



Effects of Nitrogen Deposition on Coastal Sage Scrub Invasion and Reestablishment

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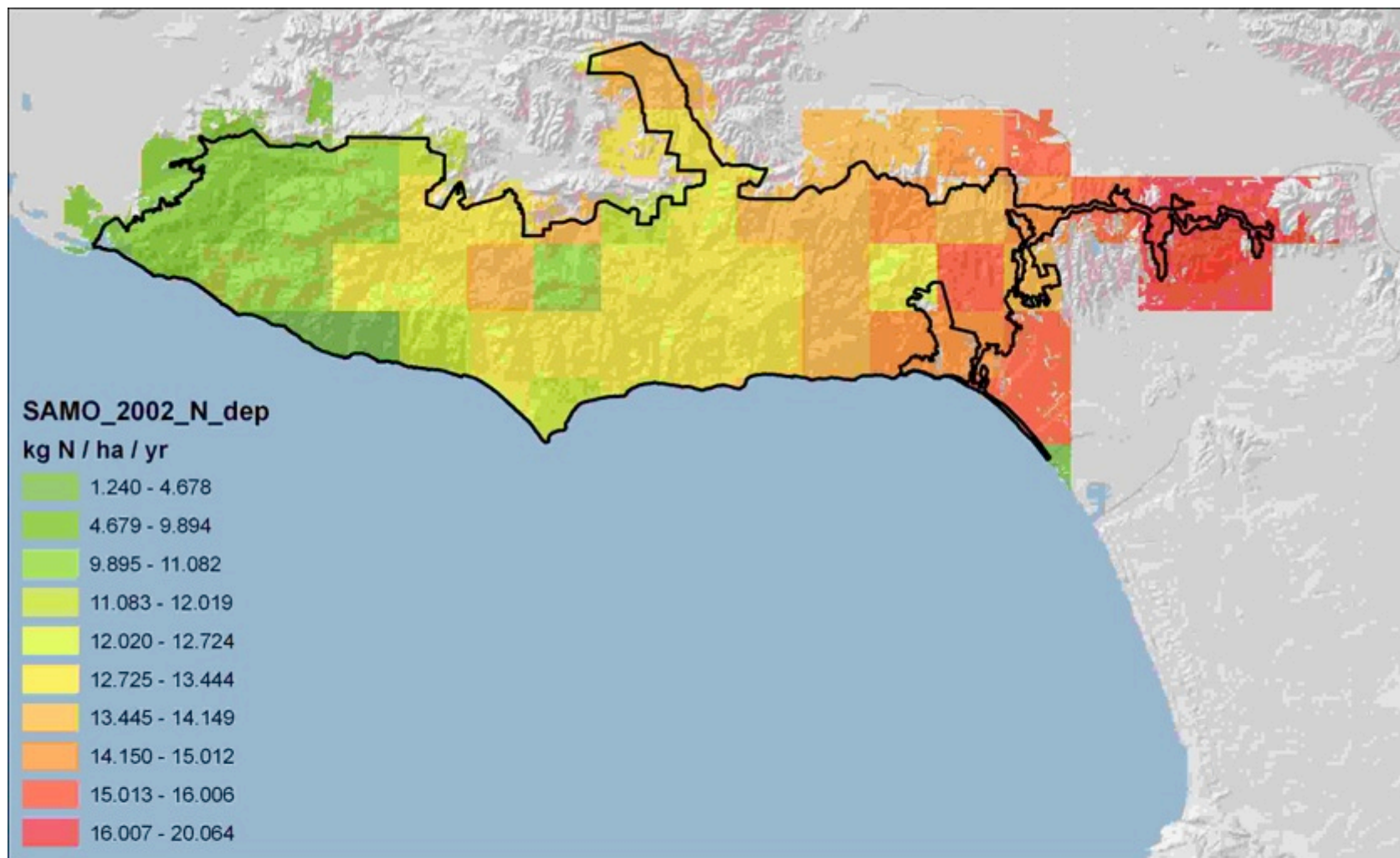
- Nitrogen deposition assessment of the Santa Monica Mountains NRA
- Effects of N deposition on coastal sage scrub
- N addition experiment 2012-2013 season data
- Conclusions
- Future directions

Nitrogen Deposition Assessment of the Santa Monica Mountains NRA



- Industrial, vehicular, and agricultural emissions contain ionic and particulate nitrogenous compounds.
- In southern California, this accumulates as dry deposition during the summer and results in an influx of nitrogen with the first rains of the season.
- In the Santa Monica Mountains NRA, N deposition has been modeled at 2-25 kg/ha/yr.

