# Developing a Systematic Approach to Protecting Farmland and Ecosystem Services in the Western United States

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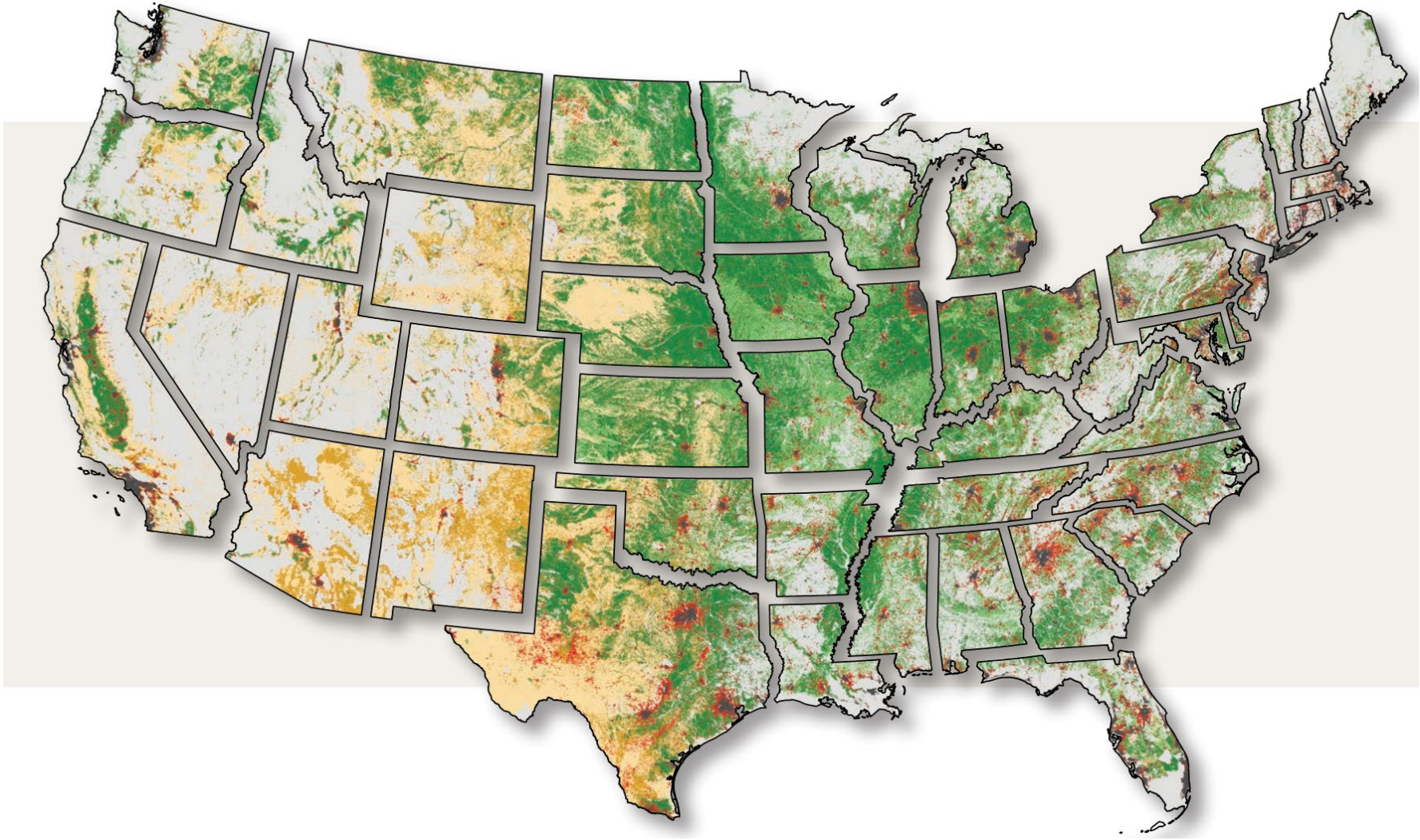
# Every day, the U.S. loses **2,000 acres** of agriculture to development

**11 Million acres lost between 2001 - 2016**



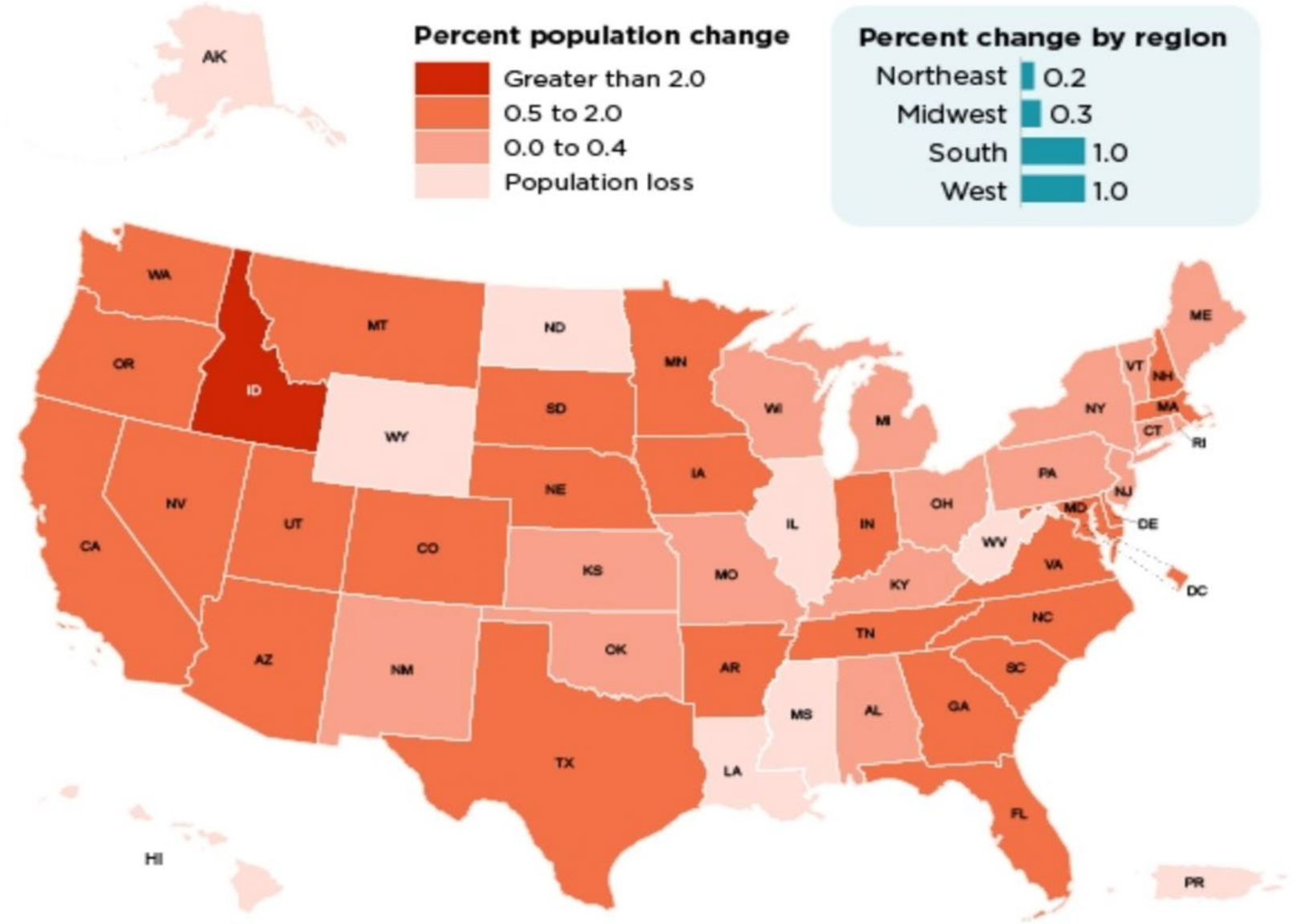
**Conversion**

**Farmland**

**Rangeland**

*AFT Farmlands Under Threat Project*

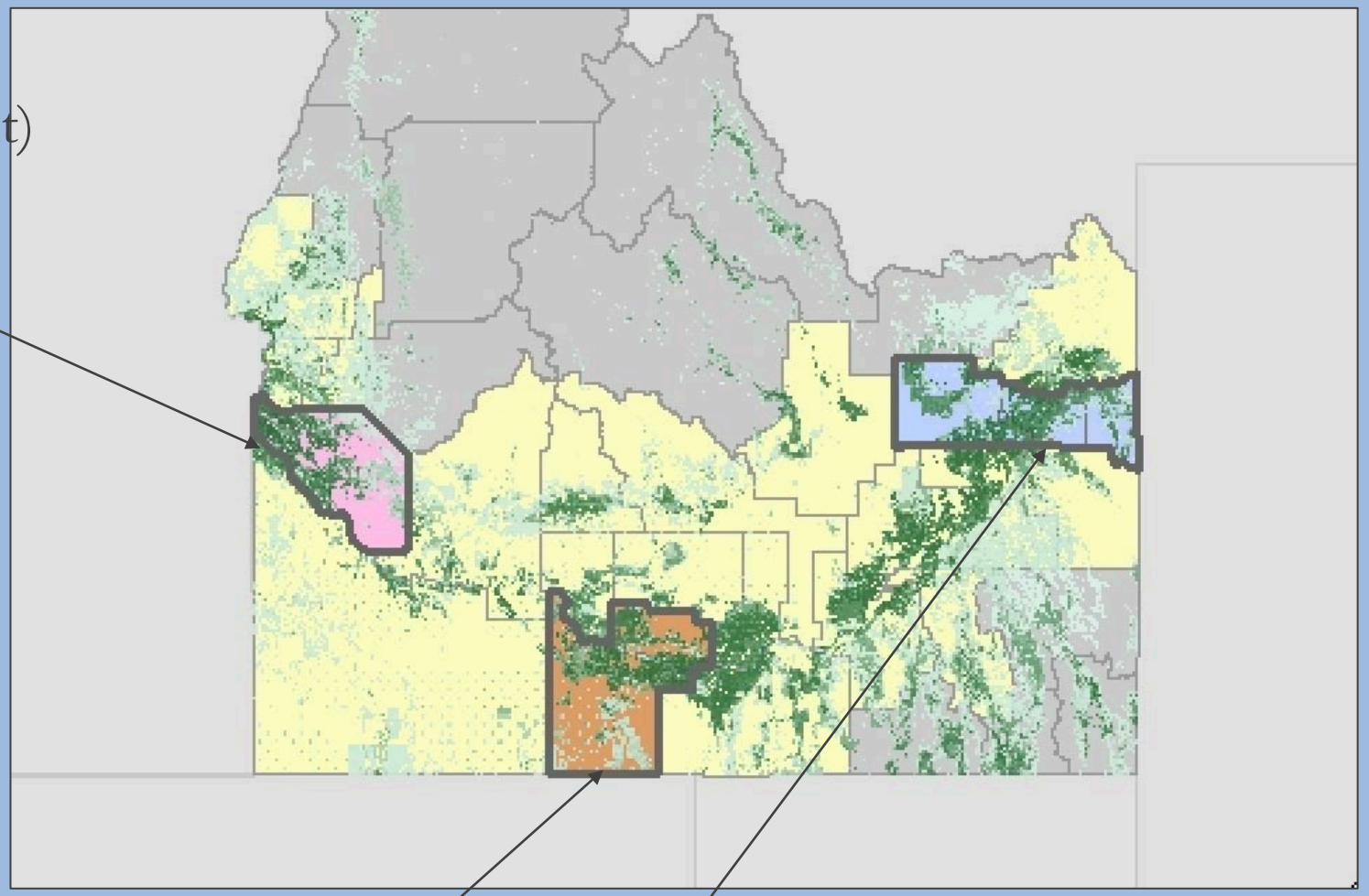
# Human population change



We cannot protect all farmland.
How can we systematically and effectively protect our agricultural land base?

