



New Tools for Monitoring Grazing Lands

RAP and RaBET: Rangeland Analysis Platform
& Rangeland Brush Estimation Tool





RANGELAND ANALYSIS PLATFORM

REVOLUTIONIZING RANGELAND MONITORING



Photo: Mandi Hirsch

What is RAP?

Developed by University of Montana
in collaboration with NRCS and BLM

Interactive, Web APP

Free Tool

Monitoring Program

Covers Western US

Estimates Percent of and Changes in
the Percent of:

- Perennial, Herbaceous Vegetation
- Annual, Herbaceous Vegetation
- Brush
- Trees
- Bare Ground

Field Monitoring vs. Area, State, MLRA Monitoring

- Field Monitoring looks at a representative area as a snapshot in time.
- Rangeland Analysis Platform looks at a broad area over time.
- Field Monitoring looks at individual species or groups.
- Rangeland Analysis Platform looks at broad categories of plants – perennial herbaceous, annuals, shrubs and trees.

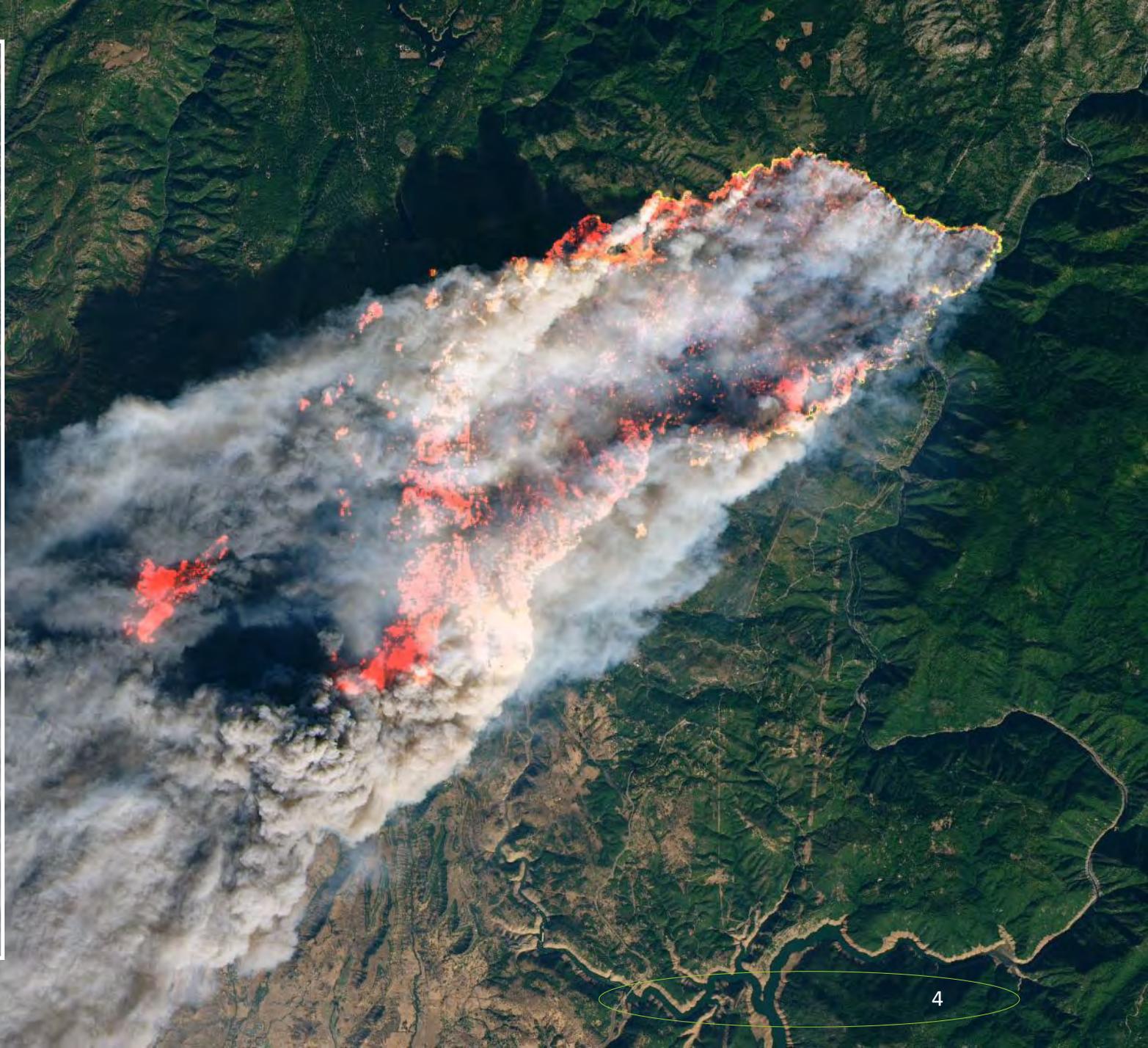


Essential RAP Inputs

1. Landsat Satellite Imagery (1984 - 2017)

- 4.7 miles / sec
- 115 mile wide swath
- 99 minutes / orbit
- 16 day / entire earth coverage
- Updated annually

Image: [nasa.gov](https://www.nasa.gov) (Camp Fire)



