

# Tools for understanding and managing grazingland systems



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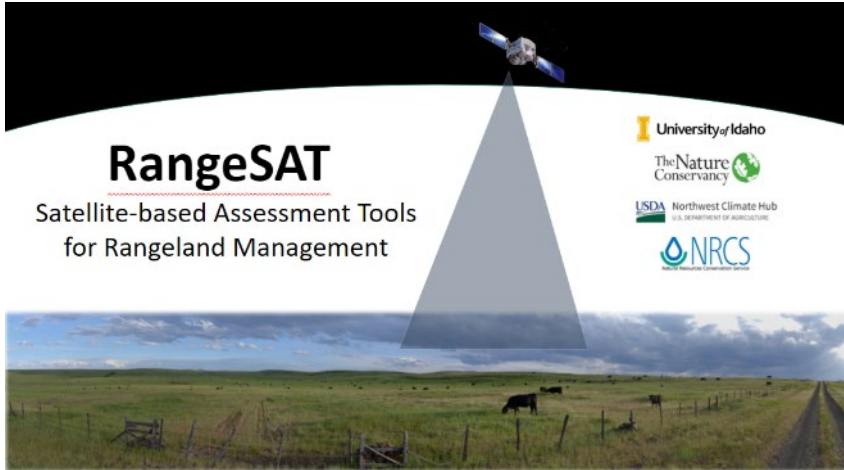
University of Idaho  
College of Natural Resources

# Outcomes from Two 2018 CIG Grants

A National Grazingland Information System: Expanding GlobalRangelands.org through a Grazingland Thesaurus and Mobile Content Access



Deploying RangeSat: Integrating satellite and field measures for improved grazingland management at ranch scales



Jen Hinds University of Idaho    Vincent Jansen University of Idaho    Jason Karl University of Idaho    Roger Lew University of Idaho    Chloe Wardropper University of Idaho

# RangeDocs: A Grazingland Information System

**RangeDocs**  
SEARCHABLE SCIENCE

🔍 Find technical resources 

Advanced Search



# RangeDocs: Science is now searchable

A landscape photograph showing a wide, flat field of dry, golden-brown grass in the foreground. In the background, there are several large, conical mountains with distinct horizontal bands of different colors, including shades of grey, brown, and red. The sky is blue with scattered white clouds. In the lower middle ground, four people are engaged in field research. One person in a red jacket stands looking at a document held by another person in a dark jacket. A third person in a plaid shirt is crouching down, and a fourth person in a dark vest is also crouching on the right side of the frame.

## THE CHALLENGE

Technical references and scientific papers are often long and dense. With limited time and energy to read literature, finding specific information can feel impossible.

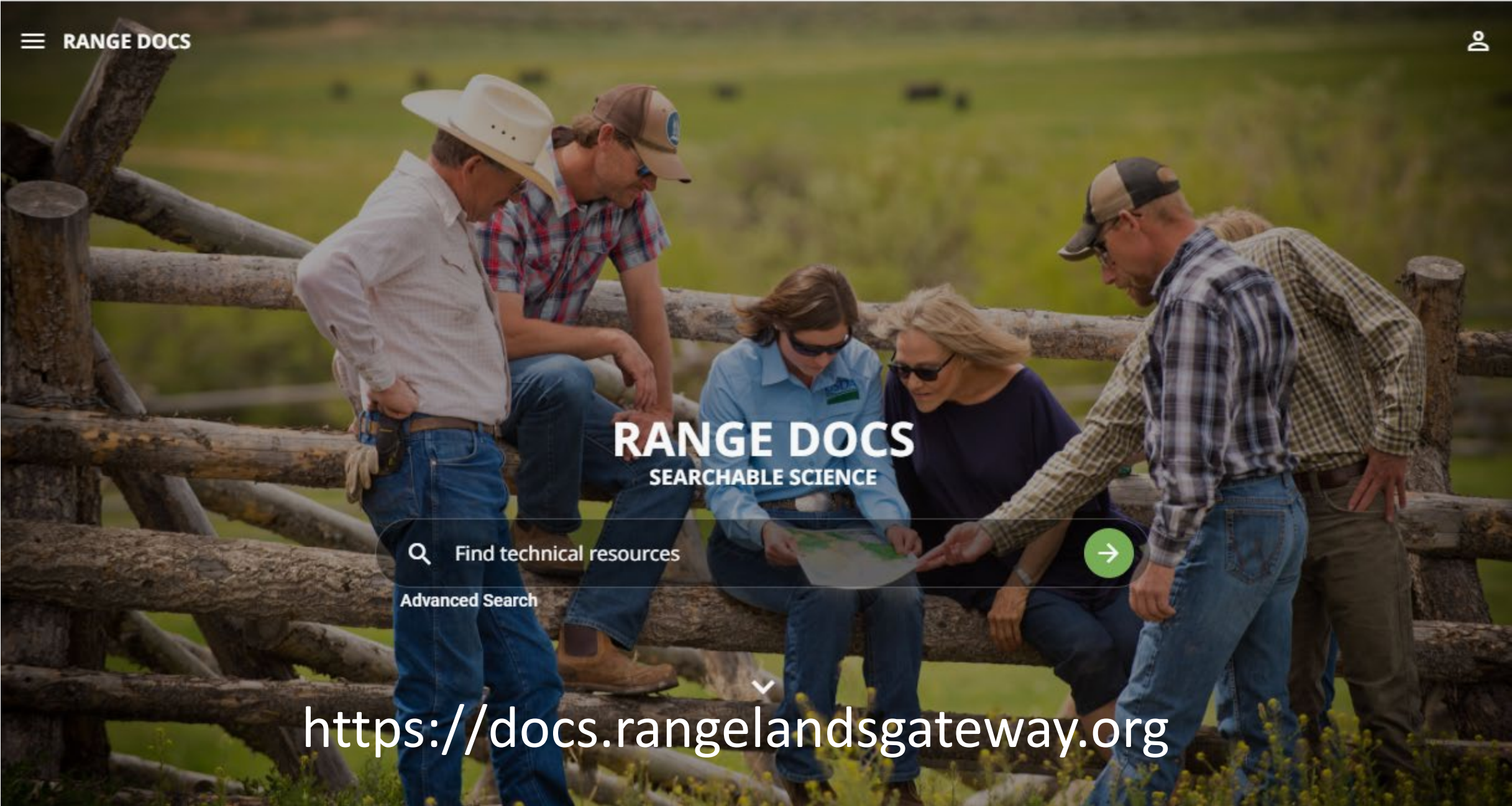
## THE SOLUTION

Range Docs is an online tool designed to search technical references and other literature at the page level. Rangeland experts have read the documents and labelled common rangeland terms where they appear in the documents. Science is now searchable.

# What sets RangeDocs apart?

Unique attributes of RangeDocs:

1. Contains the most relevant and useful resources as identified by agency staff and Extension specialists
2. Uses paragraph-level annotation of concepts to get users quickly to the most relevant information
3. Leverages a rangeland-specific thesaurus of terms harmonized from multiple sources



# RANGE DOCS

SEARCHABLE SCIENCE

🔍 Find technical resources

Advanced Search



https://docs.rangelandsgateway.org

# RangeDocs: Document Annotation

The screenshot displays the RangeDocs interface for document annotation. On the left, a sidebar lists documents, with the first one, 'MEASURING AND MONITORING PLANT POPULATIONS', selected. The main area is titled 'ANNOTATING Page Access' and features a grid of 88 numbered circles (1-88) representing page access. A 'START ANNOTATING' button is visible in the top right. To the right of the grid, an 'ISSUES' section lists several items that are not currently valid tags, such as 'Adaptive Management', 'Resource Monitoring', 'Baseline Monitoring', 'Long-term Ecological Monitoring', and 'Monitoring Plan'. The interface also includes a 'RANGE DOCS' header and a user profile icon.

**MEASURING AND MONITORING PLANT POPULATIONS**  
This technical reference applies to monitoring situations involving a single plant species, such as an indicator species, key species, or weed....

**MONITORING MANUAL FOR GRASSLAND, SHRUBLAND AND SAVANNA ECOSYSTEMS: VOLUME 2 - DESIGN, SUPPLEMENTARY METHODS AND INTERPRETATION**  
The Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems is divided into two volumes: This two-volume document is intended to assist...

**ANNOTATING Page Access**

**ISSUES**

- 17 "Adaptive Management" is not currently a valid tag.
- 18 "Resource Monitoring" is not currently a valid tag.  
"Adaptive Management" is not currently a valid tag.
- 22 "Baseline Monitoring" is not currently a valid tag.  
"Adaptive Management" is not currently a valid tag.
- 23 "Long-term Ecological Monitoring" is not currently a valid tag.
- "Monitoring Plan" is not

- Documents are annotated by rangeland professionals using concepts from the thesaurus

# RangeDocs: Document Annotation

- Concepts are annotated at the page and paragraph level
- Allows search to direct user to specific parts of a document

The screenshot displays the RangeDocs web application interface. On the left, a document is open with yellow highlights on several paragraphs. The first highlighted paragraph discusses the necessity of identifying ecological sites. The second highlighted paragraph, under the heading '(b) Establishing management objectives', describes the development of management objectives with landowners. The third highlighted paragraph, under the heading '(c) Determining treatment alternatives', discusses the determination of treatment alternatives. On the right, a sidebar shows a list of document annotations for 'emwinford' on 'Range Docs', dated 'Jan 26'. Each annotation includes a snippet of text and a 'More' link. The annotations correspond to the highlighted text in the document. The interface also features a search bar, a 'FIND TERMS' button, and a document viewer with navigation controls.

234 / 584

FIND TERMS

necessary to identify the ecological site and understand the description for that site. The ecological site description has the information necessary to interpret the findings of inventories to determine the rating of an ecological site.

**(b) Establishing management objectives**

Management objectives are developed and determined with the landowner during the planning process. All inventory and other necessary information for the development of objectives and the application of the grazing management are gathered during the planning process. The objectives of the landowner and those of the NRCS do not need to be the same, but they must be compatible. The management objective must meet the needs of the landowner, the resources, and the grazing animals.

**(c) Determining treatment alternatives**

The NRCS conservationist will use information from the ecological site description, trend determinations, similar...

This stage of the conservation involves the following steps:

- Inventory the present plant determine annual produc
- Identify from the ecologi desired plant community manager's goals and the r
- Determine what changes (determine trend).
- Compute similarity index to the desired plant comm
- Determine how the ecolc site are functioning (rang nations).
- Determine what conserva tives and resulting resour will achieve or maintain

emwinford # Range Docs Jan 26

For most management units, there are several management alternatives. These alternatives must provide the: More

Desired Plant Community

emwinford # Range Docs Jan 26

After the cooperat has set goals for the site based upon the intended use, the NRCS conservationist provides: More

Desired Plant Community Transition pathway

emwinford (edited) # Range Docs Jan 26

The NRCS conservationist will use information from the ecological site description, trend determinations, simila: More

Desired Plant Community

emwinford # Range Docs Jan 26

Vegetation management practices—Practices that are directly concerned with the use and growth of: More

Vegetative management practices

# RangeDocs Search Results

riparian grazing

RESULTS 1 - 15 of 5017

## Grazing Management Processes and Strategies for Riparian-Wetland Areas

Sandra Wyman Derek W. Bailey Mike Borman Steve Cote Jimmy Eismer Wayne Elmore Bob Leinard Steve Leonard Floyd Reed Sherman Swanson Laura Van Riper Tim Westfall Ron Wilery Alma Winward  
PUBLISHED 2006  
PAGES 120

Document that outlines grazing management strategies for riparian systems. Basic topics covered in this technical reference include riparian-wetland area attributes and processes, resource assessments and inventories of riparian-wetland areas, development of good resource management objectives, management strategy factors, grazing treatments, and collaborative ...

### PAGE 73

Each riparian area may be managed individually or in combination with other allotments or pastures and ... Riparian pastures can be used seasonally, in conjunction with rotation strategies, or as special-use ... Considerations when developing riparian pasture designs include:• Desired grazing period and duration ... area.• Need for close monitoring to avoid switch from livestock grazing to browsing.Figures 60 and ... The grazing plan calls for use in early June for 1 year out of 3 and for 2 weeks in September for gathering

Riparian Ecosystems riparian pasture Pasture Grazing management Grazing systems

### PAGE 7

, Kinch (1989) developed Technical Reference (TR) 1737-4, Grazing Management in Riparian Areas. ... that was subsequently incorporated into TR 1737-14, Grazing Management for Riparian-Wetland Areas ( ... The implementation of grazing management strategies for riparian-wetland areas and the evaluation of ... It is also the core document for the Grazing Management for Riparian-Wetlands training course. ... and riparian resources.