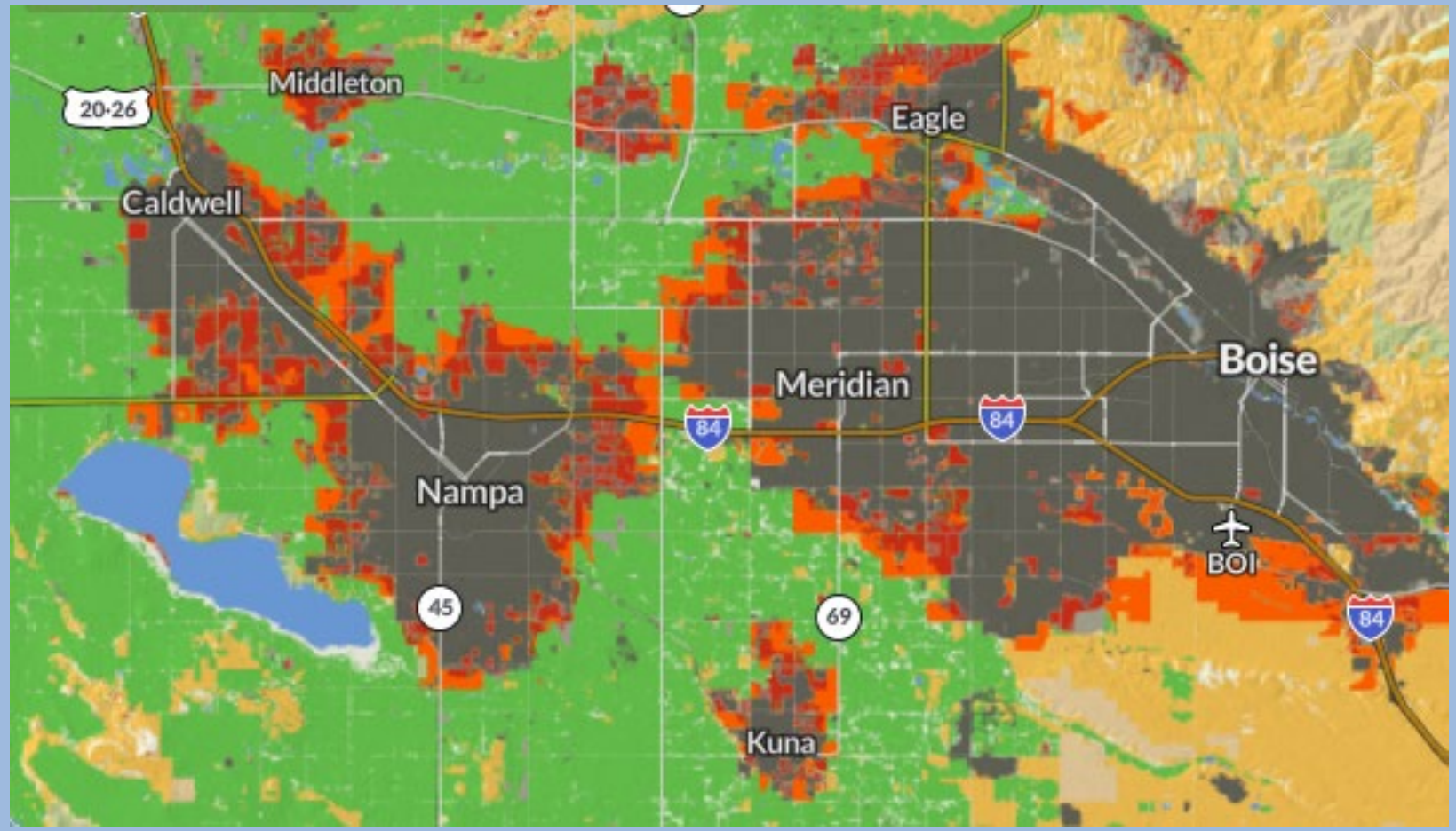
# Three “archetypal” systems.

Treasure Valley (Boise)
(USDA 2019 Seed Grant)



Magic and Teton Valleys (USDA 2021 Standard Grant)

# Archetype 1: Urban sprawl (Treasure Valley) – most commonly studied




*Farms Under Threat 2040*

# Archetype 2: Agricultural industrialization (Magic Valley)


Example: Chobani factory leads to intensification of dairy (alfalfa) production, leading to more jobs, and higher demand for housing and developed land

# Archetype 3: Amenities migration (Teton Valley)

Outdoors amenities

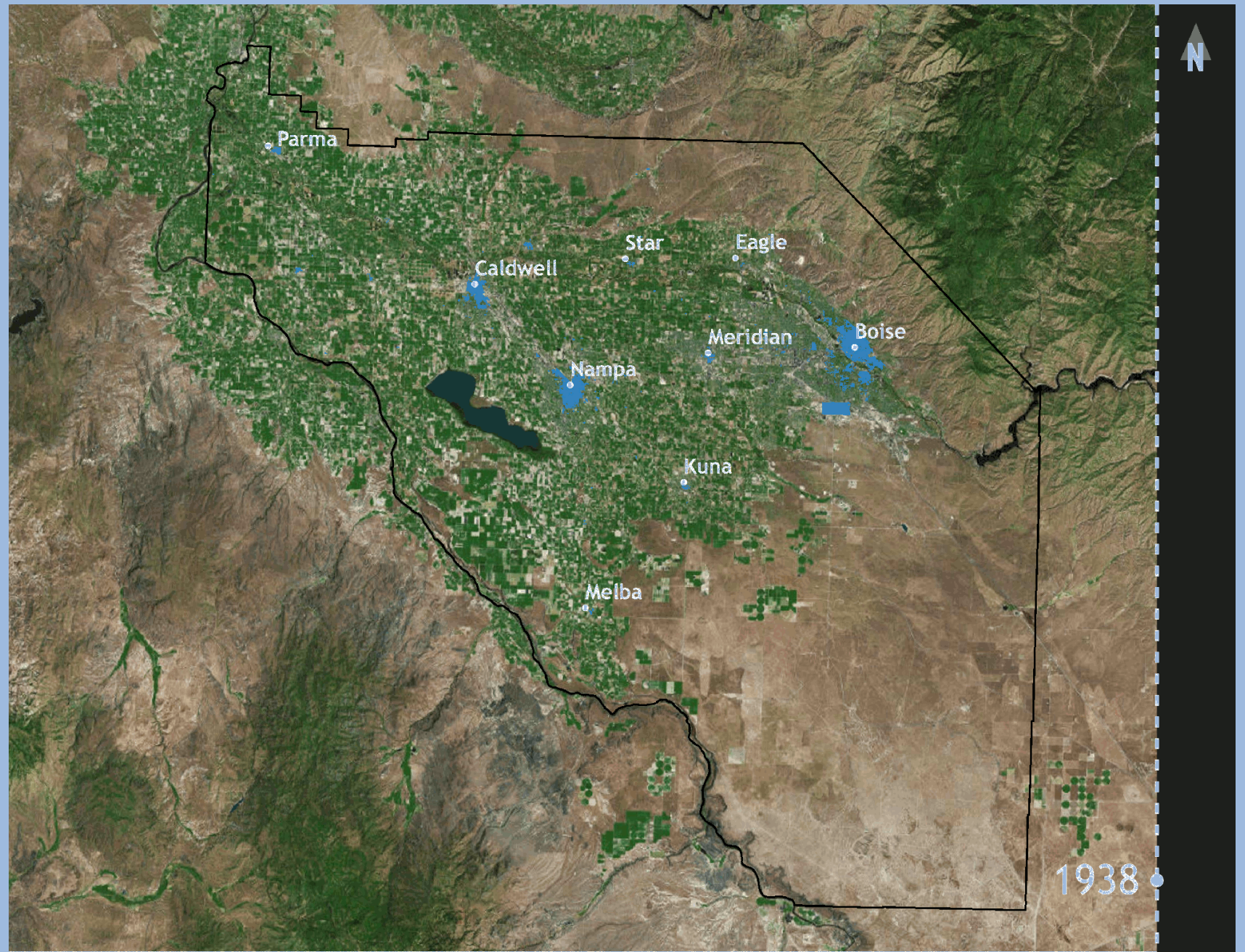
Farmland

Ranchette

# Critical questions a community needs to ask when they embark on farmland protection:

1. What does our community value about farmland?
2. What farmland should we prioritize for protection?

# Treasure Valley (Boise) – Extreme rates of farmland loss



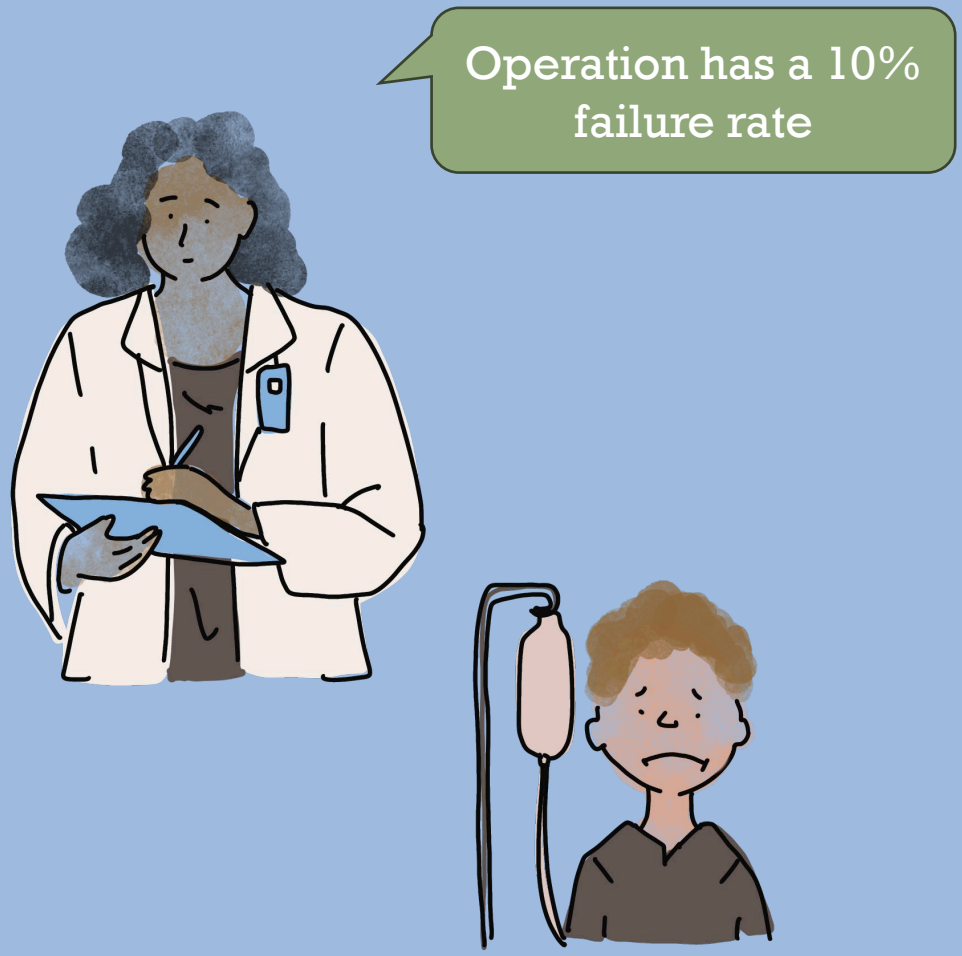

64% of farmland lost by 2100

Sarah Halperin

# What does our community value about its farmland?

# Message Framing/Frames

"Frames are **interpretive storylines** that set a specific train of thought in motion, communicating **why an issue might be a problem, who or what might be responsible for it, and what should be done about it.**" (Nisbet, 2009)


Modified from Kusmanoff et al., 2020

# What are the ways in which diverse stakeholders are framing the issue of farmland loss?

- What are policy solutions that may align with these frames?
- What are the advantages and disadvantages of different frames?

