

# The Landscape of Fitness: fusing animal GPS measures with GEDI and ECOSTRESS to map species responses to vegetation structure and water stress

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# Changing American West





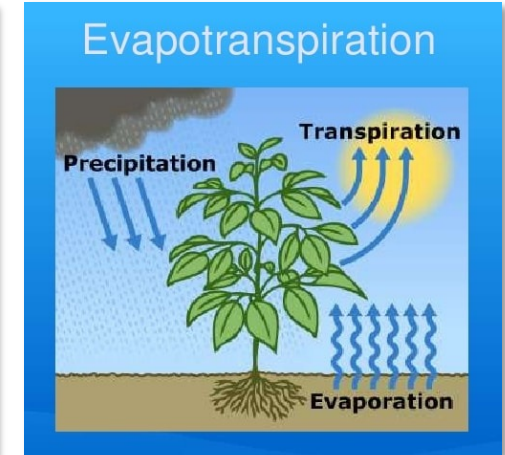
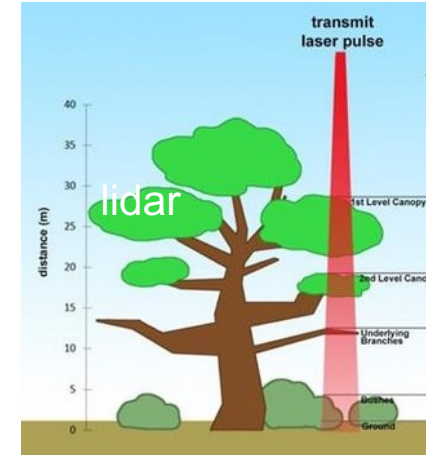
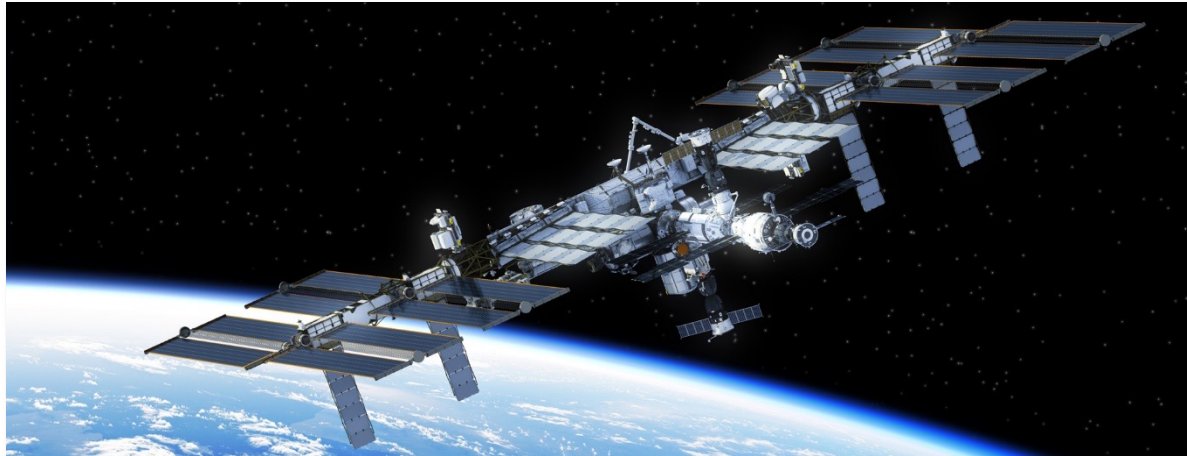
# Earth Observations from ISS

## GEDI

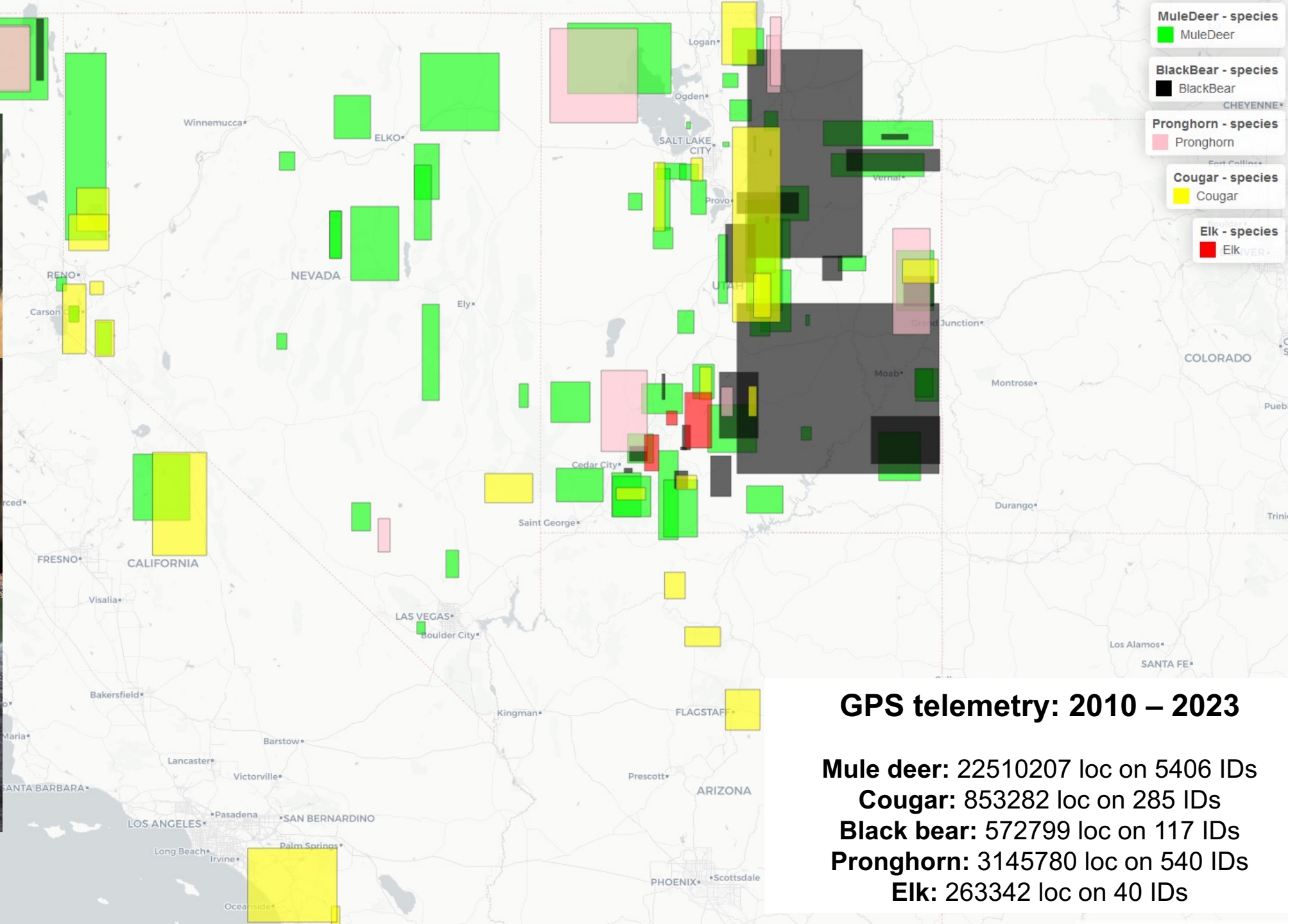
- Measures of vegetation 3D structure at broad spatial extents

## ECOSTRESS

- Measures of evapotranspiration and vegetation water stress at fine spatial resolutions



**Goal:** develop spatial models of animal habitat use across gradients of vegetation structure and water stress using GEDI and ECOSTRESS



