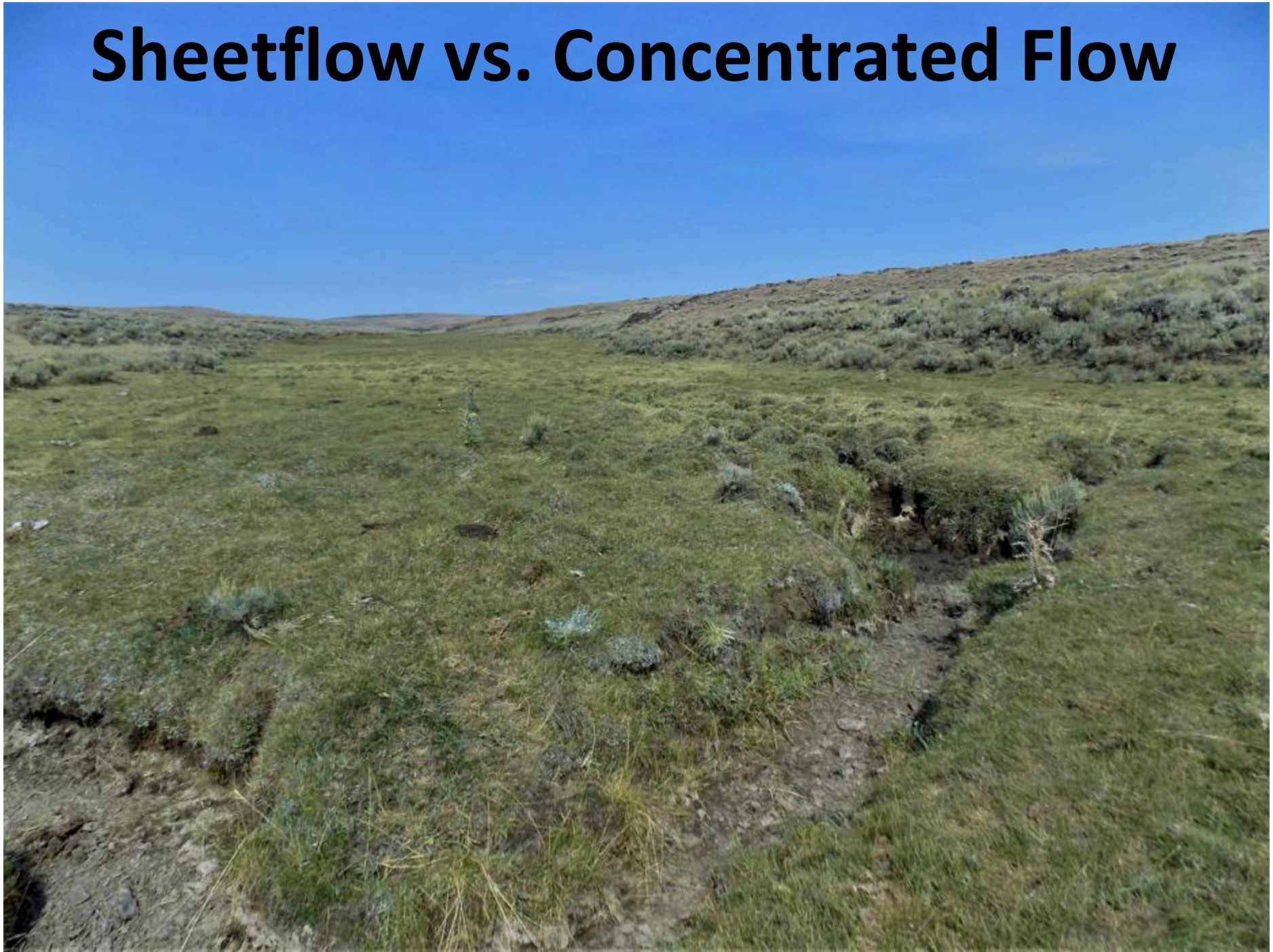

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