

Using the Rangeland Analysis Platform and the Landscape Data Commons to Understand Rangeland Spatiotemporal Dynamics

Sarah McCord + *many others*

Credit: NEON



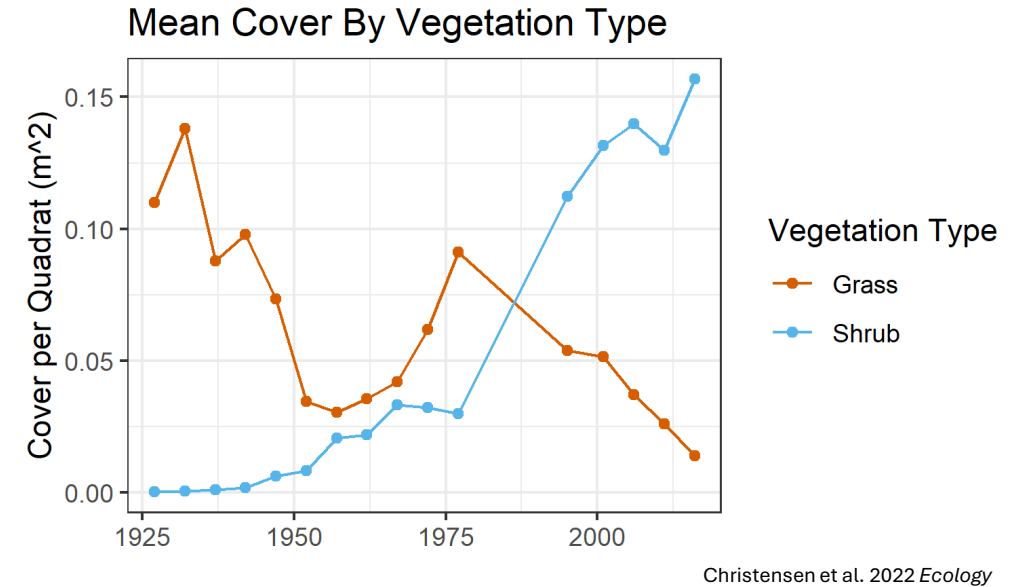
Agricultural
Research
Service



Challenges for rangeland communities

Low ecosystem productivity and high variability

- Difficult to predict management responses
- Vulnerable to abrupt land degradation (fragility)

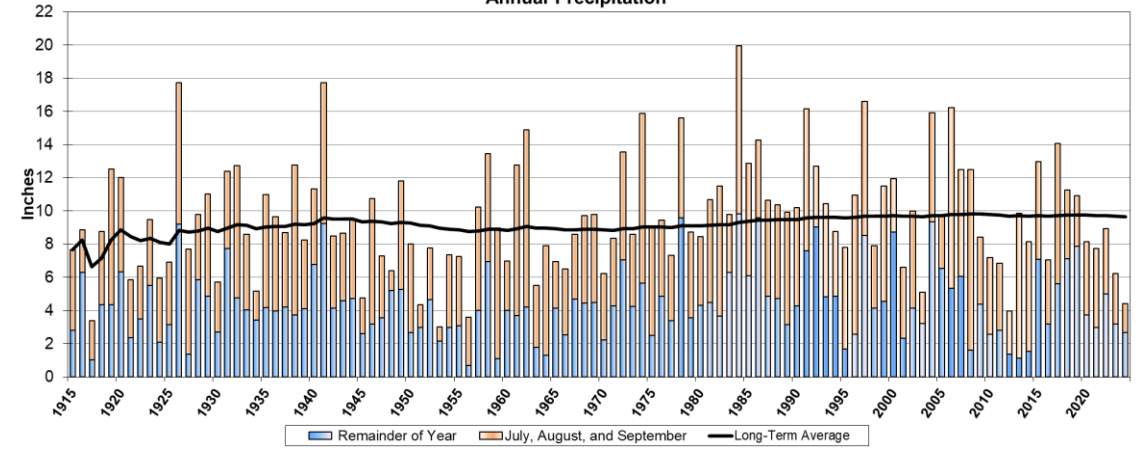


Spatial variability

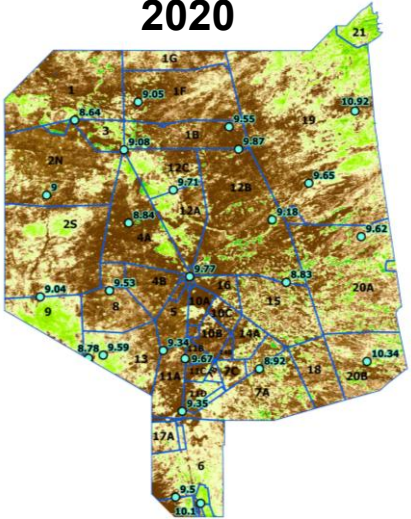


Temporal variability

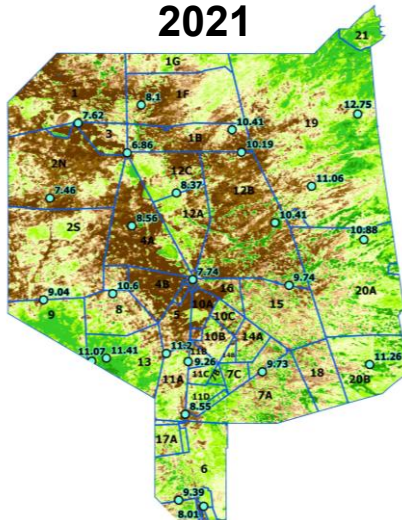
Headquarters Rain Gauge
Annual Precipitation



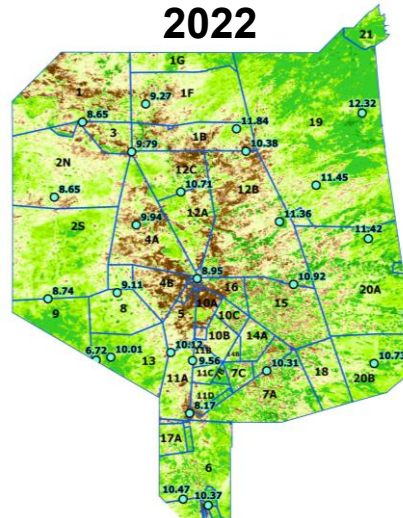
2020



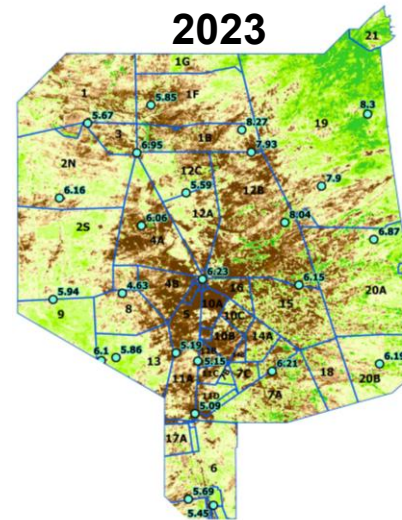
2021



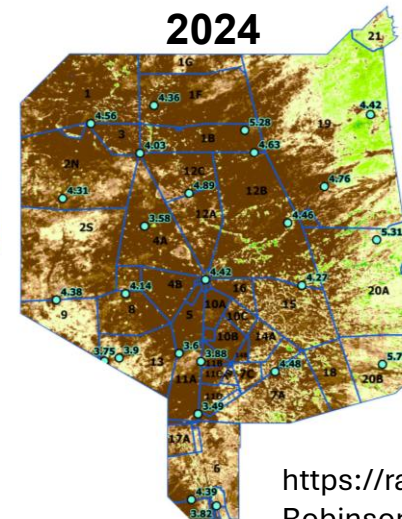
2022



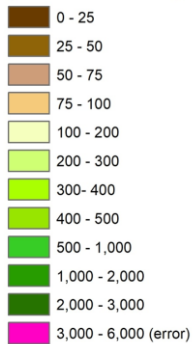
2023



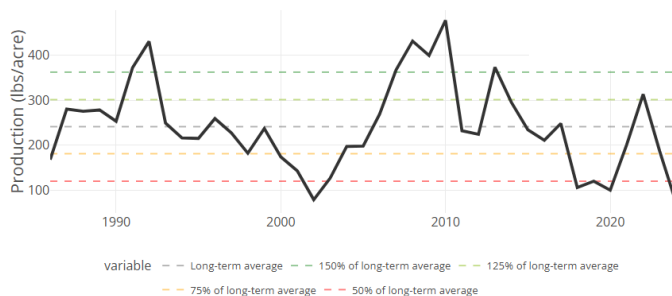
2024



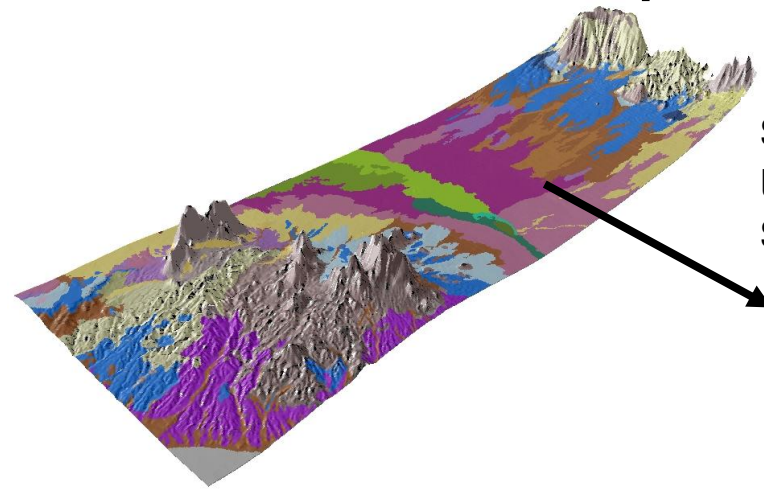
Herbaceous Production (lb/ac)



