

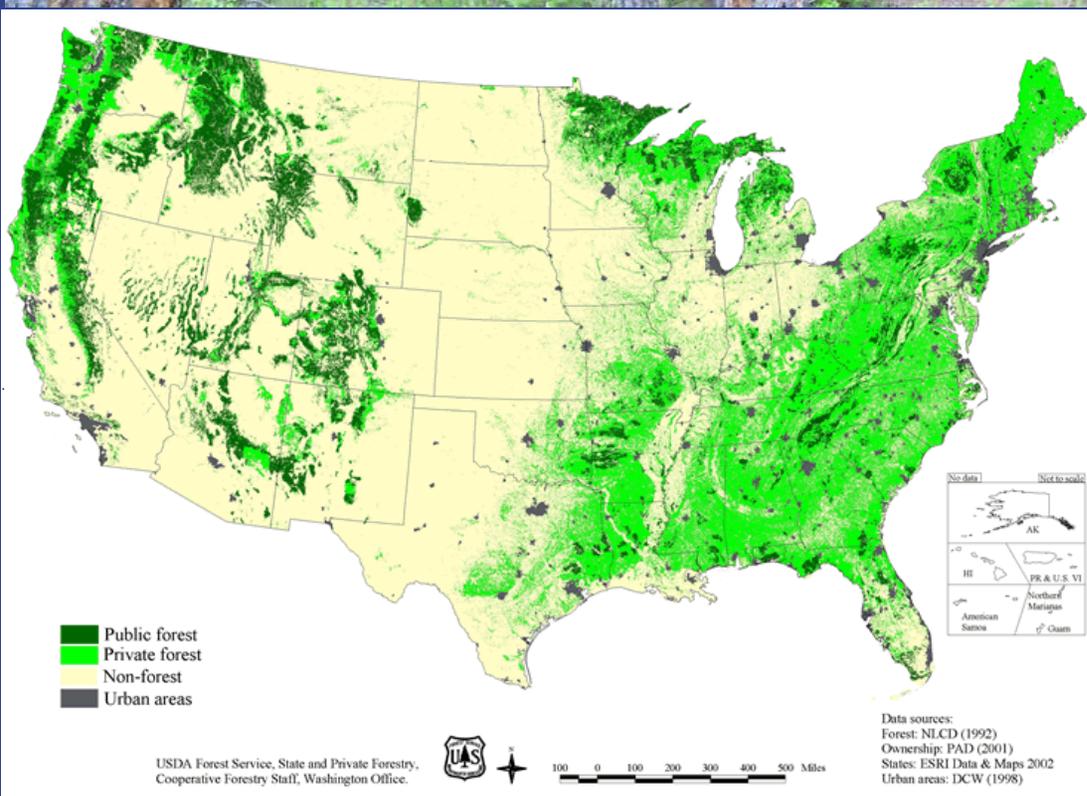
Identifying Relationships Between Long-Term Grazing Practices And Resource Condition In the Central Black Hills

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Forested lands are a substantial portion of US grazing lands



Forested grazing land

Private ~ 23 million ha

~ 10 % of all private grazing land

Public ≥ 20 million ha

≥ 20 % of all public grazing land

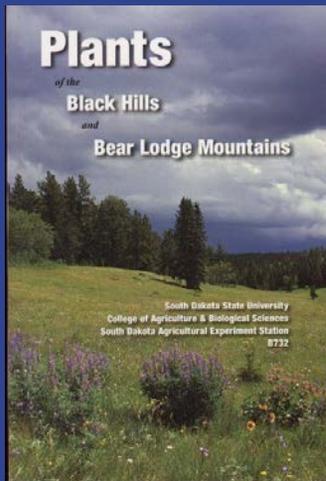
Combined ≥ 40 million ha

≥ 13 % of all grazing land

U.S. Department of Agriculture. 2009. *Summary Report: 2007 National Resources Inventory*

U.S. Government Accountability Office. 2005. *LIVESTOCK GRAZING Federal Expenditures and Receipts Vary, Depending on the Agency and the Purpose of the Fee Charged*

How do grazing management practices influence plant community composition, forage production, and ponderosa pine regeneration?



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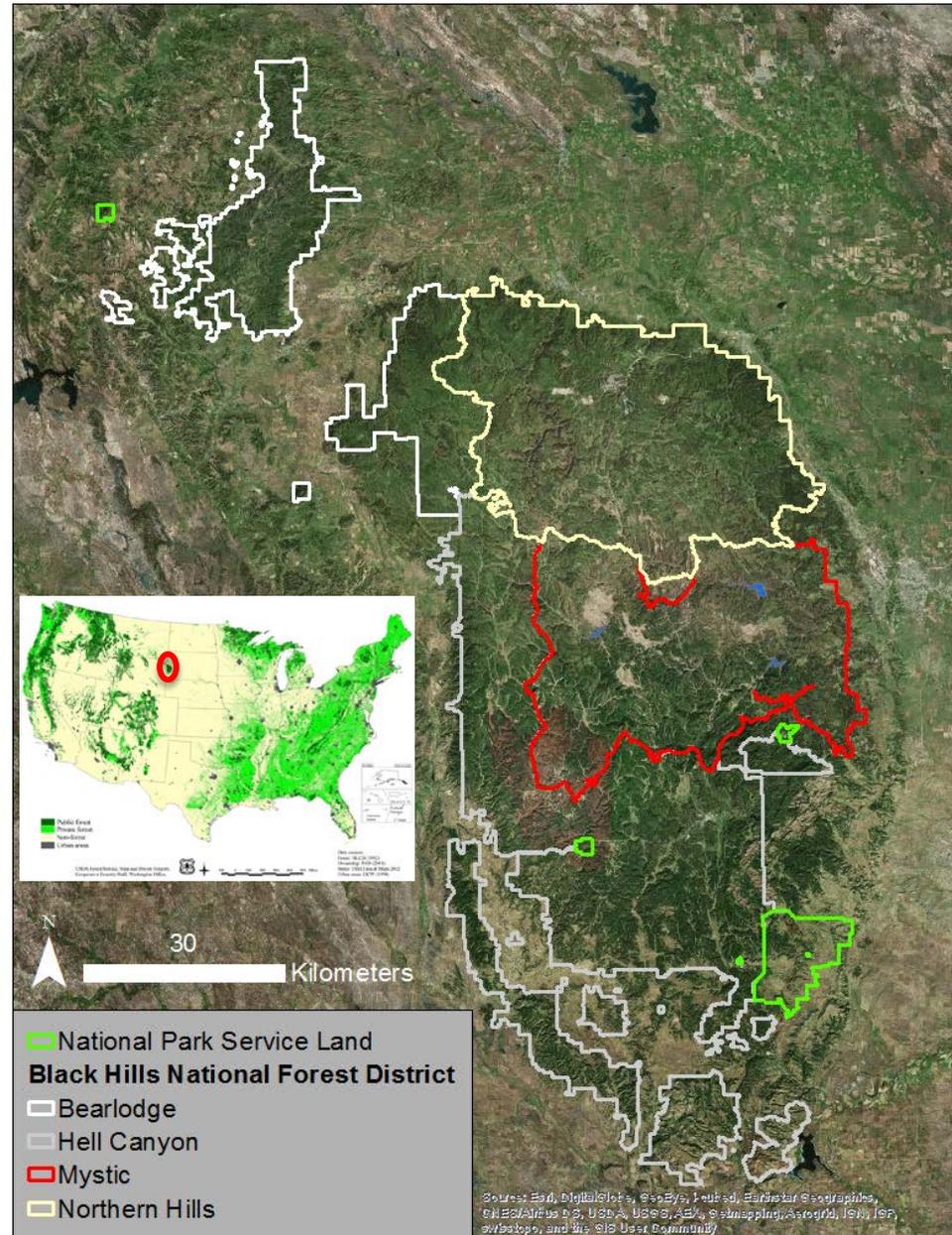
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The Black Hills



