THE INSTITUTE FOR BIRD POPULATIONS

# Assessing climate change vulnerability and developing a climate change adaptation strategy for Sierra Nevada birds

## Progress Report

**March 12, 2013**

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## nAccomplishments since March 2012 progress report

Subsequent to our March 2012 progress report we have made the following progress on our project.

**a) Conduct a vulnerability assessment for 168 bird species that breed and/or spend summer in the Sierra Nevada**

- Worked with Bruce Young at Nature Serve to refine the CCVI scoring system (Version 2.3) for use specifically in our area of interest. Version 2.3 of the CCVI is more sensitive than previous versions to the smaller degree of historic climate variation experienced in the Sierra Nevada as compared with elsewhere in temperate and boreal North America, and places a higher weighting than the prior versions on indirect exposure and sensitivity factors as compared to modeled and documented responses to climate change.

- Re-evaluated all 168 species using the revised scoring system. Evaluations were conducted under two distinct climate projections – GFDL and PCM. Seventeen species ranked as Moderately Vulnerable or Extremely Vulnerable under one or both projections (Table 1, next page). No species ranked as Highly Vulnerable, a classification between Moderately Vulnerable and Extremely Vulnerable.

Table 1. Climate change vulnerability rankings, special-status designations in California, latitude of overall breeding range relative to the Sierra Nevada, and course-scale habitat associations for the 17 species (168 species assessed) that ranked as Moderately Vulnerable or Extremely Vulnerable to climate change in the Sierra Nevada under one or both of the climate projections we assessed.

| | CCVI Assessment | | California Special | Overall Breeding | |
|---|---|---|---|---|---|
| Common Name | GFDL Climate Model | PCM Climate Model | Status[1] | Range[2] | Habitat(s)[3] |
| Common Merganser | Moderately Vulnerable | Moderately Vulnerable | | Northern | AQU |
| White-tailed Ptarmigan | Extremely Vulnerable | Extremely Vulnerable | | Northern | SUA |
| Osprey | Moderately Vulnerable | Presumed Stable | S3 | Central | AQU |
| Bald Eagle | Moderately Vulnerable | Moderately Vulnerable | S2, E | Northern | AQU |
| Northern Goshawk | Moderately Vulnerable | Moderately Vulnerable | S3, BSSC | Central | MCF |
| Peregrine Falcon | Moderately Vulnerable | Moderately Vulnerable | S2 | Central | MCF |
| Prairie Falcon | Moderately Vulnerable | Presumed Stable | S3 | Central | MCS |
| Spotted Sandpiper | Moderately Vulnerable | Moderately Vulnerable | | Northern | AQU, MMR |
| Great Gray Owl | Moderately Vulnerable | Moderately Vulnerable | S1, E | Northern | MCF, MMR |
| Black Swift | Moderately Vulnerable | Moderately Vulnerable | S2, BSSC | Central | MCF |
| Clark's Nutcracker | Presumed Stable | Moderately Vulnerable | | Central | MCF, SUA |
| American Dipper | Moderately Vulnerable | Presumed Stable | | Central | AQU |
| Swainson's Thrush | Moderately Vulnerable | Moderately Vulnerable | S4 | Northern | MMR |
| American Pipit | Moderately Vulnerable | Moderately Vulnerable | S2 | Central | SUA |
| Gray-crowned Rosy-Finch | Moderately Vulnerable | Moderately Vulnerable | | Northern | SUA |
| Pine Grosbeak | Moderately Vulnerable | Moderately Vulnerable | | Northern | MCF |
| Evening Grosbeak | Moderately Vulnerable | Moderately Vulnerable | | Central | MCF |

[1]S1-S4 indicate California State Rarity and Endangerment rankings other than 'secure' (S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S4 = apparently secure (California Department of Fish and Game 2011a); T and E indicate species listed as Threatened (T) or Endangered (E) in California (CDFG 2011b); BSSC indicates California Bird Species of Special Concern (Shuford and Gardali 2008).

[2]Overall breeding range classified as Northern (species' overall breeding range occurs primarily to the north of the Sierra Nevada Jepson Region), Southern (species' overall breeding range occurs primarily to the south of the Sierra Nevada Jepson Region), or Central (species' overall breeding range is neither predominantly north nor predominantly south of the Sierra Nevada Jepson Region).

[3]Species' primary breeding habitats classified as foothill woodlands and foothill chaparral (FWC); montane conifer forests (MCF); montane chaparral and sagebrush (MCS); aquatic habitats including rivers, ponds, and lakes (AQU); marshes, meadows, and riparian vegetation (MMR); and/or subalpine and alpine habitats (SUA).

- Analyzed patterns in species vulnerability ranks to assess ecological or distributional factors that may predispose some species to more climate vulnerability than others, some of which are summarized in Figures 1 and 2, below.