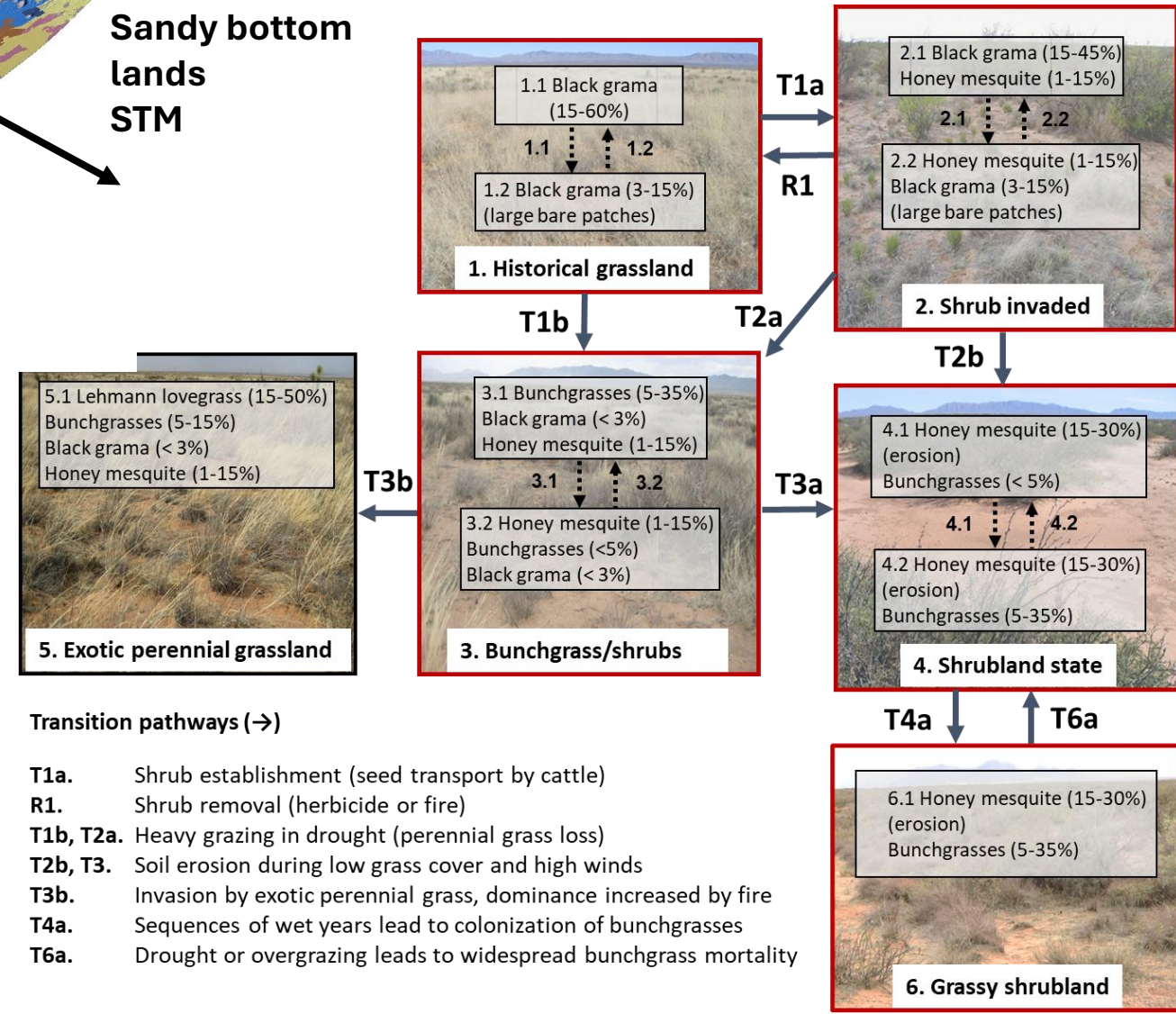
● Rainfall (in)



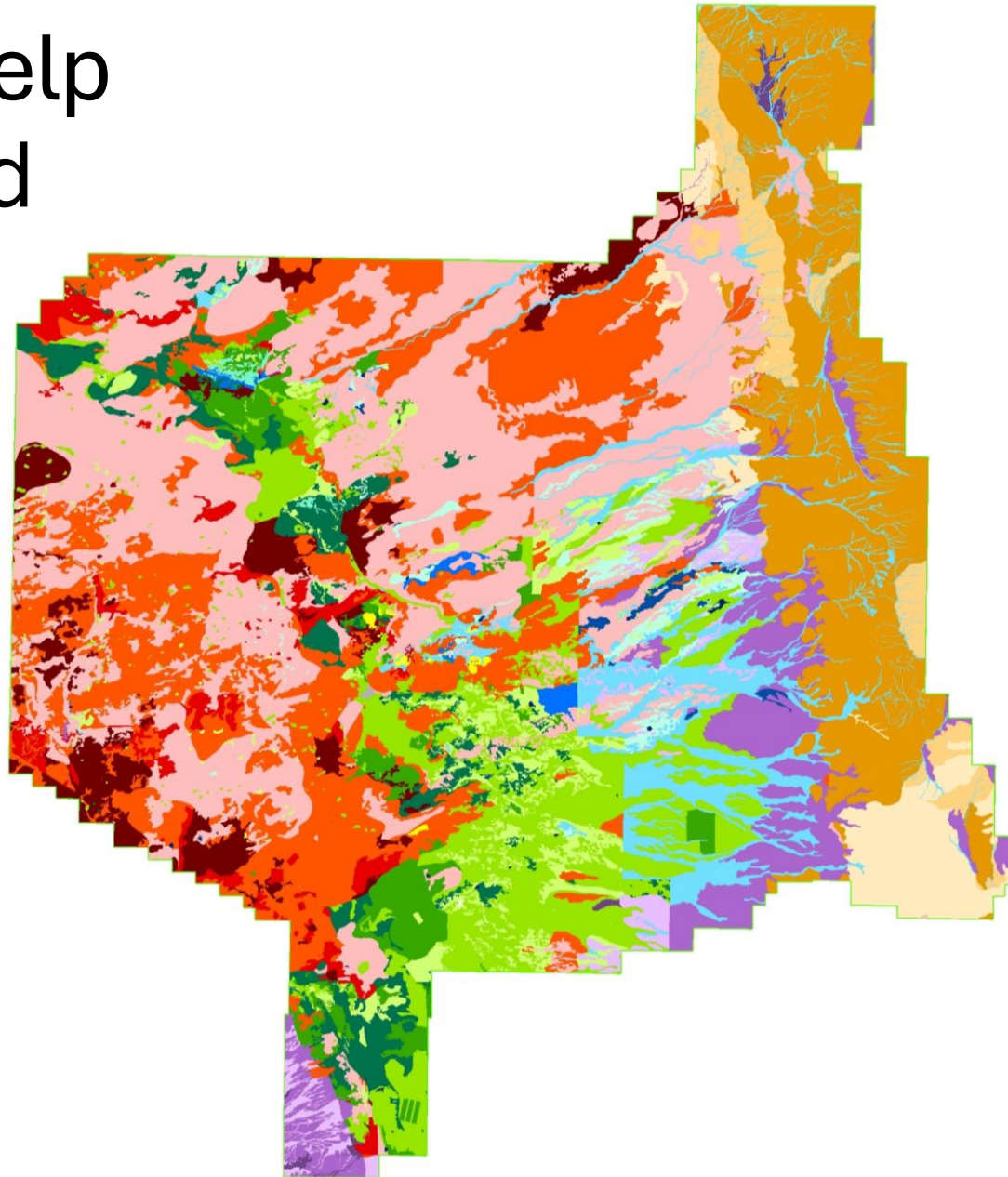
Ecological site and state helps us understand variability



Soil, climate, landscape position drive land potential includes potential productivity, degradation resistance, potential resilience.



State maps help us understand spatial land potential



Bottomland, Draw, Playette

- Grassland
- Altered grassland
- Shrub-invaded grassland
- Shrubland; Bare

Clayey, Loamy

- Grassland
- Altered grassland
- Shrub-invaded grassland
- Shrubland; Bare

Sandy, Shallow sandy, (Deep sand)

- Grassland (Deep sand Grass-shrub mix)
- Altered grassland
- Shrub-invaded grassland (Deep sand Shrub-dominated)
- Shrubland; Bare
- Exotic-invaded

Gravelly, Gravelly loam, Gravelly sand

- Grass-shrub mix
- Shrub-dominated
- Shrubland

Gyp upland

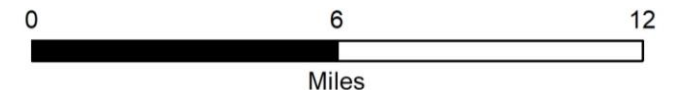
- Grassland
- Altered grassland
- Shrub-invaded grassland

Hills, Limestone Hills

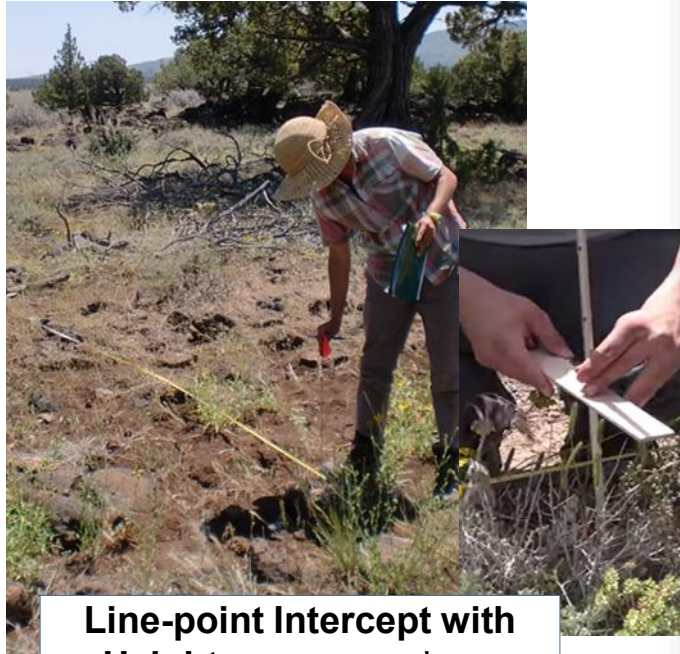
- Grass-shrub mix
- Shrub-dominated
- Shrubland

