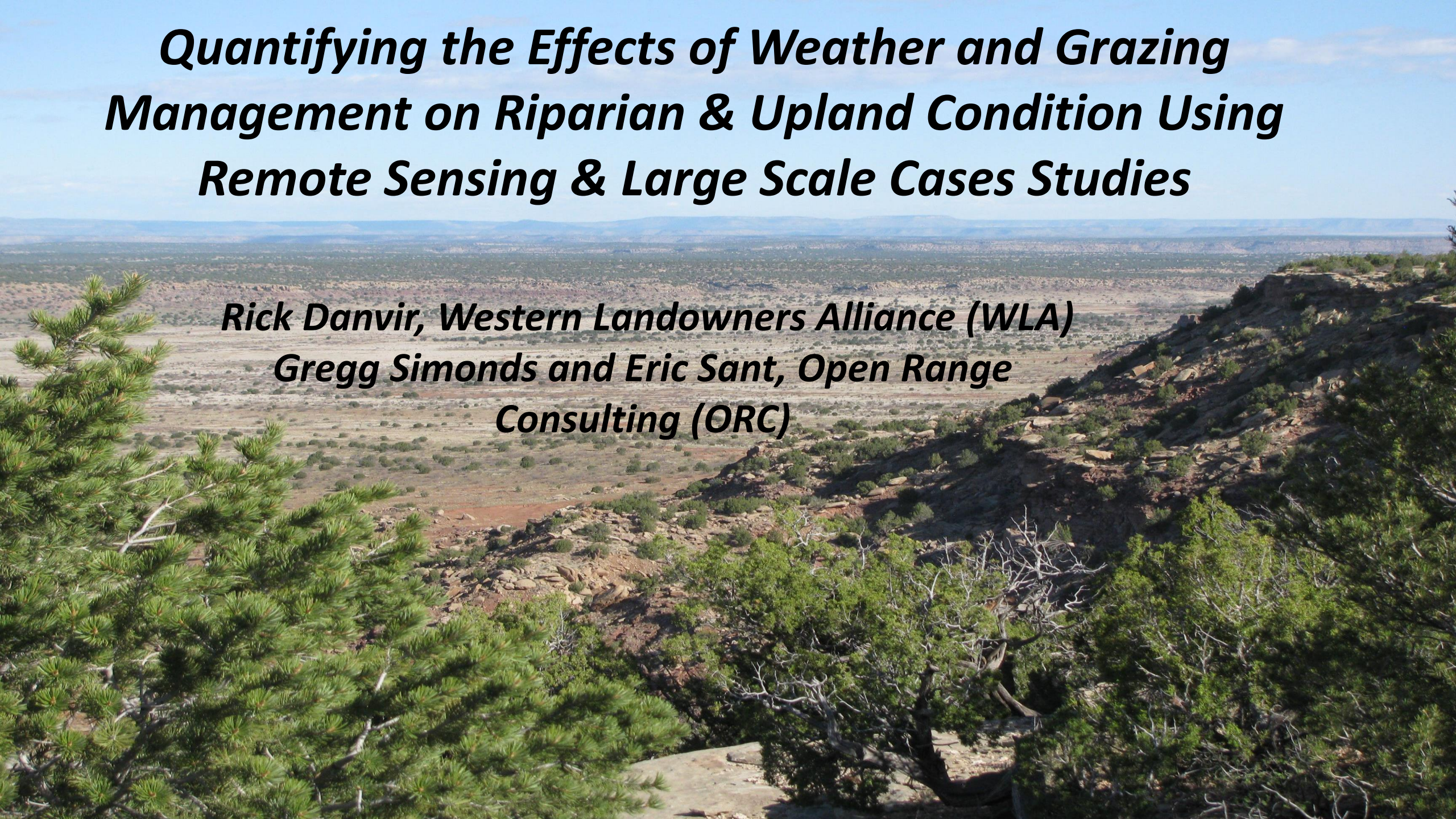
Quantifying the Effects of Weather and Grazing Management on Riparian & Upland Condition Using Remote Sensing & Large Scale Cases Studies



Rick Danvir, Western Landowners Alliance (WLA)
Gregg Simonds and Eric Sant, Open Range Consulting (ORC)

Does grazing style really matter? Can upland and riparian cover values be improved using rotational or Strategic Grazing Mgt (SGM)? Results of a New Mexico study…

- SGM ranches had significantly **less upland bare ground** and **greater riparian vegetative cover** than non-SGM neighboring lands.

- Upland bare ground cover on SGM ranches was comparable to pastures rested 3+ years.

- **Soil organic and water infiltration** were greater under SGM than Continuous Stocking (***CS***) or multi-year rest.

Sampled four eastern New Mexico ranches

- Selected four ranches of various sizes managed with strategic grazing planning & management principles for ten or more years (*often called rotational or time-controlled grazing*)
- Neighbors primarily grazed more traditionally (continuously or season-long)
- *Danvir et al. 2018. Published in **Rangelands**, Vol. 40*

The Ranches:
(field work conducted in 2015 –very wet year)

