

CURBING GREENHOUSE GAS EMISSIONS WILL REDUCE FUTURE CALIFORNIA BIRD LOSS

William B. Monahan and Gary Langham



The Western Tanager could lose as much as 30 percent of its current range, or as little as 6.5 percent, depending on how well climate change is addressed in the next several decades.

Photo by Alison Sheehey.

Climate change will cause up to 110 of 310 California native bird species to disappear from at least 25 percent of their current ranges by the end of the 21st Century. While many of these range contractions will be unavoidable, our ability to reduce greenhouse gas emissions and tailor conservation to these predictions could greatly reduce these impacts for some species and regions.

Climate change is already pushing species globally poleward and higher in elevation¹. In California, directional changes in climate during the 20th century were substantial^{2,3}. Throughout this period, and in the centuries before, California also experienced cyclical changes as a result of a weather pattern known as the Pacific Decadal Oscillation⁴. Hence, bird species in California have managed to survive various forms of past climate change, often by shifting their distributions around the state. But will they be able to continue to respond to future changes of a much larger magnitude⁵?

Two factors argue that they will not. The first is that our current network of protected lands was not designed to buffer species, communities, and whole ecosystems against large-scale processes like climate change⁶. The second is that the major climate variables influencing species' distributions are expected to change so quickly that even highly mobile species like birds will be unable to keep pace⁷. Hence, future climate change threatens California's birds with massive range reductions and, in extreme cases, statewide extirpations and global extinctions.

This policy brief examines avian responses to future climate change in California based on bird distribution data from the Audubon Christmas Bird Count and North America Breeding Bird Survey, as well as climate forecasts originating from the World Climate Research Programme's Coupled Model Intercomparison Project⁸. It also describes how different strategies for mitigating climate change will influence the magnitude of future bird loss. The brief concludes with public policy recommendations intended to promote bird conservation in a changing climate.

GREENHOUSE GAS EMISSIONS CHANGE CLIMATE

Climate change is caused by increasing concentrations of greenhouse gasses—molecules such as carbon dioxide, methane, and chlorofluorocarbons that trap heat in our atmosphere. Concentrations of these molecules are shaped by a multitude of factors, including human population growth and rates of socioeconomic and technological change. The Intergovernmental Panel on Climate Change Special Report on Emissions Scenarios⁹ provides a series of snapshots of what the future might look like under different levels of human action or response. Our analysis is based on three scenarios that bracket a wide range of expected future emissions and associated increases in temperature (Exhibit 1):

- B1: LOW EMISSIONS
- A1B: MODERATE EMISSIONS
- A2: HIGH EMISSIONS

In California, these emissions scenarios conservatively suggest that annual mean temperature will increase anywhere from 3.5 to 5.6 degrees Fahrenheit by the end of the 21st century.

