

**Jérôme Théau**  
theajero@isu.edu

**Jacob Tibbits**  
tibbjaco@isu.edu

**Keith T. Weber**  
webekeit@isu.edu

**Temuulen T. Sankey**  
sankteki@isu.edu

## Overview and Objectives

Proper diagnosis of rangeland health followed by proper management of that rangeland, whether public or privately held, is required for the conservation of rangelands and the prevention of desertification processes threatening rangelands.

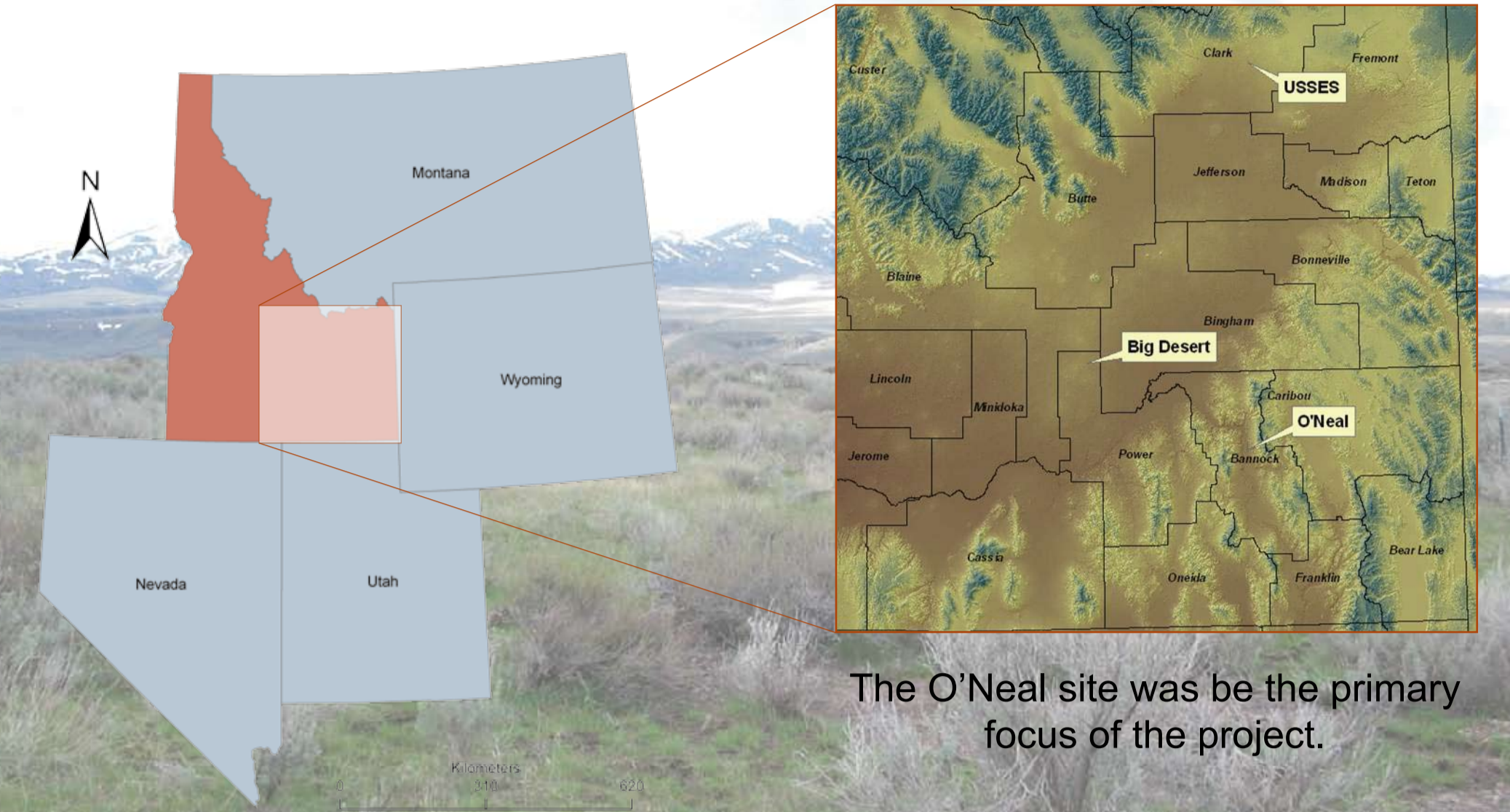
However, there is no consensus within the range community about the definition of rangeland health. For this reason, a working definition was developed at the GIS Training and Research Center:

*"Healthy rangelands exhibit effective water cycles as indicated by minimal bare earth exposure and minimal evidence of soil erosion. In addition, the vegetation present will be a mixture of grasses, forbs, and shrubs that act synergistically to provide quality forage and habitat for wildlife and grazing animals. Litter will be present and biodegrading. Very little if any litter will be decomposing through oxidation."*

Based on this definition and existing research into rangeland health indicators, the objectives of this study were:

- to examine the ecological indicators of rangeland health,
- to determine rangeland health using remote sensing technologies correlated with ground measurements of established indicators,
- to produce a rangeland health model for spatio-temporal evaluation and comparison of rangeland sites.