National Park Service photo

- 1.4 million ha
- 600,000 ha of ponderosa pine
- Extensive timber harvest and cattle grazing on both public and private lands



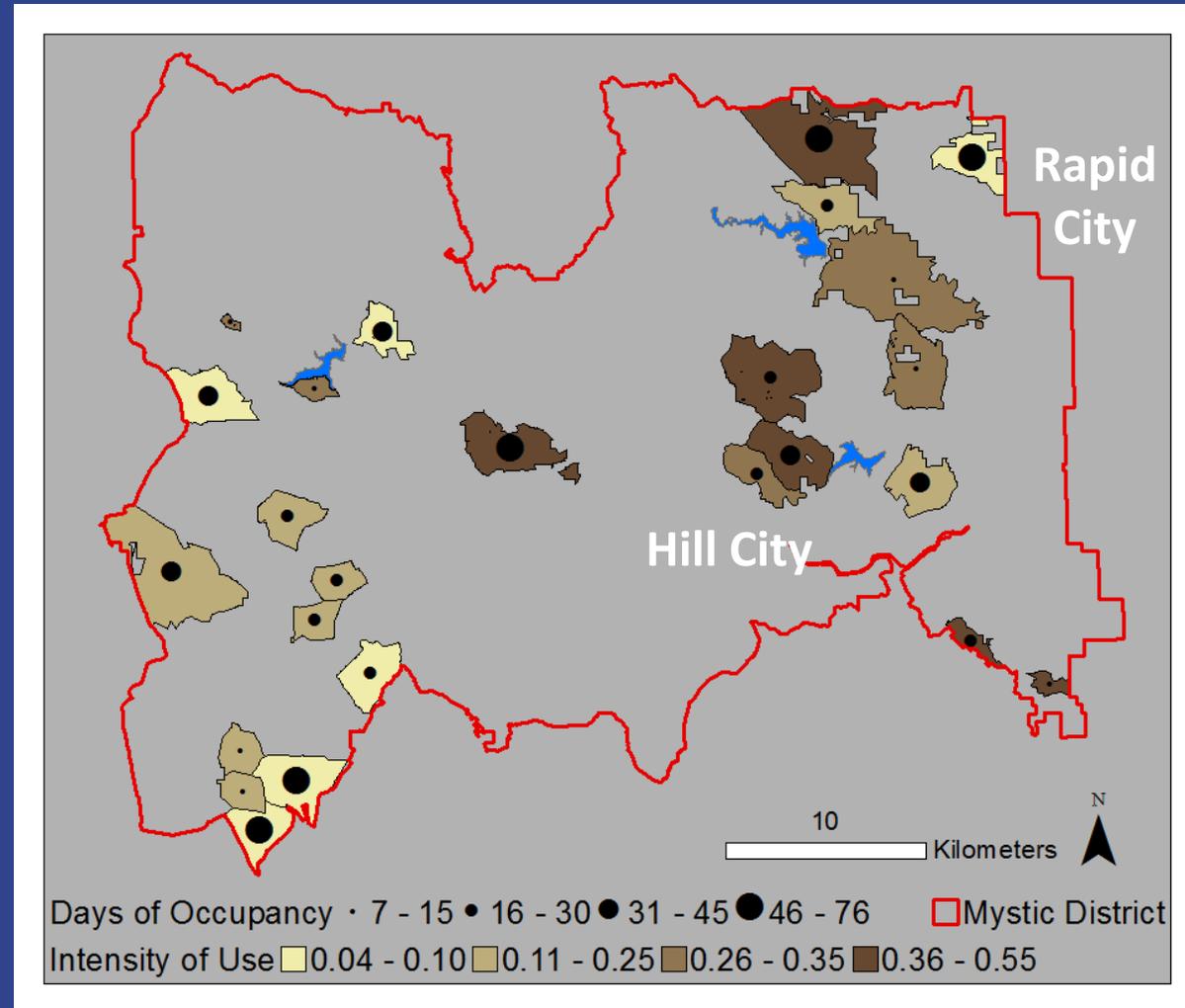
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Two management practices identified from USFS Annual Operating Instructions

