SES SYNTHESIS

BOISE STATE UNIVERSITY

University of Idaho

Idaho State UNIVERSITY

IDAHO EPSCoR

NSF

GEM3

Genes by Environment

Modeling · Mechanisms · Mapping

Supported by NSF Grant 2019 OIA-1757324

Social-Ecological Systems Mapping: *Goal and Objectives*

Goal

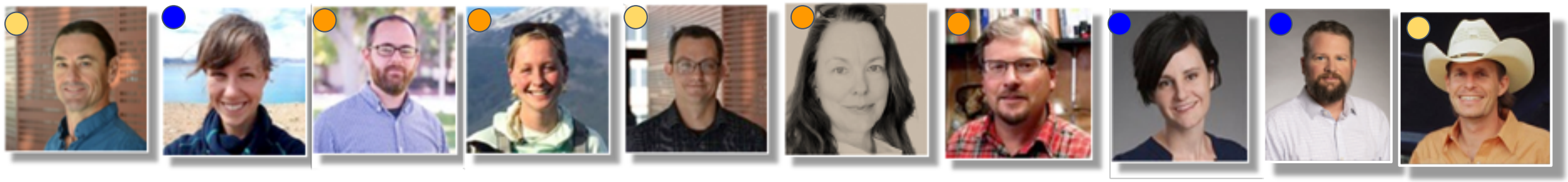
Assess and characterize human-environment interactions in sagebrush and trout systems.

Objectives:

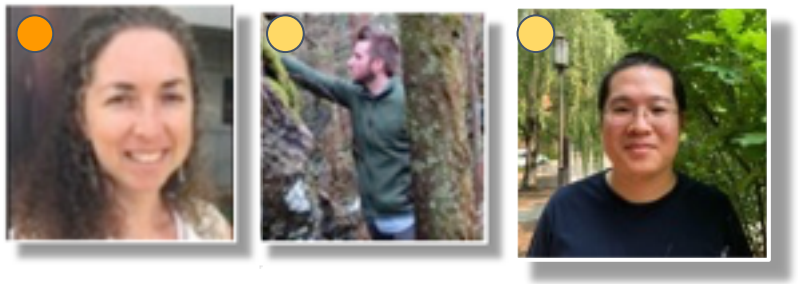
- Map complex SES conditions.
- Assess and characterize the range of abiotic and biotic that explain GxE outcomes across SES gradients.
- Stakeholder engagement