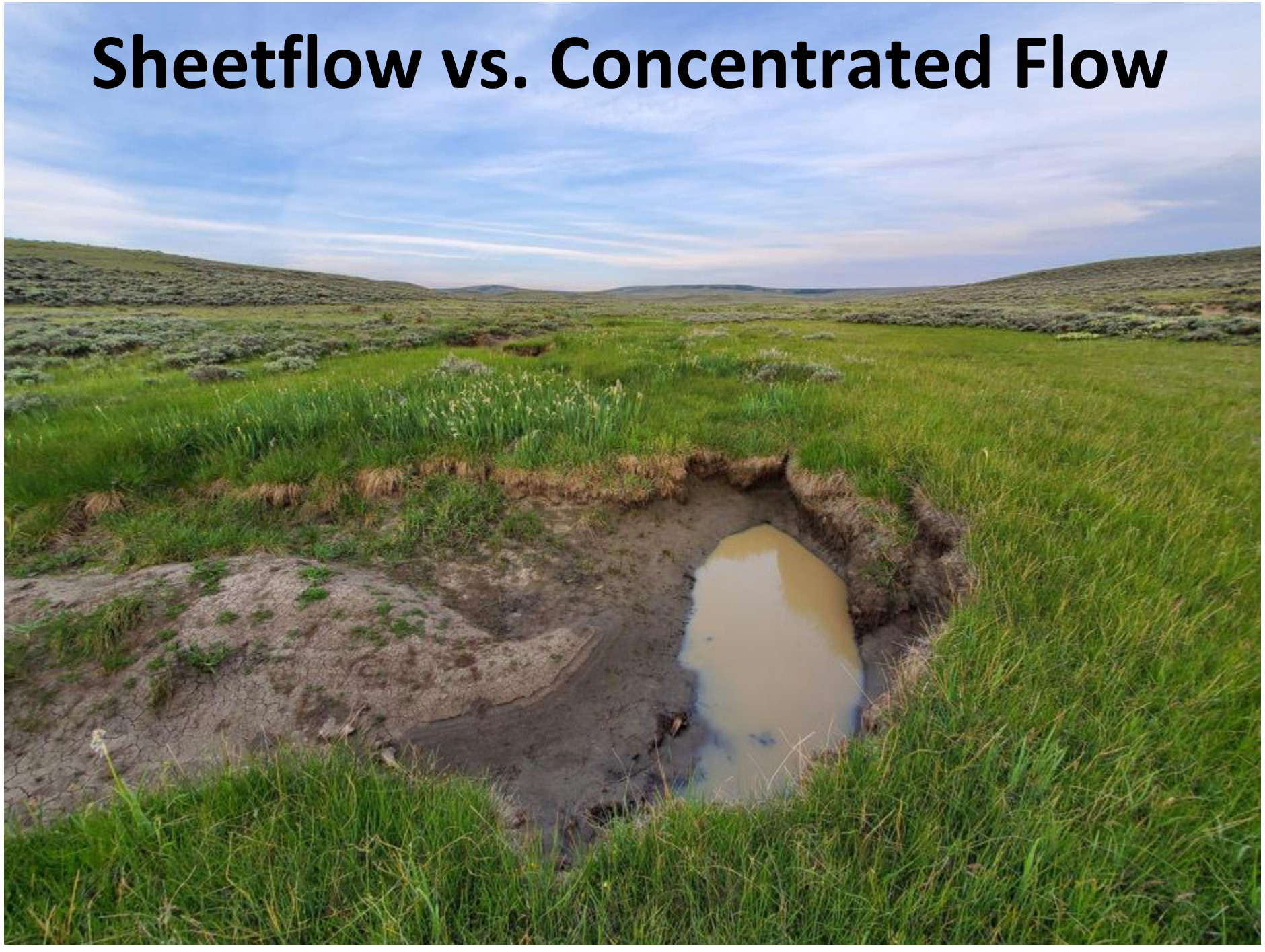