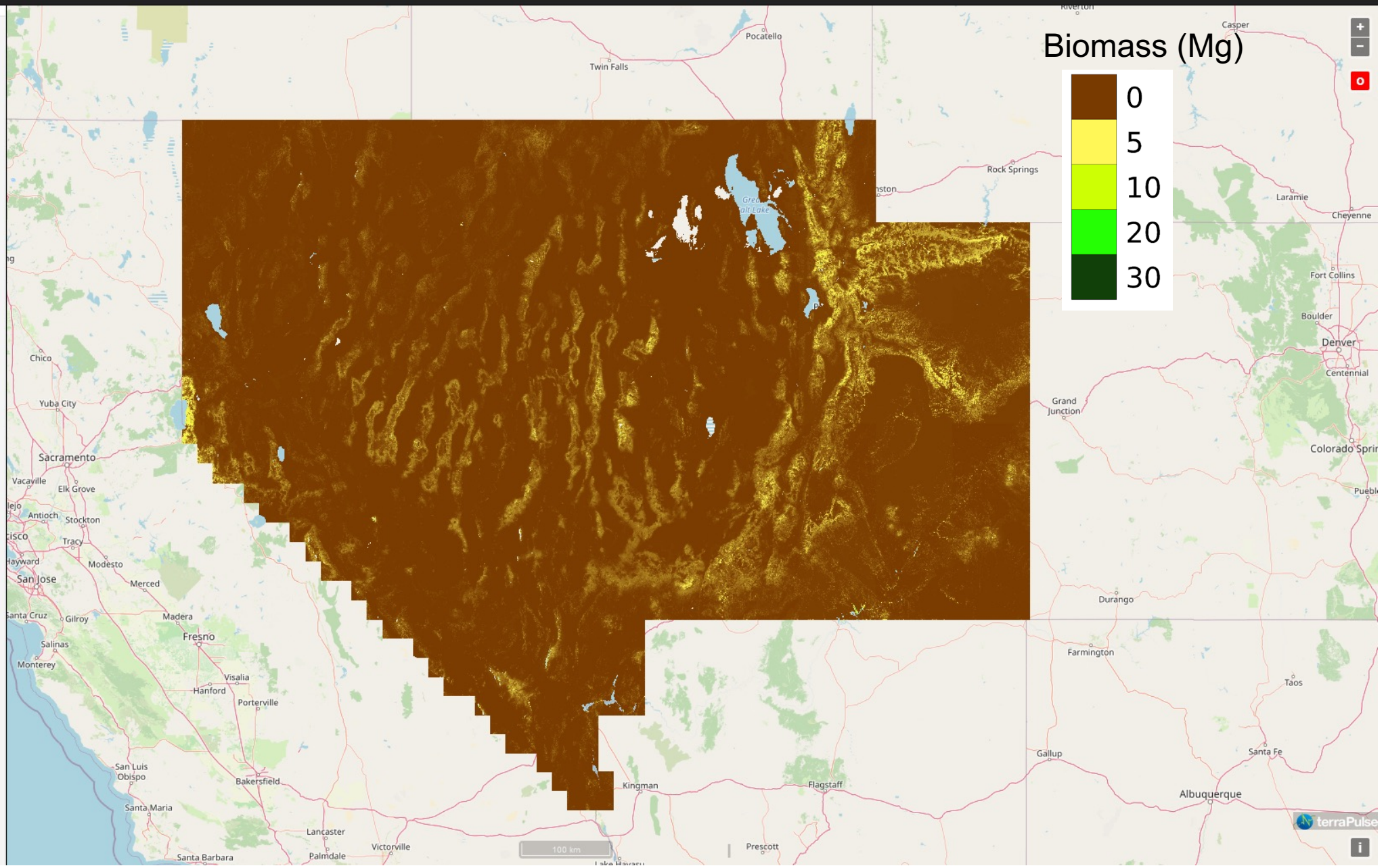
### GPS telemetry: 2010 – 2023

- Mule deer: 22510207 loc on 5406 IDs
- Cougar: 853282 loc on 285 IDs
- Black bear: 572799 loc on 117 IDs
- Pronghorn: 3145780 loc on 540 IDs
- Elk: 263342 loc on 40 IDs



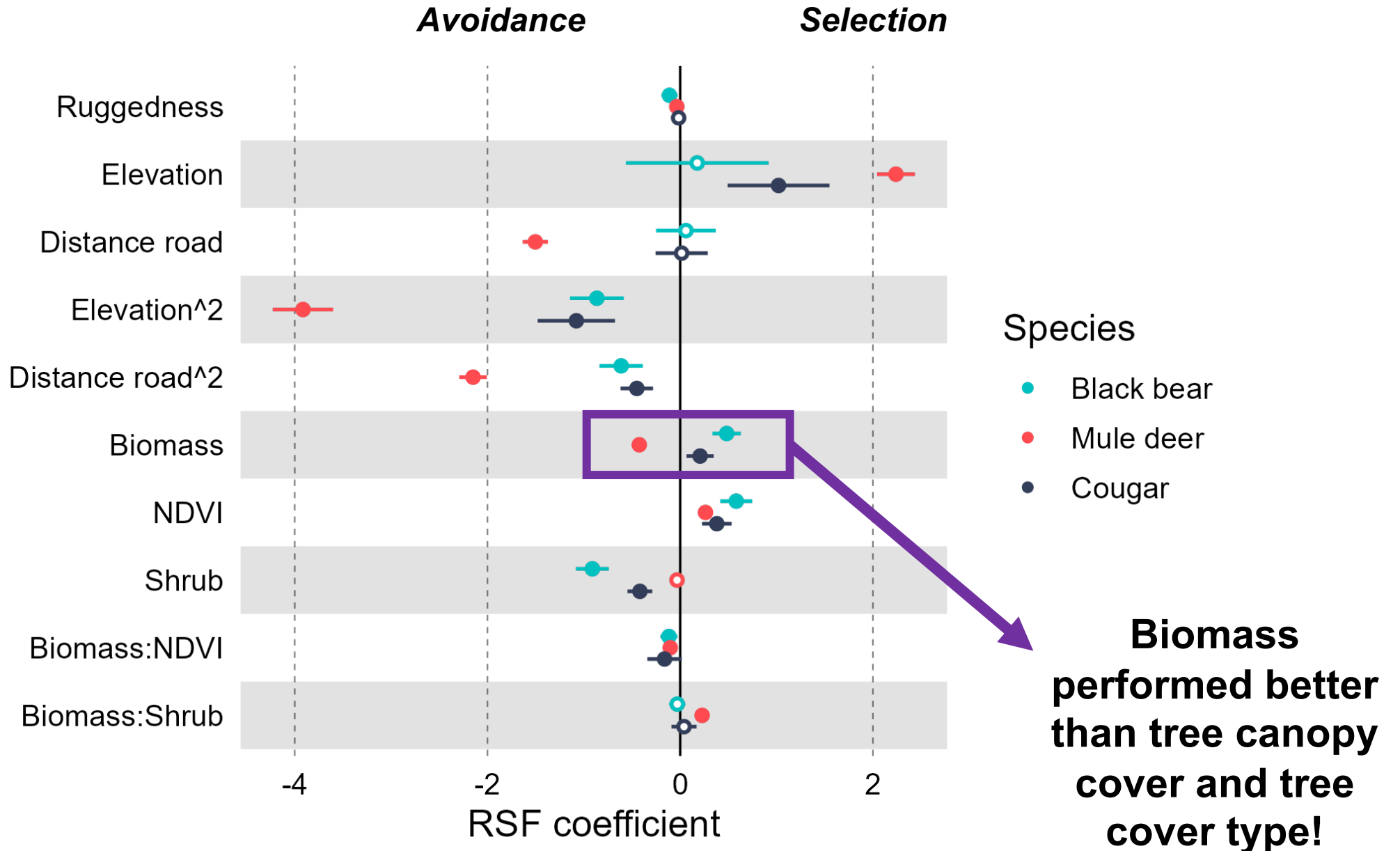
Biomass Legend

- Biomass 2001 (Mg)
- Biomass 2002 (Mg)
- Biomass 2003 (Mg)
- Biomass 2004 (Mg)
- Biomass 2005 (Mg)
- Biomass 2006 (Mg)
- Biomass 2007 (Mg)
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- Biomass 2018 (Mg)
- Biomass 2019 (Mg)
- Biomass 2020 (Mg)
- Biomass 2021 (Mg)
- Biomass RMSE 2001 (Mg)
- Biomass RMSE 2002 (Mg)
- Biomass RMSE 2003 (Mg)
- Biomass RMSE 2004 (Mg)
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- Biomass RMSE 2015 (Mg)
- Biomass RMSE 2016 (Mg)
- Biomass RMSE 2017 (Mg)