Modeled Nitrogen Deposition in the Santa Monica Mountains



SAMO N Deposition in 2002

Tonneson et al. 2007

kg N / ha / year

Minimum: 1.24
Maximum: 20.063999

Nitrogen Deposition Assessment of the Santa Monica Mountains NRA



- Funded by NPS Air Resources Division
- Collaboration between University of California, Riverside, U.S. Forest Service and Santa Monica Mountains NRA

Effects on Coastal Sage Scrub



- Monitoring coastal sage scrub vegetation across the N deposition gradient
- What are the effects on **diversity**, **invasion** and **native seedling establishment**?

Effects on Coastal Sage Scrub



Critical load- quantitative estimate of exposure to one or more pollutants below which no harmful effects occur

Effects on Coastal Sage Scrub



- What are the **critical loads** of N deposition for coastal sage scrub?
 - Diversity
 - Invasion
 - Productivity
 - Ecosystem processes

Experimental Fertilization Plots

- Installed December 2011 in mature stands of coastal sage scrub
- 10 blocks at two sites (20 total)
- Four 5x5m plots per block
- Each plot fertilized annually in the fall at three different levels plus unfertilized controls

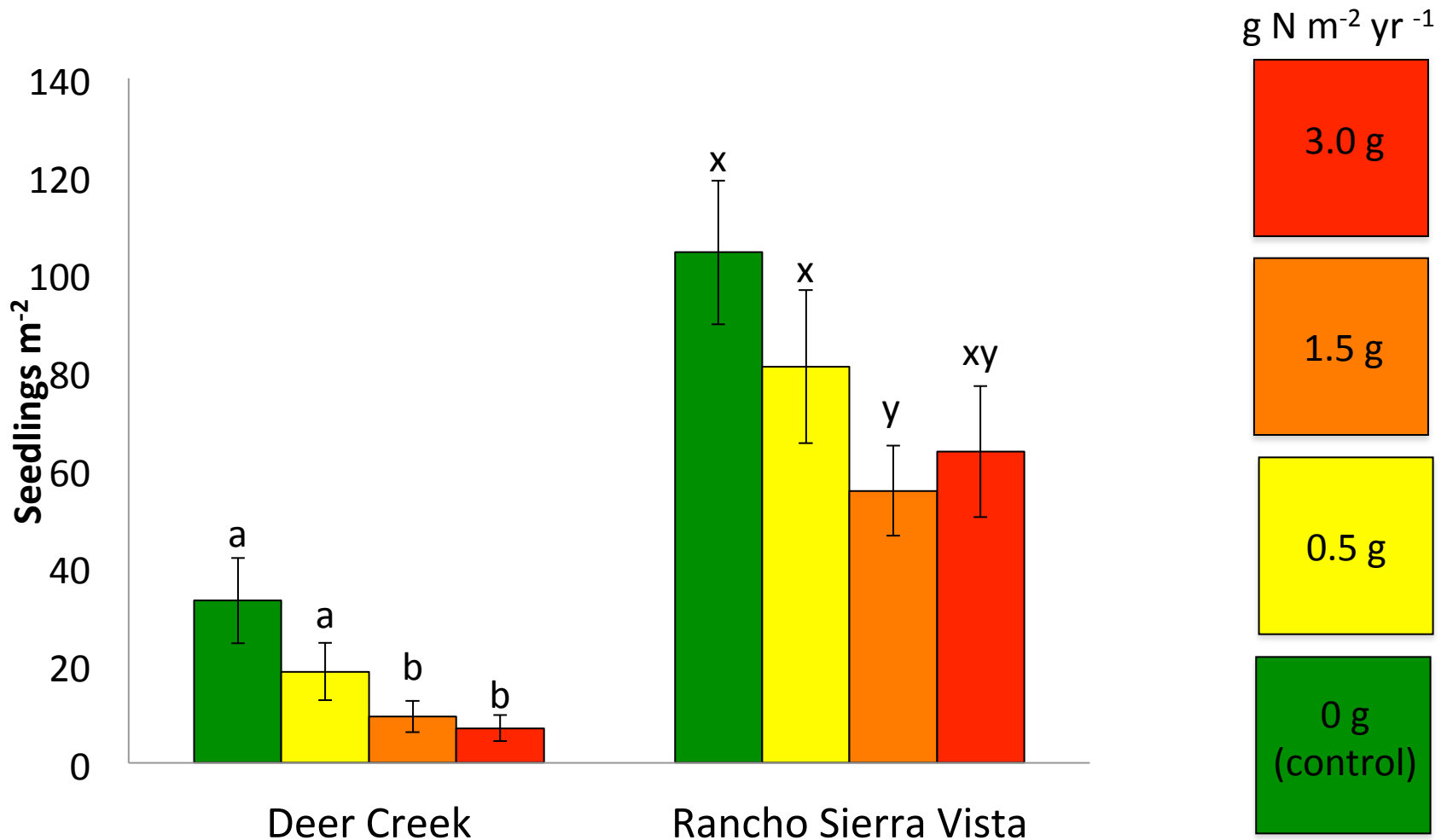


N Addition Experiment 2012-2013 Season Data

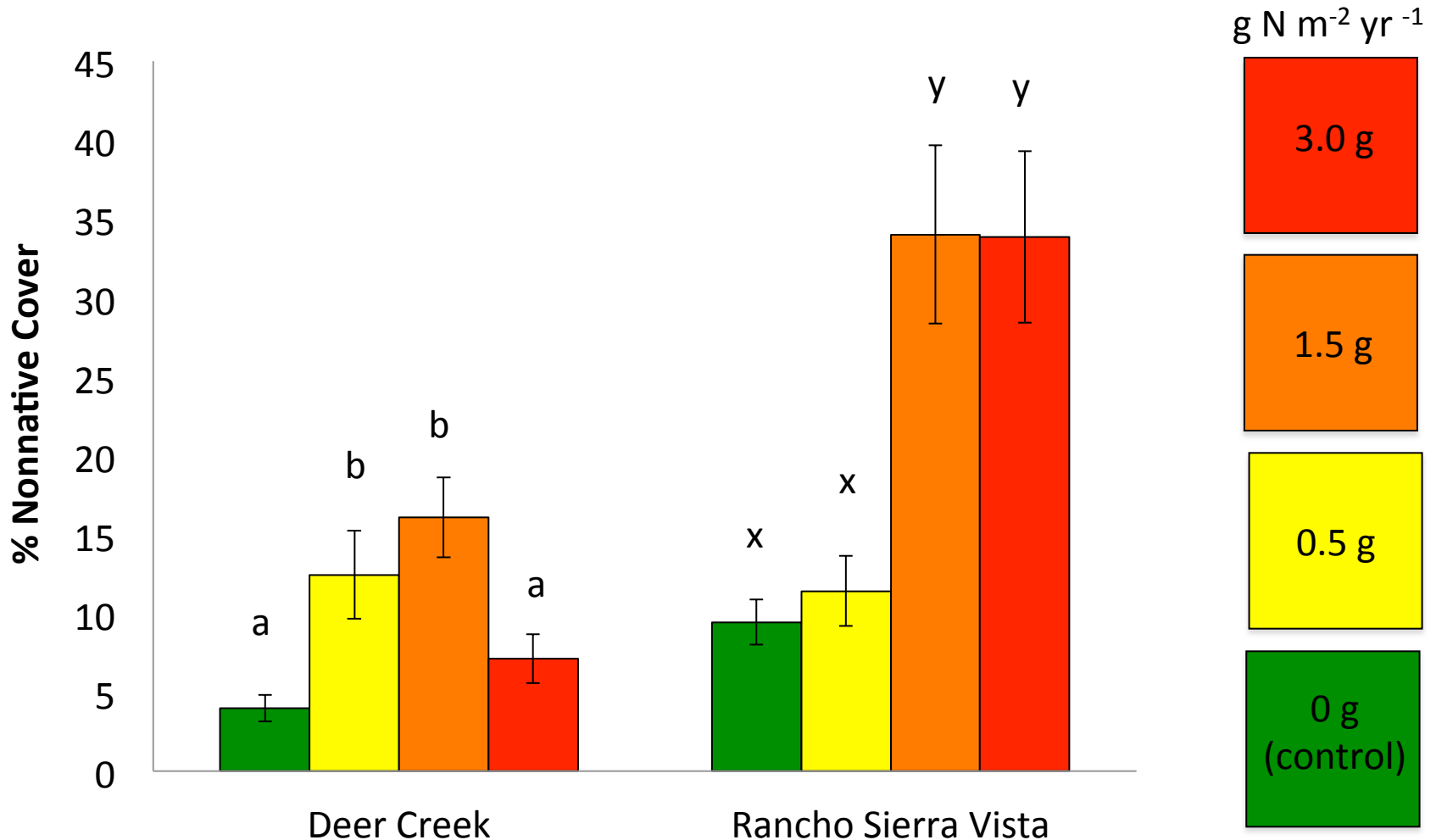


- Two sampling dates (February and April)
- Two sites: Rancho Sierra Vista and Deer Creek
- Four 0.125 m² quadrats/plot in shrub interspaces
- Measured plant density, cover, height
- Nonnative biomass
- Harvested *Artemisia californica* seedlings