Days of occupancy
number of days of
planned cattle presence

Intensity of Use
estimated production
divided by planned
cattle consumption



Measurements: Diversity, Production, Vegetation Structure, Regeneration

Meadow plots



Plant community
composition
1 m² quadrat



Herbaceous
production
1/4 m² hoop

Forest plots

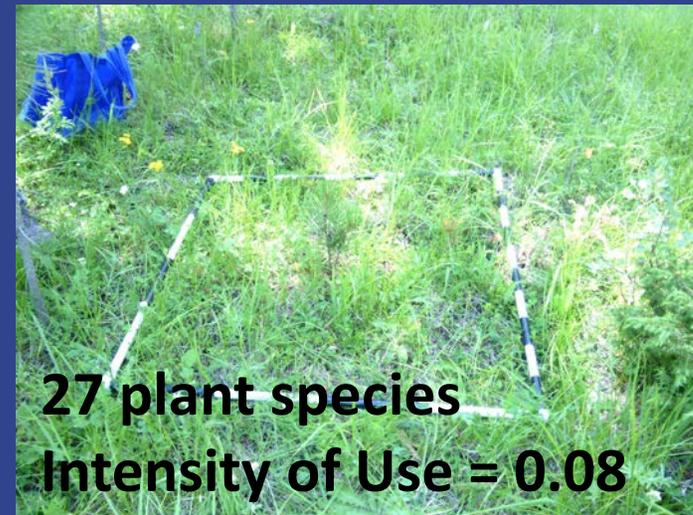


Vegetation
structure
200 m transect

Ponderosa Pine
regeneration
10 m radius circle



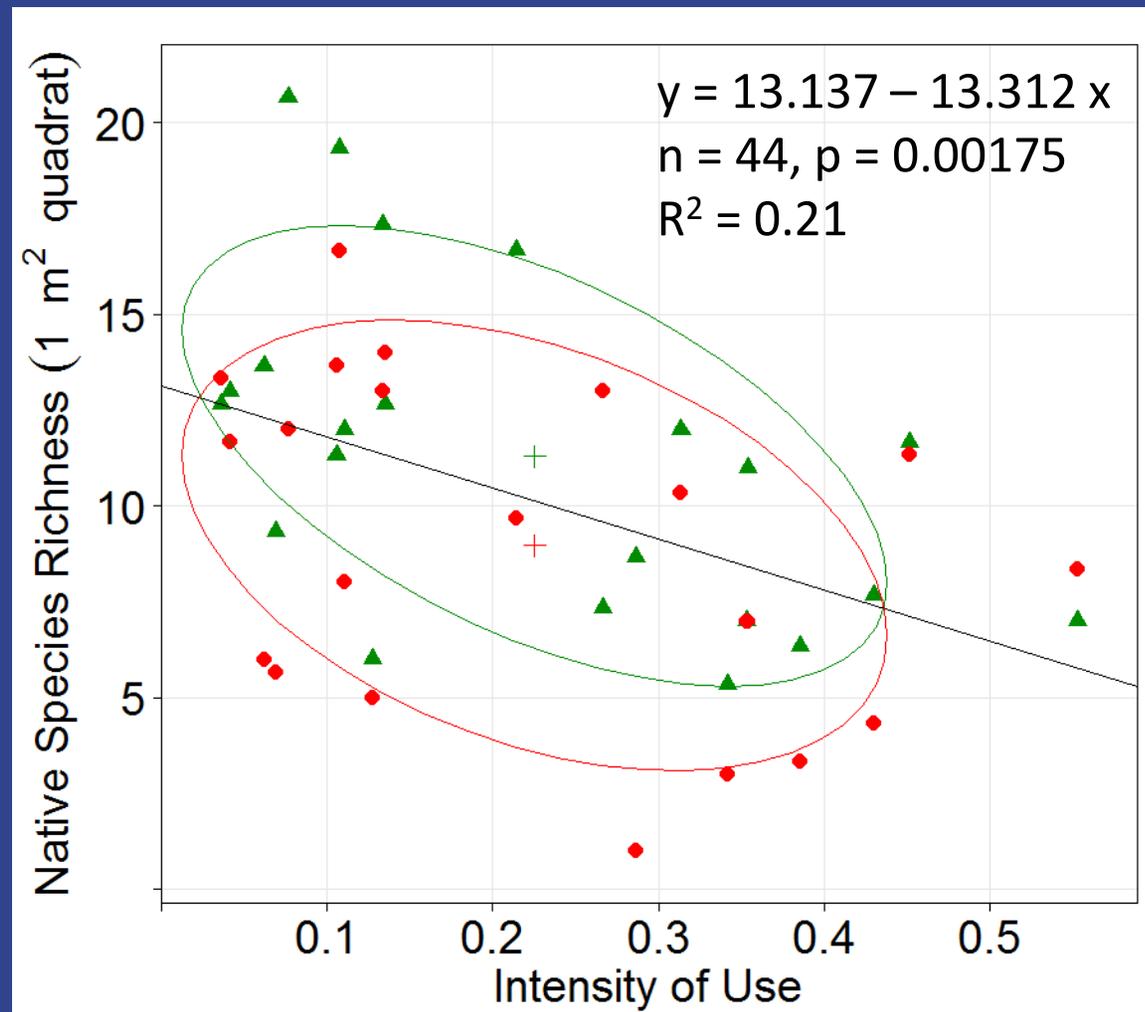
Diversity measured in 129 quadrats in 14 allotments & 22 pastures



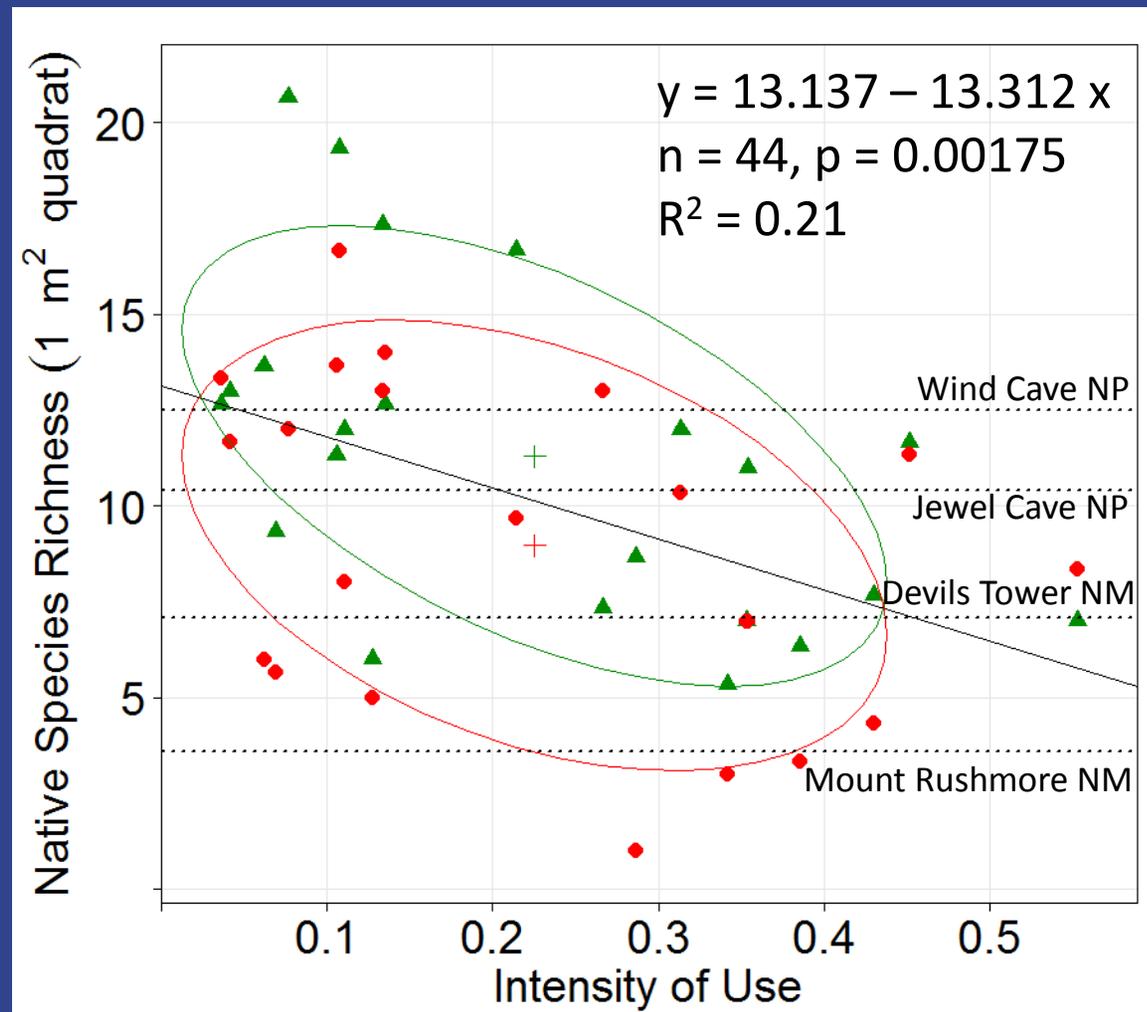
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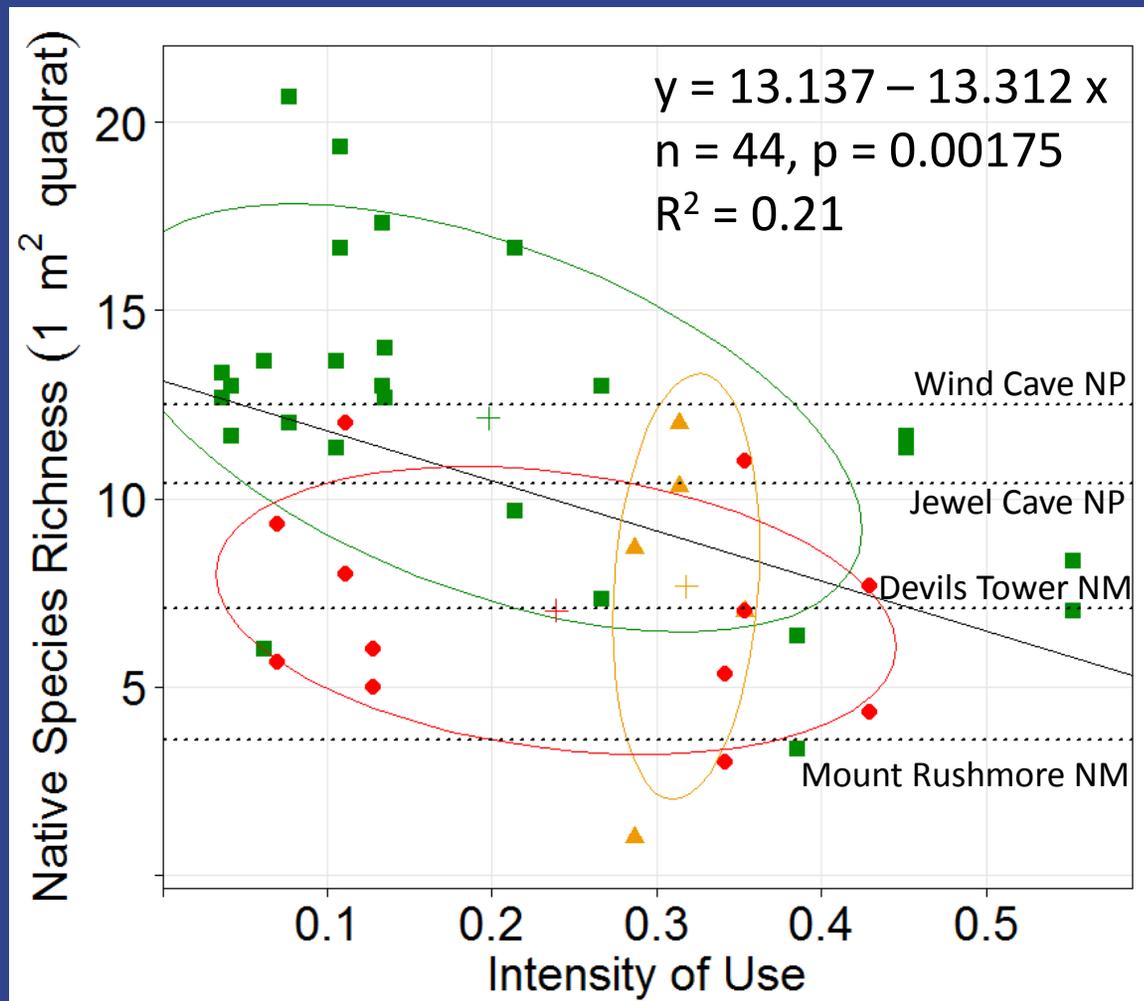
Species Richness negatively correlated with Intensity of Use