# Resource Selection Functions



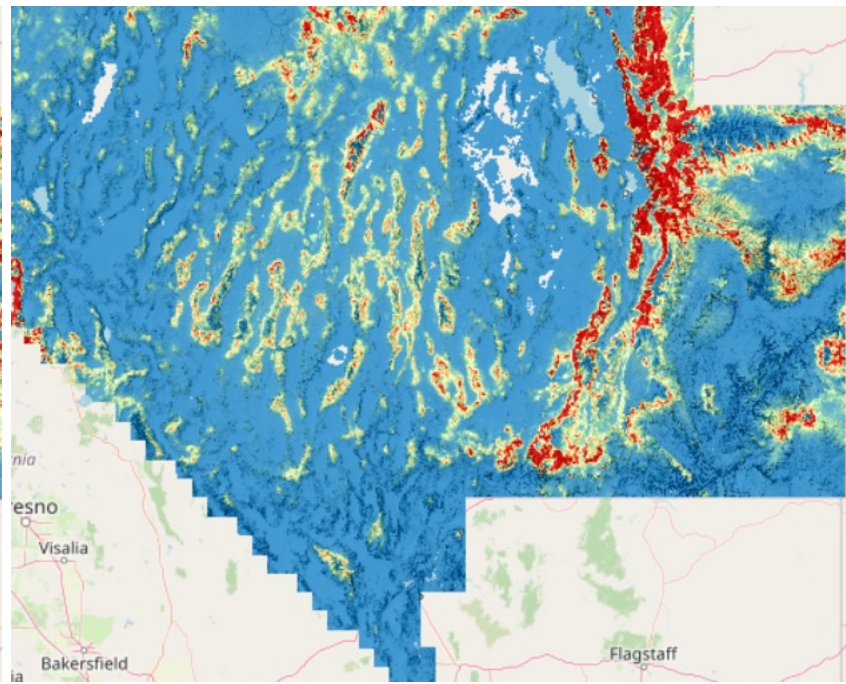
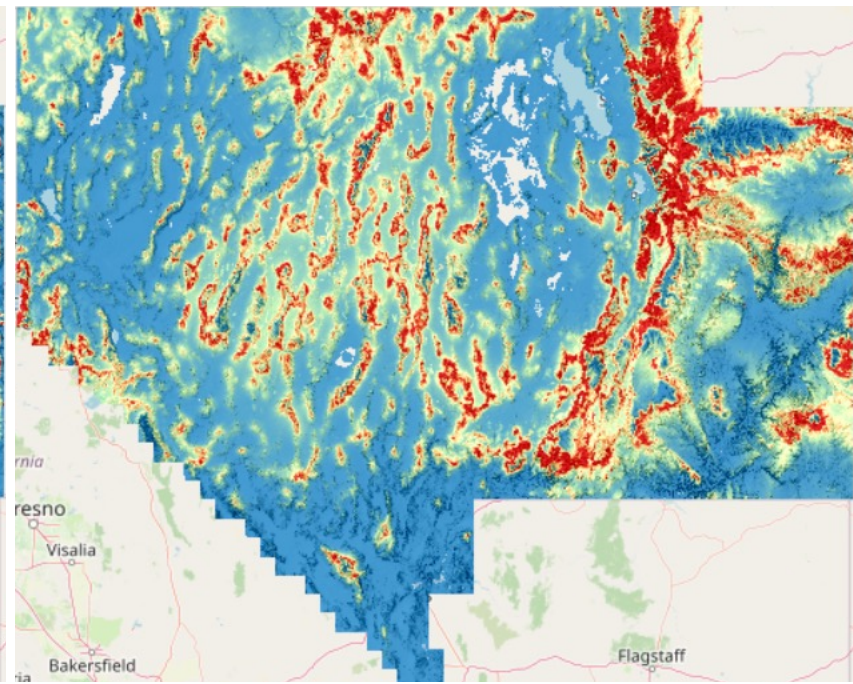
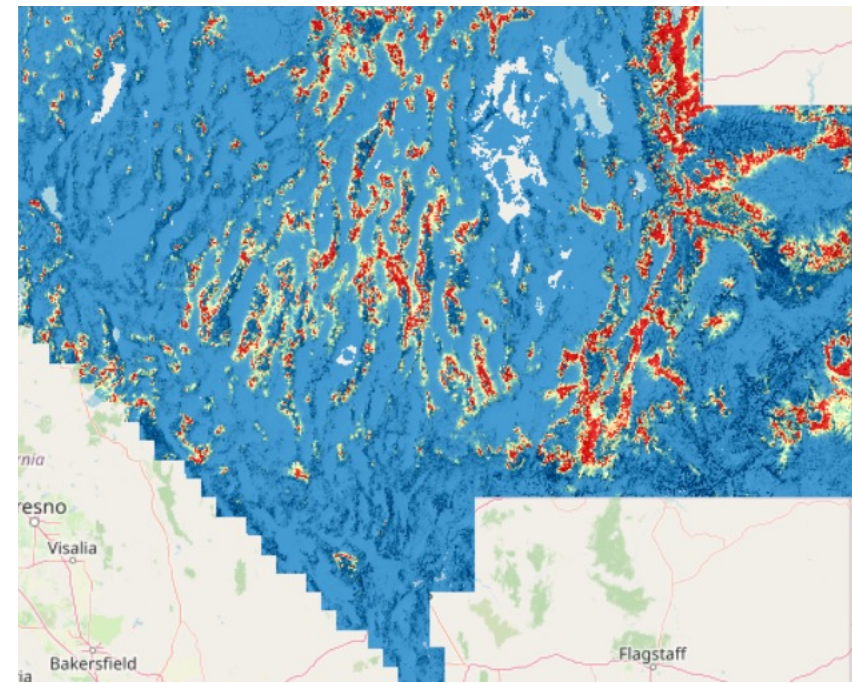


# Predictions

## Mule deer

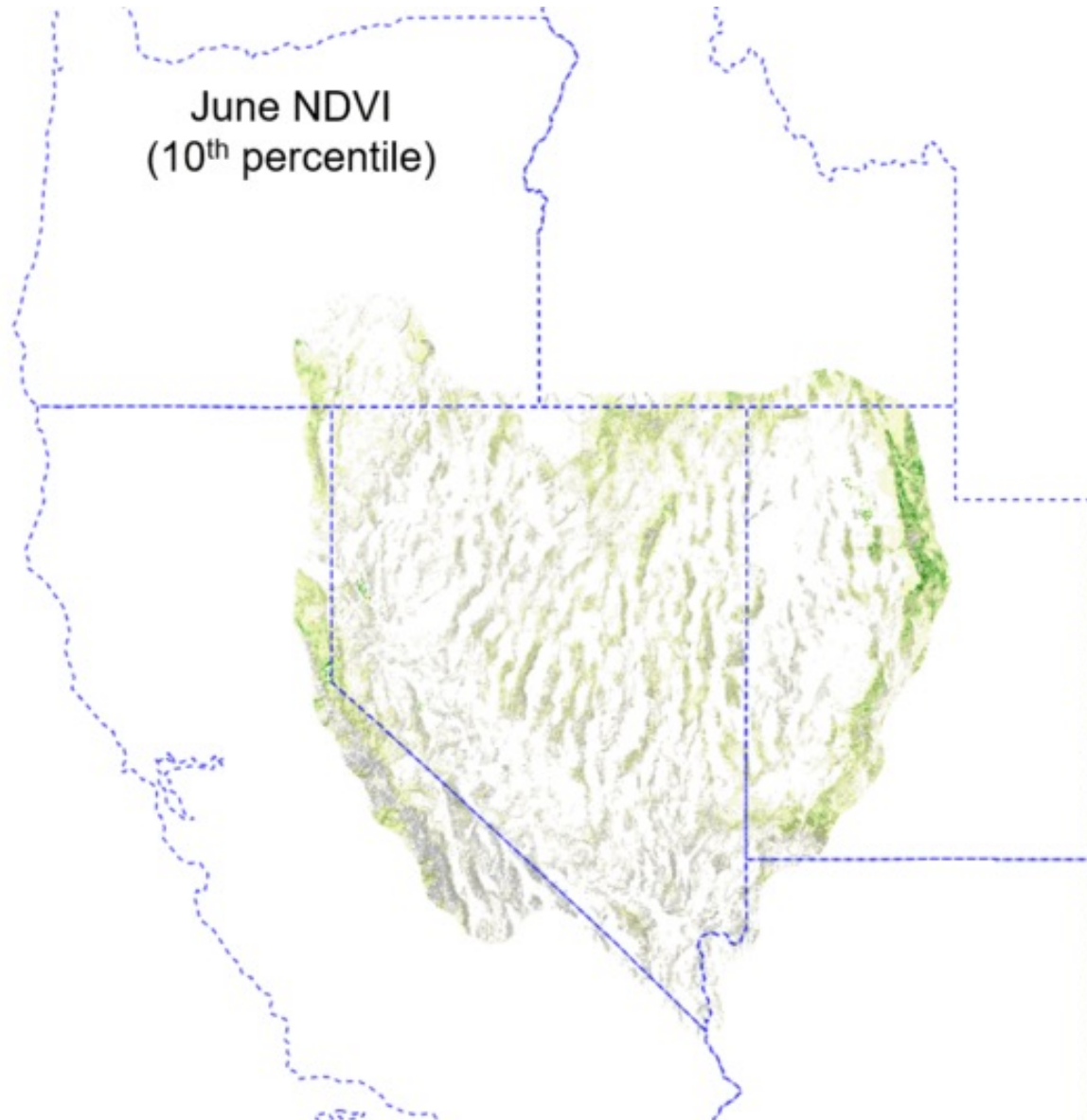
## Cougar

## Black bear





# June production



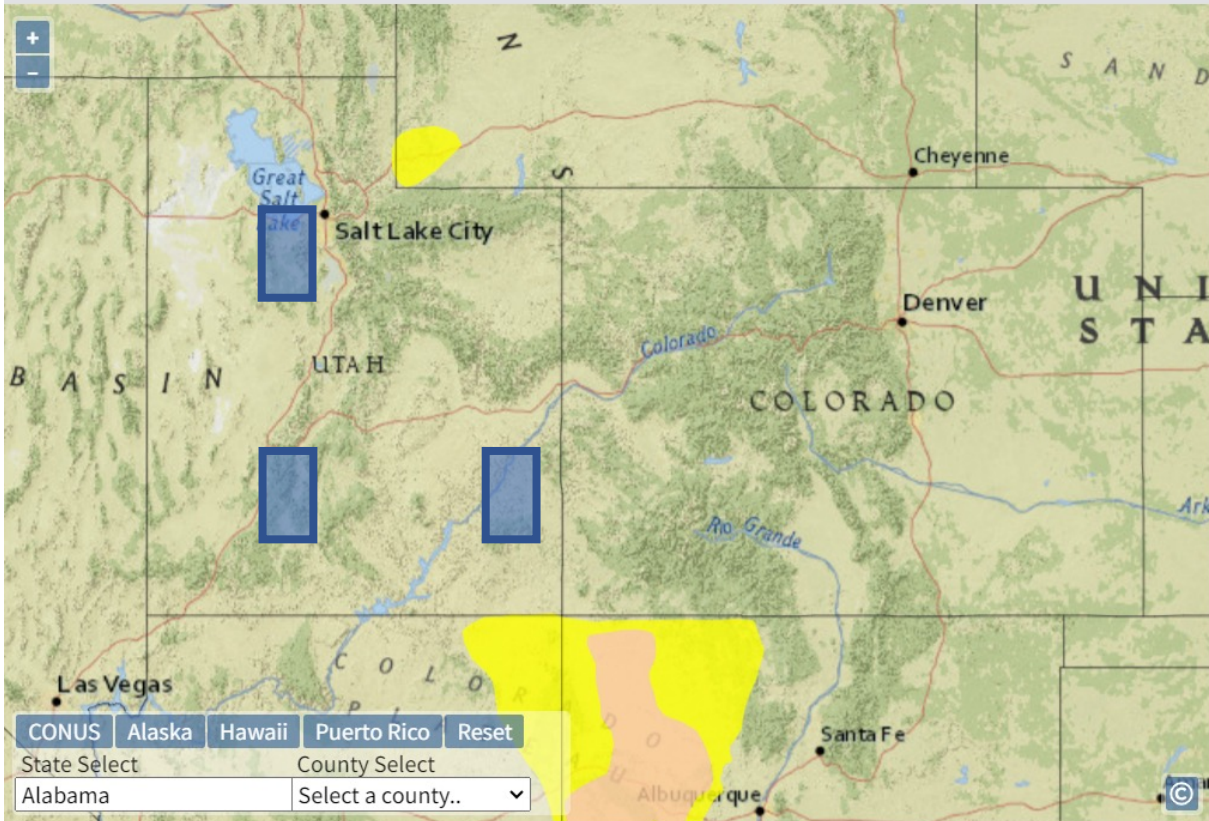
- **Dry year:** higher concentration of animals in the few wet areas;
- **Wet year:** more forage, space, lower competition