Other

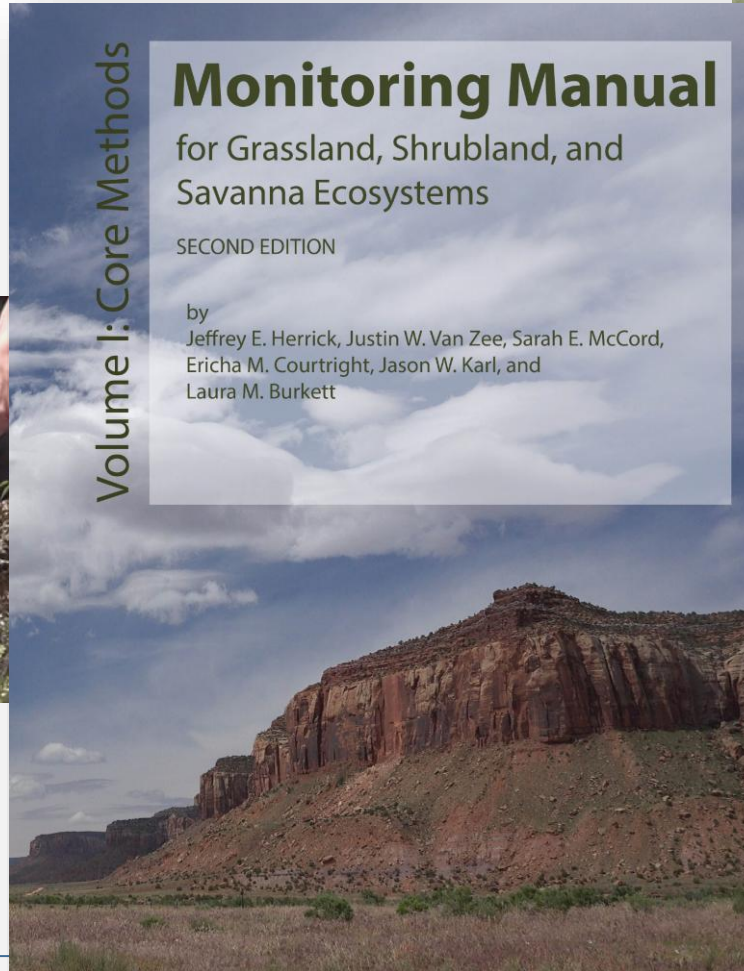
- Tank
- Road



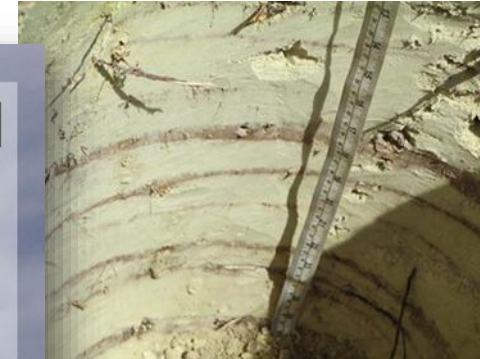
Core methods to measure core indicators



Line-point Intercept with Heights measures bare ground, vegetation composition, vertical vegetative structure etc.