Social-Ecological Systems Mapping Team

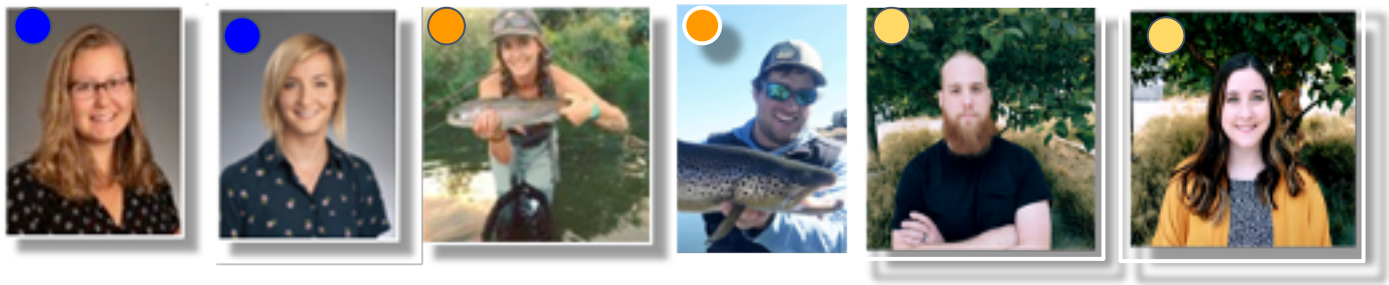
Faculty



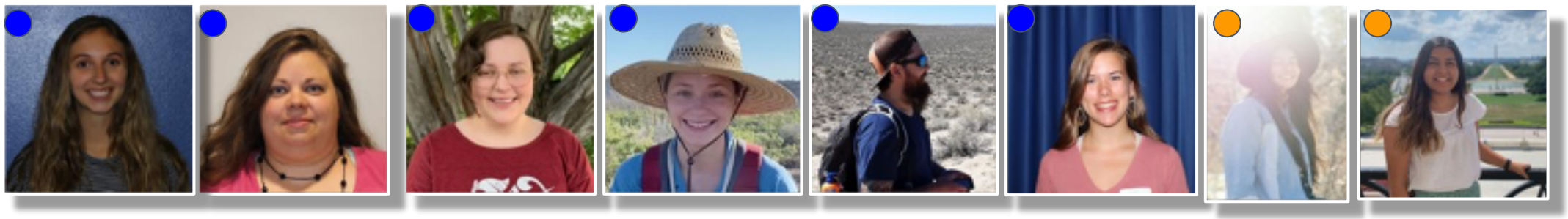
Postdocs



Graduate students

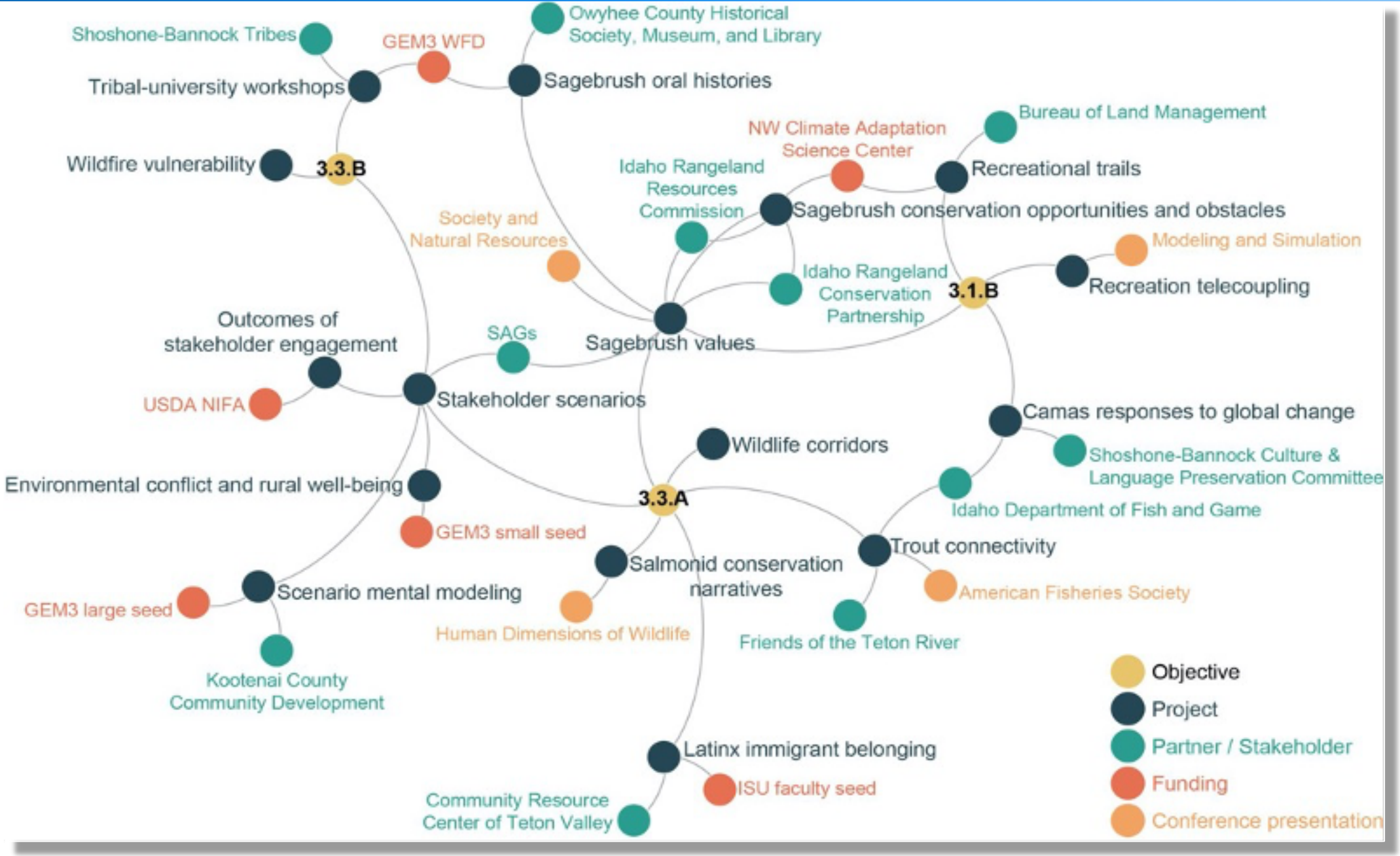


Undergraduates



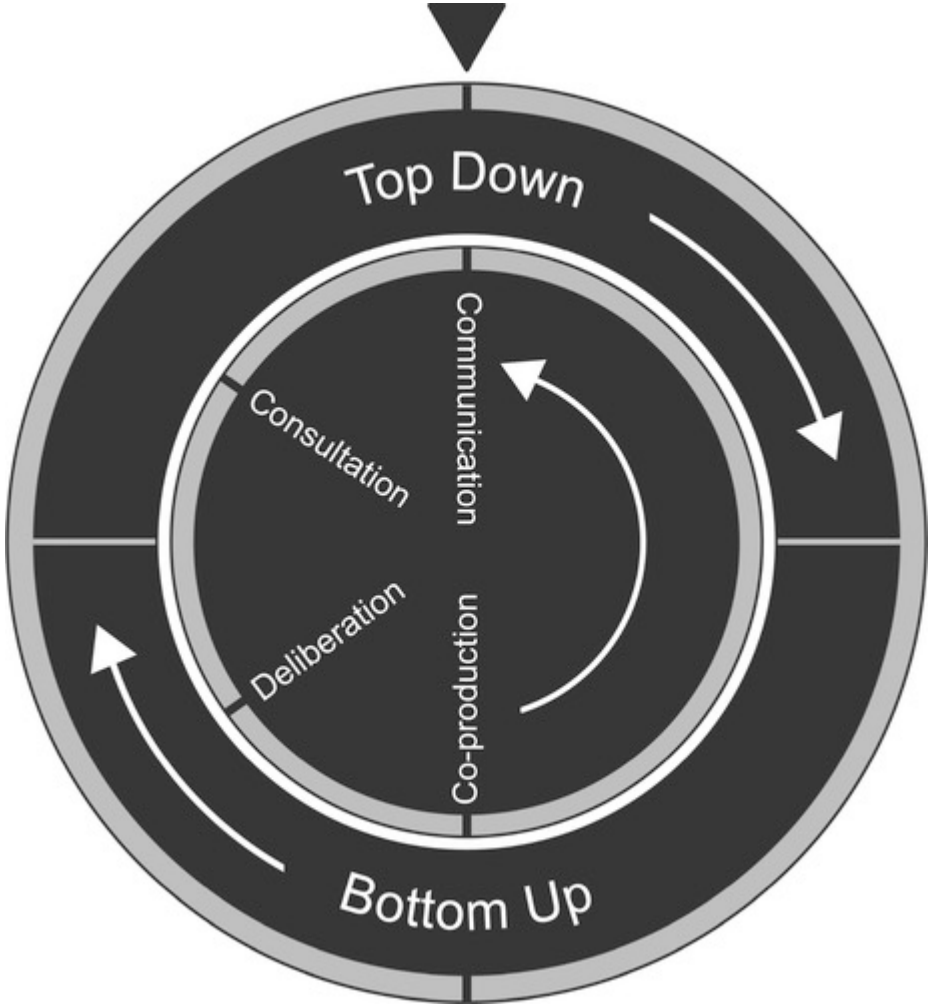
- Boise State
- U of Idaho
- Idaho State

SES Projects Overview



Stakeholder engagement

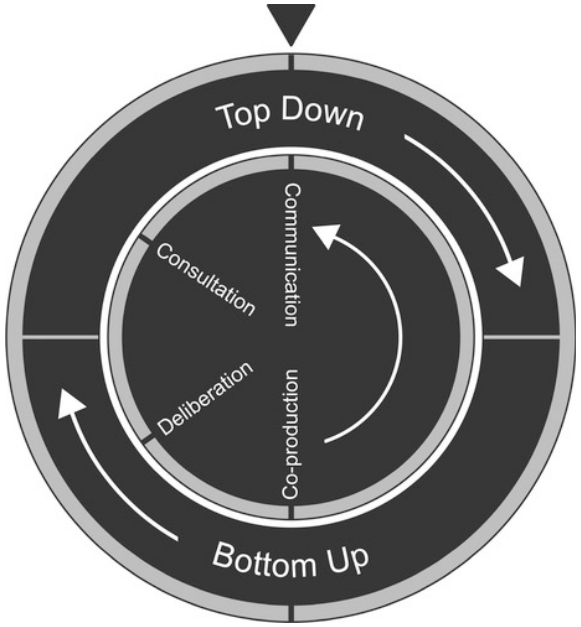
Working with stakeholders to develop research questions, methods, and other aspects of research design to meet their data and information needs



Reed et al. 2018

Stakeholder Advisory Groups

- SAG members from local & state government, tribes, state & federal agencies, NGOs, private landowners
  - 34 members in Owyhee region
  - 19 members in Teton Valley



