# Measuring and quantifying the ecosystem service values of conservation investments on western rangelands

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EARTH ECONOMICS

# RANGELAND'S CAPITAL:
# THE BENEFITS OF ECOSYSTEM SERVICES

**NATURAL CAPITAL**

Healthy rangelands contain native grasses and shrubs.

**ECOSYSTEM FUNCTION**

Plant roots can trap, slow, and filter rainwater and runoff, improving the water quality of nearby streams and rivers.

**ECOSYSTEM GOODS + SERVICES**

Cleaner water benefits people living downstream that may use it as a source for drinking water, irrigation, or industrial uses.

# RANGELAND'S CAPITAL:
# **THE BENEFITS OF ECOSYSTEM SERVICES**

- Ecosystem services provide market and non-market benefits
- Non-market benefits are hard to value, and often left out of reporting… they are effectively valued at $0
- Rangelands provide these services, but conservation success is reported in acres treated or number of practices applied

# PROJECT **SUMMARY**

- **Vision:** Build a framework federal agencies can use that adds ecosystem service values into rangeland decision-making processes.
- **Goals:**
  - Report conservation outcomes in ways the general public values **at scale.**
  - Provide broad sense of **non-market economic benefits** from conservation investments.
  - Identify existing **science gaps and research priorities**.

# PROJECT **CONSTRAINTS**

- Limited data on practice applications
- Some data suppressed for confidentiality
- Results should be timely
- Produce consistent and repeatable analysis

# PROJECT **CONSTRAINTS**

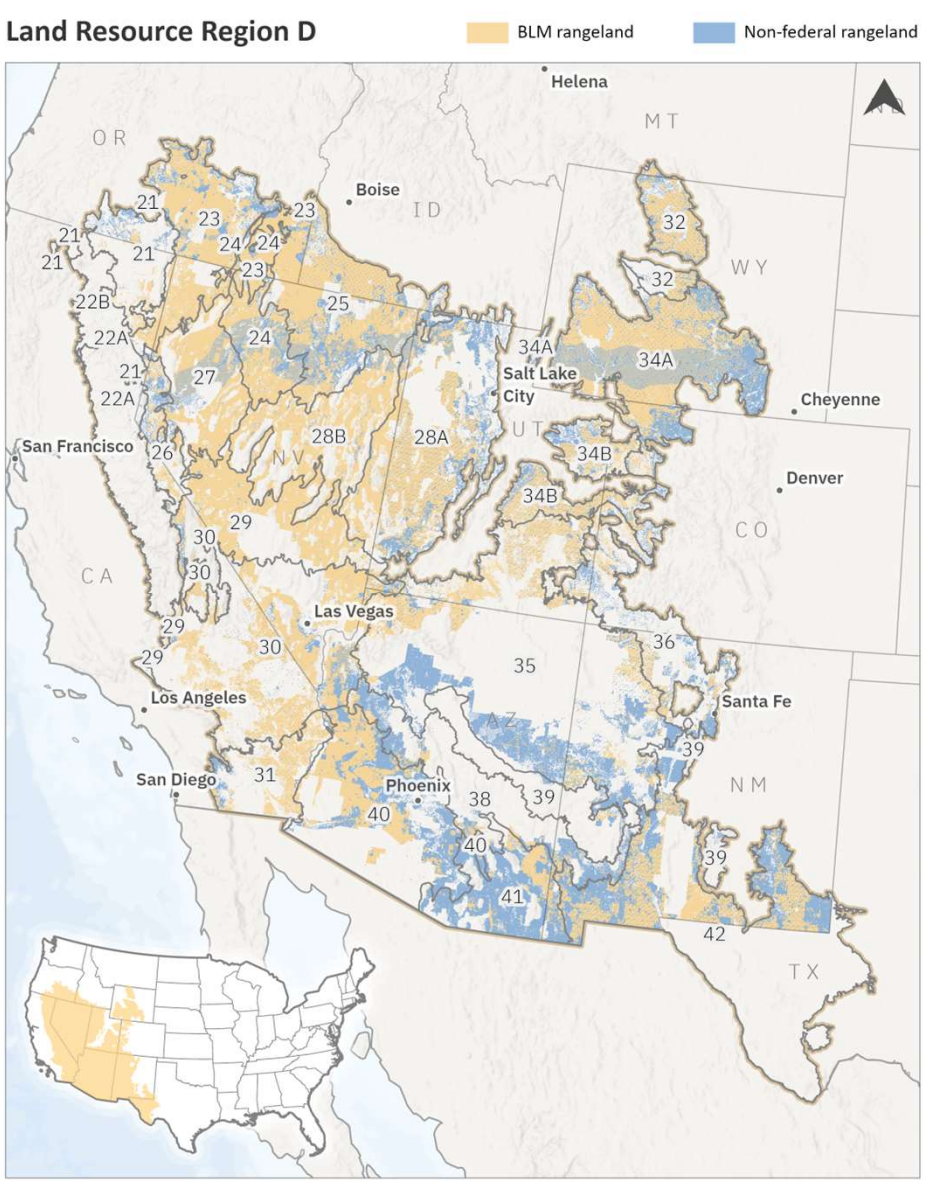
- Should use data agencies already collect, but there is limited data on practice applications
- Some data suppressed for confidentiality
- Results should be timely
- Produce consistent and repeatable analysis