Soil aggregate stability measures erosion potential

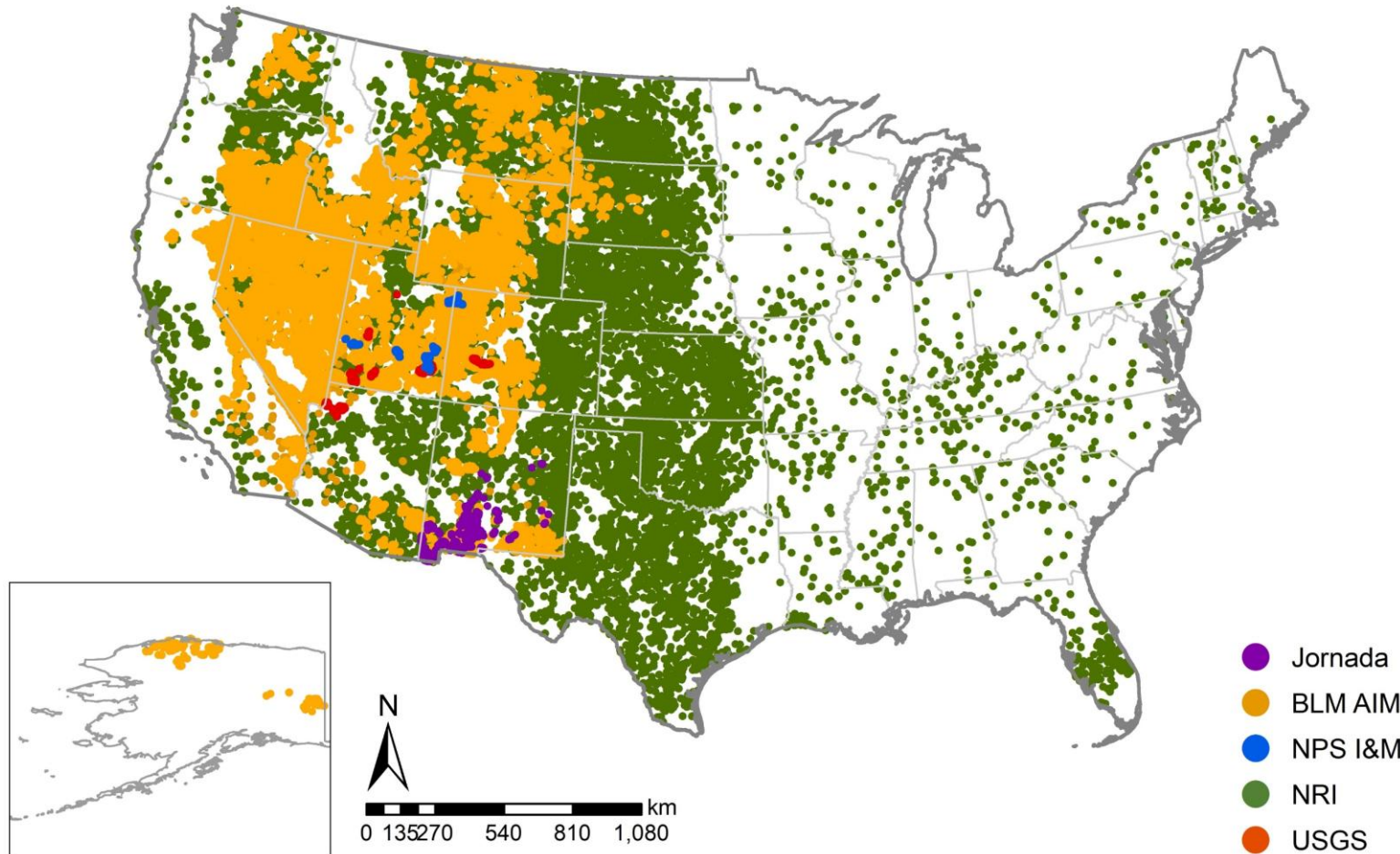


Plot characterization and observation



Species Richness finds species of management concern

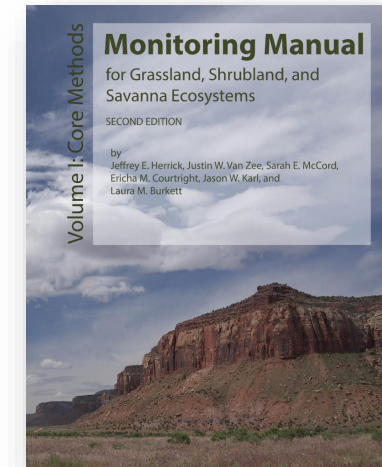
Standardized monitoring data



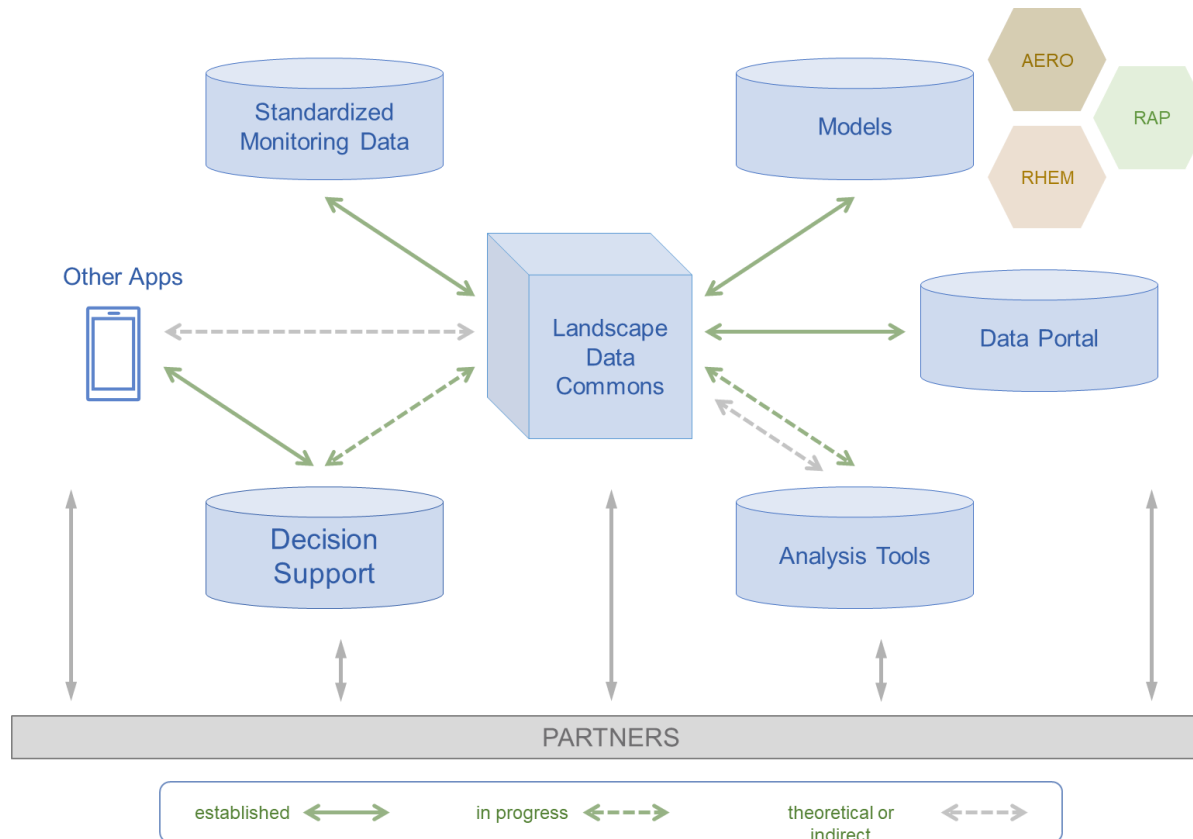
> 110,000 locations



2004-Present



Landscape Data Commons

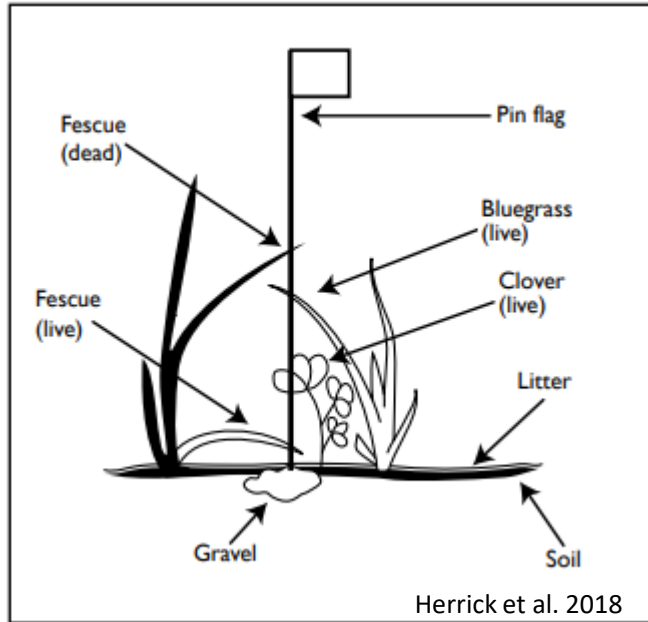


Data access → Data insight

Enable users to leverage the power of big datasets beyond local monitoring projects



Data harmonization



Pt.	Top Layer	Lower 1	Lower 2	Soil Surface
1	ARTRW8	PENST		S
2	BRTE	L		GR
3	ARTRW8	BRTE	L	ARTRW8

GROUPING ENTITY

MEASUREMENT

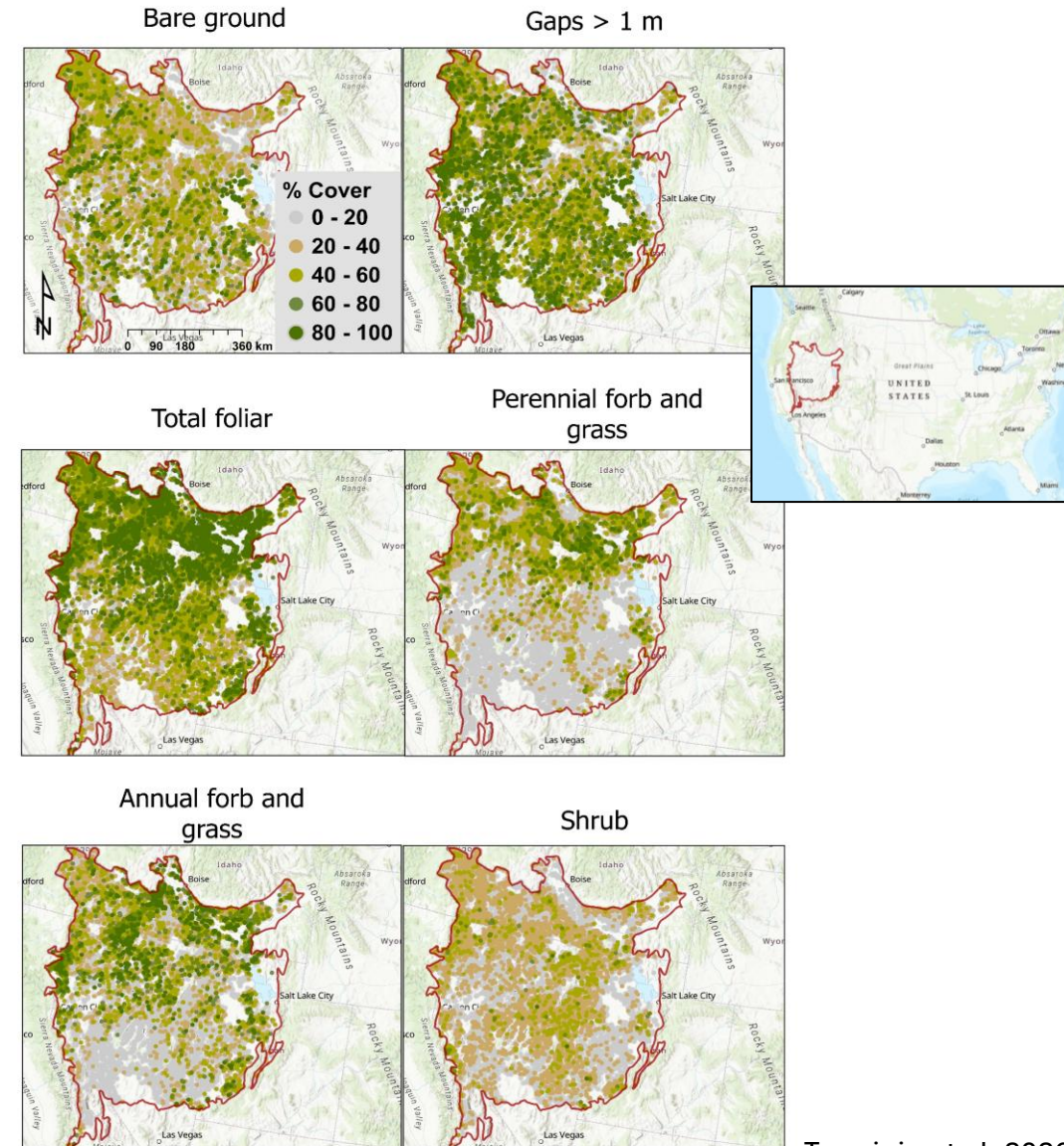
VALUE

GROUPING VARIABLES

Plot	Line	Pt	Layer	Code	Type
Sage-01	1	1	Top Layer	ARTRW8	Shrub
Sage-01	1	1	Lower 1	PENST	Forb
Sage-01	1	1	Soil Surface	S	Soil
Sage-01	1	2	Top Layer	BRTE	Grass
Sage-01	1	2	Lower 1	L	Litter
Sage-01	1	2	Soil Surface	GR	Gravel
Sage-01	1	3	Top Layer	ARTRW8	Shrub
Sage-01	1	3	Lower 1	BRTE	Grass
Sage-01	1	3	Lower 2	L	Litter
Sage-01	1	3	Soil Surface	ARTRW8	Shrub

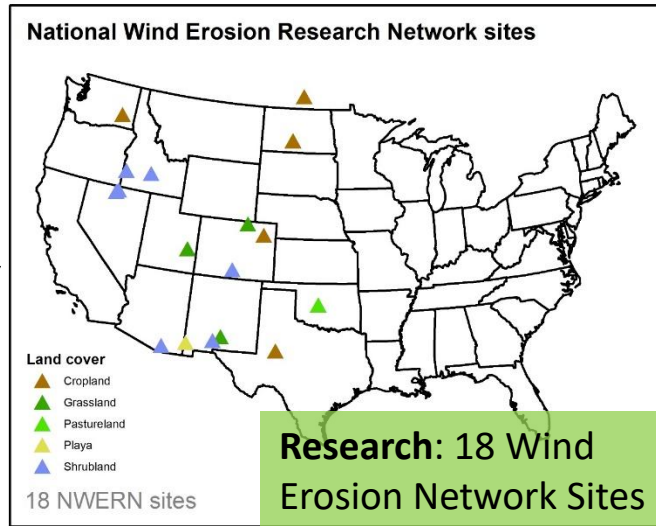
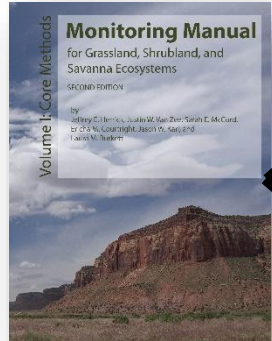
Calculate standard indicators

- 58 common grazing land indicators
 - Bare ground
 - Plant functional group cover
 - Plant species cover
 - Canopy gap cover
 - Soil stability
 - Wind erosion estimates
 - Water erosion estimates
 - IIRH
- Custom indicators
 - Rangeland Indicator Calculator