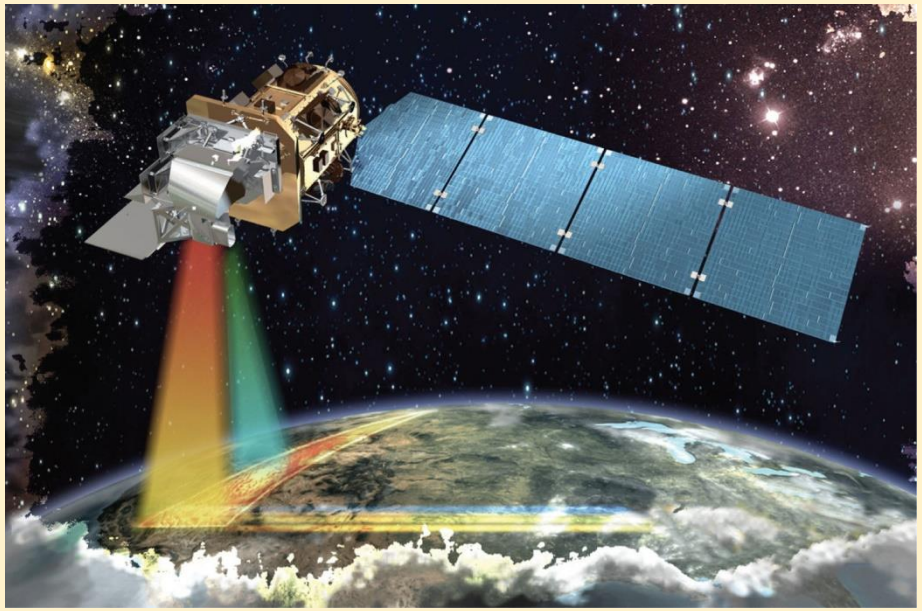
SGM Subject Ranches:

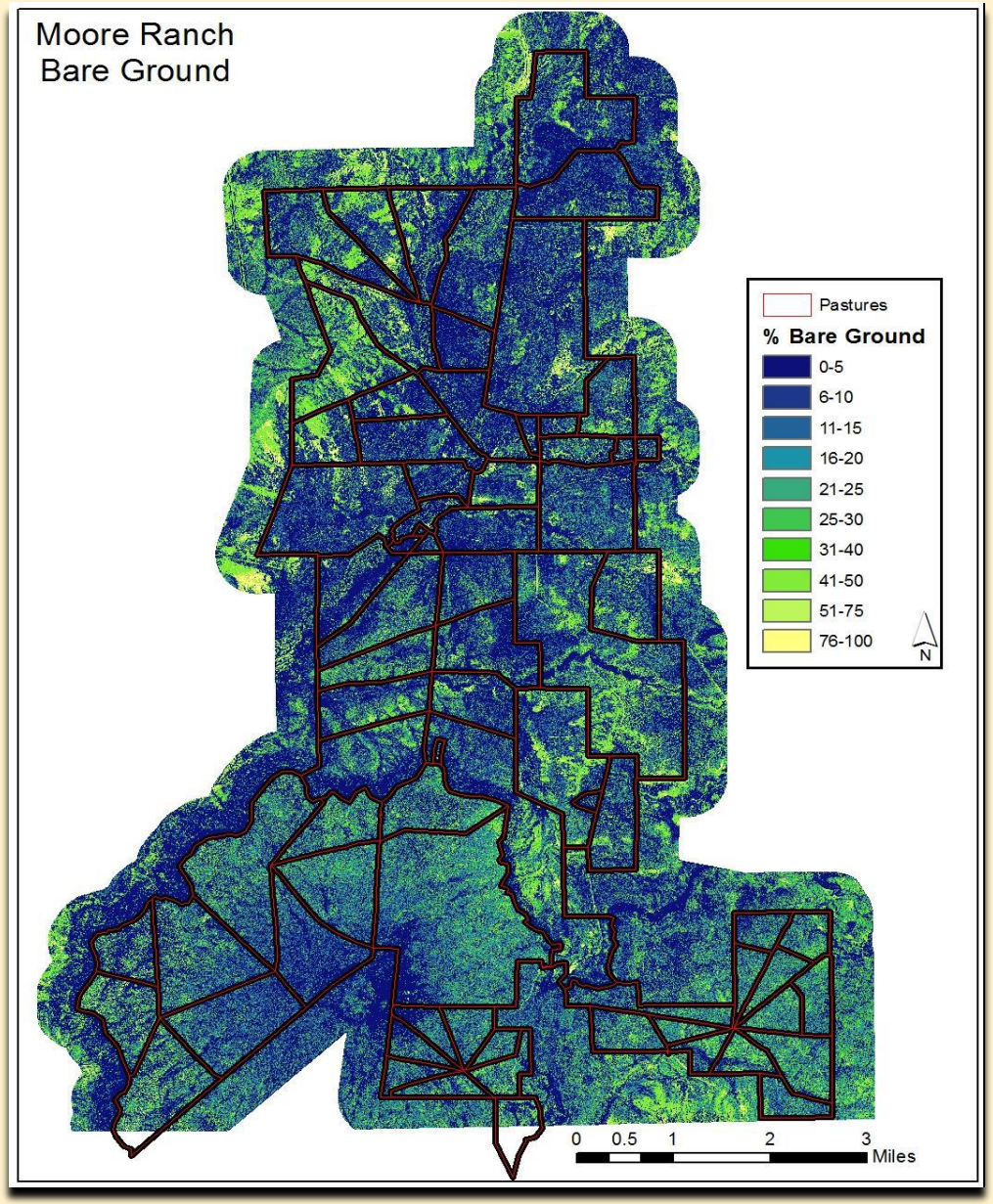
- Ranged in size from 7,000-60,000 acres
- Each herd rotated through 10-30 pastures/year
- Pastures grazed <15 days, recovering 3-12 months
- Pastures **grazed ≤ 10%, recovering ≥ 90%** of each year
- Max stocking rates 30-60acres/Animal Unit *(cow/calf)*

Neighboring Ranches:

- Continuously or seasonally stocked (*1-3 pastures/herd*)
- Some pastures rested 3+ years due to recent drought
- Similar range of stocking rates (40–60acres/AU)

ORC used machine learning to correlate GBVP and 0.5 m satellite imagery.