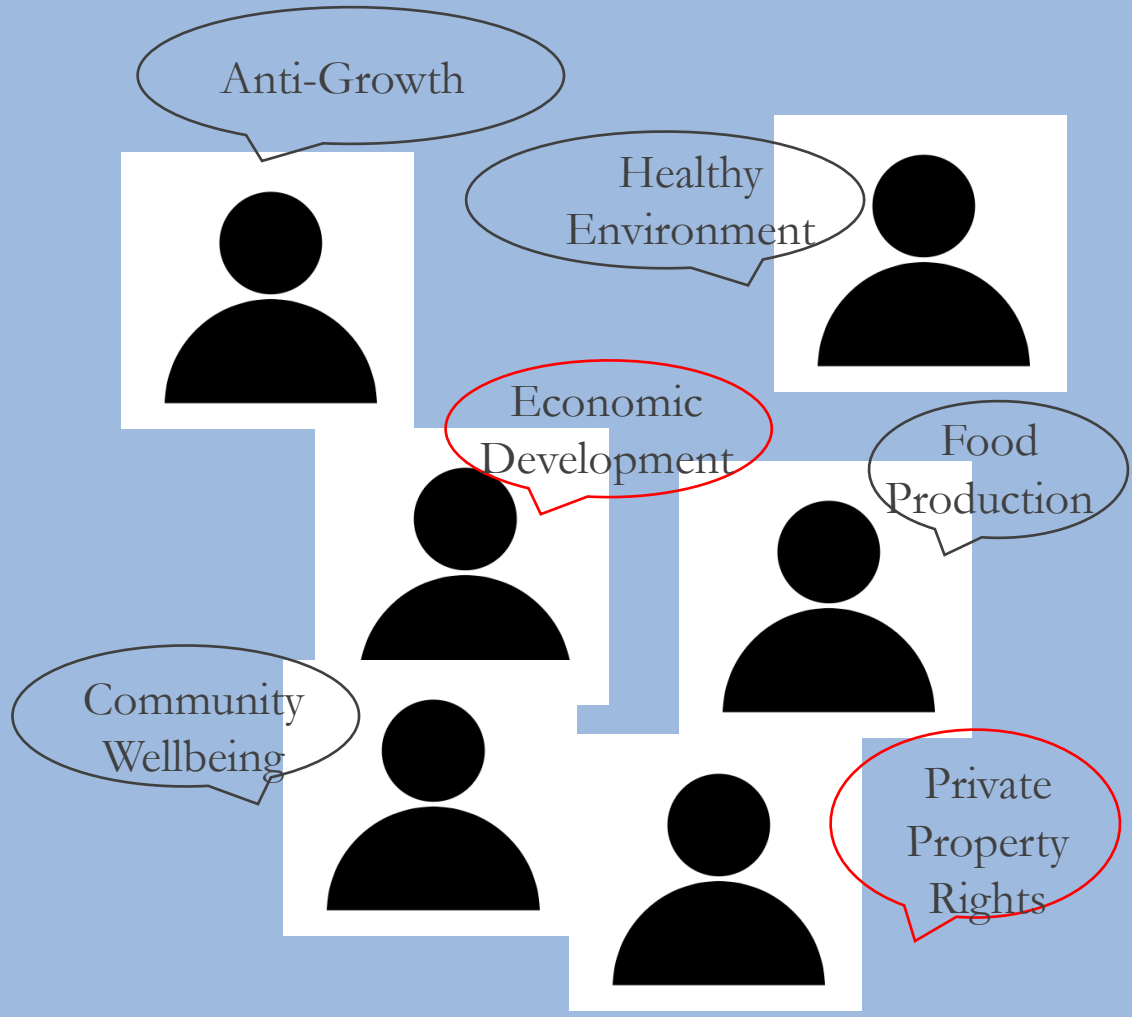
# Methods: Semi-Structured Interviews

Government

Land Trust/Non-Profit

Academia

Farmers



# Example: Resource and Cultural Loss Frame

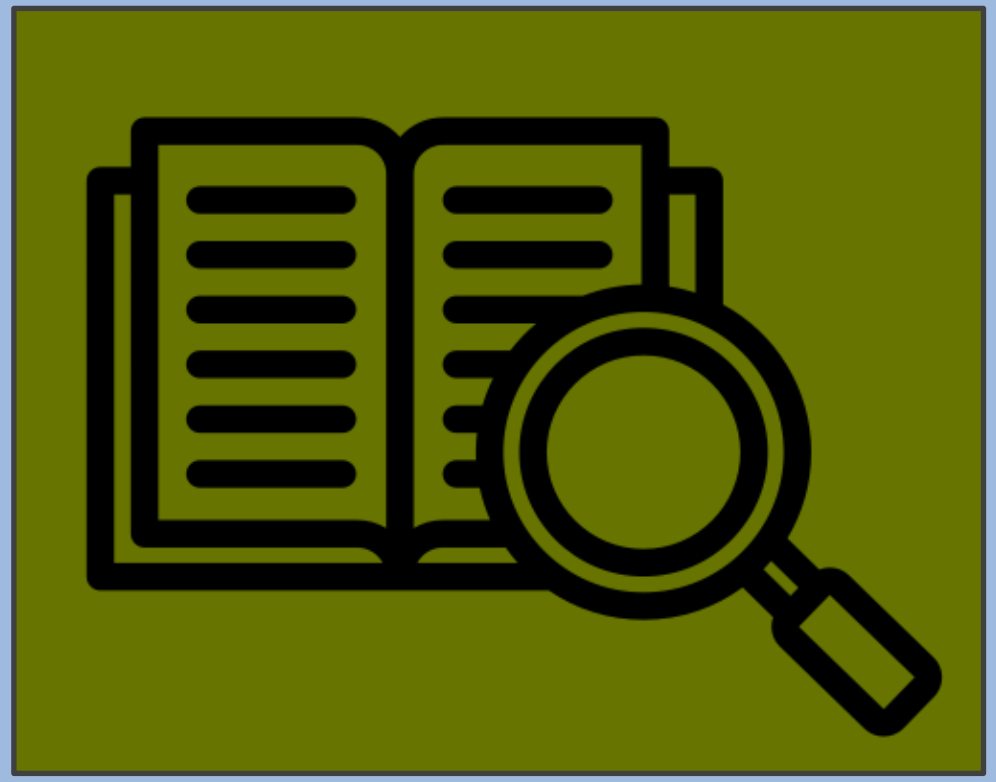
*"The culture. Are we going to pave over Idaho and put in a parking lot? That's not who we are, right?"*


- Historical importance of Idaho's agricultural land
- Part of the landscape and should continue to be farmland
- Cultural identity of Idaho

# Example: Resource and Cultural Loss Frame

## Advantages

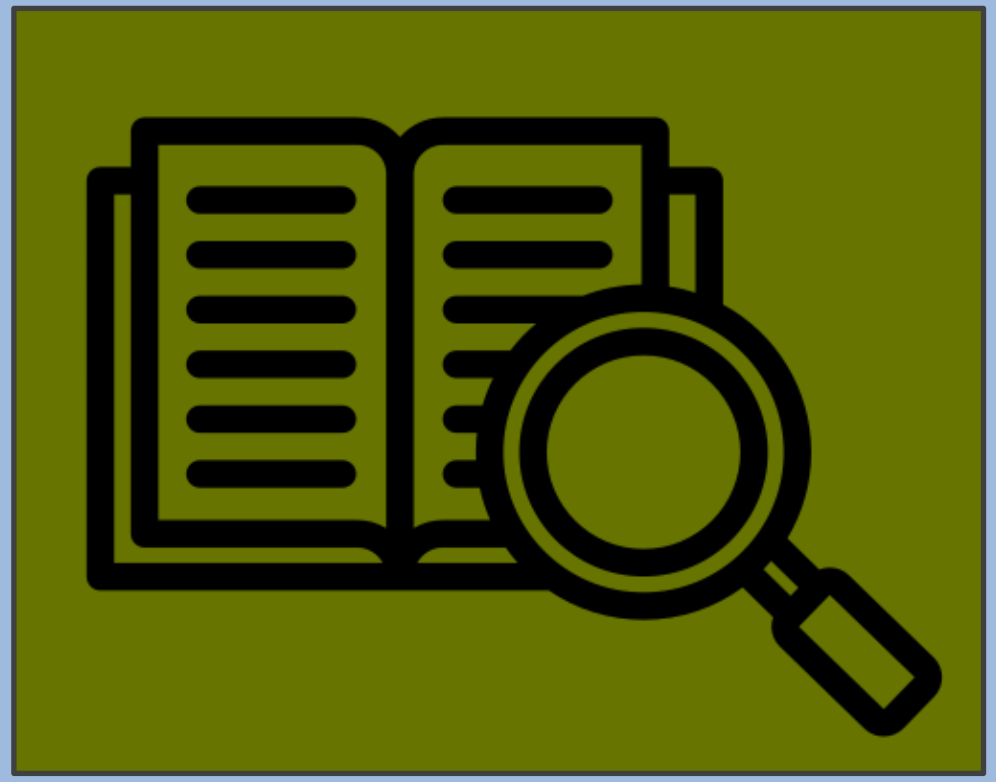
- Severe and urgent - more likely to receive attention



# Example: Resource and Cultural Loss Frame

**Disadvantages**

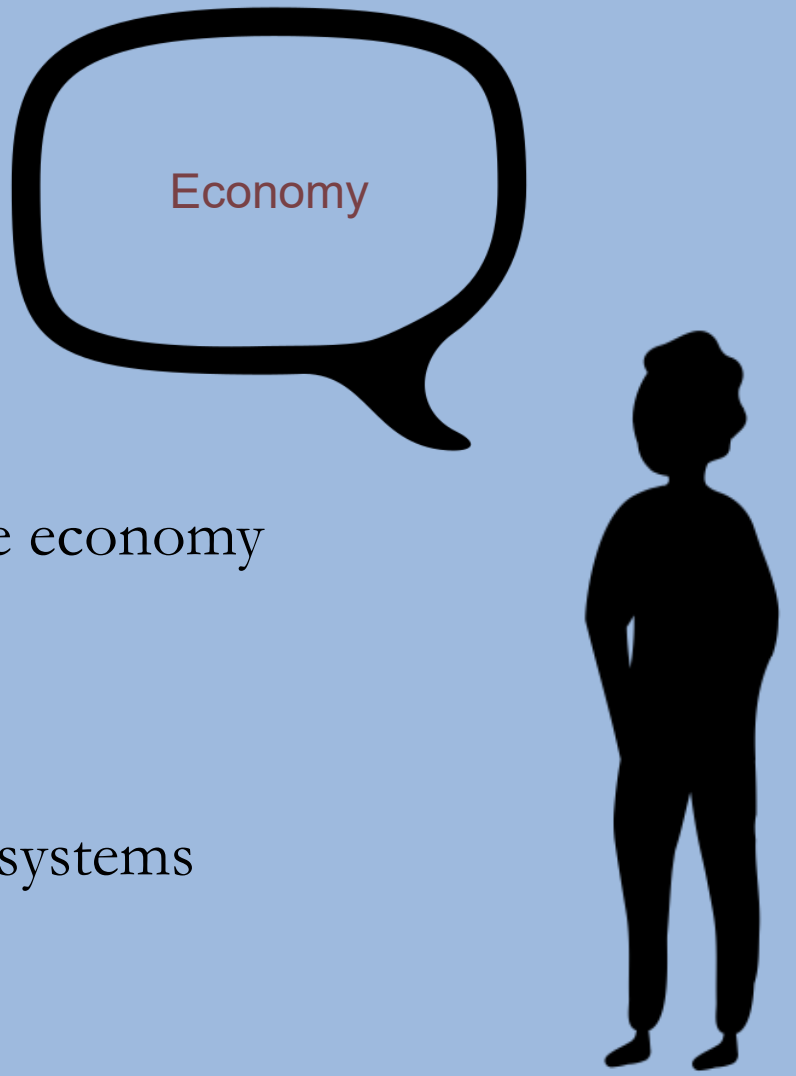
- Conflict between urban and rural communities