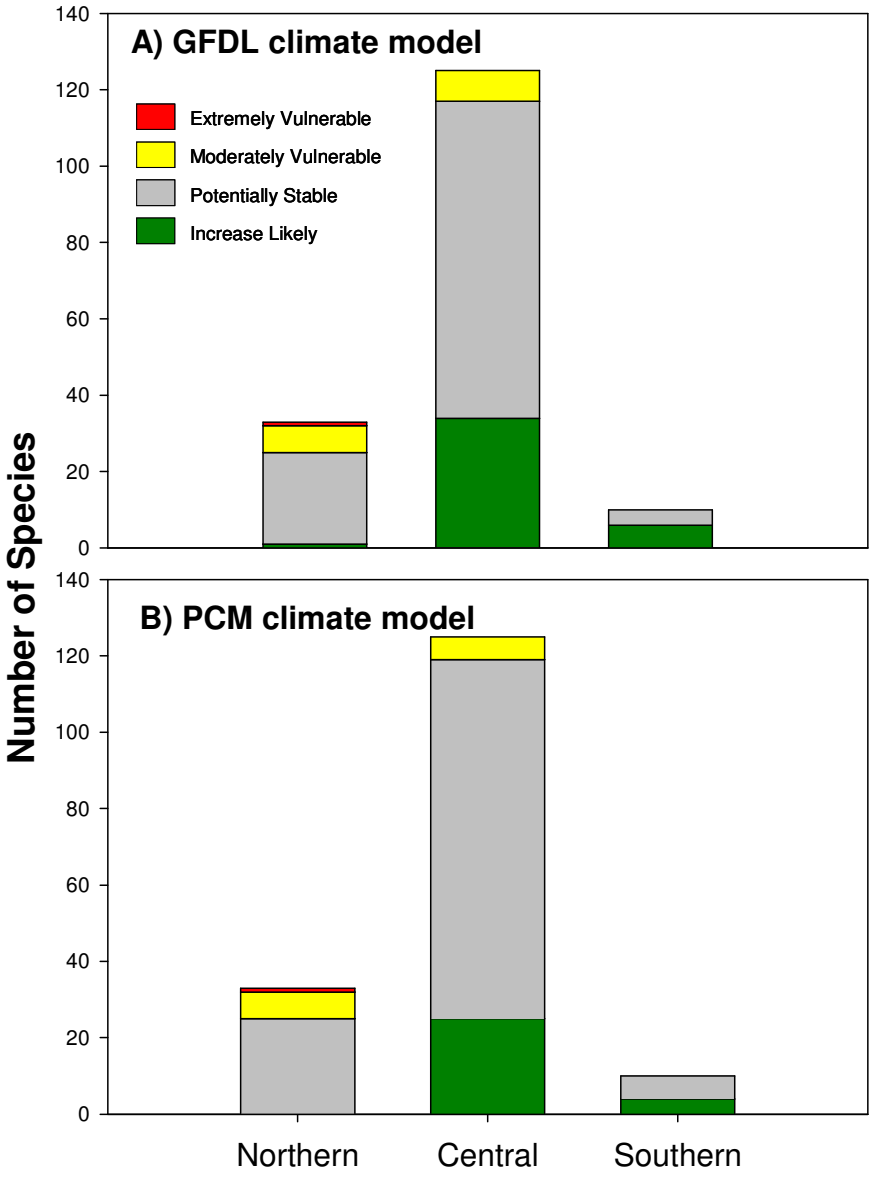


**Figure 1.** Number of species with breeding ranges primarily to the north of the Sierra Nevada (Northern), more-or-less latitudinally centered on the Sierra Nevada (Central), and primarily south of the Sierra Nevada (Southern) that ranked as Increase Likely, Presumed Stable, Moderately Vulnerable, or Extremely Vulnerable under projected climate change in the Sierra Nevada. Assessments were based on climate projections using A) the GFDL climate model and B) the PCM climate model. No species scored as Highly Vulnerable, a category between Moderately Vulnerable and Extremely Vulnerable.