Reed et al. 2018

Mapping the sagebrush social landscape

Research problem: responds to SAG identified need to better understand social dynamics affecting sagebrush steppe use and management

Research questions:

1. In what ways to Idahoans value sagebrush steppe landscapes?
2. How do Idahoans prefer to manage sagebrush steppe landscapes

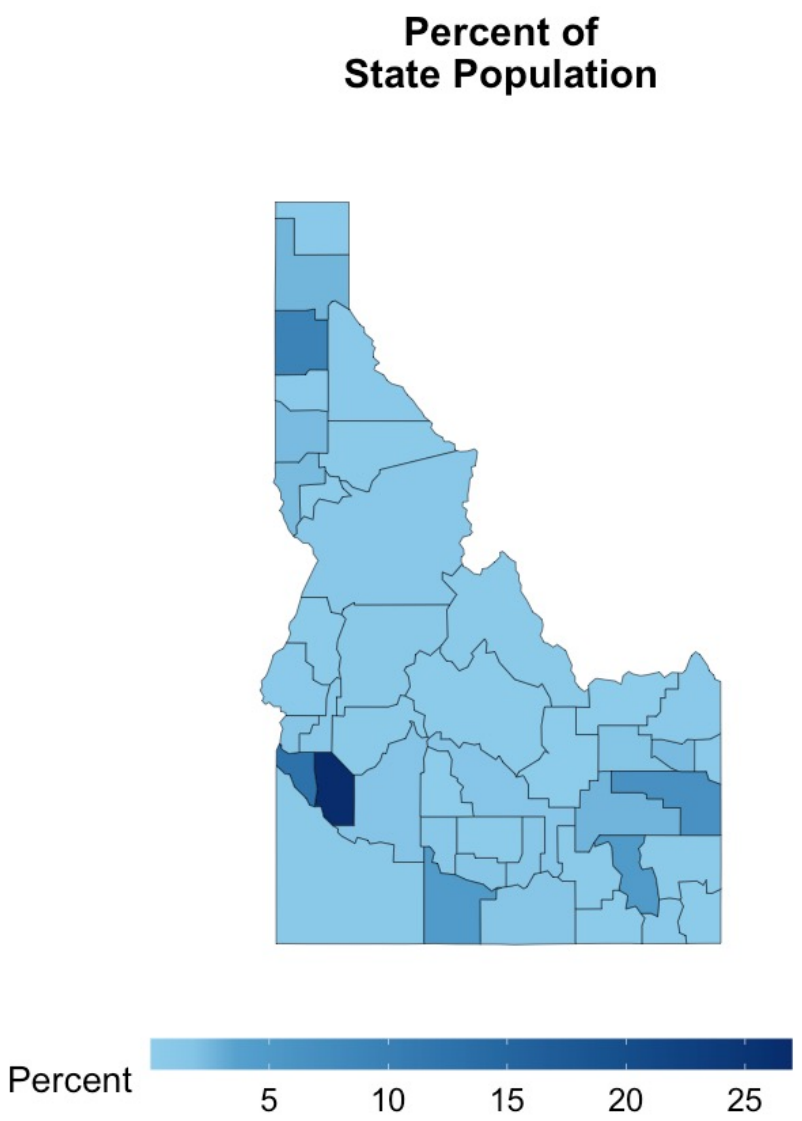
Determining who holds what values, attitudes, and management preferences and where they live on the landscape could help prioritize management actions.

IDAHO RANGELAND Resources Commission

IDAHO RANGELAND CONSERVATION PARTNERSHIP

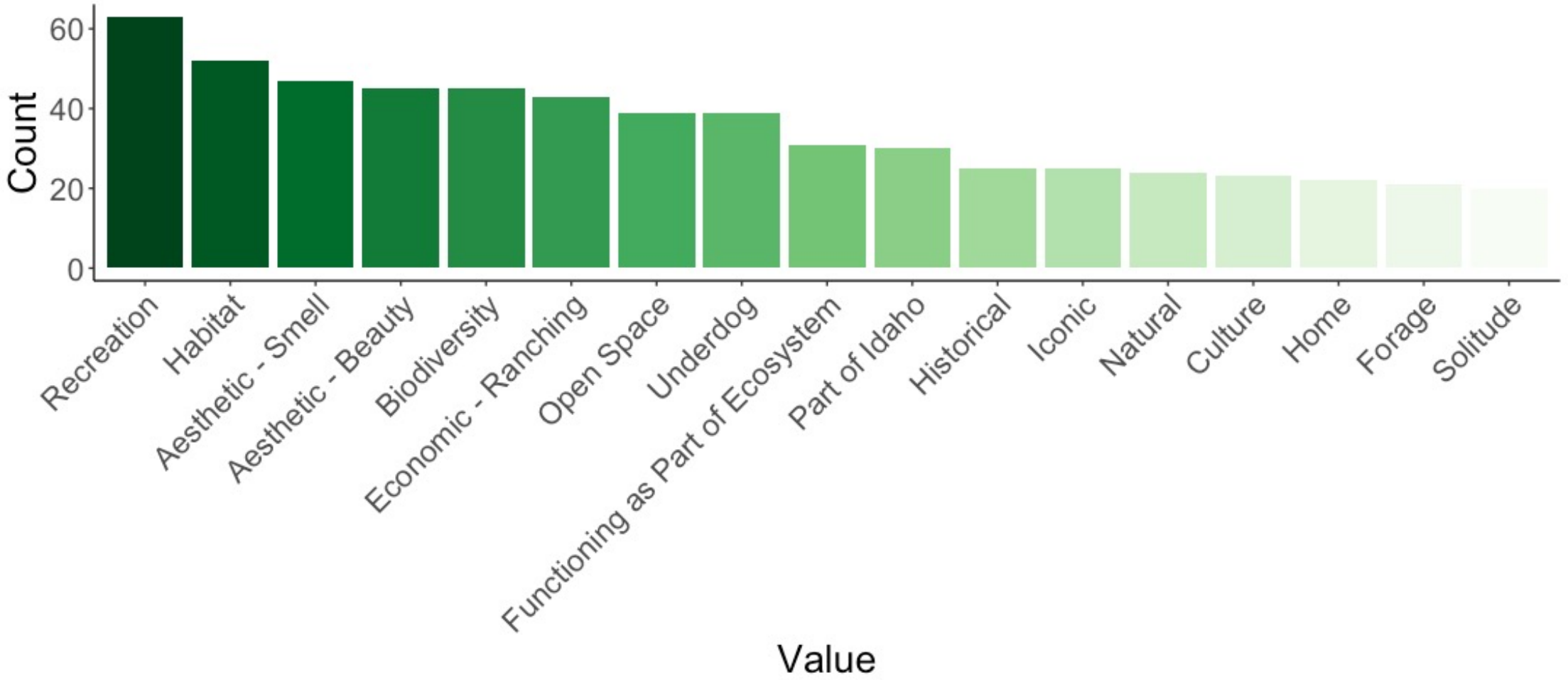
Survey Methods

- **Mode:** Phone and web-based
- **Timeline:** October – November 2021
- **Total completed:** 1,048
  - 25% from phone surveys
  - 75% from web surveys