## Study Area

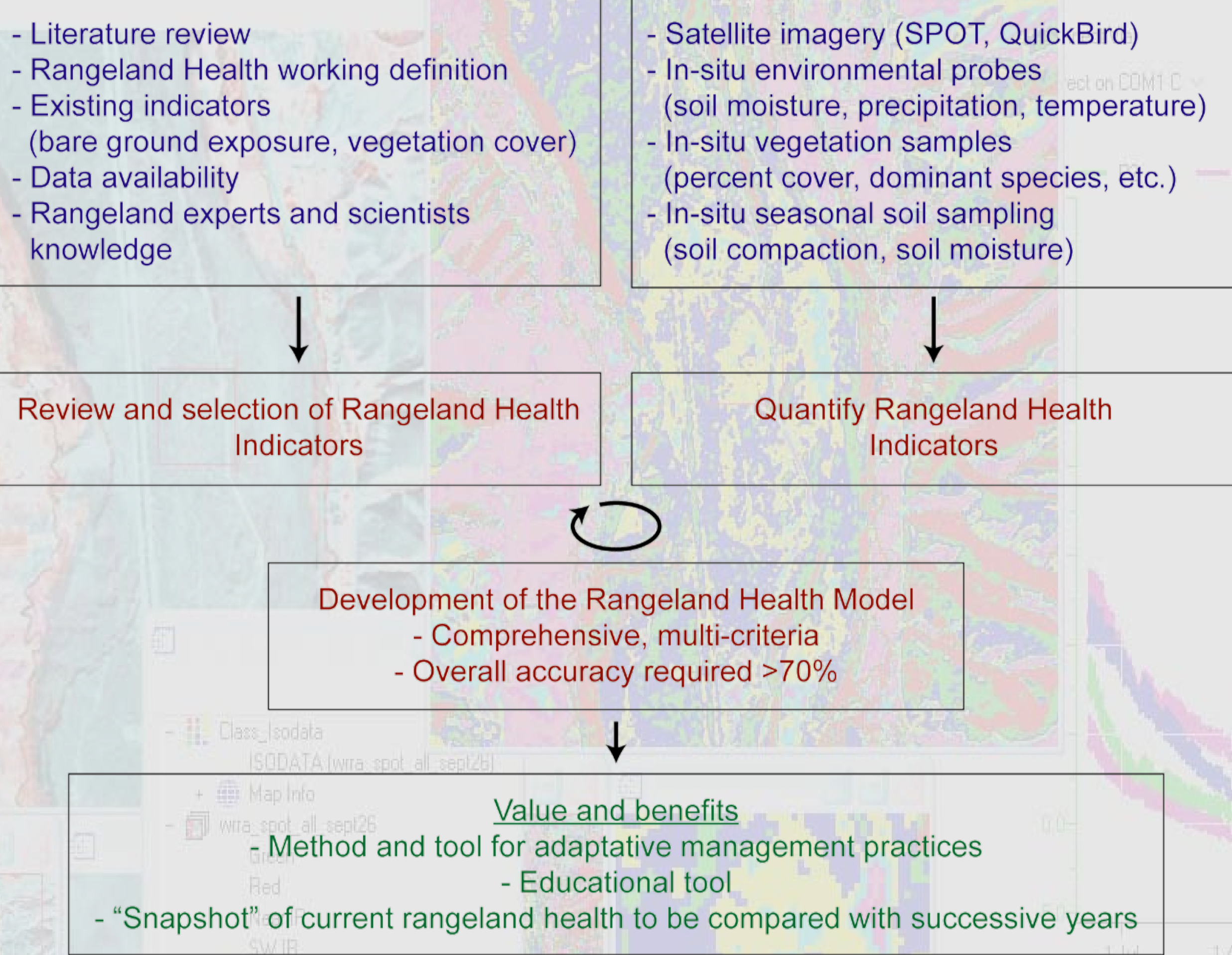


The study area was located in southeastern Idaho.