Week of  
2019-06-11

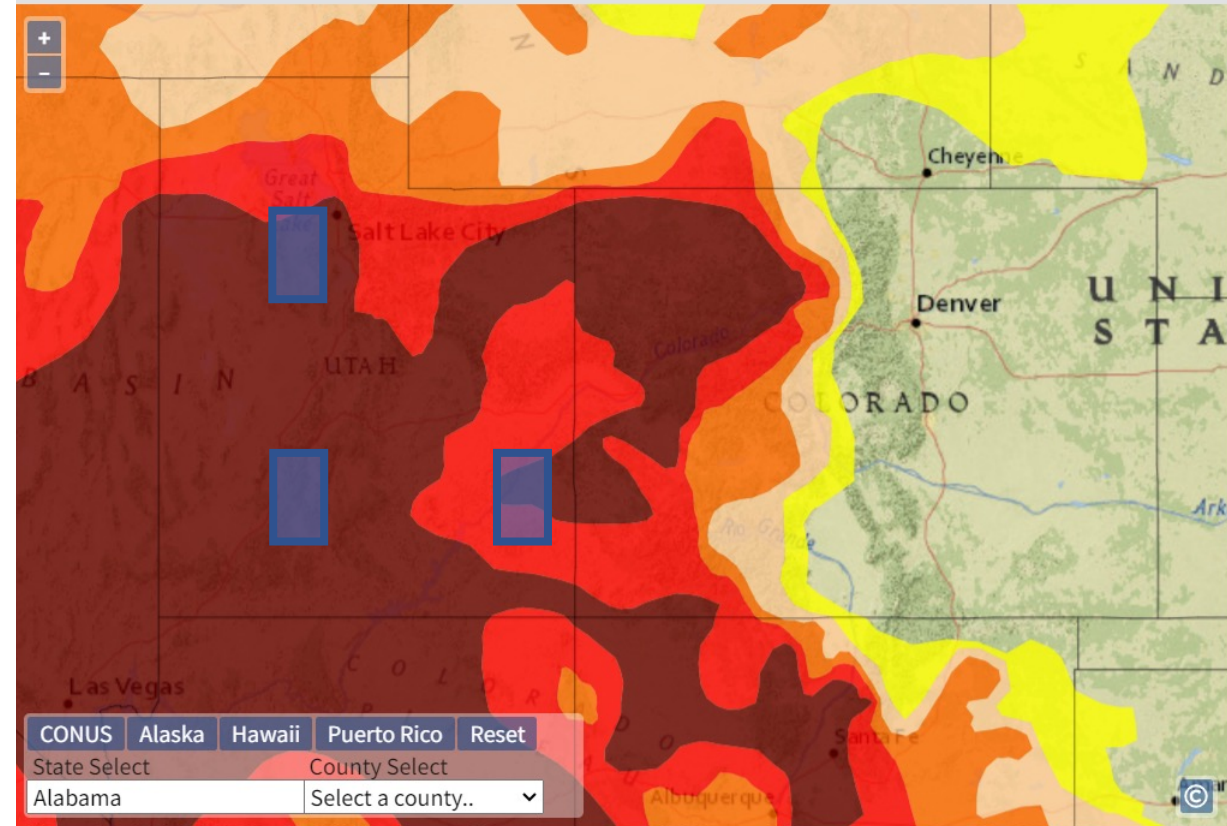
Drag to update map and legend.



**Drought intensity → 2019 = baseline year**

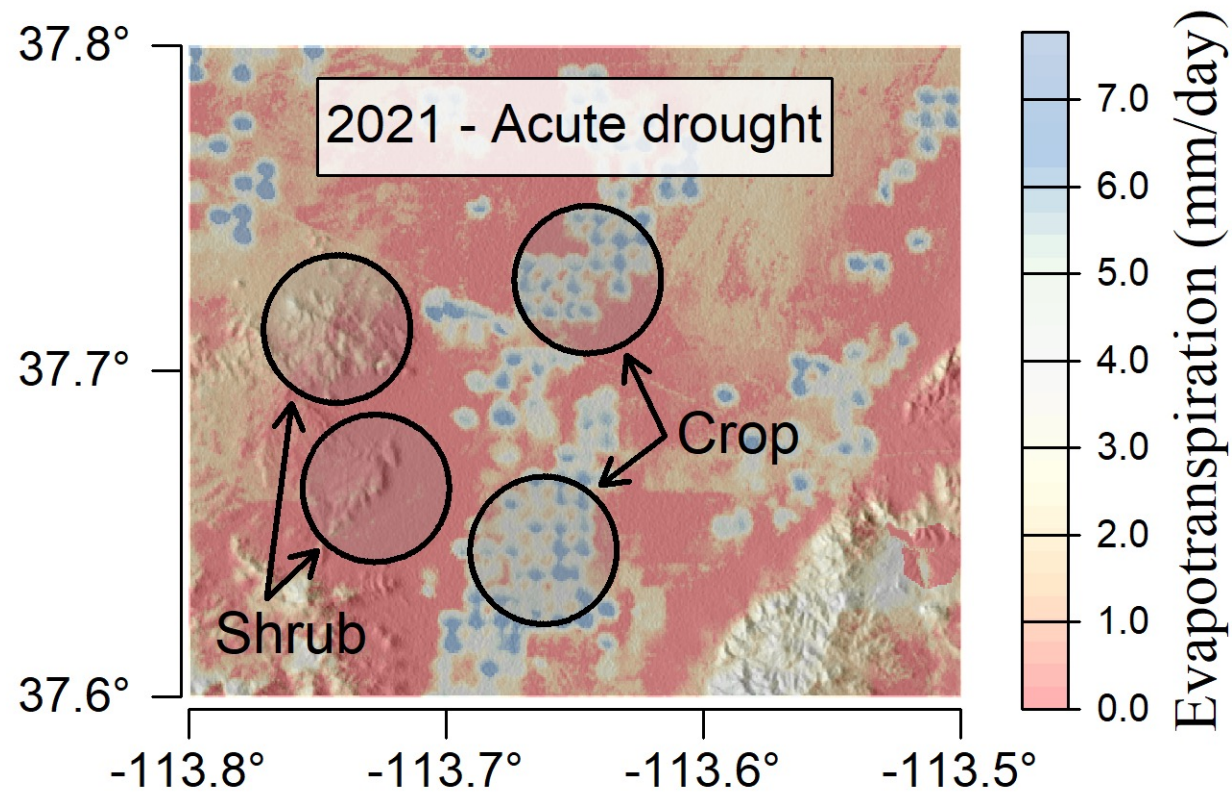
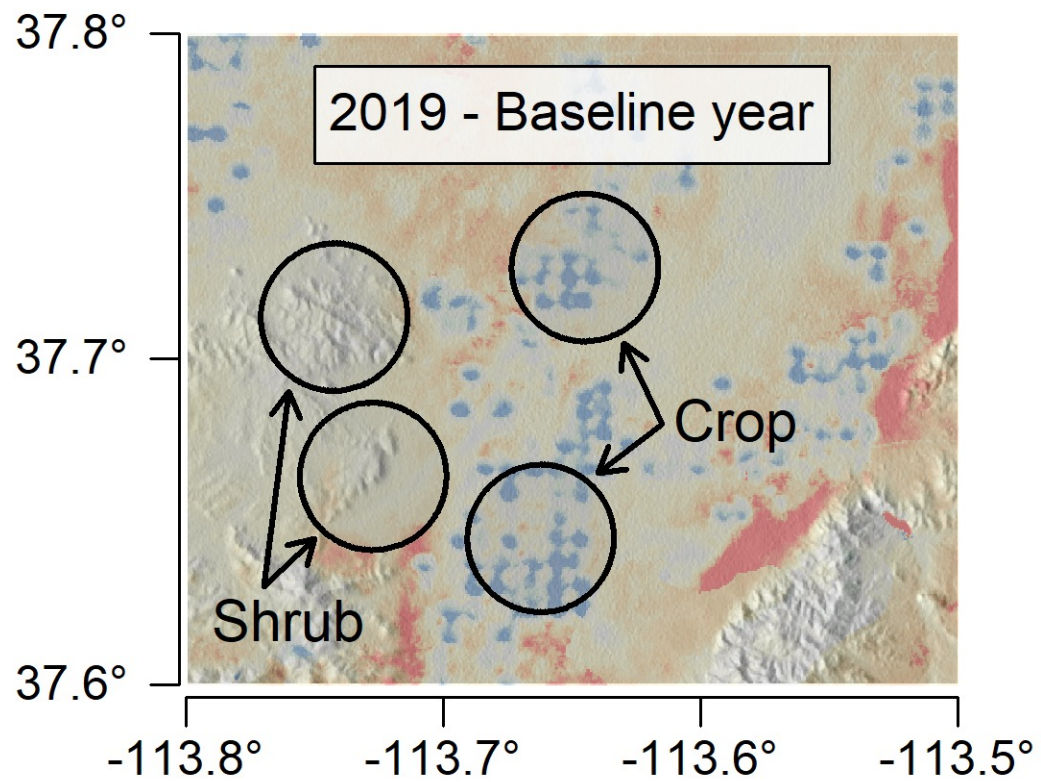
Week of  
2021-06-08

Drag to update map and legend.