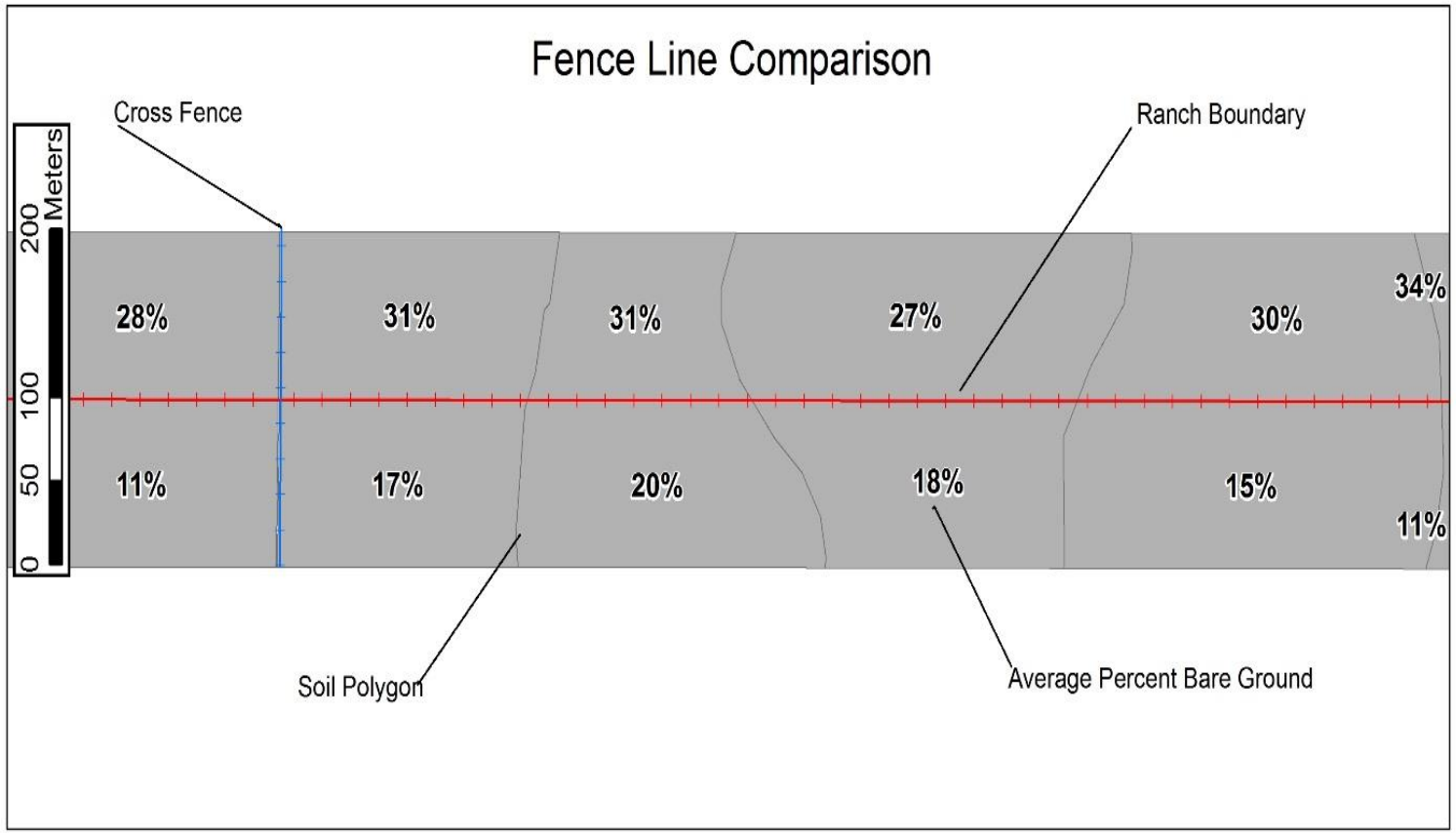


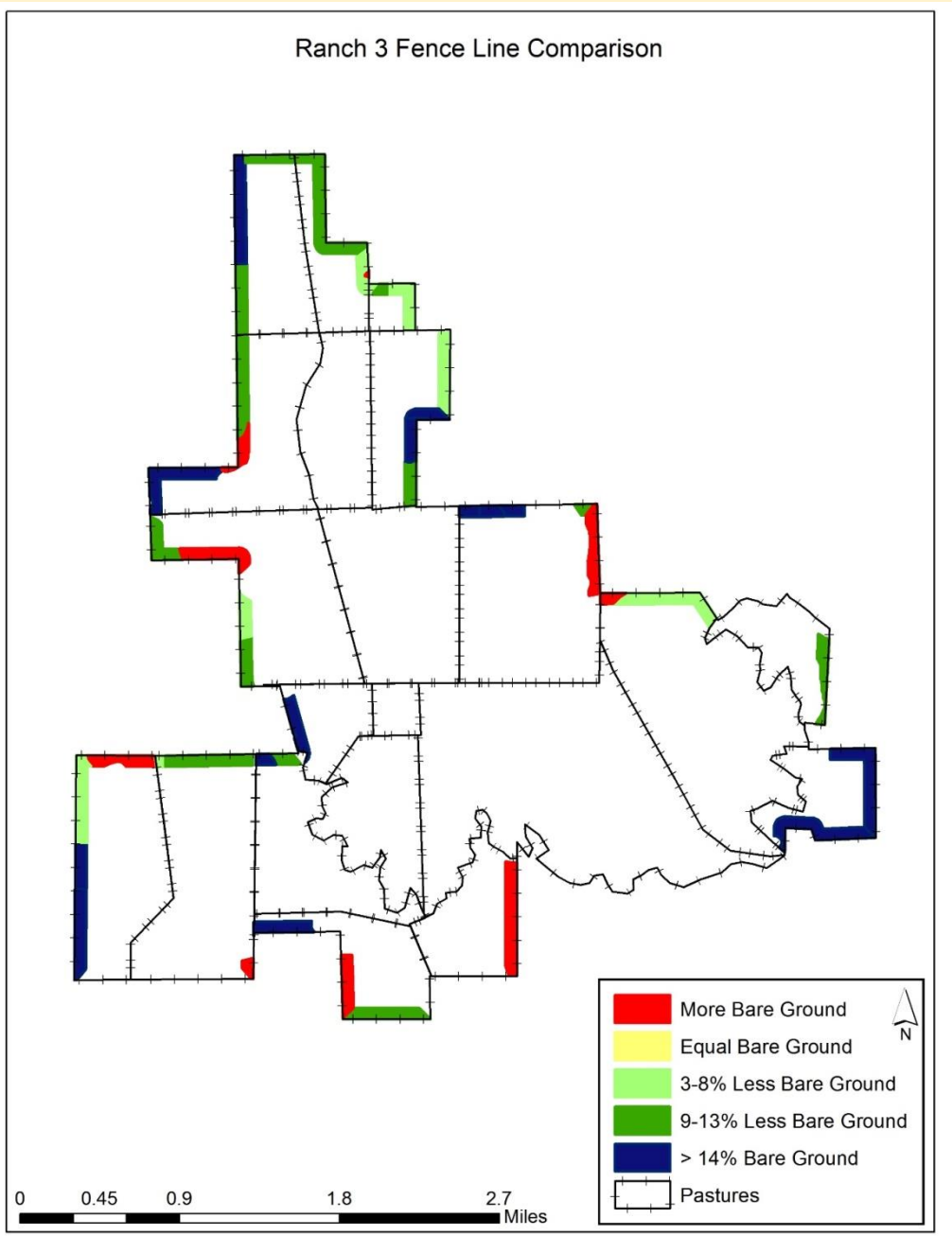


Then created continuous cover data sets for each ranch