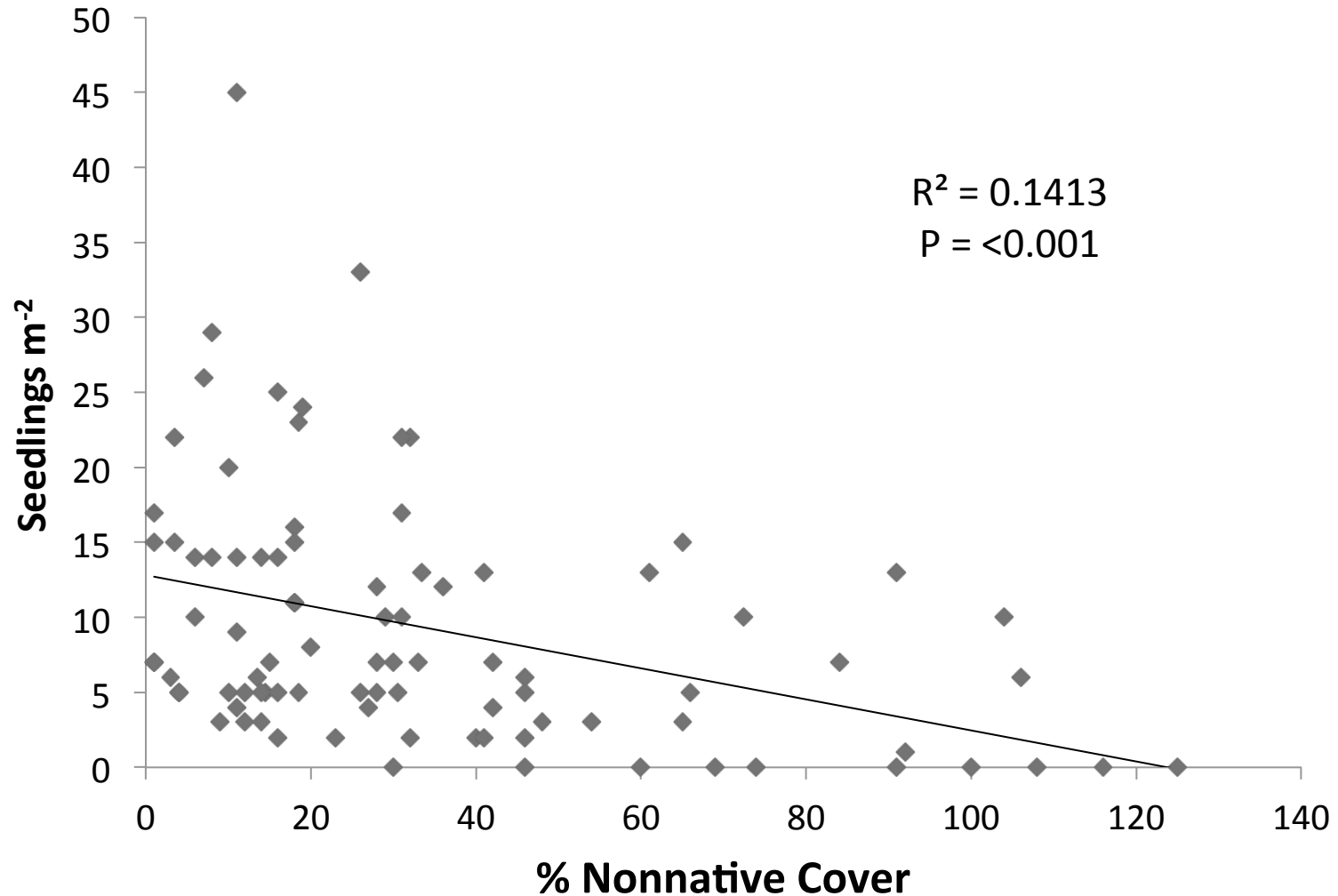
Nitrogen addition reduces *Artemisia* seedling density.