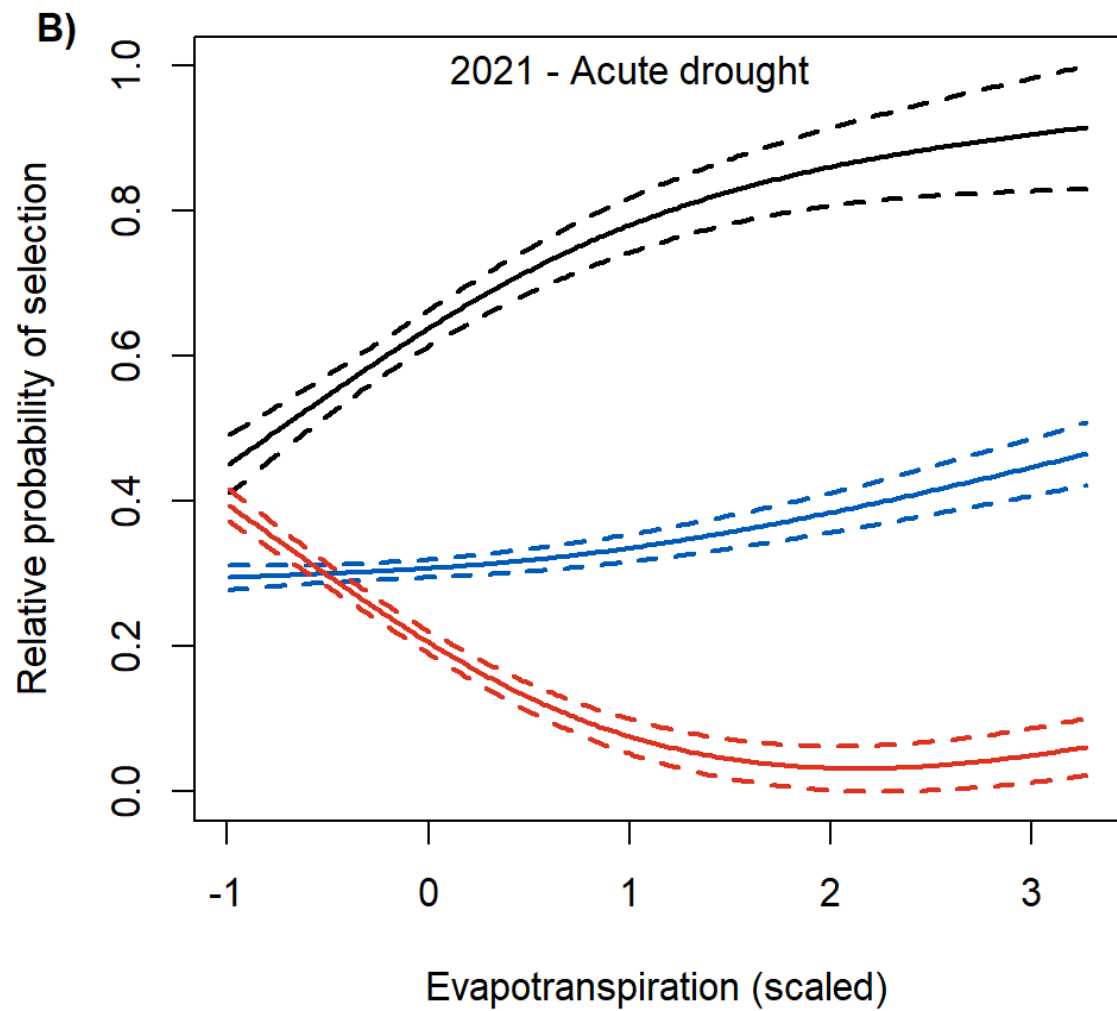
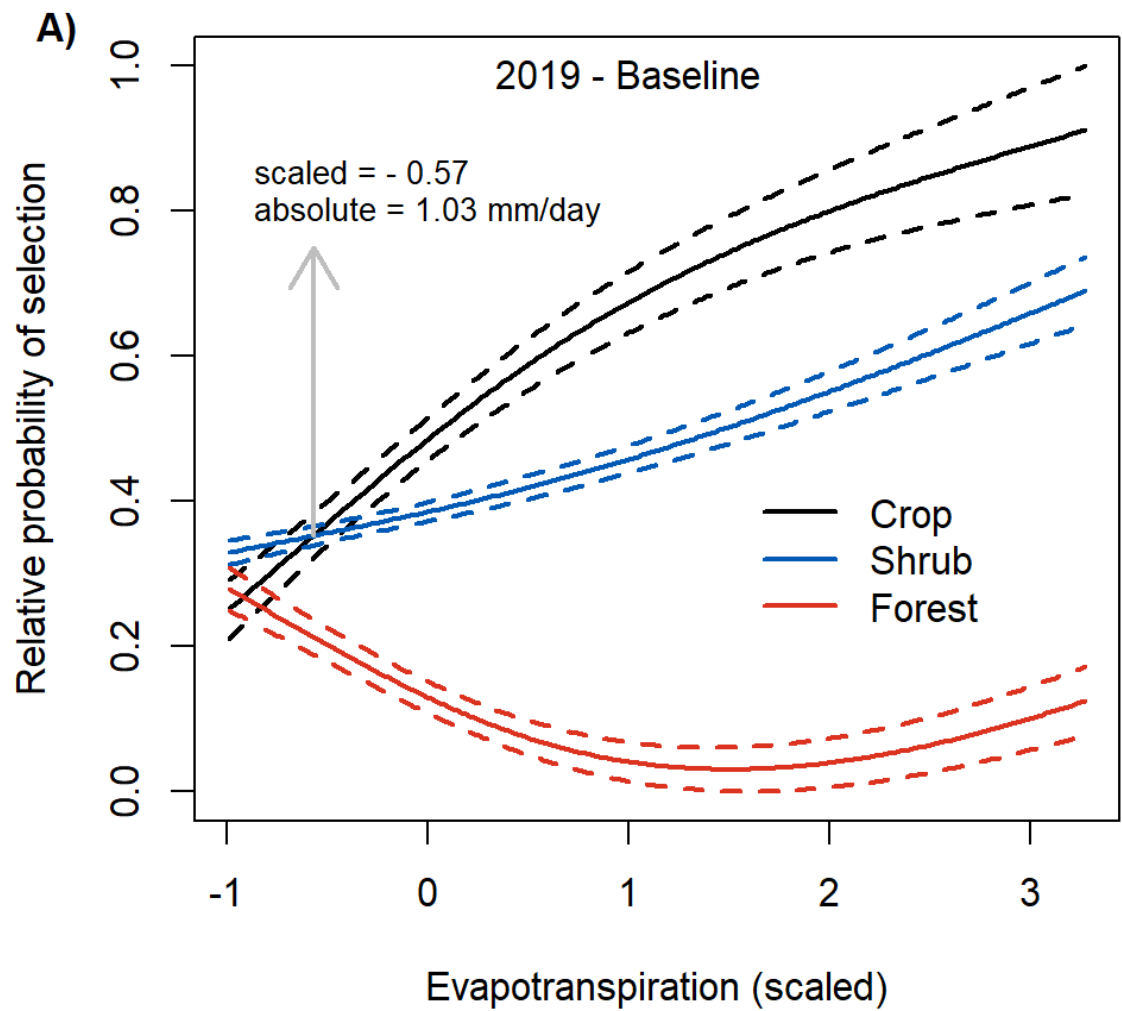