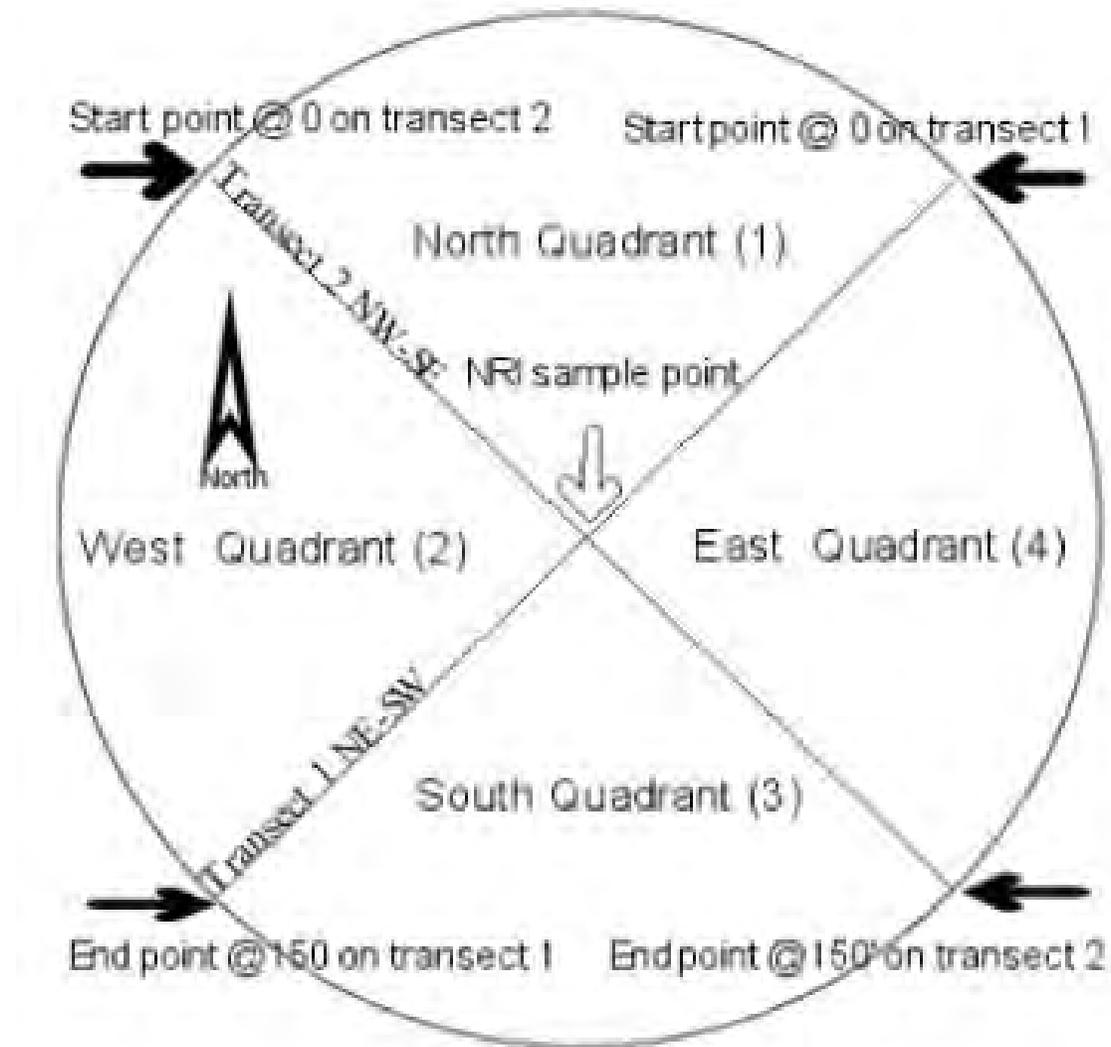
Essential RAP Inputs

- Field Plots
 - NRI and AIM
 - 31,000 + plots
 - Line Point Intercept
 - Measures canopy cover



NRI Data Collection

- 2 – 150' transects
- Cover recorded every 3' along transect
- Canopy by species
- Litter
- Bare ground



RAP Basics

- Cloud-Computing
 - 215 data layers (soils, elevation, climate, Landsat reflectance, vegetation indices, precipitation, elevation, and more)
 - Random Forests machine learning method
 - Algorithm predicts cover at 30m resolution.
 - NRI-AIM data used to train the model
 - Bare ground
 - Annuals
 - Perennial grasses and forbs
 - Trees
 - Shrubs

RAP is a Model, Not Actual Measurements

- Absolute Mean Error
 - Annual Forbs and Grasses – 7.8%
 - Perennial Forbs and Grasses – 11.2%
 - Shrubs – 6.9%
 - Trees – 4.7%
 - Bare Ground – 7.3%



RAP Outputs

- Charts & Maps
 - Maps showing cover classes
 - Graphs showing % of each cover class
- Tracks trends over time
- Useful prioritize workload and identify areas with resource problems.



NEBRASKA-Statewide Example

Rangeland Analysis Platform BETA
Vegetation Cover ⓘ

Landcover type: Tree cover
Year: 2019 ▶

Tree cover (%)
0 ————— 60

Opacity —————

Exclude croplands, development, & water
 Display fire boundaries for selected year (1984 to 2016) ⓘ