Concentrated Flow Paths: Roads and Trails

Old Road Cuts

- Trap runoff
- Channelize flow
- Increase incision/erosion

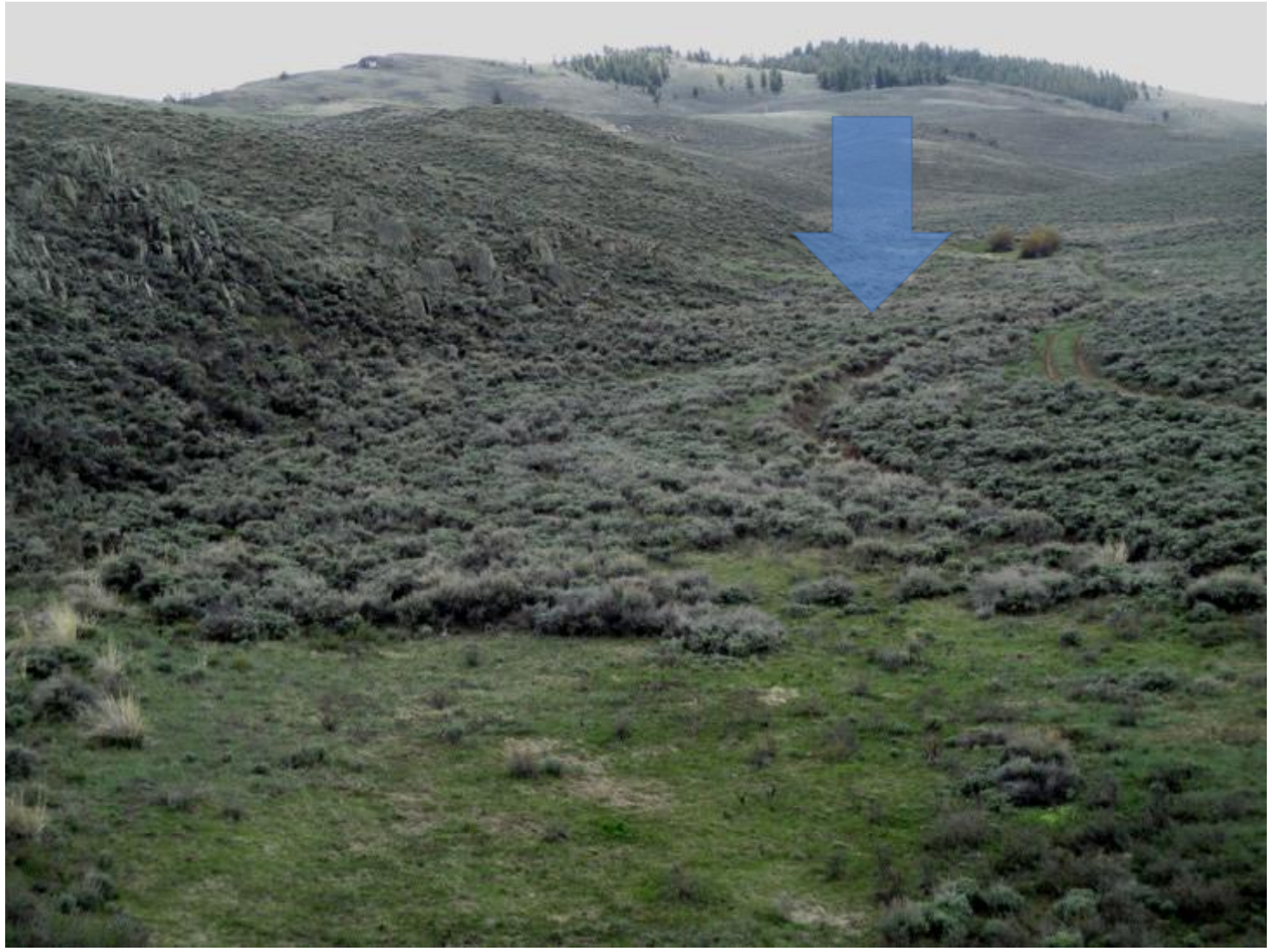
Concentrated Flow Paths: Roads

Concentrated Flow Paths: Roads

Concentrated Flow Paths: Roads

<u>Read the Landscape:</u> Learn to recognize un-natural condition.

- The old road – now a gully
- Traps and channelizes all flow
- Adjacent flat and former wet meadow system has dried out and sagebrush moved in on deep rich soils.
- <u>Reading the Landscape</u> – tells you to put the water back to where it used to be.



Is this “Creek” in the true Valley Bottom?

Concentrated Flow Paths: Trails

Ungulate trailing

- Livestock, elk, wild horses
- Trailing up and down the valley bottom in riparian areas
- Channels runoff/water moves faster/incision happens