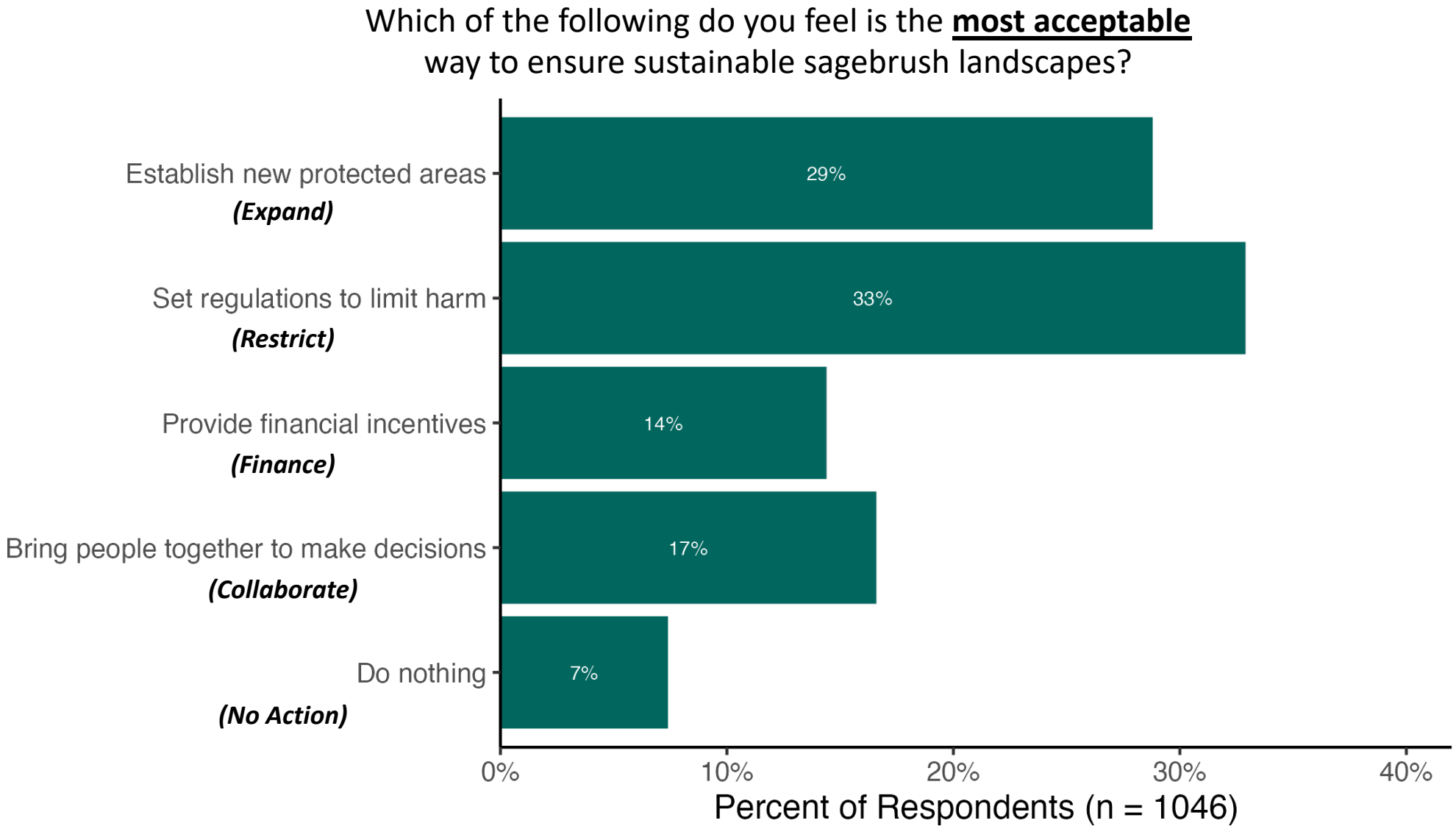


Idahoans value sagebrush in numerous ways

Over 48 values were identified, including:

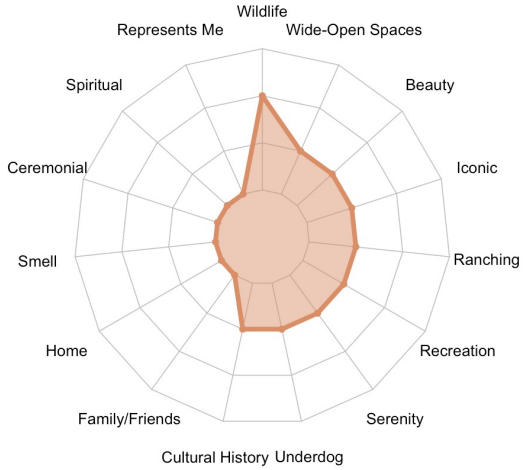


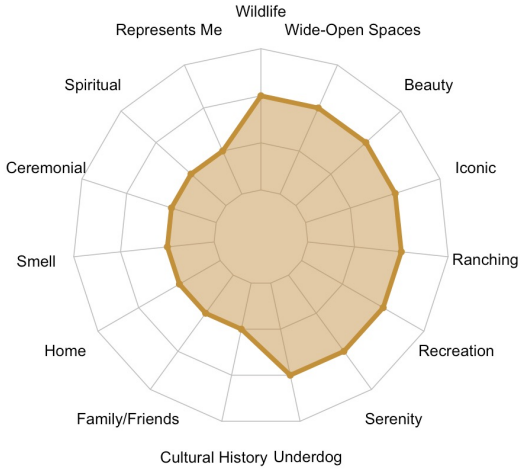
Most Preferred Management Strategy (**General**)



Even when sagebrush steppe isn't personally important, "broader benefits" are often still valued.