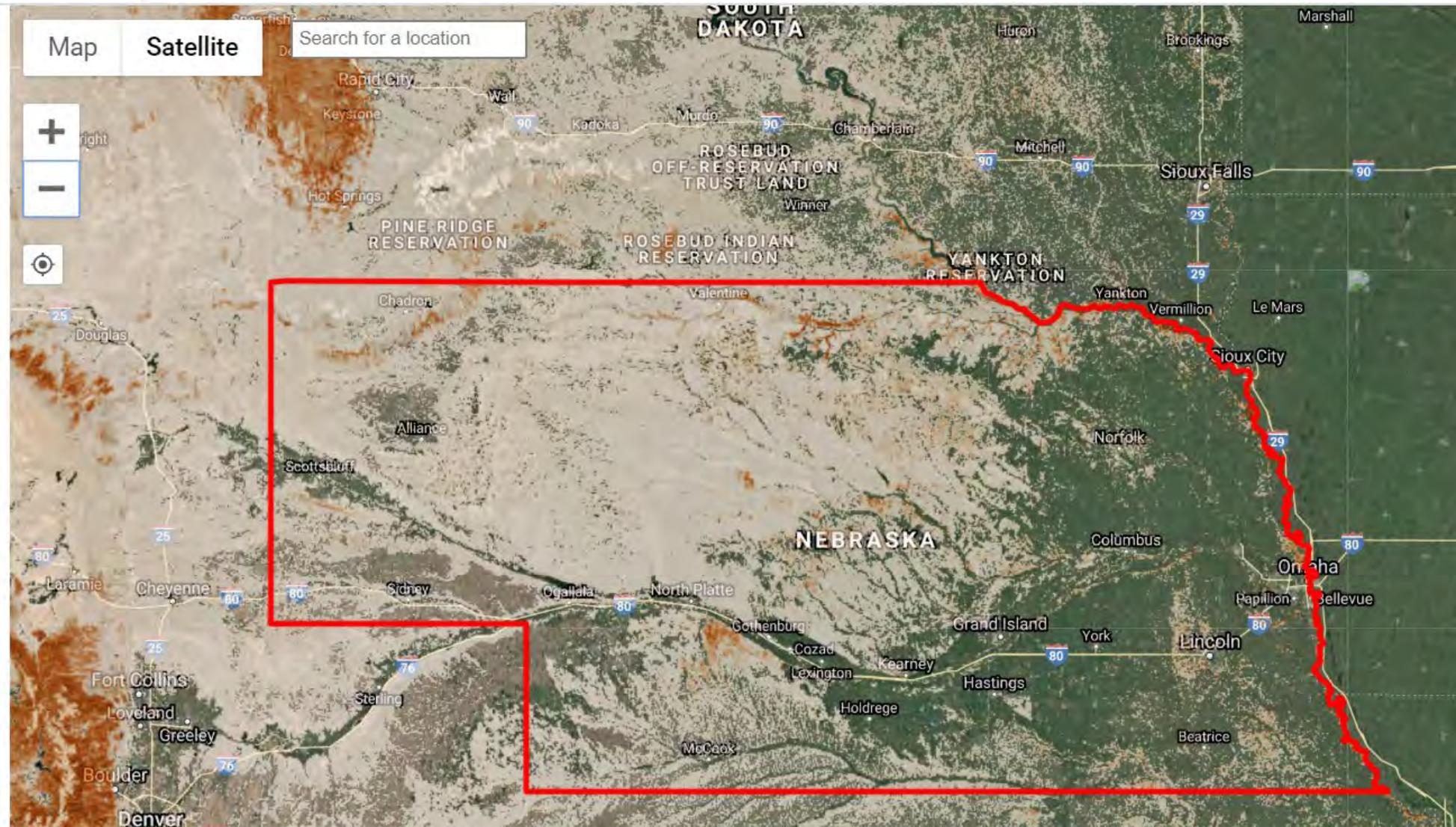
Draw features Clear map

Upload shapefile Calculate time series

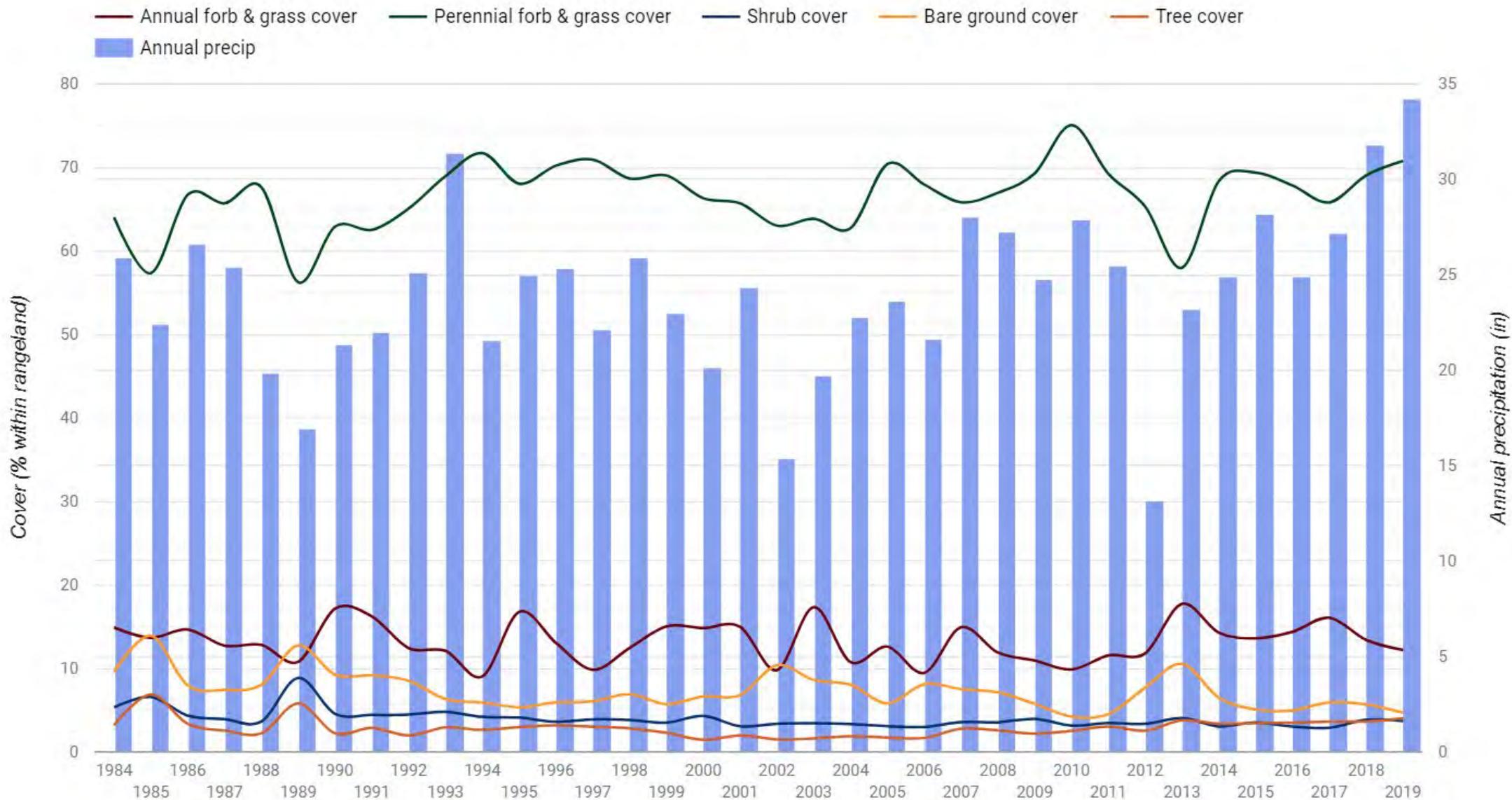
Generate report

Continuous Vegetation Cover

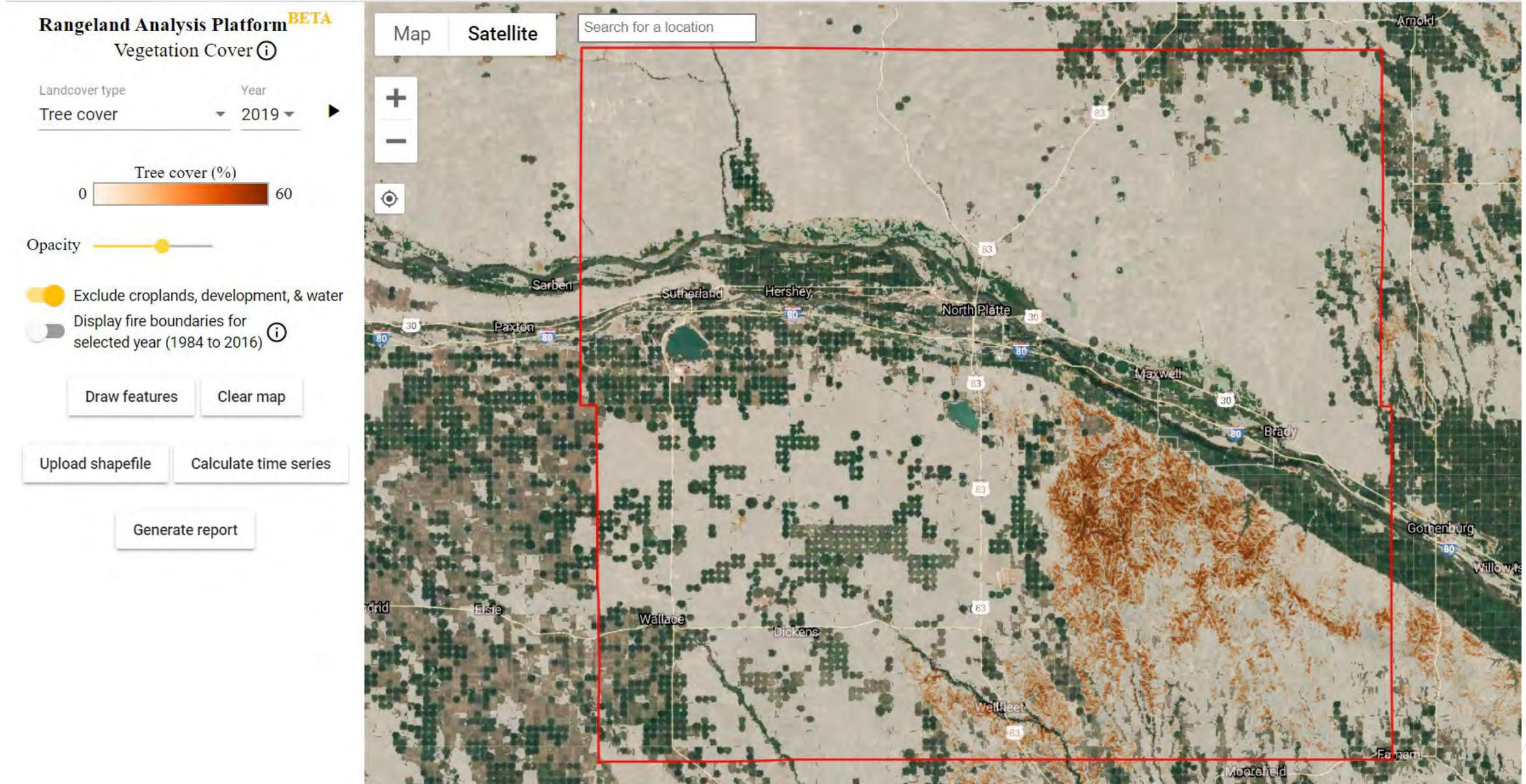
— Annual for... — Perennial... — Shrub cover