Policy Implications: Conservation easements programs as a way to retain some level of agriculture on the landscape

# Example: Economy and Trade Frame

*"It's 20% of our [Idaho's] GDP. Idaho is feeding the world."*

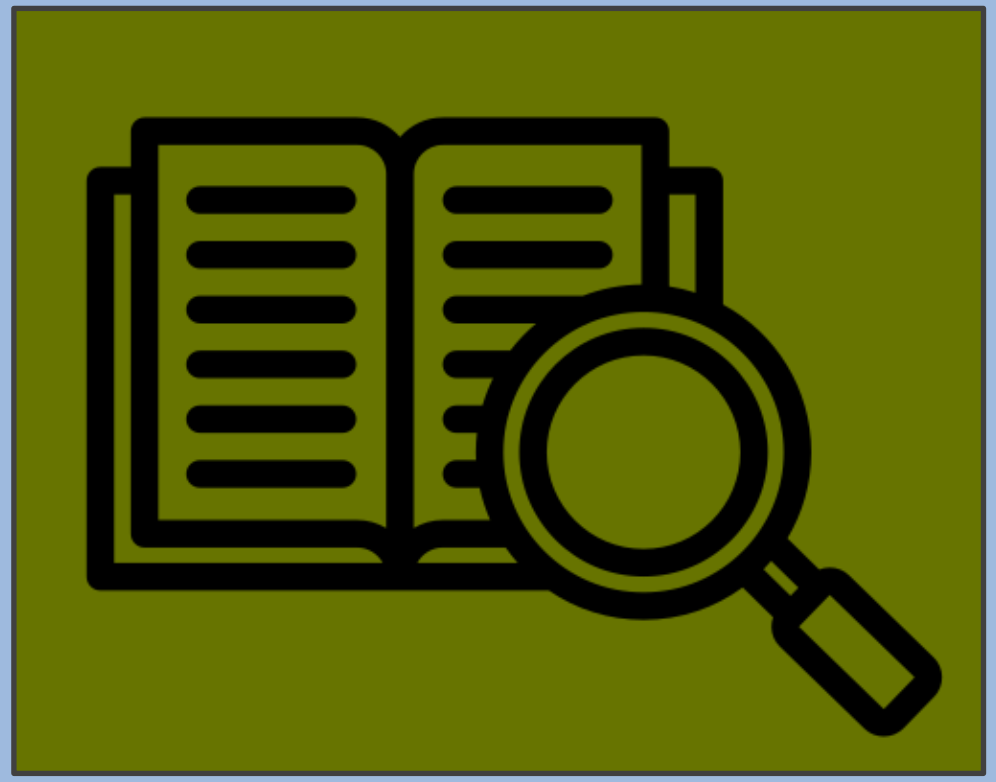



- Relate to value of farmland in terms of its role in the economy
- Fear of economic uncertainty
- Idaho's agricultural industry in terms of global food systems

# Example: Economy and Trade Frame

## Advantages

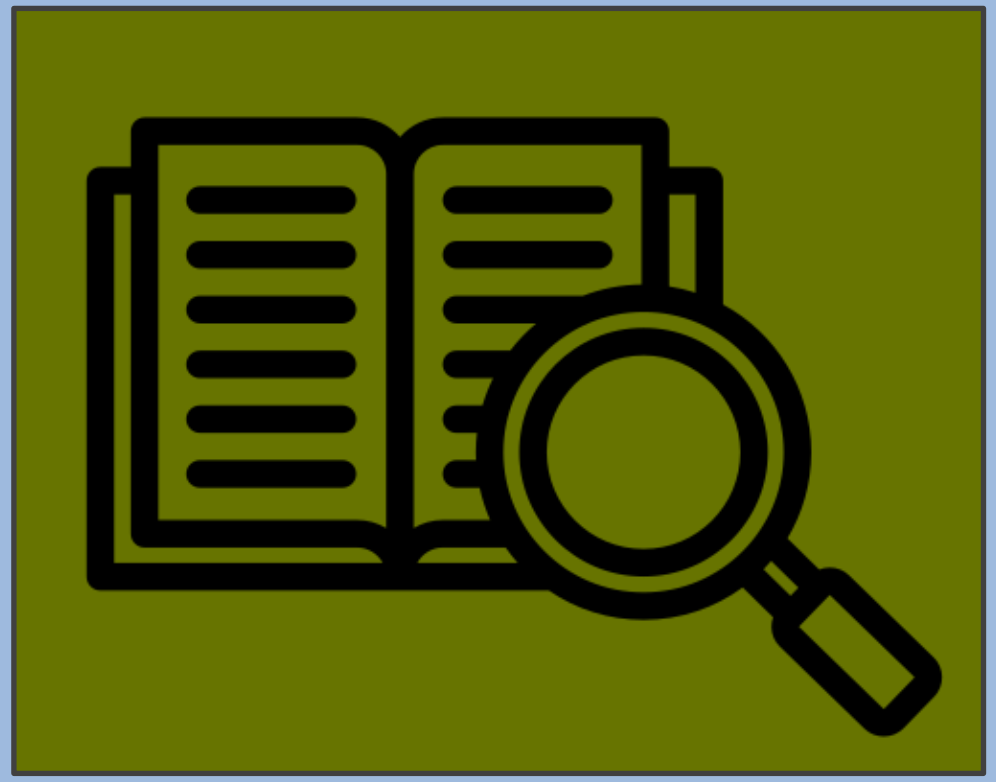
- Financial impacts/economic growth effective at increasing political support
- Relate to existing public values



# Example: Economy and Trade Frame

**Disadvantages**

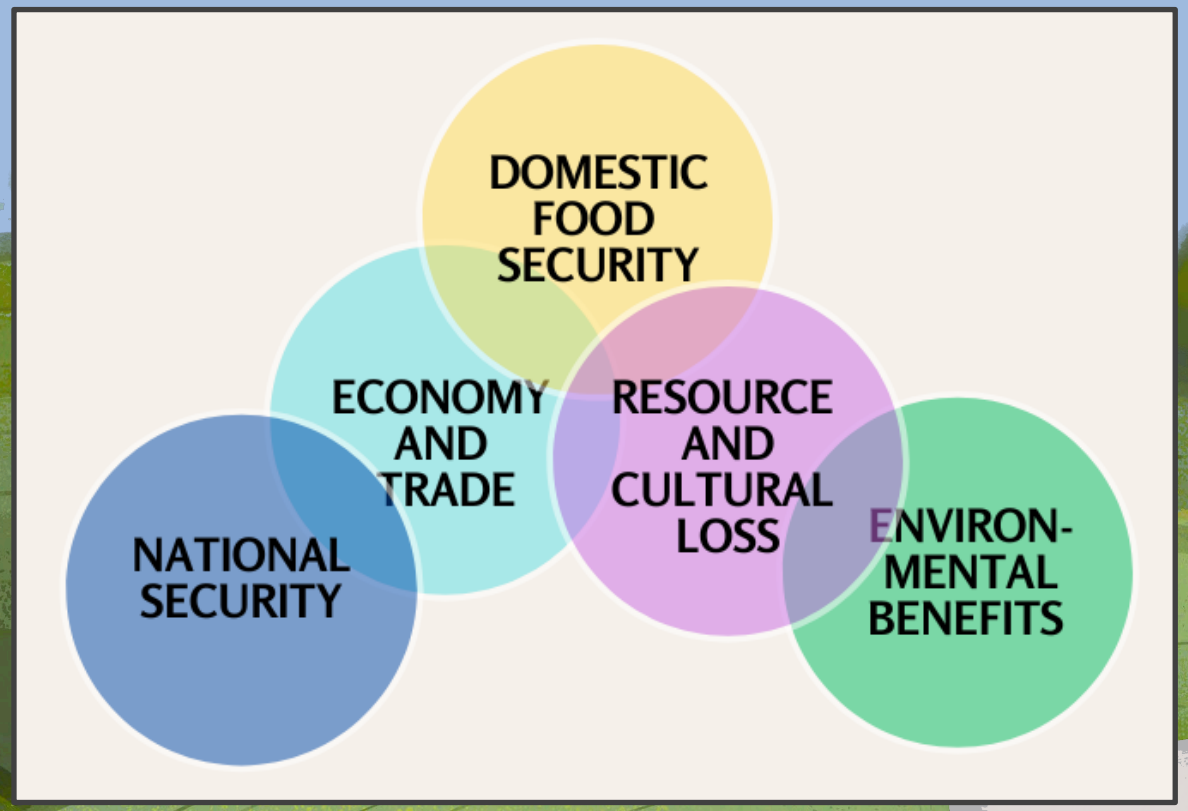
- Land can be used for multiple economically-beneficial purposes, i.e. Development leads to a lot of short-term economic benefits.



Policy Implications: Broad-scale policies to support landscape-scale agricultural viability. E.g. Aid rural communities to update their comprehensive plans, improve public services, and plan for economic development.