**Use secondary analysis**:

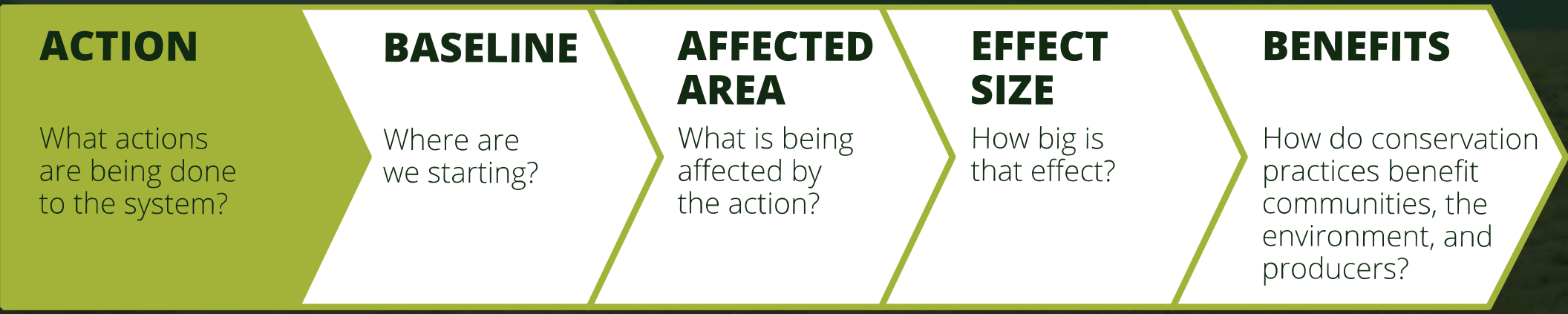
- available Agency-collected data
- Scientific literature reviews

# STUDY AREA

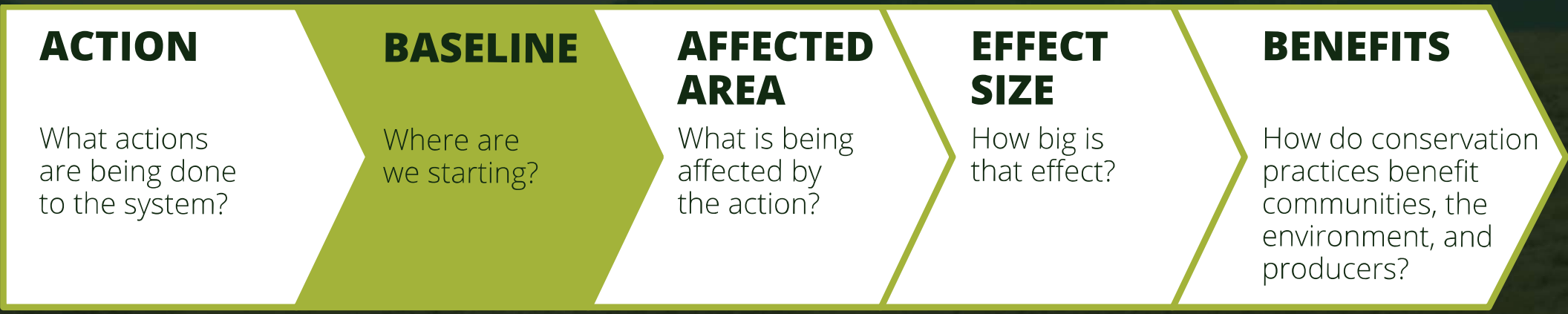
- Land Resource Region D
- 351 million acres
- 11 states
- 23 MLRAs
- Non-federal rangeland and BLM