Grazing Management Riparian Ecosystems Wetlands Holistic Management

## Grazing Management Processes and Strategies for Riparian-Wetland Areas

Sandra Wyman Derek W. Bailey Mike Borman Steve Cote Jimmy Eismer Wayne Elmore Bob Leinard Steve Leonard Floyd Reed Sherman Swanson Laura Van Riper Tim Westfall Ron Wilery Alma Winward  
PUBLISHED 2006

← 1 ... 31 (32) 33 ... 120 →



RIPARIAN AREA MANAGEMENT  
TR 1737-20

Grazing Management  
Processes and Strategies for  
Riparian-Wetland Areas

*"Effective riparian grazing management should begin on the skyline rather than the greenline. Simply reducing numbers of livestock without developing improved grazing strategies will not solve a riparian problem."*

Floyd Reed, Retired USFS  
Rangeland Management  
Specialist

another forage source because of physical limitations of a cow's mouth. "Wolfy" plants (plants containing standing dead material from previous growth) are also generally avoided, especially when plants without standing dead material are available. Separating green, nutritious leaves from among the dead leaves and stems slows the rate of intake and reduces the desirability of wolfy plants.

### b. Principles of Grazing Management

To properly manage livestock grazing in riparian areas, it is important to recognize that:

- Grazing management practices that maintain or improve an upland site may or may not maintain or improve a riparian area and may be detrimental to them. Problematic upland watershed conditions, such as excess runoff and erosion, often reduce the effectiveness of management in the riparian area. Although riparian areas respond uniquely, they should not be considered independently of uplands.
- Passive, continuous grazing rarely improves a deteriorated riparian area or maintains a riparian area in good condition without reducing stocking levels to extremely low and uneconomic levels.
- The grazing management plan must address the

### (1) Timing, Duration, and Frequency of Grazing

Successful grazing management strategies for riparian areas can usually be achieved by using a combination of options, including grazing treatments that:

- Limit grazing intensity, frequency, or season of use, thereby providing sufficient opportunity to encourage plant vigor, regrowth, and energy storage and minimize compaction of soils.
- Control the timing of grazing to prevent damage to streambanks, the transition area between the wet and dry area of the meadow or streambank, and wet and semiwet meadows when they are most vulnerable to trampling damage.
- Ensure sufficient vegetation during periods of high flow to protect streambanks, dissipate energy, and trap sediments.
- Intensify grazing, in certain situations, to increase hoof action to trample wolfy plants and stimulate regrowth while reducing time and duration of exposure so animals do not have adequate time or need to move to less preferred riparian plants (sedges and woody plants).

Timing of grazing is particularly important in pastures that are large and include a high proportion of upland forage. This upland forage is more palatable than riparian forage during certain seasons (generally spring, early summer, and fall if green-up occurs). Grazing in these seasons will shift use away from riparian areas especially if water is available close to the upland forage. Although preferences for certain areas are a factor in smaller riparian pastures, distribution is much more important as pastures increase in size and in their proportion of

# Saving results to collections

Livestock accessibility	Difficult because of surface rock, steep slopes, debris, etc.	Some difficulty, but consistently used by livestock classes able to deal with limitations (e.g., yearlings)	Readily accessed and consistently used by all classes of livestock.
Habitat/forage for livestock	Livestock do not congregate for protection or forage based on season of grazing, geographic location.	Livestock congregate for water, protection, or forage based on season of grazing, geographic location.	Livestock congregate for water, protection, and forage based on season of grazing, geographic location.
Ecological site	Similar to associated sites.		
Ecological rating	No less than associated sites.		
Decision-support riparian area key grazing area status	Consider area part of the associated area but not necessarily a grazing area.		

\* Select column based on preponderance of characteristic

5.1-6

## COLLECTIONS Access Targeted Information

Collections are groupings of individual pages from various rangeland literature for a specific critical issue. Curated collections allow land managers and producers to efficiently search readymade topics. My collections are private, highly customizable rangeland literature organized for individual needs (geography, topics, audience) collections can be shared and stored on a smartphone for offline use.

CURATED MY COLLECTIONS

Quick Find

ADD COLLECTION

REM 460

Reading list for the University of Idaho's REM 460 class.

3 ITEMS

RANGEDOCS

COLLECTIONS

CURATED MY COLLECTIONS

Quick Find

ADD COLLECTION

REM 460  
Reading list for the University of Idaho's REM 460 class.  
3 ITEMS

REM 460  
Reading list for the University of Idaho's REM 460 class.  
3 ITEMS

National Range and Pasture Handbook  
PAGES 37-40,238

Rangeland Systems: Processes, Management and Challenges  
PAGES 532-550

Grazing Management Processes and Strategies for Riparian-Wetland Areas  
PAGES 32,67

BROWSE

READ

# Curated Collections

## COLLECTIONS

### Access Targeted Information

Collections are groupings of individual pages from various rangeland literature focused on one specific critical issue. Curated collections allow land managers and producers to quickly and efficiently search readymade topics. My collections are private, highly customizable groupings of rangeland literature organized for individual needs (geography, topics, audience, etc.). All collections can be shared and stored on a smartphone for offline use.

CURATED MY COLLECTIONS

Quick Find

#### State and Transition Models

Authored by: Jason Karl

State and transition models are conceptual models that seek to capture what is known about an ecological site and how it works. A well-constructed state and transition model contains valuable information on the types of vegetation communities that may occur on a site and the natural and disturbance processes and management actions that cause one plant community to change to another. A state and transition model will suggest meaningful indicators for monitoring and provide information for how to interpret those indicators. This collection assembles some background information on the concepts underpinning state and transition models and information describing how state and transition models are created and used.

4 ITEMS

RANGEDOCS

COLLECTIONS

CURATED MY COLLECTIONS

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4 ITEMS

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#### Rangeland Systems: Processes, Management and Challenges

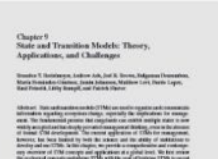
PAGES 209-239

The theory of non-linear dynamics - that plant communities may not return to their original state or condition following disturbance - underpins the concept of state and transition models. To really understand the value of state and transition models and how to use them, you need to understand non-linear ecosystem dynamics. This chapter from the Rangeland Systems book, edited by David Briske, is a good introduction to the topic.

#### Rangeland Systems: Processes, Management and Challenges

PAGES 313-355

You're not going to find a better discussion of the theory, development, and applications of state and transition models than from Bestelmeyer et al. This chapter in the Rangeland Systems book dives deep into the topic and provides lots of good examples and extensive references. It's a long read, but well worth it.



# Taking collections offline

The screenshot displays the RANGEDOCS application interface. On the left, a sidebar contains a 'COLLECTIONS' section with tabs for 'CURATED' and 'MY COLLECTIONS'. Below these is a 'Quick Find' search bar and an 'ADD COLLECTION' button. A collection card for 'REM 460' is visible, indicating it is a reading list for the University of Idaho's REM 460 class and contains 3 items.

The main content area shows the details for the 'REM 460' collection, specifically the 'National Range and Pasture Handbook' (pages 37-40,238). A 'READ' button is overlaid on a preview of the document. A floating menu on the right side of the document preview offers options: 'BROWSE', 'EDIT', 'SHARE', and 'SAVE TO DEVICE'. Below the handbook preview, another document titled 'Rangeland Systems: Processes, Management and Challenges' (pages 532-550) is partially visible.

# Significance of RangeDocs

- Annotations leverage the collective knowledge of rangelands experts
- Targeted search results = faster, more efficient
- Organize and share information across documents



# What's down the road?

- Status and future of RangeDocs
  - Available online now!
  - Complete annotation of initial document set
  - Fall 2021 launch and outreach
    - Altar Valley Conservation Alliance – curated collections, marketing to producers
  - RREA National Focus Funds grant
    - Develop training and outreach materials



<https://docs.rangelandsgateway.org>

**RangeDocs**  
SEARCHABLE SCIENCE

🔍 Find technical resources 

Advanced Search





University of Idaho  
College of Natural Resources

# Development & Implementation of an open-hardware location tracker

Jason W. Karl, Ph.D.

Department of Forest, Rangeland, and Fire Sciences

University of Idaho



University of Idaho

College of Natural Resources

A project funded through NRCS Conservation Innovation Grant NR193A750008G005

# Uses of GPS Collars for Livestock Studies

A photograph of a large herd of cattle in a grassy field. Two cowboys on horseback are visible in the background, herding the animals. The scene is set in a hilly, open landscape under a clear sky.

- Most uses of GPS collars focus on understanding behavior of livestock
  - Few collars per herd
- Can GPS Collars be used to estimate livestock use/utilization of entire pastures or ranges?
- If so, how many collars would we need to get a good estimate???

An aerial photograph of a landscape, likely a ranch or farm, with several red lines delineating different sections or pastures. In the lower-left quadrant, there is a cluster of blue and green icons representing cows. The text "How many GPS collars to describe landscape use of an entire herd?" is overlaid in white on the left side of the image.

How many GPS collars to describe landscape use of an entire herd?

Potentially a lot.

# How low (cost) can we go?

- Commercial GPS collars are expensive
  - \$300-\$600 each
  - Unnecessary features
- Existing DIY collars still too expensive
  - \$150-\$200 each
- Individual electronics components are not that expensive
- Should be able to build a GPS collar for less than \$50 each\*.

\*Original goal

# Open Hardware

Physical objects for which the design information/specs are made available so the object can be:

Studied

Modified

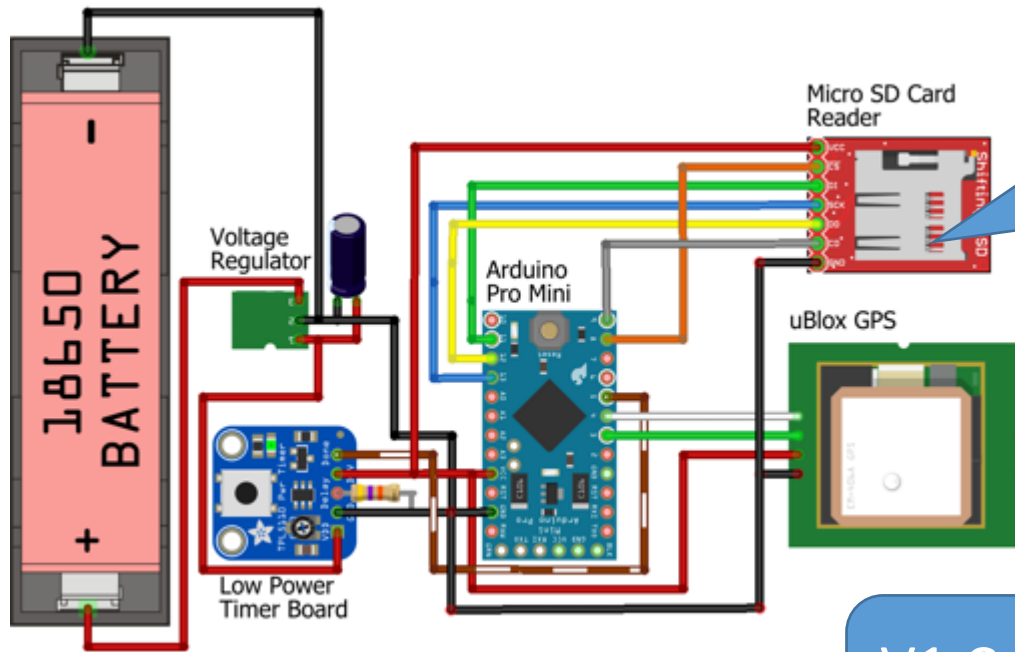
Created

Distributed



open source  
hardware

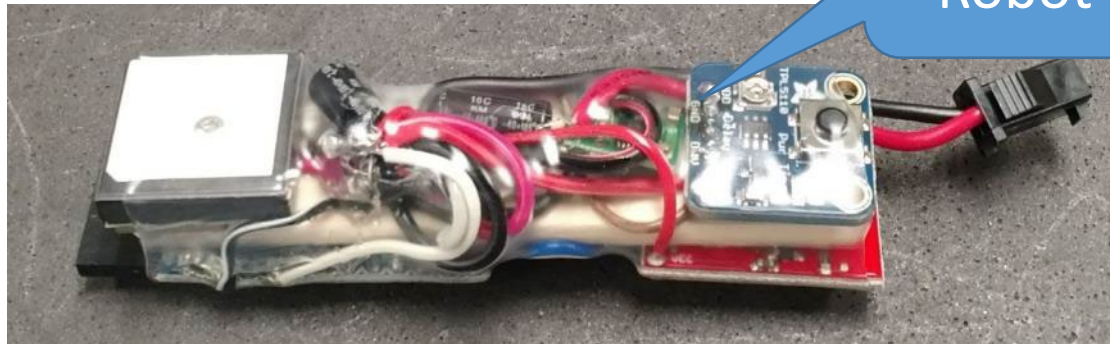
# GPS Collar Version 1 (2018)