# In total, we identified five different frames in our “urban growth” archetype site.

- Many interviewees cited multiple frames
- Each message frame has pros and cons, with no ”one-size-fits-all”
- Solutions will likely need to encompass diverse concerns




KEY TAKEAWAYS

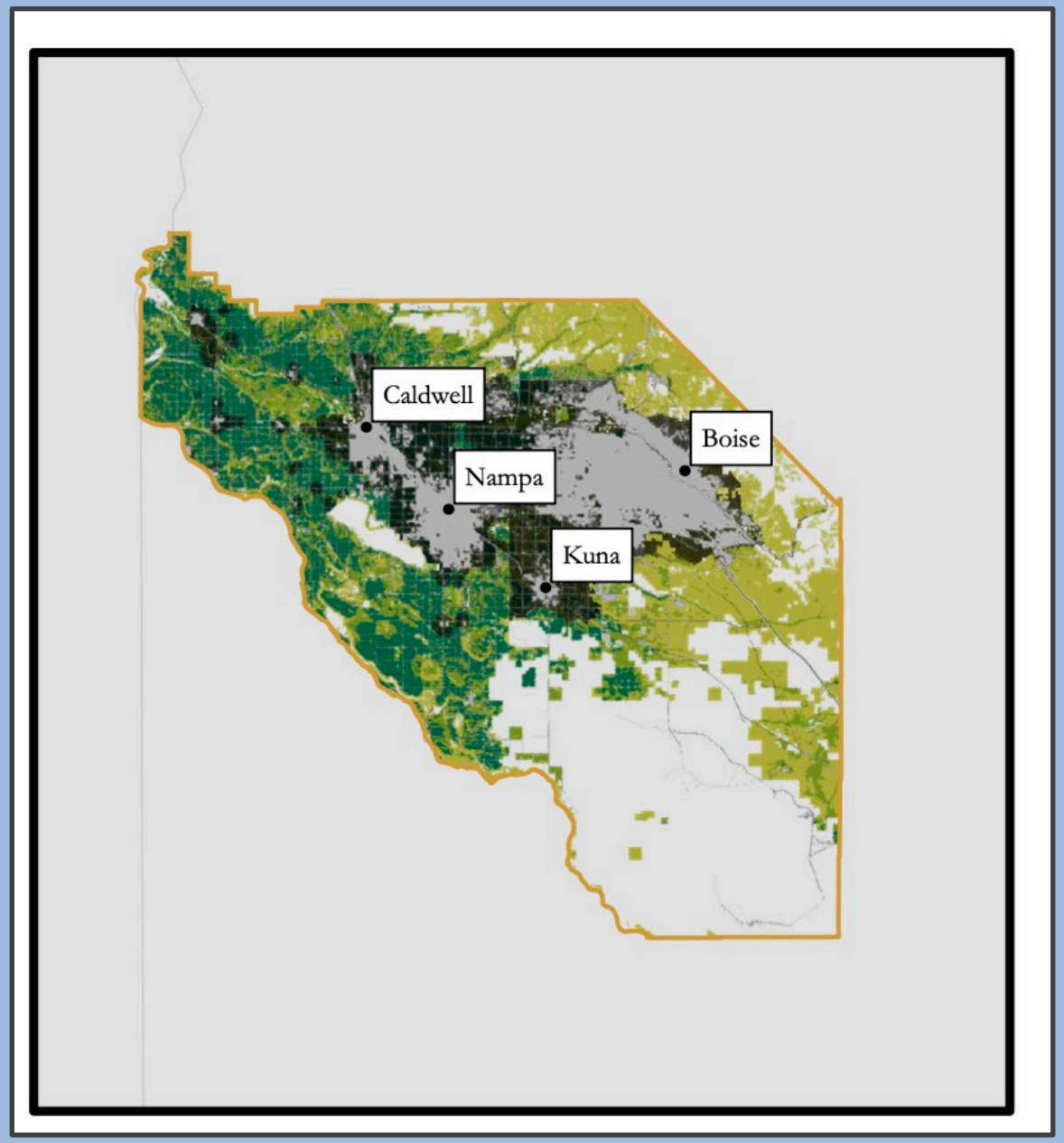
# What farmlands should we prioritize for protection?

(Halperin et al., 2023)

# The current state of farmland protection

- Selection of lands to protect are based on:
  - agricultural productivity (soils, irrigation, etc).
  - Opportunistic (e.g. a farmer willing to do an easement)
  - Arbitrary (urban growth boundaries)
- The literature shows that we are not getting the "most bang for our buck" with the above approaches.

# Agricultural land quality varies a great deal




**Agricultural Land Quality**

- Low
- Medium
- High

Business as usual: Should we just focus on protecting the high quality land?

# Ecosystem Services framework

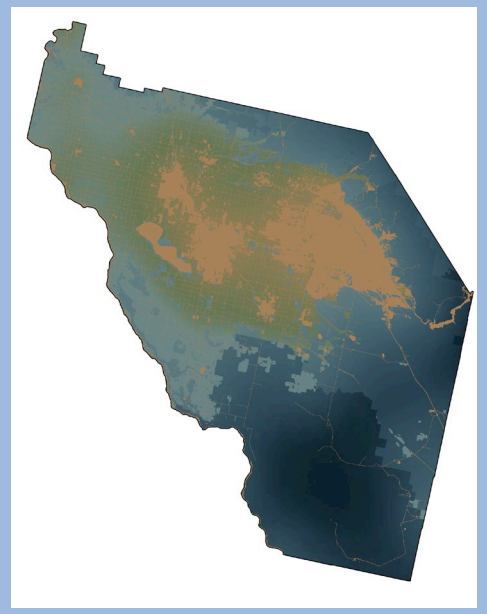
**Food production capacity will certainly decline with farmland loss**

**But what about other ES that people value?**

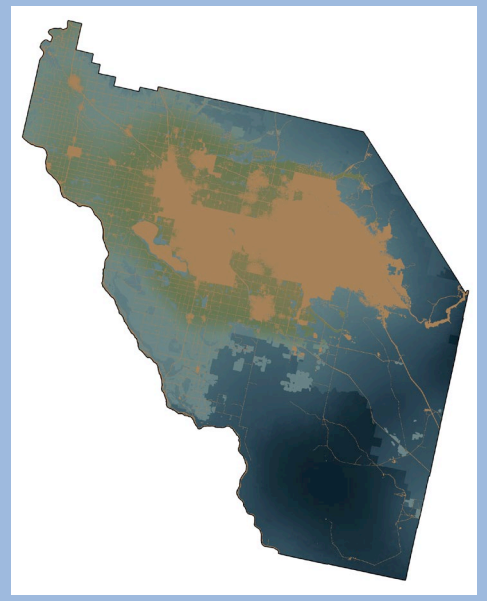
- **Recreation**
- **Water quality**
- **Carbon sequestration**
- **Wildlife Habitat**


(Power, 2010; Swinton et al., 2007)

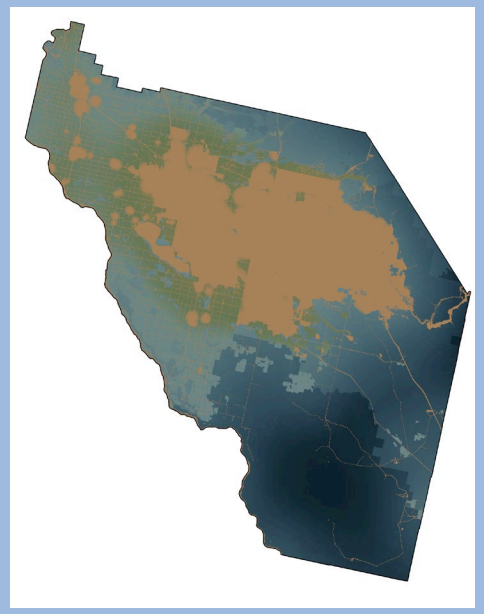
# Ecosystem Services in 2016, 2030 and 2050



2016



2030

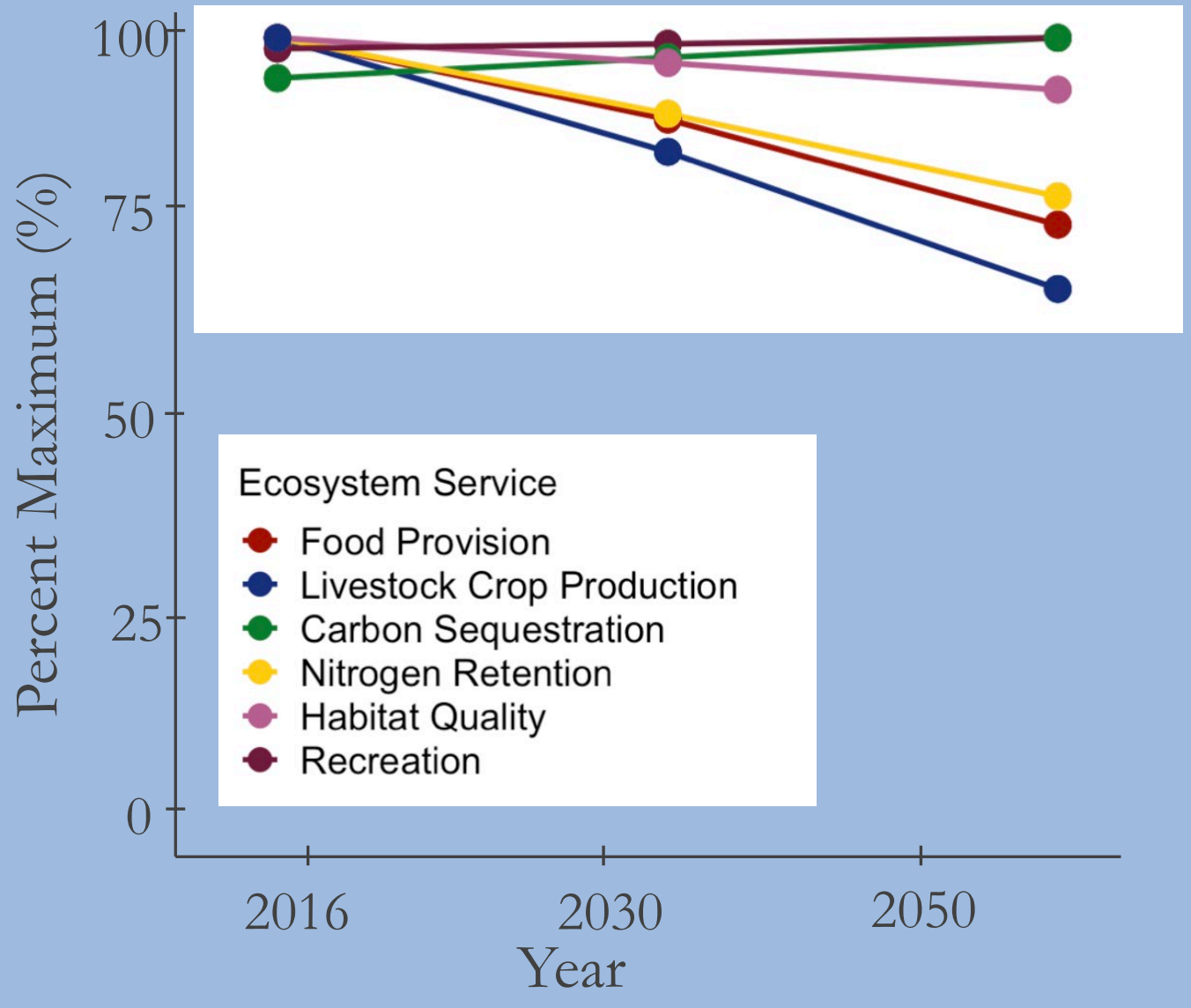


2050

- Food Provision
- Livestock Crop
- Nitrogen Retention
- Carbon Sequestration
- Habitat Quality
- Recreation