The O'Neal site was the primary focus of the project.

The Big Desert and USSES sites will be used to validate the model developed at the O'Neal site.

## Health Modeling Approach



## Experimental Design

**O'Neal Study area**

**Grazing treatments to be repeated each year**

- 1 North Pasture 11 ha**  
Treatment: High-intensity/Short-duration grazing  
Grazing intensity: 5.97 AU/ha (12 animal days/acre)
- 2 South Pasture 18 ha**  
Treatment: Total rest  
Grazing intensity: 0.00 AU/ha (0 animal days/acre)
- 3 BLM (The Bureau of Land Management) Pasture**  
Treatment: Rest-rotation grazing  
Grazing intensity: 0.32 AU/ha (6 animal days/acre)

**Imagery to be acquired throughout the study**

- Digital topo-maps
- NAIP aerial photography (1 m resolution)
- 3Di aerial photography (0.05 m resolution)
- QuickBird (2.44 m and 0.61 m (PAN) resolution)
- SPOT5 (10 meters resolution)
- MODIS (250 meters resolution)

**Soil moisture probes (EC-10 - 10 cm) permanently installed and linked to dataloggers (total of 36 probes linked to 9 dataloggers)**

**Full weather station recording:**

- Wind parameters
- Temperature, UV, and total solar radiation
- Rainfall, humidity

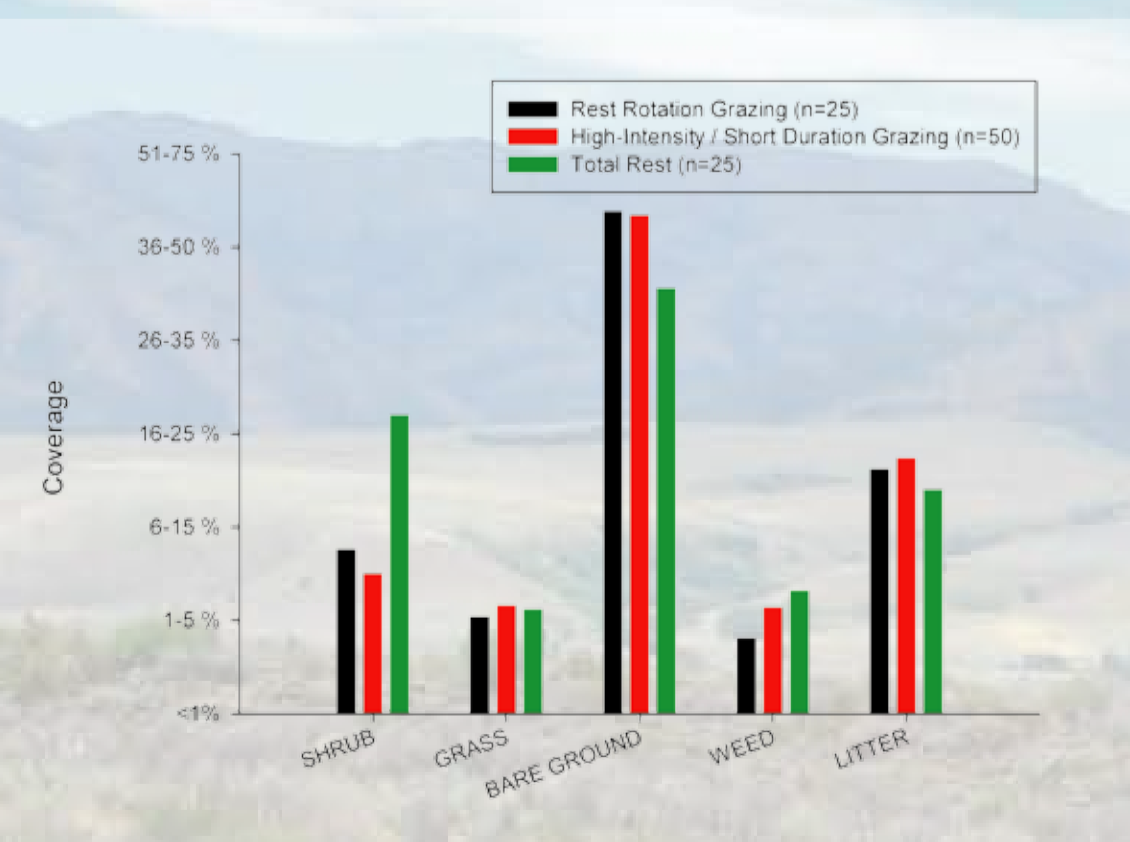
**Ground Control Platforms designed to improve geo-registration of images**

