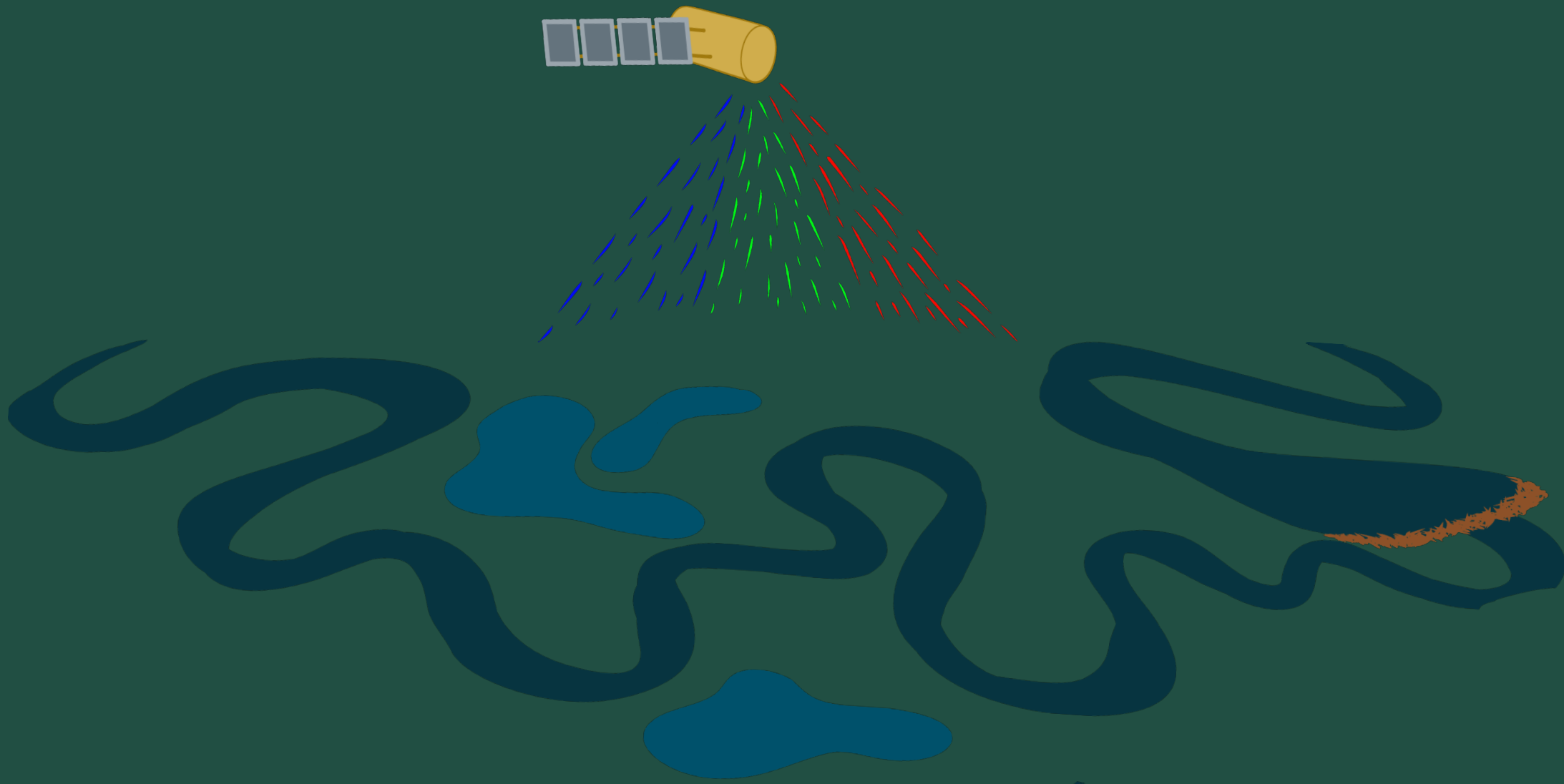
Decision support for beaver rewilding

Jodi Brandt, Emily Iskin, Nick Kolarik, Nawaraj Shrestha, Boise State University



Project Team

Nick Kolarik, Co-I, FINESST Fellow

Nawaraj Shrestha, former post-doc, now faculty at U. Nebraska

Emily Iskin, Postdoc, Artist

Dedicated landowners and agency and NGO partners

Mesic (i.e. wet) ecosystems: < 5% of the landscape, but are critical for > 90% of species during dry season.

Long-term drought in western U.S.

Unlikely alliances……

+

=

….. small reservoirs across the landscape

Rewilding “experiments” are ubiquitous…….

…. But the science is way behind the implementation

Mesic Resource

Restoration

Monitoring

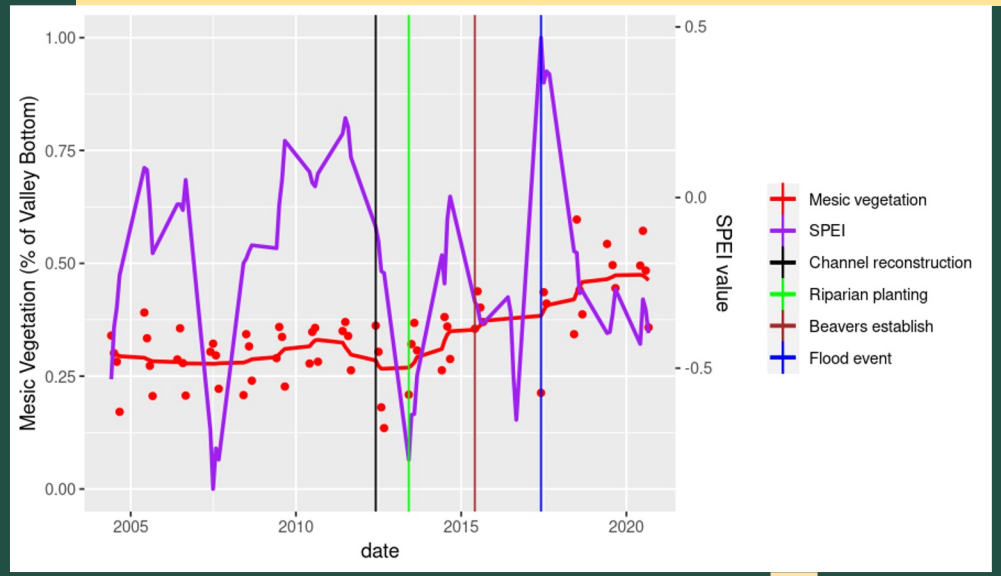
MRRMaid

MRRMaid Toolbox

Monthly MRRMaid

MVP MRRMaid

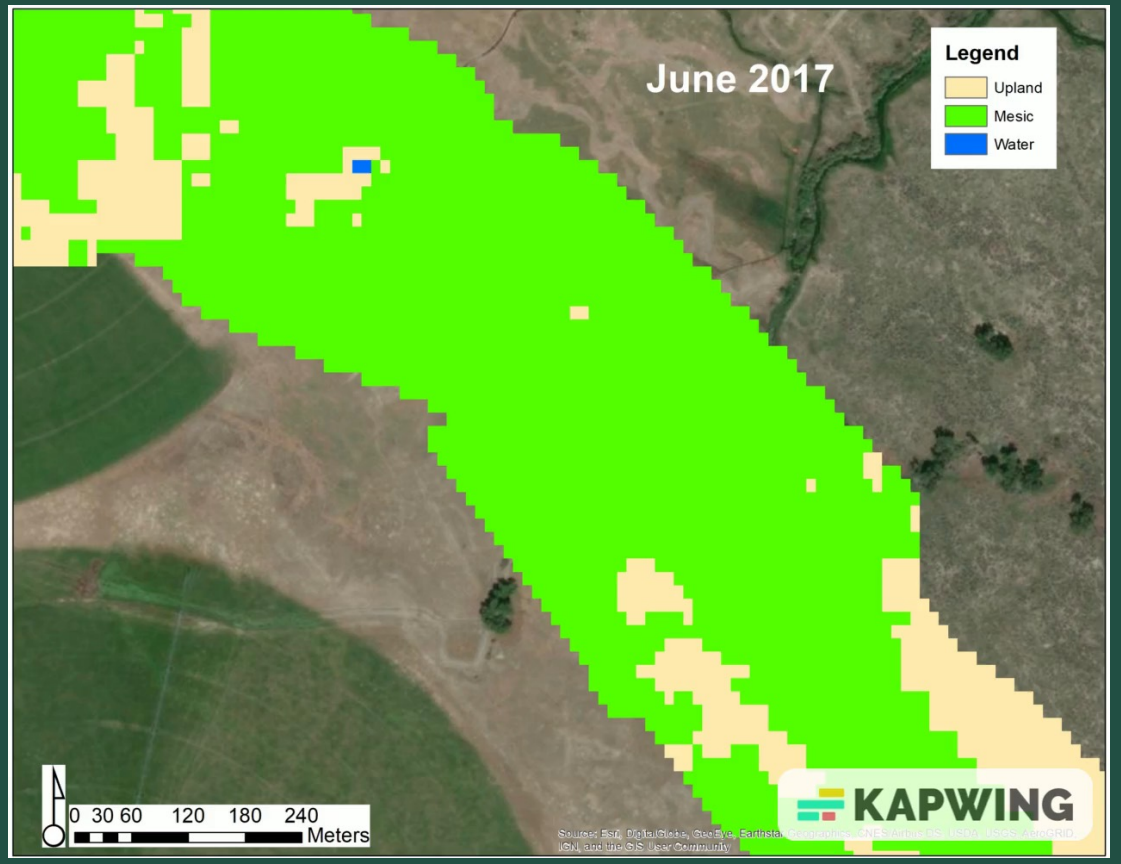
Generate insights for adaptive management



End user engagement & creative public outreach

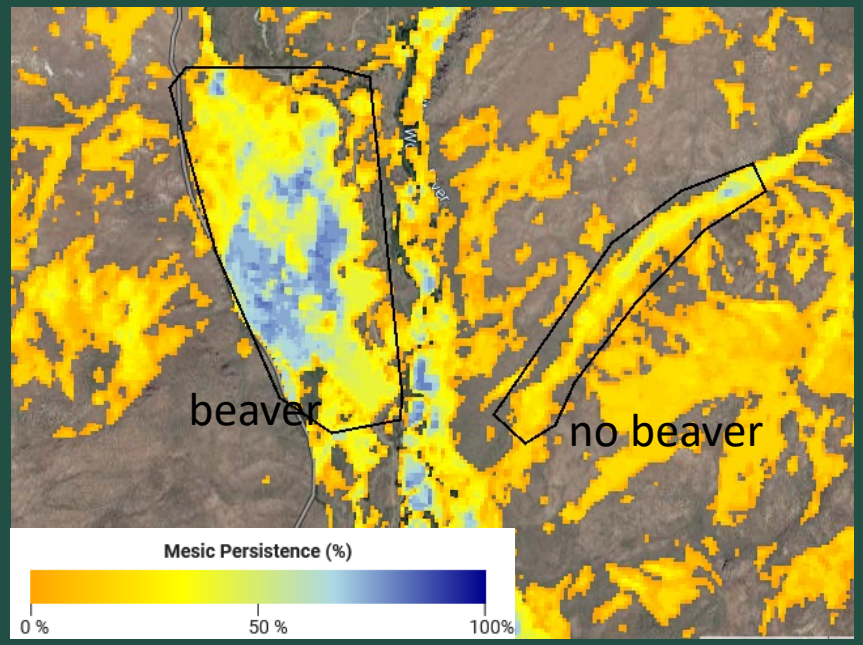
Monthly MRRMaid

- Monthly quantifications of surface water and mesic vegetation
- Sentinel optical-radar fusion classifications 10-m classifications
  - Kolarik et al. 2023
- Landsat fractional coverage - Machine Learning Regression
  - Kolarik et al. 2024