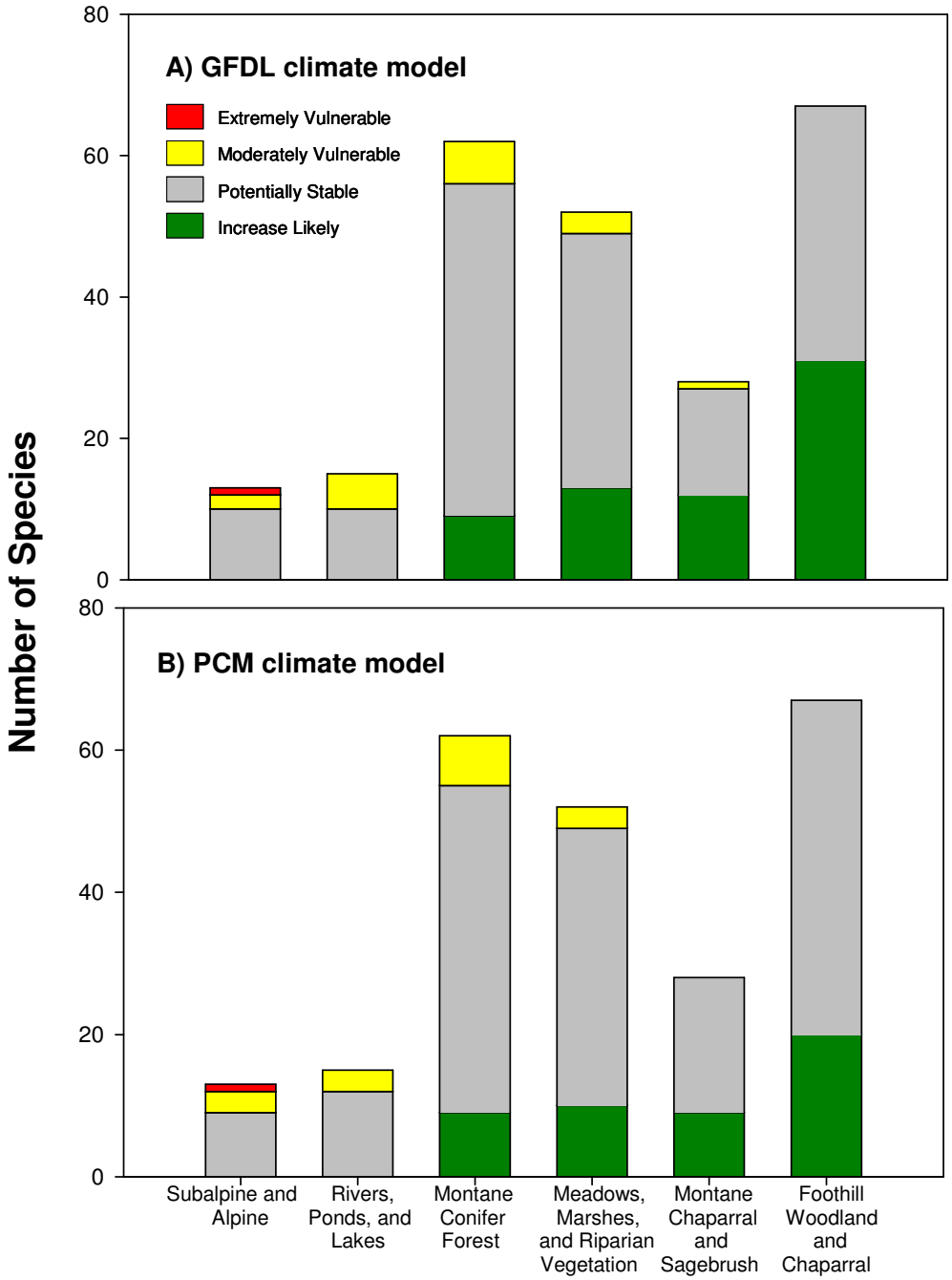


**Figure 2.** Number of species associated with each major habitat that ranked as Increase Likely, Presumed Stable, Moderately Vulnerable, or Extremely Vulnerable under projected climate change in the Sierra Nevada. Assessments were based on climate projections using A) the GFDL climate model and B) the PCM climate model. No species scored as Highly Vulnerable, a category between Moderately Vulnerable and Extremely Vulnerable. Some species were classified as being associated with multiple habitats.

- Nearly completed a draft manuscript detailing vulnerability assessment results for submission to a peer-reviewed journal:

  **Siegel, R. B., P. Pyle, J. H. Thorne, A. J. Holguin, S. Stock, and C. A. Howell. *In preparation.* Vulnerability of birds to climate change in the Sierra Nevada Mountains of California.**

- We reported last March that we were conducting a secondary analysis of 18 years of mark-recapture data from IBP-operated MAPS bird banding stations at Yosemite National Park to assess the effect of annual variation in spring snowpack on annual productivity indices of common bird species. Winter snowpack and timing of snowmelt in the Sierra Nevada vary dramatically from year to year, and snow cover can persist at higher elevations well into spring and summer months following severe winters. Spring snowpack is expected to decrease in the coming decades, as snowmelt occurs earlier in the spring - a pattern already being observed across much of western North America and other montane regions of the world. In our previous progress report we reported the preliminary result that most species showed a negative relationship between productivity and spring snowpack, suggesting that one aspect of Sierra Nevada climate change in the coming decades – decreased spring snowpack – may actually boost productivity for many landbird species. We are pleased to report that we prepared these results for publication and submitted a manuscript to the journal *Condor*. The manuscript was reviewed favorably, and we are now working on revisions:

  **Saracco, J. F., R. B. Siegel, S. Stock, R. L. Wilkerson, and D. F. DeSante. *In revision*. Annual variation in spring snowpack and landbird productivity in Yosemite National Park. *The Condor*.**

**b) Produce an adaptation strategy for the most vulnerable species.**

We have made modest progress on the adaptation strategy since our previous progress report, choosing instead to finalize our conservation assessment results first. With the assessment nearly complete, we will shortly turn our focused attention back to the adaptation strategy.

**c) Conduct outreach efforts disseminating our findings to land managers and other researchers working in the Sierra Nevada.**

- Presented vulnerability assessment results in a talk at the California LCC Climate Change Symposium on November 5, 2012, in Sacramento.

- Presented vulnerability assessment results at the Sierra Adaptation Workshop on February 20-22 in Visalia.