Consumer Electronics Components

Sophisticated Housing

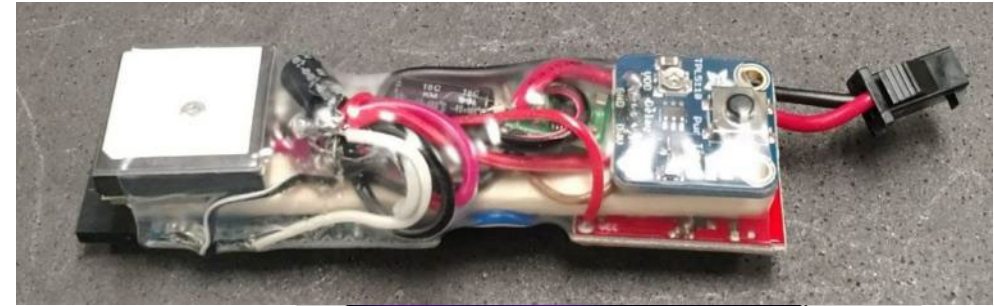
V1 Codename "Robot Turd"



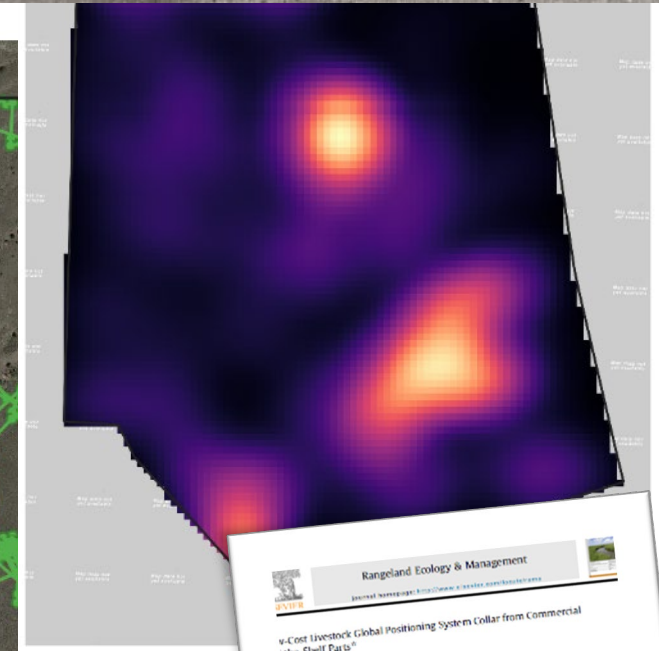
Stylish Cow



# GPS Collar Version 1 (2018)

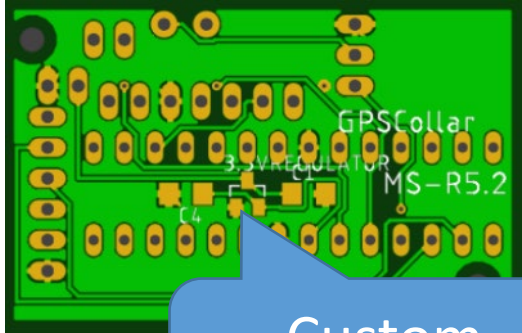


- Proof of concept (n=25)
  - Cost per unit = \$54\*
- Mostly successful
  - REM Tech Note
- Problems encountered
  - Battery holder
  - Soldered connections between components
  - \$%^@\$& Reset buttons!



\* Not including labor costs

# GPS Collar Version 2 (2019)



Custom Circuit Boards

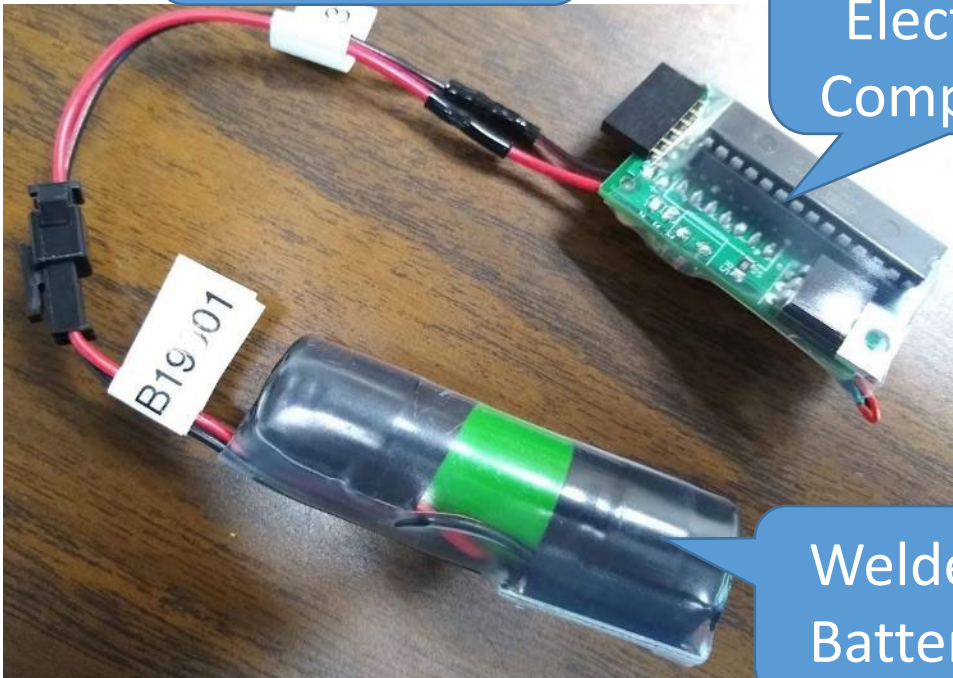


Bulk Electronics Components

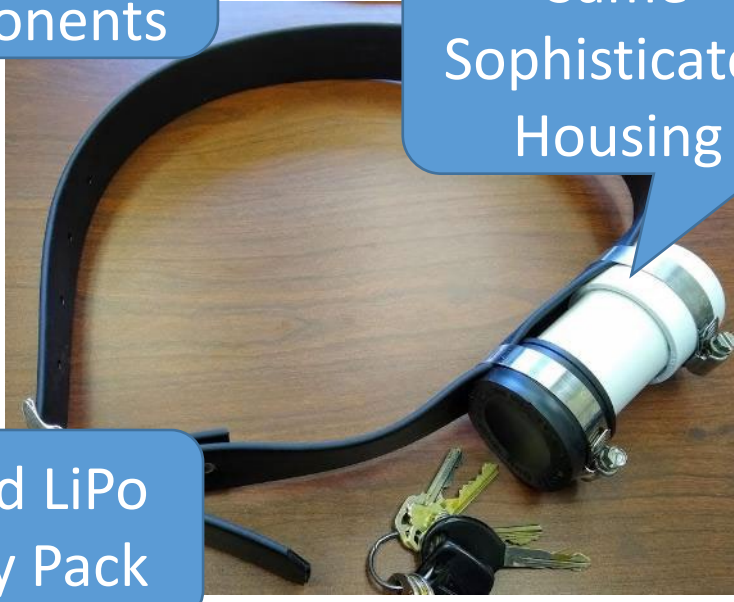


Red Angus "Land Whale"

Starving Engineering Students



Welded LiPo Battery Pack



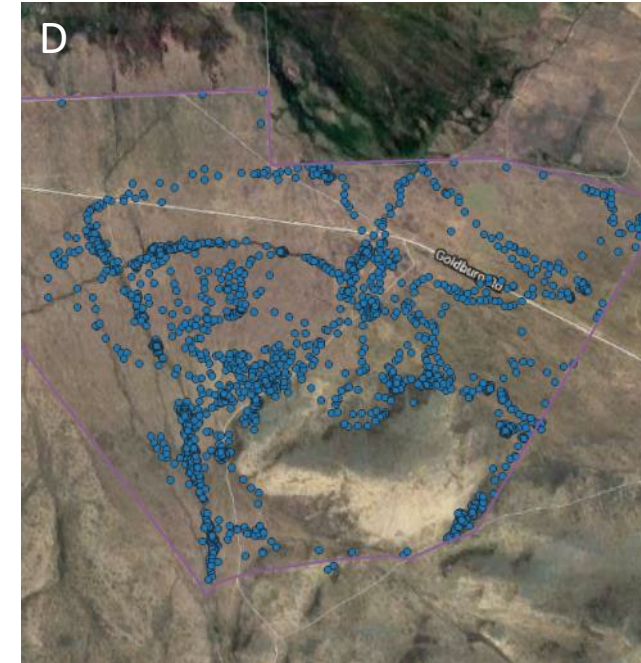
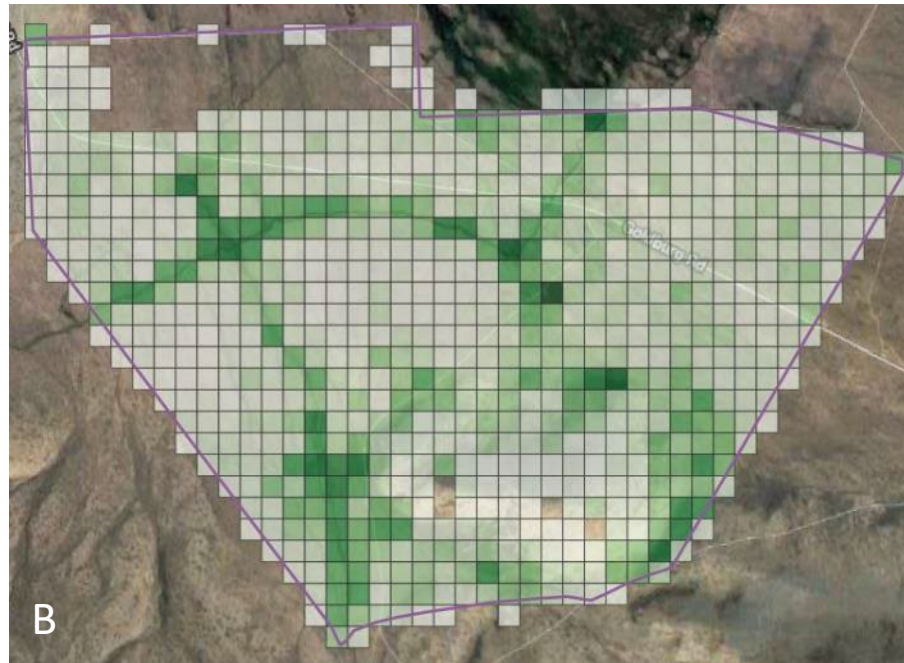
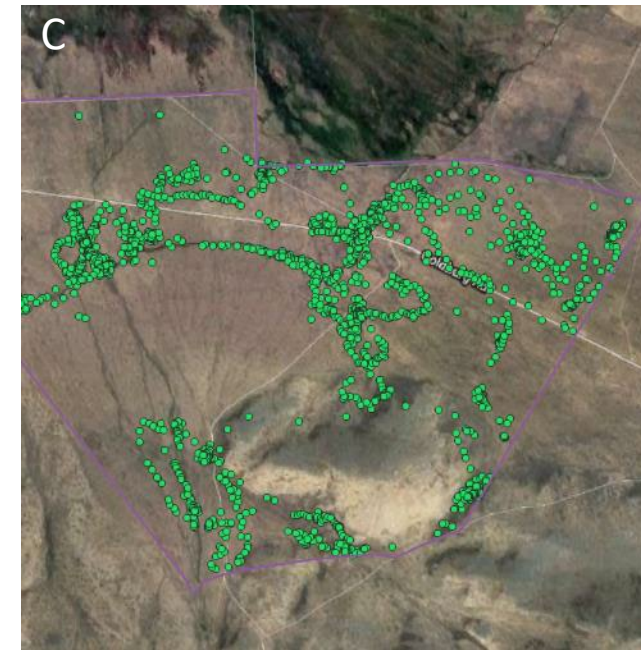
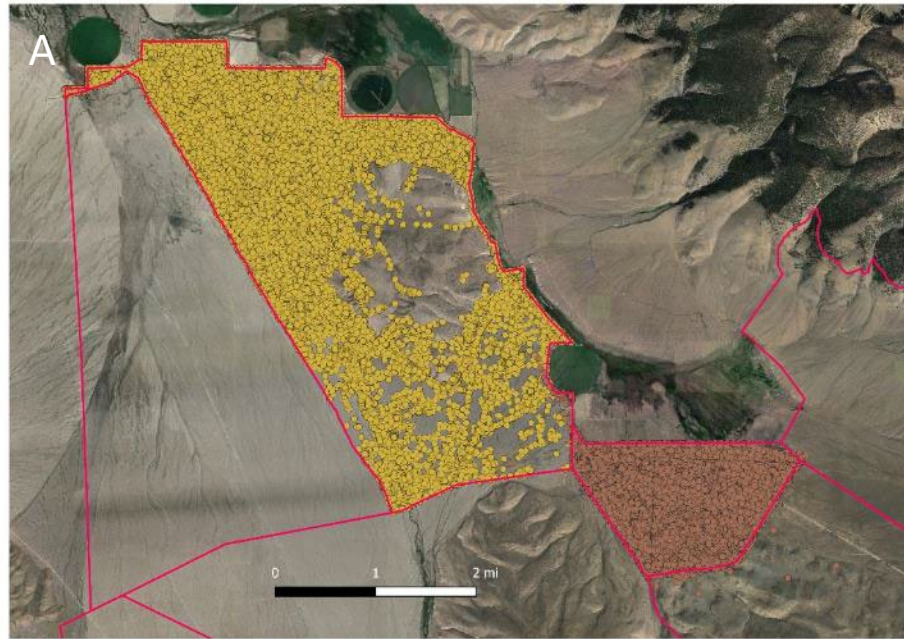
Same Sophisticated Housing



