



Climate Change, Birds, and Military Readiness on Department of Defense Lands in California

John Wiens¹, Christine A. Howell¹, Diana Stralberg¹,
Dennis Jongsomjit¹, Mark A. Snyder²

¹PRBO Conservation Science, ² University of California, Santa Cruz



Introduction

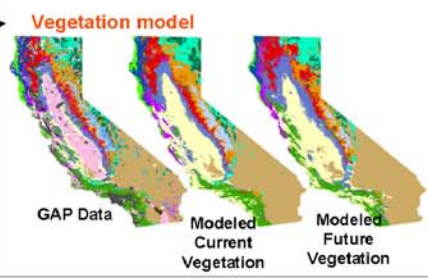
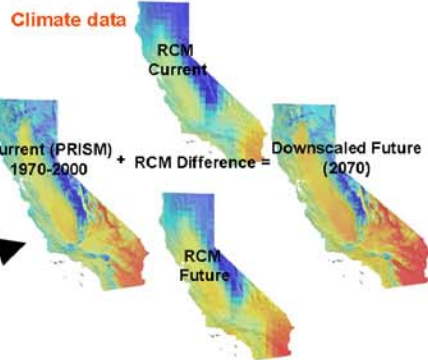
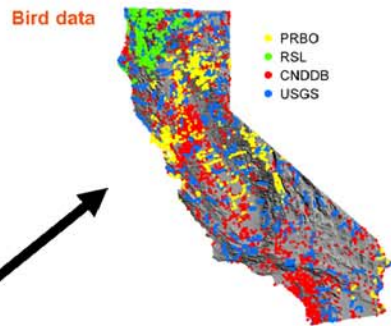
Climate change will affect the environment of military installations. Managing installations to ensure their capacity to sustain military readiness will require an understanding of what changes the future may hold. We have developed spatial models to predict changes in bird distributions resulting from climate change in California. The models indicate that losses of bird species on DoD lands may be greater than on any other public lands in California. These changes may be harbingers of broader environmental changes that may compromise environmental management and the sustainability of lands for military training.

Approach

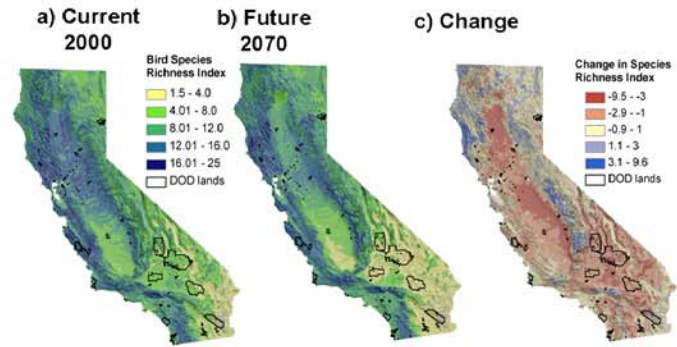
- Develop species distribution models (SDMs) of current bird distributions based on associations with climate and vegetation
- Use 2 SDM algorithms (Maximum Entropy [Maxent] and Generalize Additive Models [GAM]) to predict future bird distributions based on future climate and vegetation
- Validate models using a subset of the data and expert review
- Overlay map of DoD lands in California with predicted bird distributions to assess changes

Data sources

- Bird data: Presence/absence breeding season records from over 21,000 individual locations within California by PRBO Conservation Science, USFS Redwood Sciences Lab and Klamath Bird Observatory (RSL), California Natural Diversity Database (CNDDB), and the USGS's Breeding Bird Survey.
- Species: 60 focal species based on the Partner's in Flight Bird Conservation Plans for riparian, coniferous forest, grassland, scrub, and oak woodlands.
- Land use ownership: California Protected Areas Database summarized by federal land owners.
- Current climate: PRISM 30-year normals (1971-2000), 800 m resolution; 8 bioclimatic variables used in models.
- Future climate data: Projections from a Regional Climate Model (RegCM3) at 30-km resolution using the IPCC SRES A2 scenario with two global climate models: National Center for Atmospheric Research (NCAR) Community Climate System Model (CCSM3.0) and Geophysical Fluid Dynamics Laboratory (GFDL) GCM CM2.1; models downscaled to 800-m resolution by projecting change values relative to PRISM data.
- Current vegetation inputs: Aggregated California Wildlife Habitat Relationship (WHR) vegetation classes from California GAP analysis landcover dataset.
- Future vegetation inputs: Aggregated WHR classes projected from models based on current vegetation, soil, and climate using the Random Forest classification algorithm.

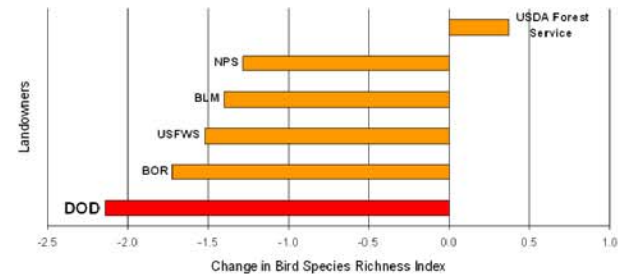


Predicted Bird Species Distributions

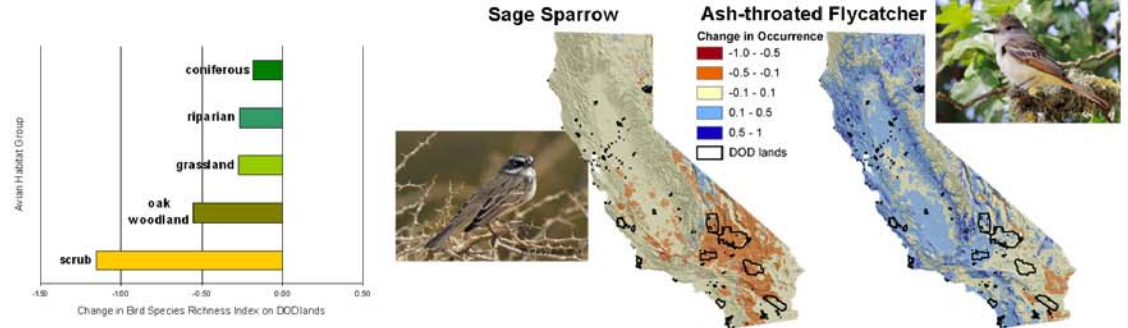


a) & b) Predicted probability of occurrence summed over all focal species (an index of species richness). c) Change between current and future species richness.

Change on DOD lands relative to other Federal landowners



Climate change winners and losers



On DOD lands every habitat grouping of birds is projected to decrease in species richness following climate change. However, individual species vary in their responses; Sage Sparrows are projected to decrease in occurrence, whereas Ash-throated Flycatchers are predicted to increase in occurrence following climate change.

Main Points

1. Climate change will alter plant and animal distributions and change habitats.
2. Distributional models predict that some parts of California will gain bird species while others will lose species.
3. DoD lands show the largest predicted decrease in bird species among six federal agencies in California.
4. Reductions will be greatest in breeding species of scrub and chaparral habitats, though not all species will respond in the same way.

Implications

1. Changes in bird distributions on DoD lands may be harbingers of other environmental changes, compromising the suitability of these lands to support the military mission.
2. Managing military lands to sustain military readiness will require an understanding of future environmental changes.

For additional information contact John Wiens
jwiens@prbo.org
www.prbo.org

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www.klamathbird.org
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