Concentrated Flow Paths: Trails

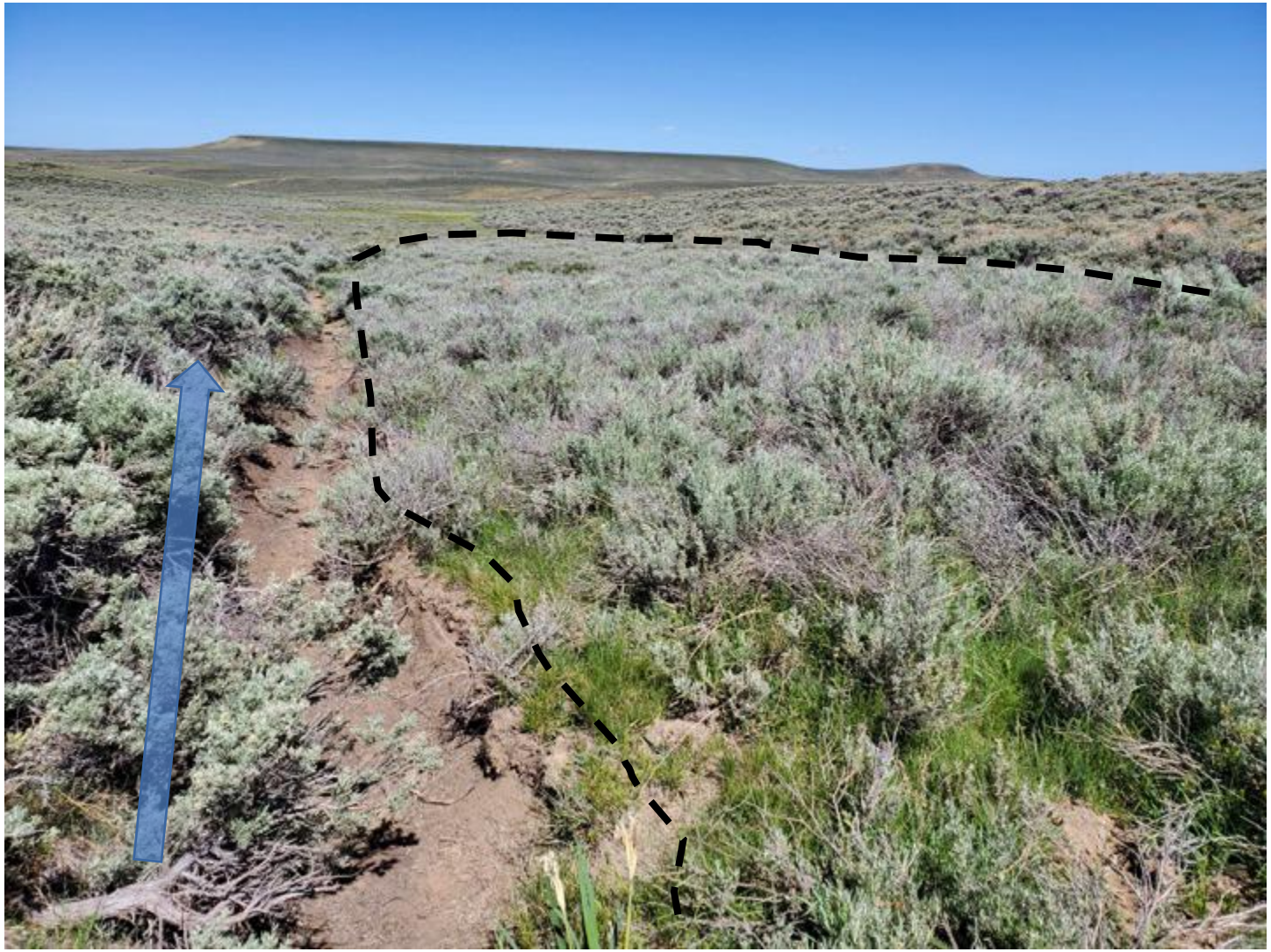
Ungulate trailing

- Trail captures water and eliminates sheet flow
- Adjacent meadow dries out in the absence of sheet flow and water table dropping
- Sagebrush moves in and we lose herbaceous meadow

Concentrated Flow Paths: Trails

Read the Landscape: Learn to recognize un-natural condition.

- The trail is now a small gully and traps and channelizes all flow
- Adjacent former wet/mesic meadow system has dried out and sagebrush moved in.
- Reading the Landscape – tells you to put the water back to where it used to be.



Concentrated Flow Paths: Trails

Read the Landscape: Learn to recognize un-natural condition.

- This sedge meadow should not have a channel
- Is the channel in the true valley bottom?
- Reading the Landscape – tells you this channel is up on the sidehill and is likely an old trail that captured surface runoff, channelized it and downcut.
- Restoration - put the water back to where it used to be.

What is the Vegetation Telling You?

