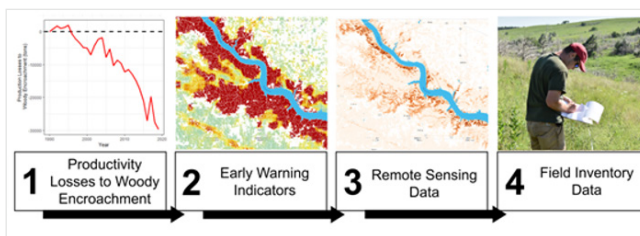


# THE PRAIRIE PROJECT

## USING THE RANGELAND ANALYSIS PLATFORM TO MEASURE LANDCOVER CHANGE

Erika Sullivan<sup>1</sup>, Casey Matzke<sup>2</sup>, and Morgan Treadwell<sup>3</sup>

Advances in remote sensing have opened the door to new possibilities for rangeland monitoring and management. Spatially and temporally comprehensive datasets have improved rangeland managers' abilities to monitor the state and trajectory of U.S. rangelands, creating opportunities for more targeted and proactive management that aligns with large-scale threats. However, bridging the gap between advanced monitoring tools and rangeland management will require stakeholder engagement strategies that connect the consequences of key threats to rangeland monitoring, inventory, and management frameworks. While this report focuses on using remote sensing data for rangeland monitoring, it is important to remember that this is one step in a broader engagement process.



**Overview:** The **Rangeland Analysis Platform (RAP)** is a web-based application that was designed for landowners, managers, and conservationists to look at vegetation data. This activity will use this platform to analyze the pastures on a paired demonstration ranch that has been treated with prescribed fire, pyric herbivory, and livestock.

**Objective:** Identify trends in functional group cover and biomass through time on Prairie Project Demonstration Ranches that are comparable across multiple scales and regions, which can be used to support nationally consistent approaches to rangeland management.

**Approach:** Annual 30-m pixel percent cover data were collected from the Rangeland Analysis Platform (RAP) between the years 1984 and 2020 for four vegetation functional groups (annual forbs and grasses, perennial forbs and grasses, trees, and shrubs), along with bare ground.

It is important to note that the RAP is generated to give continuous vegetation cover estimates over extensive spatial and temporal scales in order to monitor multi-scale trends in vegetation. Thus, the data set emphasizes broad spatial and temporal accuracy over fine-scale precision. Isolating small temporal and/or spatial scales (for instance, examining a single year at the scale of a few pixels) in the data may have a higher margin of error. Thus, this data is best used to look at trends through time or to compare relative differences in average percent cover or biomass values across regions or landscapes. Pairing this data with local expertise and knowledge will provide the best outcomes for assessments that require high levels of precision.

### TOOLS REQUIRED FOR ACTIVITY

- ▶ Computer
- ▶ Lab sheet
- ▶ Pencil/pen
- ▶ Reliable internet connection
- ▶ Microsoft Excel
- ▶ Zip files of ranch data

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## PART 1: Navigating the RAP

1. Open the browser on your computer and type in <https://rangelands.app/>.
2. Click **Launch RAP**.
3. In the Map Layers window click **Upload shapefile**.
4. Upload the zip file provided by your instructor to RAP.
5. Now you should see an outlined map of your ranch appear with lines separating the different pastures.

Demonstration Ranch (Check)

- Duff                       Rocking Chair  
 Head of River         Hoover K. Bar

## PART 2: Livestock + Prescribed Fire versus Cattle Only

1. Find your ranch in **Table 1** below. You will see two different columns labeled “Pasture with Livestock + Fire” and “Pasture with Cattle.” You will be using the two pastures in each column that correspond with your ranch to complete the rest of this activity.
2. Now, locate those same two pastures on the map in RAP. You can do so by clicking on each pasture, and their name and treatments will appear. Once you have found them, move on to step 3.

Table 1. Consecutive Ranches and Pastures for Part 2.

| Ranches       | Pasture with Livestock + Fire | Pasture with Cattle |
|---------------|-------------------------------|---------------------|
| Duff          | Pasture 5                     | Pasture 2           |
| Rocking Chair | Entrance Pasture              | West Pasture        |
| Head of River | River Bend 1                  | Cliffs              |
| Hoover K. Bar | Big Valley                    | Draw                |

### 3. Finding the Information: Perennial Forbs and Grasses

- ▶ Navigate to the **Map layers window** on the left-hand side of your screen.
- ▶ You should see four switches: Cover, Biomass, Excluding croplands, and Fire boundaries.
- ▶ Turn **on** the **Biomass** switch and turn **off** the Cover, Excluding croplands, and Fire boundaries switches.
- ▶ Next to the Biomass switch, you have the option to change the biomass type to Perennial or Annual Forbs and Grasses.