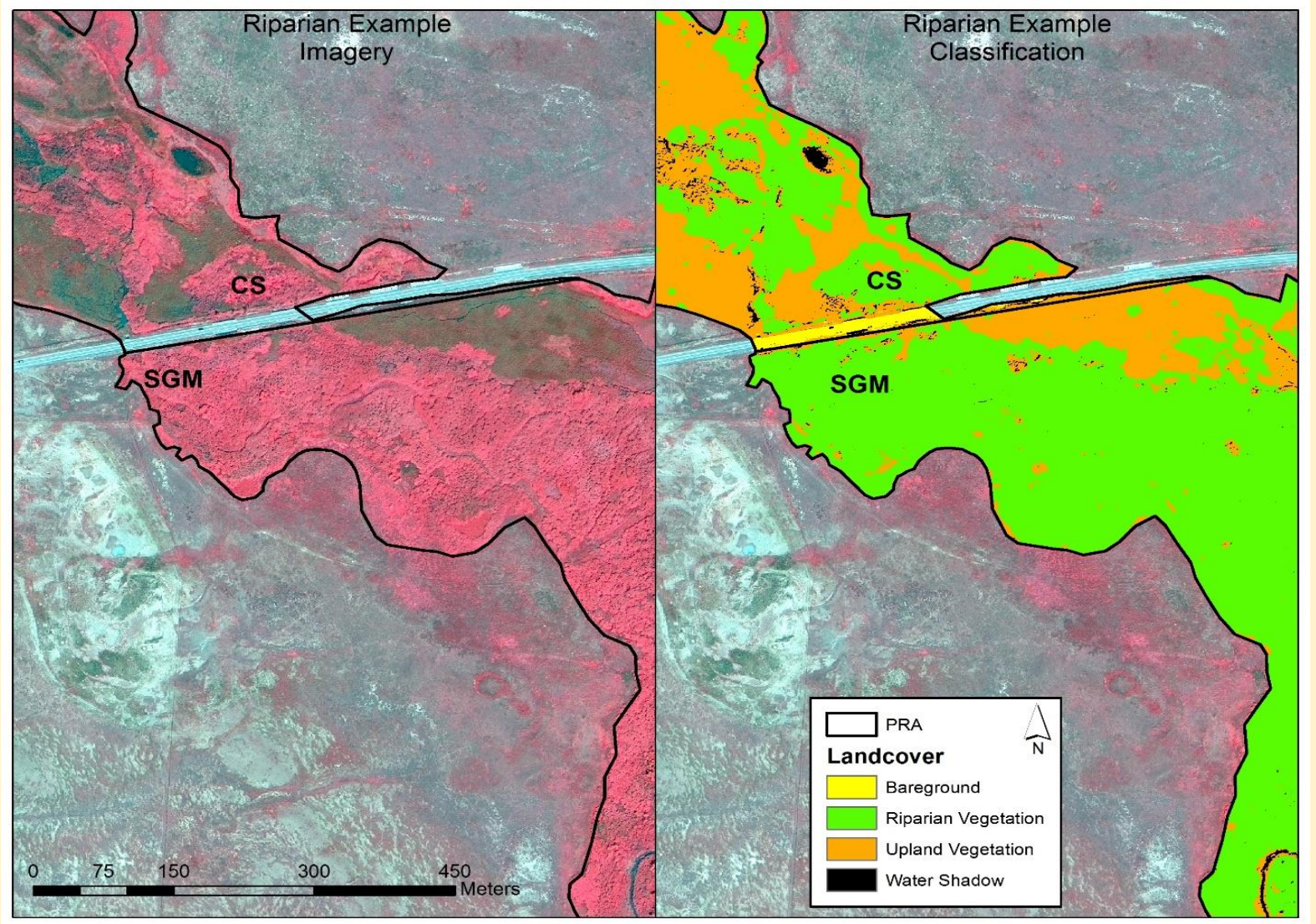
Compared cover on paired polygons of same-soil type on 100-m-wide strips along the inside & outside of ranch boundaries