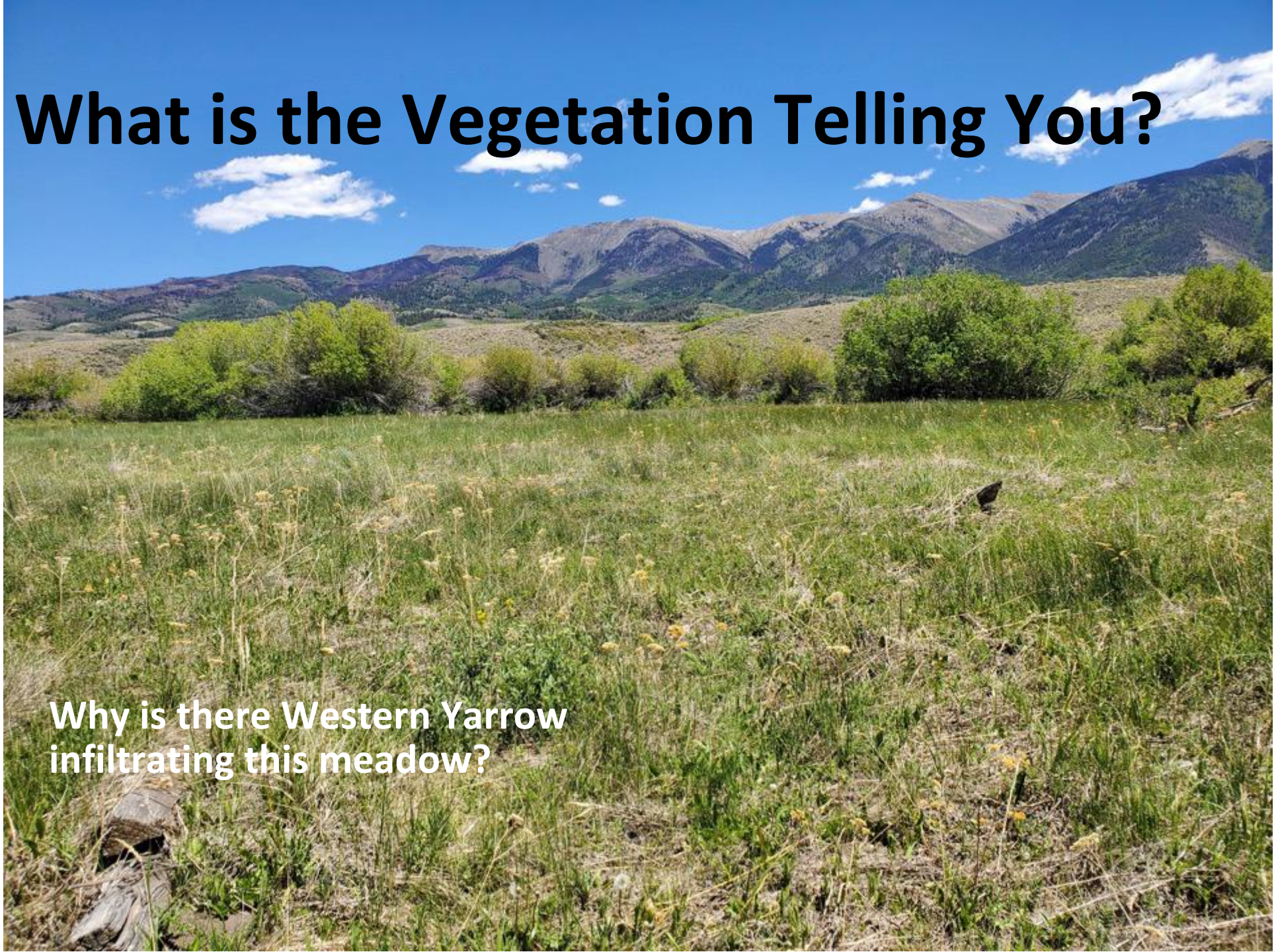
Remnant willow stands can tell you where the water is

Remnant willow bodies can tell you where the water used to be.

What is the Vegetation Telling You?

Why might the sedge meadow on the left side of the channel be turning brown?

What is the Vegetation Telling You?



What is the Vegetation Telling You?

What is the Vegetation Telling You?


What are the Soils Telling You?

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What are the Soils Telling You?

Preservation vs. Restoration

Preservation

- Critical need
- Save what is left
- Headcut control – save what is above the headcut

Restoration

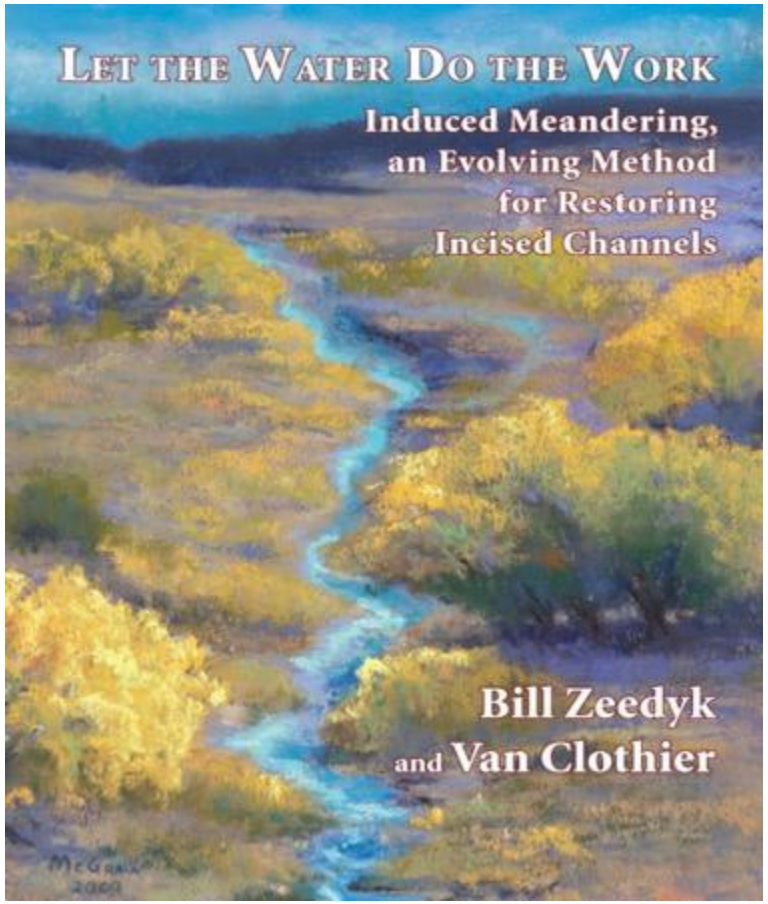
- Reconnect the floodplain
- Grade Control
- Restore sheet flow

Preservation

Restoration – eliminate channelized flow

Restoration – Restore sheetflow

“Sticks and Stones”



Three types of treatments for meadow systems:

1. Headcut control
2. Grade control
3. Flow dispersal

Principles for Treating Headcuts

- Lower the height of the falls in order to reduce the force of falling water.
- Widen the lip of the falls to disperse concentrated flow.
- Harden the base of the falls to protect substrates from erosion.
- Conserve soil moisture to enhance plant growth and root densities.