Species Richness negatively correlated with Intensity of Use



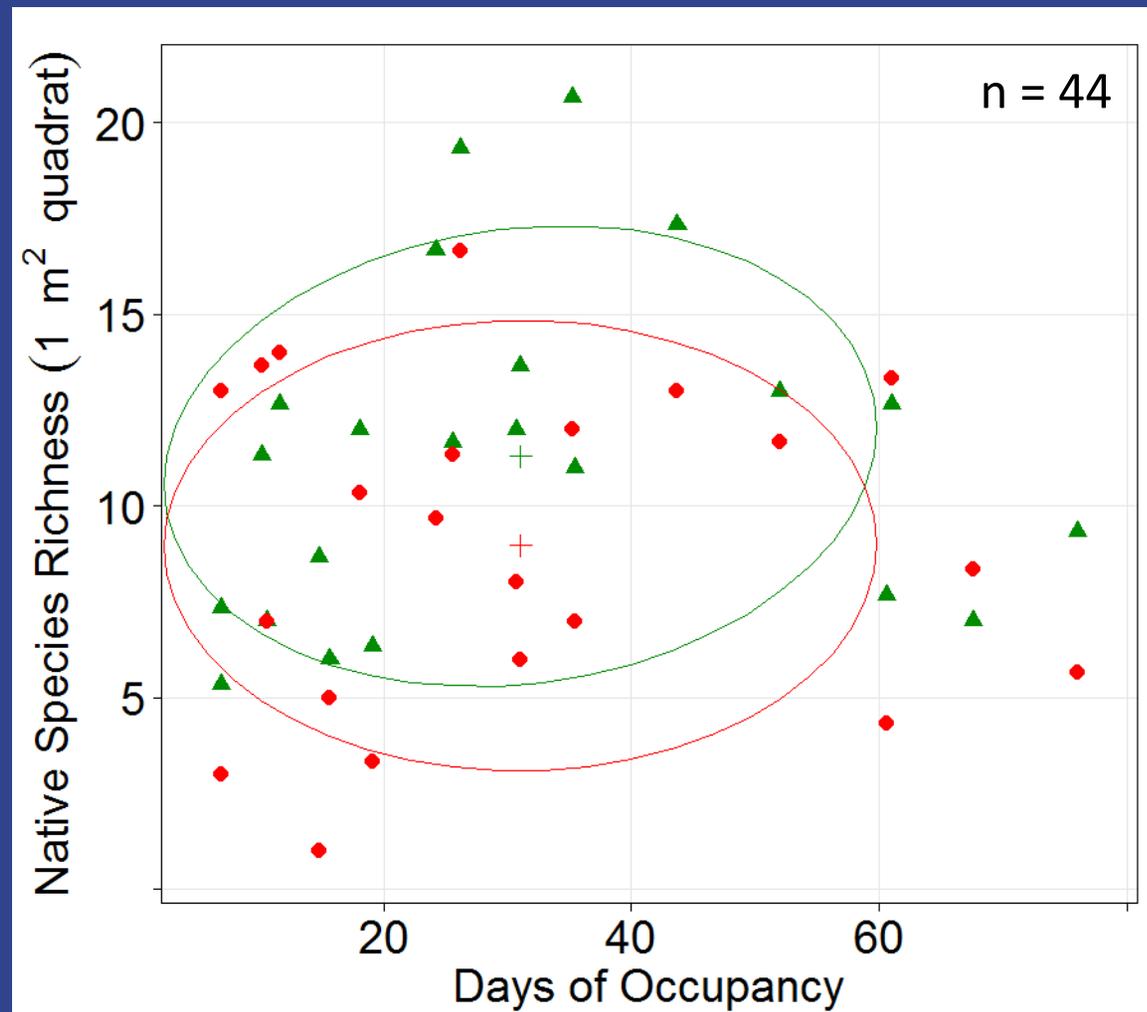
Species Richness may be related to timing of grazing