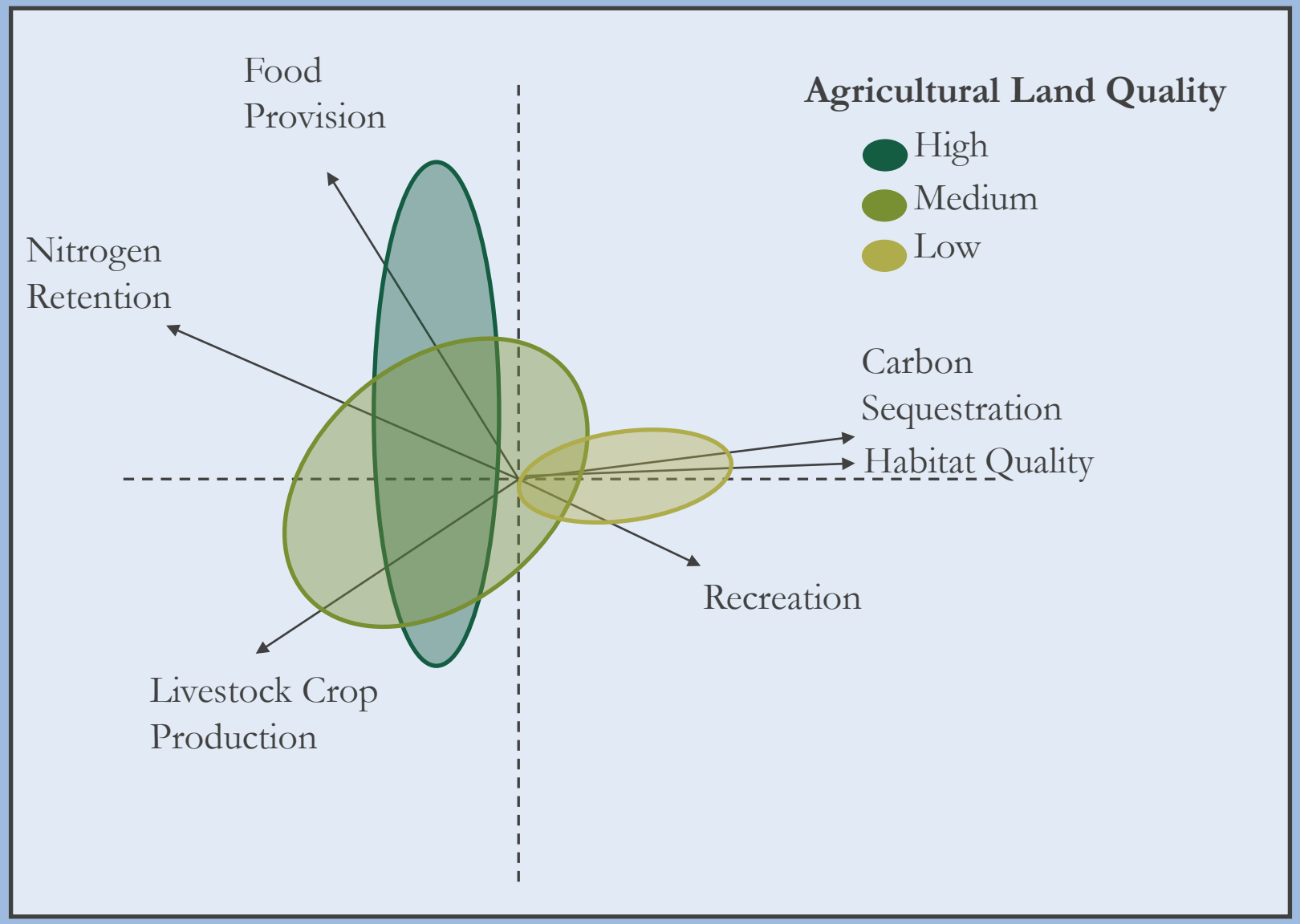
High Low

# Will Ecosystem Services supply change with the projected development of farmland?




- The landscape in 2050 will supply much less ES overall:
- Livestock crop production (-28.8%)
- Food provision (-22.8%),
- Nitrogen retention (-19.3%),
- Habitat quality (-7.4%).
- Carbon sequestration (+5.5%)
- Recreation (+1.6%)

# Lands of different agricultural quality provide different ES




High Quality Land
-food provision
-livestock crop production

Low Quality Land
-Carbon sequestration
-habitat quality
-recreation

How do we decide which lands are priority for protection?

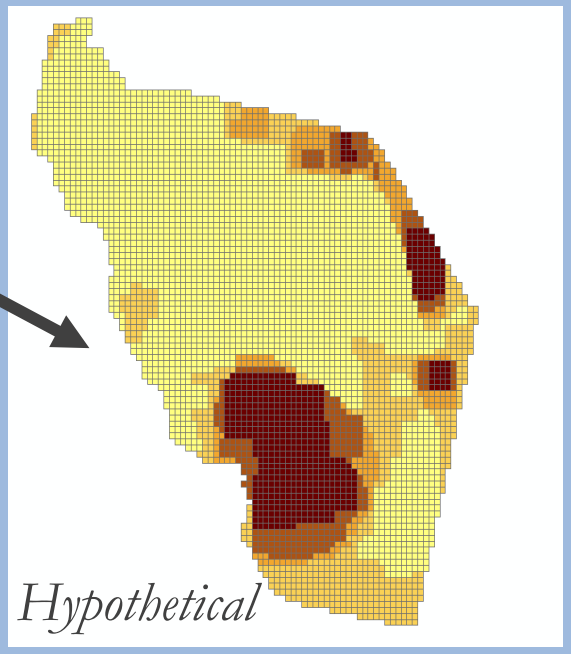
# Optimization algorithms developed for biodiversity conservation.

Agricultural Land Quality (e.g. productivity, versatility)

Ecosystem Services (e.g. carbon storage, habitat, based on survey)

$ Cost of protection (Development Threat)

*Method: Optimization algorithm (Gurobi in prioritizr).*




High Priority Areas for Protection

# Four scenarios with different explicit targets

1. Agricultural Productivity
2. Climate Adaptation
3. Wildlife Habitat
4. Combined Ecosystem Services

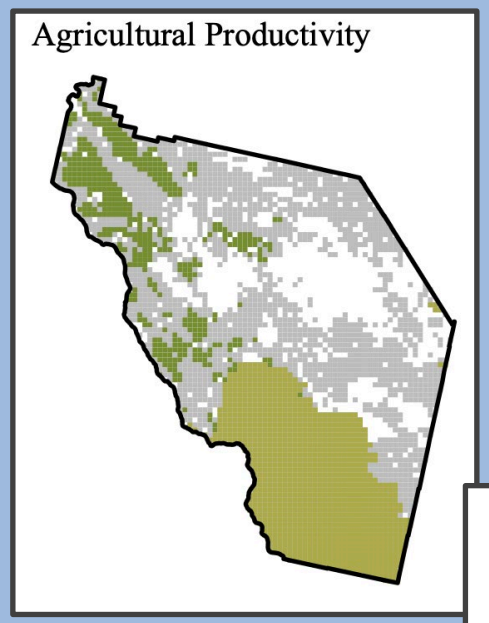
"Business as Usual" – targeting food productivity alone

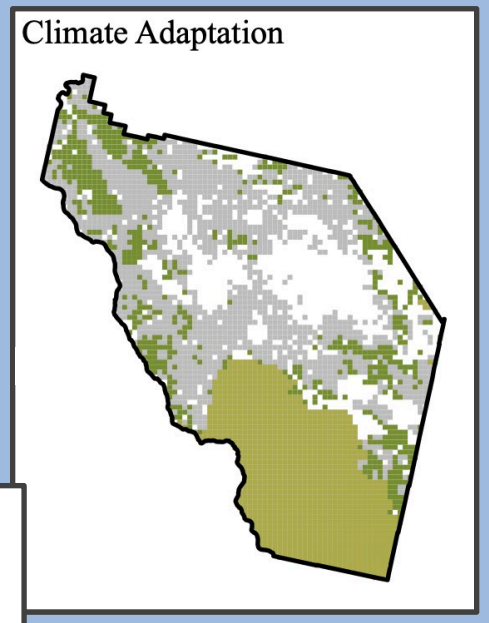
Food productivity + Carbon storage

Food productivity + Habitat quality

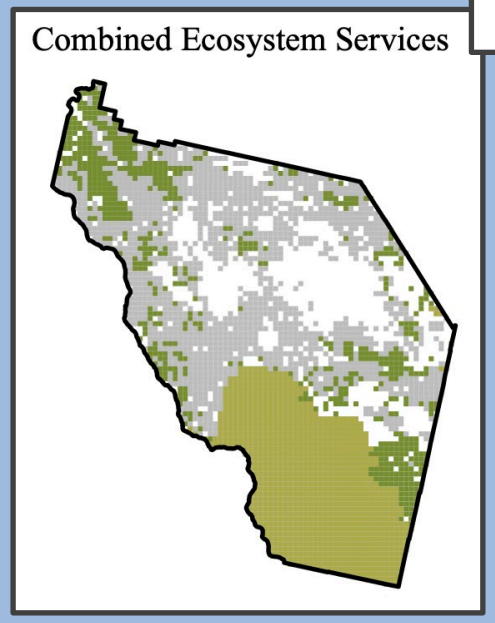
Food productivity + Carbon storage + Habitat quality + Recreation + Nitrogen retention

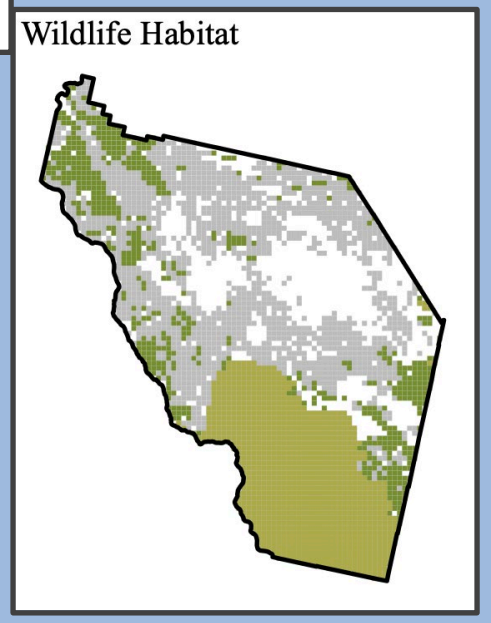
# Maps provide guidance to land use planners.

