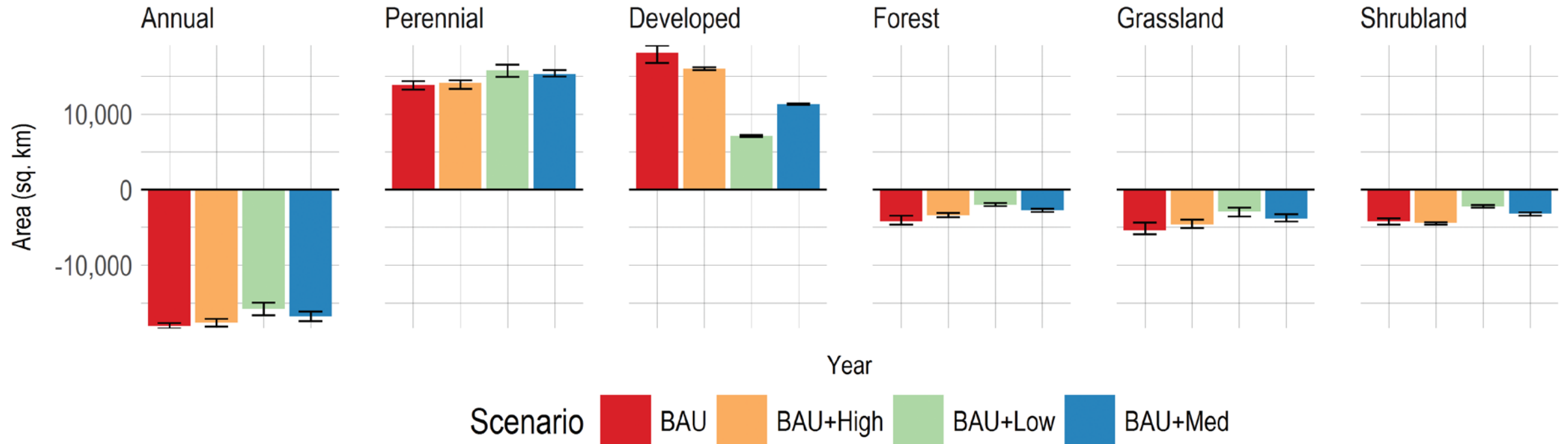


# Land Use, Fire, and Cannabis

