To Graze or not to Graze?

Grazing Impacts on Plant Diversity at Point Reyes National Seashore

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Introduction

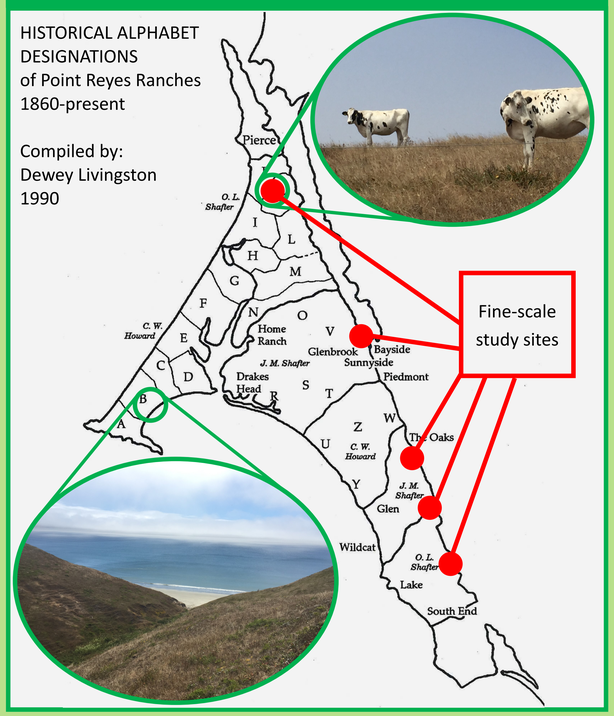
Point Reyes National Seashore is a protected shoreline with a unique purpose of supporting rancher livelihoods and protecting biodiversity. **Using multiple spatial and temporal scales, I researched how the presence of dairy farms and long-term grazing influences plant diversity within grazing plots and within ranches across Point Reyes.** A fine-scale approach helps give an understanding of grassland community structure, while a broad-scale approach gives a perspective of long term vegetation change. Using multiple spatial scales provides a fuller understanding of vegetation diversity as a whole.

Historical Context

- **1850s** — Cattle ranching begins at Point Reyes
- **1962-1971** — The National Parks Service (NPS) bought Point Reyes and ranches for shoreline conservation
- **1991** — Most 5-year leasing contracts begin
- **2016** — Environmental lawsuit against ranchers

Understanding this history can uncover how changes in plant diversity reflect the relationship between ranchers and the NPS

Study Area

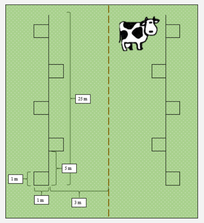


Fine-Scale Analysis

Methods

- I selected 5 sites across Point Reyes with fences that separated grazed and ungrazed portions of the ranches

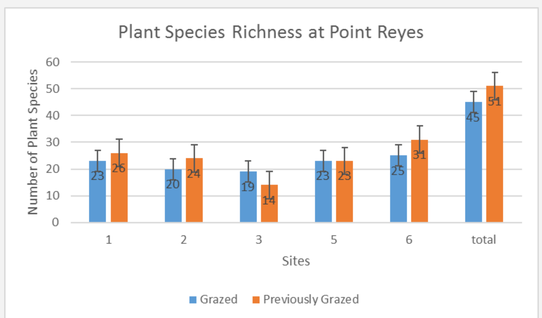
- I extended a 25 m long transect on either side of the fence and placed a 1x1 m quadrat alternating at every 5m.



- Each quadrat had a nested sampling design used to count species richness

Results

- Using an ANOVA test on square root transformed data, I found that plant species richness in grazed and ungrazed areas (**P = 0.1151)** had no significant difference
- I cannot reject the null hypothesis of no difference
- There is a (non-significant) trend of slightly more species in ungrazed sites than grazed sites



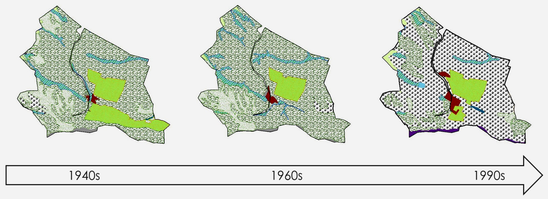
- A common non-native grass, *Festuca perennis*, was found more frequently in grazed (24/25 quadrats) than ungrazed areas (21/25 quadrats)

- *Stipa pulchra*, a native grass, was found more frequently in grazed (16/25) than ungrazed areas (11/25)

Broad-Scale Analysis

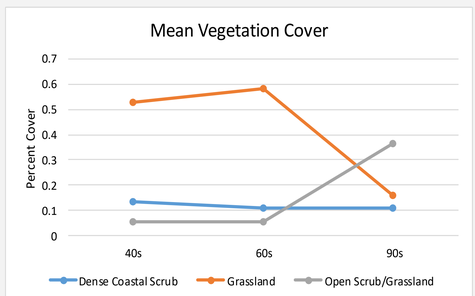
Methods

- I used GIS to characterize vegetation types per ranch in 3 time periods:
  - 1942-1943
  - 1962-1965
  - 1994
- I treated ranches as individual samples
  - A through N Ranch, Home Ranch, Pierce Ranch
- I researched management history of the ranches
  - Beef or Dairy? Management changes?
- Vegetation categories
  - **Grassland** (<15% shrub cover)
  - **Open Scrub/Grassland** (15%-50% shrub cover)
  - **Dense Coastal Scrub** (>50% shrub cover)



Results

- There is a wide-scale trend of grassland decrease and open scrub/grassland increase between the 1960s and the 1990s
- On average, there was a **30% increase in open shrub cover** and a **60% decrease in grassland**
- There was no significant difference in dense shrub cover
- There were no significant differences in vegetation change patterns between beef and dairy ranches



- Using a Generalized Additive Model, I found a significant difference in vegetation between time steps (**P <0.000**)
  - **This signifies the importance of a historical analysis**

Discussion

Fine-Scale

- There is no significant difference in plant diversity between grazed and ungrazed plots
- Grazing is not a huge concern for conserving plant diversity
- **Grazing should not be eliminated for the sake of biodiversity conservation**

Broad-Scale

- Shrub increase is correlated significantly with time, indicating the importance of the historical context
- In **1971**, the National Parks Service bought most of the ranches and established 5-year leases
- From research about the land purchase, most **ranchers opposed the NPS** as a threat to their operations
- **The purchase of the land by the NPS may have contributed to the broad-scale shrub encroachment**

Broader Implications

- Both scales of study suggest that long-term ranching at Point Reyes is not a threat to plant diversity, both in terms of individual species and wide spread shrub expansion
- **The NPS should extend ranching leases and allow more rancher ownership of the land to preserve plant diversity**

Future Directions

- Add more fine-scale sites for comparison
- Sample during spring, when more plants are identifiable
- Expand the time-scale into the past and to the present day
- Interview ranchers for a more detailed social history

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