Exhibit 1: CLIMATE CHANGE BY EMISSIONS SCENARIO

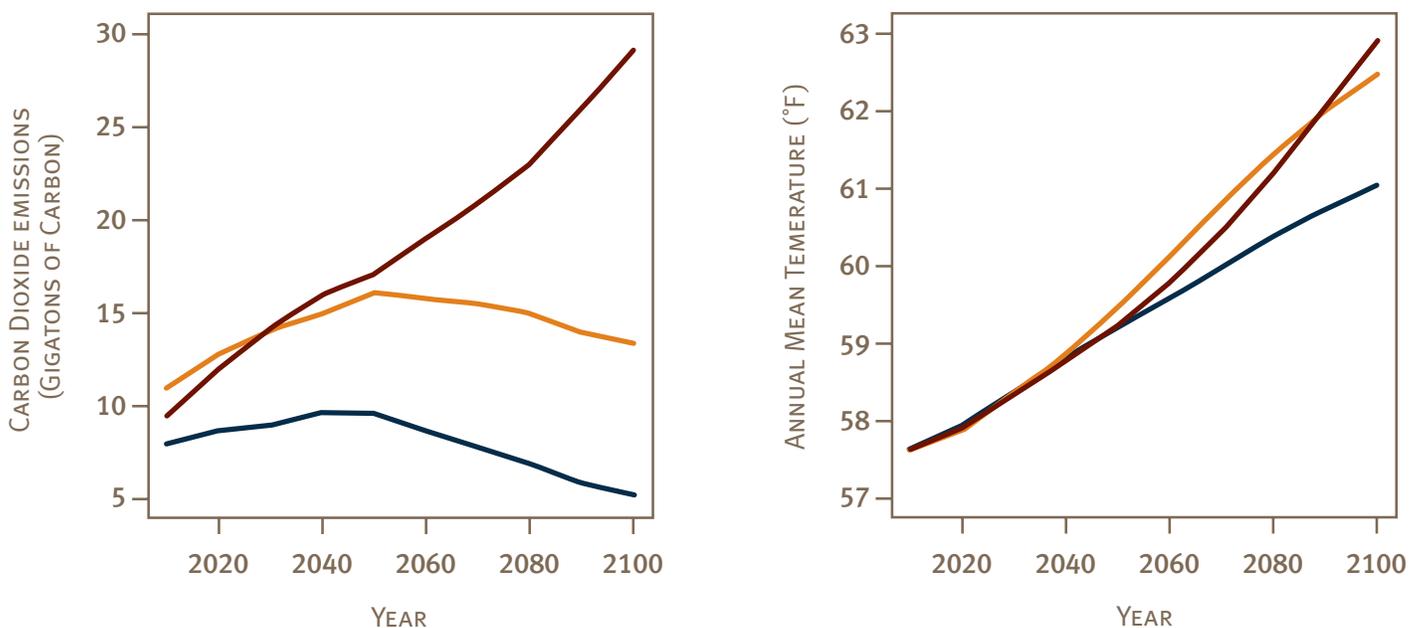


Exhibit 1 legend

B1 LOW EMISSIONS ■ A1B MODERATE EMISSIONS ■ A2 HIGH EMISSIONS ■

FAILURE TO CURB EMISSIONS WILL EXACERBATE BIRD LOSS

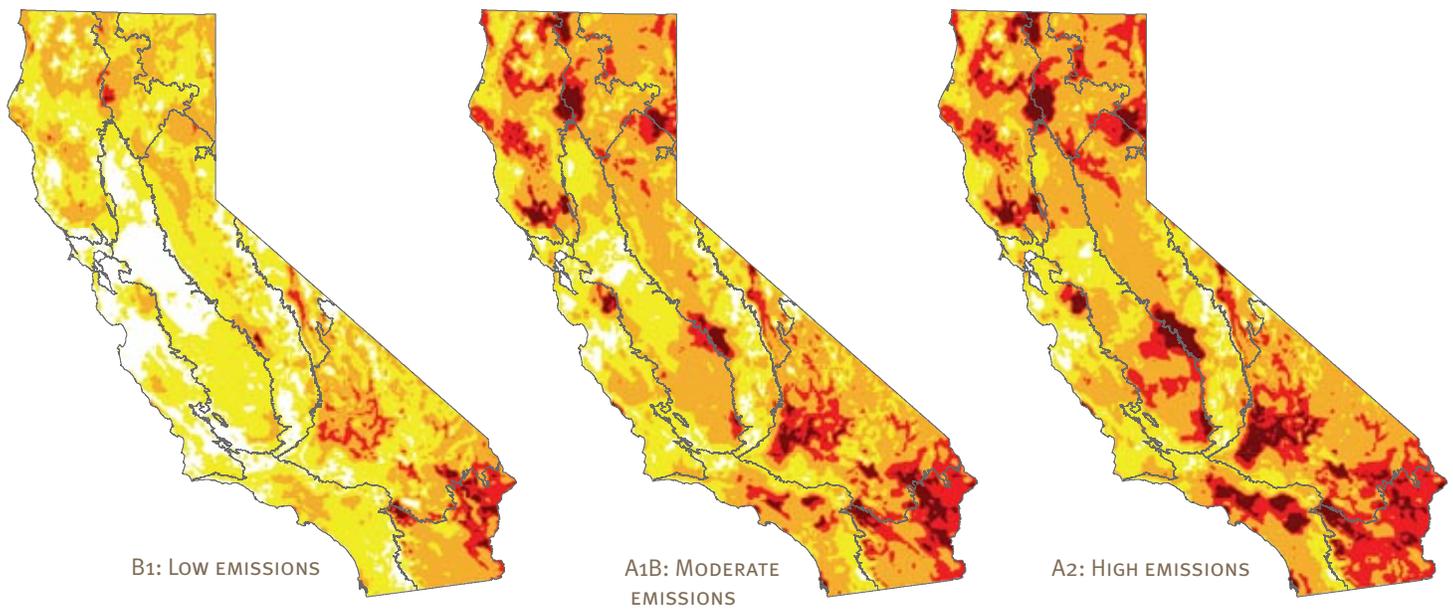
Future bird loss in California will vary dramatically depending on how successful we are at reducing greenhouse gas emissions. On average, California’s landscapes will lose 6% of their bird species under low emissions, 14% under moderate emissions, and 19% under high emissions.