# GPS Collar Version 2 (2019)

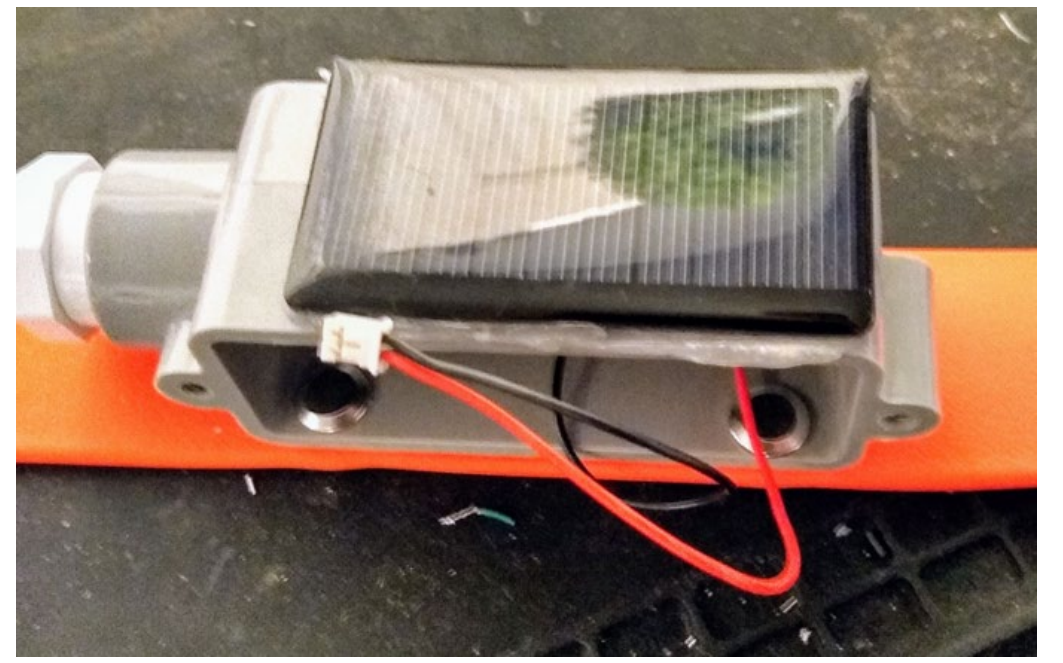
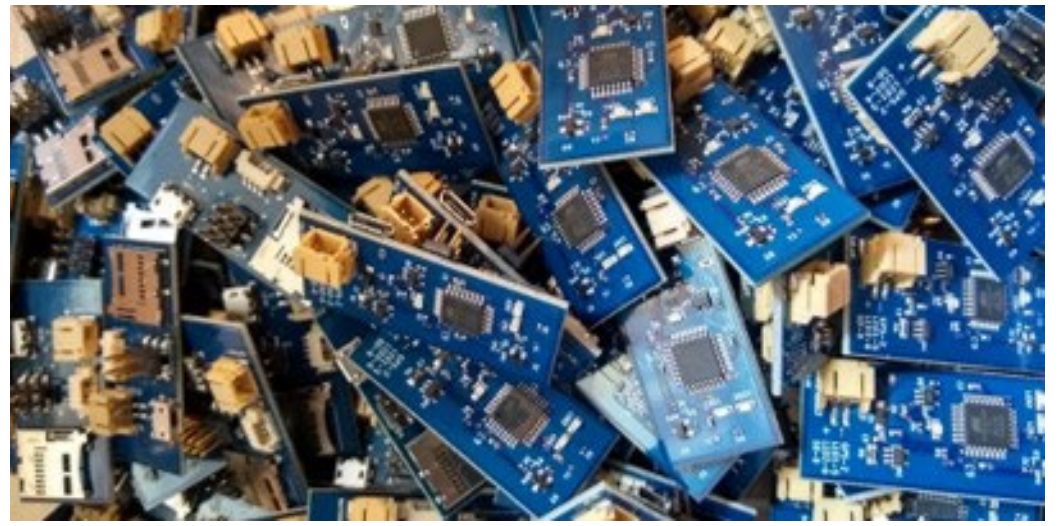
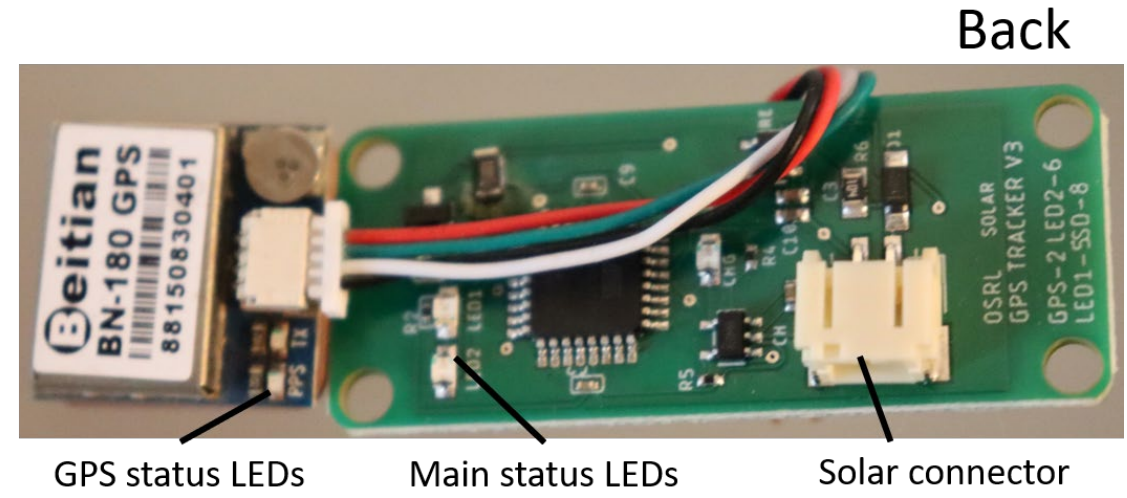
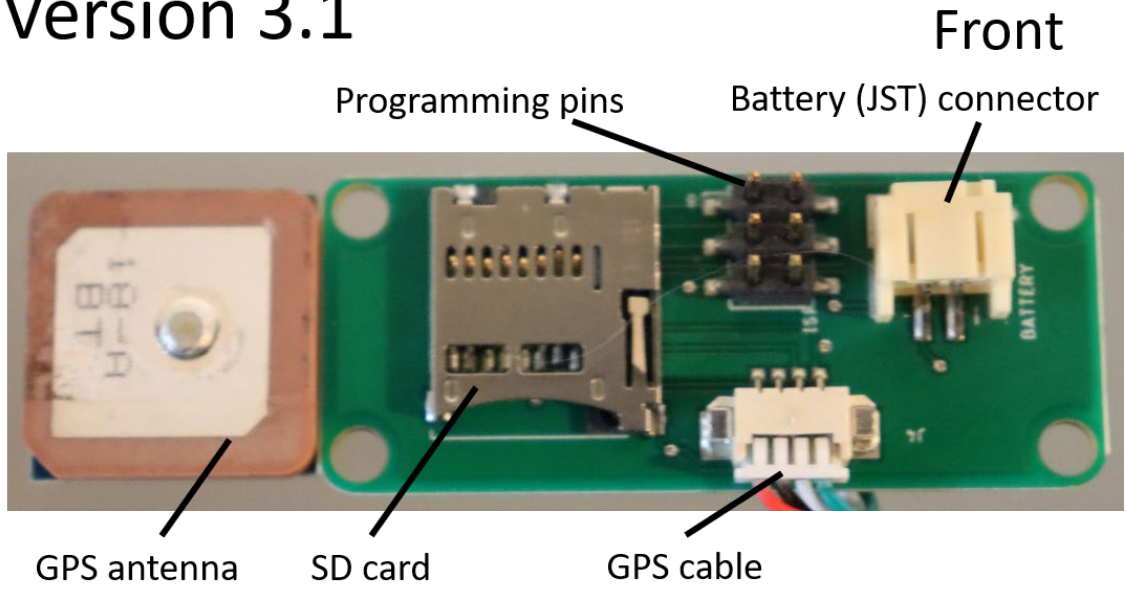
- Measure grazing intensity
  - 3 Study Areas
  - 10-min intervals
  - Average unit life 4 weeks
- n=150
- Cost per unit \$38\*
- Much more reliable
  - Some problems with soldering/  
microcontroller chips

\* Not including labor costs



# GPS Collar Version 3 (2020)

## Version 3.1



# Labor Costs

- 2018 (pilot phase)
  - Priceless
- 2019 (V2 Production)
  - Engineering & Range Undergraduate Students
  - Labor cost ~ 270 calories\* per unit
- 2020 (V3 Production)
  - SeeedStudios PCB assembly (~\$4/unit)
  - Plug/Play assembly (volunteer, interns) ~ \$2 per unit

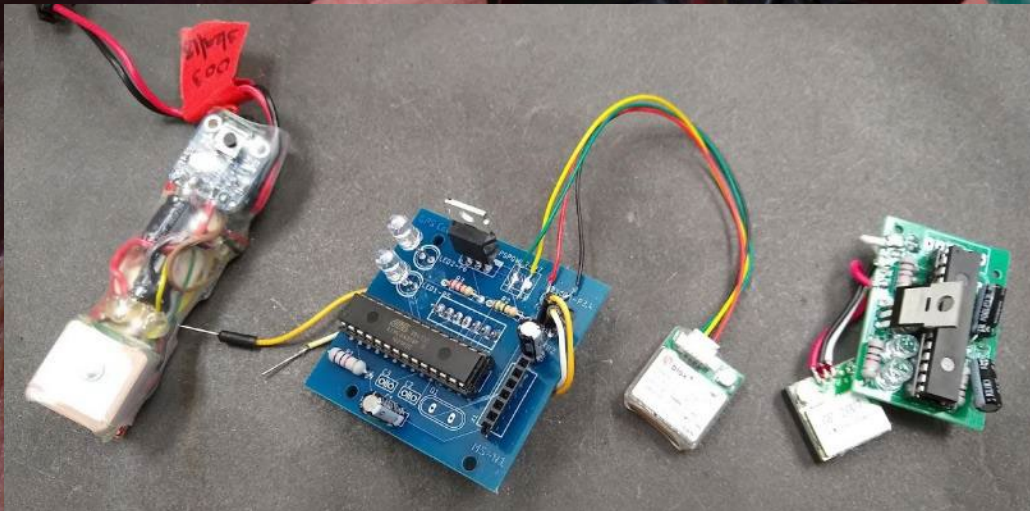
\* Approximately 2/3 piece of meat-lover's pizza