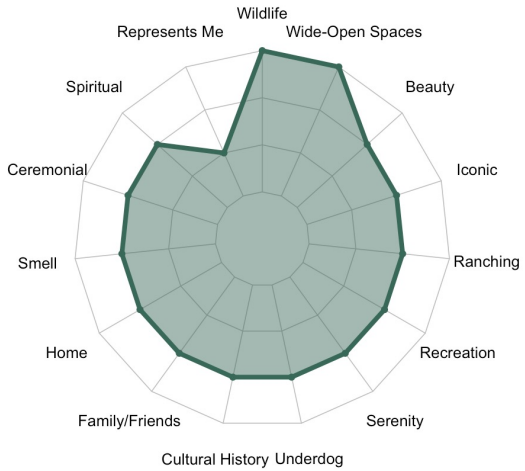
"Sagebrush steppe is ***not*** important to me"

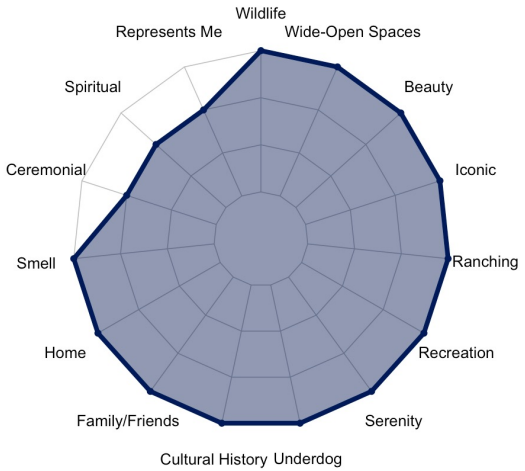




"Sagebrush steppe is ***slightly*** important to me"

"Sagebrush steppe is ***moderately*** important to me"





"Sagebrush steppe is ***very*** important to me"

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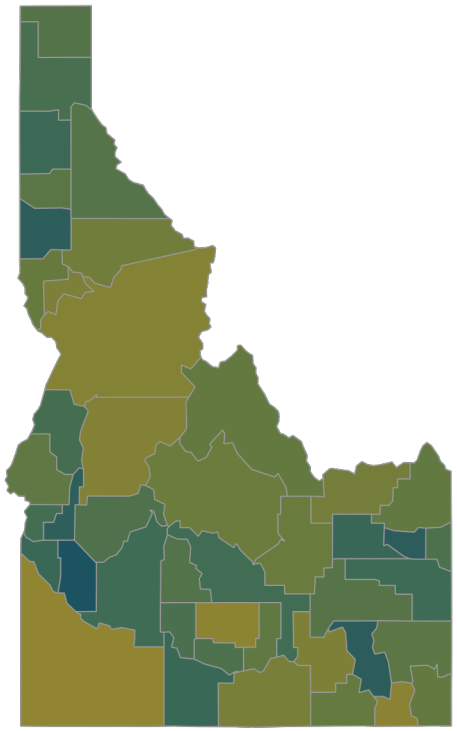
Most counties prefer to set regulations to limit harm.