Continuous Vegetation Cover

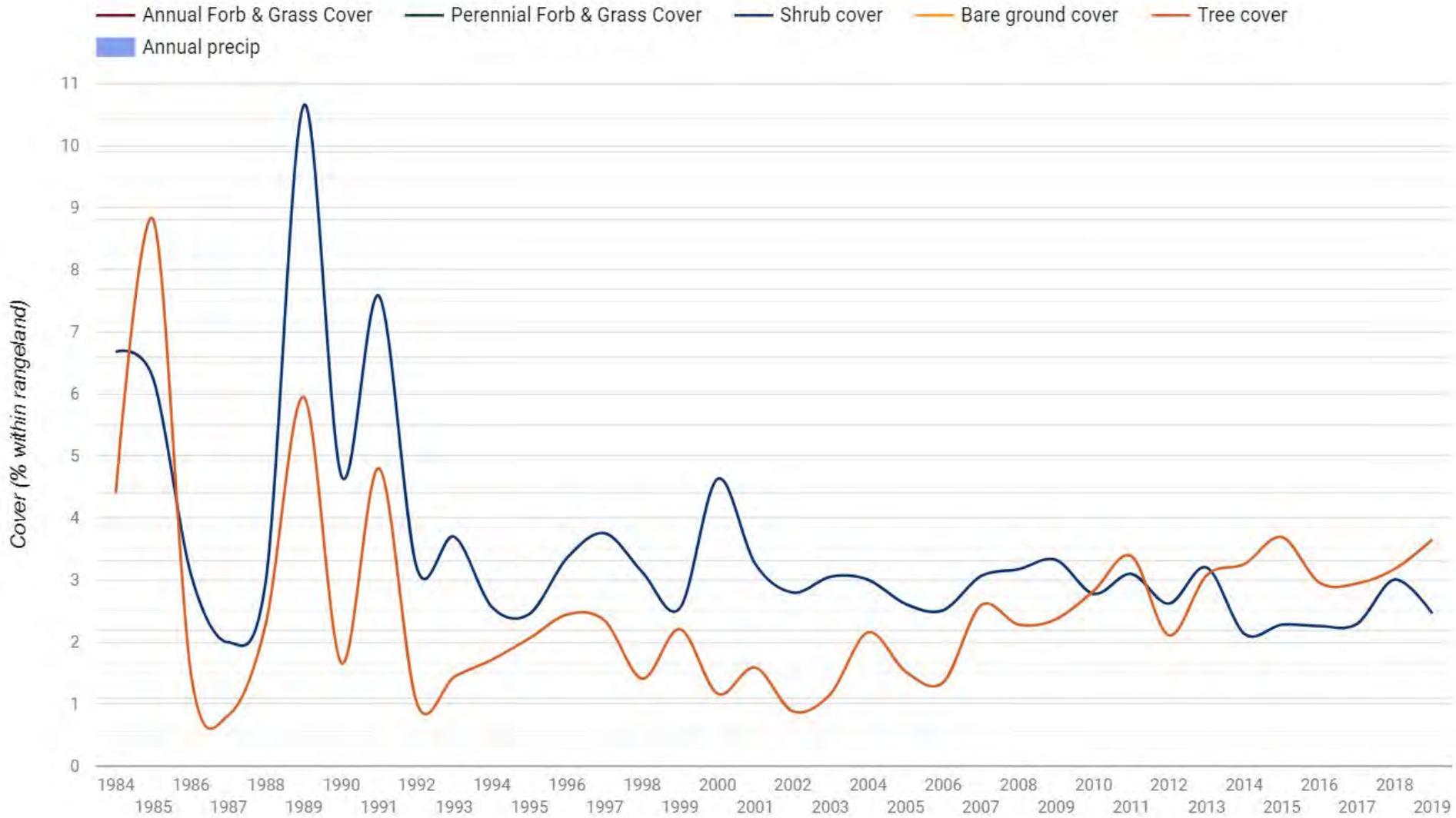


County Scale – Lincoln County Example



County Scale – Lincoln County

Continuous Vegetation Cover



Ranch Scale Example

Vegetation Cover

Type

Year

2019

Tree cover (%)

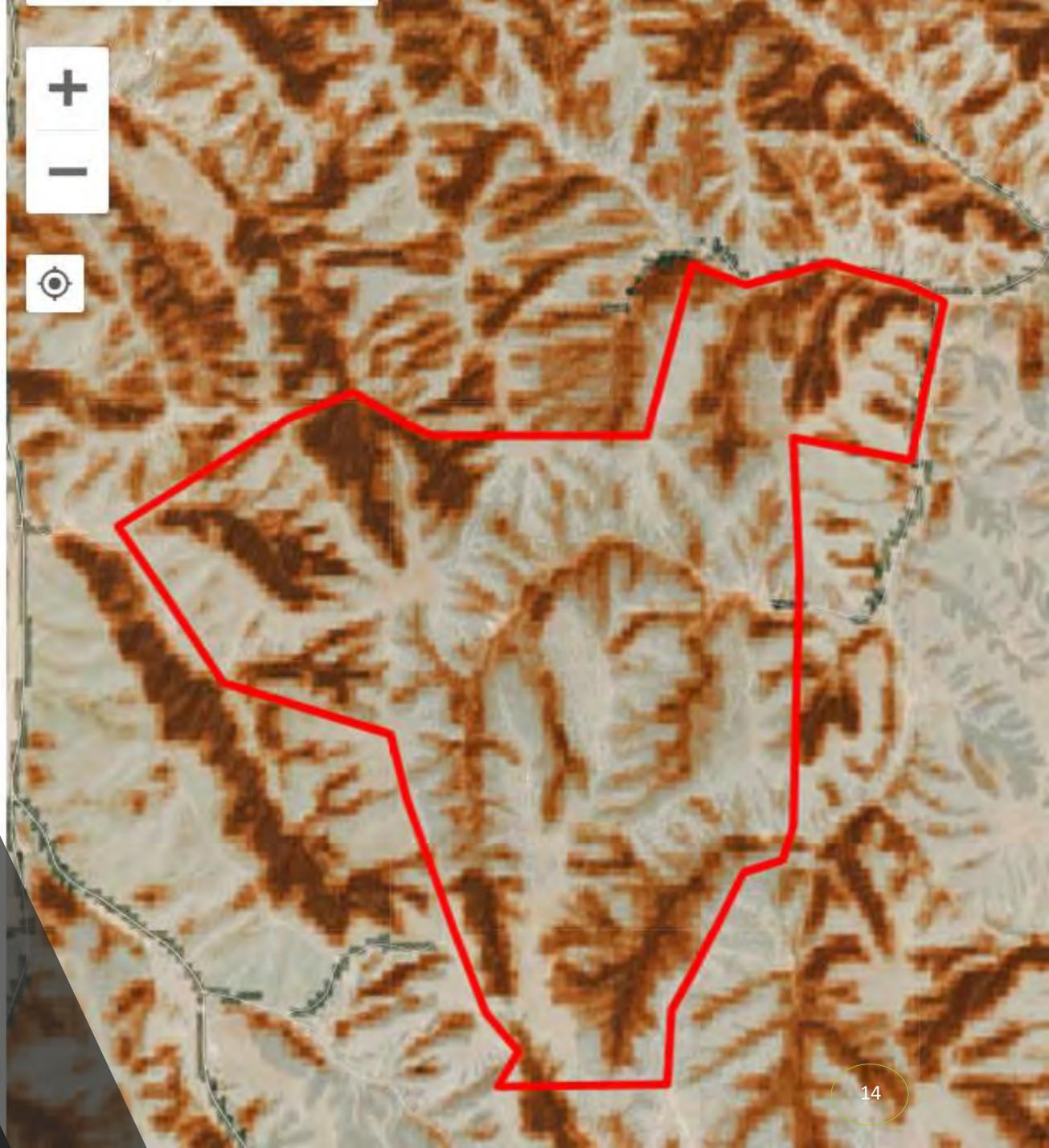
60

development, & water

for (2016)