- Adjoining (paired) polygons of same soil types
- Since adjoining polygons experienced same weather, cover differences were attributed to management





Determine potential riparian area (PRA) and % riparian vegetative cover



PRA determined using Pleaides infra-red (CIR) imagery, self-learning software, elevational and topographic layers and visual interpretation

Results…

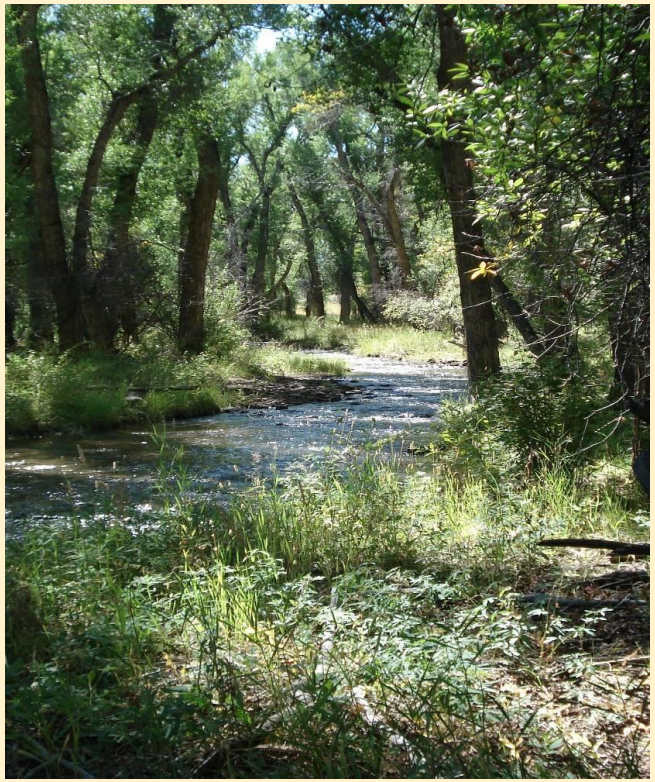
Upland sites**:** *(comparing paired soil polygons)*

All Ranches Combined:

- SGM ranches had **13% less** bare ground than non-SGM neighboring lands

Ranch Three Alone:

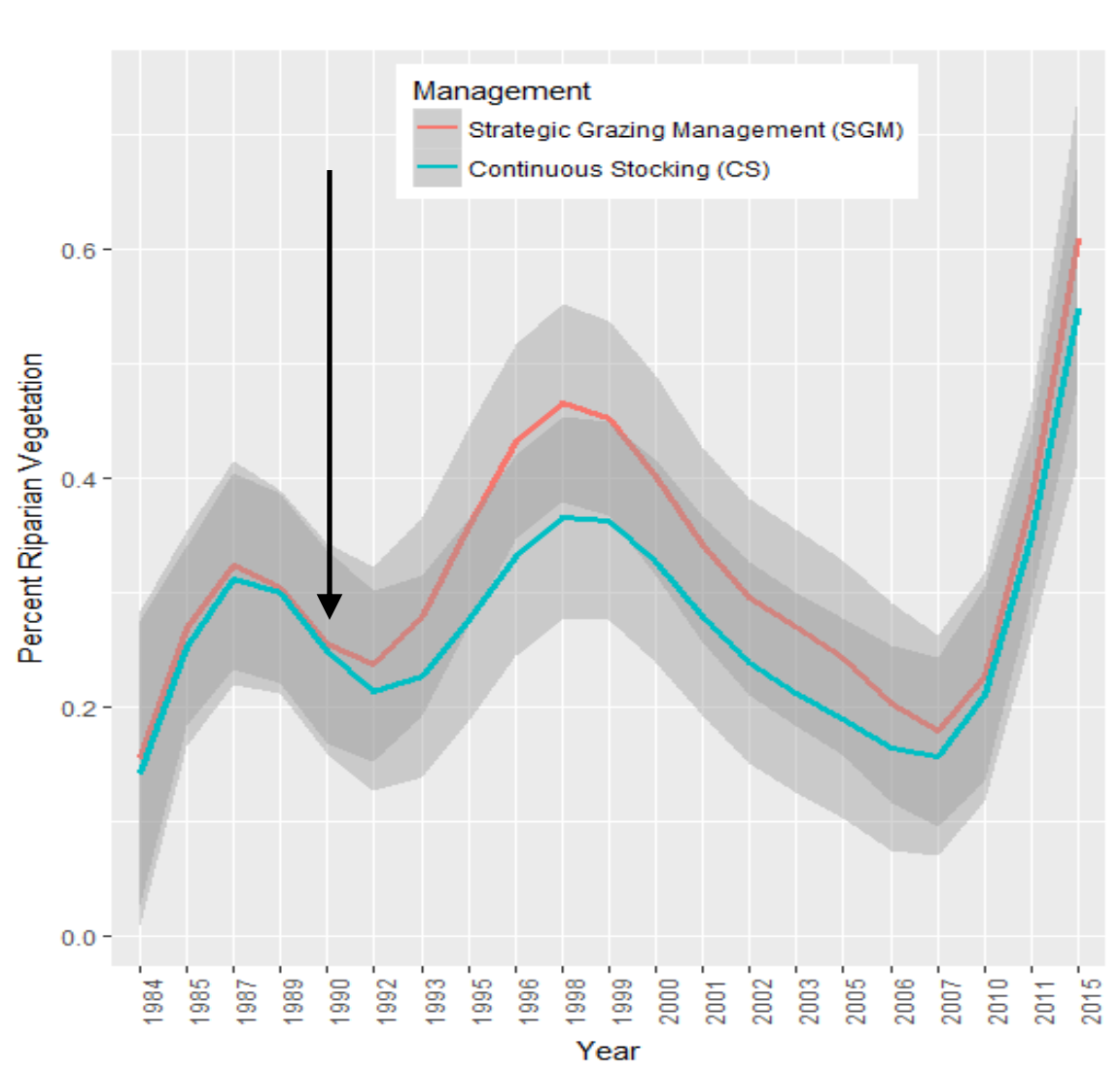
- SGM **27% less** bare ground than CS
- SGM **9% less** bare ground than 3+ years of rest