Mesic Vegetation Persistence (MVP)

- Uses every Sentinel and Landsat image in the archives
- Thresholds based on vegetation and moisture indices
  - Shrestha et al., 2024



Current Spatial Extent

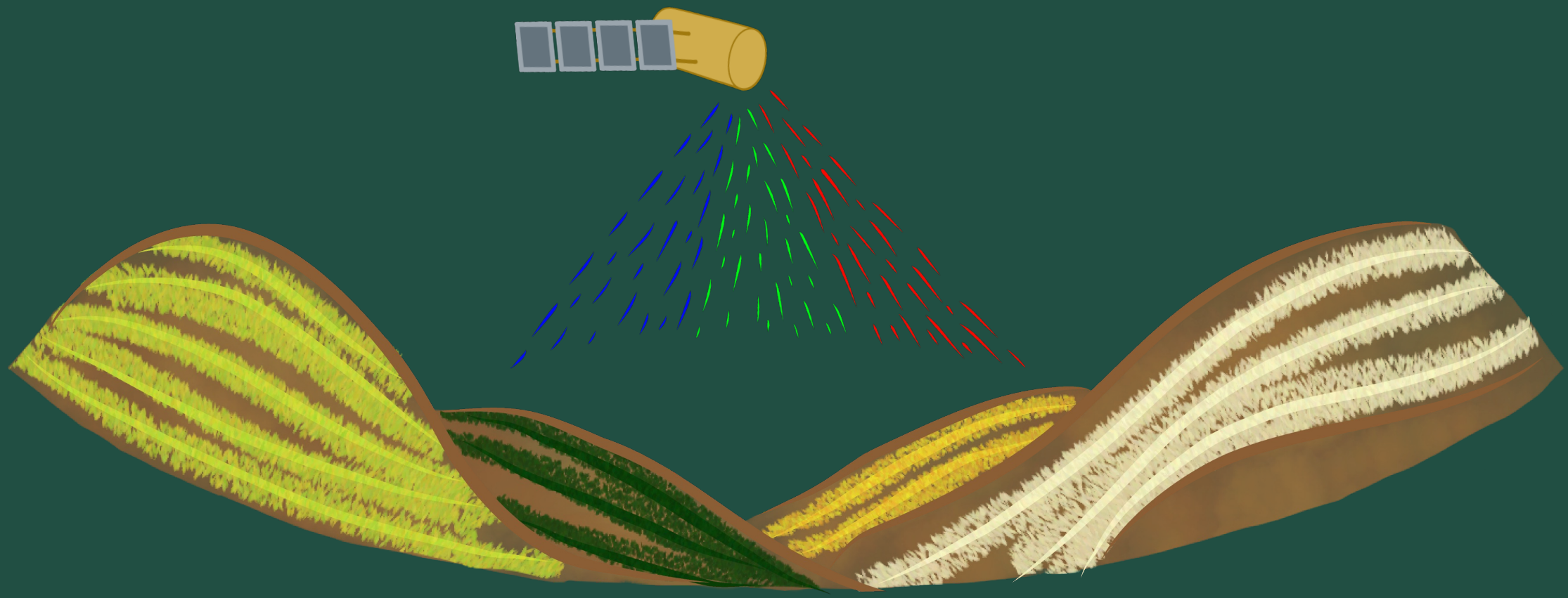
Monthly MRRMaid
High Divide

Region straddling Idaho, Montana, and Wyoming and connects vital western ecosystems

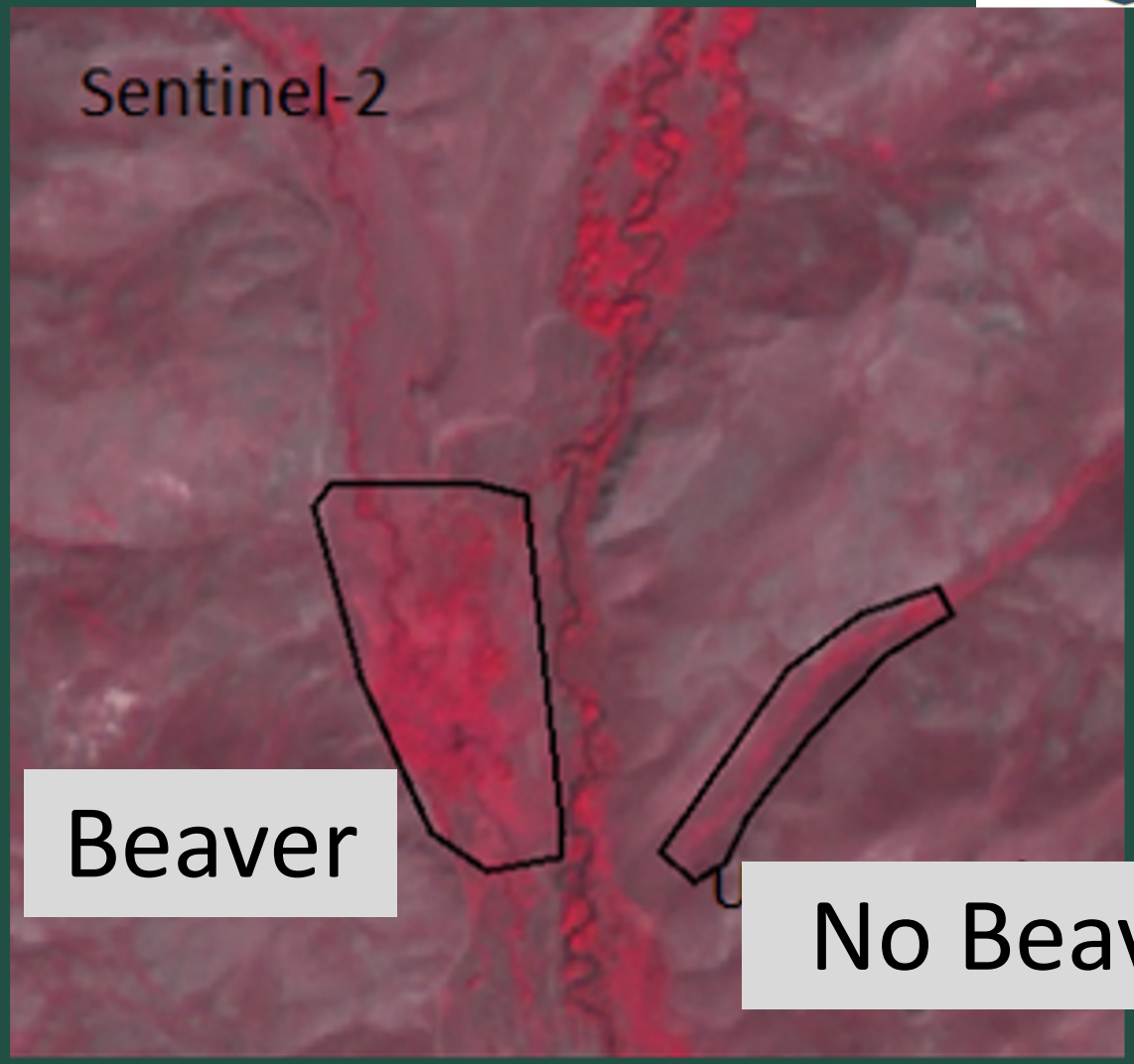
Mesic Vegetation Persistence (MVP)
Sagebrush Biome