From Zeedyk and Jansens (2009)

Headcut Control Structures

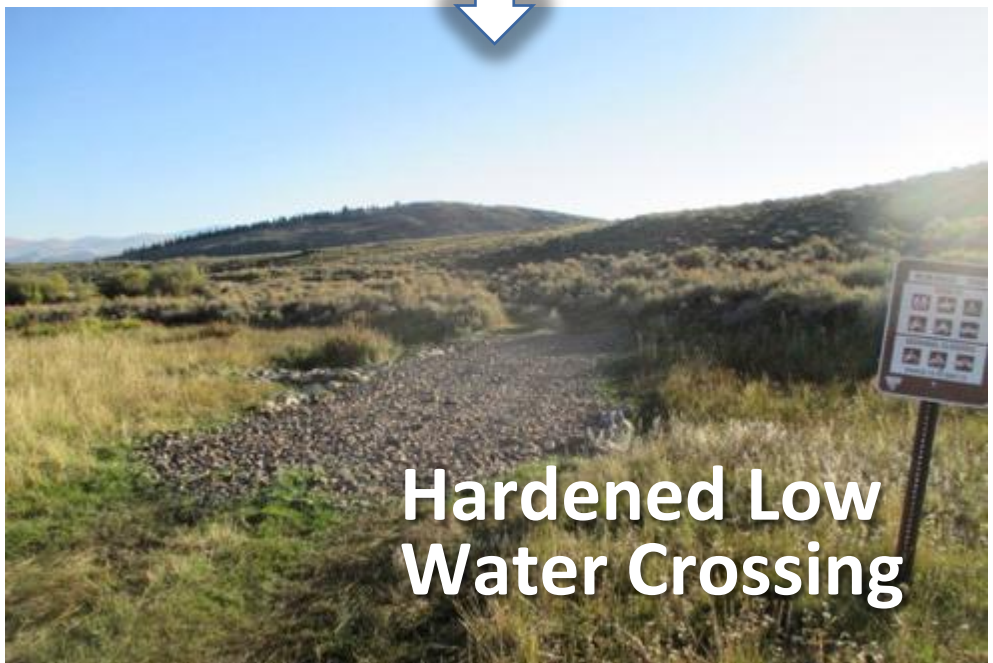
Principles for Treating Gullies

Photo by: John Coffman

- Disperse surface flow, prevent concentration, increase infiltration and percolation.
- Reduce channel slope to reduce runoff velocities to reduce available energy.
- Widen channel bottom to lessen erosion force.
- Increase channel roughness.
- Retain soil moisture to improve environment for colonization and growth of plants.

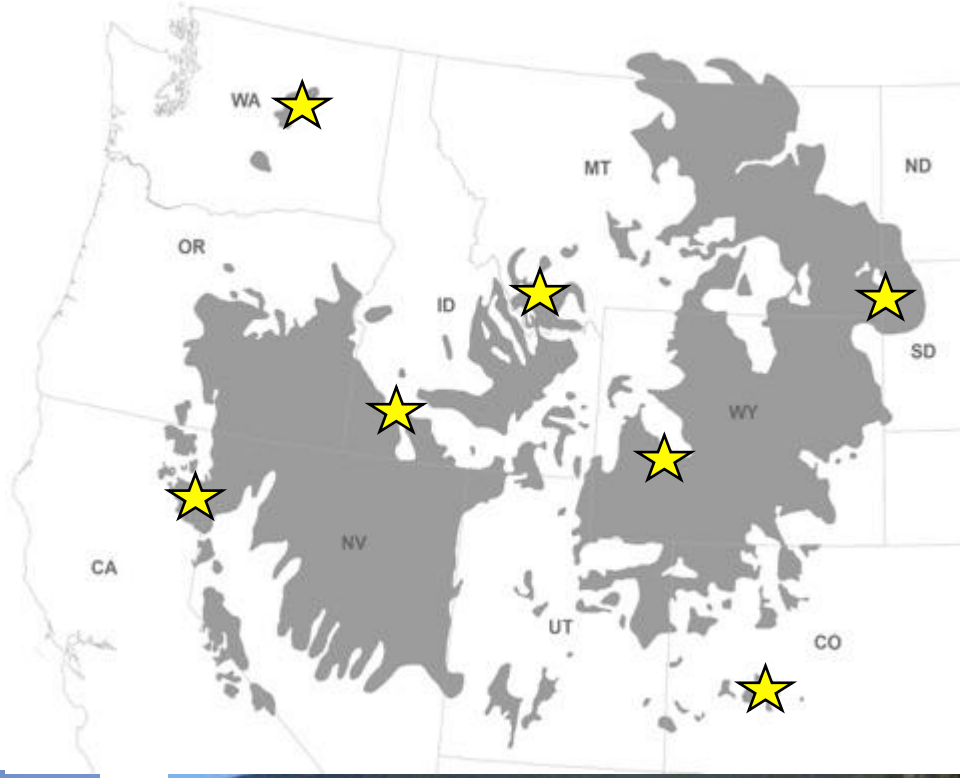
From Zeedyk and Jansens (2009)

