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Vulnerability of public rangelands to climate change in the Southwest United States

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Livestock grazing in the Southwest (AZ and NM)

- Important role for public rangelands as supply of forage
- Operations use both public and private rangelands
- Climate change may alter the relative conditions of public vs. private rangelands

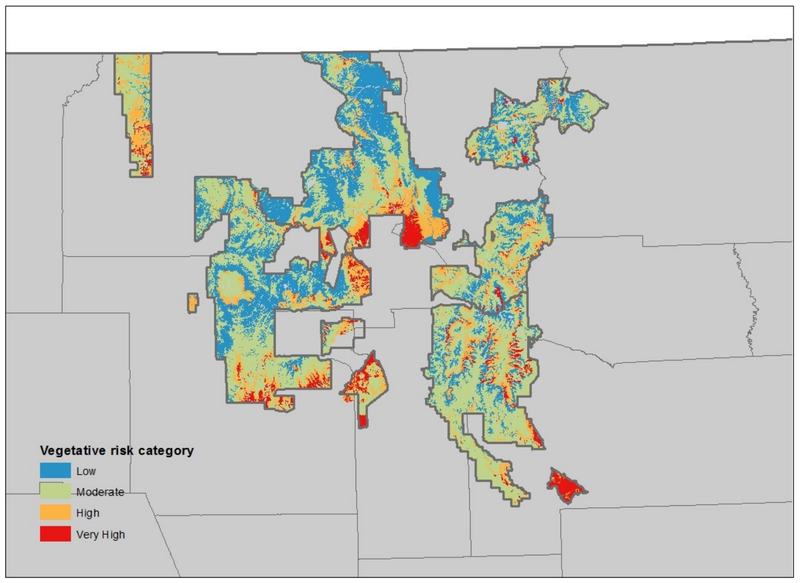
Broad research questions:

⇒ How might climate change affect demand for public rangeland grazing?

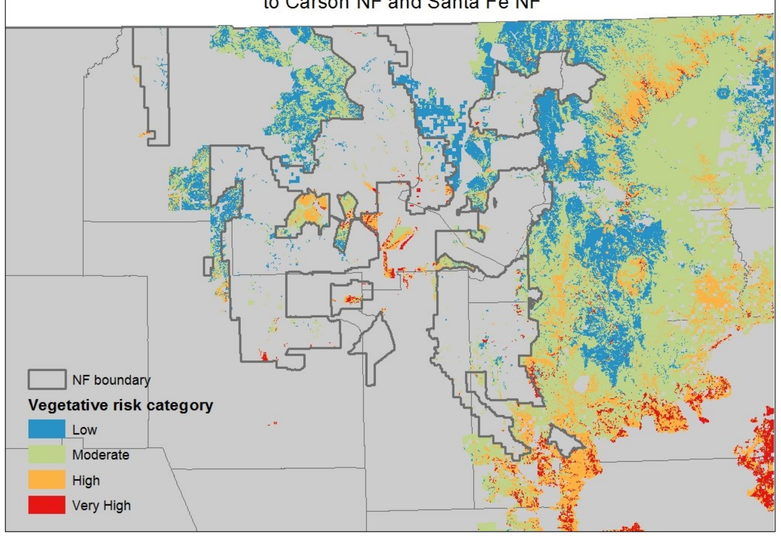
⇒ Where are conditions of public rangelands most at risk from climate change relative to adjacent private rangelands?

⇒ What is the potential economic impact of public rangeland grazing under climate change?

Risk of vegetative change on Santa Fe NF and Carson NF, New Mexico



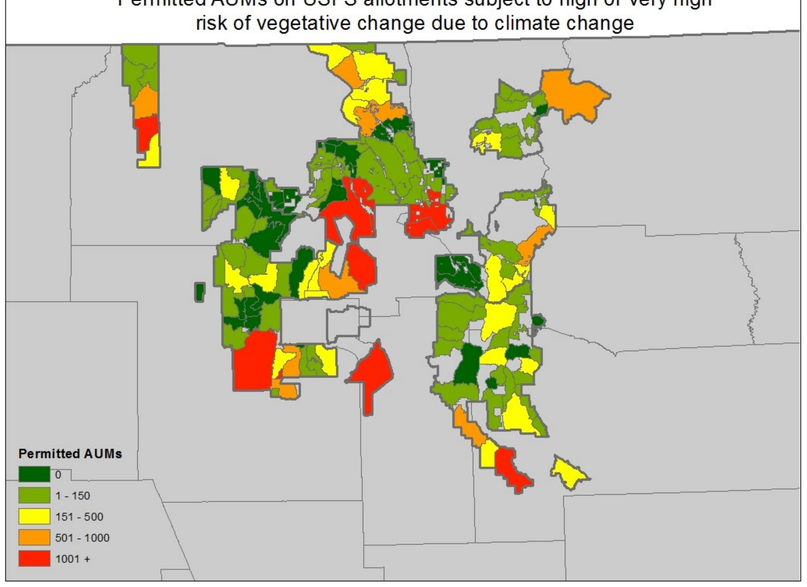
Risk of vegetative change on privately-owned lands adjacent to Carson NF and Santa Fe NF