Habitat covering most of the Intermountain West and supports many species

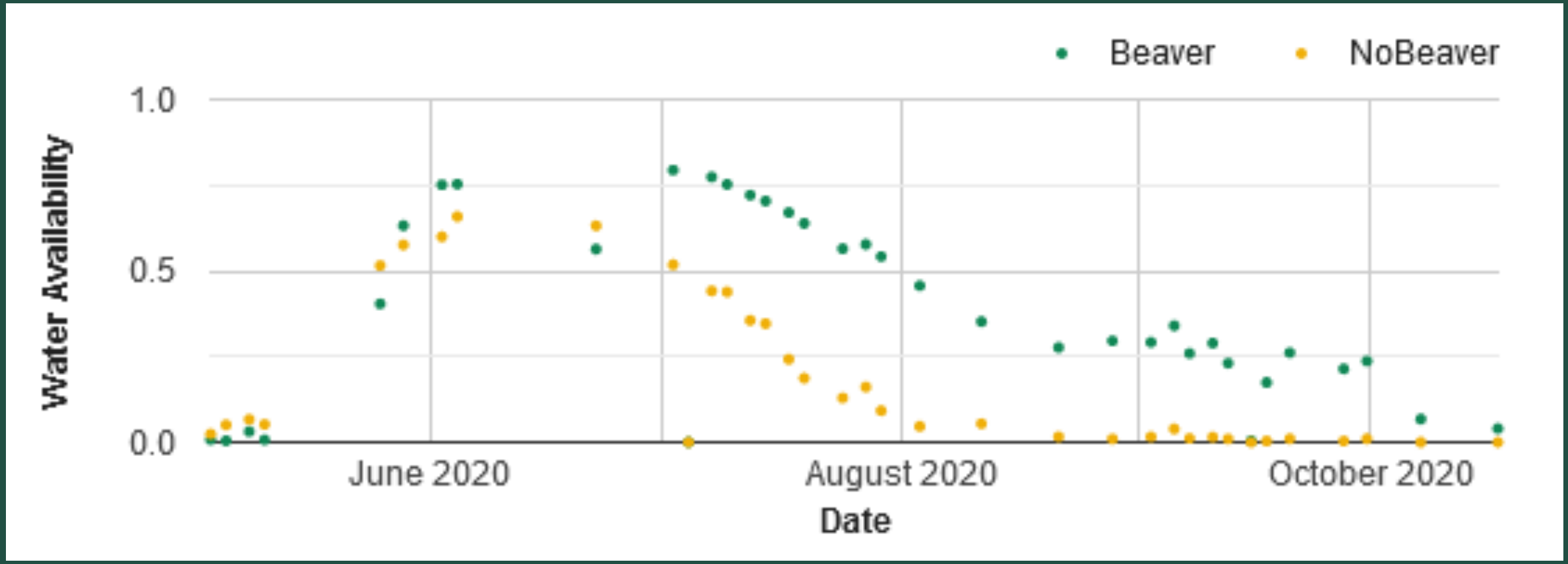
Case Studies



Case 1: Dense time-series to identify temporal and spatial patterns

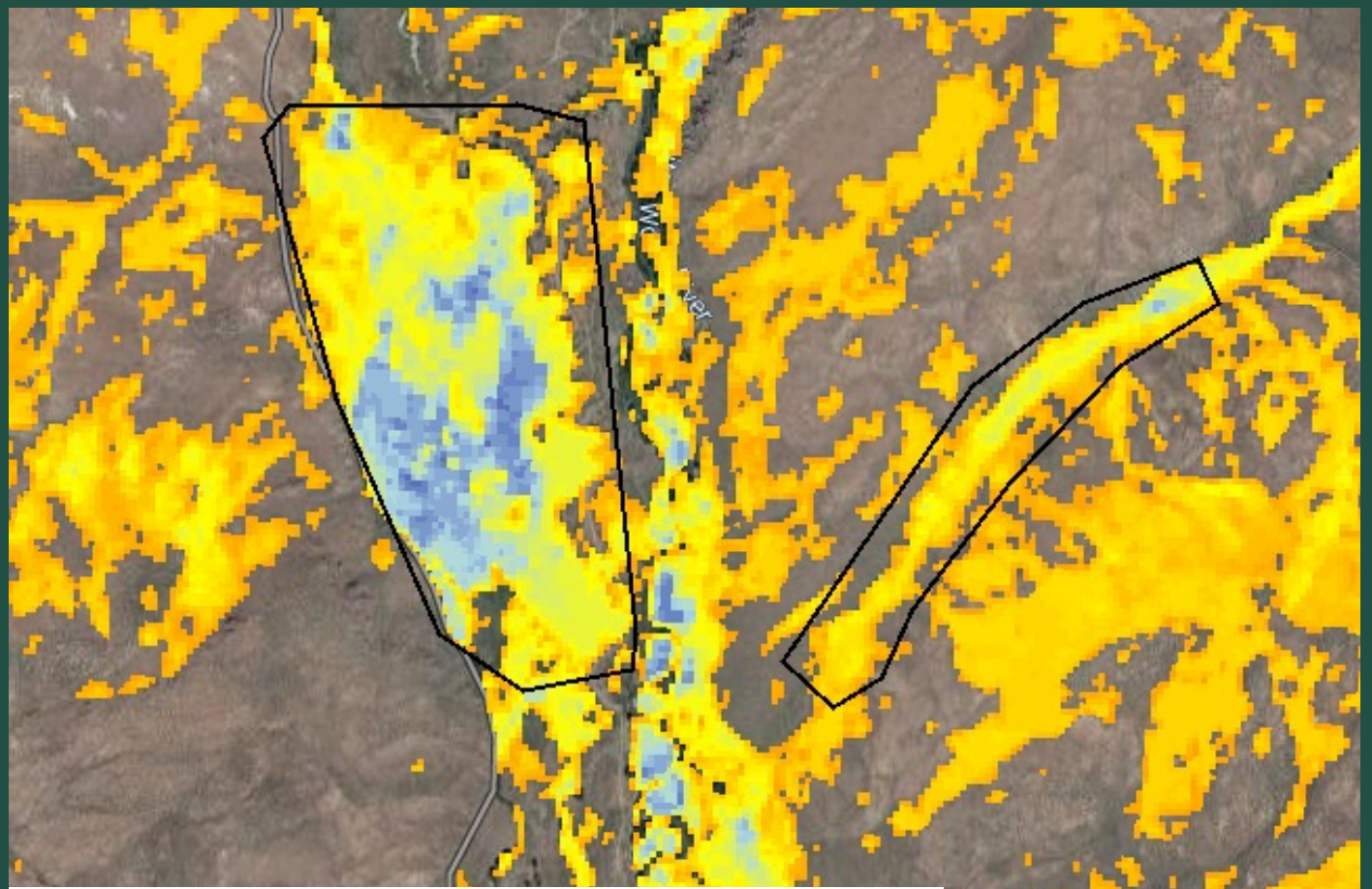


Dense time-series – Sentinel – 5-10 days



MVP MRRMaid, Sentinel-based Mesic Vegetation Persistence, Shrestha et al., 2024

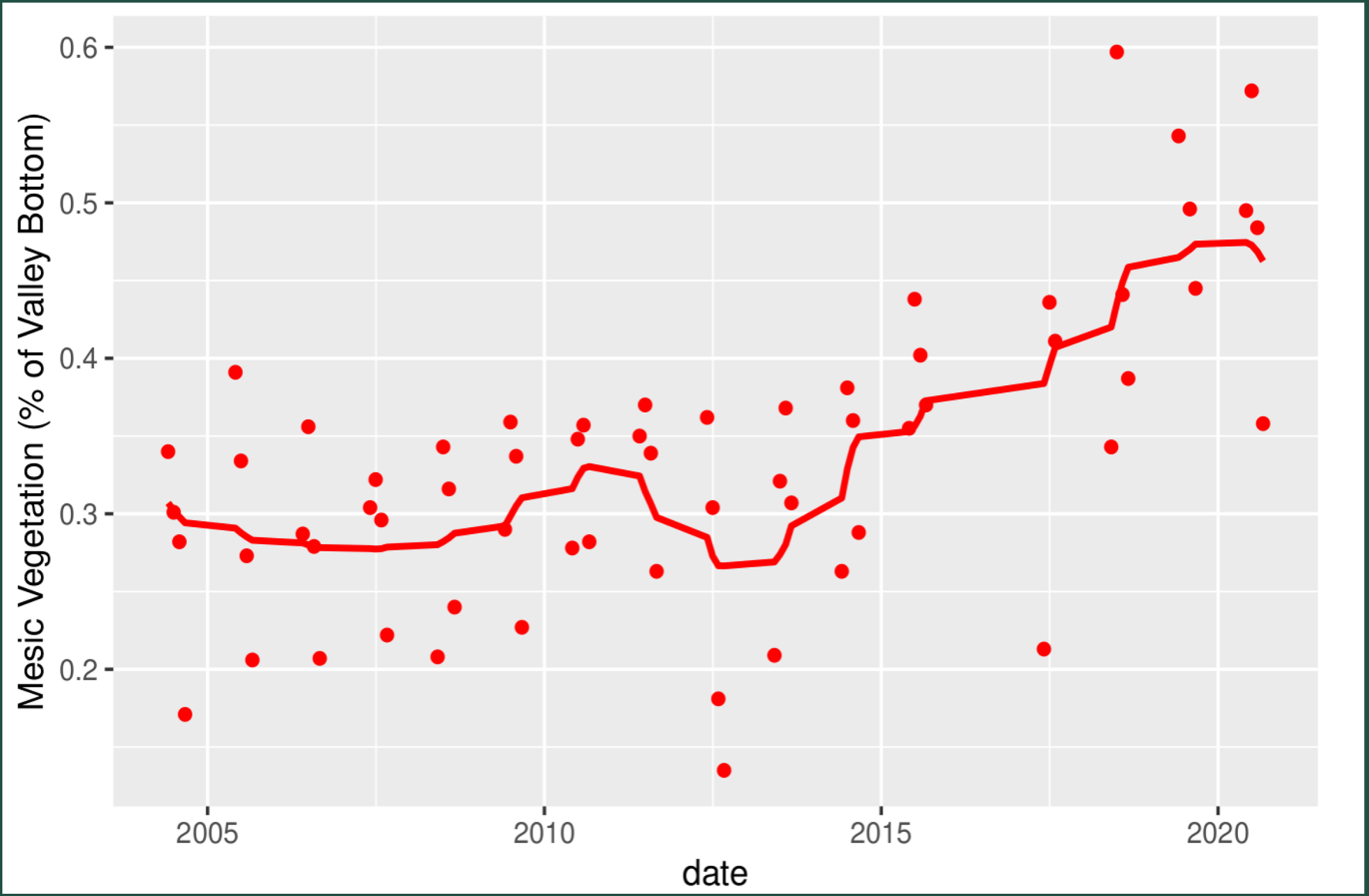
Spatial patterns of mesic persistence



Case 2: Changepoint analysis to identify key interventions

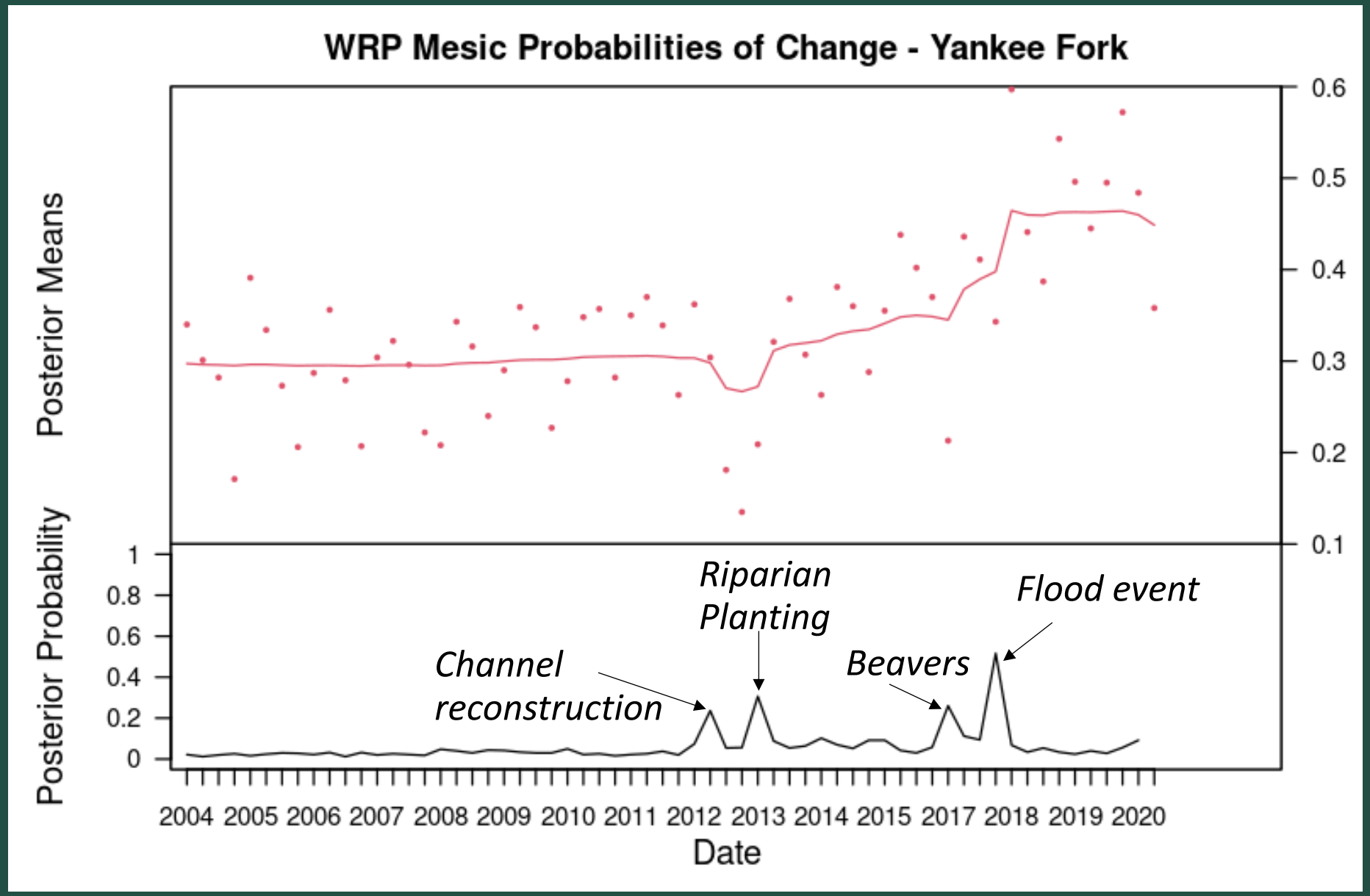
- Gold dredging 1940-1952
- Restoration began in 2012
- -Floodplain reconstruction
- -Riparian planting
- -Beavers moved in
- -Natural flood event

Wetland expanded from 30% to 50% of valley bottom



Monthly MRRMaid, Landsat fractional components with machine learning regression, Kolarik et al., 2024