- ▶ Change the biomass type to **Perennial Forbs and Grasses**. The map should now look **Green**.
- ▶ Find the years tab on the right. Here you can change the years to different years around the time of the fire. Notice how the green gets darker/lighter in your two pastures.

### 3A. Form a hypothesis.

Write below what you think is happening in your pastures.

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### 4. Finding the Information: Tree Cover

- ▶ Navigate back to the **Map layers window** and turn **off** the Biomass switch and turn **on** the **Cover** switch.
- ▶ Change the cover type to **Tree cover**. The map should now look **Orange**.
- ▶ Find the years tab, and change the years to different years around the time of fire. Notice how the orange gets darker/lighter in your two pastures while changing the years.

### 4A. Form a hypothesis.

Write below what you think is happening in your pastures.

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### 5. Draw the Shape of the Pasture

- ▶ Navigate back to the **Map layers window** and click **off** all the switches.
- ▶ Click on **Satellite** so you can see natural terrain.
- ▶ Click **Draw features** on the **Map layers window**, and then click on the **Draw a shape tool**, located directly next to Hand tool.
- ▶ Click on your screen to outline the whole perimeter of your **First Pasture with Fire+Livestock**.
- ▶ Double-click your mouse once you have finished creating a shape around your pasture.

## 6. Download Data to Excel File: Pasture with Fire+Livestock

- ▶ Once you create your shape, a drop-down bar will appear.
- ▶ Click on the **arrow ^**, and a graph of the different cover types should appear.
- ▶ There are also three columns that should be apparent: Cover, Annual biomass, and 16-day biomass.
- ▶ Click on the **Cover column**, and download the Excel data.

## 7. Analyzing Collected Data: Pasture with Fire+Livestock

- ▶ Find the Excel data that you downloaded.
- ▶ At the top of the Excel sheet, find PFG, SHR, TREE, and BG.
- ▶ You will use the 2021 data collected from these cover categories to fill out **Table 2** below.

| Table 2. Patch burn grazing. |                   |
|------------------------------|-------------------|
| Pasture Name: _____          |                   |
| Livestock Species: _____     |                   |
| Cover Types                  | Cover Data % 2021 |
| Perennial Grasses            |                   |
| Shrubs                       |                   |
| Trees                        |                   |
| Bare Ground                  |                   |

## 8. Clearing First Pasture's Shape and Creating Second Pasture's Shape

- ▶ Once you have collected the data for Table 2, close out of that Excel sheet.
- ▶ Go back to the RAP platform.
- ▶ To clear the previous shape you drew, click **Draw features again**. **Note:** If you click **clear map**, you will have to re-upload the zip file of your ranch.
- ▶ On the **Map layers window**, click on the **Draw a shape tool**, located directly next to the Hand tool.
- ▶ Click on your screen to outline the whole perimeter of your **Second pasture with Cattle**.
- ▶ Double-click your mouse once you have finished creating a shape around your pasture.

## 9. Download Data to Excel File: Pasture with Cattle

- ▶ Once you create your shape, a drop-down bar will appear.
- ▶ Click on the **arrow ^**, and a graph of the different cover types should appear.
- ▶ There are also three columns that should be apparent: Cover, Annual biomass, and 16-day biomass.
- ▶ Click on the **Cover column**, and download the Excel data.

## 10. Analyzing Collected Data: Pasture with Cattle

- ▶ Find the Excel data that you downloaded.
- ▶ At the top of the Excel sheet, find PFG, SHR, TREE, and BG.
- ▶ You will use the 2021 data collected from these cover categories to fill out **Table 3** below.

| Table 3. Cattle grazing. |                   |
|--------------------------|-------------------|
| Pasture Name: _____      |                   |
| Livestock Species: _____ |                   |
| Cover Types              | Cover Data % 2021 |
| Perennial Grasses        |                   |
| Shrubs                   |                   |
| Trees                    |                   |
| Bare Ground              |                   |

## 11. Graphing Results

- ▶ Create a simple **bar graph** in Excel to compare the cover data collected from Tables 2 and 3.
  - View a tutorial on creating a bar graph at [https://www.youtube.com/watch?v=fk-iFv5\\_Rdo](https://www.youtube.com/watch?v=fk-iFv5_Rdo).
- ▶ The **title** of the graph should be labeled "Percent Cover of Plant Functional Groups: Two Grazing Treatments."
- ▶ The **x-axis** should be labeled with the Cover Types, and the **y-axis** should have the label Cover Data % 2021.