- Different time each year bimodal (Green square)
- Different time each year trimodal (Yellow triangle)
- Same time each year (Red circle)



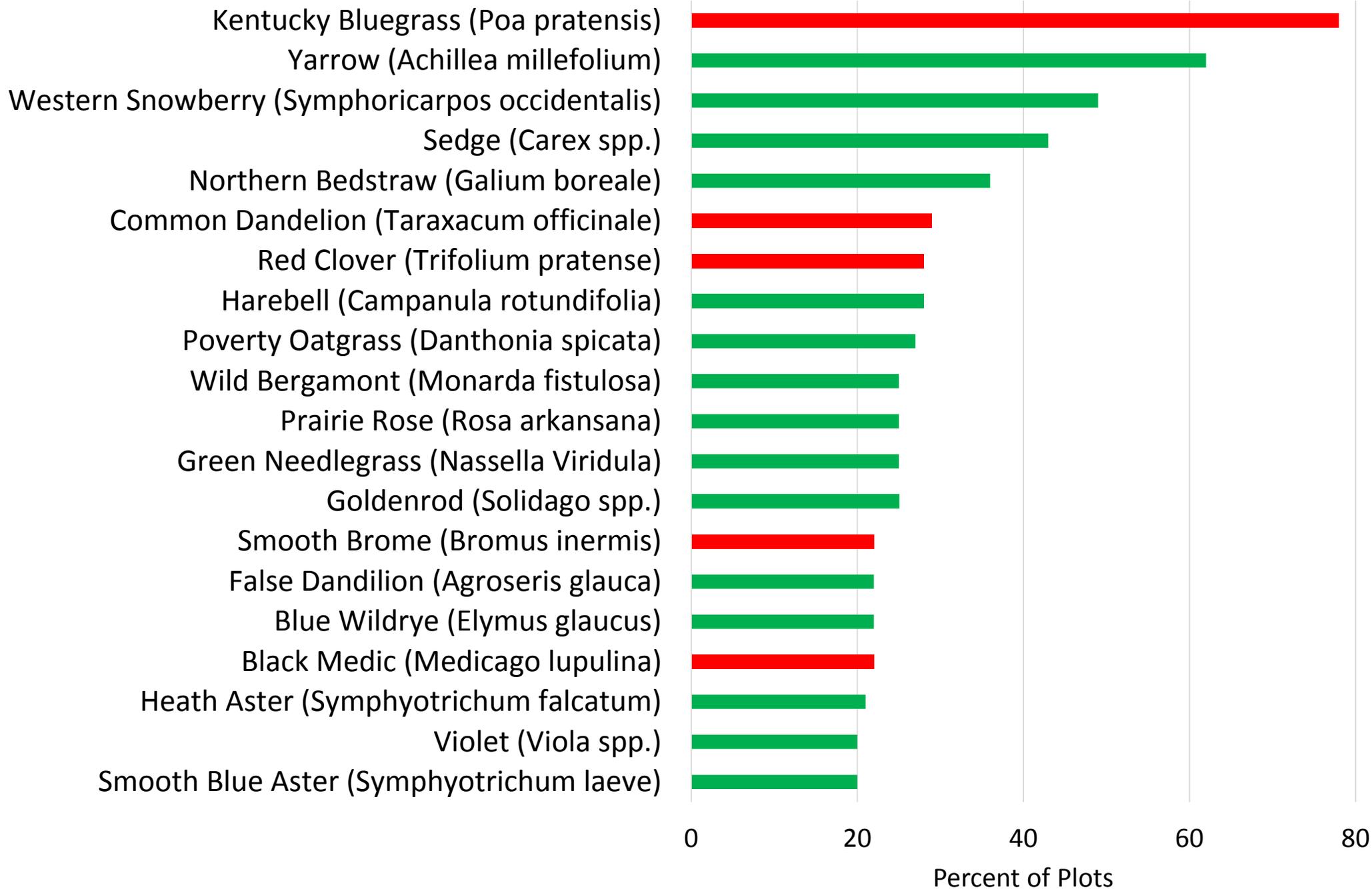
No relationship between Species Richness and Days of Occupancy



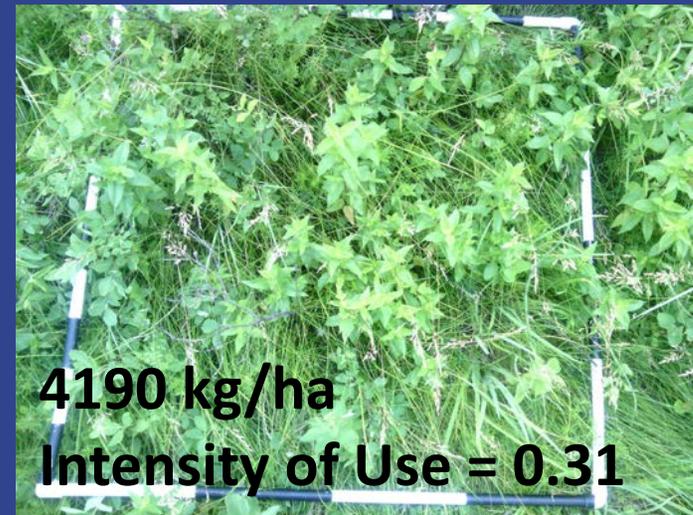
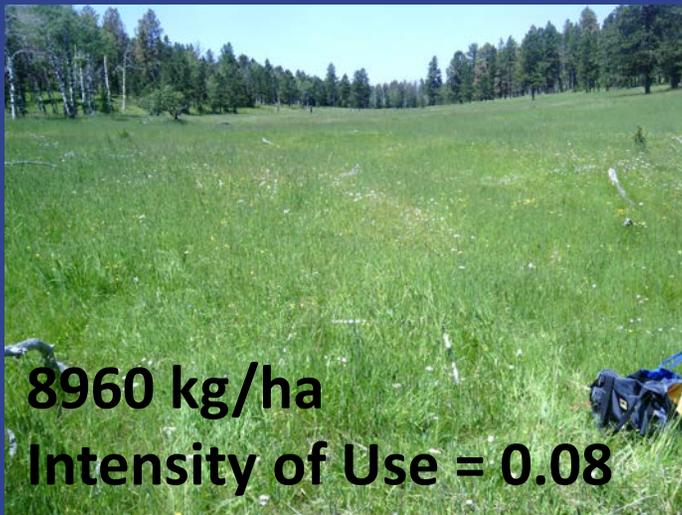
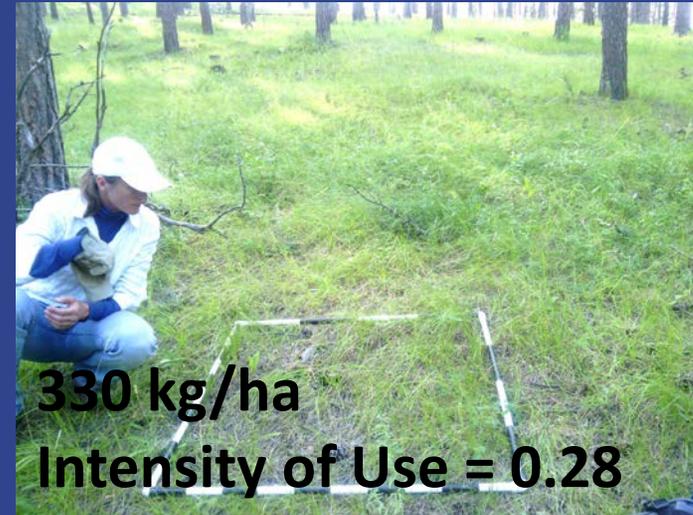
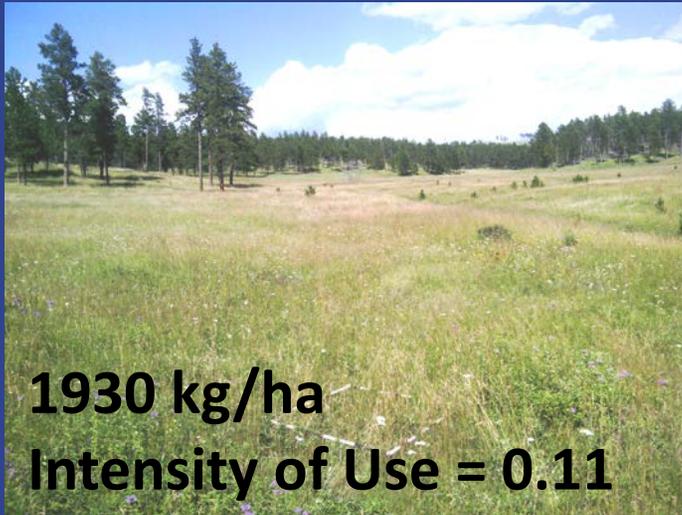
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195 plant species, 20 in $\geq 20\%$ of plots