Bayesian changepoints align with key events

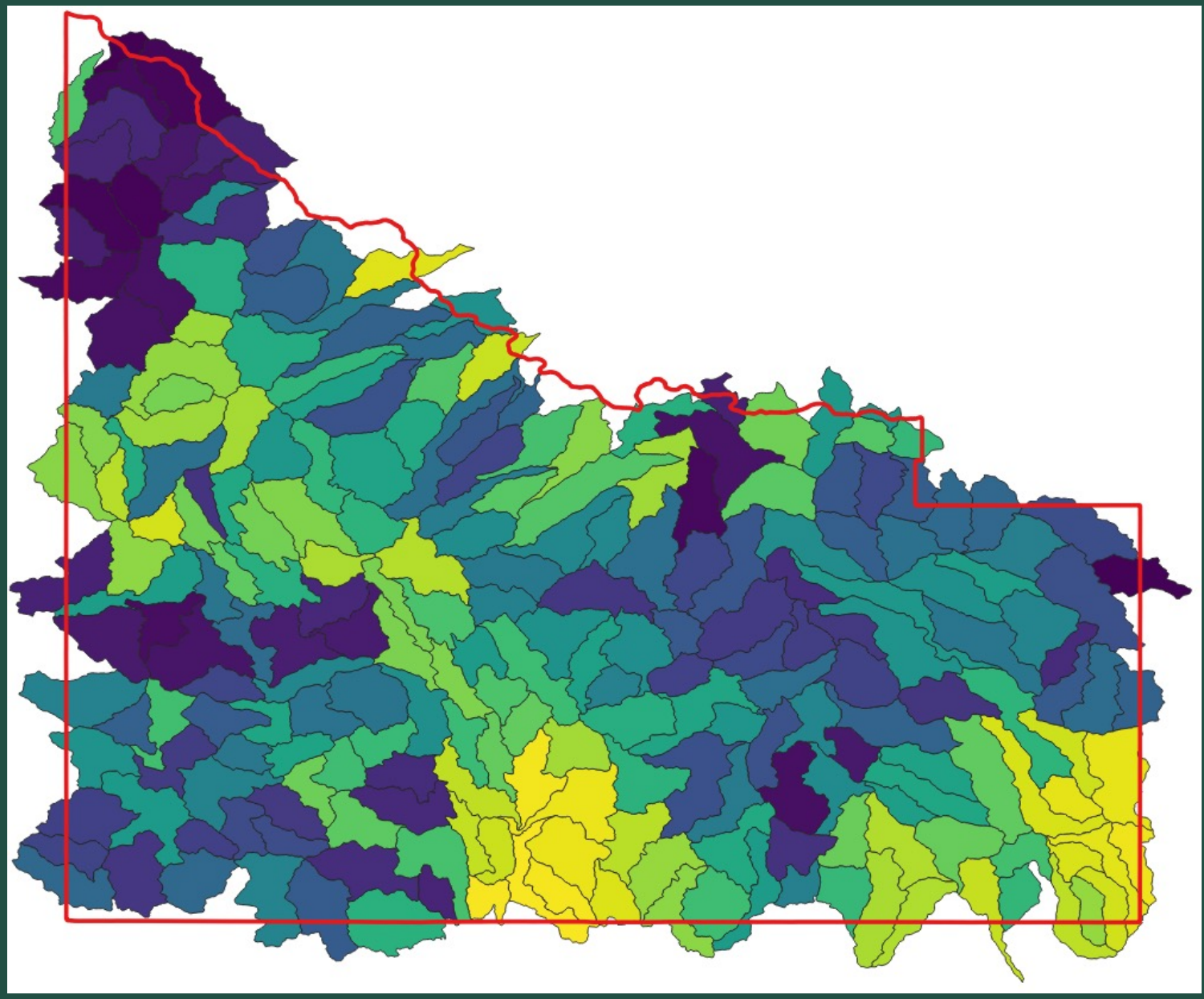


Case 3: Prioritizing watersheds based on drought resilience

Mesic vegetation trend 2017-202

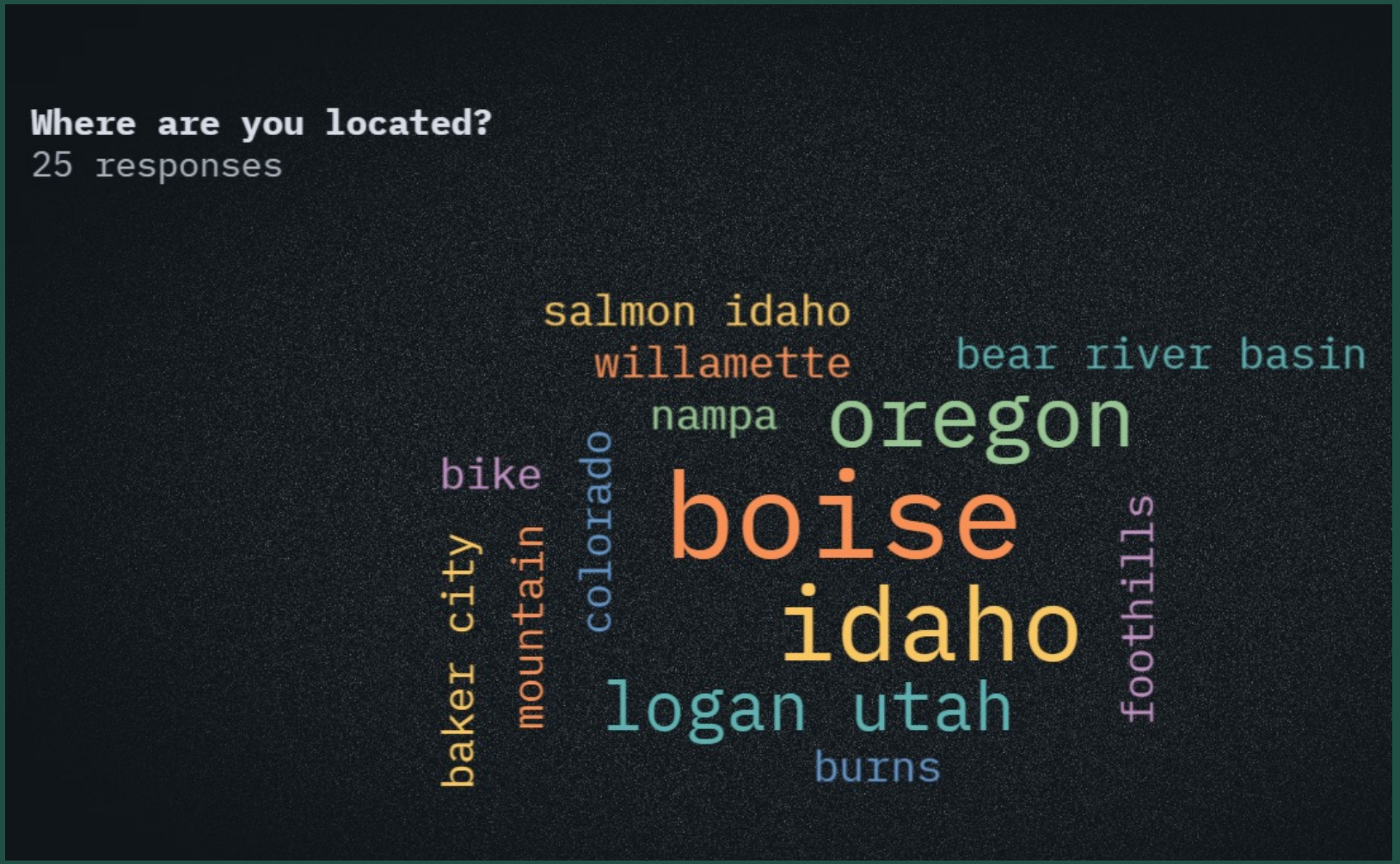
Decreasing Increasing

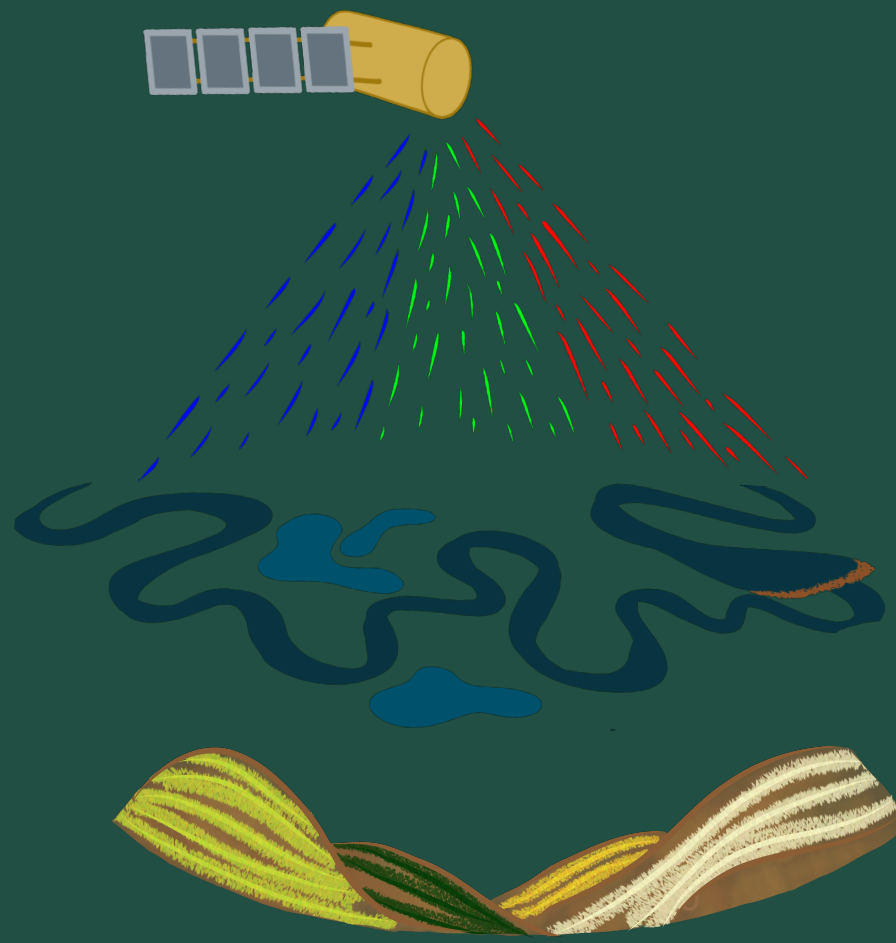
Owyhee County



End user engagement & creative public outreach

Where are you located?
25 responses



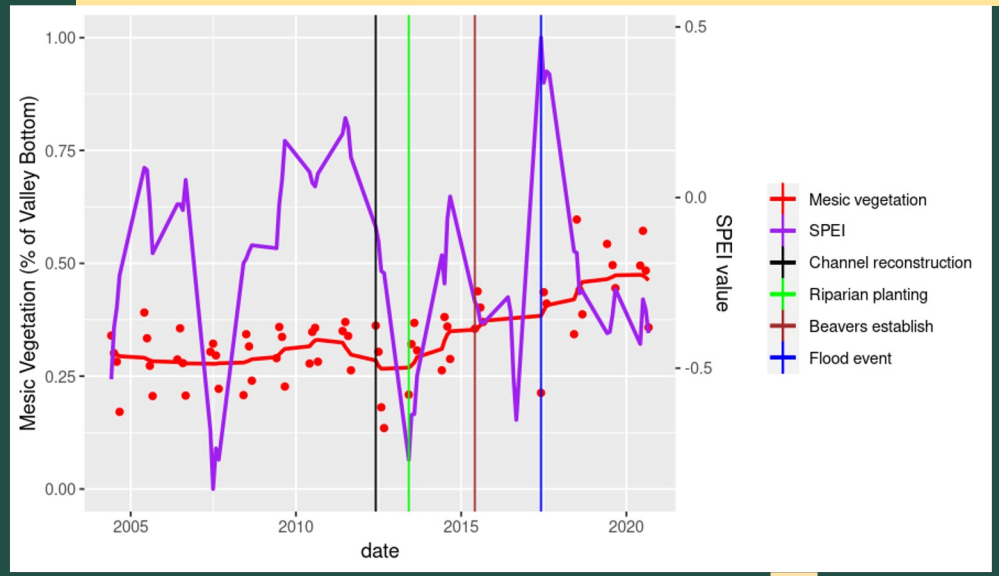


MRRMaid Toolbox

Monthly MRRMaid

MVP MRRMaid