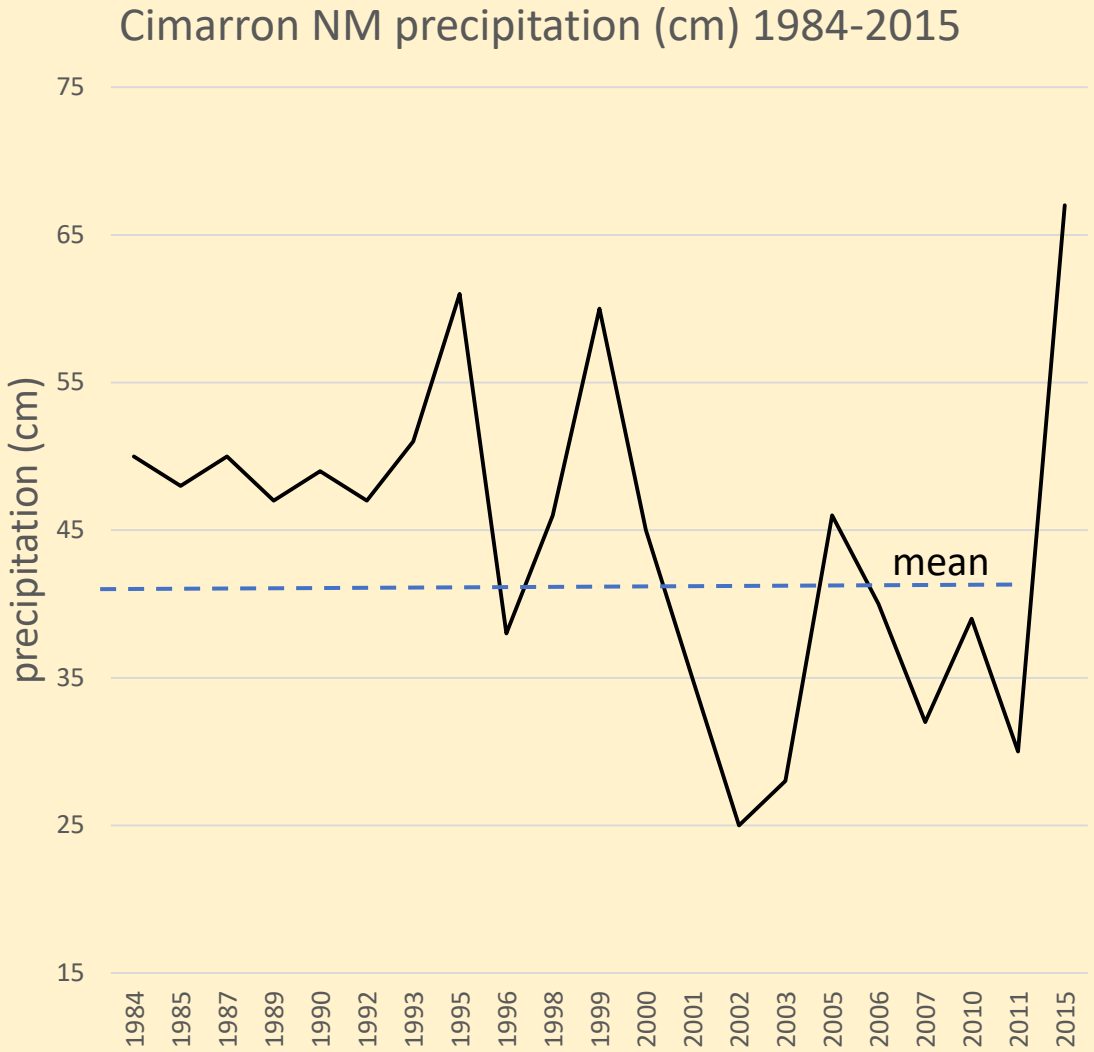


Riparian areas**:** *(paired polygons)*

- SGM **19% more** riparian vegetation than non-SGM