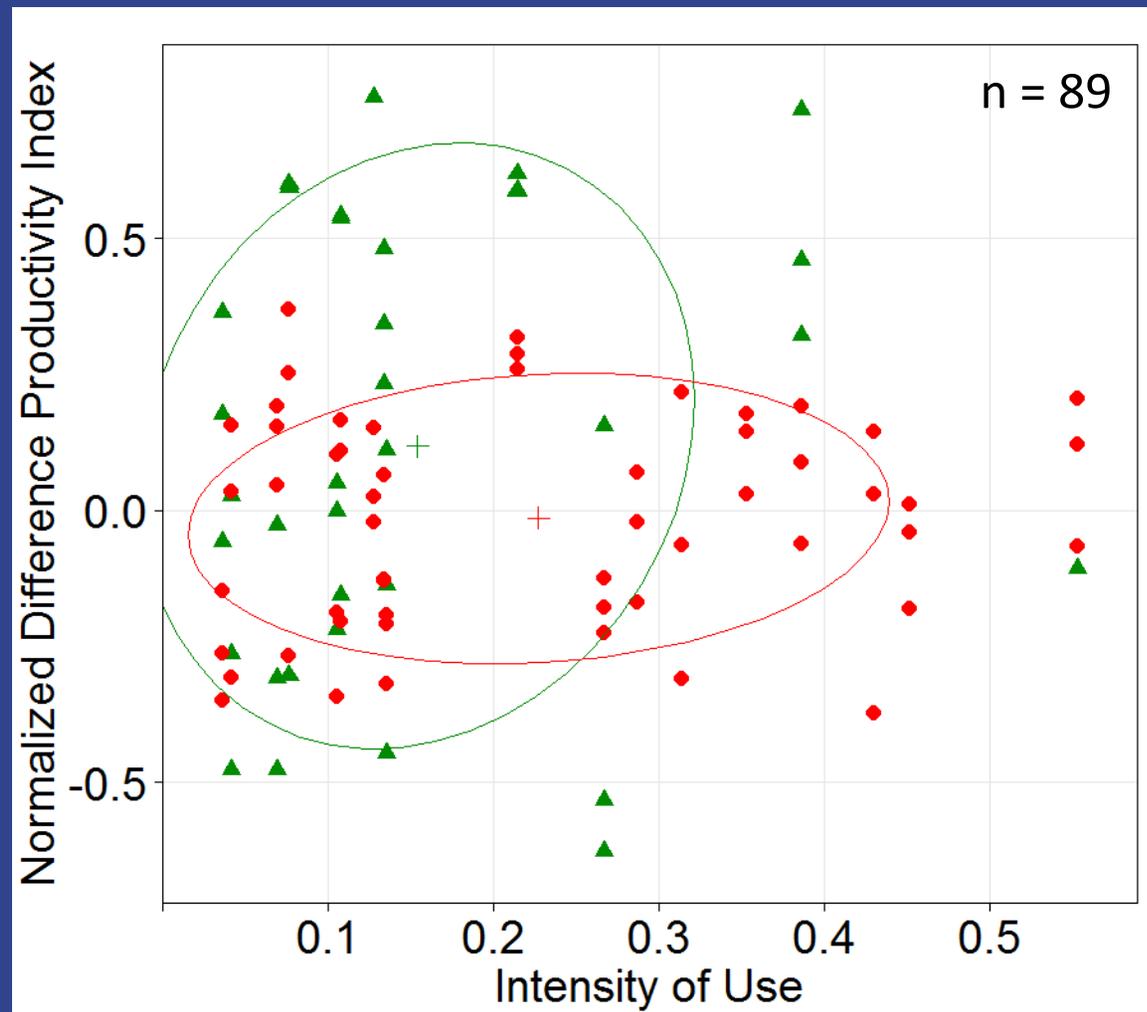
Productivity measured in 176 hoops in 11 allotments & 18 pastures