UI Undergraduate Engineering Students working on the assembly line

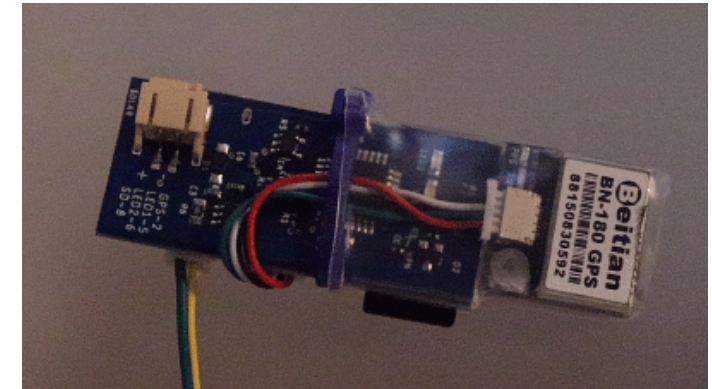
# Lessons Learned

- Be prepared to deal with challenges
- Success requires iteration
- Fail early, fail often



# Next Steps

- COVID has caused extreme supply chain issues
  - Increased prices
  - Part availability
  - Longer shipping times
- Next steps:
  - Significant demand for inexpensive GPS collars
  - Collaboration with researchers from other institutions
  - Develop versions using different microchip architecture
  - Additional sensors (e.g., accelerometers) and features (e.g., wireless data transfer)
  - **Seek additional funding**



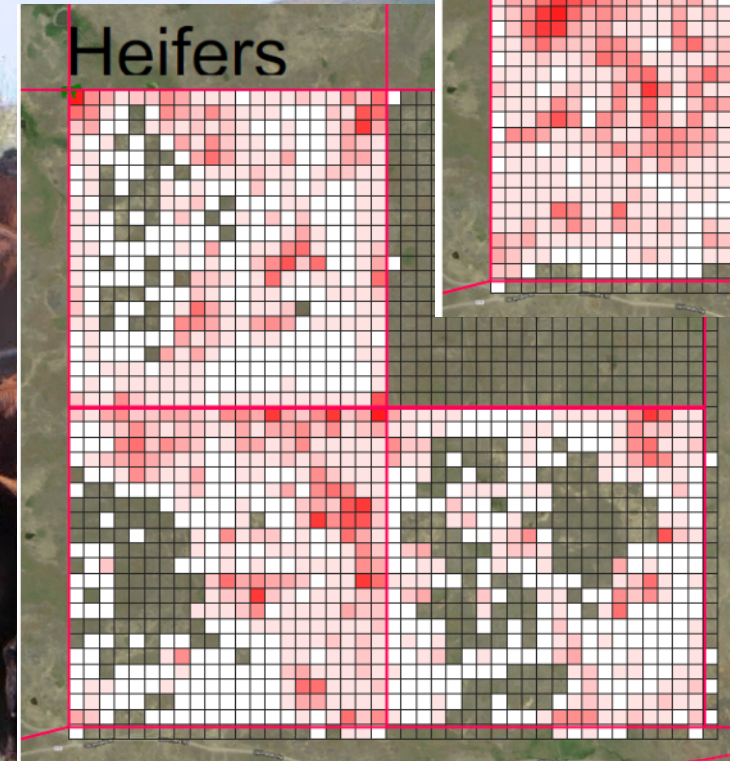
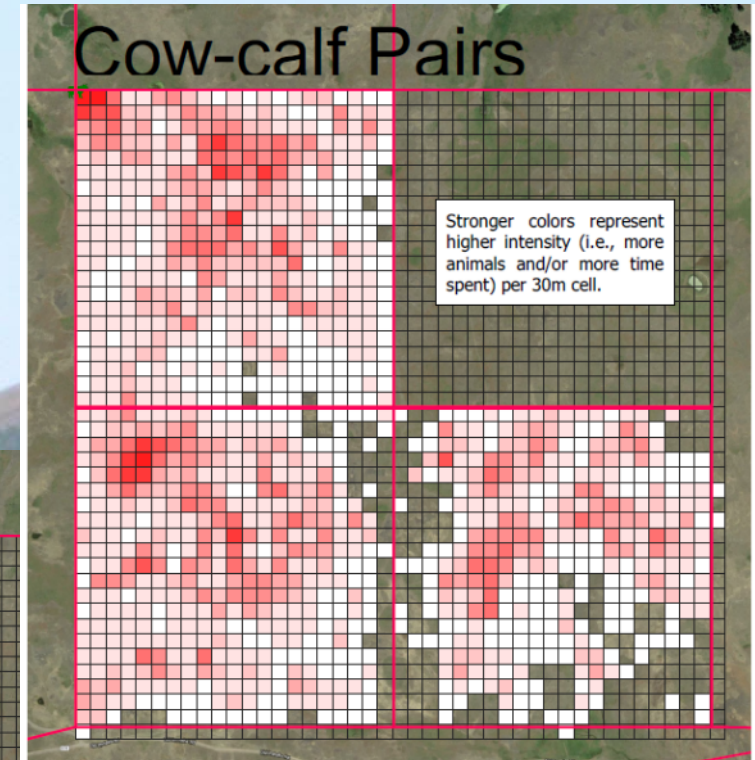
# Conclusion

- Inexpensive, reliable GPS Collars are possible
  - Cost continues to decline with quantity
- Allows for much wider implementation of sensors than previously possible
- Ask new questions
- Value in open-source projects



University of Idaho  
College of Natural Resources

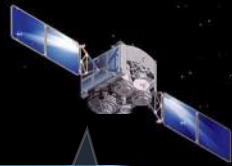
[https://github.com/Open-Source-Range/OSR\\_GPS\\_Collar](https://github.com/Open-Source-Range/OSR_GPS_Collar)



A woman with long brown hair, wearing a black jacket and blue jeans, stands next to a black garage door. She has a large blue backpack on her back and is smiling. Her right hand is raised towards the top of the door, and her left hand is resting on the bottom edge. The garage door has yellow text that reads "ENGINEER like a VANDAL". The door is set in a brick wall. The text "ENGINEER" and "VANDAL" are in large, bold, yellow capital letters, while "like a" is in smaller, white lowercase letters. The door has yellow horizontal stripes at the top and bottom.

**ENGINEER**  
like a  
**VANDAL**

[https://github.com/Open-Source-Range/OSR\\_GPS\\_Collar](https://github.com/Open-Source-Range/OSR_GPS_Collar)



# RangeSAT

Satellite-based Assessment Tools  
for Rangeland Management



**Jen Hinds**  
*University of Idaho*

**Vincent Jansen**  
*University of Idaho*

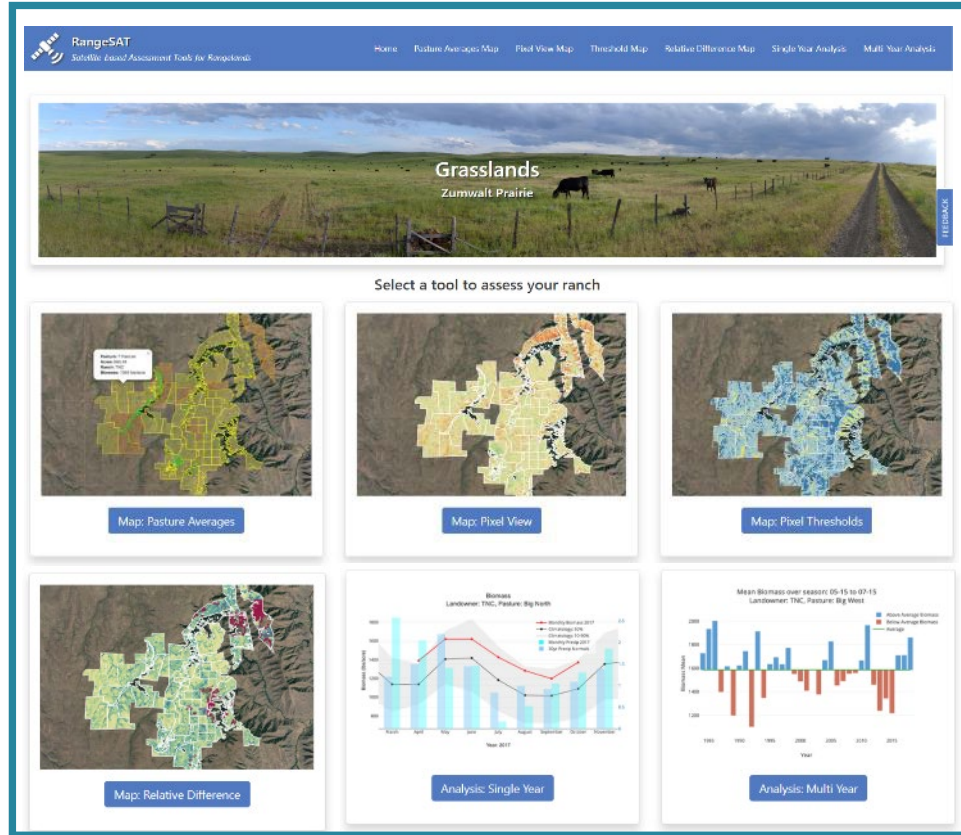
**Jason Karl**  
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**Roger Lew**  
*University of Idaho*

**Chloe Wardropper**  
*University of Idaho*

A project funded through NRCS Conservation Innovation Grant NR193A750008G005

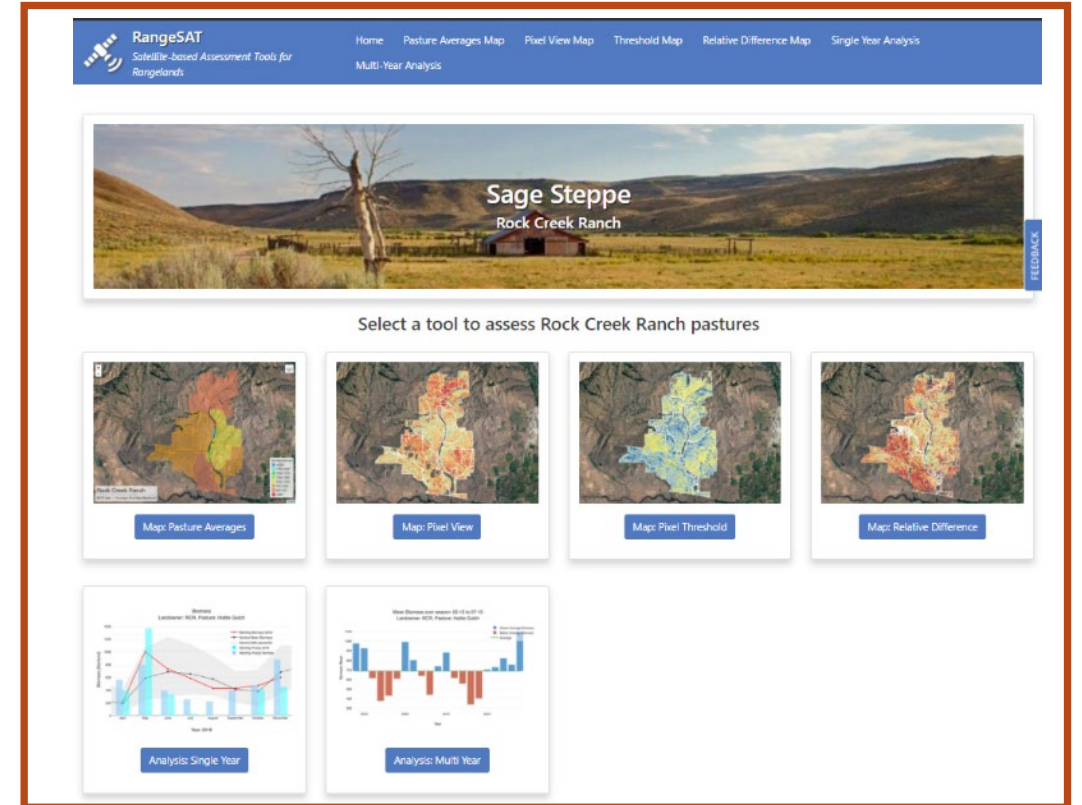
# Rangeland Vegetation Monitoring Tools for Adaptive Management



**Grasslands**  
Zumwalt Prairie

Select a tool to assess your ranch

- Map: Pasture Averages
- Map: Pixel View
- Map: Pixel Thresholds
- Map: Relative Difference
- Analysis: Single Year
- Analysis: Multi Year