**Hand-held soil moisture sensor (measurement of the spatial distribution of soil moisture)**

**Bulk-density infiltrometer (soil compaction analysis)**

## Preliminary Results

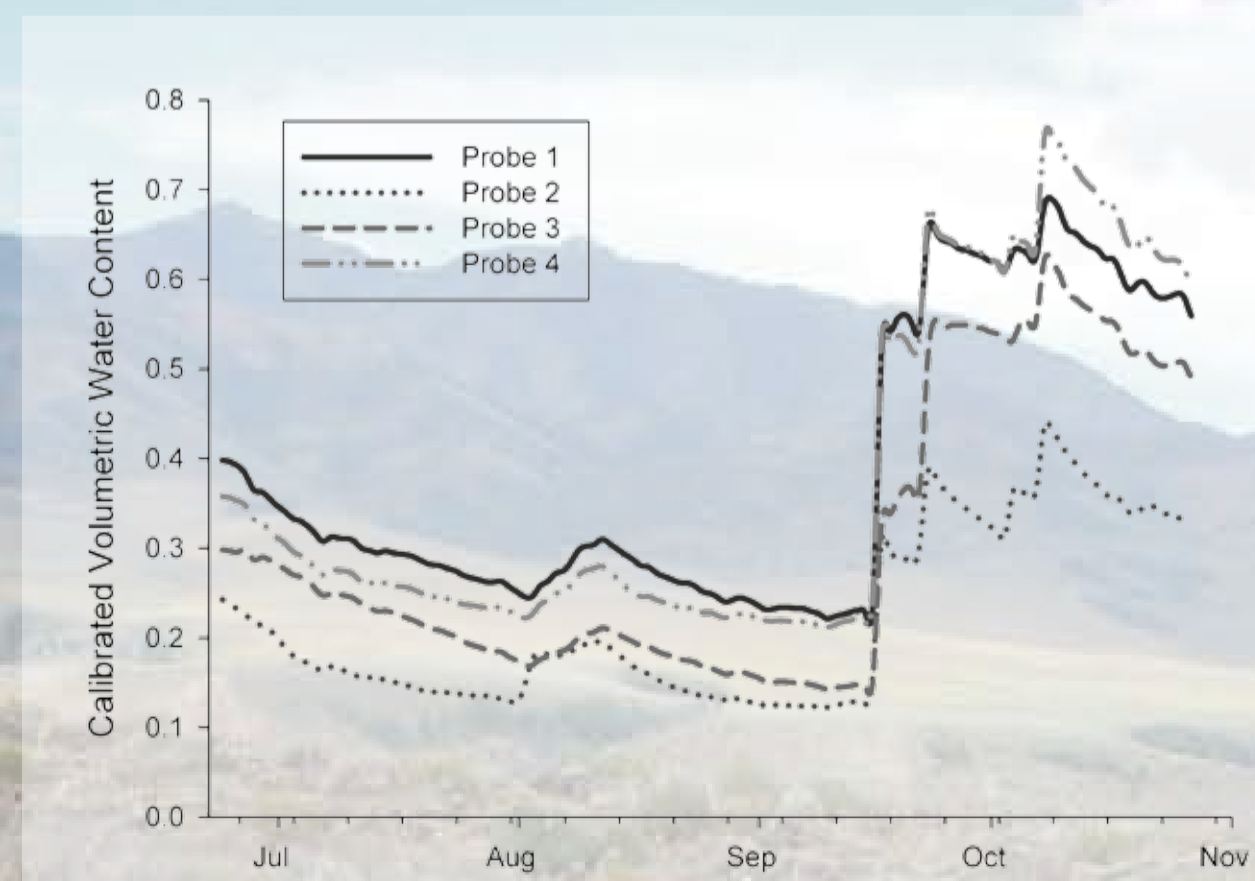
### Pre-treatment vegetation inventory at the O'Neal study area



Results from vegetation sampling in 2005 using randomly located plots within each treatment.