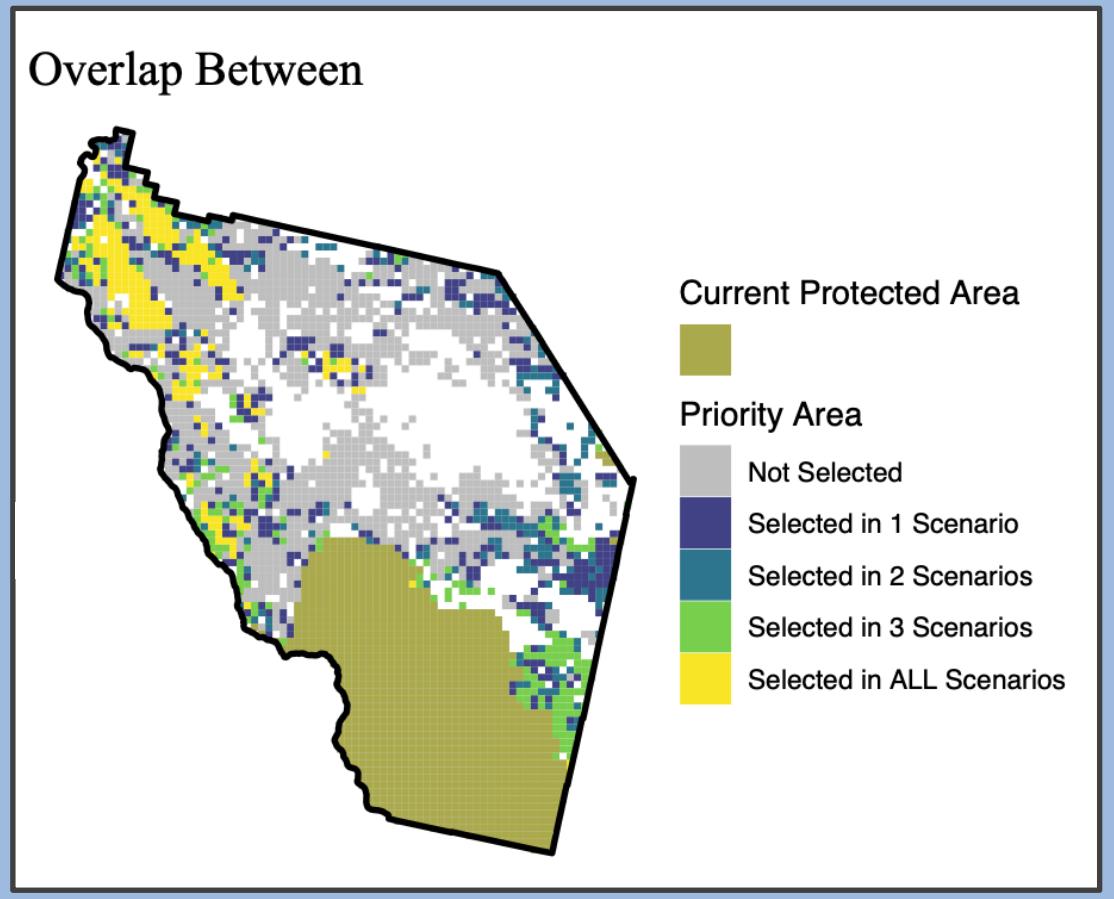


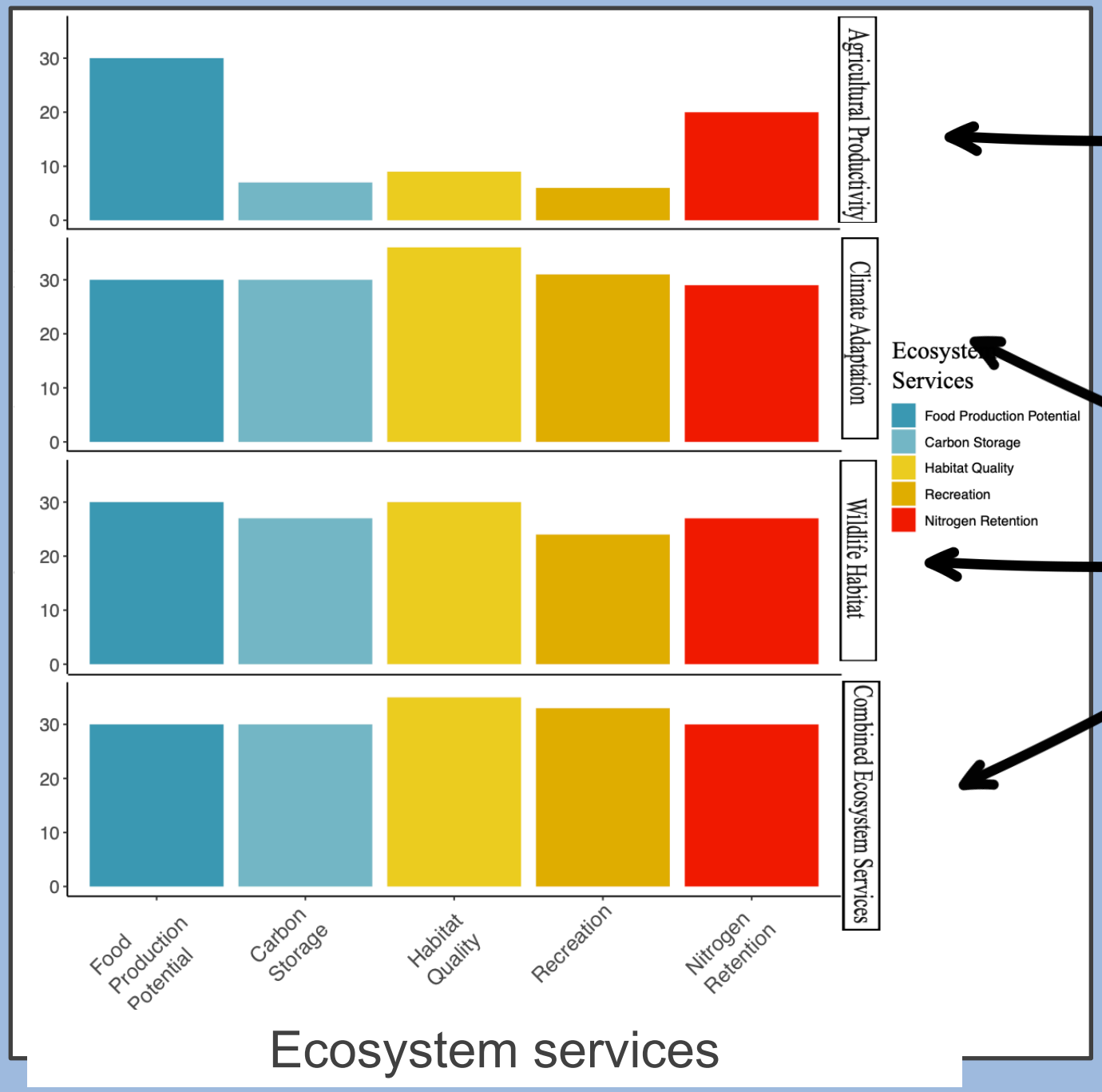





In Idaho, counties are now working with AFT to develop their own maps!




Ag productivity scenario leads to lowest protection of other ES

Including other ES as targets leads to more protection of all ES

Take home: If done right, protecting farmland can protect a lot of other values!

# Summary of main results for Treasure Valley-prioritization

- **4 of 6 ES will decline with projected farmland loss**
- **Agricultural land of different qualities provide different ES**

- **Systematic Conservation Planning, customized for each community based on their targets, can be a valuable tool for identifying areas for protection.**
- **With systematic planning, protected agricultural lands can meet a variety of societal goals, including climate, biodiversity, and food security**

# Summary of main results for Treasure Valley – social science

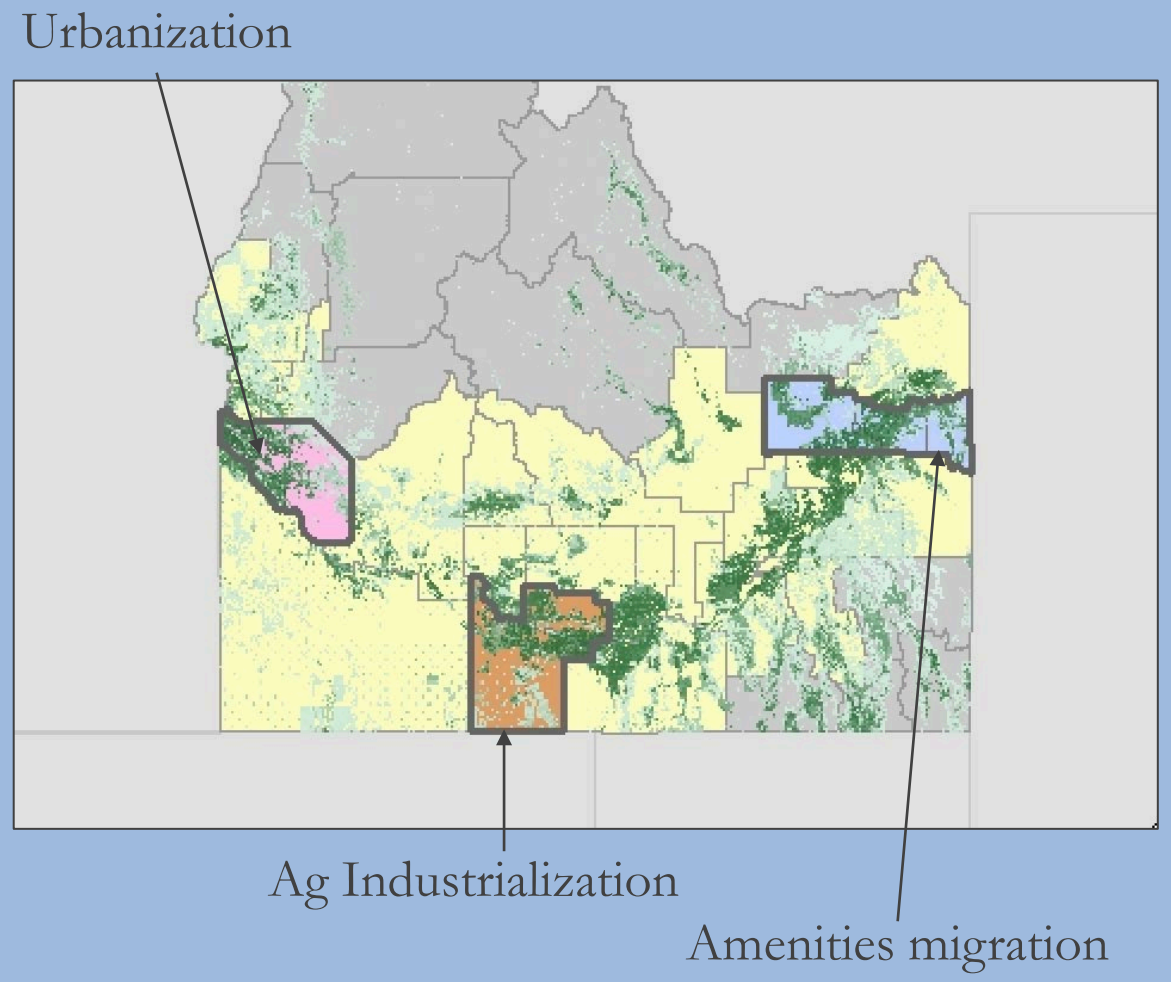
Diverse community members have different frames, but there is a lot of overlap.

We will have more success if the language, policies and prioritization strategies are aligned with what the community values.

# Current work: Expanding to other archetype sites

Preliminary results indicate:

- ES provided by farmlands differ among sites.
- Communities have fascinating differences, socially, and in their approaches to farmland protection