**Drought intensity → 2021 = acute drought**

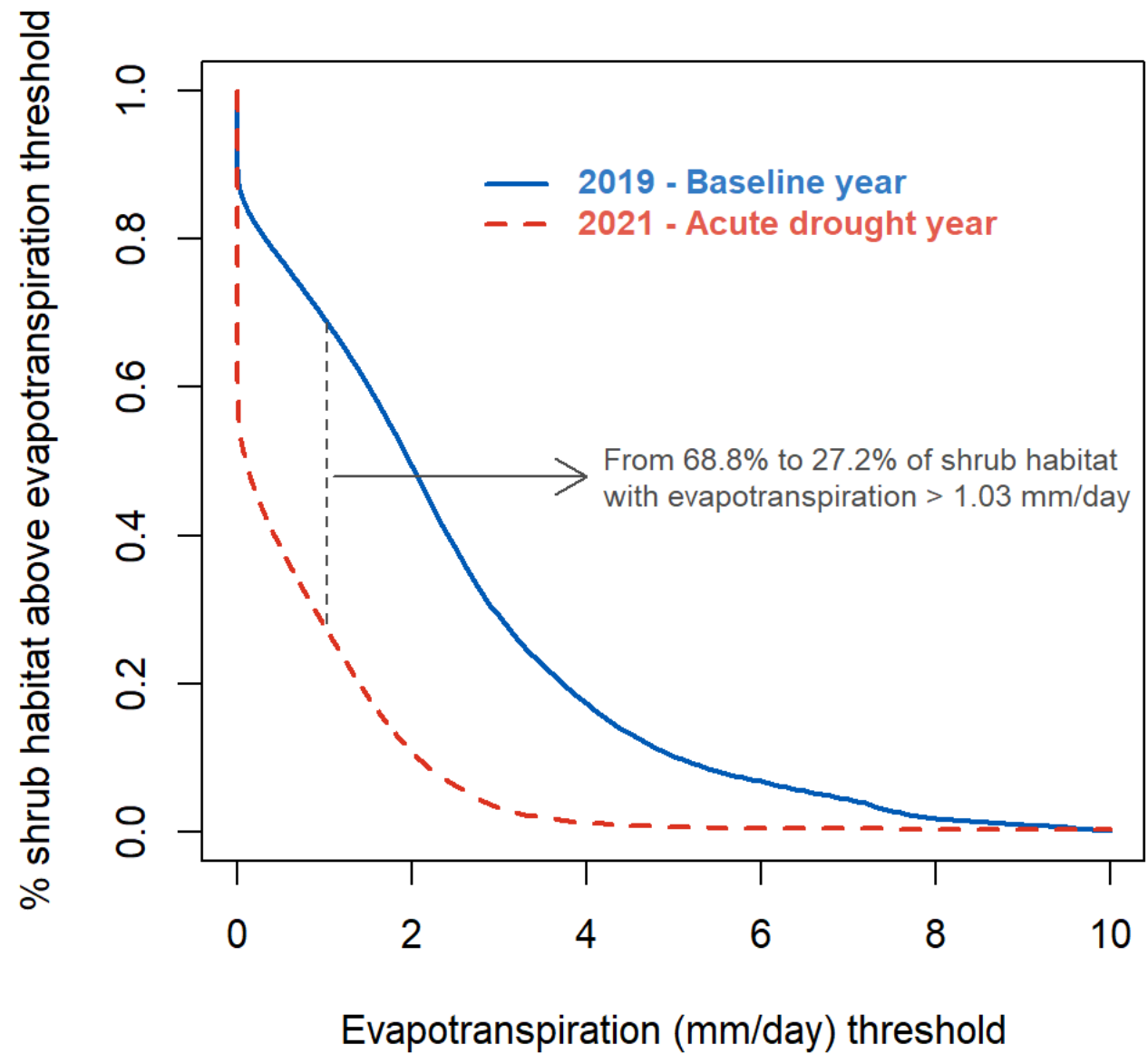






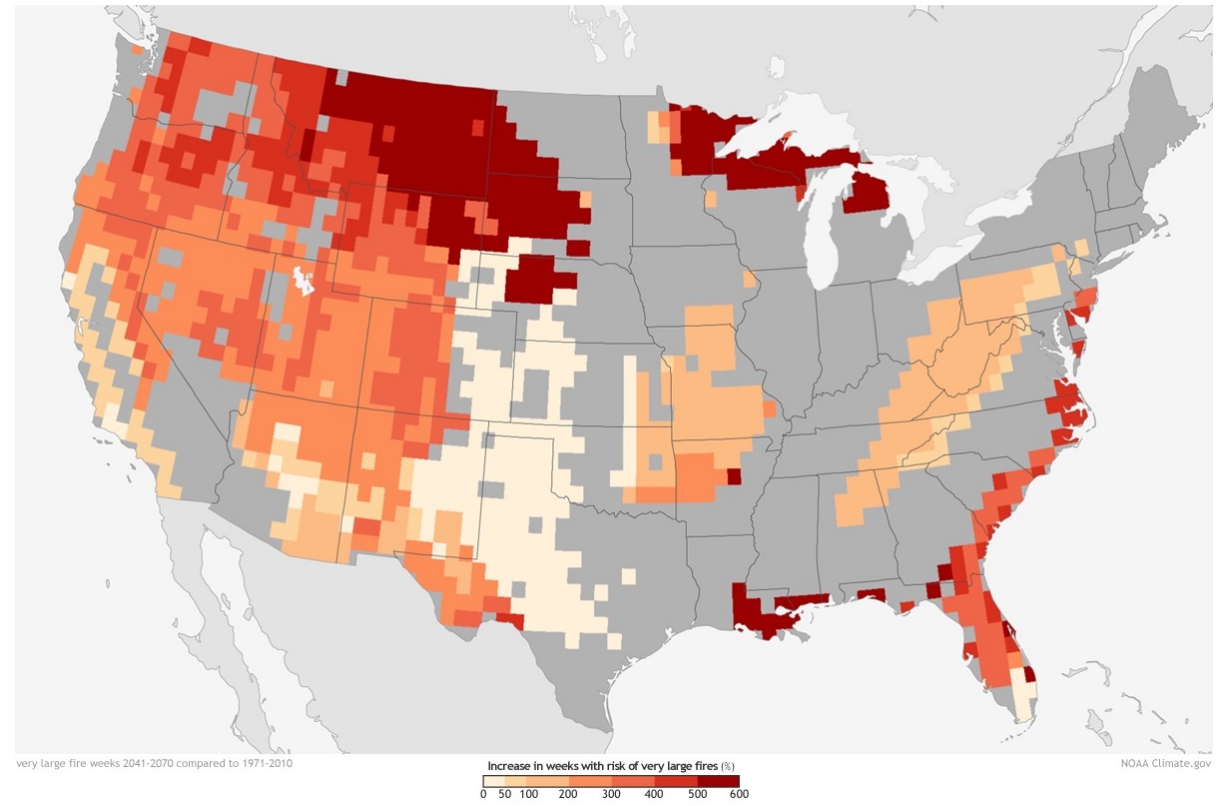
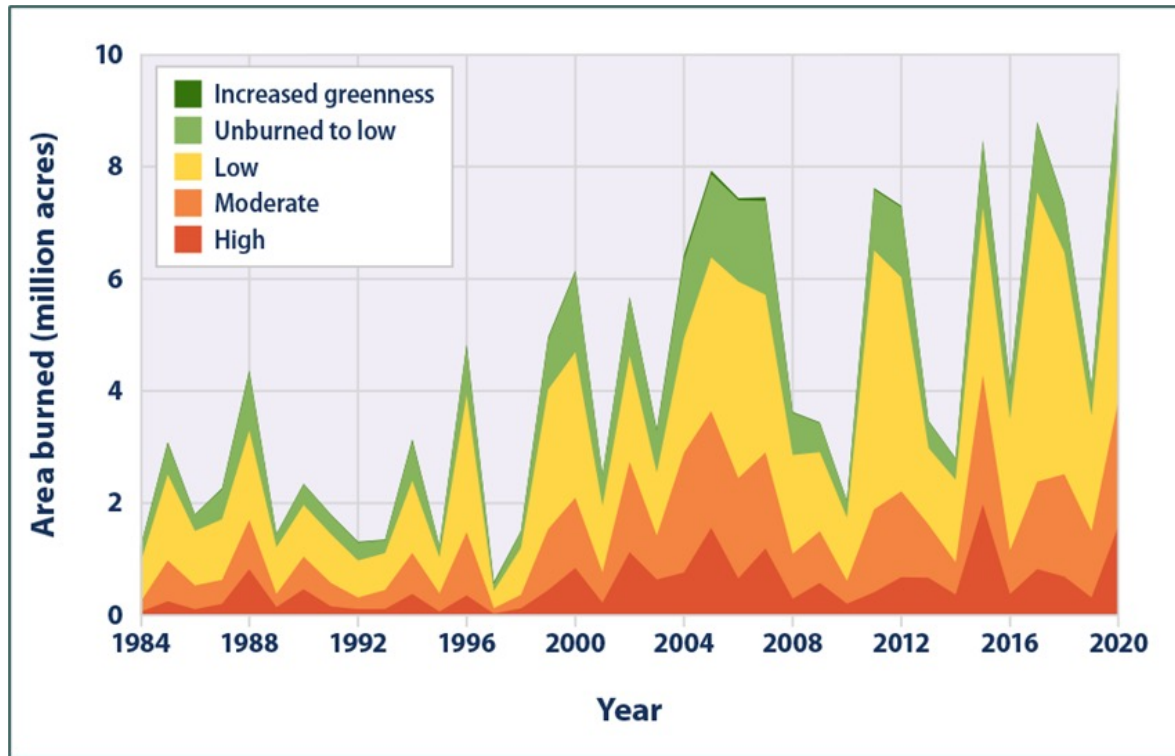