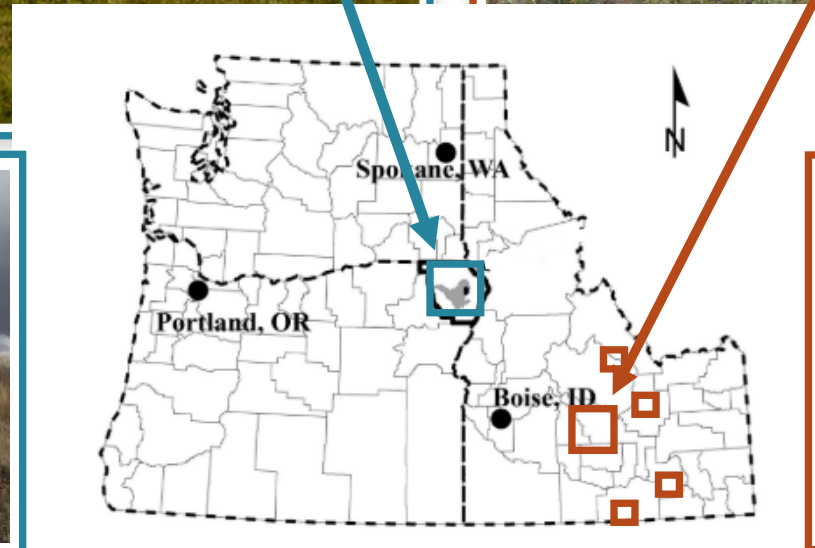


**Sage Steppe**  
Rock Creek Ranch

Select a tool to assess Rock Creek Ranch pastures

- Map: Pasture Averages
- Map: Pixel View
- Map: Pixel Threshold
- Map: Relative Difference
- Analysis: Single Year
- Analysis: Multi Year

## Rangeland Vegetation Monitoring Tools for Adaptive Management



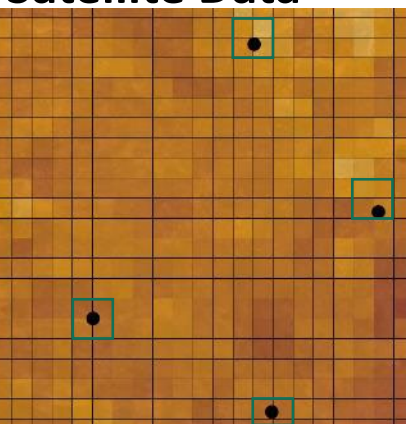
# From global data to ranch data

## Mapping Vegetation Amounts

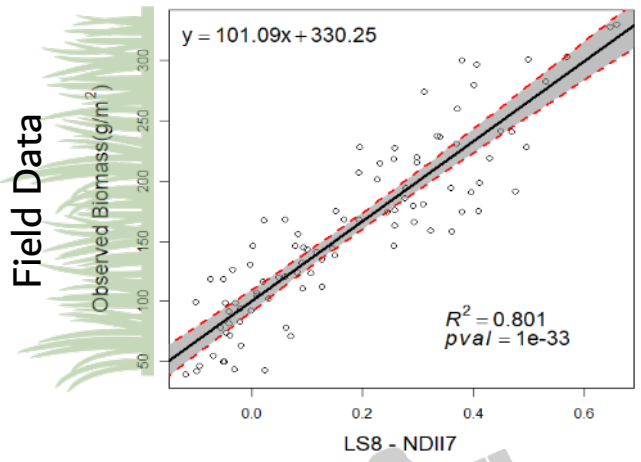
### Field Data



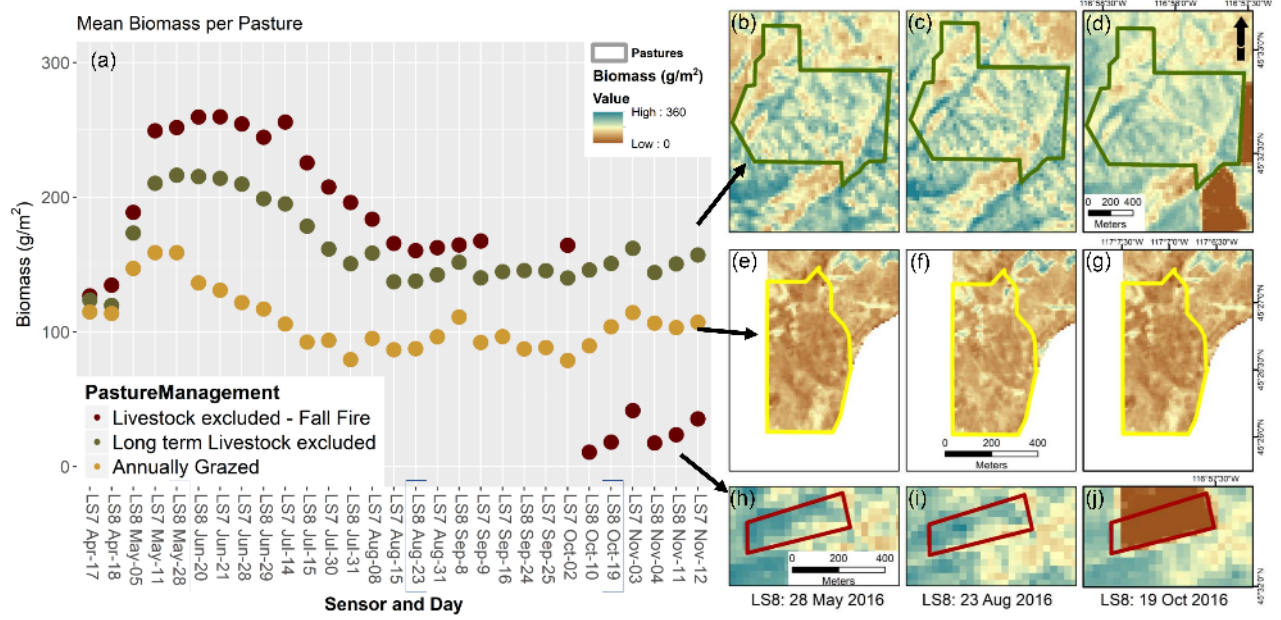
### Satellite Data



### Statistical model



### Results



Jansen VS, Kolden CA, Schmalz HJ. The Development of Near Real-Time Biomass and Cover Estimates for Adaptive Rangeland Management Using Landsat 7 and Landsat 8 Surface Reflectance Products. *Remote Sensing*. 2018; 10(7):1057.

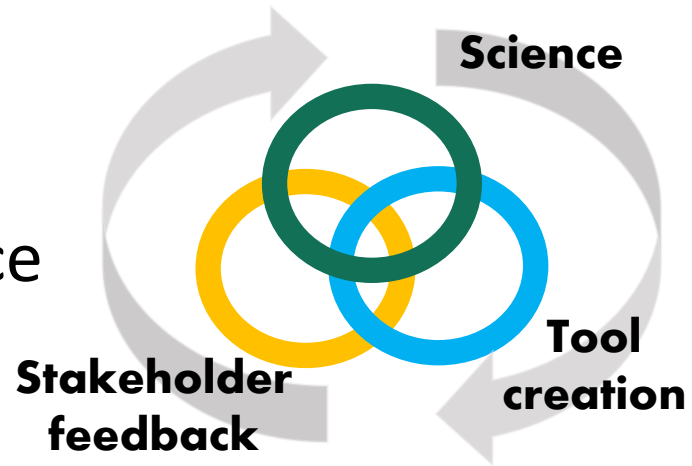
<https://www.mdpi.com/2072-4292/10/7/1057>

# Going from the global to the ranch

## Building RangeSAT: a collaboration

### Collaborative effort

- Ranchers
- Land managers
- Interdisciplinary Science team



https://www.rangesat.org/grasslands

Grasslands  
Zumwalt Prairie

Select a tool to assess Nature Conservancy pastures

Map: Pasture Averages

Map: Pixel View

Map: Pixel Thresholds

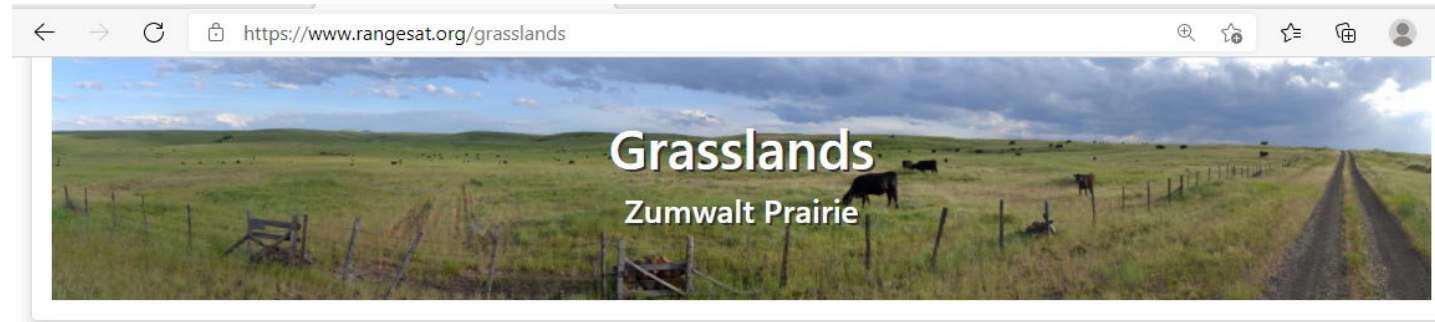
Map: Relative Difference

Analysis: Single Year

Analysis: Multi Year



# RangeSAT Tools



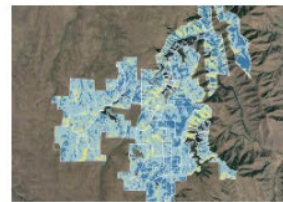
Select a tool to assess Nature Conservancy pastures



Map: Pasture Averages



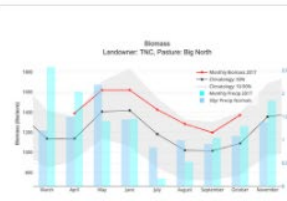
Map: Pixel View



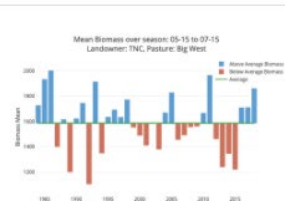
Map: Pixel Thresholds



Map: Relative Difference



Analysis: Single Year



Analysis: Multi Year

# RangeSAT Tools

## My Overlays:

- utilizDatawithsymbols.kmz
- WeedRx.kmz
- KeyAreasFolder.kmz

### Scene Date #1:

2020 ▾ Jul ▾ 26 ▾  show

### Scene Date #2:

2020 ▾ Oct ▾ 05 ▾  show

 Calculate Difference

Opacity: 0%  100%

### Relative Difference:

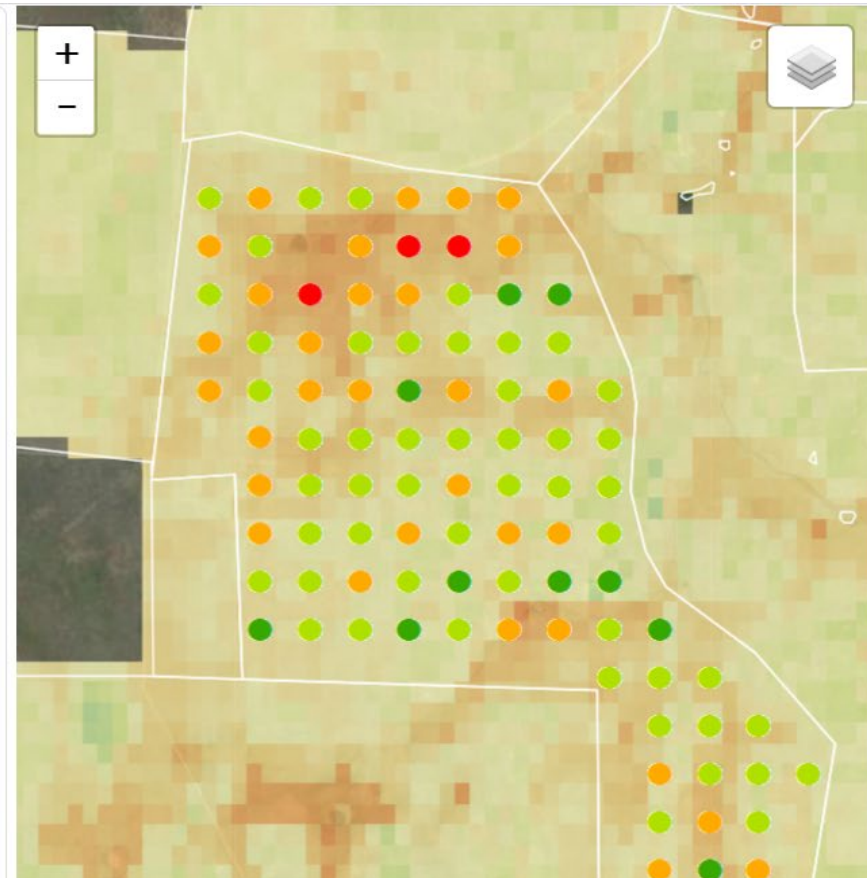
-100%  100%

Value at mouse click point is: N/A%

 Download Difference GeoTIFF

 Download Difference by Pasture (csv)

downloads may take several moments to initiate



# RangeSAT Tools

## Single-Year Pasture Analysis (TNC)

This graph compares average monthly values from a selected year to historic averages for a selected pasture. Climate variables can be shown in the background as well.