# Acknowledgements

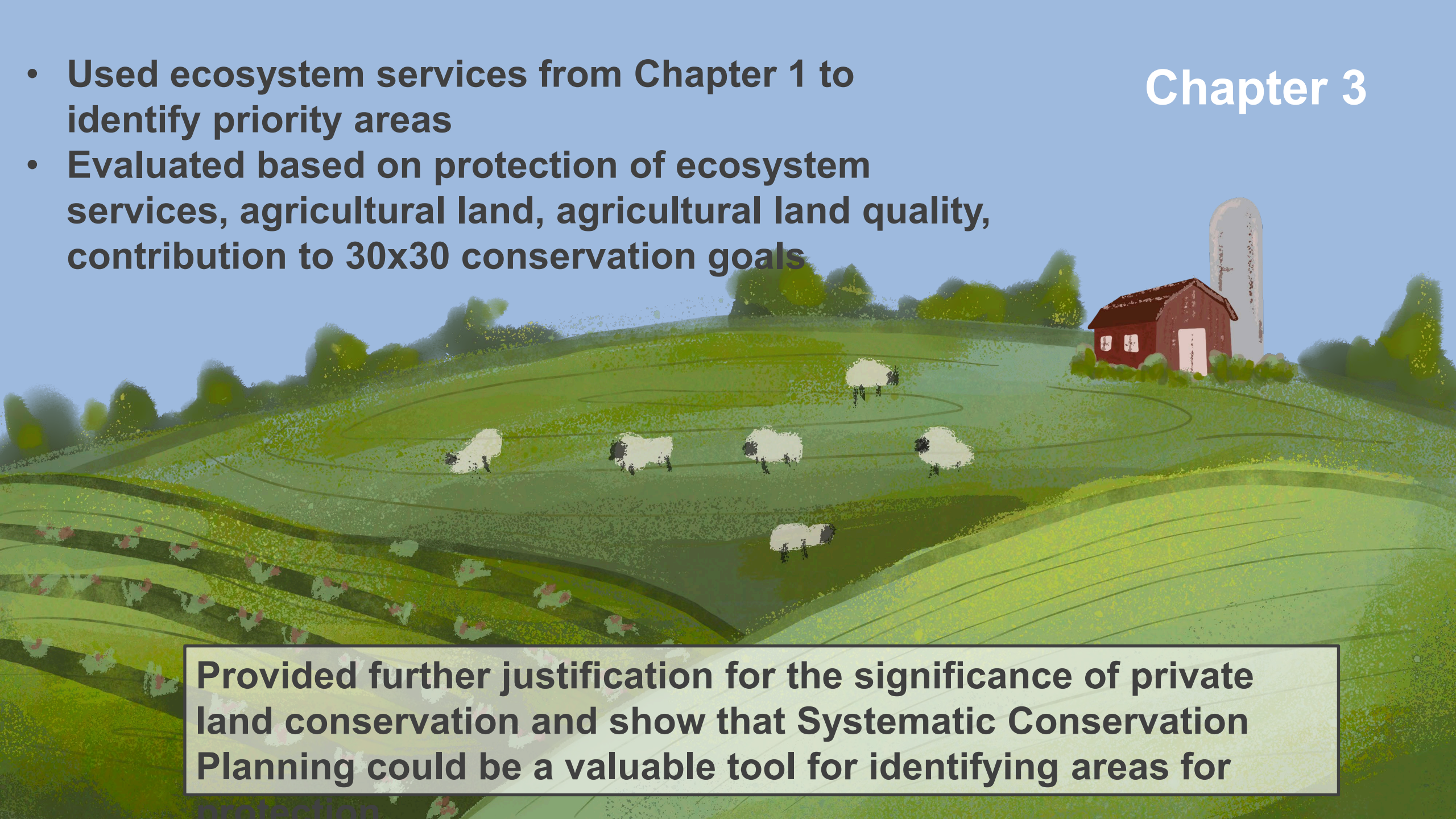
Graduate students: Sarah Halperin, Carolyn Koehn, Gwenaelle d'Aumale

Collaborators: Rebecca Som-Castellano, Jen Schneider, Vicken Hillis, Kelsey Johnson, David Anderson, Theresa Nogeire-McRae

Project funded by: USDA BNRE 2019 and 2021

# Chapter 3

- Used ecosystem services from Chapter 1 to identify priority areas
- Evaluated based on protection of ecosystem services, agricultural land, agricultural land quality, contribution to 30x30 conservation goals



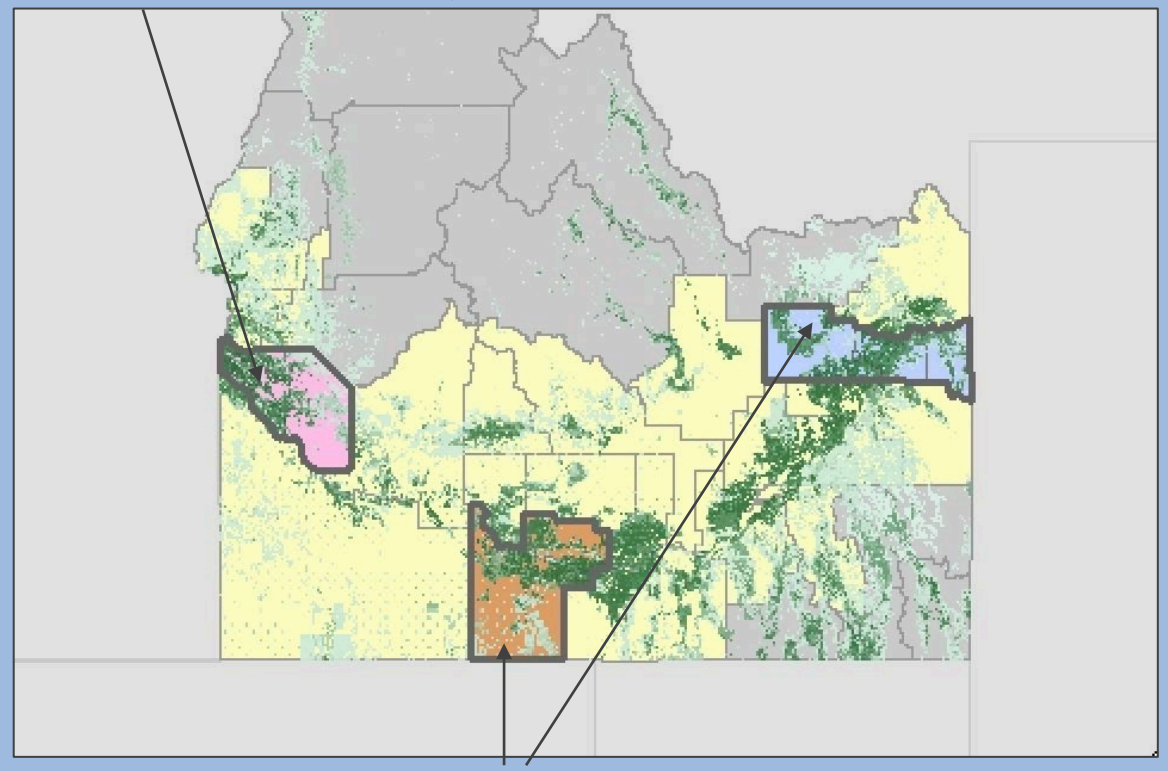
Provided further justification for the significance of private land conservation and show that Systematic Conservation Planning could be a valuable tool for identifying areas for protection

# Systematic protection: What farmland should we protect in order to maintain those ecosystem services?

# Three “archetypal” systems.

1. What’s at stake?
2. Systematic protection?
3. Overcoming socio-political obstacles?

Treasure Valley (Boise)
(USDA 2018 Seed Grant)



Magic and Teton Valleys (USDA 2022 Standard Grant)

# What are several critical questions a community needs to ask when they embark on farmland protection?

1. What's at stake? That is, what ecosystem services, or benefits, are we likely to gain and lose with farmland loss?
2. Systematic protection: What farmland should we protect in order to maintain those ecosystem services?
3. Overcoming socio-political obstacles: What are the ways in which diverse stakeholders are framing the issue of farmland loss?

Sarah Halperin

# Three critical questions a community needs to ask when they embark on farmland protection?

1. What ecosystem services, or benefits, are we likely to gain and lose with farmland loss?
2. What farmland should we prioritize for protection?
3. Overcoming socio-political obstacles: What are the ways in which diverse stakeholders are framing the issue of farmland loss?

# For Example:

*Frame:* Environmental Benefits

*Quote:* "…and the health of the land and the biological diversity that offers, not just to you know the farm animals, but the pollinators come back, the birds of prey and all these different creatures that weren't living there when the land was dead"

*Policy Implication:* May suggest policies that incentivize **regenerative agriculture** and protection of lands that provide **ecosystem services**.

*Halperin et al., 2023*

# Frames identified from the research

1. Resource and Cultural Loss
2. Economy and Trade
3. Domestic Food Security
4. Environmental Benefits
5. National Security

# Summary of “framing” research

- Semi-structured interviews with diverse actors in the farmland protection community
- 5 message frames with associated policy solutions
- Published as a white paper policy-brief

**Provided information to continue the conversation around the issue of farmland loss and the need for solutions**

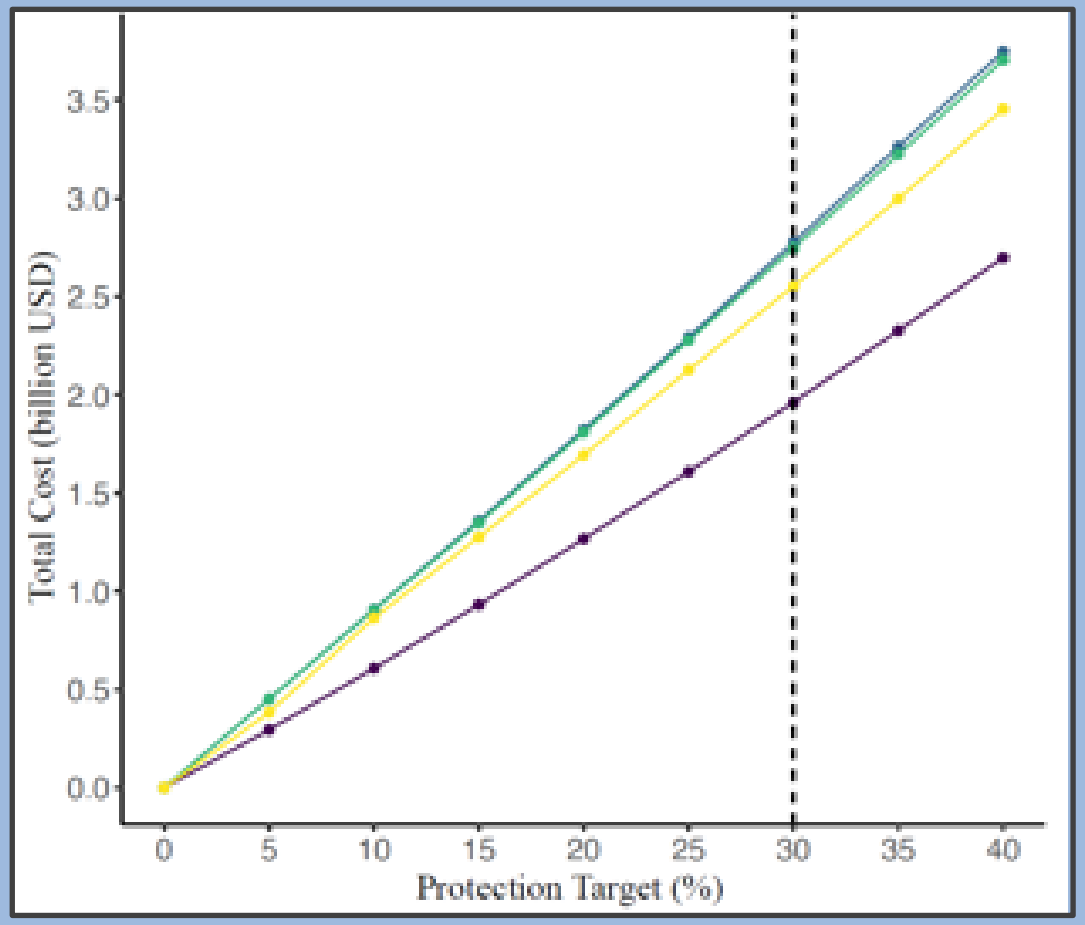
Most policies focus on urban sprawl archetypes, but each community will have different answers to the key questions:

1. What Ecosystem Services will be lost?
2. Which lands should we prioritize for protection?
3. Overcoming socio-political obstacles?

# Three critical questions a community needs to ask when they embark on farmland protection?

1. What are we likely to gain and lose with farmland loss?
2. What farmland should we prioritize for protection?
3. How do we overcome socio-political obstacles to farmland protection?

# What about cost?





Agricultural Productivity scenario is cheapest, because we protect less land of very high productivity to reach our target.

Total Cost is higher when we protect all ecosystem services, but we are also protecting more acreage.