Generate insights for adaptive management



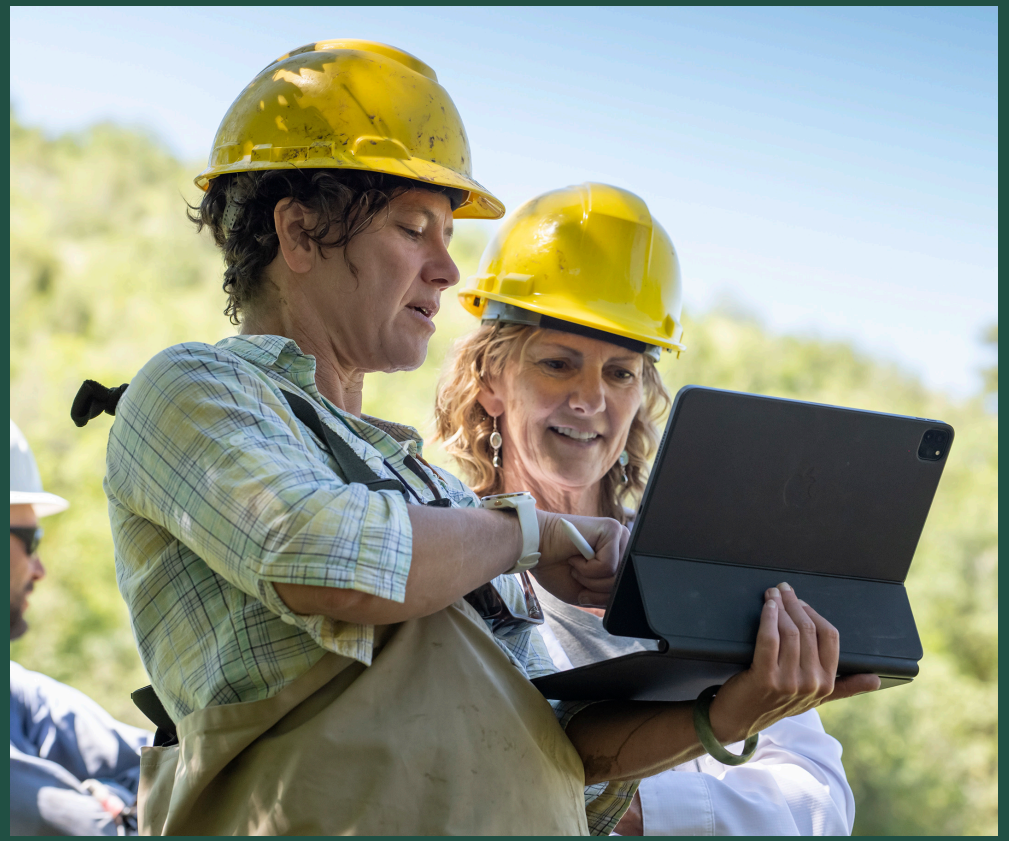
End user engagement & creative public outreach

Thank you!

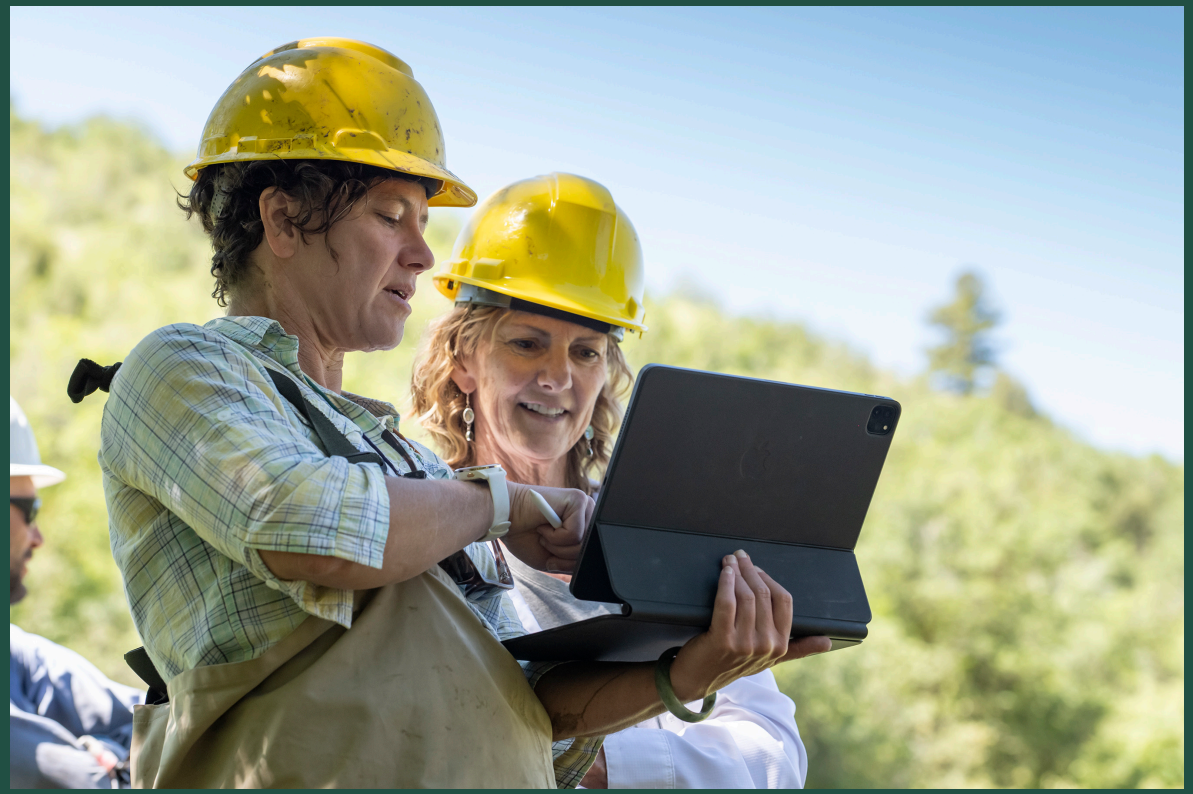
Our landing page with GEE apps: https://www.boisestate.edu/hes/projects/mrrmaid-mesic-resource-restoration-monitoring-aid/

Our Utah State partners also have lots of cool stuff in the works for this project. Ask me!

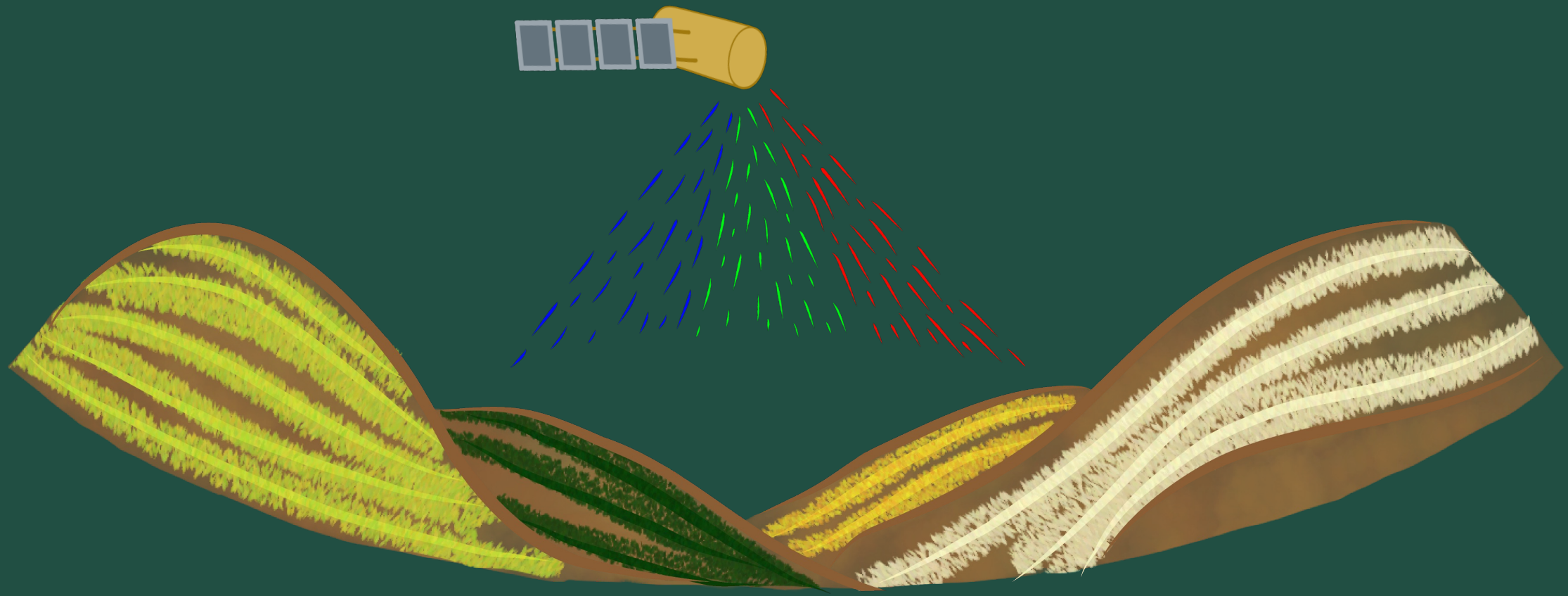
Cindy, we will miss you!!!