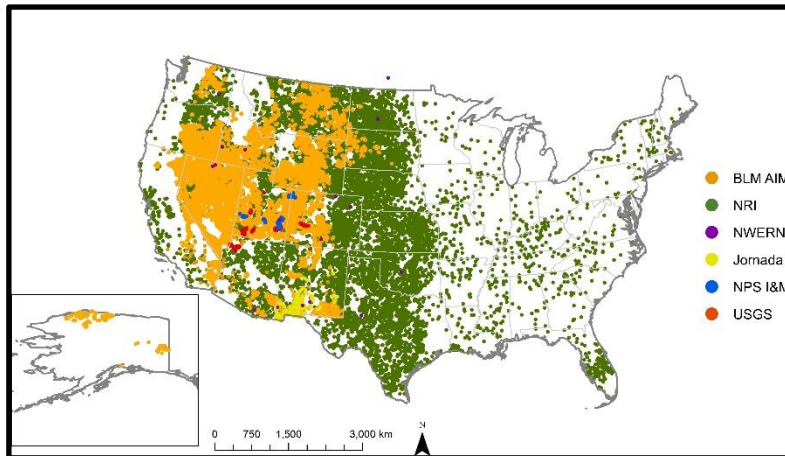


Modeled indicators

Standard methods:
Rangeland monitoring



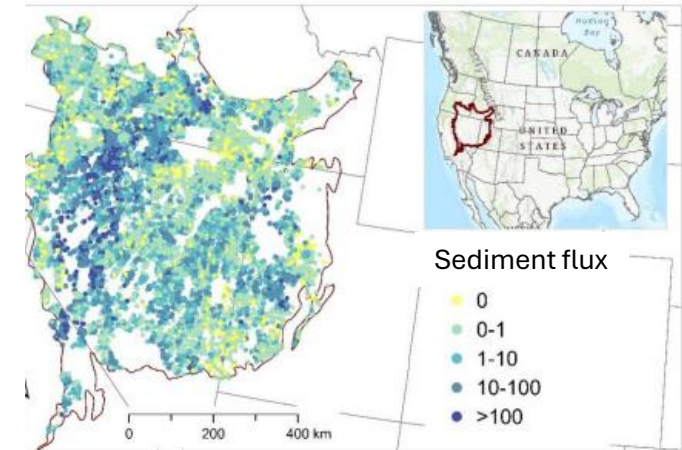
Research: 18 Wind
Erosion Network Sites



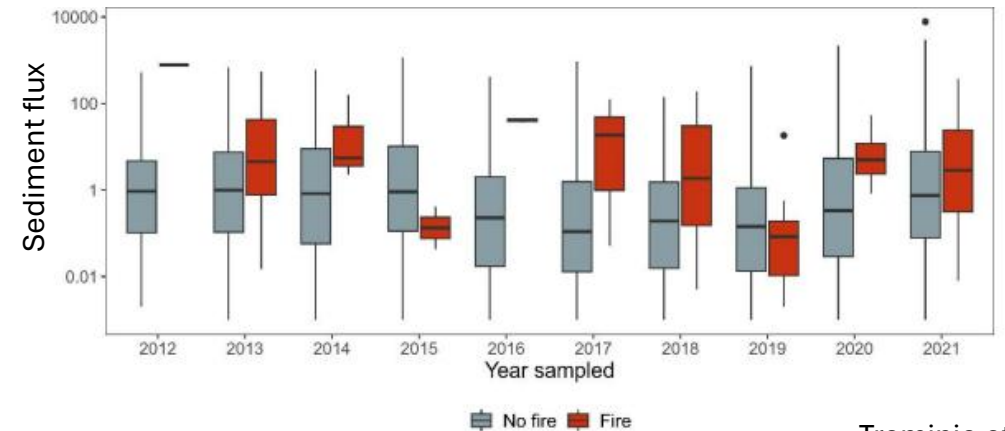
Monitoring databases: >100,000
field sites, multiple agencies.

AERO
Aeolian EROsion Model

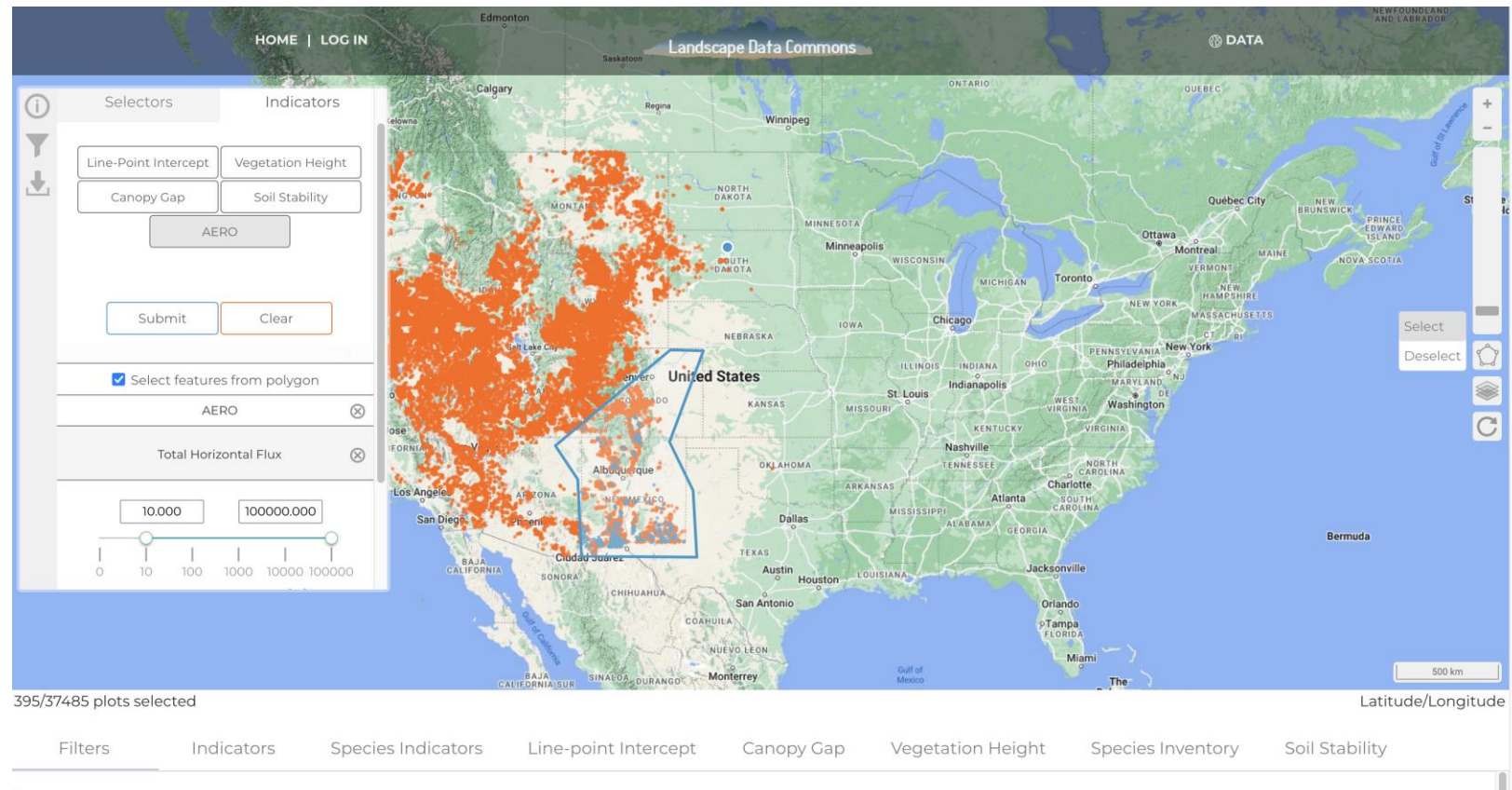
Modelled indicators: Wind Erosion



Wind erosion response to fire in the Great Basin



Data access



+ API

<https://www.landscapedatacommons.org>

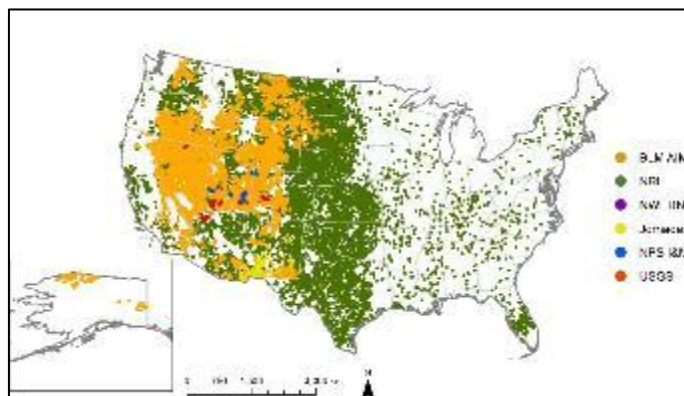
RAP: Linking Field Data with Remote Sensing



Rangeland Analysis Platform

Cover

Standard methods:
Rangeland monitoring



All lands monitoring: >100,000 field sites, multiple agencies.