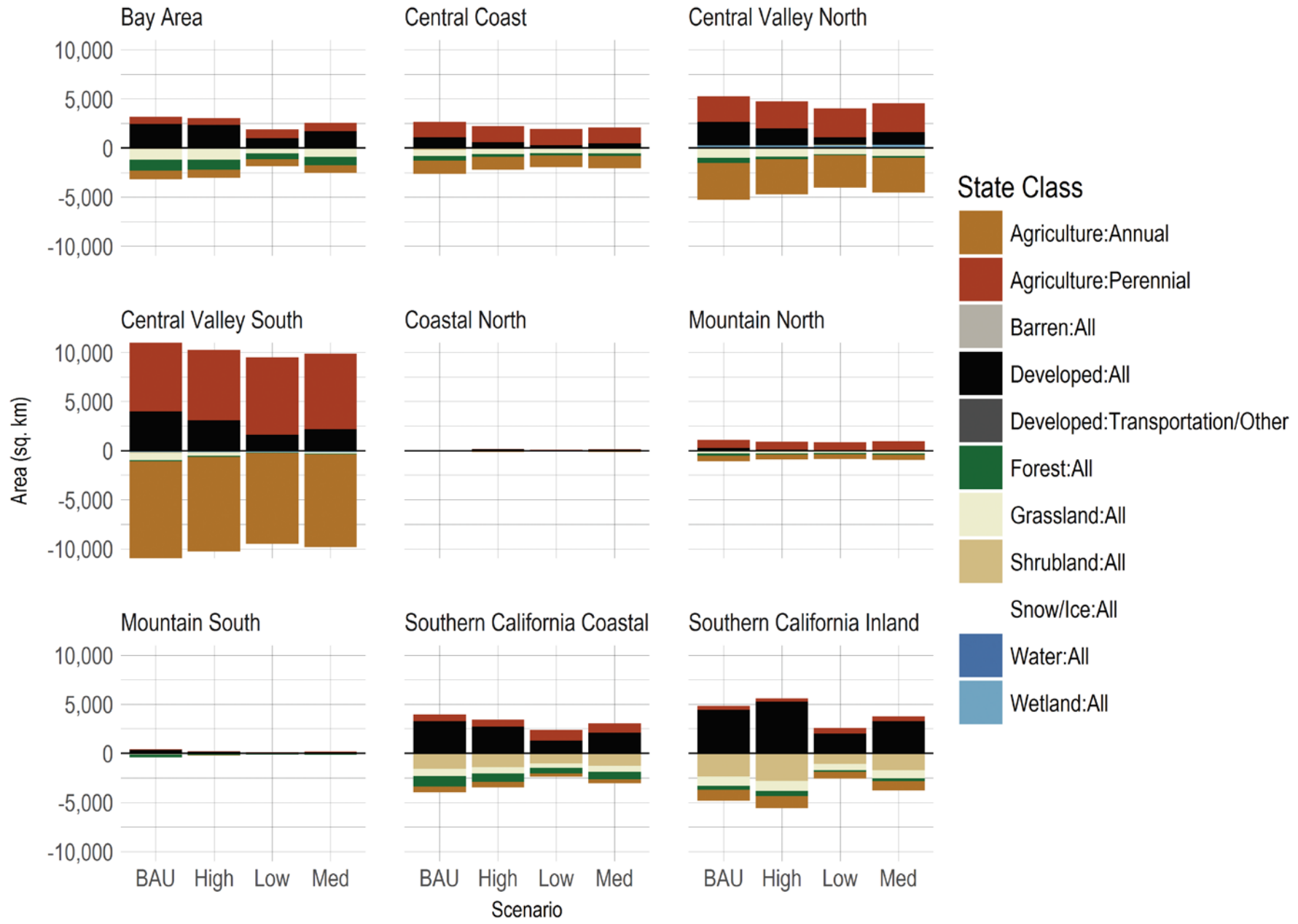
Van Butsic, Asst. Specialists, UC  
Berkeley