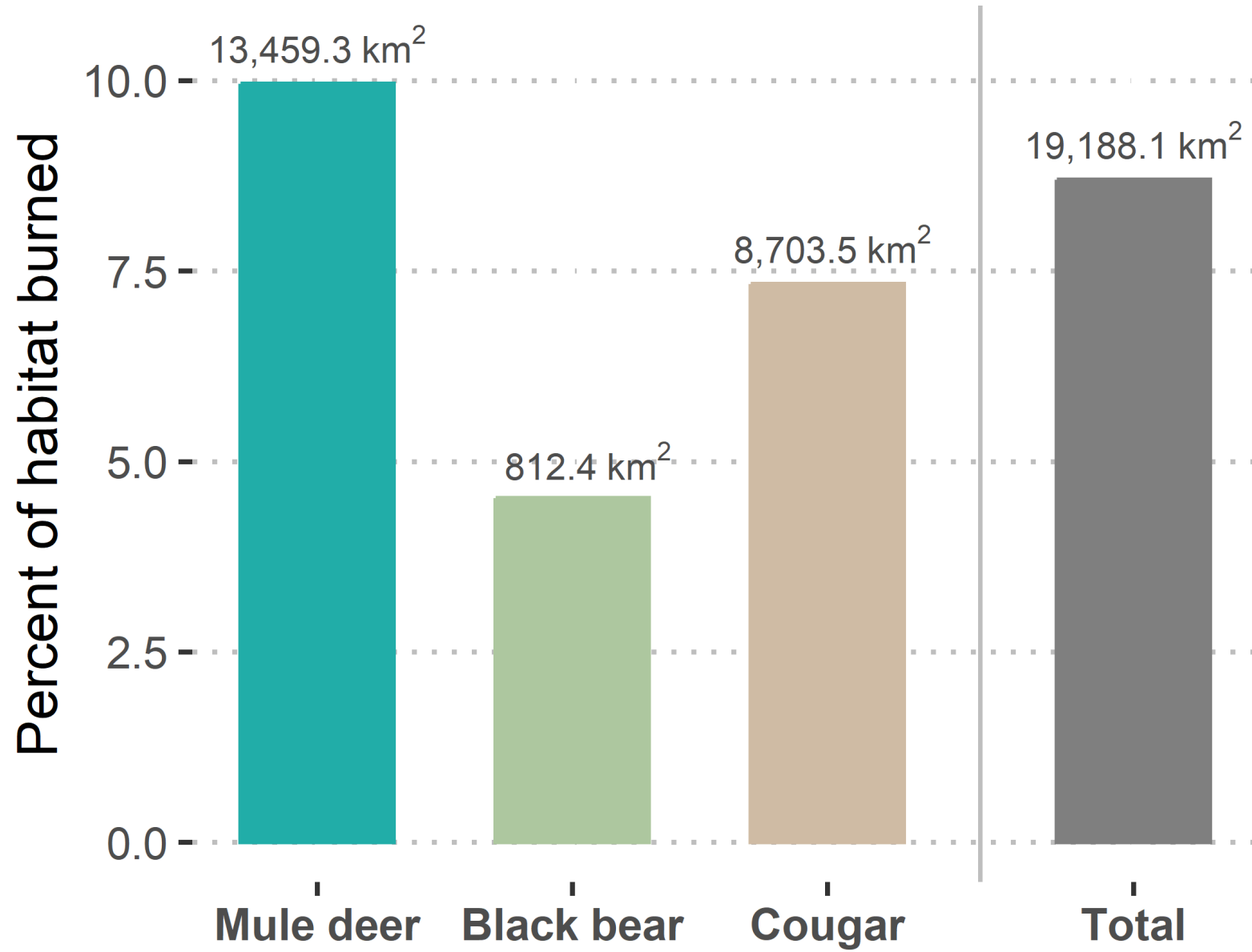




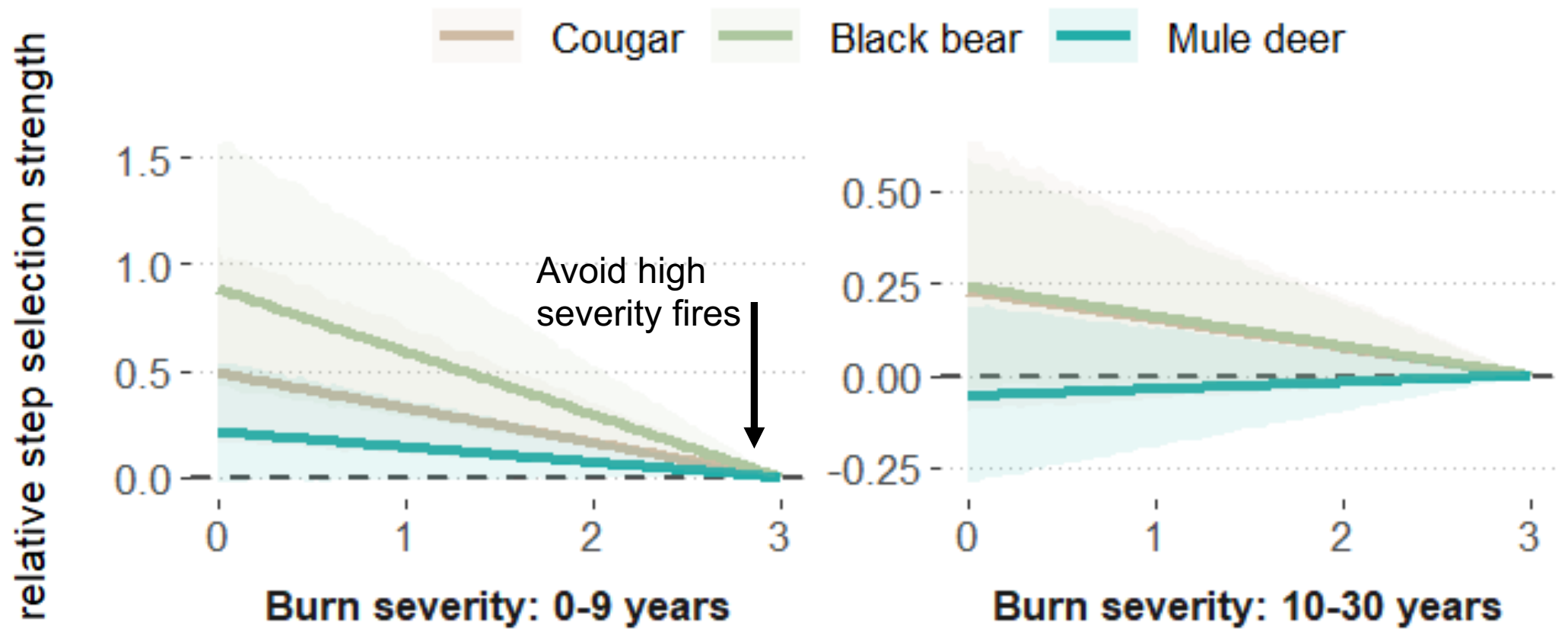
# Increasing impacts from fire













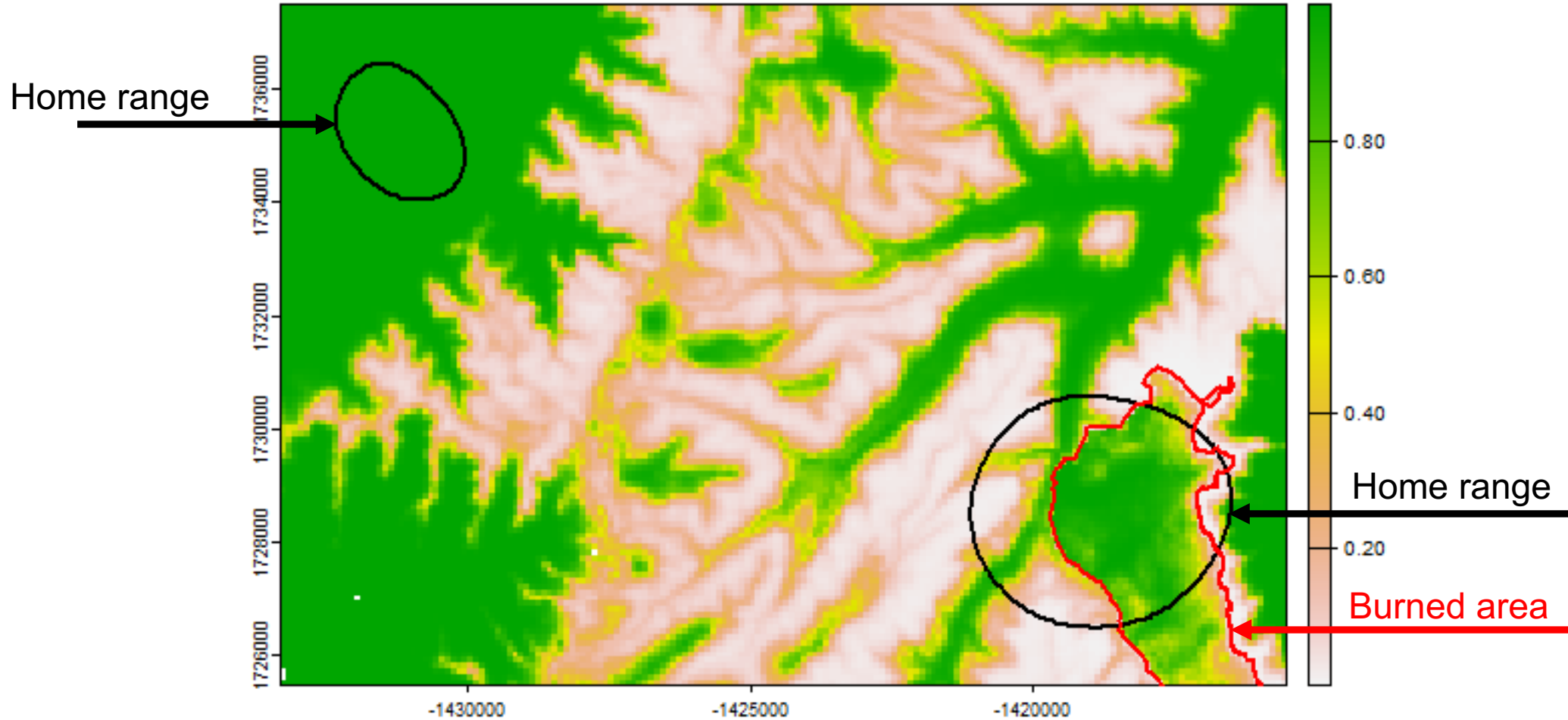
relative step selection strength



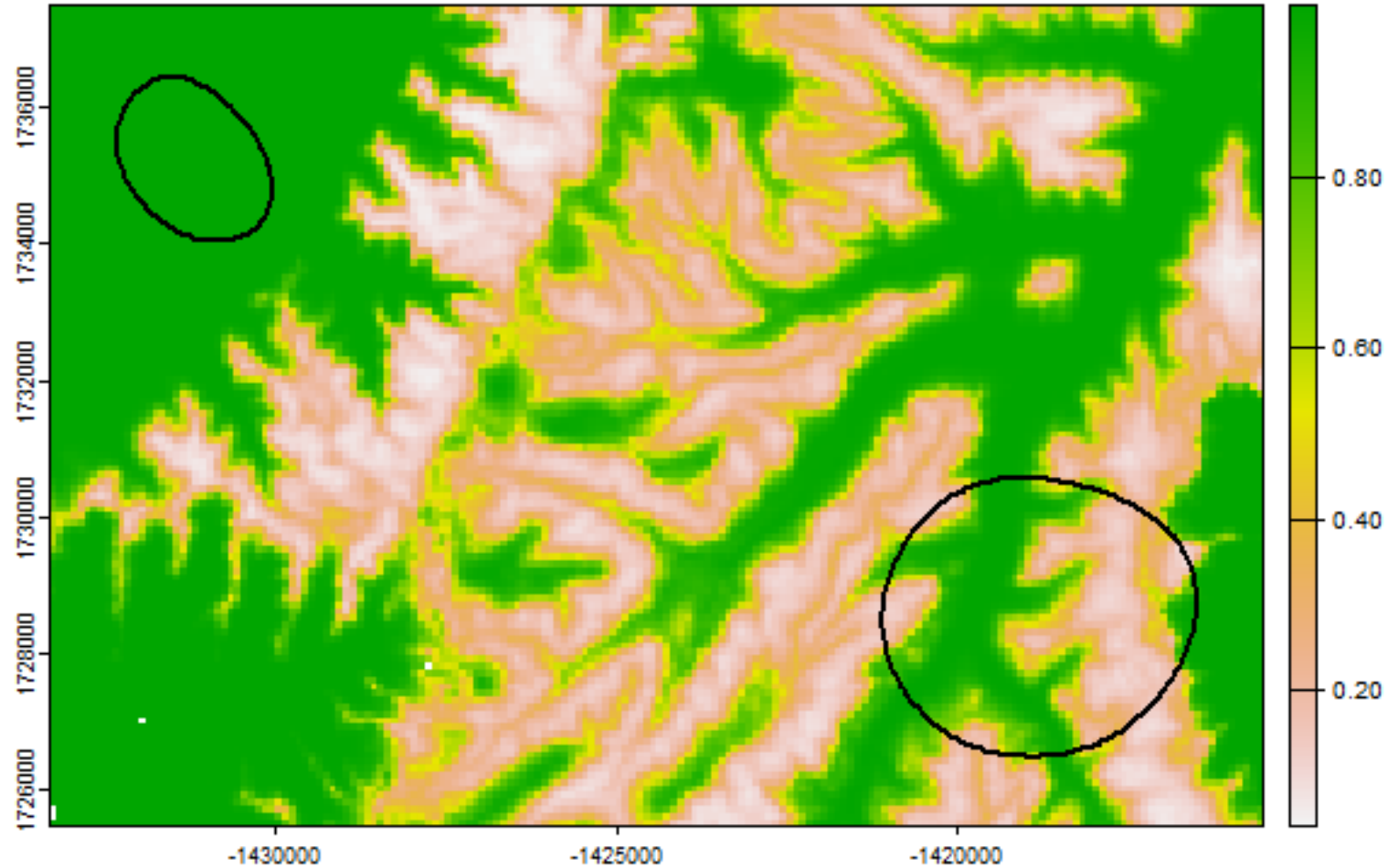
Deer prefer to be inside burned area



# Deer habitat with fire (prescribed)

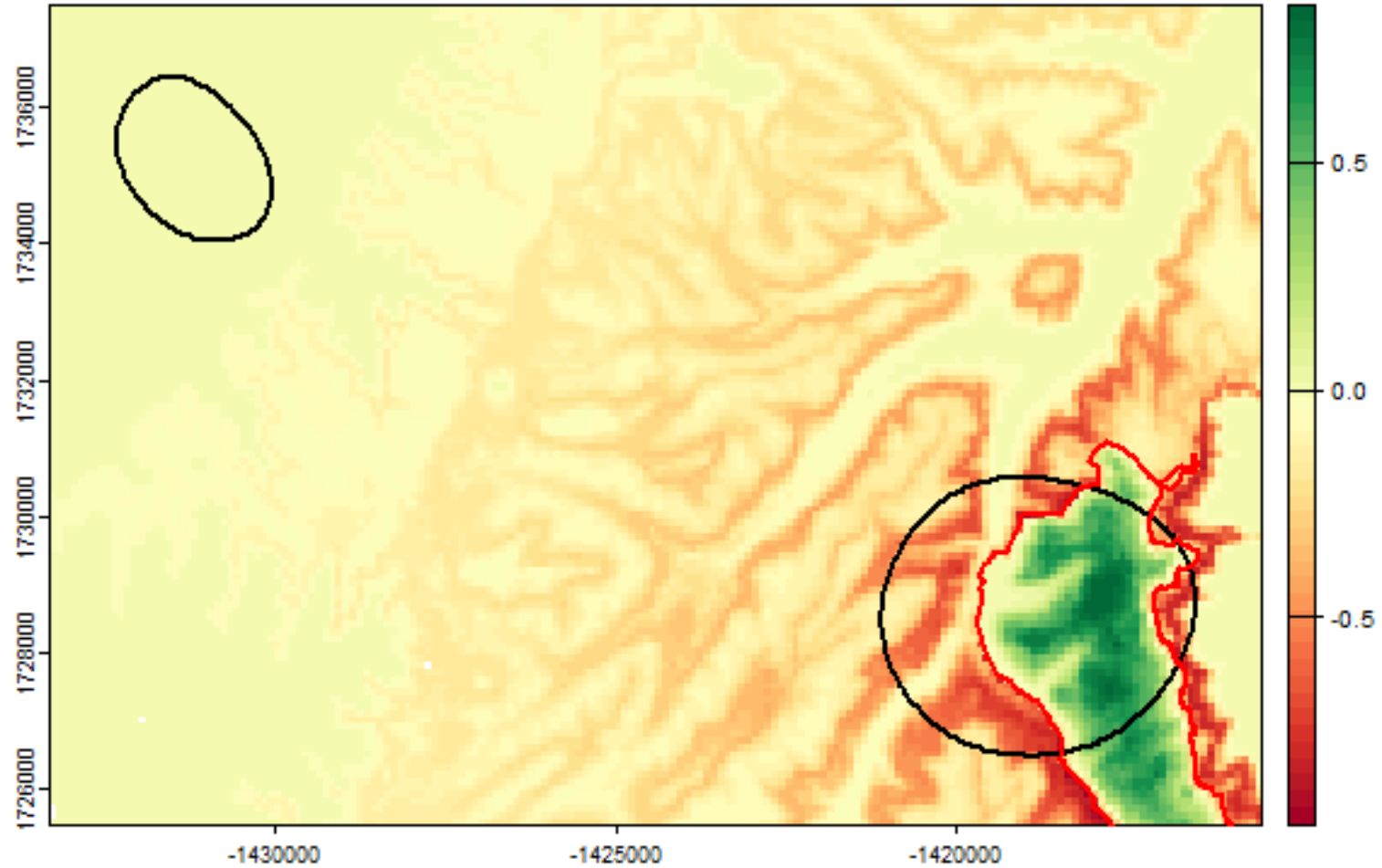


# Deer habitat without fire (simulated)





# Difference in deer habitat



# Conclusions

- GEDI and ECOSTRESS providing added value
  - GEDI-derived biomass improving habitat models
  - ECOSTRESS -> water availability influences animal foraging
- Drought
  - Habitat suitability
  - Driving deer use of irrigated croplands
- Fire
  - Responses vary by burn severity and time since burn



# Thanks!



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