### Land manager:

The Nature Conservancy

Loading...

Pasture:

Vegetation indicator:

Year:

### Interval:

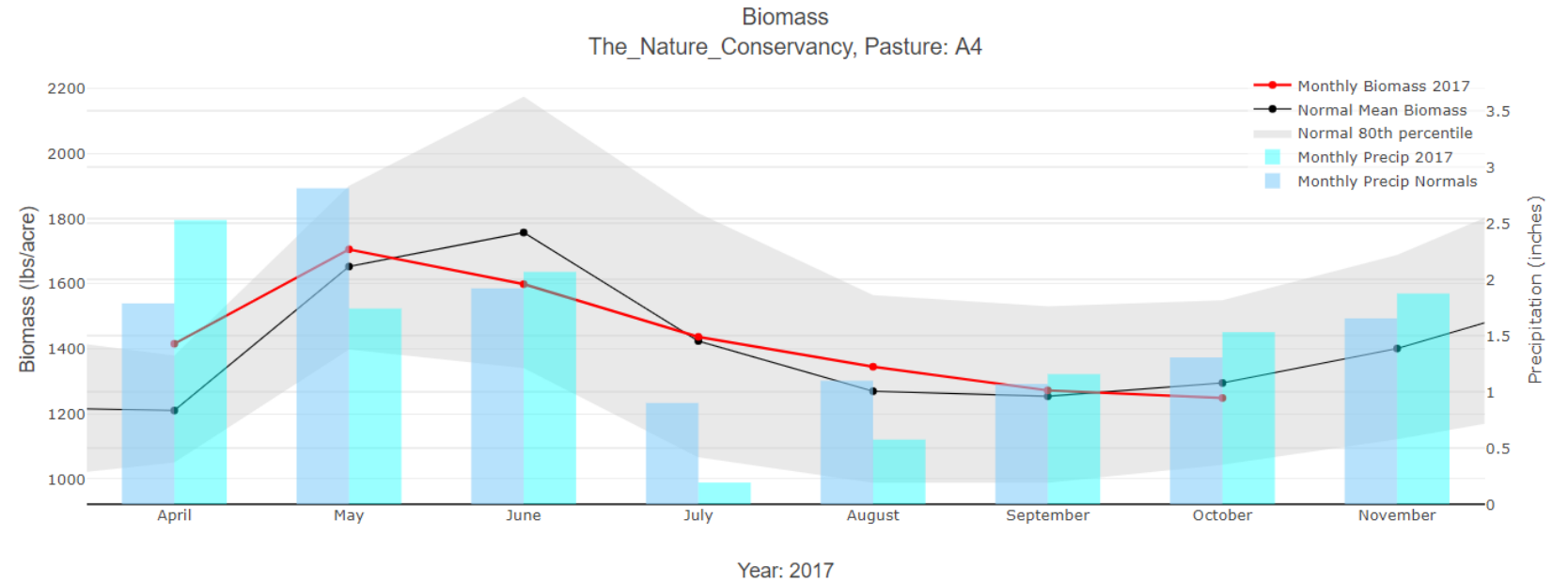
- Grazing season (Apr - Nov)
- Calendar year

### Climate comparison:

- Precipitation (inches)
- Potential Evapotranspiration (inches)
- Min Temperature (°F)
- Max Temperature (°F)

### Data Sources:

Biomass data computed using algorithms from Jansen et al., 2018; source data comes from the Landsat 5/7/8 surface reflectance product. The seasonal progression of biomass is computed by month per pasture. Climate data are from gridmet (Abatzoglou, J. T., 2011).



[Download \(csv\)](#) Download monthly pasture statistics for 2017

# RangeSAT Tools

## Multi-Year Pasture Analysis

This graph compares average values for a selected date range across selected years for a single pasture. Selecting different date ranges and year ranges will re-calculate averages. [Chart Tips](#)

Area of Interest:

Pasture:

Vegetation indicator:

Years:  to

Date Range:   to

Statistic:

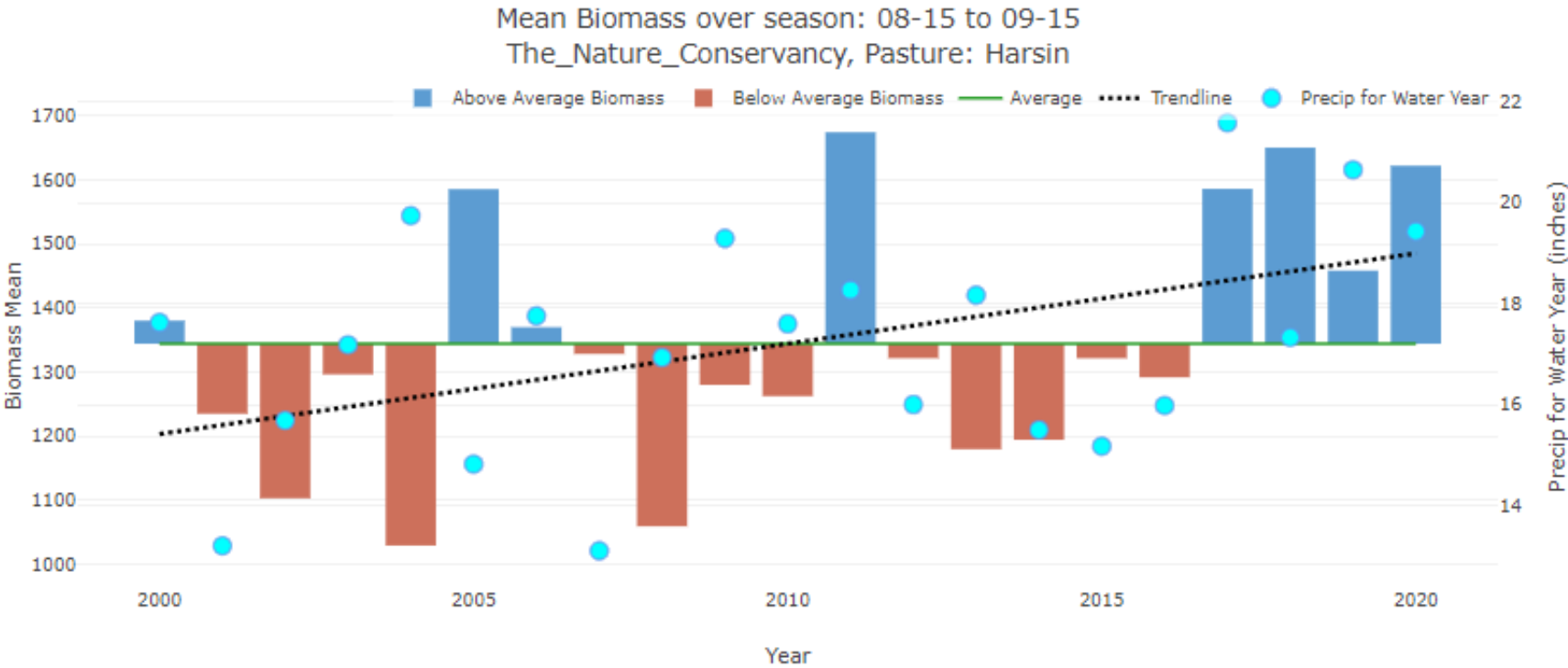
### CSV Downloads:

[Individual Pasture Stats by Year](#)

Download all individual pasture biomass statistics per year for the above date range.

[All Pasture Stats across Years](#)

Download all of your pasture biomass statistics collapsed across the years for the above selections.