# What does the future of land use in California look like?

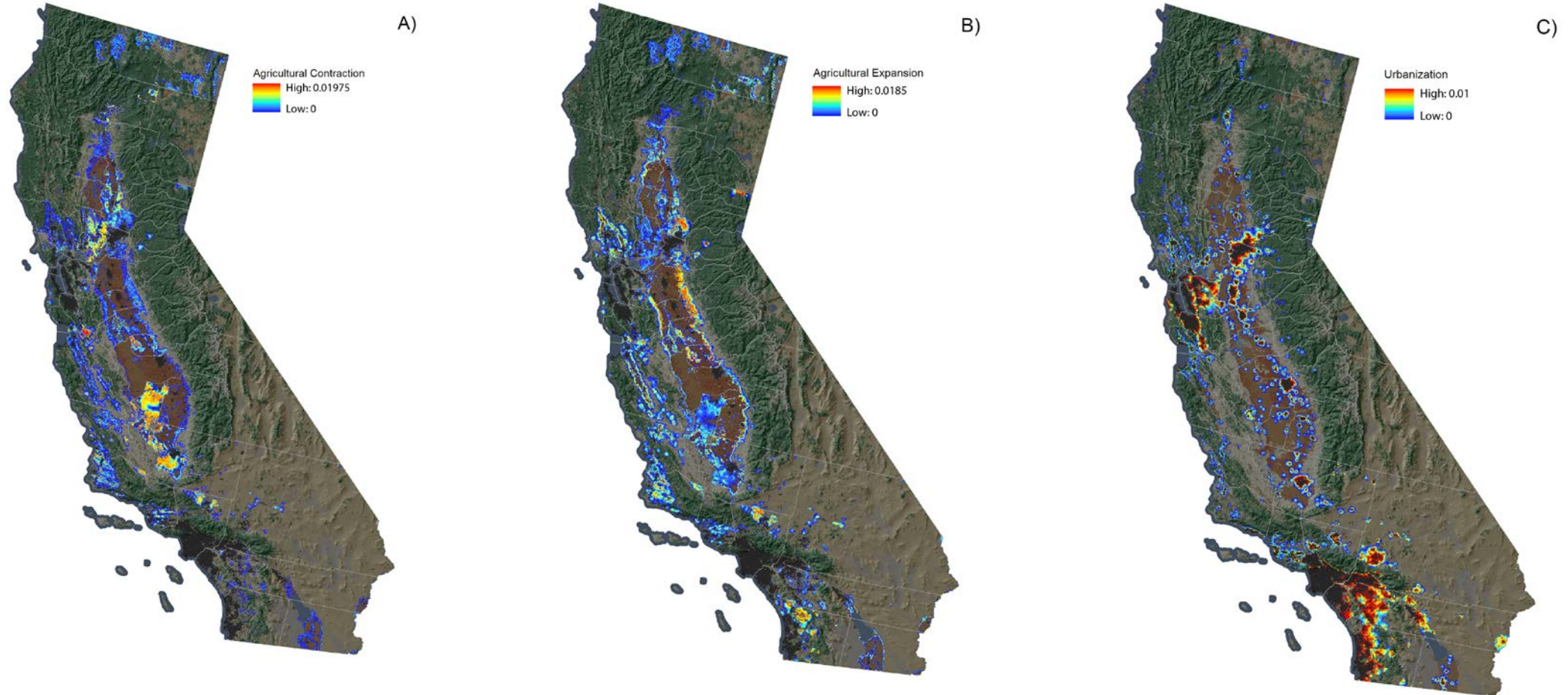


**Figure 5.** Estimated net change in LULC classes between 2001 and 2100. Bars represent the mean estimated net change area

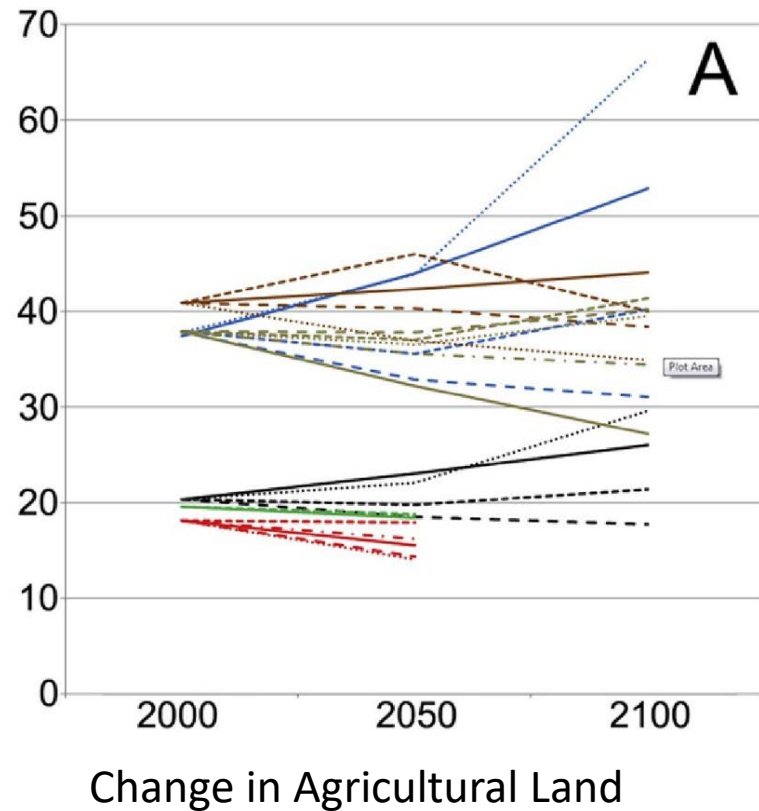
(1) Sleeter, B. M.; Wilson, T. S.; Sharygin, E.; Sherba, J. Future Scenarios of Land Change Based on Empirical Data and Demographic Trends. *Earth's Future*. 2017, 1–16.