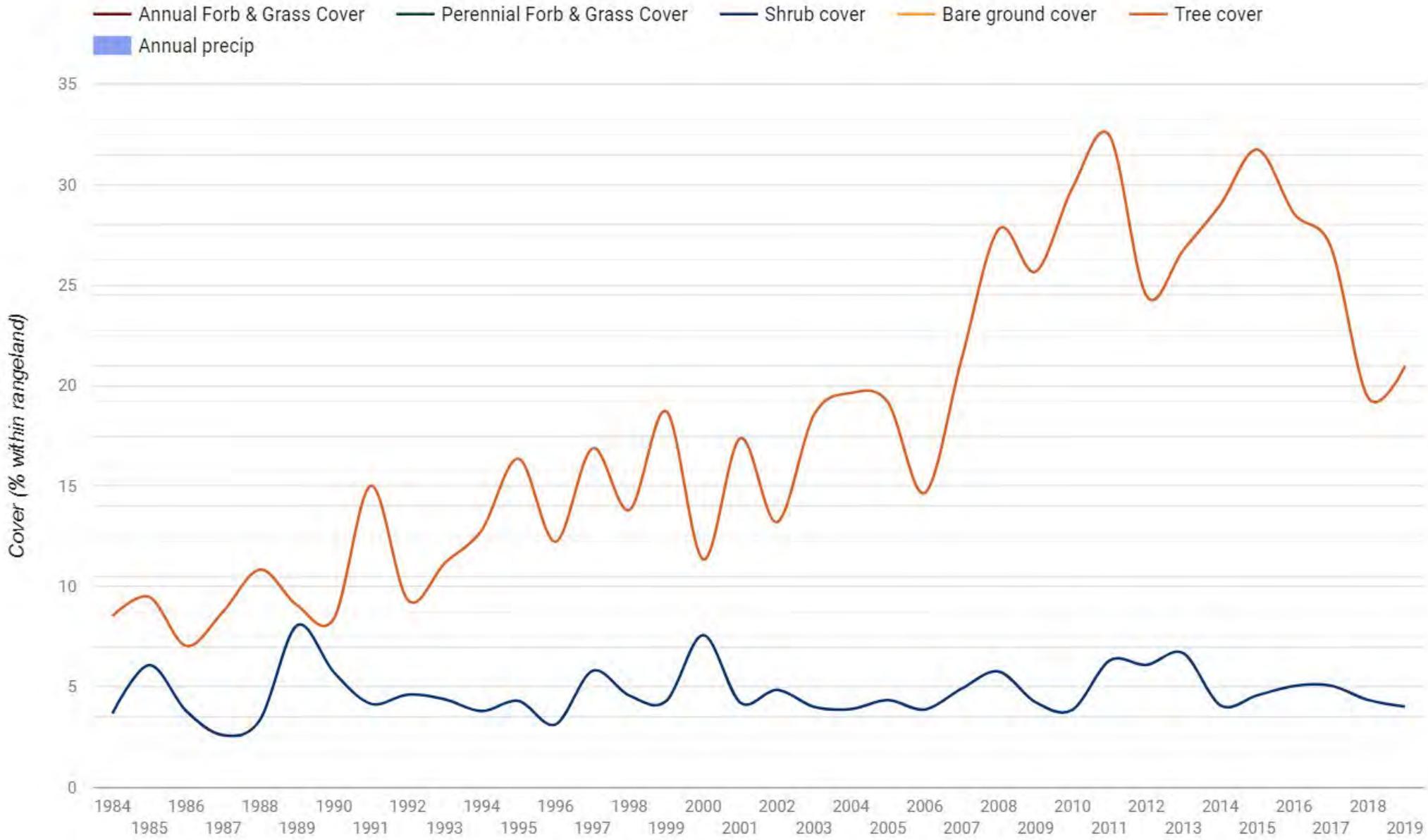
map

series

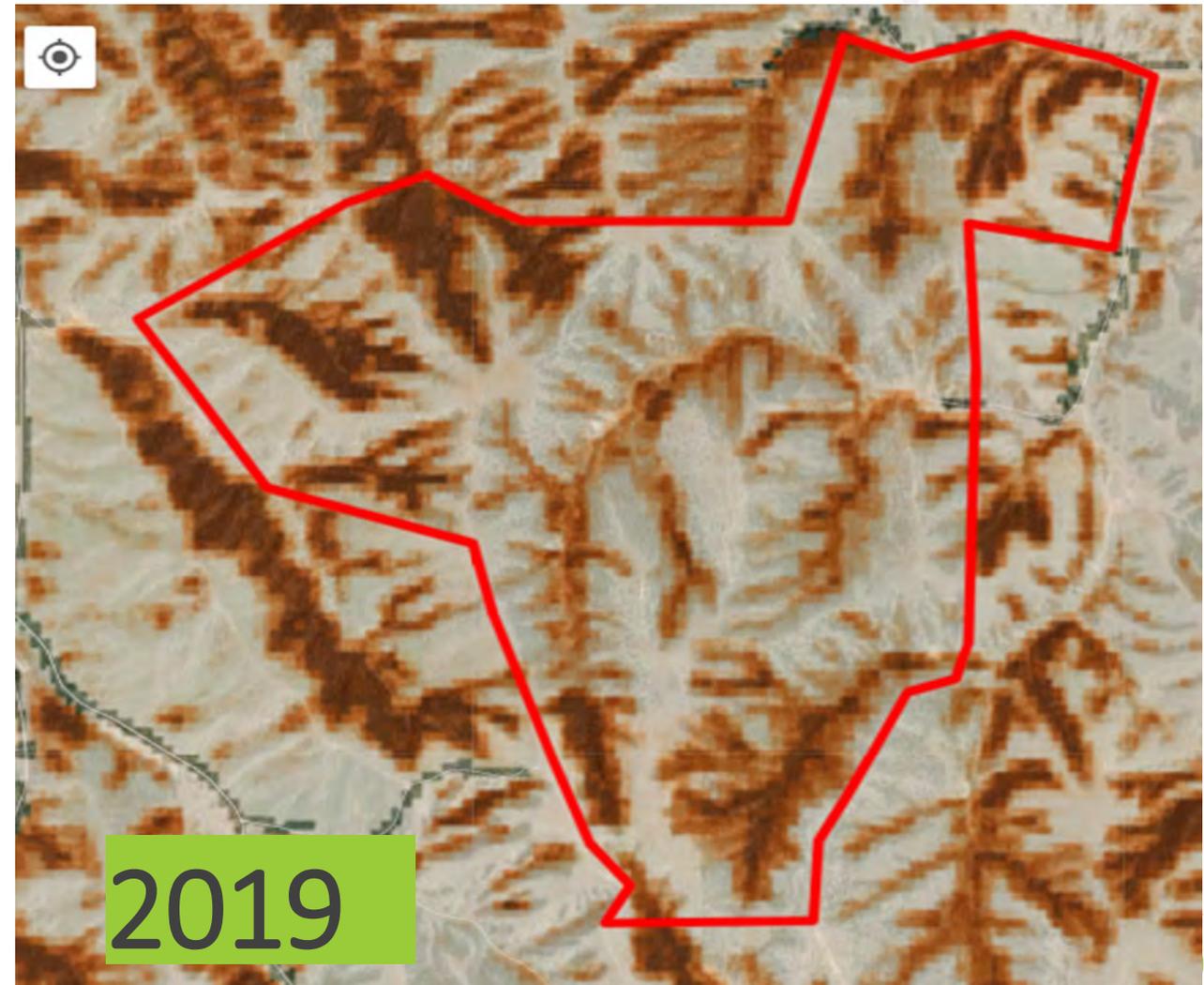
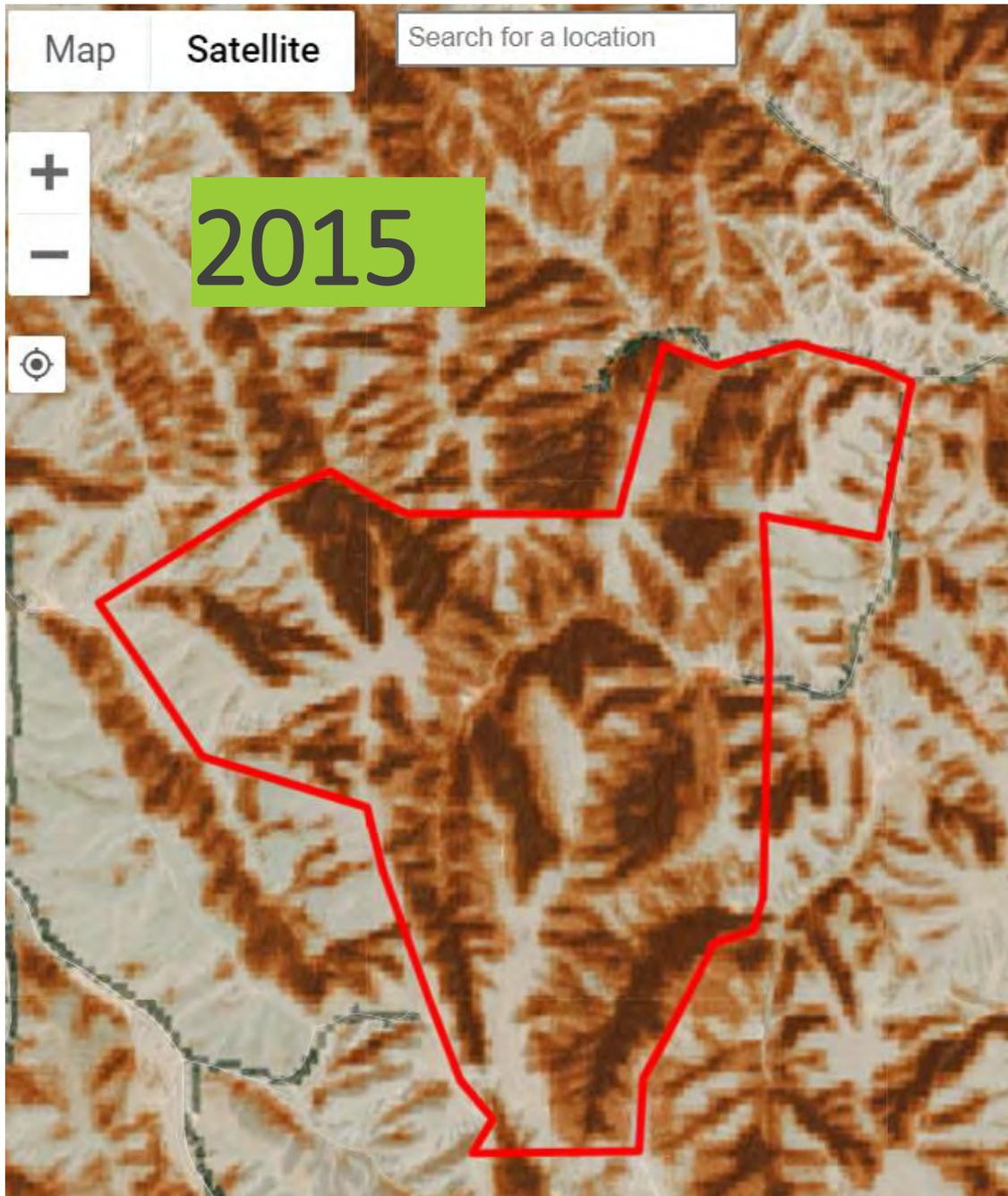


Ranch Scale

Continuous Vegetation Cover

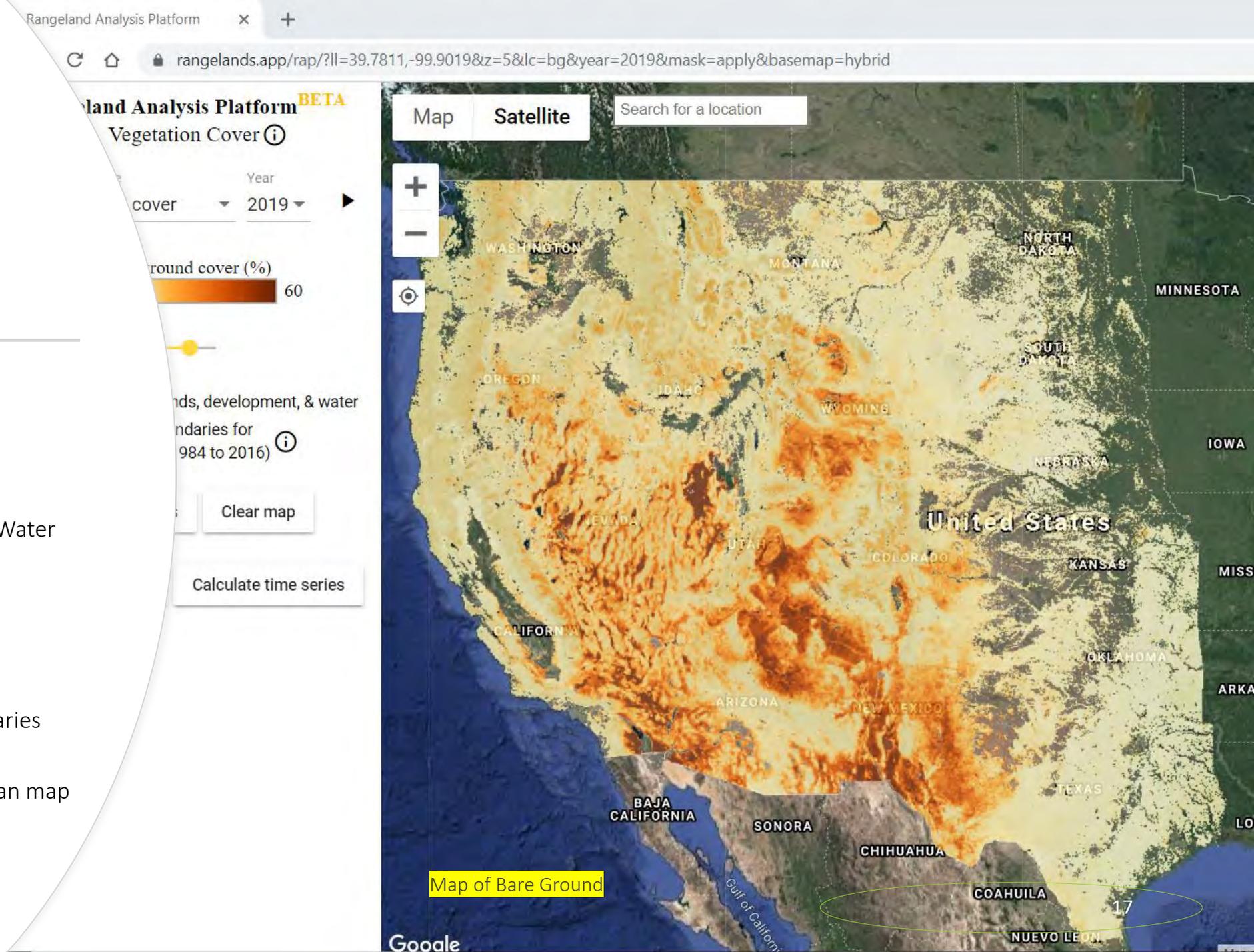


Ranch Scale



RAP DEMO

- <https://rangelands.app/>
- Launch APP
- Select Parameter
- Exclude Croplands, Development, Water
- Either Draw Features or Upload a shapefile (must be a zip file).
 - 50 feature limit
- Calculate Time Series
- If appropriate – display fire boundaries for selected year.
- If desired, select satellite rather than map