ACTION
What actions are being done to the system?
BASELINE
Where are we starting?
AFFECTED AREA
What is being affected by the action?
EFFECT SIZE
How big is that effect?
BENEFITS
How do conservation practices benefit communities, the environment, and producers?




- **NRCS Contracts** certified from 2011-2020
- **BLM Land Treatment Digital Library** from 2016-2020
- **Practices:** Brush Management, Prescribed Grazing, Herbaceous Weed Treatment
- **Land Use:** Rangeland



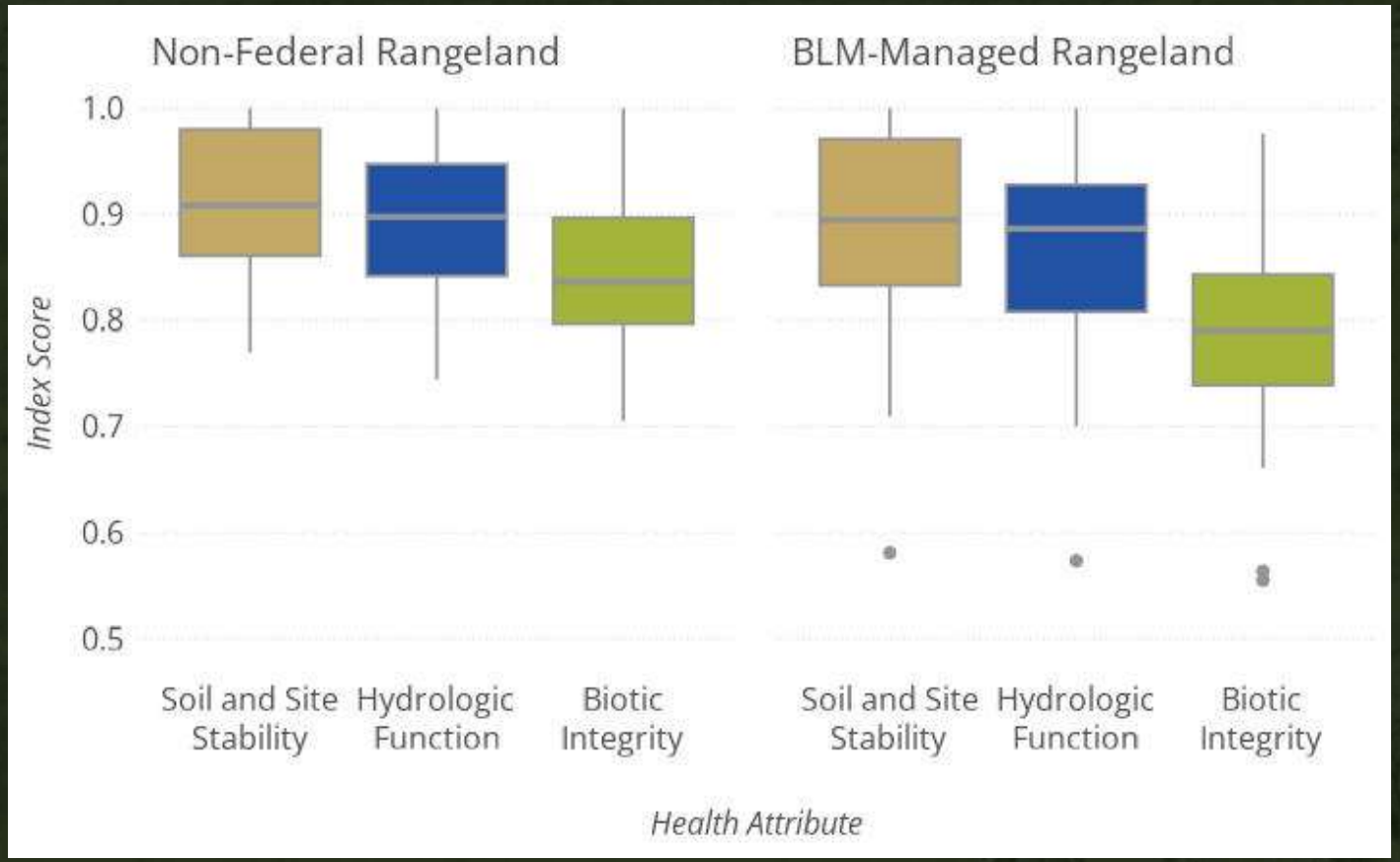

- **Rangeland types**
- **Rangeland health attributes**
- **Unit values of ecosystem services**


*millions of acres*
*(percent of acres)*

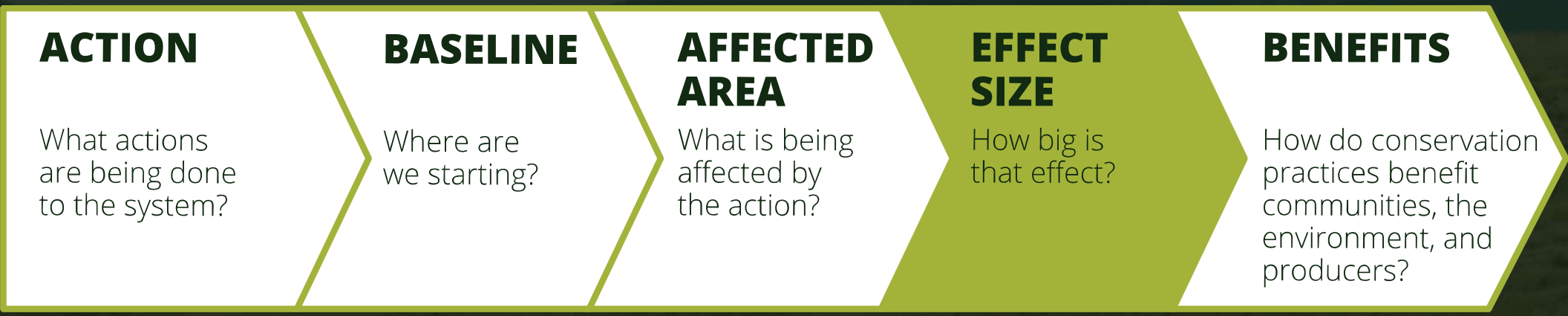
| Landcover | Study Area | Non-Federal Land | BLM Land |
|---|---|---|---|
| Forest | 4.5 (2%) | 3.2 (4%) | 1.3 (1%) |
| Grassland | 27.9 (15%) | 13.7 (15%) | 14.1 (14%) |
| Shrubland | 160.5 (83%) | 72.7 (81%) | 87.9 (85%) |
| **Total** | **192.9 (100%)** | **89.6 (100%)** | **103.4 (100%)** |