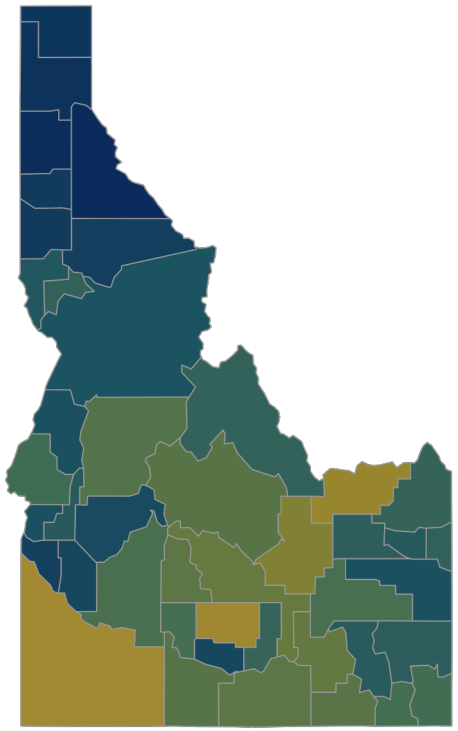
Percent General Preference

0% 10% 20% 30% 40%

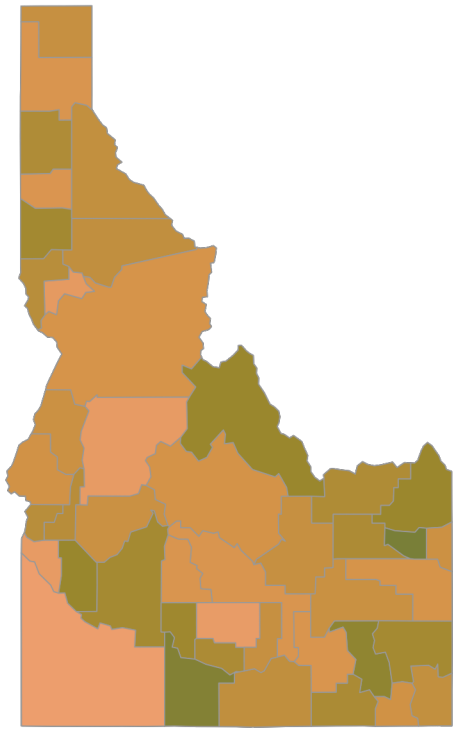
Establish new protected areas



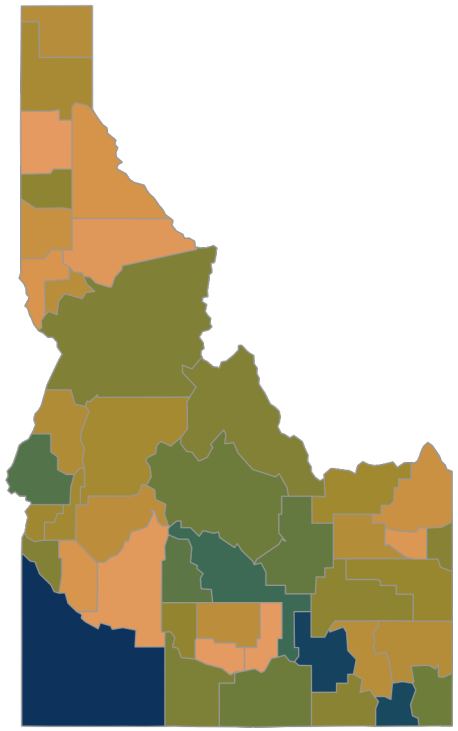
Set regulations to limit harm



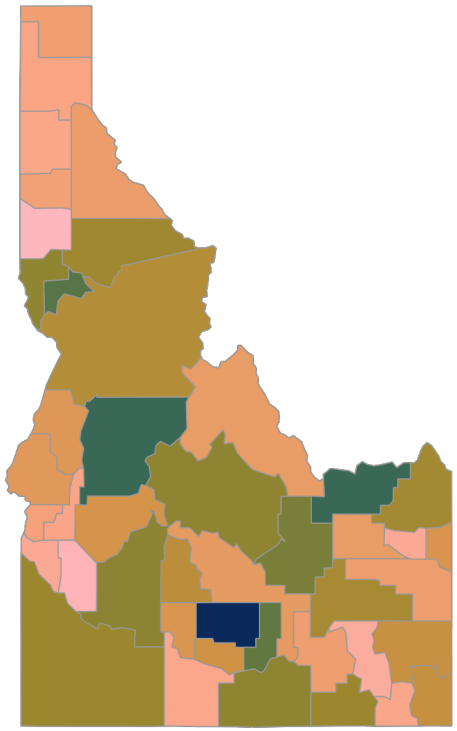
Provide financial incentives



Bring people together to make decisions

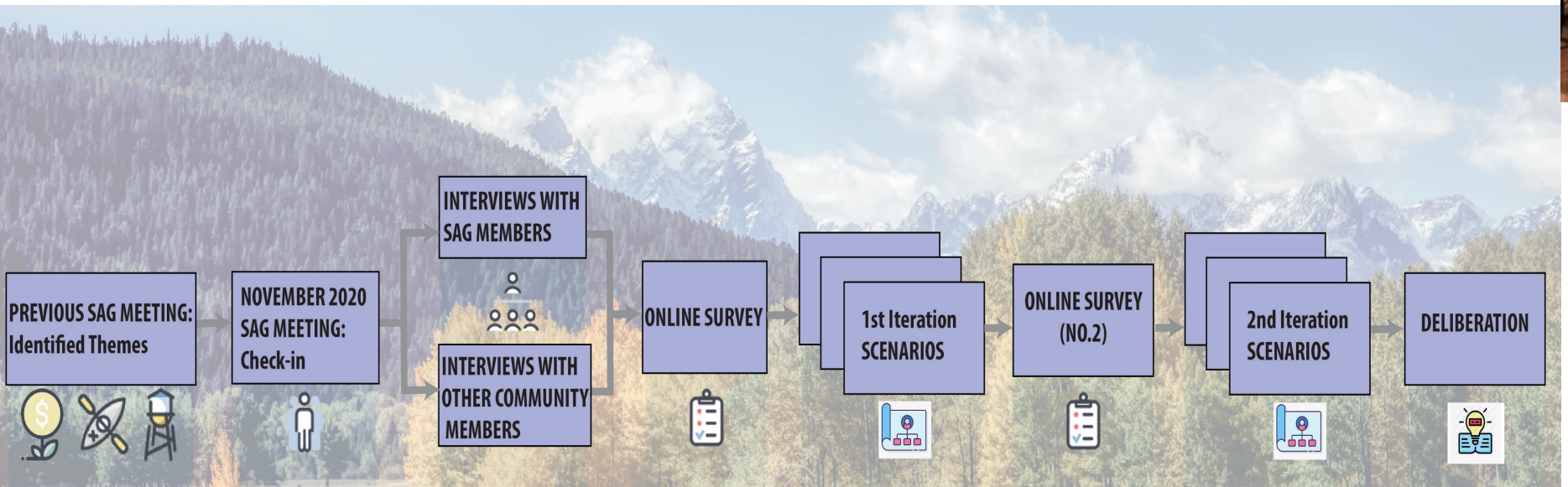


Do nothing



Building alternative futures scenarios with our Stakeholder Advisory Groups

Scenarios are plausible stories about the range of potential future pathways that social-ecological systems might take based on different human choices. Once developed, they can be used to model how the different choices affect an outcome of interest.



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Destroying Resources in Owyhee County

Scenario Narrative:

As Treasure Valley has experienced excessive population growth, the needs and interests for various types of recreation have also been on an incline. Swaths of recreators have inundated surrounding regions of Treasure Valley including the Owyhee region. By 2030, campsites are beyond capacity, impromptu ATV trails have become a problem, and other various other year-round recreational uses have caused various impacts including: increased soil erosion, conflicts with rangeland managers. Riparian areas in close proximity to trails are impacted with ecological issues. Noxious weeds spread due to excessive trail usage and areas which used to thrive with natives plant materials, now have become conduits for invasives, including cheatgrass. With excessive heat and decreased precipitation events, fire has also become a problem within the Owyhees.

Ecological Conservation Scenario

As increased heat and wildfire events continue within the Owyhee region, so have efforts to control invasive species impacting the area. The Bureau of Land Management in conjunction with County Commissioners have devised methods to incrementally reduce the amount of invasive species affecting the area. Efforts such as the Cheatgrass Challenge and the Soda Fire Restoration have aided in a tremendous shift of proactive management of invasive species. Similarly, due to incremental restoration practices, habitat availability has also increased procuring rich and viable habitats for the following species: *salmon, big sagebrush, redband trout, mule deer, pronghorn, greater sage-grouse.* Sagebrush and riparian areas now thrive with biodiversity. Due to these impacts, the local economy has begun to thrive as recreationists not only visit the area but aid in stewardship to support restoration and protection of habitat.

Managed Recreation Scenario

With droves of recreators from Treasure Valley and other neighboring communities, the Owyhee region has seen an uptick in use on private and public land. The Owyhees' local communities are seen as 'gateways' providing services for local communities, thus providing a revenue stream supporting infrastructure. In an effort to control increased recreation, regulations and improved infrastructure have been managed through the planning of designated areas of use to prevent trespassing. Along with population growth and increases in infrastructure, fire risk has also become an issue, in particular, along highways and roadways. Outreach and education efforts continue to inform visitors of fire and invasive risk. Strict regulations for motorized and non-motorized vehicle use are also enforced to control spread of wildfire and detrimental issues on habitat and private land uses.

