



Obed Wild and Scenic River

Background

Birds are useful indicators of ecological change because they are highly mobile and generally conspicuous. As climate in a particular place changes, suitability may worsen for some species and improve for others. These changes in climate may create the potential for local extirpation or new colonization. **This brief summarizes projected changes in climate suitability by mid-century for birds at Obed Wild and Scenic River (hereafter, the River) under two climate change scenarios (see Wu et al. 2018 for full results, and Langham et al. 2015 for more information regarding how climate suitability is characterized).** The high-emissions pathway (RCP8.5) represents a future in which little action is taken to reduce global emissions of greenhouse gases. The low-emissions pathway (RCP2.6) is a best-case scenario of aggressive efforts to reduce emissions. These emissions pathways are globally standardized and established by the Intergovernmental Panel on Climate Change for projecting future climate change. The findings below are model-based projections of how species distributions may change in response to climate change. A 10-km buffer was applied to each park to match the spatial resolution of the species distribution models (10 x 10 km), and climate suitability was taken as the average of all cells encompassed by the park and buffer.

Results

Climate change is expected to alter the bird community at the River, with greater impacts under the high-emissions pathway than under the low-emissions pathway (Figure 1). Among the species likely to be found at the River today, climate suitability in summer under the high-emissions pathway is projected to improve for 6, remain stable for 19, and worsen for 6 species. Suitable climate ceases to occur for 5 species in summer, potentially resulting in extirpation of those species from the River (e.g., Figure 2). Climate is projected to become suitable in summer for 12 species not found at the River today, potentially resulting in local colonization. Climate suitability in winter under the high-emissions pathway is projected to improve for 4, remain stable for 13, and worsen for 2 species. Suitable climate does not cease to occur for any species in winter. Climate is projected to become suitable in winter for 23 species not found at the River today, potentially resulting in local colonization.

IMPORTANT

This study focuses exclusively on changing climatic conditions for birds over time. But projected changes in climate suitability are not definitive predictions of future species ranges or abundances. Numerous other factors affect where species occur, including habitat quality, food abundance, species adaptability, and the availability of microclimates (see Caveats). Therefore, managers should consider changes in climate suitability alongside these other important influences.

We report trends in climate suitability for all species identified as currently present at the River based on both NPS Inventory & Monitoring Program data and eBird observation data (2016), plus those species for which climate at the River is projected to become suitable in the future (Figure 1 & Table 1). This brief provides park-specific projections whereas Wu et al. (2018), which did not incorporate park-specific species data and thus may differ from this brief, provides system-wide comparison and conclusions.

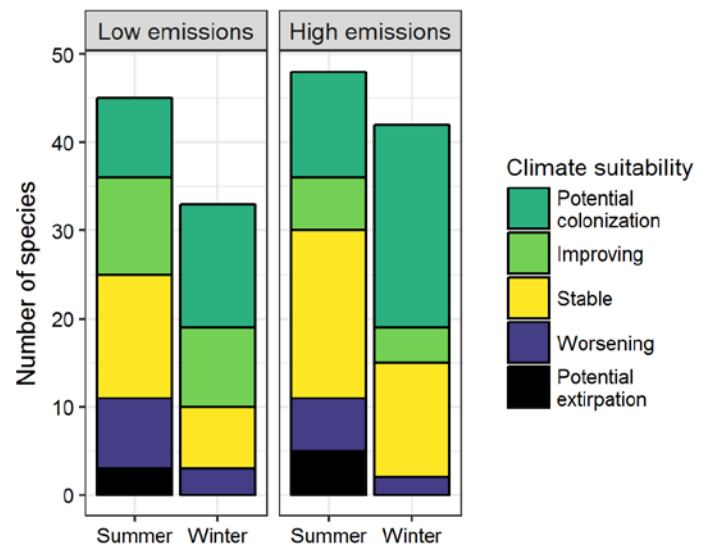


Figure 1. Projected changes in climate suitability for birds at the River, by emissions pathway and season.

Results (continued)

Potential Turnover Index

Potential bird species turnover for the River between the present and 2050 is 0.16 in summer (22nd percentile across all national parks) and 0.13 in winter (14th percentile) under the high-emissions pathway. Potential species turnover declines to 0.10 in summer and 0.07 in winter under the low-emissions pathway. Turnover index was calculated based on the theoretical proportions of potential extirpations and potential colonizations by 2050 relative to today (as reported in Wu et al. 2018), and therefore assumes that all potential extirpations and colonizations are realized. According to this index, no change would be represented as 0, whereas a complete change in the bird community would be represented as 1.

Climate Sensitive Species

The River is or may become home to 2 species that are highly sensitive to climate change across their range (i.e., they are projected to lose climate suitability in over 50% of their current range in North America in summer and/or winter by 2050; Table 1; Langham et al. 2015). Suitable

Management Implications

Parks differ in potential colonization and extirpation rates, and therefore different climate change adaptation strategies may apply. **Under the high-emissions pathway, Obed Wild and Scenic River falls within the low change group.** Parks anticipating low change can best support landscape-scale bird conservation by emphasizing habitat restoration, maintaining natural disturbance regimes, and reducing other stressors.

Caveats

The species distribution models included in this study are based solely on climate variables (i.e., a combination of annual and seasonal measures of temperature and precipitation), which means there are limits on their interpretation. Significant changes in climate suitability, as measured here, will not always result in a species response, and all projections should be interpreted as potential trends. Multiple other factors mediate responses to climate change, including habitat availability, ecological processes

climate is not projected to disappear for these 2 species at the River; instead the River may serve as an important refuge for these climate-sensitive species.