# Where are changes likely to take place

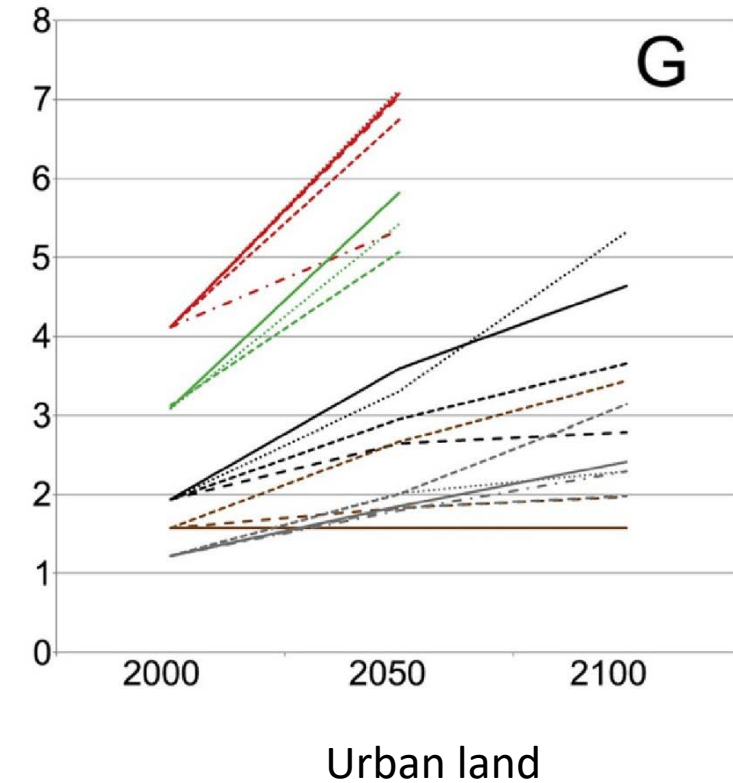


# Uncertainty



Between 1.8 and 6.5 million sq km of Ag Land

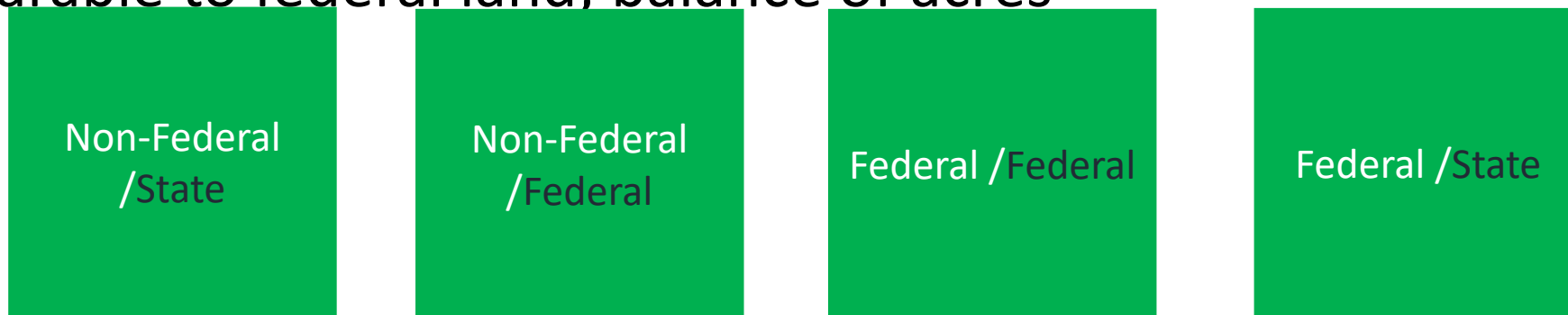
Between 0.15 and 0.7 million sq km of Urban land



Sohl, T.L., M. Wimberly, V. Radeloff, D. Theobald, **B.M. Sleeter**, 2016, Divergent projections of future land use in the United States arising from different models and scenarios, *Ecological Modeling*, Vol 337, pp. 281-297, doi: 10.1016/j.ecolmodel.2016.07.016. IP-074476.

# Fire is increasing

- But why is this?
- And can we do anything about it?
- Compare fire frequency in California across land ownership, fire fighting agency, and reserve status
- Apples to apples comparison – only compare non-federal land that is comparable to federal land; balance of acres



(1) Starrs, C. F.; Butsic, V.; Stephens, C.; Stewart, W. The Impact of Land Ownership, Firefighting, and Reserve Status on Fire Probability in California. *Environ. Res. Lett.* 2018, 13.