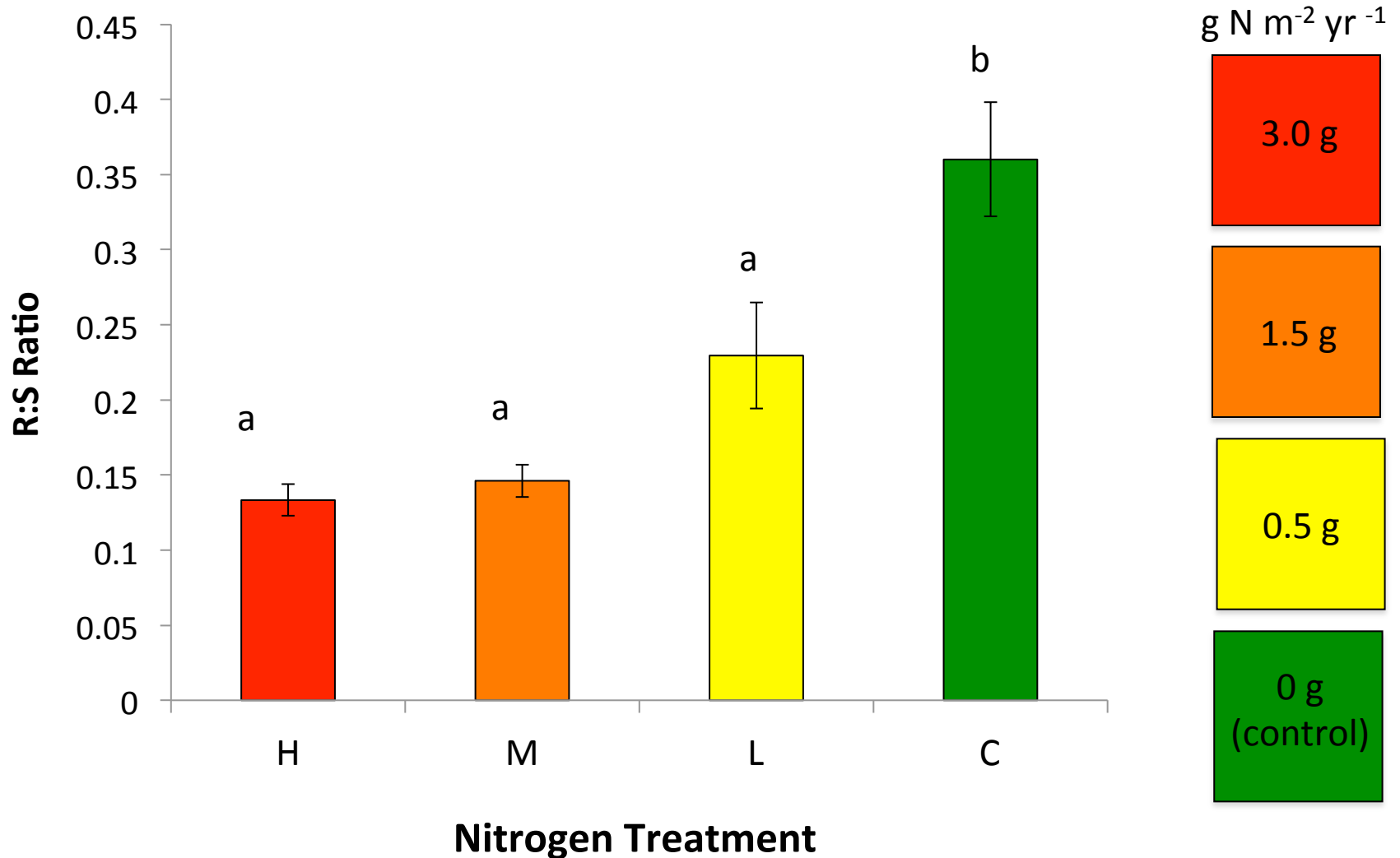
Nitrogen addition increases percent nonnative cover.



Native seedling density is not significantly correlated with nonnative cover.



Nitrogen addition reduces *Artemisia* seedling root:shoot ratio.





Conclusions

- N addition reduces establishment and alters growth allocation of native shrub seedlings
- Increased N results in higher cover and aboveground biomass of nonnative plant species
- Nitrogen deposition may reduce native seedling establishment due to increased nonnative cover and altered seedling physiology.



Conclusions

- N deposition may limit passive re-colonization and active restoration of coastal sage scrub and increase invasibility.
- Levels of N deposition within the SMMNRA may need to be taken into consideration when developing management plans.

Future Directions:

Post-fire Effects of Nitrogen Deposition on Coastal Sage Scrub Invasion and Reestablishment



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