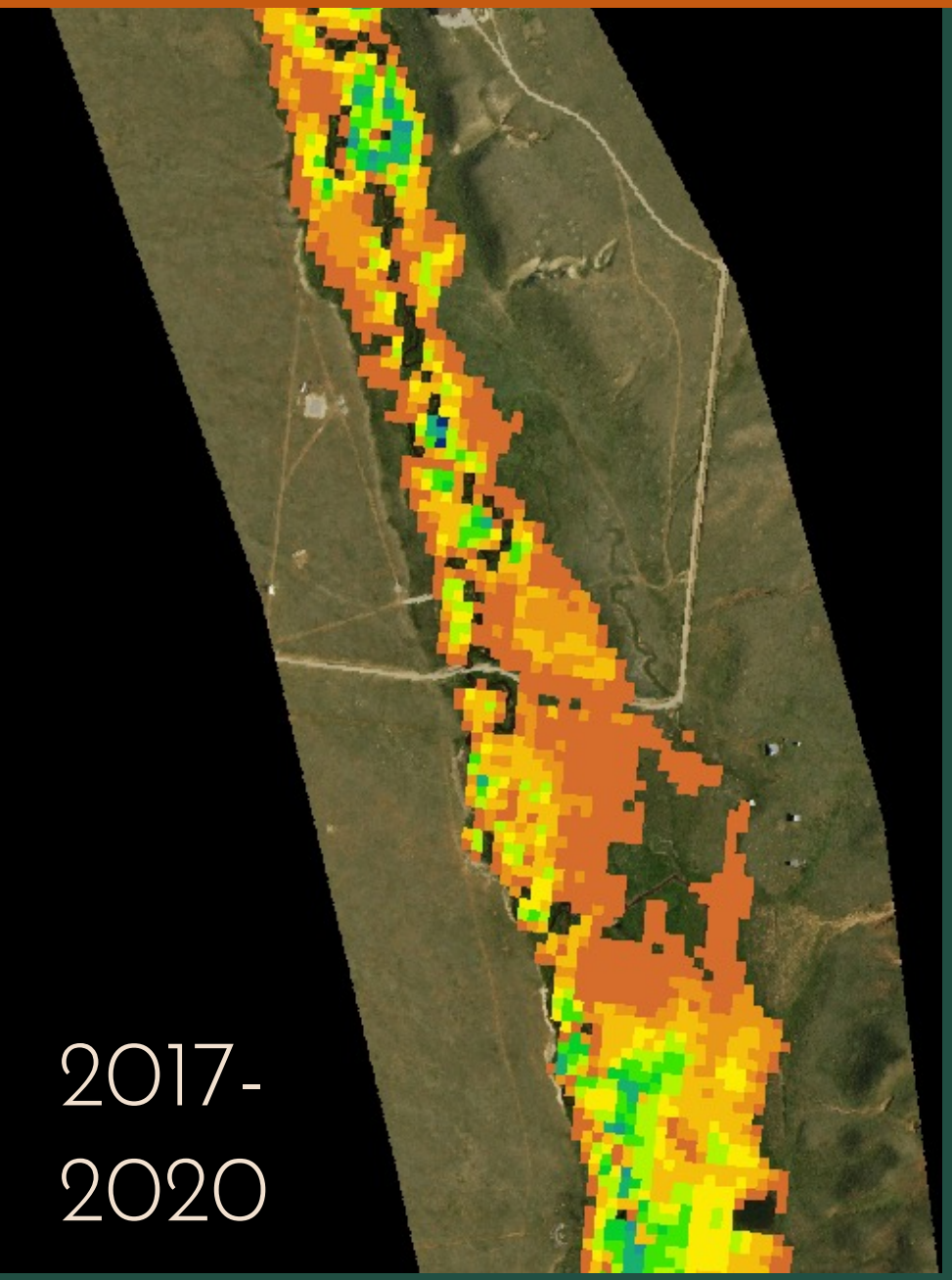
Thank you!



Thank you!

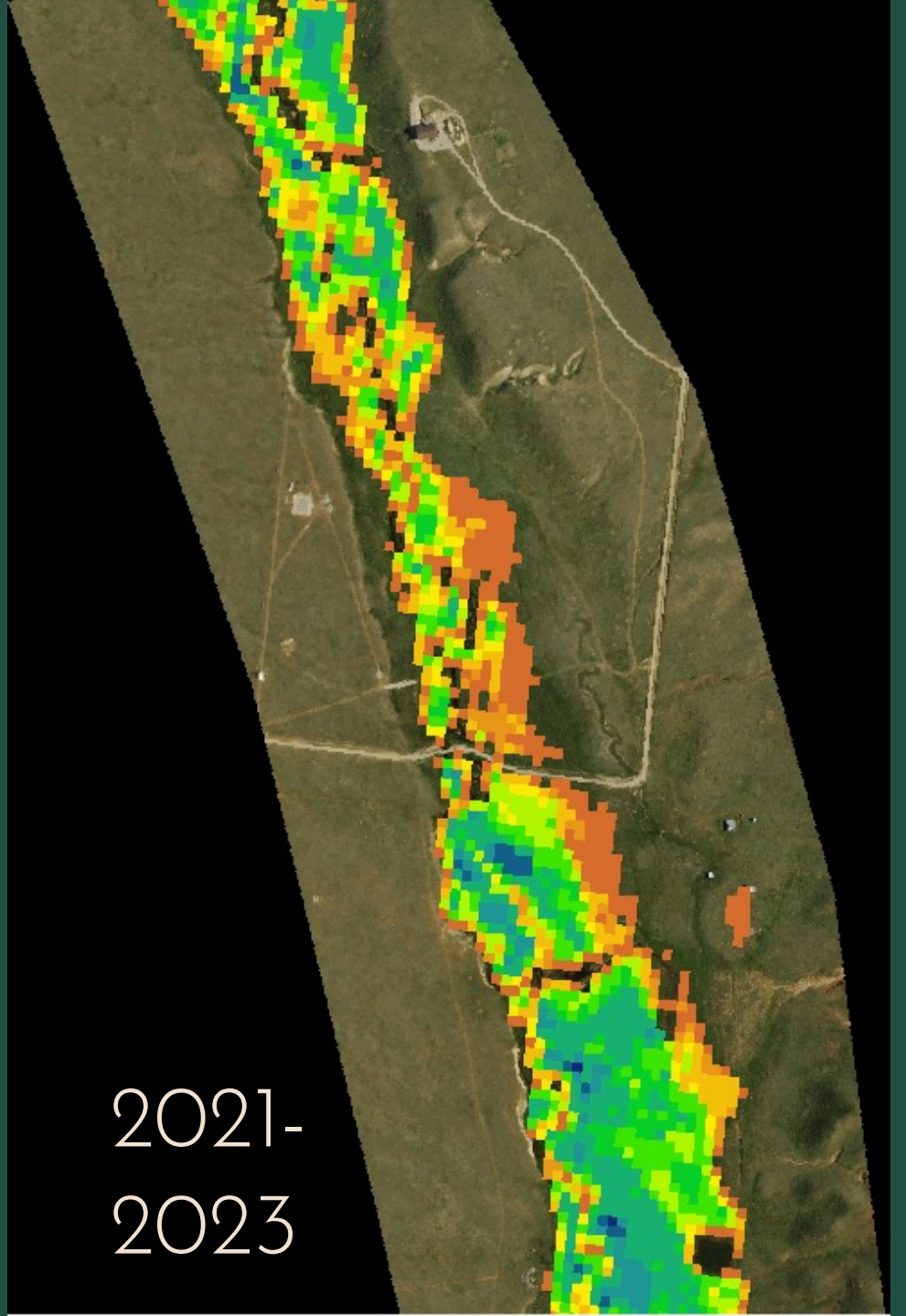


Increased “persistence”



2017-2020

0-5%
5-10%
10-15%
15-20%
20-25%
25-30%
30-35%
35-40%
40-45%
45-50%
50-55%
55-60%



2021-2023

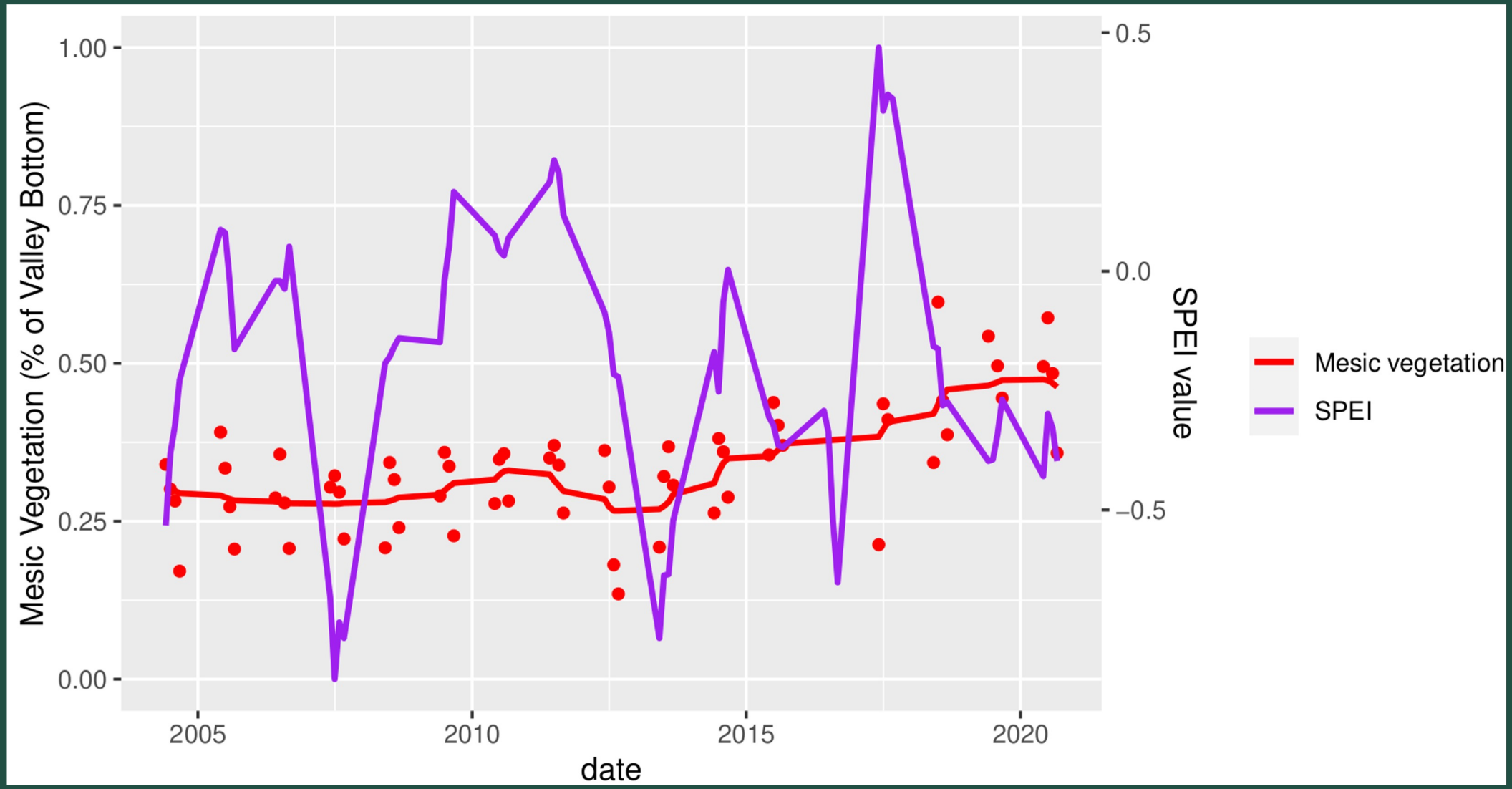
Rewilding with beaver for climate adaptation

Jodi Brandt[1], Nick Kolarik[1], Emily Iskin, Nawaraj Shrestha[1], Nancy Glenn[1,]