## 12. Review

Look back at your hypotheses from steps 3 and 4. Were you correct or incorrect? Which pasture had more grass? Which pasture had more trees? Is Fire+Livestock or Cattle better? Write your answers below.

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## PART 3: Multi-Species Grazing Versus Single-Species Grazing

1. Find your ranch in **Table 4** below. You will see two different columns labeled “Pasture with Multi-species Grazing” and “Pasture with Single-species Grazing.” You will be using the two pastures in each column that correspond with your ranch to complete the rest of this activity.
2. Now, locate those same two pastures on the map in RAP. You can do so by clicking on each pasture. Their names and treatments will appear.
3. Once you have found them, you can move to step 4. **Note:** Skip step 4 if assigned to Rocking Chair or Head of River.

Table 4. Consecutive Ranches and Pastures for Part 3.

| Ranches       | Pastures with Multi-species Grazing | Pastures with Single-species Grazing |
|---------------|-------------------------------------|--------------------------------------|
| Duff          | Pasture 7                           | Pasture 6                            |
| Hoover K. Bar | High Lonesome                       | Draw Tap                             |

### 4. Finding the Information: Perennial Forbs and Grasses

- ▶ Navigate to the **Map layers window** on the left-hand side of your screen.
- ▶ You should see four switches: Cover, Biomass, Excluding croplands, and Fire boundaries.
- ▶ Turn **on** the **Biomass** switch and turn **off** the Cover, Excluding Croplands, and Fire Boundaries switches.
- ▶ Next to the Biomass switch, you have the option to change the biomass type to Perennial or Annual Forbs and Grasses.
- ▶ Change the biomass type to **Perennial Forbs and Grasses**. The map should now look Green.
- ▶ Next, find the years tab on the right-hand side.
- ▶ Here you can change the years to different years around the time of the fire. Notice how the green gets darker/lighter in your two pastures.

### 4A. Form a hypothesis.

Write below what you think is happening in your pastures.

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### 5. Finding the Information: Tree Cover

- ▶ Navigate back to the **Map layers window**, and turn **off** the Biomass switch and turn **on** the **Cover** switch.
- ▶ Change the cover type to **Tree cover**. The map should now look **Orange**.
- ▶ Find the years tab, and change the years to different years around the time of the fire. Notice how the orange gets darker/lighter in your two pastures.

### 5A. Form a hypothesis.

Write below what you think is happening in your pastures.

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### 6. Draw the Shape of the Pasture

- ▶ Navigate back to the **Map layers window**, and click off all the switches.
- ▶ Click on **Satellite** so you can see natural terrain.
- ▶ Click **Draw features** on the **Map layers window**.
- ▶ Click on the **Draw a shape tool**, located directly next to the Hand tool.
- ▶ Click on your screen to outline the whole perimeter of your **First Pasture with Multiple Livestock Species**.
- ▶ Double-click your mouse once you have finished creating a shape around your pasture.

## 7. Download Data to Excel File: Pasture with Multiple Livestock Species

- ▶ Once you create your shape, a drop-down bar will appear.
- ▶ Click on the **arrow ^**, and a graph of the different cover types should appear.
- ▶ There are also three columns that should be apparent: Cover, Annual biomass, and 16-day biomass.
- ▶ Click on the **Cover column**, and download the Excel data.

## 8. Analyzing Collected Data: Pasture with Multiple Livestock Species

- ▶ Find the Excel data that you downloaded.
- ▶ At the top of the Excel sheet, find PFG, SHR, TREE, and BG.
- ▶ You will use the 2021 data collected from these cover categories to fill out **Table 5** below.

| Table 5. Multi-species grazing. |                   |
|---------------------------------|-------------------|
| Pasture Name: _____             |                   |
| Livestock Species: _____        |                   |
| Cover Types                     | Cover Data % 2021 |
| Perennial Grasses               |                   |
| Shrubs                          |                   |
| Trees                           |                   |
| Bare Ground                     |                   |

## 9. Clearing First Pasture's Shape and Creating Second Pasture's Shape

- ▶ Once you have collected the data for Table 5, close out of that Excel sheet.
- ▶ Go back to the RAP platform.
- ▶ To clear the previous shape that you drew, click **Draw features again**. **Note:** If you click **clear map**, you will have to re-upload the zip file of your ranch.
- ▶ On the **Map layers window**, click on the **Draw a shape tool**, located directly next to the Hand tool.
- ▶ Click on your screen to outline the whole perimeter of your **Second Pasture with a Single Livestock Species**.