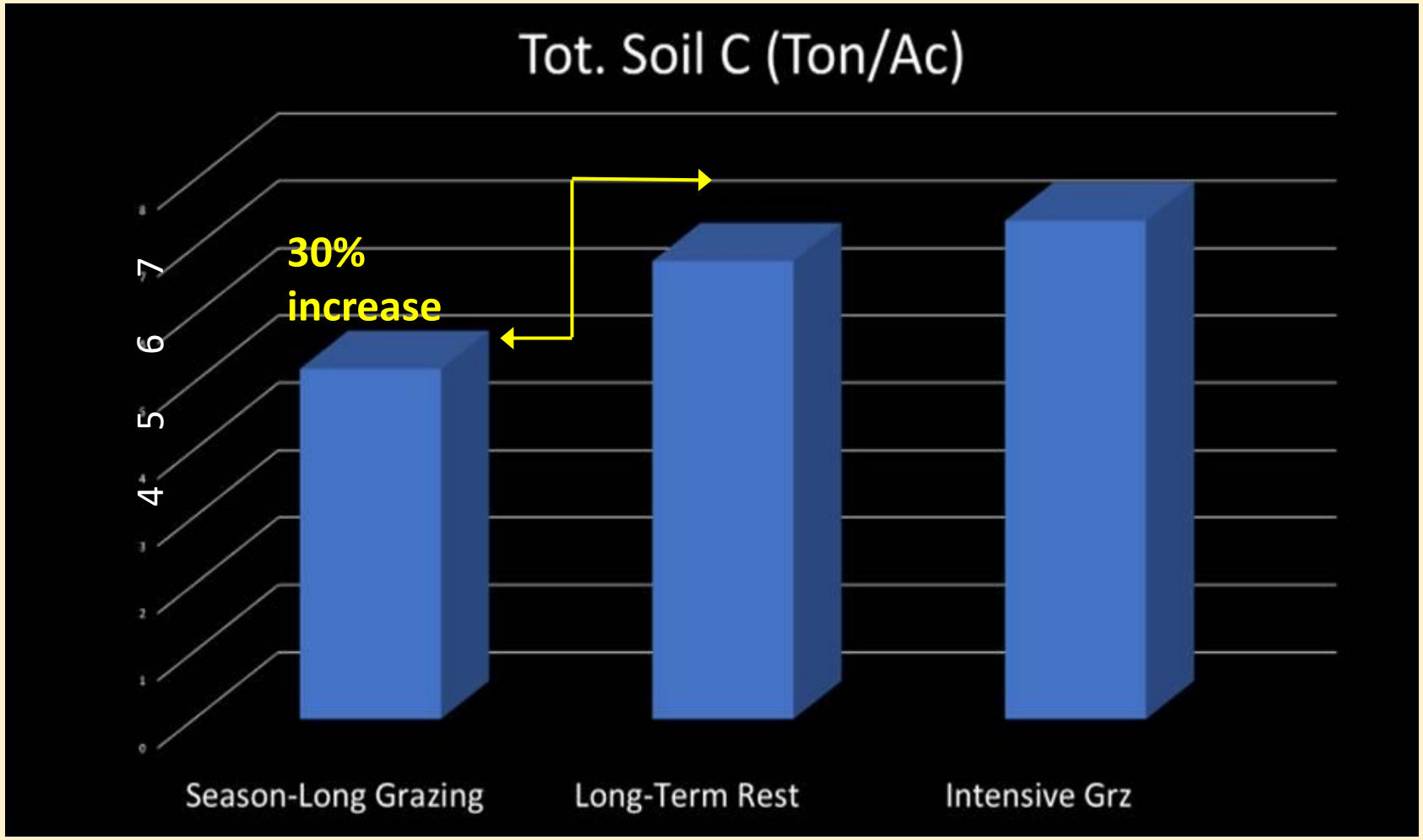
Riparian trend comparison, 1984-2015





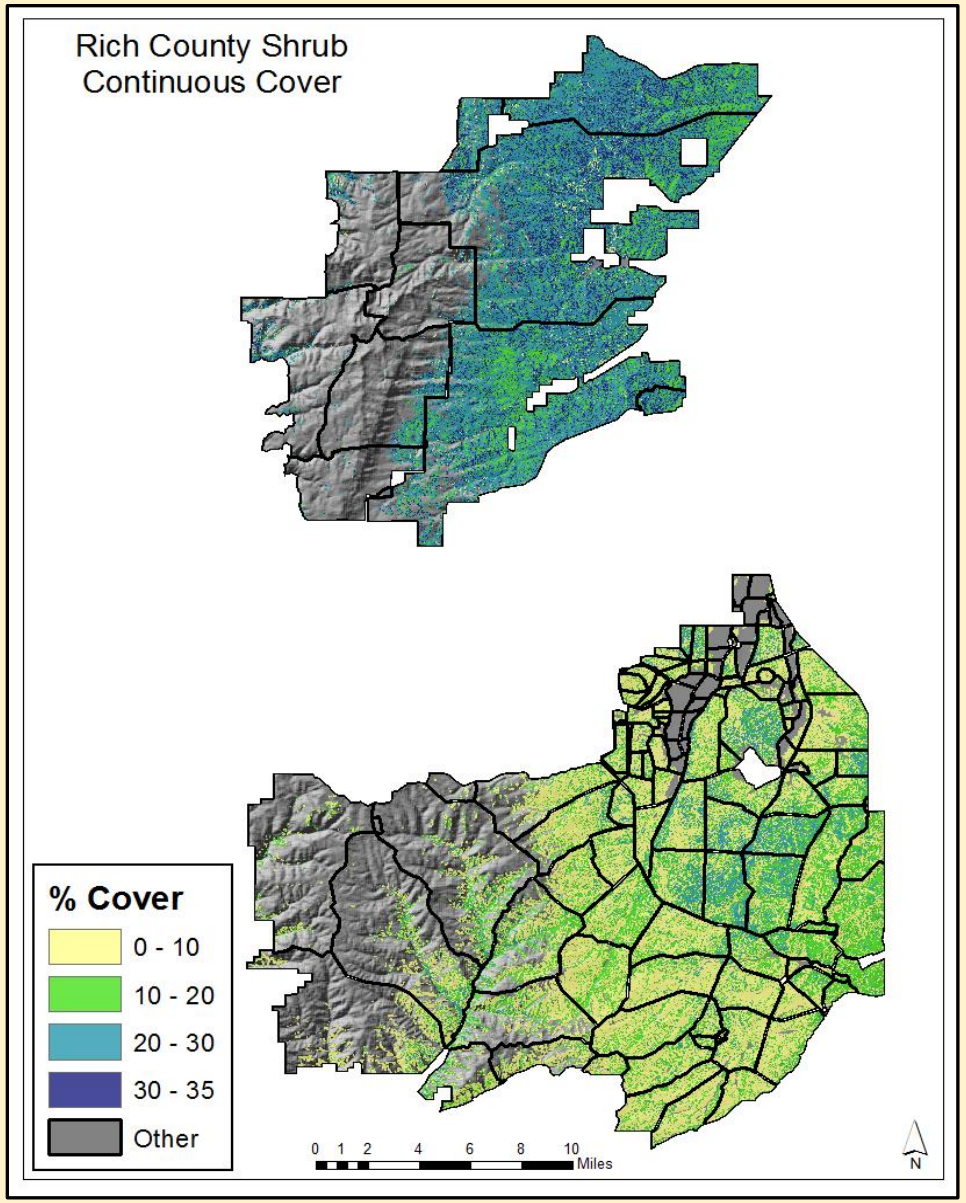
Illustrates importance of long-term trend monitoring