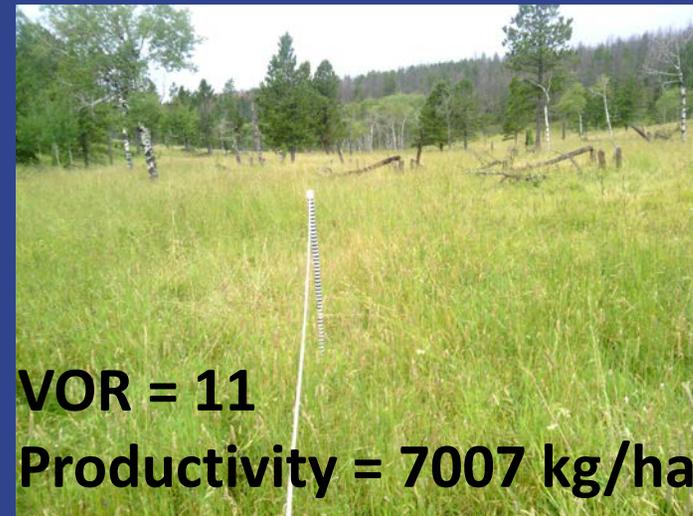
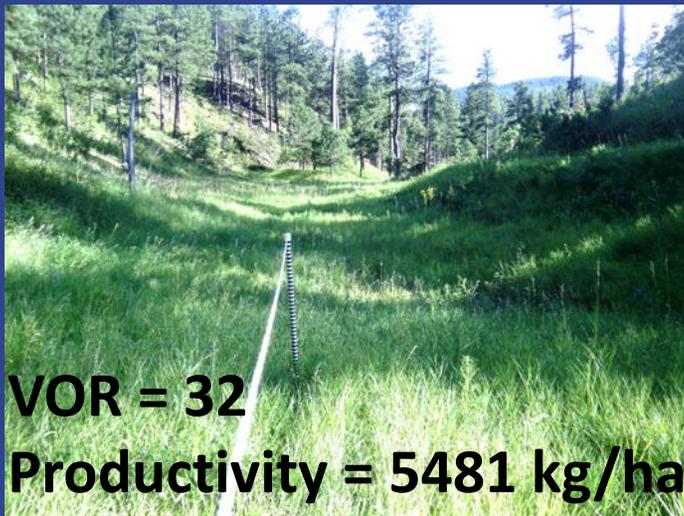
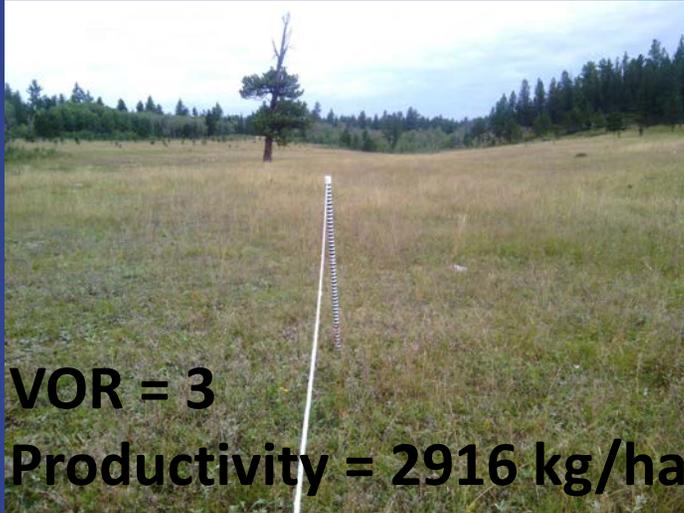
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No relationship between productivity and Intensity of Use or Days of Occupancy



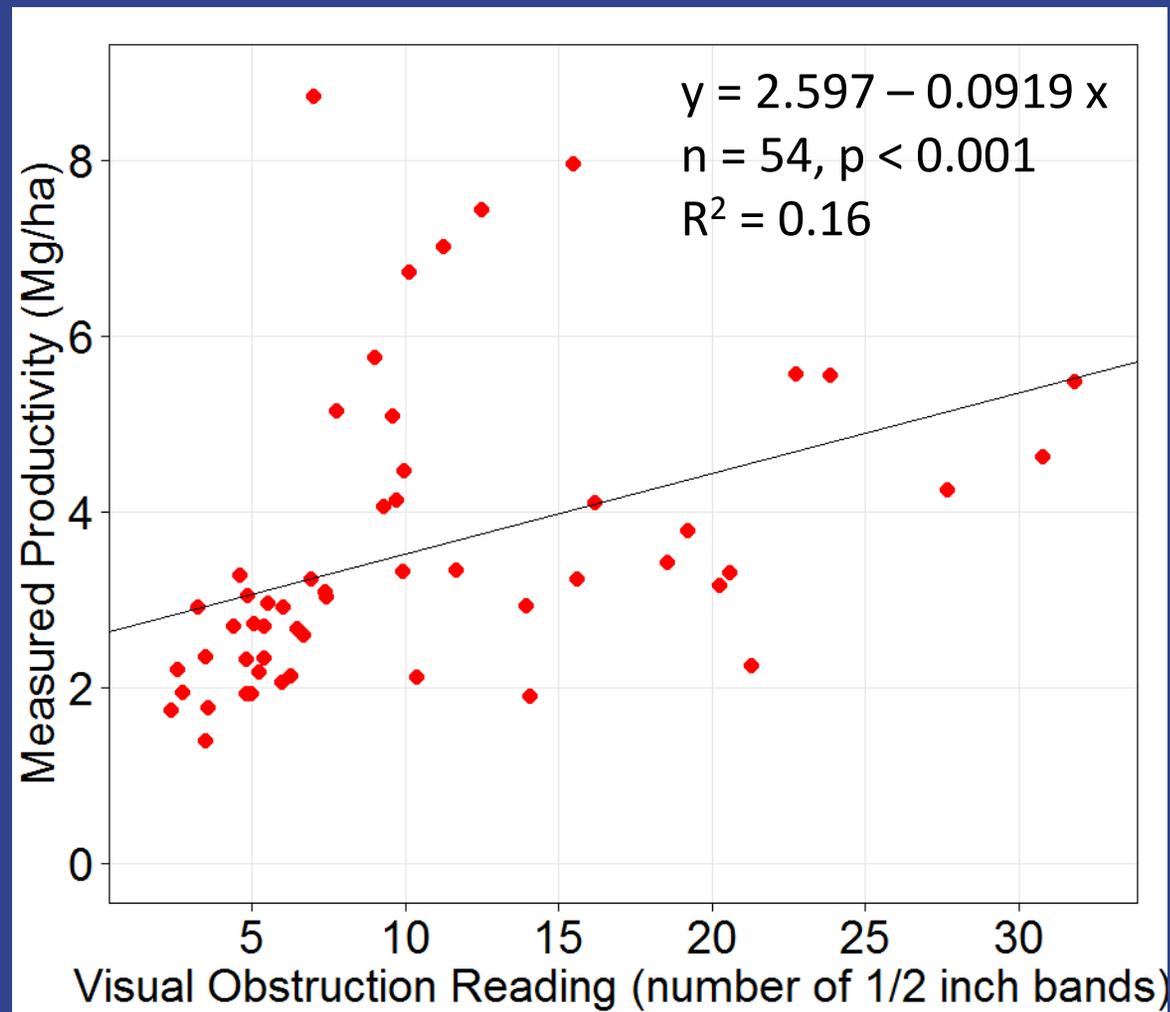
Visual Obstruction Readings: 54 Transects measured in 11 allotments & 18 pastures