FEEDBACK

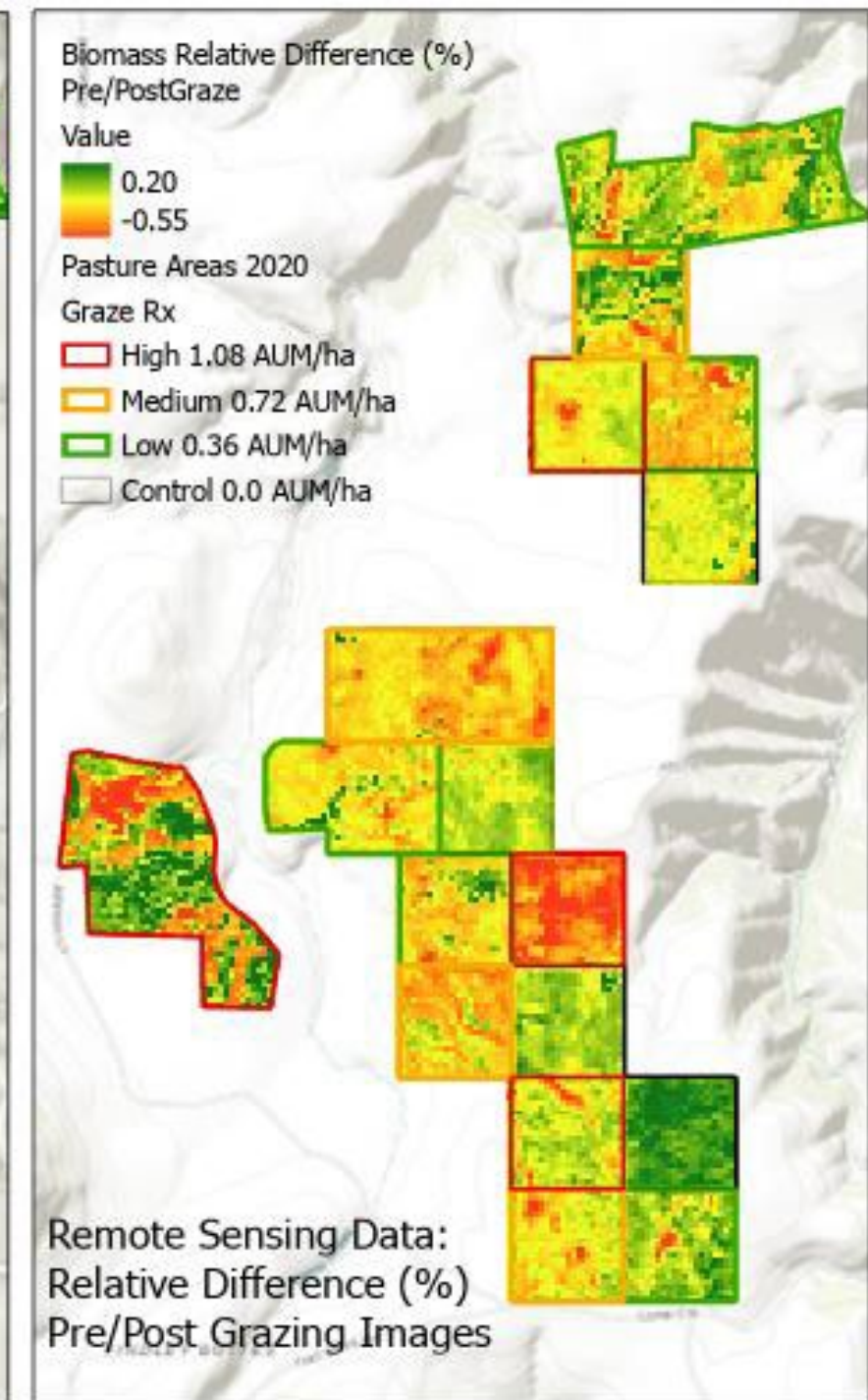
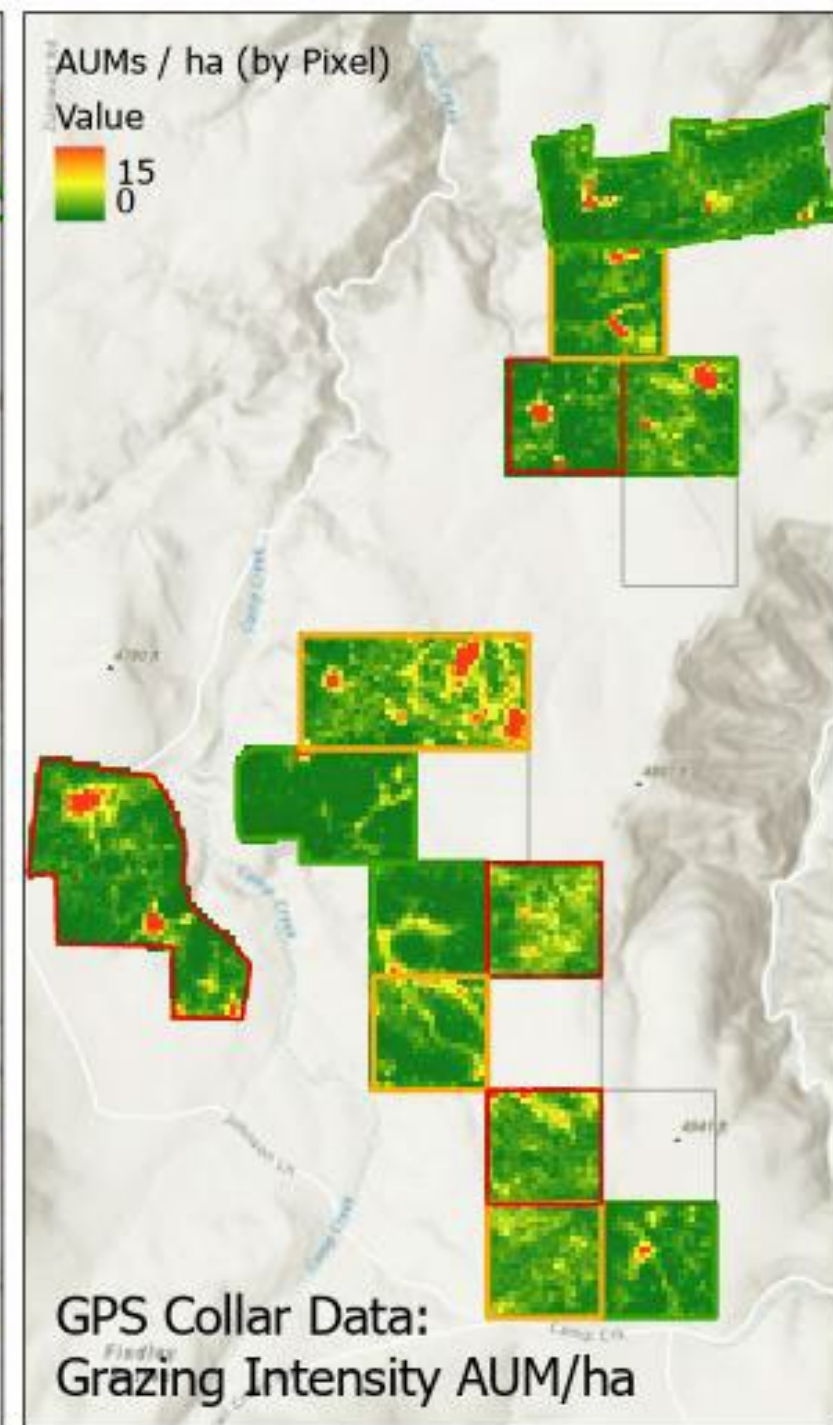
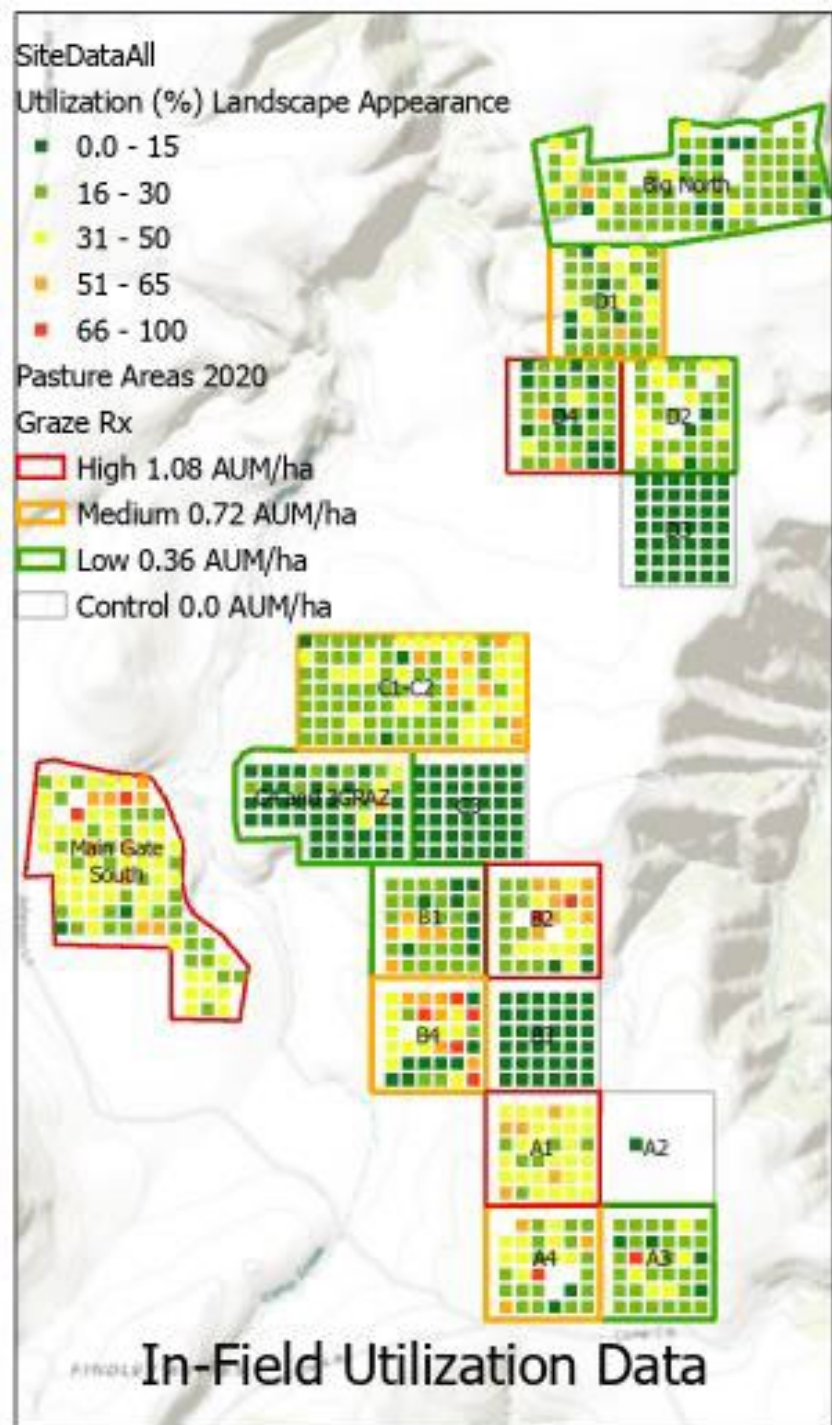
# RangeSAT

- Created for ranchers and land managers interested in vegetation amounts in relation to grazing
- Seeking ways to better integrate field and remotely sensed data for use-based monitoring



- Tool limitations
  - Limited geographic extent
  - Model error
  - Sometimes sparse data, and therefore not near-real time
  - Alignment of RangeSAT data with desired data for management action

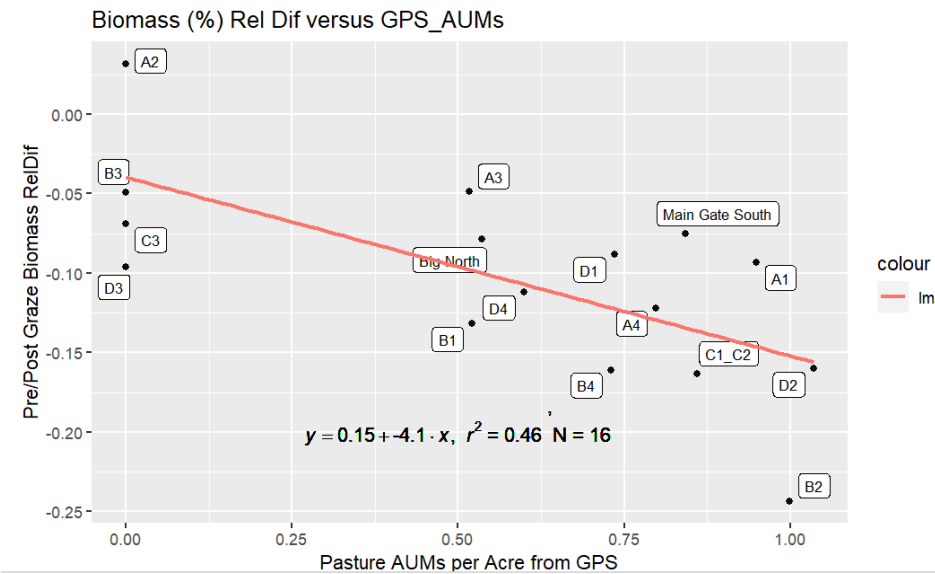
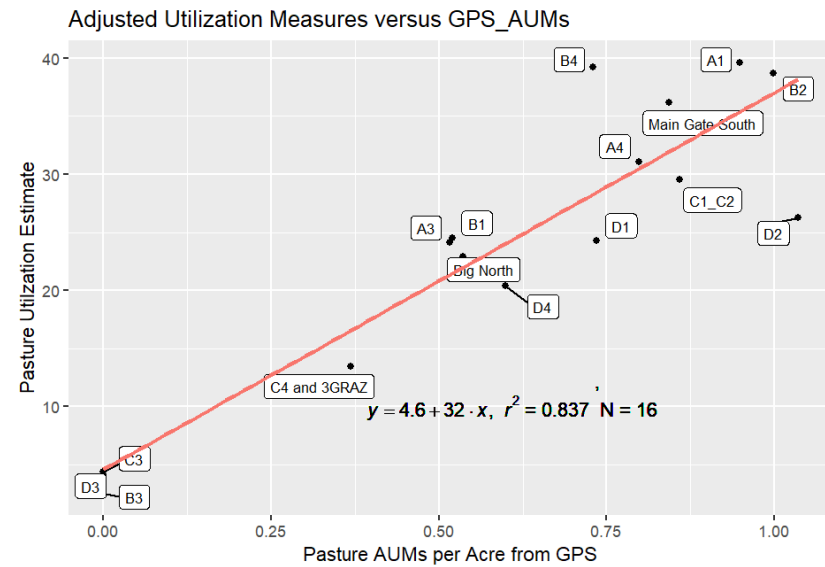
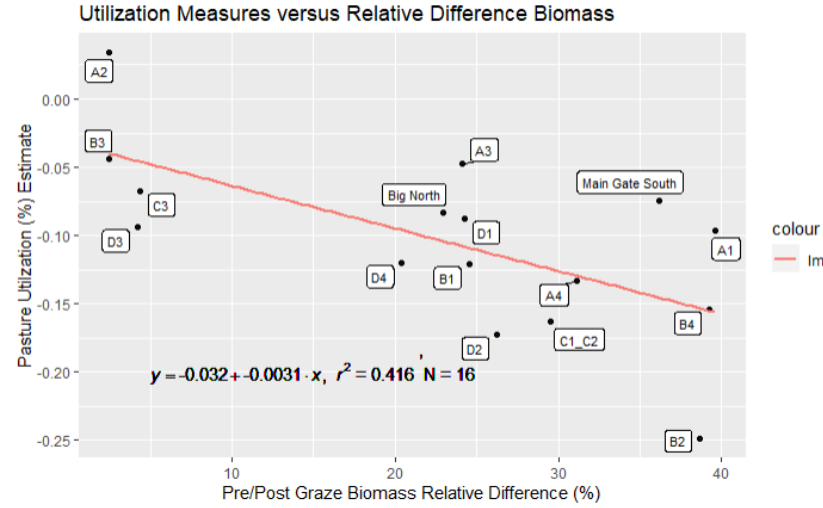




# Results - Pasture Scale

Utilization

Remote Sensing



GPS derived AUM/ha

# Questions?

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University of Idaho



University of Idaho  
College of Natural Resources