Model: AI/ML



Landsat
Sentinel-2

Model: Process
based



Production



Changes in vegetation composition

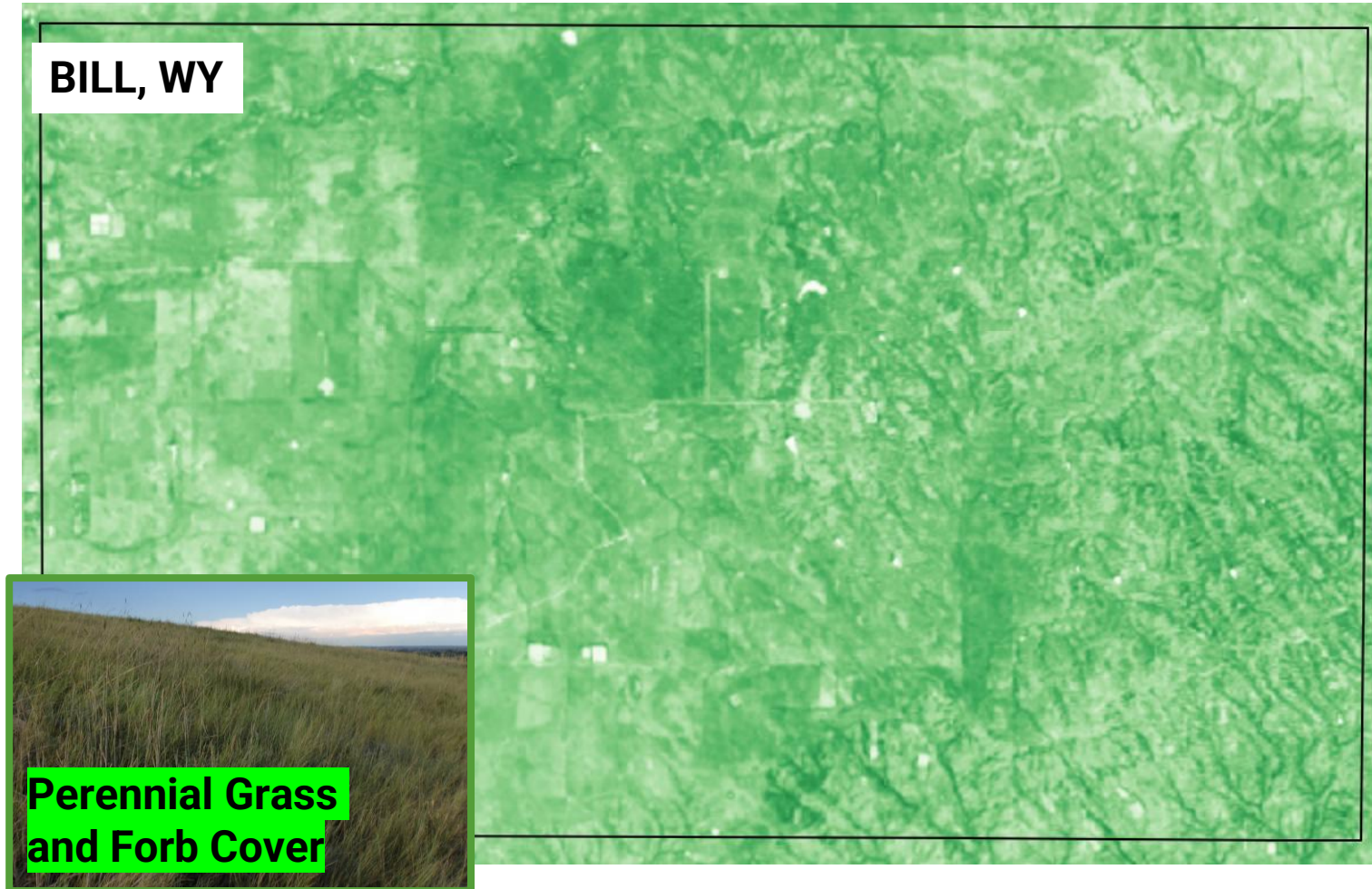
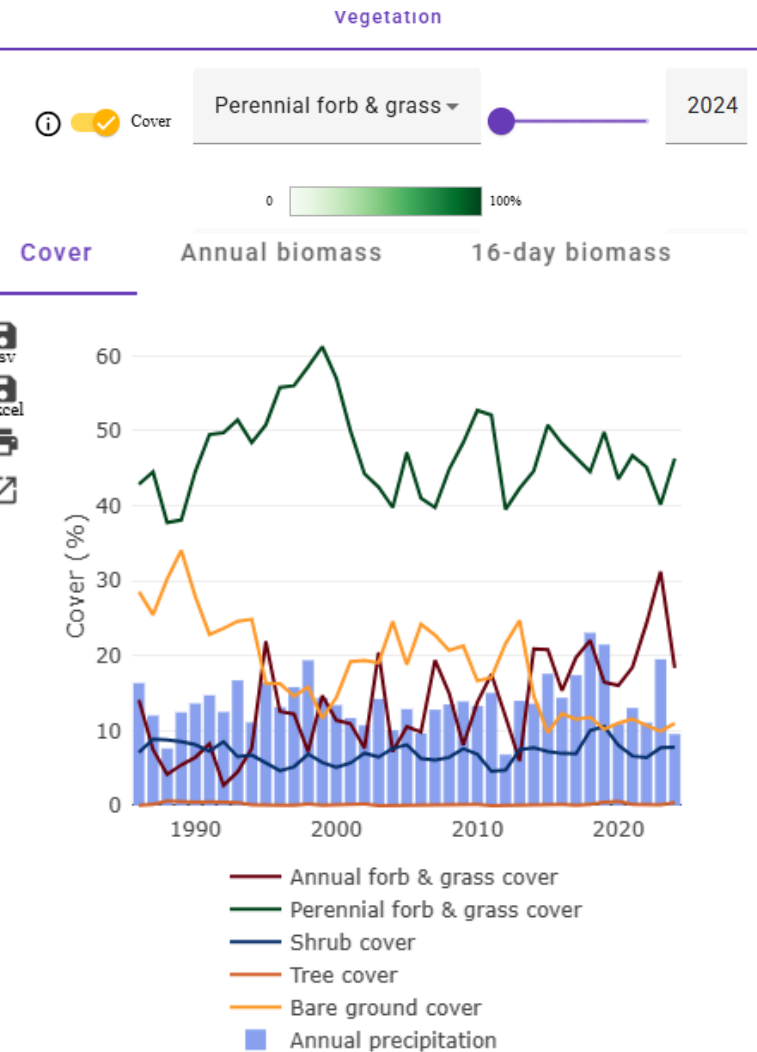


Photo Credit: BLM



Rangeland Analysis Platform

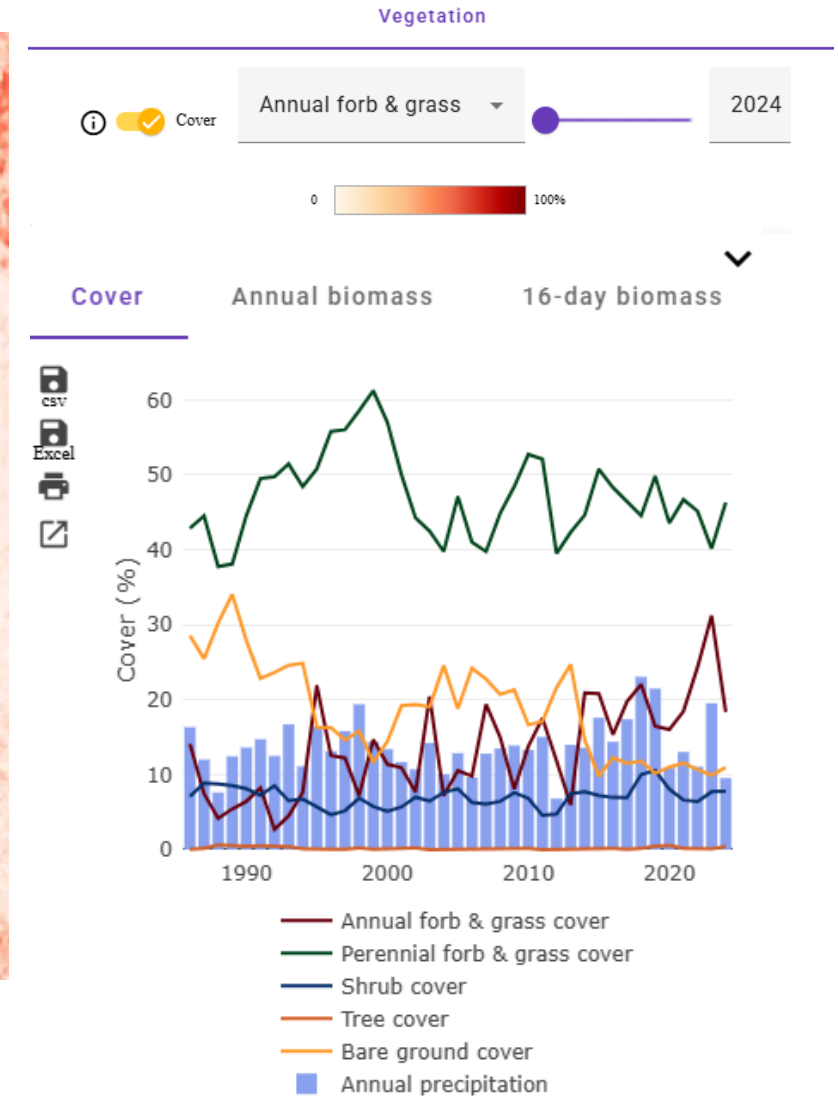


Where are invasive species a threat?

BILL, WY



Photo Credit: BLM



10-m: New functional groups

Pinyon-juniper

Juniperus monosperma
J. Occidentalis
J. Osteosperma
J. Scopulorum
Pinus edulis
P. monophylla

Sagebrush

Artemisia arbuscula
A. cana
A. nova, *A. tridentata*
A. tripartita

Invasive annual grass

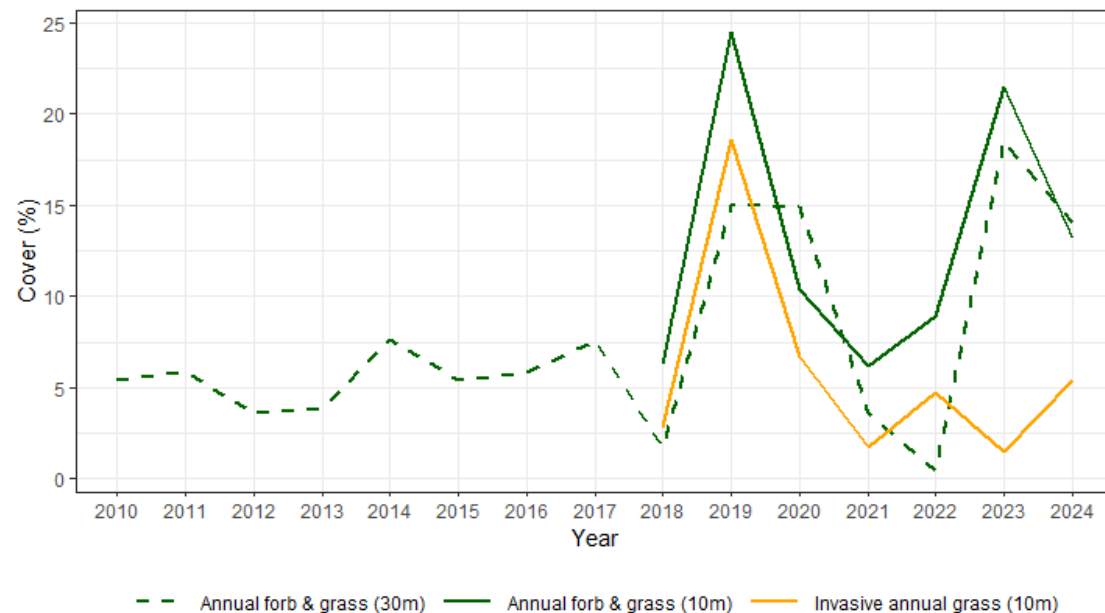
Bromus tectorum
B. Arvensis
B. Rubens
B. Hordeaceus
Eremopyrum triticeum
Schismus spp.
Taeniatherum caput-medusae
Ventenata dubia