Grade Control Structures



Flow Dispersal Treatments

Community-based partnerships are key to scaling this up



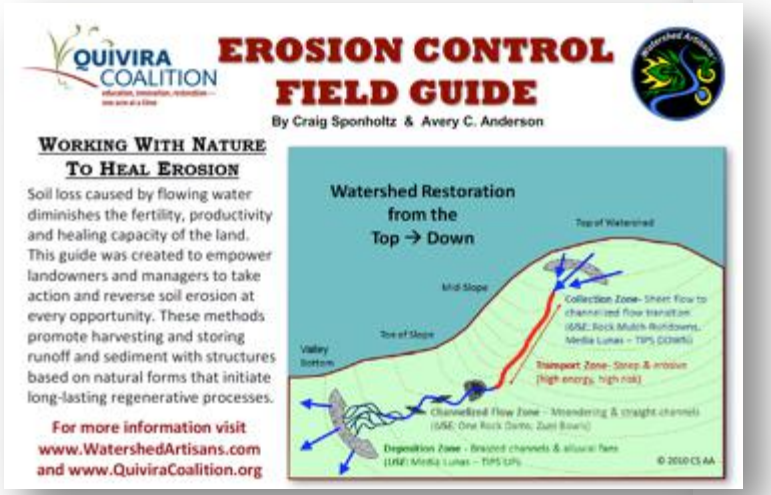
Watershed-Scale Collaboration

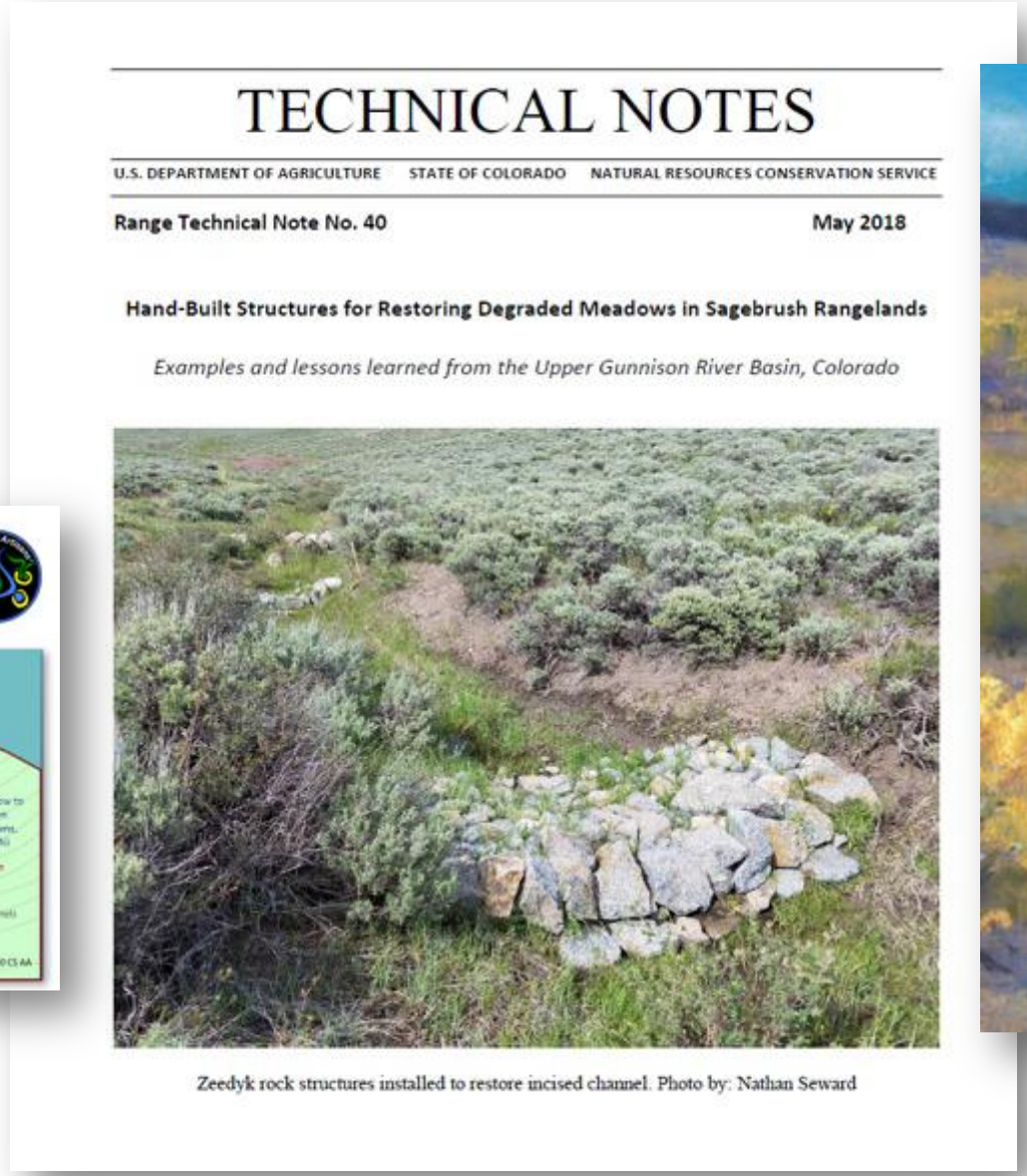
Keystone Gulch, Southwest Montana

In less than 2 years,
~400 meadow restoration structures installed

Beaverhead Watershed Committee

Resources




TECHNICAL NOTES

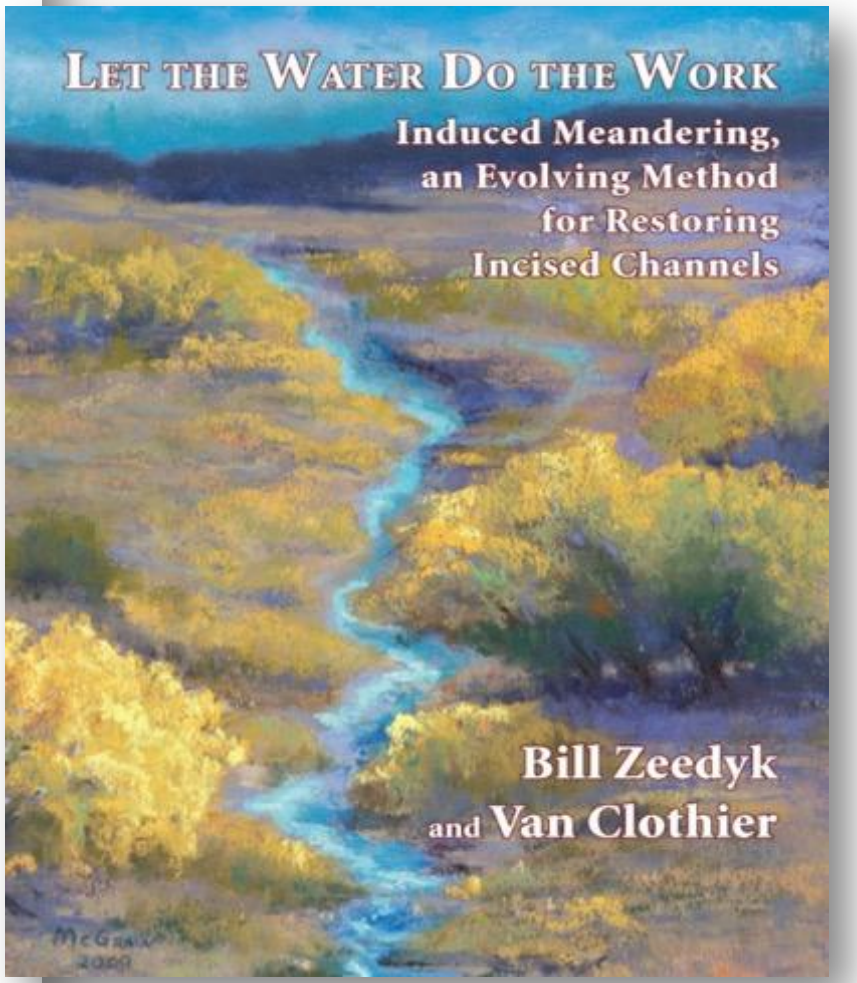
U.S. DEPARTMENT OF AGRICULTURE STATE OF COLORADO NATURAL RESOURCES CONSERVATION SERVICE

Range Technical Note No. 40 May 2018

Hand-Built Structures for Restoring Degraded Meadows in Sagebrush Rangelands

Examples and lessons learned from the Upper Gunnison River Basin, Colorado

Zeedyk rock structures installed to restore incised channel. Photo by: Nathan Seward



https://quiviracoalition.org/techguides/

Questions/Discussion

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