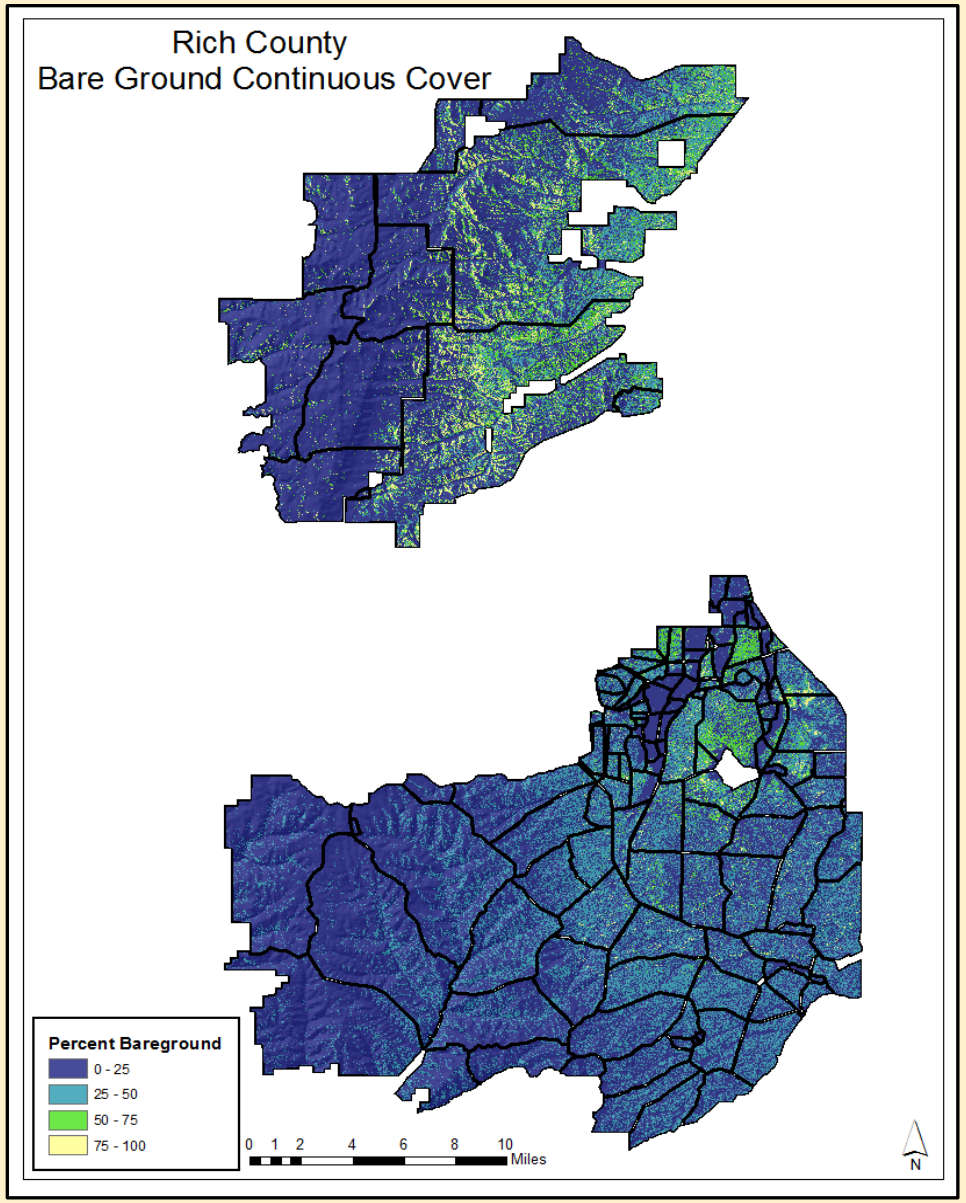
Paired-plot sampling on Ranch Three suggests Soil Carbon increases as bare ground decreases



Water infiltration rate also 2X faster on SGM than CS or Rested Pastures

Compared Grazing Effects on Paired Landscapes In Northern Utah.





Open Range Consulting

Compare Riparian Vegetative Cover 1976 vs. 2006

Grazing strategy	% Increase Riparian Vegetation	% PRA (Potential)
SGM	**38%**	**72%**
Season-long	**9%**	**28%**

Upland comparison: Semi-desert loam soil

Grazing Mgt	% Bare Ground	% Shrub	% Litter	% Herbaceous
SGM	26	17	32	24
Season-long	38	24	22	14

***30%** less bare ground & **40%** more herbaceous cover under SGM*

Conclusions

- Riparian and upland cover values were greatest on lands providing long periods of grazing recovery (rest) interspersed with periodic grazing. *(**Grazing** and **rest** are complimentary…)*
- Strategically (rotationally) grazed lands improved land cover characteristics while also producing grazing revenue.
- Management proficiency and weather both influence land health.

Thanks to the participating ranchers, WLA, ORC and the Thornburg Foundation.