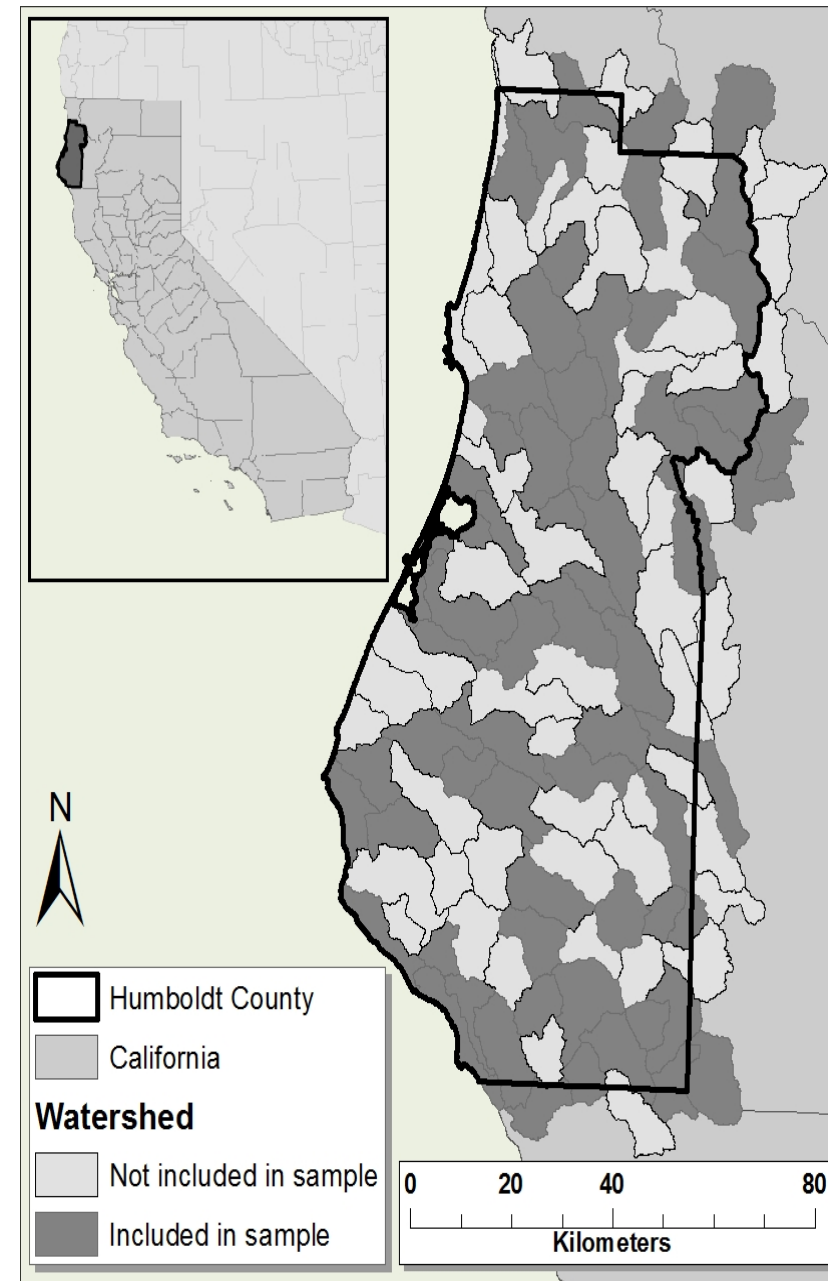
# Results

Ownership	Firefighting	1967-1983	2000-2015	Percentage point change

# Will cannabis have an impact?

## Undergraduate Researchers

- ~30 undergraduate researchers at two schools
- ~3000 hours of digitizing total
- Original study ~50% of Humboldt County in 2012
- Update with help from TNC for Mendocino and Humboldt Counties 2012 and 2016