RAP DEMO (4 Examples)

<https://rangelands.app/>

- Wildfire
- Smooth Sumac
- Cheatgrass
- Draw your own boundaries (Frontier County) Eastern Redcedar





Rangeland Analysis Platform Take Home Message

RAP Is NOT Intended to:

- Replace site specific data and boots on the ground.
- Be used in place of precise monitoring and management.
- Be used to quantify rangeland resources or evaluate the effectiveness of treatments.

RAP IS intended to:

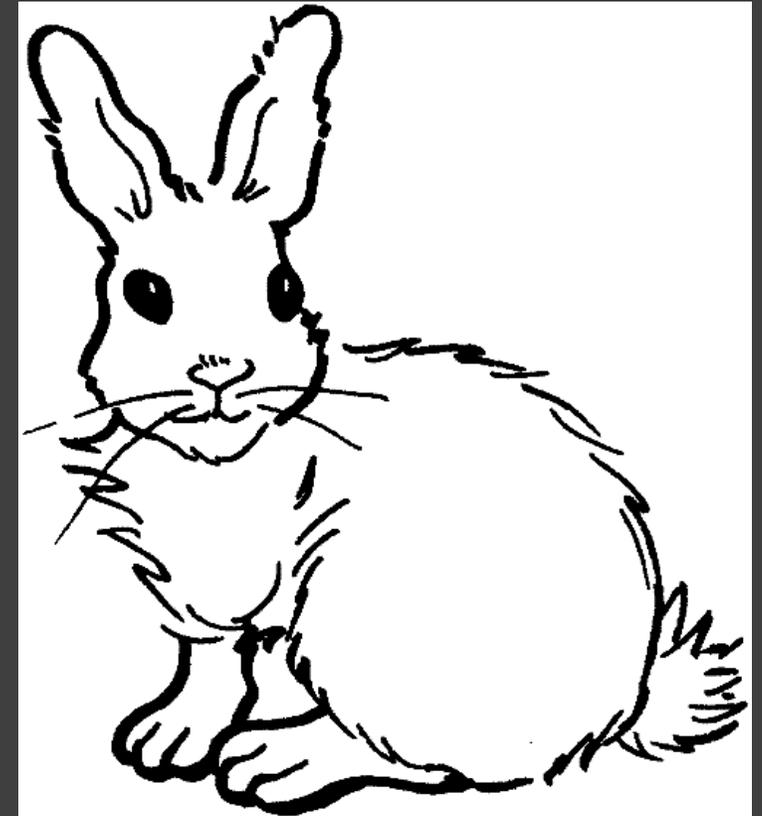
- Provide historical and spatially complete view of an area
- Be used to examine land cover trends through time.
- Be used to assess land cover variability in the area of interest.
- Be used along with local knowledge and data to inform conservation and management plans.



Rangeland Brush Estimation Toolbox

- RaBET

- Chandra Holifield Collins & Susan Skirvin—
USDA-ARS Southwest Watershed Research Center
- Funding through NRCS Grazinglands CEAP
- Efficient, repeatable way to determine woody canopy to document baseline and treatment results.



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What is Purpose of RaBET?

- NRCS spent over \$18.6 million on brush management in 2012-2014 nationwide
- Very little documentation to support need for brush management.
 - Photo Interpretation not measurements
- Very little documentation to evaluate the success of brush management.

Rangeland Brush Estimation Toolbox - RaBET

- Landsat imagery - 30 meter resolution
- NAIP Imagery (National Agriculture Imagery Program) – 1 meter resolution
- Use a condensed time window
 - RAP uses year round imagery.
 - RaBET can use the time window with greatest separation between woody and herbaceous cover.
 - 4 year composites to dampen impact of high precipitation years.
 - Not interested in trends
 - Interested in measurable canopy levels



Rangeland Brush Estimation Toolbox - RaBET

- Woody cover map tool will be on a automated platform on Google Earth Engine.
- Will produce graphs, maps, and tables.
- Maps will identify different levels of cover by location within an area (pasture, field, paddock) .
- Tables will identify the acres in a defined area by cover class.