National Resources Inventory

Assessment, Inventory, and Monitoring data




- We know:
  - Acres treated
  - MLRA



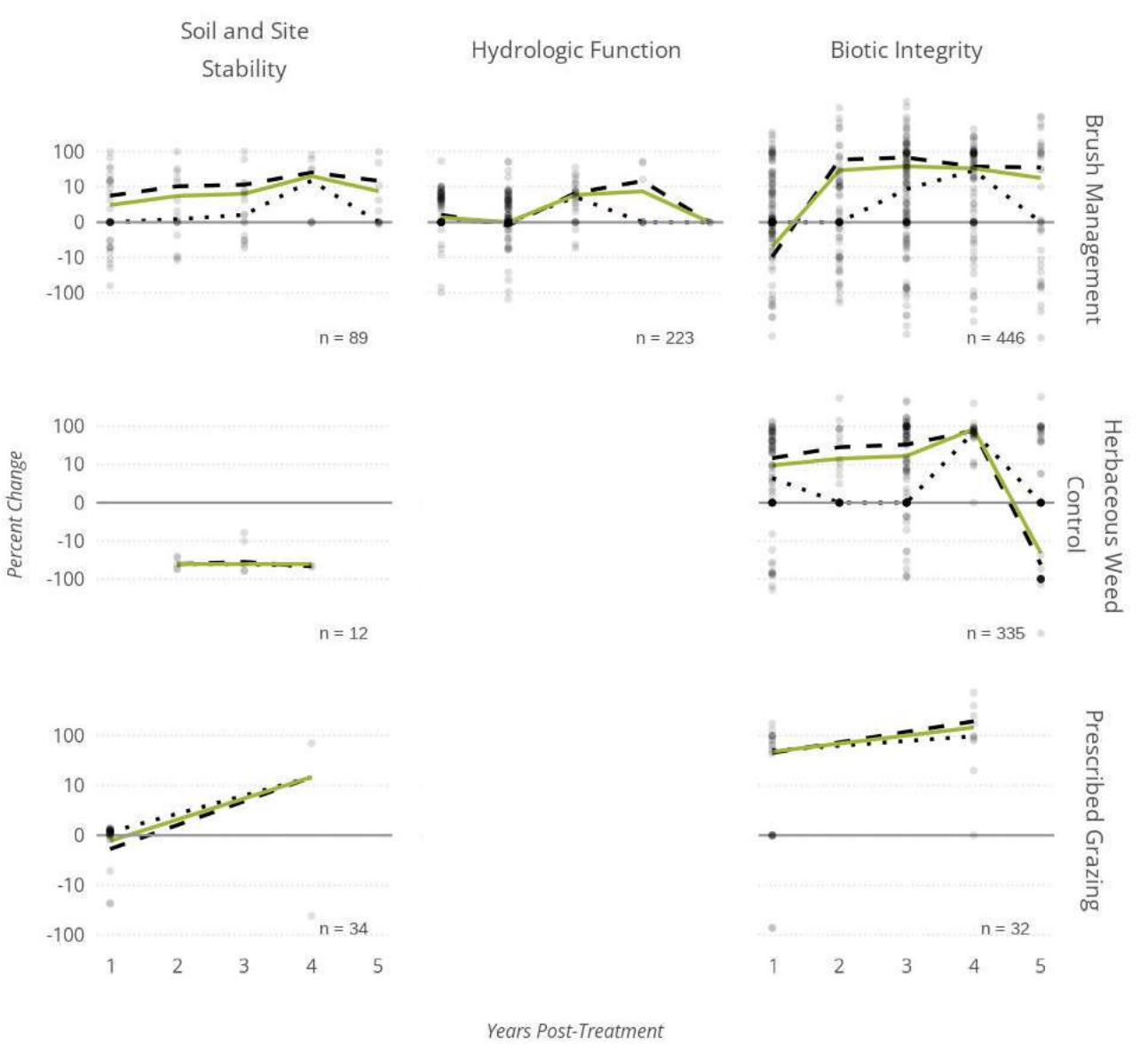

- Review published literature on the effects of conservation practices
- Link effects to rangeland health index categories