- ▶ Double-click your mouse once you have finished creating a shape around your pasture.

## 10. Download Data to Excel File: Pasture with Cattle

- ▶ Once you create your shape, a drop-down bar will appear.
- ▶ Click on the **arrow ^**, and a graph of the different cover types should appear.
- ▶ There are also three columns that should be apparent: Cover, Annual biomass, and 16-day biomass.
- ▶ Click on the **Cover column**, and download the Excel data.

## 11. Analyzing Collected Data: Pasture with Cattle

- ▶ Find the Excel data that you downloaded.
- ▶ At the top of the Excel sheet, find PFG, SHR, TREE, and BG.
- ▶ You will use the 2021 data collected from these cover categories to fill out **Table 6** below.

| Table 6. Single-species grazing. |                   |
|----------------------------------|-------------------|
| Pasture Name: _____              |                   |
| Livestock Species: _____         |                   |
| Cover Types                      | Cover Data % 2021 |
| Perennial Grasses                |                   |
| Shrubs                           |                   |
| Trees                            |                   |
| Bare Ground                      |                   |

## 12. Graphing Results

- ▶ Create a simple **bar graph** in Excel to compare the cover data collected from Tables 5 and 6.
  - View a tutorial on creating a bar graph at [https://www.youtube.com/watch?v=fk-iFv5\\_Rdo](https://www.youtube.com/watch?v=fk-iFv5_Rdo).
- ▶ The **title** of the graph should be labeled "Percent Cover of Plant Functional Groups: Multiple- versus Single-species Grazing."
- ▶ The **x-axis** should be labeled with the Cover Types, and the **y-axis** should have the label Cover Data % 2021.

### 13. Review

Look back at your hypotheses from steps 4 and 5. Were you correct or incorrect? Which pasture had more grass? Which pasture had more trees? Is multi-species grazing or single-species grazing better? Write your answers below.

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## PART 4: Grasslands versus Juniper Woodlands

1. Find your ranch in **Table 7** below. You will see two different columns labeled “Grassland Ecological Site” and “Juniper Woodland Ecological Site.” You will be using the two pastures in each column that correspond with your ranch to complete the rest of this activity.
2. Locate those same two pastures on the map in RAP. You can do so by clicking on each pasture, and their names and treatments will appear. Once you have found them, move on to step 3.

Table 7. Consecutive Ranches and Pastures for Part 4.

| Ranches       | Grassland Ecological Site | Juniper Woodland Ecological Site |
|---------------|---------------------------|----------------------------------|
| Duff          | Pasture 7                 | Pasture 4                        |
| Rocking Chair | Pecan                     | Middle                           |
| Head of River | Dry Creek                 | Dam                              |
| Hoover K. Bar | Big Valley                | Rock House Draw                  |

### 3. Finding the Information: Perennial Forbs and Grasses

- ▶ Navigate to the **Map layers window** on the left-hand side of your screen.
- ▶ You should see four switches: Cover, Biomass, Excluding croplands, and Fire boundaries.
- ▶ Turn **on** the **Biomass** switch, and turn **off** the Cover, Excluding croplands, and Fire boundaries switches.
- ▶ Next to the Biomass switch, you have the option to change the biomass type to Perennial or Annual Forbs and Grasses.
- ▶ Change the biomass type to **Perennial Forbs and Grasses**. The map should now look **Green**.
- ▶ Find the **years tab** on the right, and here, you can change the years from 2016 to 2021. Notice how the green gets darker/lighter in your two pastures.

### 3A. Form a hypothesis.

Write below what you think is happening in your pastures.

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### 4. Finding the Information: Tree cover

- ▶ Navigate back to the **Map layers window**, and turn **off** the Biomass switch and turn **on** the **Cover** switch.
- ▶ Change the cover type to **Tree cover**. The map should now look **Orange**.
- ▶ Find the **years tab** and change the years from 2016 to 2021. Notice how the orange gets darker/lighter in your two pastures while changing the years.

### 4A. Form a hypothesis.

Write below what you think is happening in your pastures.

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### 5. Draw the Shape of the Pasture

- ▶ Navigate back to the **Map layers window**, and click off all the switches.
- ▶ Click on **Satellite** so you can see natural terrain.
- ▶ Click **Draw features** on the **Map layers window**, and then click on the **Draw a shape tool**, located directly next to the Hand tool.
- ▶ Click on your screen to outline the whole perimeter of your **First Pasture that is Grassland Ecological Site**.
- ▶ Double-click your mouse once you have finished creating a shape around your pasture.