Credit: National Park Service

New 10-m: Invasive Annual Grass

Detect vegetation state changes and response to disturbance



Spring 2019



Spring 2023



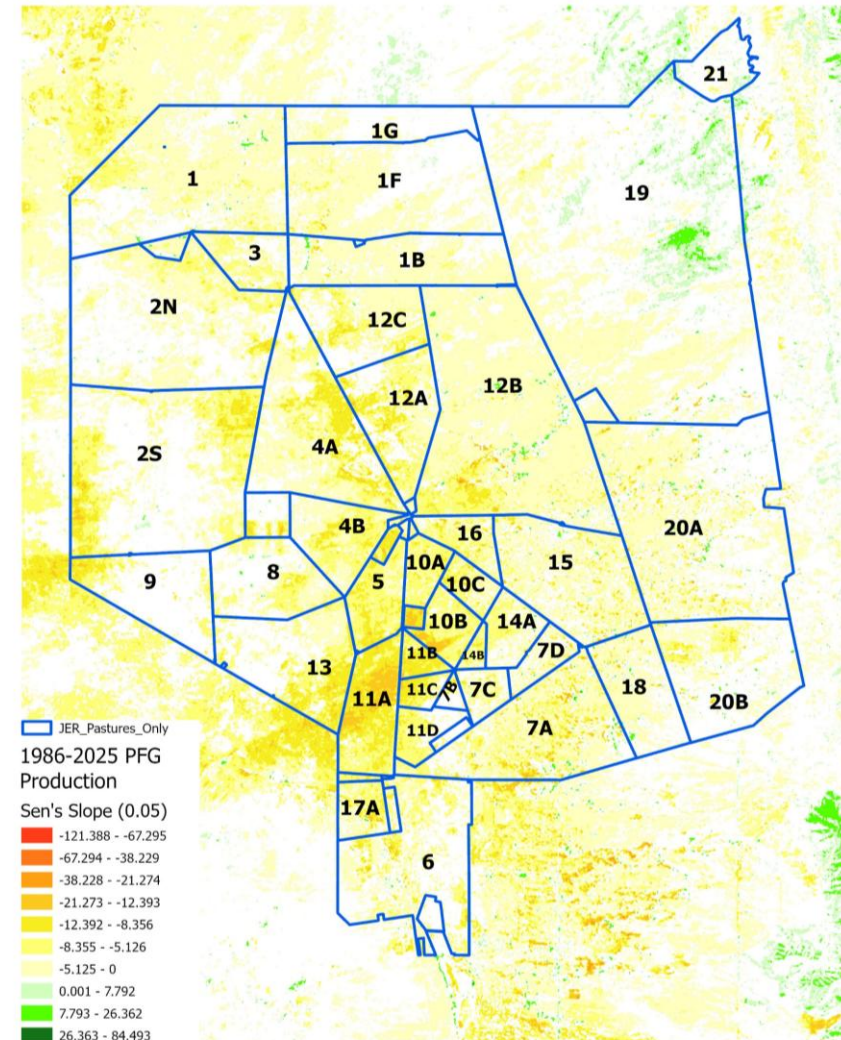
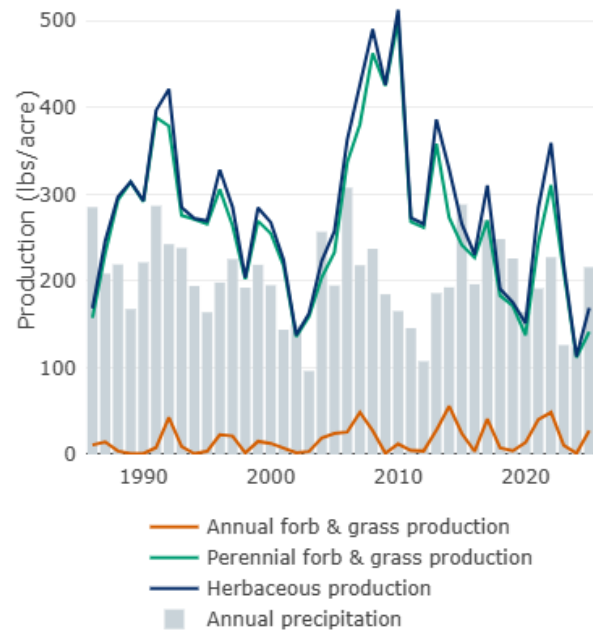
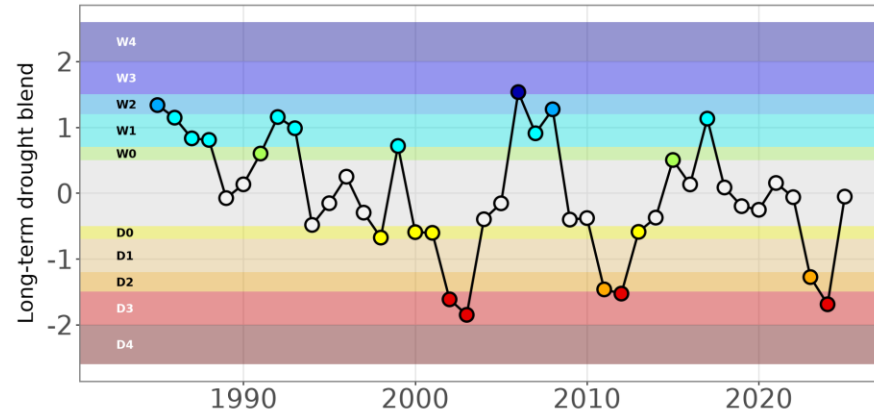
Fall 2019



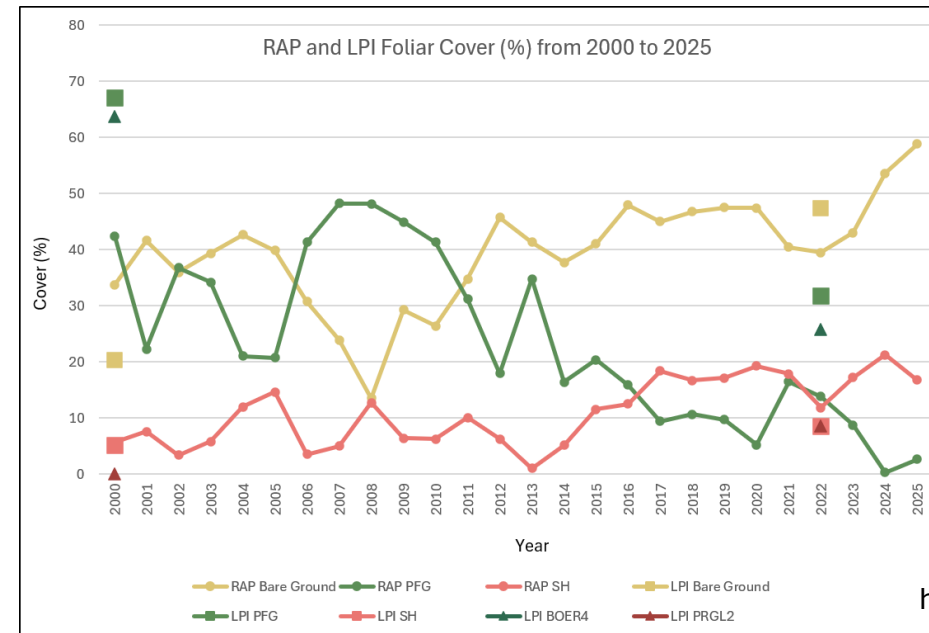
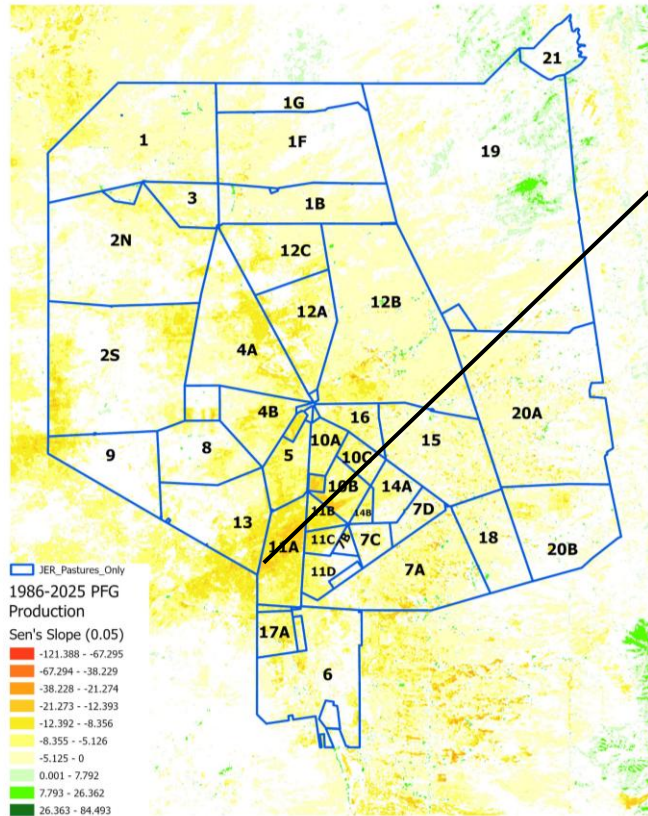
Fall 2023