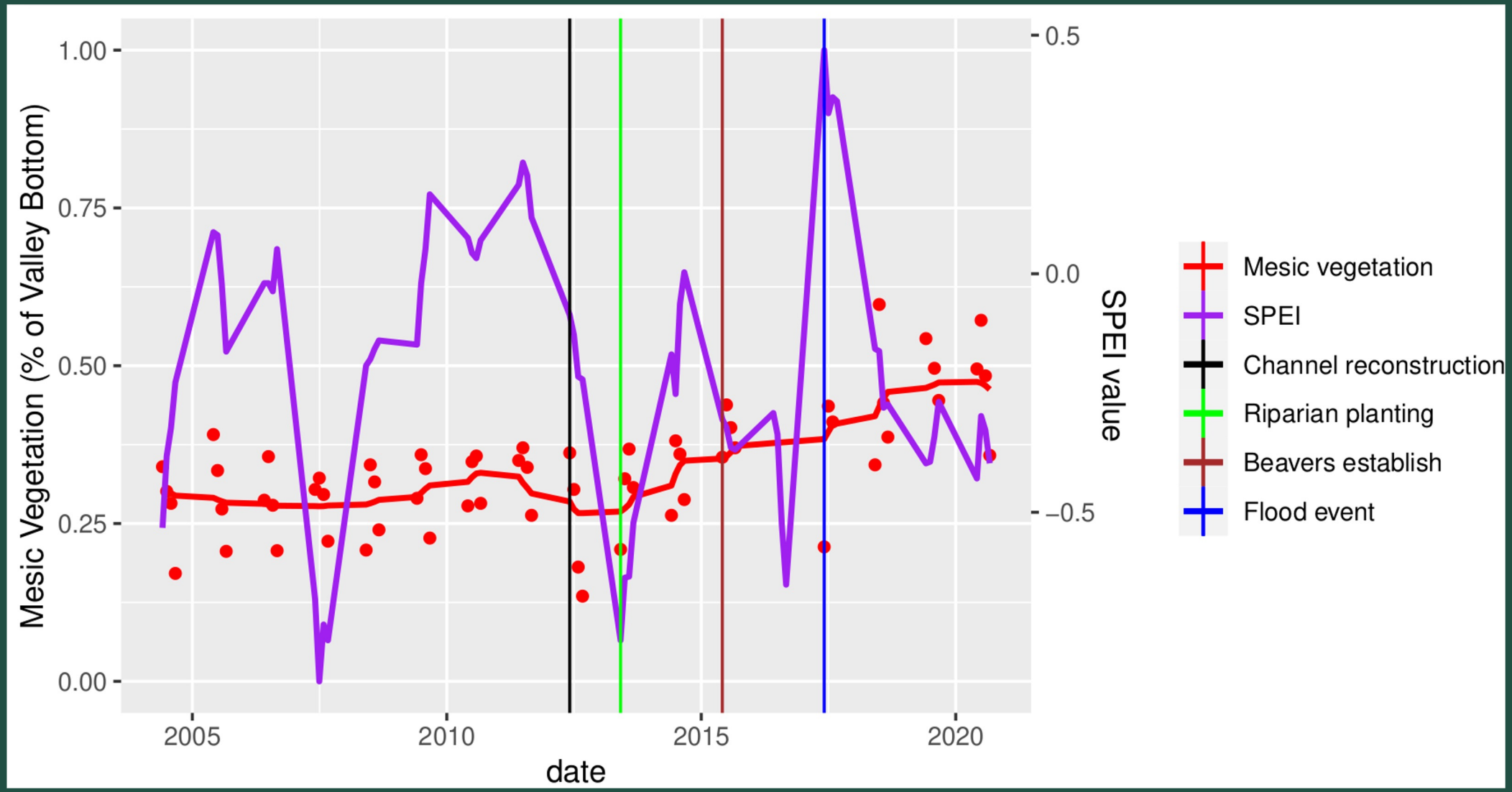
Joe Wheaton[2], Philip Bailey[3], Wally Macfarlane[2]

[1] Boise State University, [2] Utah State University, [3] North Arrow Research

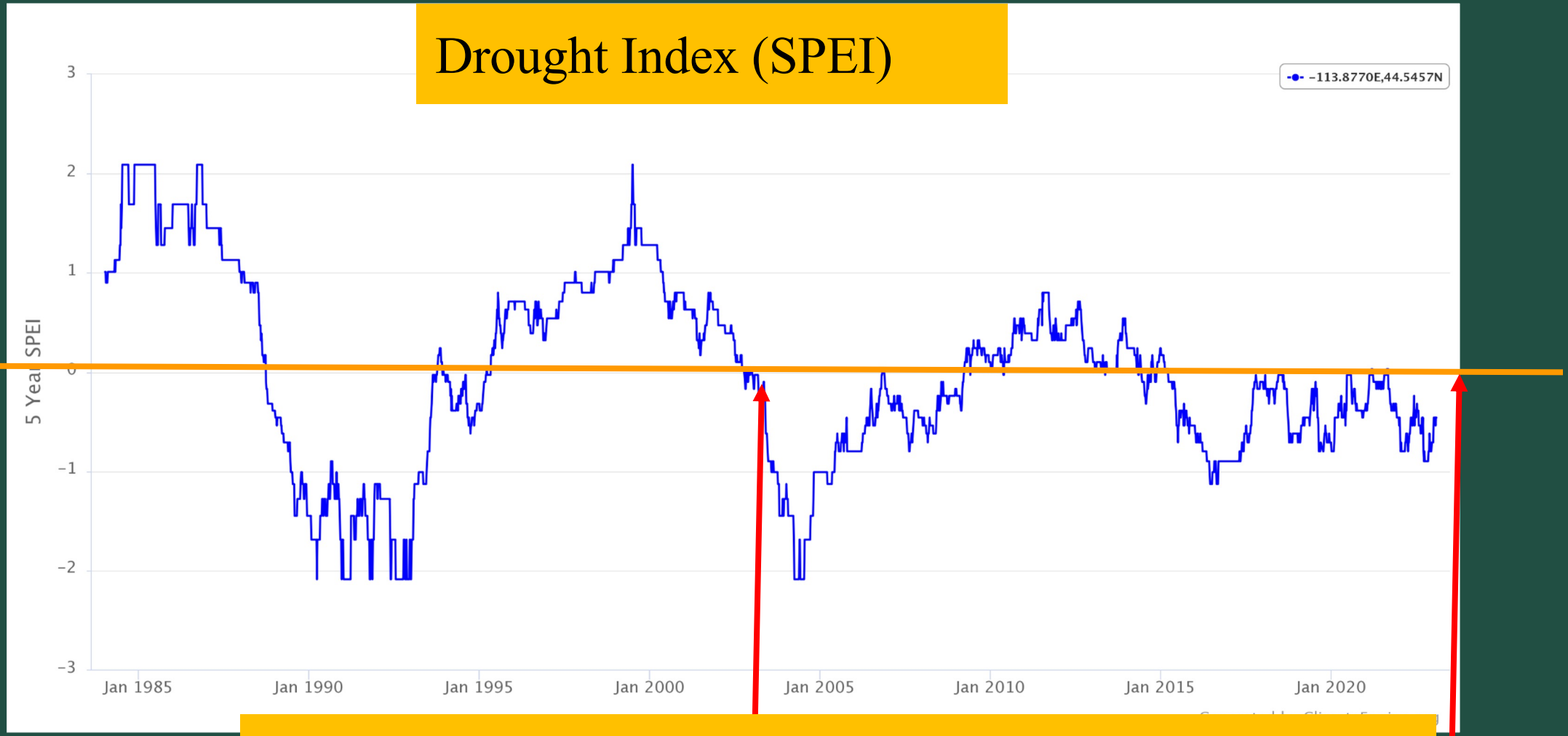
Wetland expansion associated with benchmark events



Wetland expansion associated with benchmark events



Long-term drought in western U.S.



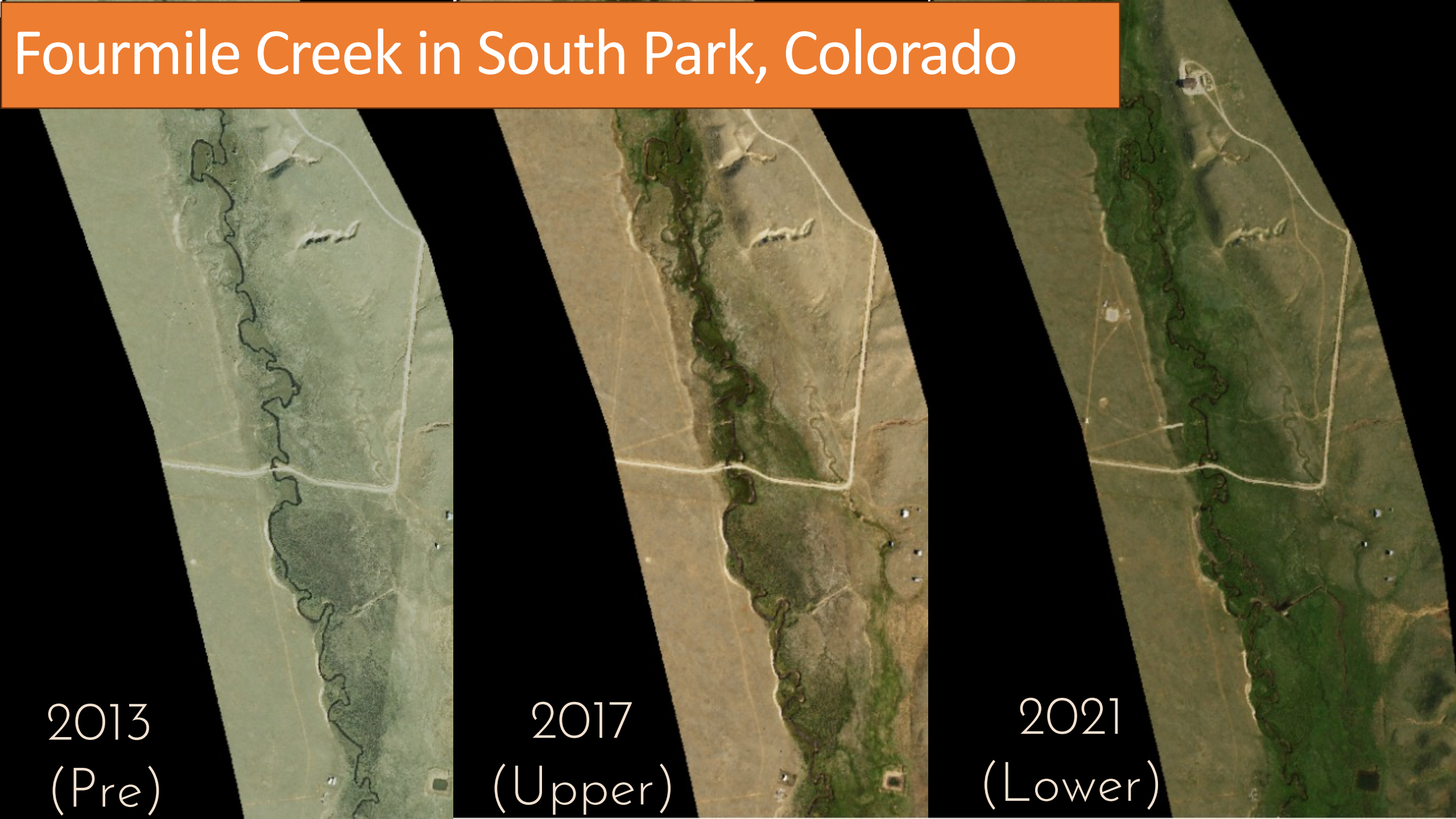
Since 2004 - 13 of 18 years below historical average