# Effects of Practices on Health Indices

Solid green = values used in report

Dashed = mean

Dotted = median

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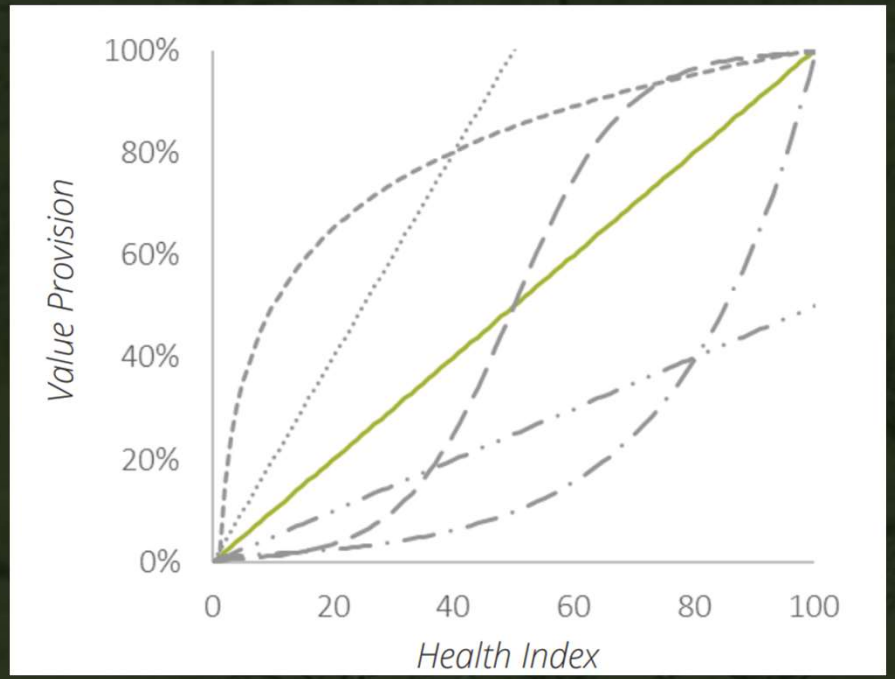
# VALUING **ECOSYSTEM SERVICES**

- Benefit transfer methods (BTM): applies values estimated for one site to a different site
- Provides rapid analysis when primary site data doesn't exist
- More literature reviews!

| ECOSYSTEM SERVICES VALUED IN THIS STUDY | FOREST | GRASSLAND | SHRUBLAND |
|---|---|---|---|
| Aesthetics | • | • | • |
| Air quality | • | • | • |
| Biological control | • | • | • |
| Carbon sequestration | • | • | • |
| Fire risk reduction | | • | • |
| Forage production | | • | • |
| Habitat | | • | |
| Recreation | • | • | • |
| Social | | • | • |
| Soil fertility | | • | |
| Soil retention | | • | • |
| Waste treatment | | • | |
| Water supply | • | • | |

# VALUING **ECOSYSTEM SERVICES**

- Expect ability of rangelands to provide ES to decline with health
- Discount ecosystem service values by range health index (Aplet et al., 2000; Esposito et al., 2011; Phillips & McGee, 2014)
- Assumes $ values are for "healthy" locations
- Assumed linear response of health and valuation effects from practices



| ACTION | BASELINE | AFFECTED AREA | EFFECT SIZE | BENEFITS |
| --- | --- | --- | --- | --- |
| What actions are being done to the system? | Where are we starting? | What is being affected by the action? | How big is that effect? | How do conservation practices benefit communities, the environment, and producers? |

Acres of land cover type *x*

Index of rangeland health *x*

Percent change in health index *x*

$/acre/year ecosystem service values **=**

$/year changes to ecosystem service values

# RESULTS

**NRCS (2011-2020)**

- $13.1 million/year in Financial Assistance
- 795 contracts/year
- 1.7 million acres treated per year (~1.8%)
- ***Increase in ESV of $8M - $21M/year***
- ***$25 - $75/acre treated over 5 years***

**BLM (2016-2020)**

- 105 treatments/year
- 83 thousand acres treated per year (~0.07%)
- ***Increase in ESV of $6M - $9M/year***
- ***$30 - $55/acre treated over 5 years***