RaBET

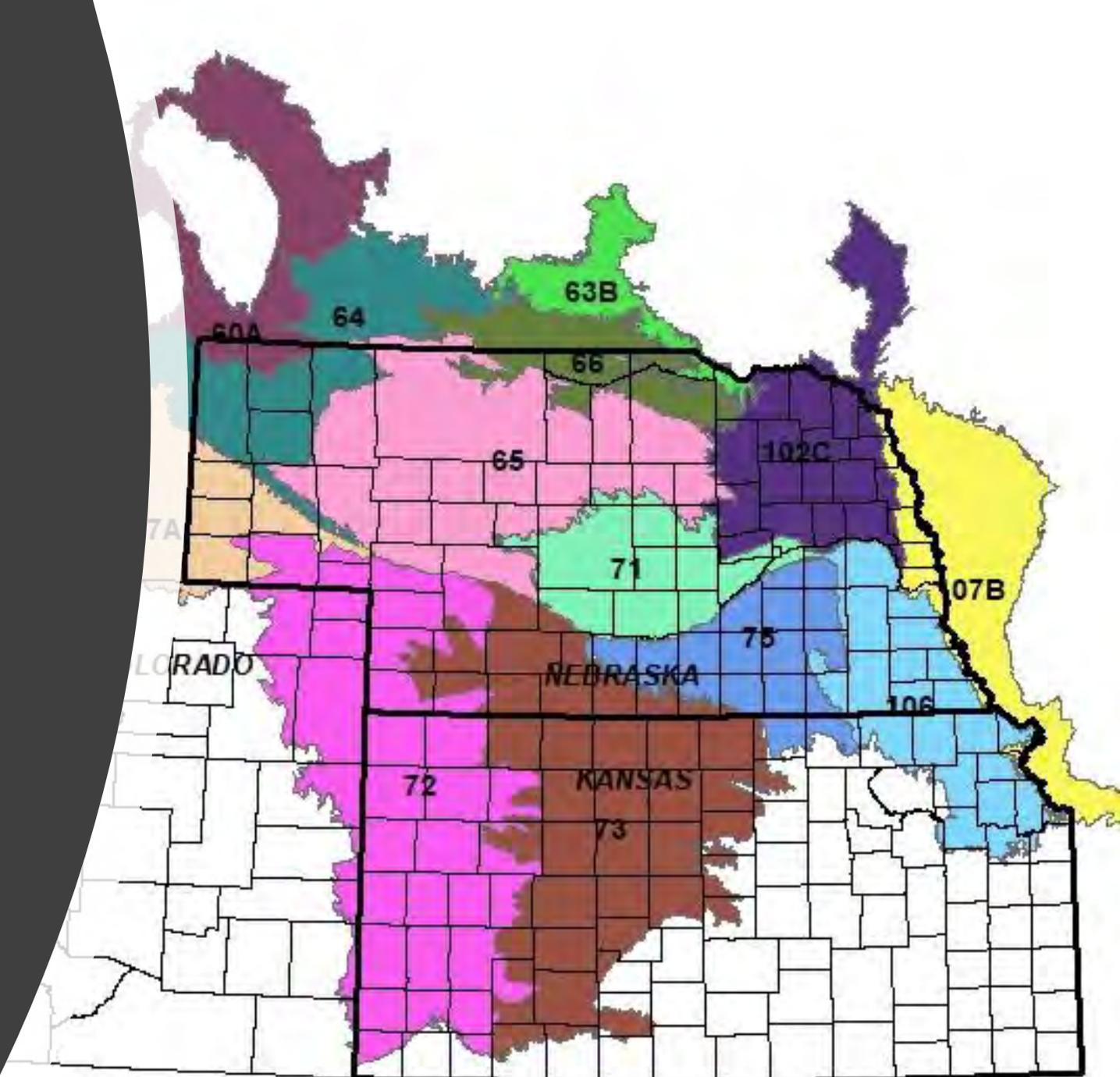
24

- Uses the information used in RAP
- Focuses on tree and shrub levels
- Includes additional local data collection
 - Expanded plots (larger than NRI)



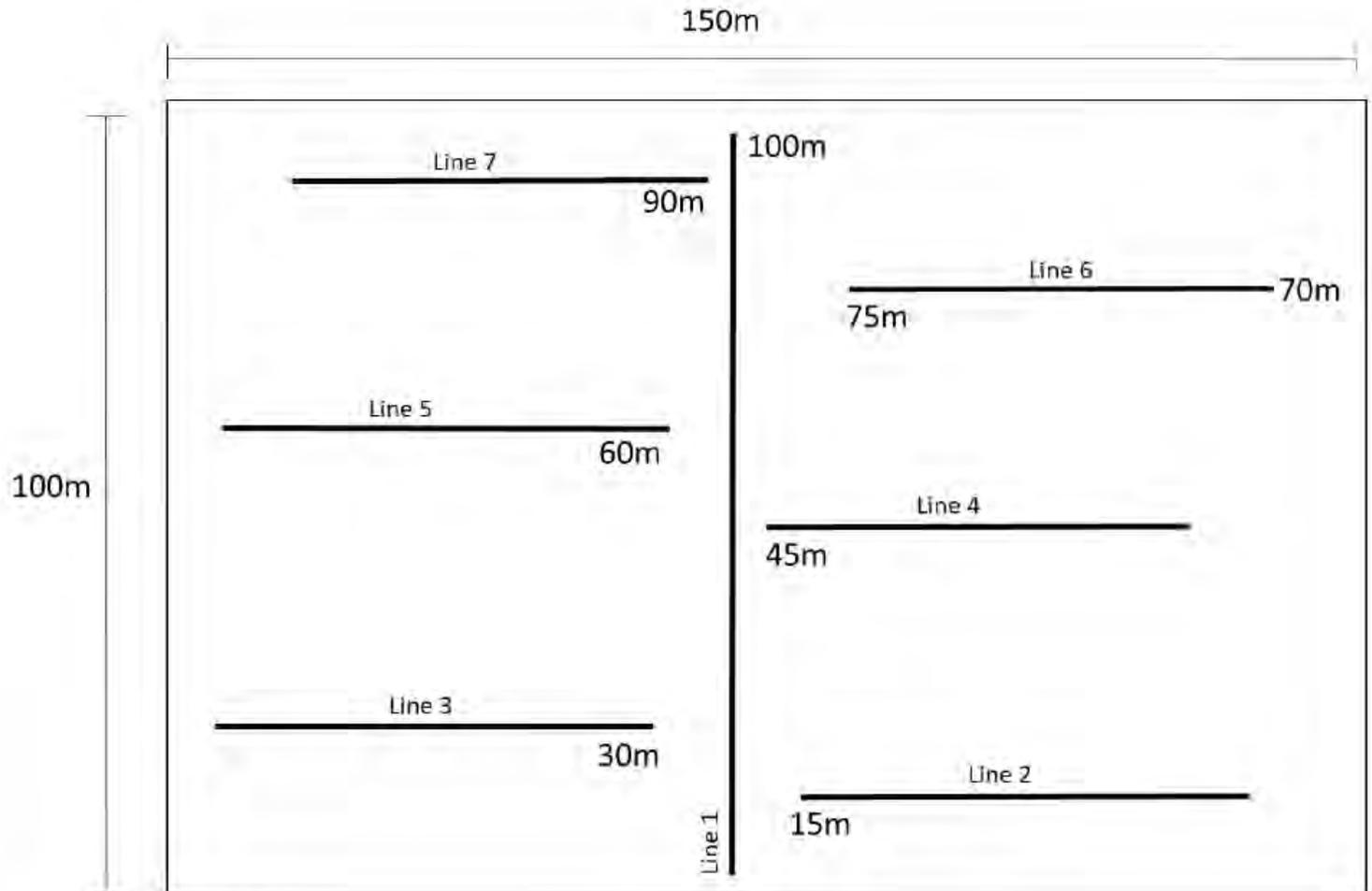
RaBET

- MLRA Basis
 - MLRA 65 in 2019-2020
 - MLRA 71 and 73 in 2020-2021
 - Large amount of brush management
 - Possibly MLRA 72
 - Woody encroachment at beginning stages



RaBET – MLRA 65 Experience

- 50+ additional data plots
- Eastern & Central Sandhills
- Partnership effort
- Data collection in fall of 2019
 - 7 transect lines per plot
 - 100 m baseline
 - 6 – 70m sidelines
 - Points read every 0.5 meters
 - 1040 points per plot
 - Perennial grass, annual grass, forb
 - Shrubs and trees by species
 - 2 / day



Sampling Block Layout

RaBET

- MLRA 65 Lessons Learned
 - 4 people per team
 - 2 sample locations / day
 - Takes a lot of trees to pick up on transect.
 - Expanded to a belt transect rather than a line point transect
 - Reeds/cattails appear as woody vegetation
 - Mask out
 - Small trees may not be picked up by the tool.



RaBET Timeline in Nebraska

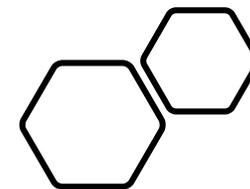
- April 2020 – Beta Test
- June 2020 – Full Use
- MLRA 71 Data Collection – Summer 2020
- MLRA 73 Data Collection – Fall 2020
- MLRA 72 Data Collection - TBD

Image Name: prbe 2-2018-Jun-12 plot 1
GPS co-ordinates: 41.724717,-103.617642
Date: Jun 12, 2018 at 12:39:40 PM MDT
Direction: 48 N



Expanded Uses of Information Used in RAP

- Identifying areas in danger of crossing an ecological threshold.
- When is the most appropriate time to fund invasive species projects?
 - Before or after a threshold is crossed.



Questions/Comments?



- NRCS is an Equal Opportunity Employer and Provider.