CERTAIN REGIONS OF CALIFORNIA WILL SUFFER GREATER BIRD LOSS THAN OTHERS

The loss of bird species will not be uniform across California (Exhibit 2). By the end of the 21st century, bird losses will be most severe throughout portions of northern and southern California. Hotspots of loss in the south include areas of the Mojave and Sonora deserts, Coast Ranges, Eastern Sierra Nevada, and Central Valley. In the north, losses will be most severe across Modoc Plateau and throughout portions of the Cascade and Coast Ranges.

Exhibit 2: BIRD LOSS BY SCENARIO AND REGION

MAPS SHOW PERCENTAGE OF CURRENT BIRD SPECIES LOST BY THE END OF THE 21ST CENTURY



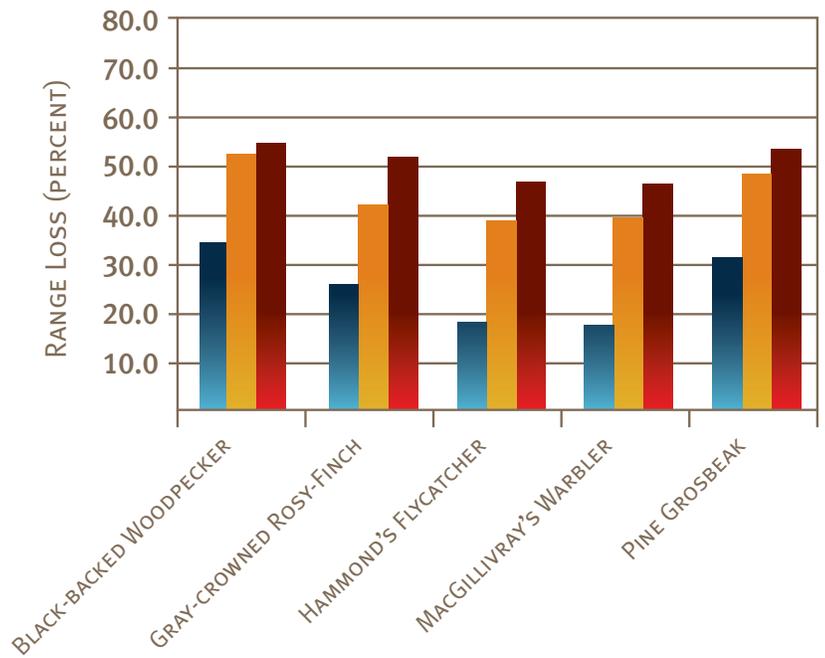
RANGE LOSS WILL VARY BY SPECIES

The Gray-crowned Rosy-Finch, a high elevation specialist found in the Sierra Nevada, could lose as much as 52% of its range, or as little as 26%, depending on how successful we are at reducing greenhouse gas emissions (Exhibit 3).

Exhibit 3: BIRD LOSS IN THE SIERRA NEVADA



GRAY-CROWNED ROSY-FINCH BY MARTIN MEYERS



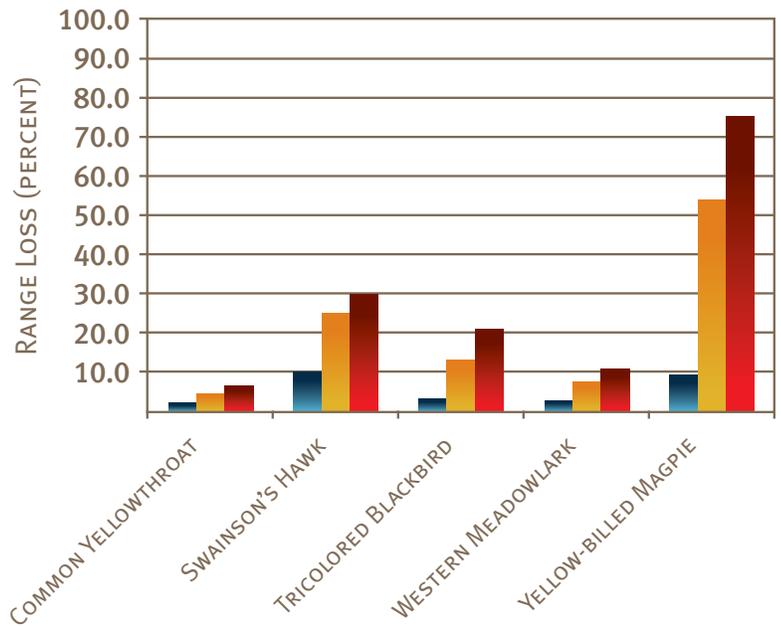
The Yellow-billed Magpie, a striking bird whose entire global population lives in California’s Central Valley and Coast Ranges, could lose as much as 75% of its range, or as little as 9% (Exhibit 4).