# TAKE-AWAYS

- Federal agencies are called to incorporate the values of ecosystem services more and more
- Including ecosystem services value into conservation planning efforts communicates the cost-effectiveness of rangeland conservation and the off-site benefits to the public.
- Estimated scale of benefits of rangeland conservation: at least as much as NRCS spends in Financial Assistance—tens of millions annually
- There are many gaps in the literature that can be filled to improve secondary analysis of benefits at-scale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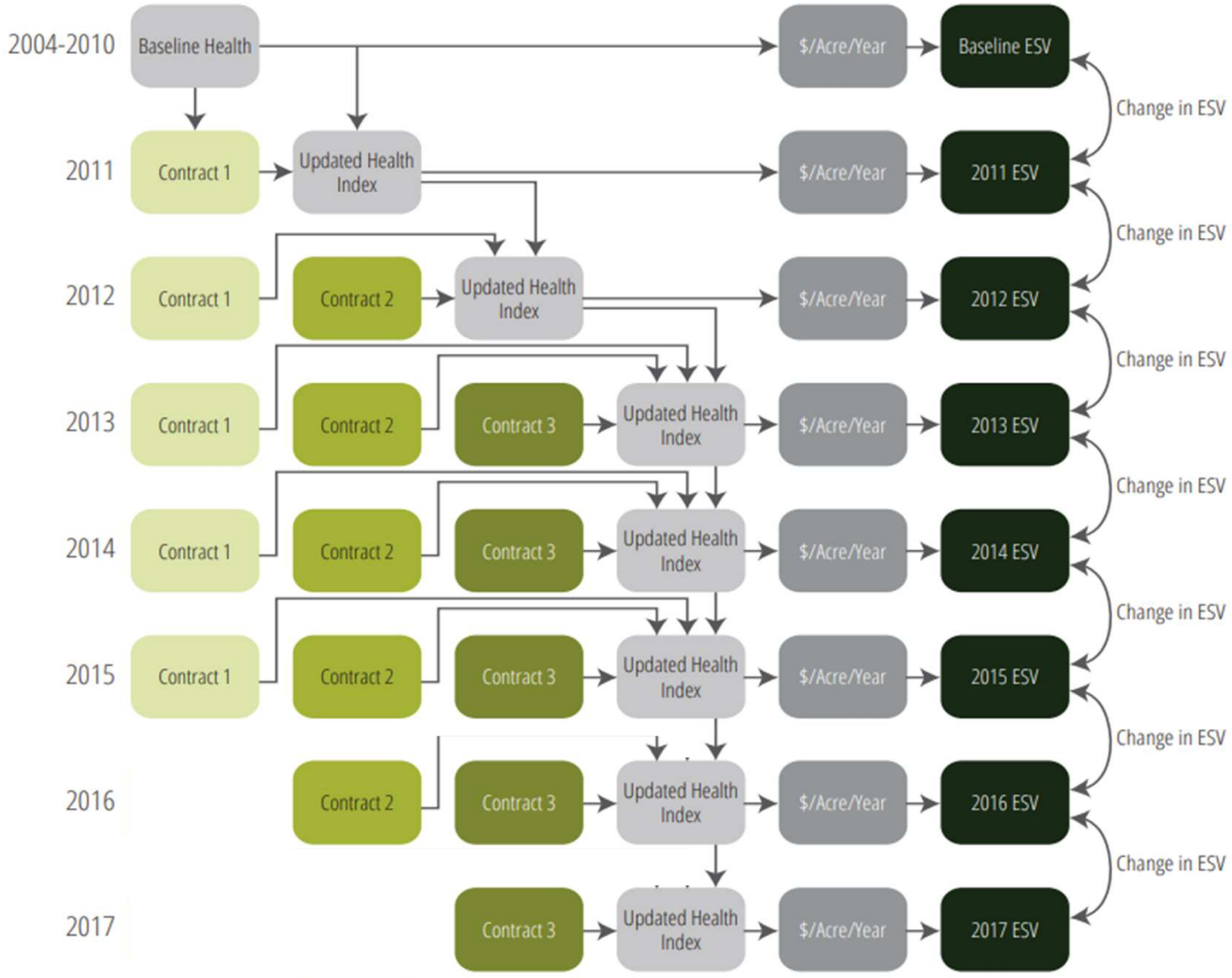
EARTH ECONOMICS

Interactive summary & PDF report:

**www.eartheconomics.org/conservation-and-communities**


2004-2010
Baseline Health
$/Acre/Year
Baseline ESV
Change in ESV
2011
Contract 1
Updated Health Index
$/Acre/Year
2011 ESV
Change in ESV
2012
Contract 1
Contract 2
Updated Health Index
$/Acre/Year
2012 ESV
Change in ESV
2013
Contract 1
Contract 2
Contract 3
Updated Health Index
$/Acre/Year
2013 ESV
Change in ESV
2014
Contract 1
Contract 2
Contract 3
Updated Health Index
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