Low summer flows

Extended fire season

Spring floods

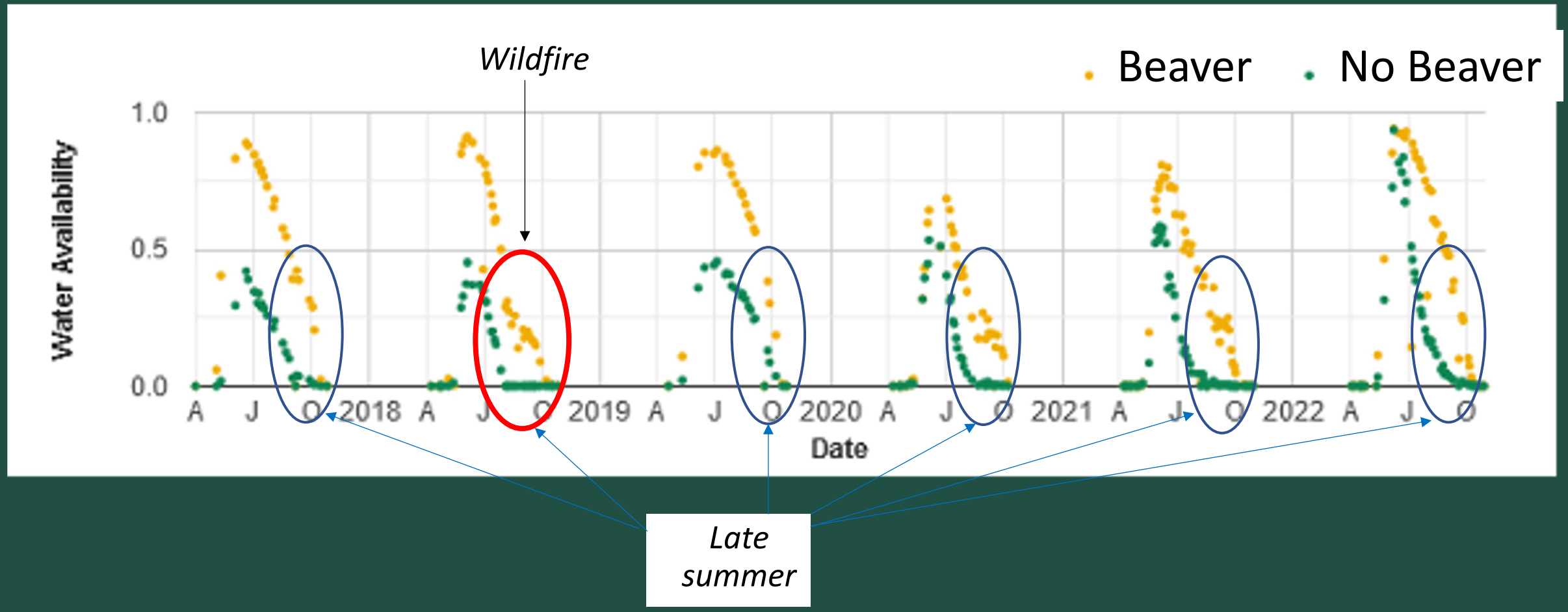
Fourmile Creek in South Park, Colorado



Beaver Translocation

- Ranching, overgrazing
- Beaver translocation
- Wildfire in 2019

Dense time-series from Sentinel



Refugia during drought and wildfire

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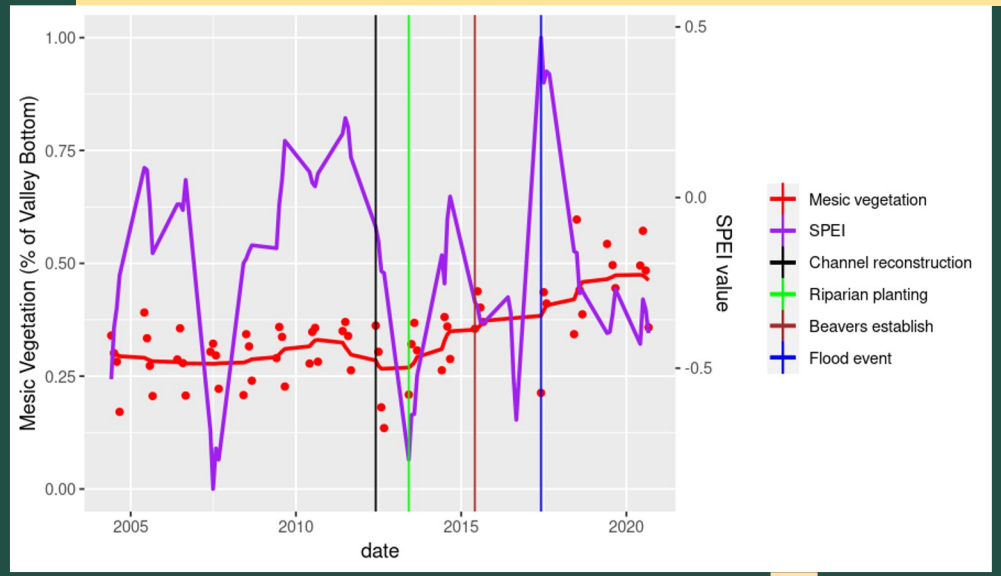
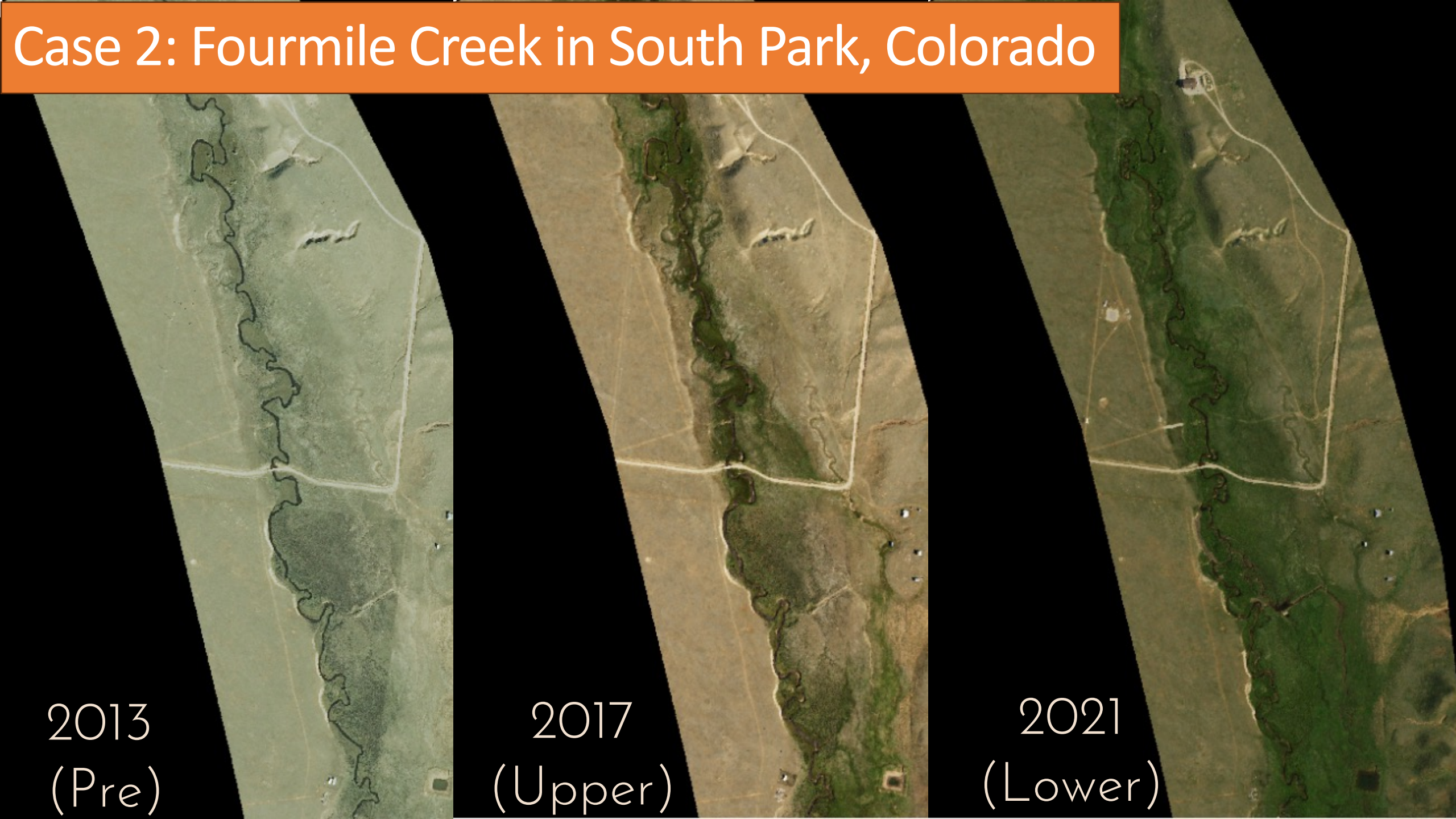
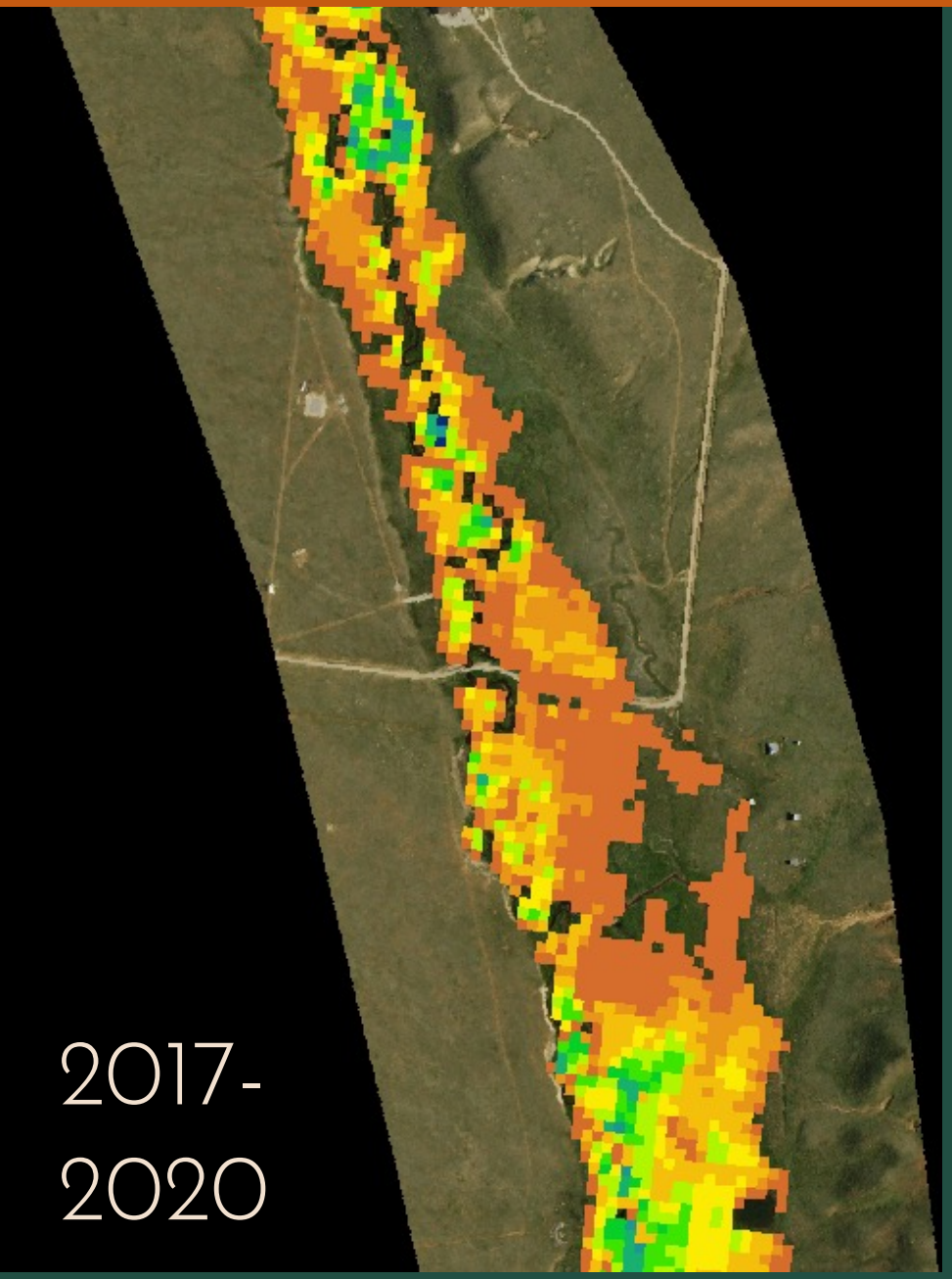


End user engagement & creative public outreach

Case 2: Fourmile Creek in South Park, Colorado



Spatial patterns of persistence - Four Mile Creek, CO



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