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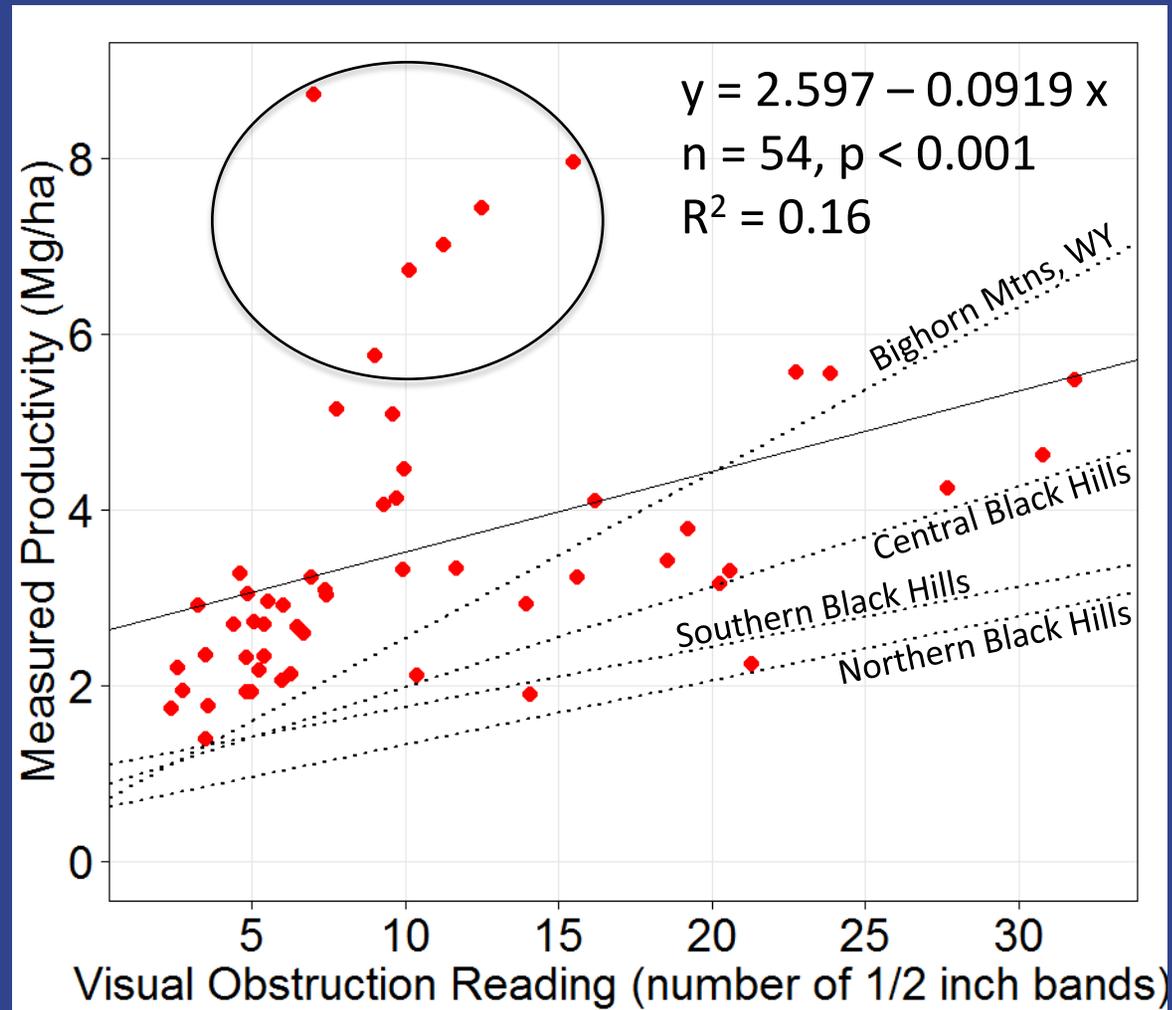
Productivity correlated with Vegetation Structure



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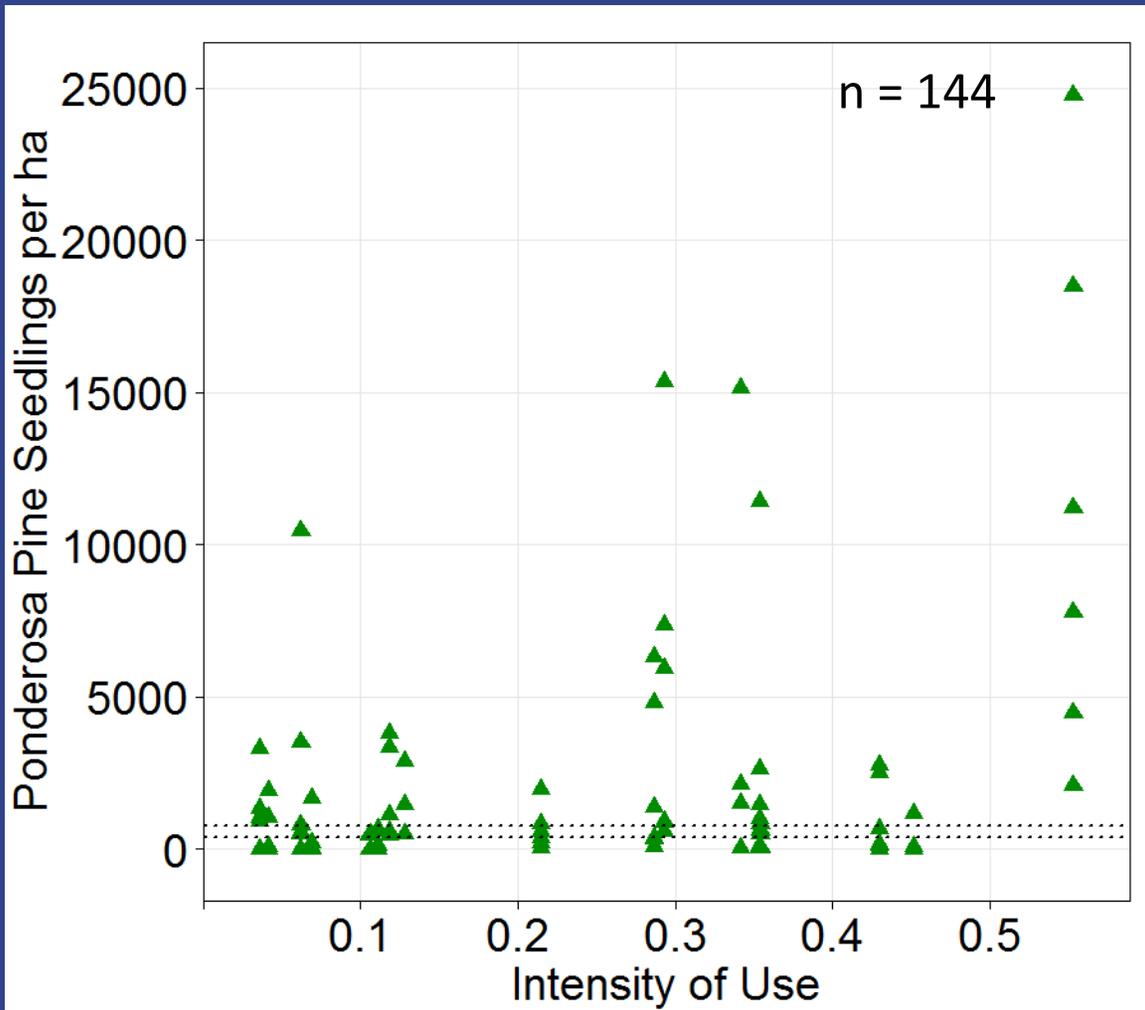
Productivity correlated with Vegetation Structure



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No relationship between pine regeneration and Intensity of Use or Days of Occupancy



25 Pastures
14 Allotments



▲ Forest
● Meadow



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Conclusion

1. Lower diversity associated with more intensive grazing use
2. Productivity not associated with either grazing management practice when growing conditions are favorable
3. Days of occupancy not related to either diversity or productivity
4. Pine regeneration not associated with either grazing management practice



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Future Directions

- Investigate possible relationship between timing of grazing, diversity, and production
- Revisit
 - Diversity and production are sensitive to precipitation
 - Additional plots measuring pine regeneration



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Thank You

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