Assessing vulnerable and expanding vegetation stands and species in the SF Bay Area for conservation management under climate change

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Historical Climate 1951-1980

PRISM climate layers downscaled to 270 m;
Climatic water deficit from Basin Characterization Model (Flint et al. 2013)

Winter min temperature

0.9 – 7.9 °C

Summer max temperature

16 – 35 °C

Total annual precipitation

280 – 2000 mm

Climatic water deficit

208 – 1050 mm

California climate ‘current’ Bay Area climate
Expected vegetation changes?

• Species Distribution Models (SDMs)
  • 27 species
  • Data: Consortium of California Herbaria

• Probabilistic Vegetation Models (PVMs)
  • 22 vegetation types
  • Data: Conservation Lands Network

• BCM 2014 climate data:
  • CWD, DJF, JJA, PPT
Blue oak (*Quercus douglasii*)

Comparison of wetter and drier conditions under warm and hot climates.
Douglas fir (*Pseudotsuga menziesii*)

Warm

Hot

Wetter

Drier
What is driving the predicted changes?

• Stein-Alpert decomposition – Douglas fir
What might the Bay Area vegetation of the future look like?

Current +7 ºF drier +7 ºF wetter

Chornesky et al. 2015 Bioscience
Are SDMs good for all types of projections?

• **Best** at predicting where species **cannot** occur (receding stands)

• **OK** at predicting where species **might** occur (persisting stands)

• **Not good** at predicting where species **will** occur (expanding stands)
  - Restoration, dispersal limitation
Communicating with managers

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<th>Contracting</th>
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Dramatic Decline
Moderate Decline
Relative Stability
Increase
Conclusions

• Simplify results – but presenting uncertainty
• Tools available to inform on direct drivers
• Asymmetry of species distribution modelling
  Contraction – Persistence – Expansion
• Large changes expected
  • Often dependent on precipitation projection
  • Resist or manage for change?
  • Coordination across landscape units needed
Co-authors:
• Nicole E Heller
• Blair McLaughlin
• Stuart B Weiss
• David Ackerly

Help cleaning occurrence data:
• Andrew Thornhill
• Matthew Kling
• David Baxter
• Will Freyman