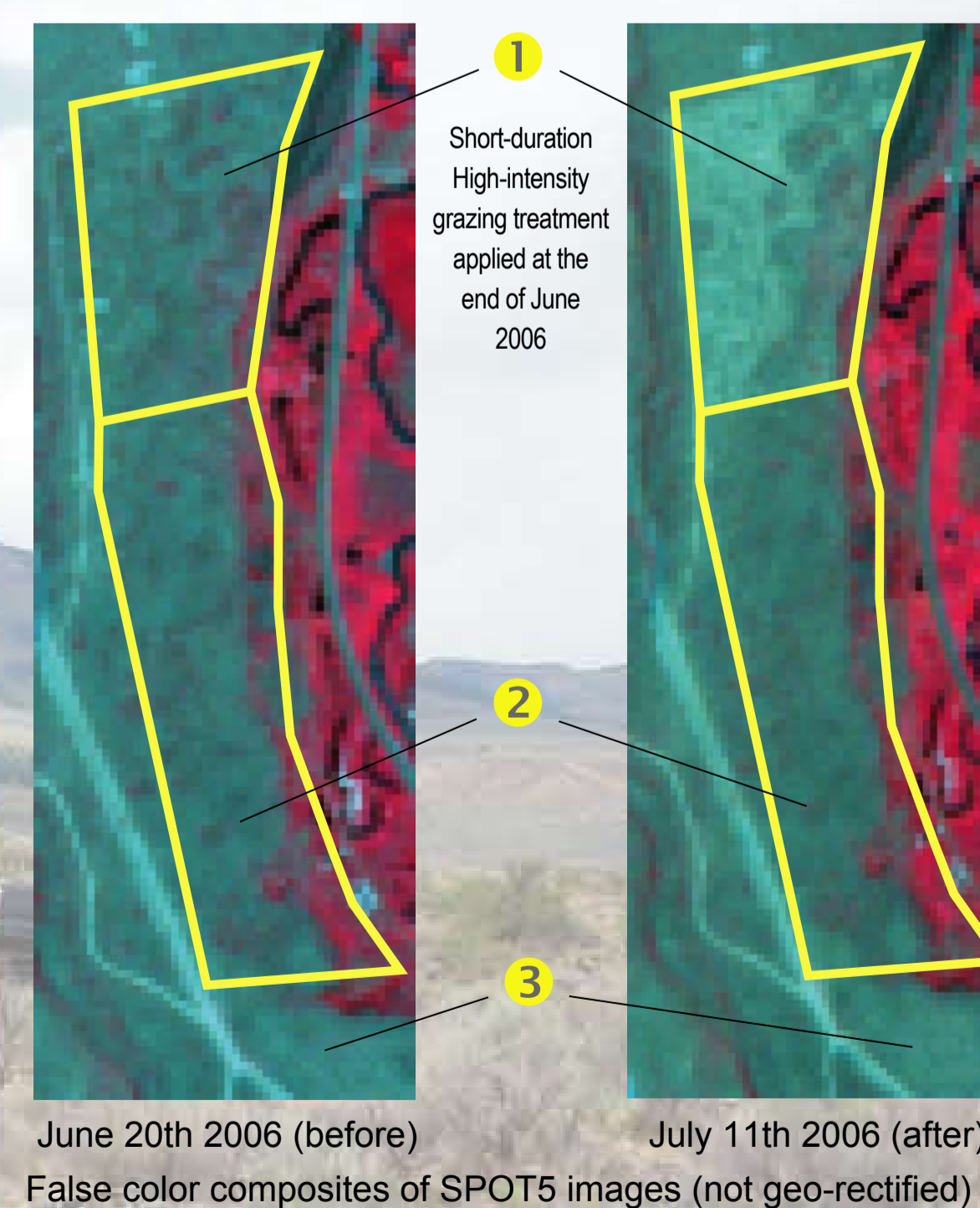
Preliminary analysis showed no statistical differences between vegetation coverage over the O'Neal study area before grazing treatments.

### Soil Moisture Monitoring



Daily averages of soil moisture at four random locations. Data from 4 probes (36 available) are presented here.

### Grazing treatment in 2006 at the O'Neal study area (site 1)



June 20th 2006 (before) July 11th 2006 (after)  
False color composites of SPOT5 images (not geo-rectified)

## Timetable

- 2006**
  - Begin imagery acquisition
  - Field equipment installation
  - Begin environmental monitoring
  - Begin field work
- 2007**
  - Complete review and selection of health indicators
  - Complete 1<sup>st</sup> version of health indicator models
- 2008**
  - Validate and revise indicators and modeling techniques
  - Complete a 1<sup>st</sup> Version of the rangeland health model
  - Complete manuscripts submission in peer-reviewed journals

## Collaborators

**Corey Moffet**, US Sheep Experimentation Station, USDA  
**Bhushan Gokhale**, GIS Training and Research Center, Idaho State University  
**Concepción L. Alados**, Instituto Pirenaico de Ecología, Spain

## Partners