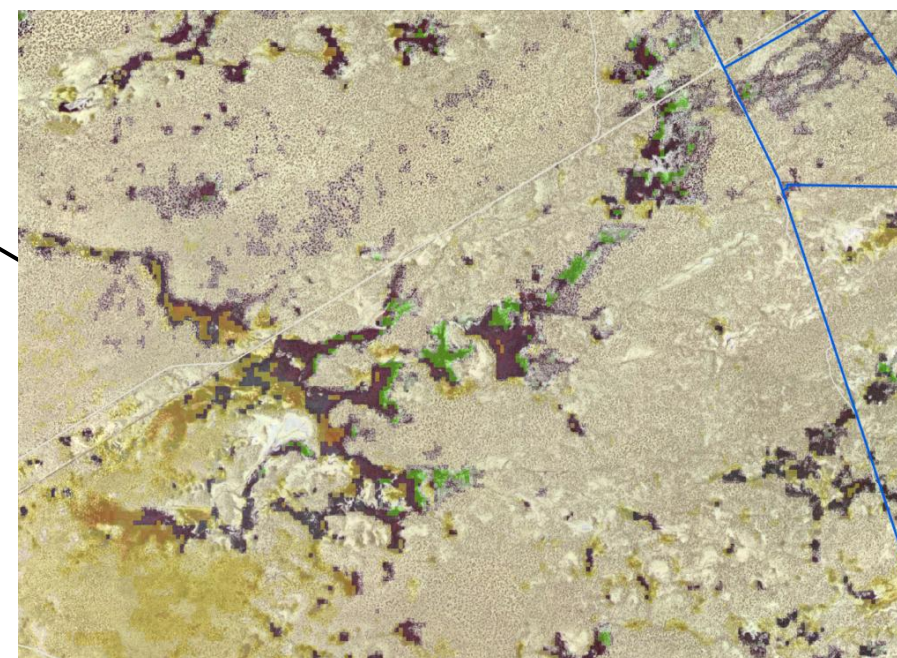
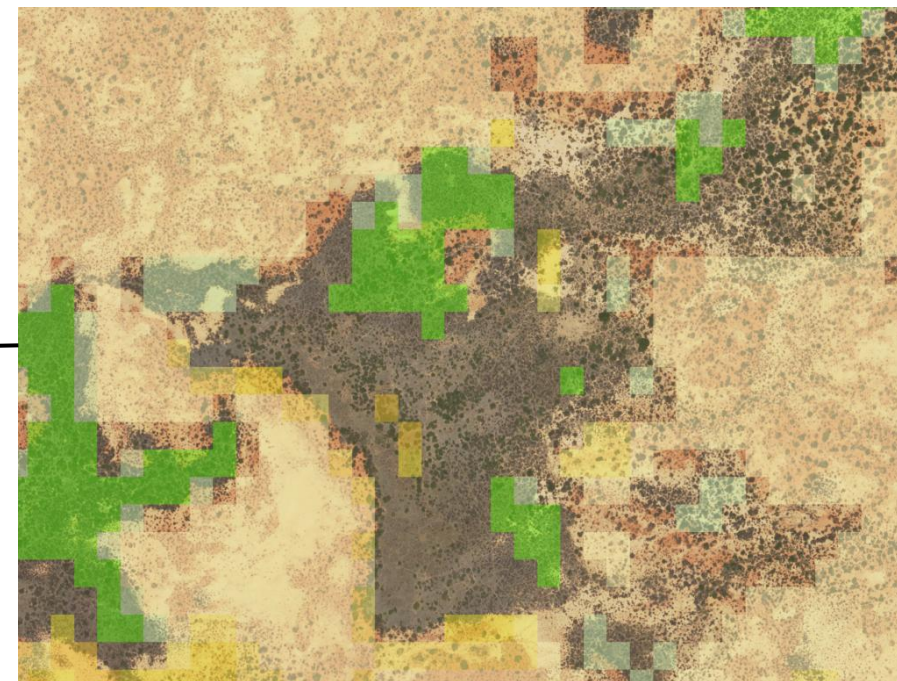
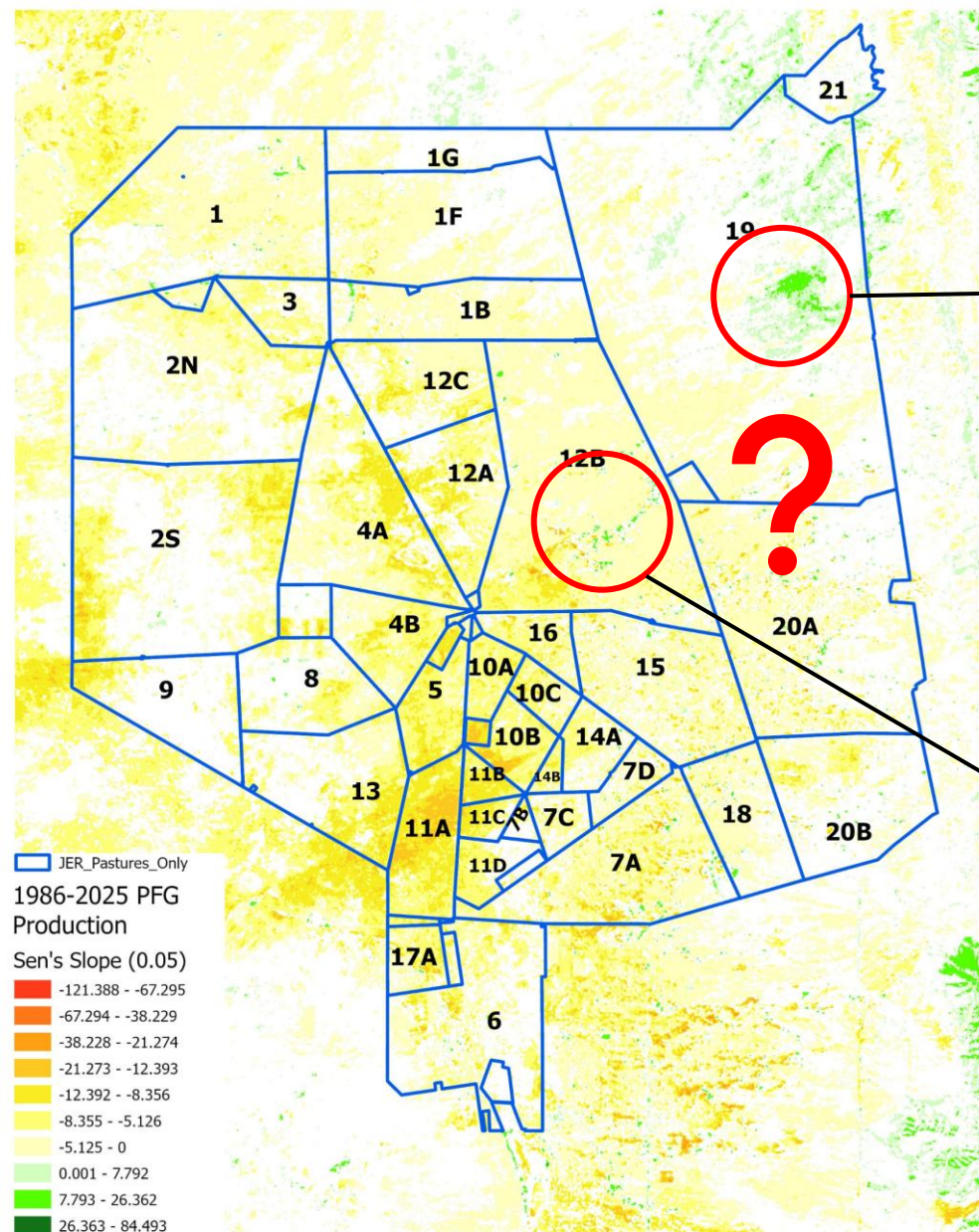


Long term responses to drought cycles



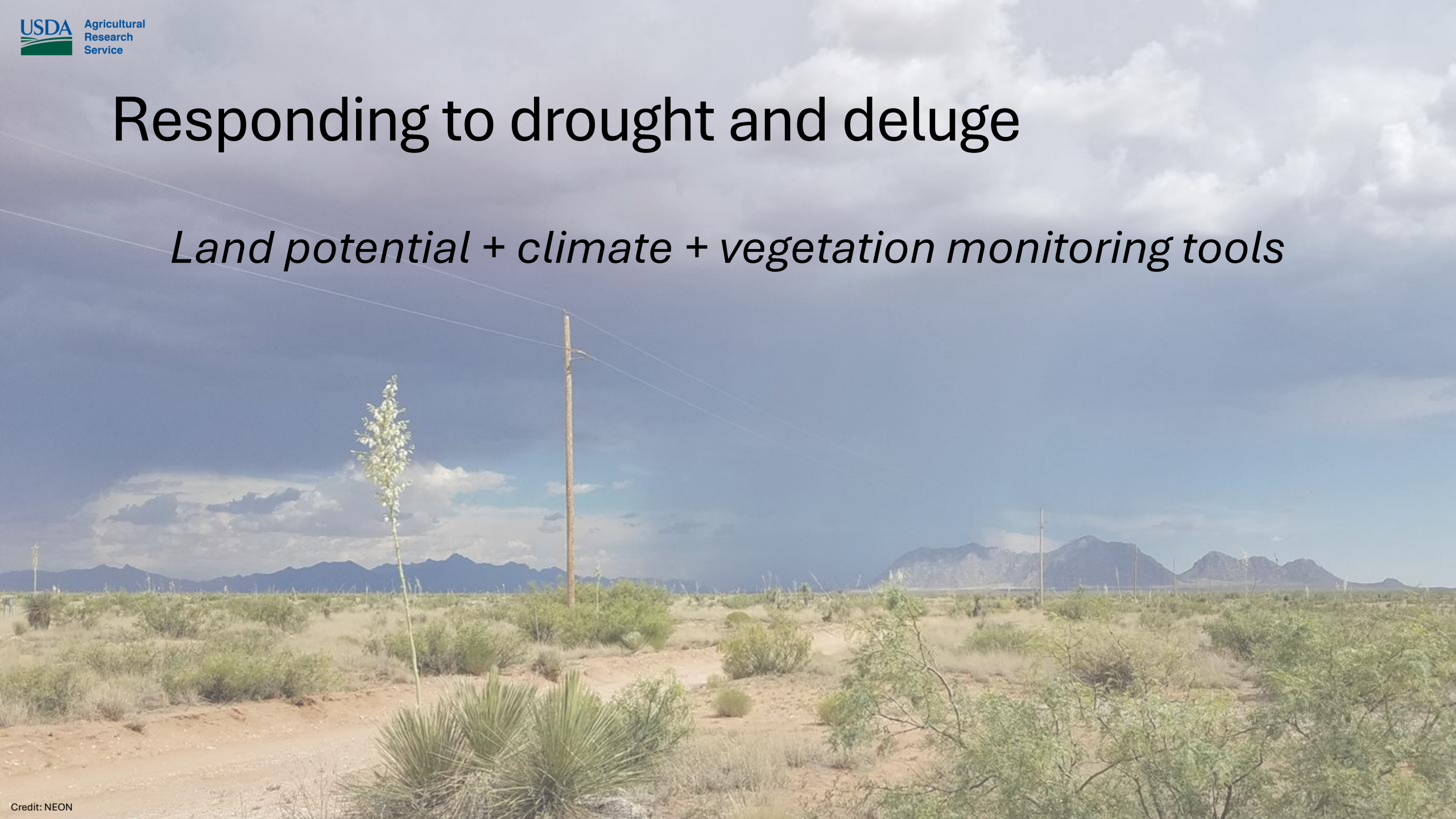
State changes in response to drought





Responding to drought and deluge

Land potential + climate + vegetation monitoring tools



Questions?

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[https://rangelands.app/
landscapedatacommons.org](https://rangelands.app/landscapedatacommons.org)



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