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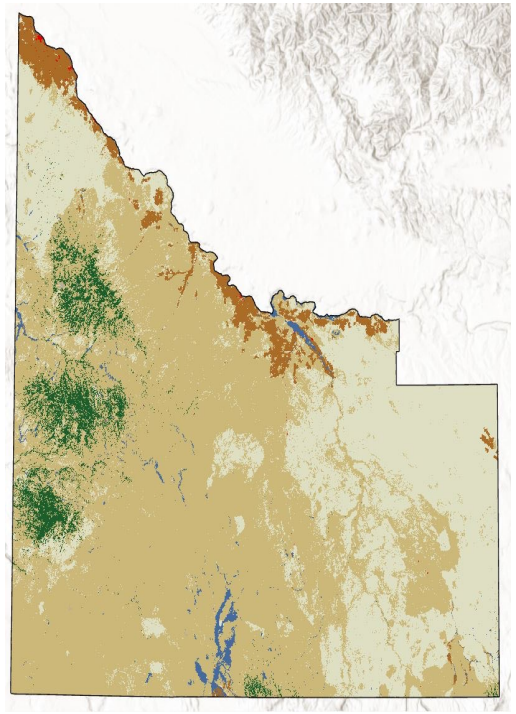
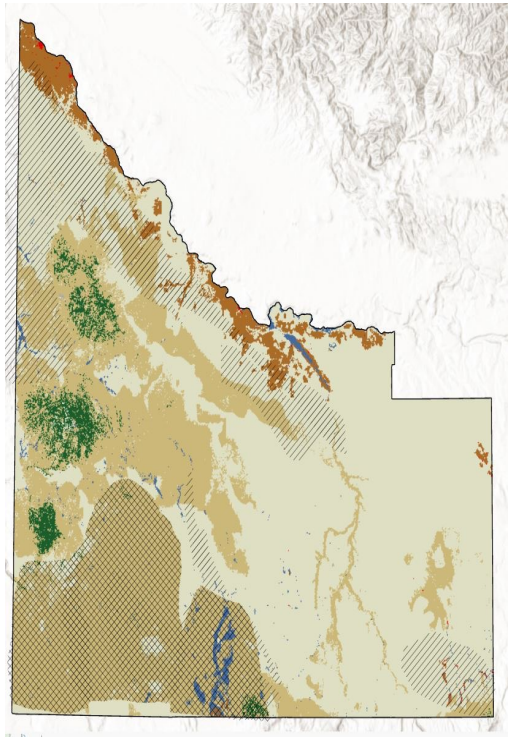
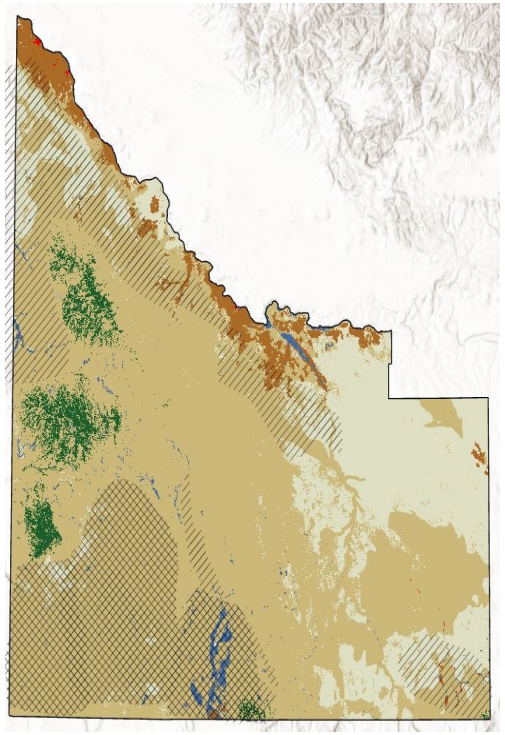
How does each scenario effect land cover?



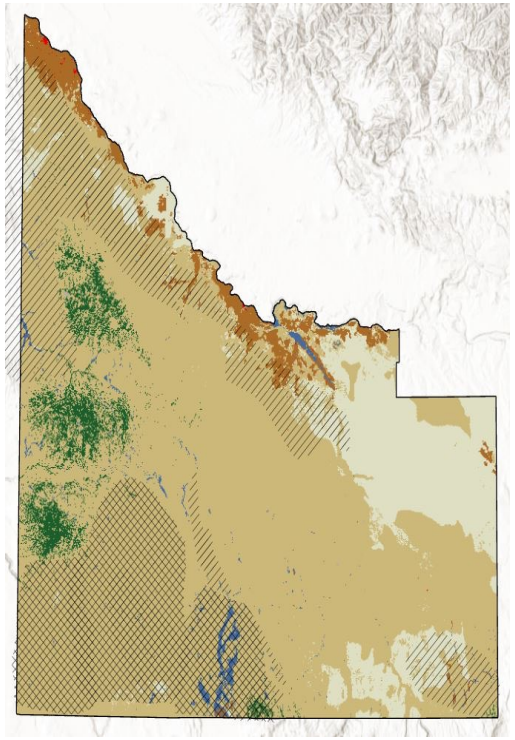
Land use 2019



Destroying Resources 2050



Managed Recreation 2050



Ecological Conservation 2050

- Water/Wetlands
- Urban
- Barren
- Forest
- Shrubland
- Grassland
- Crops/Hay
- Conservation/Restoration
- Less resilient area

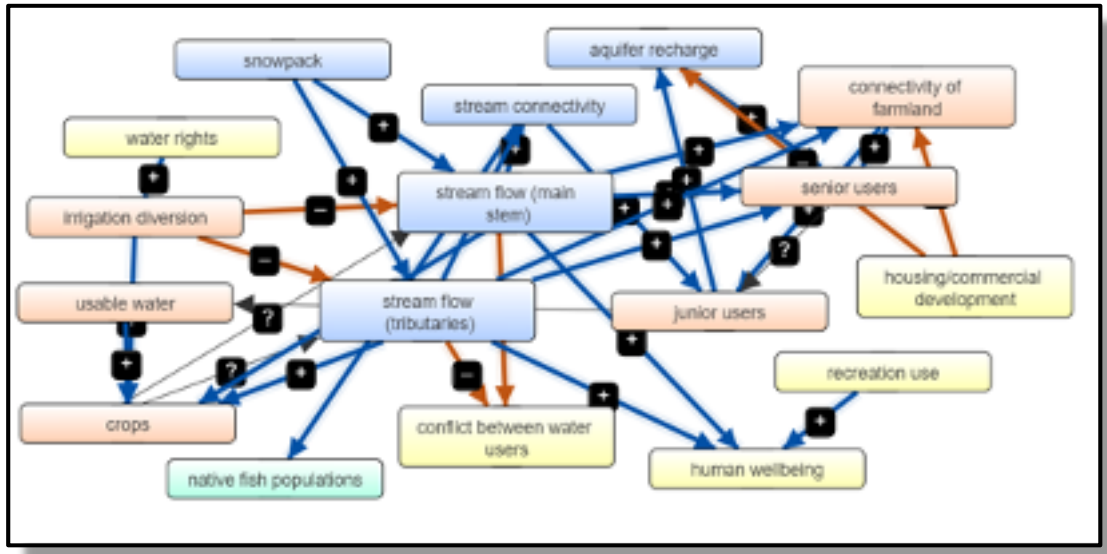
Effects of connectivity conservation on Yellowstone Cutthroat Trout SESs