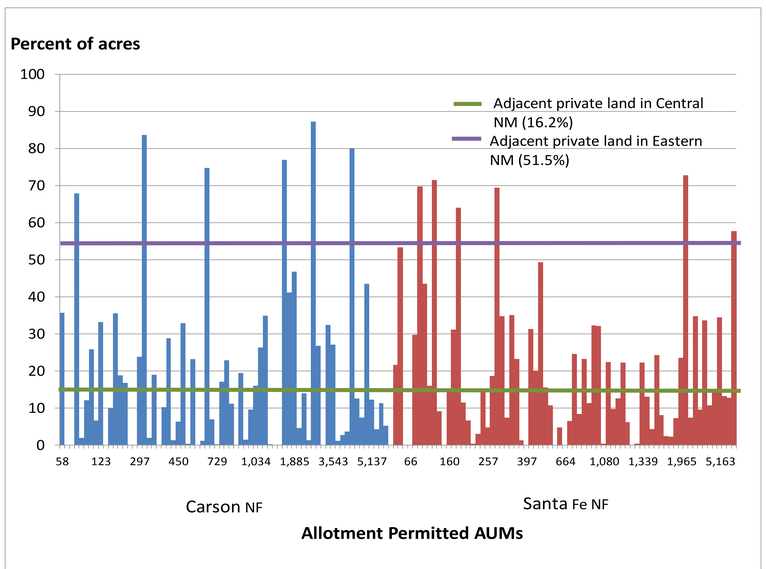
Data

- Risk of vegetative change (Triepke et al. 2014):
  - Downscaled GCM climate variables
  - Potential vegetation/ecosystem type
  - Historical climate supporting existing vegetation
  - ⇒ Identify where future climate is unlikely to support existing vegetation
- USFS grazing permits
  - Total permitted AUMs by grazing allotment on Carson and Santa Fe National Forests from USFS I-Web
- Direct expenditures related to USFS grazing (TEAMS calculations of 2010 Annual Grazing Statistical Forest/Grassland Detail at Forest Level, USFS I-Web)

Permitted AUMs on USFS allotments subject to high or very high risk of vegetative change due to climate change

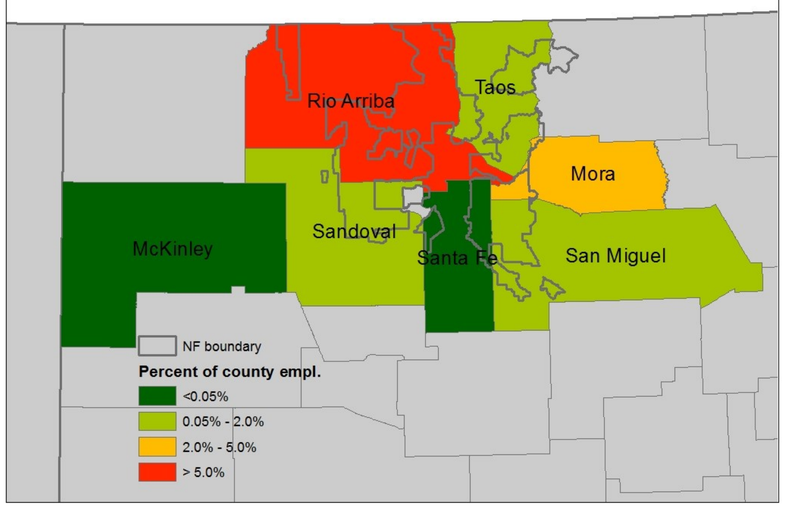


Percent of acres at high or very-high risk of vegetative change by USFS grazing allotment



Economic contribution of public land grazing: where will changes have the greatest impact?

Contribution of direct expenditures from NF grazing to county employment



Summary

- Potential shifting demand for public and private rangeland resources:
  - Within-NF shifts—Increased demand on allotments with little risk of vegetative change
  - Between NF-private shifts—Many public allotments on average have lower risk of vegetative change compared to private land, suggesting overall increase in demand for public allotments
- Key remaining issues:
  - Spatial patterns are important—Highest-risk private land further from NFs may limit additional demand for public allotments
  - Need to identify private land that is suitable for grazing
- Heterogeneous economic impacts
  - Public-land grazing a small component of most county economies
  - Counties with less diversified economies (e.g., Rio Arriba) have largest exposure to economic changes due to climate-related changes to public land grazing

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