## 6. Download Data to Excel File: Pasture with Multiple Livestock Species

- ▶ Once you create your shape, a drop-down bar will appear.
- ▶ Click on the **arrow ^**, and a graph of the different cover types should appear.
- ▶ There are also three columns that should be apparent: Cover, Annual biomass, and 16-day biomass.
- ▶ Click on the **Cover column**, and download the Excel data.

## 7. Analyzing Collected Data: Pasture with Multiple Livestock Species

- ▶ Find the Excel data that you downloaded.
- ▶ At the top of the Excel sheet, find PFG, SHR, TREE, and BG.
- ▶ You will use the 2021 data collected from these cover categories to fill out **Table 8** below.

| Table 8. Grassland ecological site. |                   |
|-------------------------------------|-------------------|
| Pasture: _____                      |                   |
| Cover Types                         | Cover Data % 2021 |
| Perennial Grasses                   |                   |
| Shrubs                              |                   |
| Trees                               |                   |
| Bare Ground                         |                   |

## 8. Clearing First Pasture's Shape and Creating Second Pasture's Shape

- ▶ Once you have collected the data for Table 8, close out of that Excel sheet.
- ▶ Go back to the RAP platform.
- ▶ To clear the previous shape that you drew, click **Draw features again**. **Note:** If you click **clear map**, you will have to re-upload the zip file of your ranch.
- ▶ On the **Map layers window**, click on the **Draw a shape** tool, located directly next to the Hand tool.
- ▶ Click on your screen to outline the whole perimeter of your **Second Pasture that is Juniper-Woodland Ecological Site**.
- ▶ Double-click your mouse once you have finished creating a shape around your pasture.

## 9. Download Data to Excel File: Pasture with Cattle

- ▶ Once you create your shape, a drop-down bar will appear.
- ▶ Click on the **arrow ^**, and a graph of the different cover types should appear.
- ▶ There are also three columns that should be apparent: Cover, Annual biomass, and 16-day biomass.
- ▶ Click on the **Cover column**, and download the Excel data.

## 10. Analyzing Collected Data: Pasture with Cattle

Find the Excel data that you downloaded.

At the top of the Excel sheet, find PFG, SHR, TREE, and BG.

You will use the 2021 data collected from these cover categories to fill out **Table 9** below.

| Table 9. Juniper woodland ecological site. |                   |
|--|-------------------|
| Pasture: _____                             |                   |
| Cover Types                                | Cover Data % 2021 |
| Perennial Grasses                          |                   |
| Shrubs                                     |                   |
| Trees                                      |                   |
| Bare Ground                                |                   |

## 11. Graphing Results

- ▶ Create a simple **bar graph** in Excel to compare the Cover data collected from Tables 8 and 9.
  - View a tutorial on creating a bar graph at [https://www.youtube.com/watch?v=fk-iFv5\\_Rdo](https://www.youtube.com/watch?v=fk-iFv5_Rdo).
- ▶ The **title** of the graph should be labeled "Percent Cover of Plant Functional Groups: Grassland versus Juniper Woodland Ecological Site."
- ▶ The **x-axis** should be labeled with the cover types, and the **y-axis** should have the label Cover data % 2021.

## 12. Review

Look back at your hypotheses from steps 3 and 4. Were you correct or incorrect? Why do you think one pasture had more grass and one pasture had more trees? What treatments did each pasture have?

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## PART 5: Comparisons and Conclusions

After completing Parts 2 to 4, compare your graphs and results for each part. What conclusions can you make? For the whole property, what treatments had the most dramatic impact on vegetation cover?

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What treatments would have been most effective at restoring land to Perennial Forbs and Grasses?

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## CONCLUSIONS

After completing this activity, you should be more comfortable using the Rangeland Analysis Platform (RAP). For additional information, please watch this short supplemental video explaining each step of the RAP activity, <https://www.theprairieproject.org/resources/videos>.

This activity can be repeated with any land from the Great Plains to the Pacific Ocean. With RAP's easy navigational features, it is possible to identify the four cover classes identified in this activity as well as Annual Forbs and Grasses (AFG). In addition, you can also identify annual temperature, precipitation, and areas that are at risk. This platform has data tracking the vegetation changes back to 1984.

Next time you have land decisions to make or are looking at new land to buy, the Range Analysis Platform can provide valuable insight into the decision process. Take a deep dive into the platform, and study the land and the changes that have taken place over the years. This information can be useful in decision-making for ranch scale issues. With the increase in environmental awareness, it is imperative that you use the best practices for land management. The RAP tool provides valuable support for making informed decisions for your land management goals.

For more information on how to use the Range Analysis Platform, reach out to your local Extension agent or Specialist that is in your state.