The California Gnatcatcher, long an important species for conservation in California, could lose as much as 56% of its range, or as little as 7% (Exhibit 5, next page).

Exhibit 4: BIRD LOSS IN THE CENTRAL VALLEY



YELLOW-BILLED MAGPIE BY GLEN TEPKE



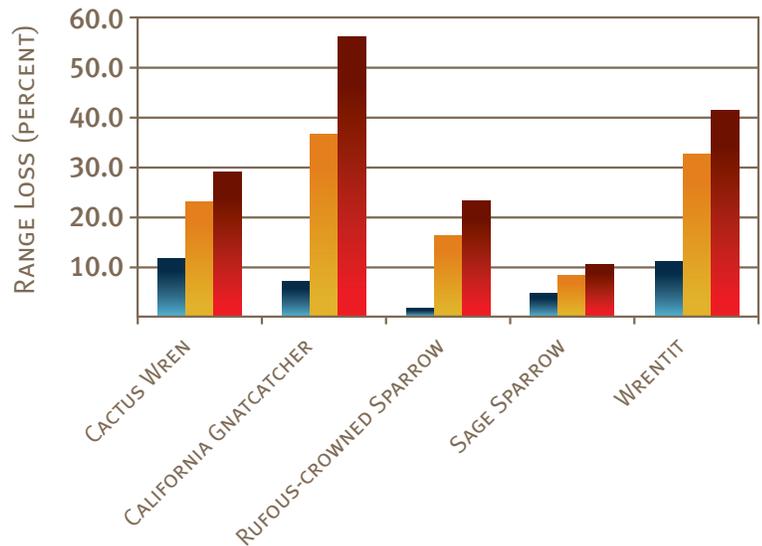
Exhibits 3, 4 & 5 legend

B1 LOW EMISSIONS ■ A1B MODERATE EMISSIONS ■ A2 HIGH EMISSIONS ■

Exhibit 5: BIRD LOSS IN SOUTHERN CALIFORNIA COASTAL REGIONS



CALIFORNIA GNATCATCHER BY DENIS ANCINEC



CONCLUSIONS AND POLICY RECOMMENDATIONS

Climate change is a complex problem because it is global in scope yet local in effect. Implementing key policies now will strengthen California's position as a world leader in combating climate change and help ensure that our present-day avifauna is here for future Californians.

MITIGATING CLIMATE CHANGE IMPACTS TO CALIFORNIA'S BIRDS

Long term protection of California's birds ultimately requires that we reduce greenhouse gas emissions globally. California can promote climate change mitigation locally through State Assembly Bill 32 (AB32), the California Global Warming Solutions Act. Specifically, we should:

- Reduce our greenhouse gas emissions through cap-and-trade. California should provide for a strong, cost-effective cap on emissions and a market-based program designed to stabilize greenhouse gasses at a level that ensures ecosystem resilience.
- Cut our oil consumption. California should cut its dependence on oil by half by requiring higher fuel efficiency standards and providing its citizens with both sustainable fuel alternatives and clean public transportation.

- Repower with clean and efficient electricity. California should strive towards a 100 percent clean energy future by increasing reliance on renewable energy and developing environmentally sound infrastructure to deliver clean energy statewide.

HELPING BIRDS ADAPT TO CHANGES IN CLIMATE THAT ARE ALREADY UNDERWAY

Unfortunately, even under our best possible mitigation scenario, greenhouse gasses in our atmosphere are already sufficiently concentrated that climate will continue to change through the foreseeable future. We thus need to couple climate change mitigation with new policies that promote climate change adaptation. Specifically, we should:

- Promote habitat conservation through carbon sequestration. California should use AB32 to ensure that forests and other terrestrial systems are managed for both conservation and carbon capture through inclusion of forest compliance credits (offsets) that are verifiable, additional, and permanent in the trading program.
- Build ecosystem resilience and connectivity. California should dedicate a portion of revenues generated by market mechanisms toward building resilience and connectivity of ecosystems so that species can track changes in climate on the landscape.
- Provide adequate water supplies for wildlife. California should ensure that wildlife refuges and private lands are able to maintain viable wetlands for both breeding and migratory birds.
- Expand lands for conservation. California should strengthen partnerships of public agencies, conservation non-profits, and private landowners working on private and public lands to ensure connectivity among core wildlife populations are maintained.

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CITATION

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The Acorn Woodpecker could lose as much as 24 percent of its current range, or as little as 4.7 percent, depending on how well we reduce greenhouse gas emissions in the next several decades. Photo by Greg Smith.

NOTES & REFERENCES

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