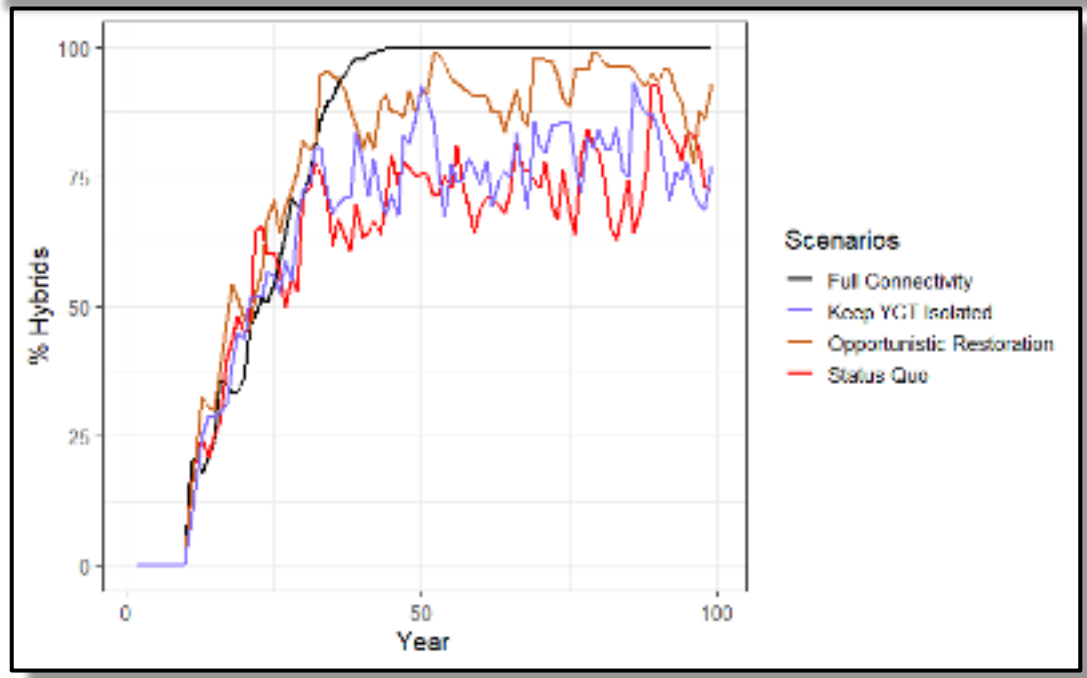
- **Research problem:** Connecting streams for Yellowstone cutthroat trout is assumed to be an effective conservation strategy, but social and ecological impacts not known
- **Data:**
  - 21 interviews with managers, farmers, and fishing guides about the social-ecological outcomes of re-establishing river connectivity
  - Legacy YCT life history data
- **Analysis:** Connectivity scenarios and modeled social-ecological outcomes in CDMetaPop

Effects of connectivity conservation on Yellowstone Cutthroat trout life history

- **Mental model results:**
  - Ecologists and conservation organizations mostly discussed *life history* impacts of connectivity.
  - Farmers, guides, and others discussed impacts on the *economy*, water availability for *agriculture*, and *tourism*

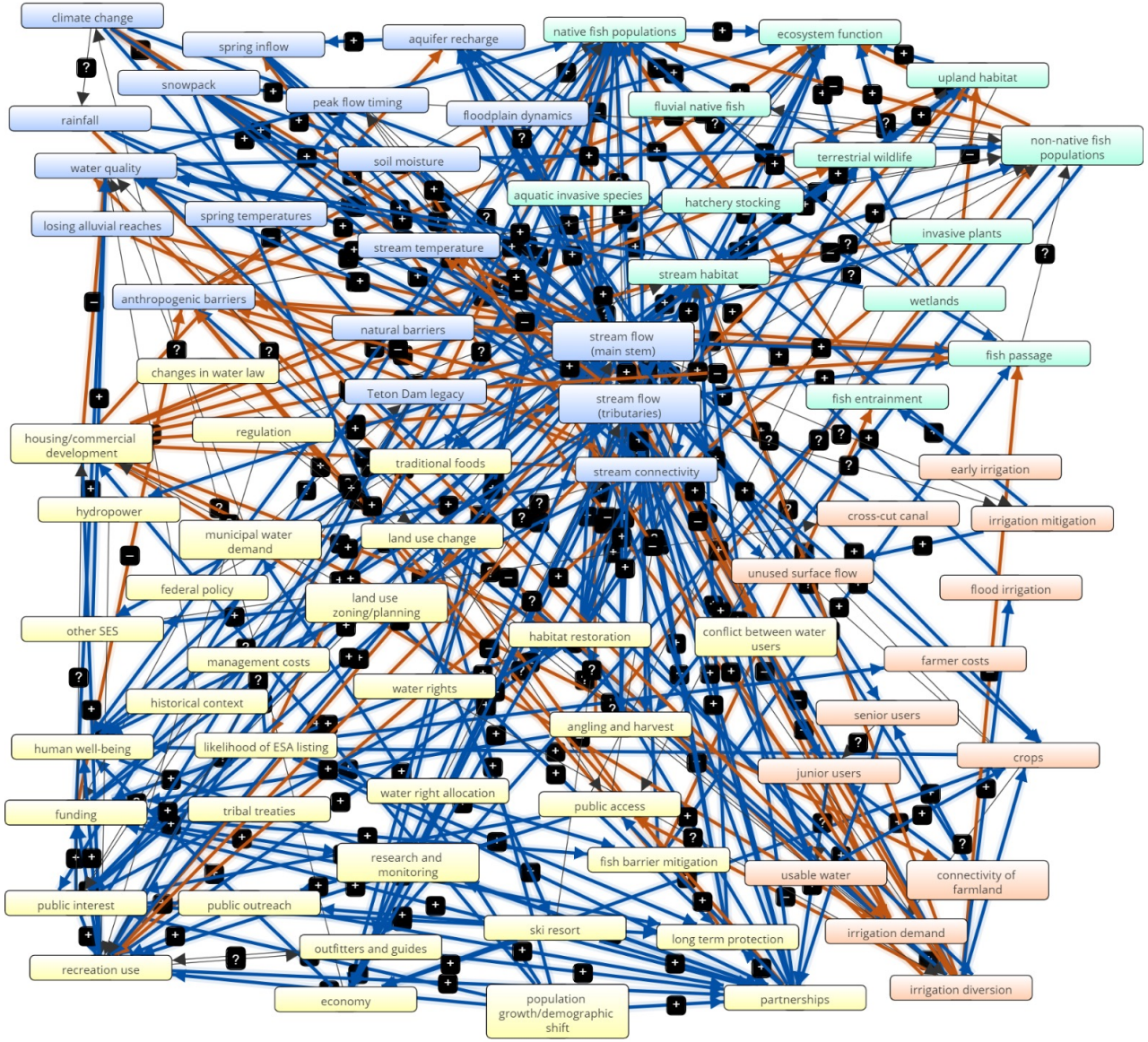
- **Connectivity results:**
  - Full connectivity leads to 100% hybridization with rainbow trout in the model outcomes
  - Doing nothing is the best option (status quo or keeping YCT isolated)





Effects of connectivity conservation on Yellowstone Cutthroat trout SES

	participants	components	relationships
Agriculture	3	24	43
Conservation	5	41	103
Development	3	24	43
Fisheries	7	50	120
Recreation	3	28	51
Aggregate	21	77	304



Key takeaways