# Identifying cannabis grows - greenhouses



2006



2008



2010



2012



2014

# Water impacts from cannabis ?

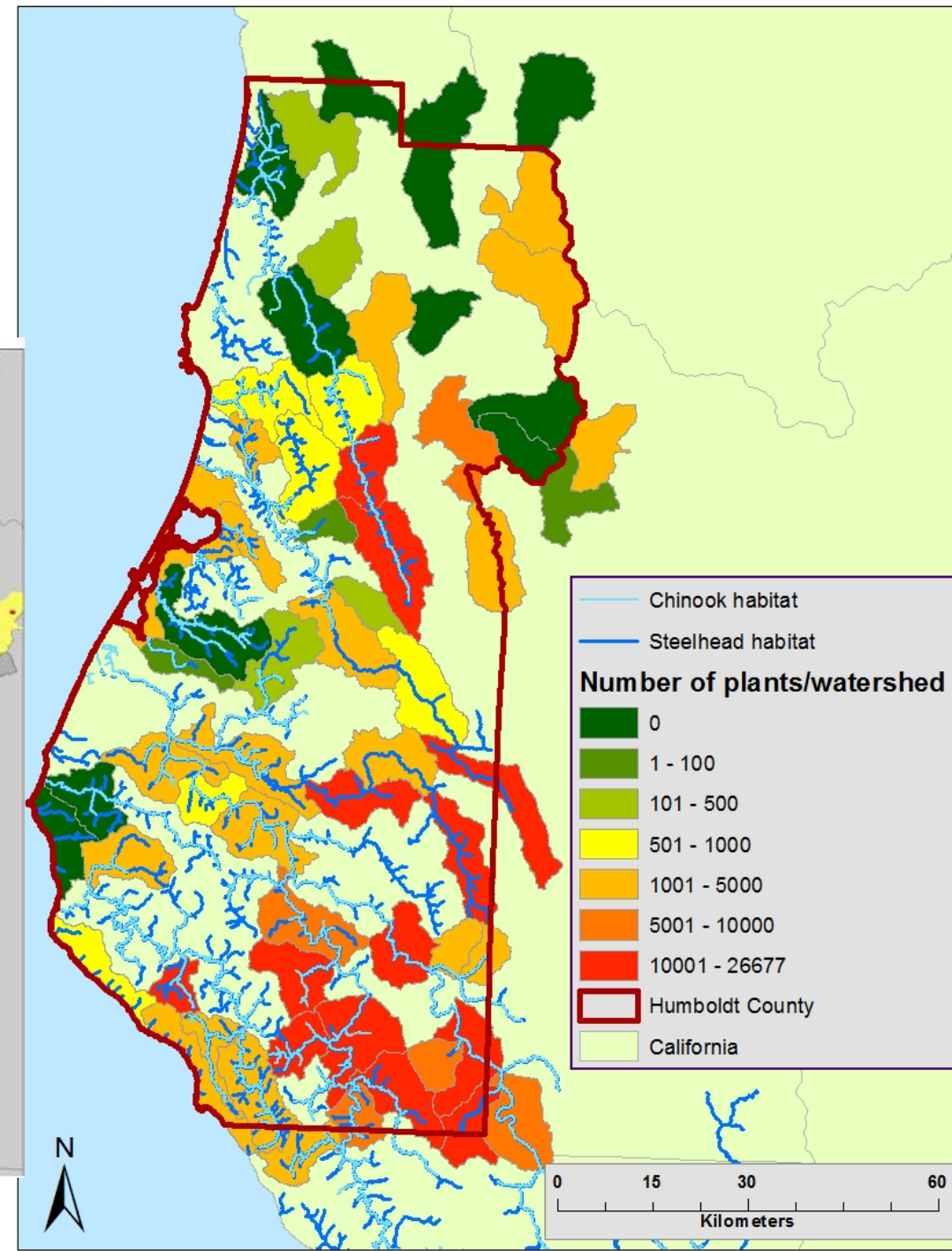
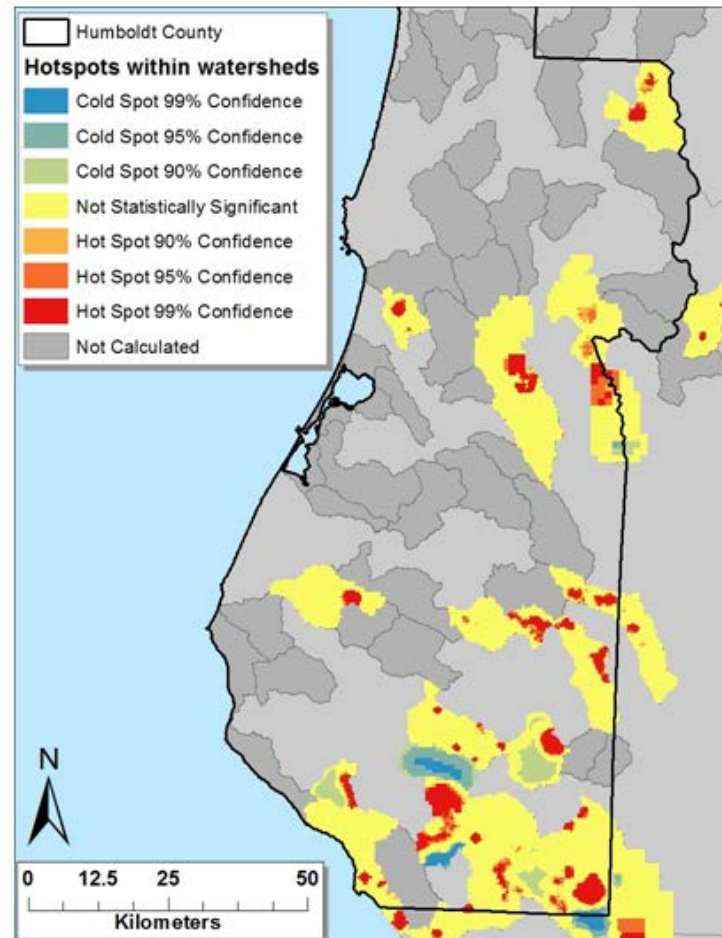
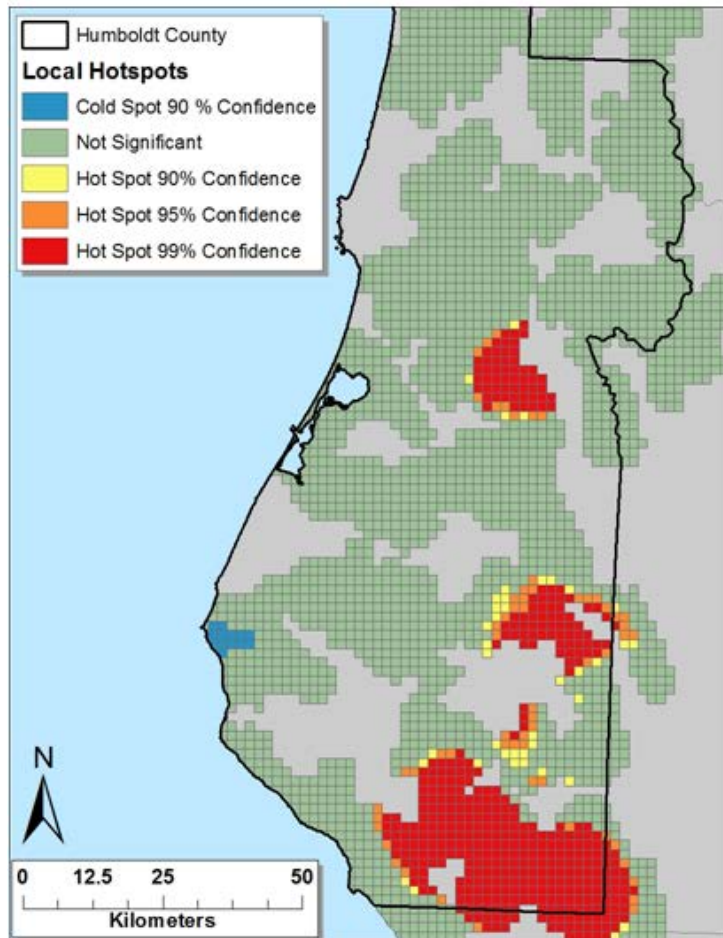
## Extrapolations...

- 22 Liters a day
- 150 days of irrigation
- 1.5 million plants
- 5 trillion liters of water
- 1600 acre feet of water – for  $\frac{1}{2}$  the area
- ~3200 acre feet in total

## In comparison

- Equal for about 2250 families
- Or about 1000 acres of irrigated wine grapes – There are close to 500,000 acres of grapes in California
- Potter Valley Project – exports 159,000 acre feet of water a year from Eel River
- But, the timing of water use is critical
- And diversions may be coming from many small streams – reports of complete dewatering

# Spatial arrangement of grow sites



# Conclusion: We face significant challenges

- Urban expansion and perennial crops may stress water systems
  - Planning may help
  - Increases in efficiency may help as well
- Fire, and its associated impacts, can be at least partially mitigated by management
  - But this will require increased investment and coordination
    - Public + private
- Cannabis is not sucking California dry
  - Timing of irrigation and location of grows is not optimal
  - Current regulations may help, or not.