Figure 2. Although currently found at the River, suitable climate for the American Goldfinch (*Spinus tristis*) may cease to occur here in summer by 2050, potentially resulting in local seasonal extirpation. Photo by John Benson/Flickr (CC BY 2.0).

Furthermore, park managers have an opportunity to focus on supporting the 2 species that are highly sensitive to climate change across their range (Table 1; Langham et al. 2015) but for which the park is a potential refuge. Monitoring to identify changes in bird communities will inform the selection of appropriate management responses.

that affect demography, biotic interactions that inhibit and facilitate species' colonization or extirpation, dispersal capacity, species' evolutionary adaptive capacity, and phenotypic plasticity (e.g., behavioral adjustments). Ultimately, models can tell us where to focus our concern and which species are most likely to be affected, but monitoring is the only way to validate these projections and should inform any on-the-ground conservation action.

More Information

For more information, including details on the methods, please see the scientific publication ([Wu et al. 2018](#)) and the [project overview brief](#), and visit the [NPS Climate Change Response Program website](#).

References

eBird Basic Dataset (2016) Version: ebd_relAug-2016. Cornell Lab of Ornithology, Ithaca, New York.

Langham et al. (2015) Conservation Status of North American Birds in the Face of Future Climate Change. PLOS ONE.

Wu et al. (2018) Projected avifaunal responses to climate change across the U.S. National Park System. PLOS ONE.

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Species Projections

Table 1. Climate suitability projections by 2050 under the high-emissions pathway for all birds currently present at the River based on both NPS Inventory & Monitoring Program data and eBird observation data, plus those species for which climate at the River is projected to become suitable in the future. "Potential colonization" indicates that climate is projected to become suitable for the species, whereas "potential extirpation" indicates that climate is suitable today but projected to become unsuitable. Omitted species were either not modeled due to data deficiency or were absent from the I&M and eBird datasets. Observations of late-season migrants may result in these species appearing as present in the park when they may only migrate through. Species are ordered according to taxonomic groups, denoted by alternating background shading.

* Species in top and bottom 10th percentile of absolute change

^ Species that are highly climate sensitive

- Species not found or found only occasionally, and not projected to colonize by 2050

x Species not modeled in this season

Common Name	Summer Trend	Winter Trend
Wood Duck	x	Improving
Blue-winged Teal	-	Potential colonization
Eared Grebe	-	Potential colonization
American White Pelican	-	Potential colonization
Great Egret	Potential colonization	Potential colonization
Little Blue Heron	Potential colonization	-
Cattle Egret	Potential colonization	Potential colonization
Green Heron	Improving	-
Yellow-crowned Night-Heron	Potential colonization	-
Turkey Vulture	x	Stable
Mississippi Kite	Potential colonization	-
Red-tailed Hawk	Stable	Stable
Greater Yellowlegs	-	Potential colonization

Common Name	Summer Trend	Winter Trend
Least Sandpiper	-	Potential colonization
Forster's Tern	-	Potential colonization
Eurasian Collared-Dove	-	Potential colonization
Greater Roadrunner	-	Potential colonization
Barn Owl	-	Potential colonization
Downy Woodpecker	Stable	Stable
Red-cockaded Woodpecker	-	Potential colonization
Northern Flicker	Stable	Stable
Pileated Woodpecker	Stable	Stable
Eastern Wood-Pewee	Worsening	-
Acadian Flycatcher	Stable	-
Eastern Phoebe	Stable	Improving
Loggerhead Shrike	Potential colonization	-
White-eyed Vireo	-	Potential colonization

Common Name	Summer Trend	Winter Trend
Red-eyed Vireo	Worsening	-
Blue Jay	Improving	Stable
American Crow	Stable	Stable
Northern Rough-winged Swallow	Stable	-
Purple Martin	Improving*	-
Cliff Swallow	Potential colonization	-
Carolina Chickadee	Stable	Improving
Tufted Titmouse	Stable	Improving
White-breasted Nuthatch	Worsening*	Worsening*
Brown-headed Nuthatch	Potential colonization ^	-
Sedge Wren	-	Potential colonization
Carolina Wren	Stable	Stable
Blue-gray Gnatcatcher	Stable	-
Golden-crowned Kinglet	-	Stable
Wood Thrush	Worsening	-
American Robin	Potential extirpation	Stable
Gray Catbird	Potential extirpation	Potential colonization
Brown Thrasher	Stable	-
Chestnut-collared Longspur	-	Potential colonization
Smith's Longspur	-	Potential colonization
Ovenbird	Potential extirpation	-
Worm-eating Warbler	Worsening	-
Black-and-white Warbler	Stable	-

Common Name	Summer Trend	Winter Trend
Orange-crowned Warbler	-	Potential colonization
Common Yellowthroat	-	Potential colonization
Hooded Warbler	Stable	-
Northern Parula	Stable	-
Pine Warbler	Stable^	-
Yellow-throated Warbler	Stable	-
Black-throated Green Warbler	Potential extirpation	-
Yellow-breasted Chat	Improving	-
Eastern Towhee	Stable	x
Bachman's Sparrow	Potential colonization	Potential colonization
Vesper Sparrow	-	Potential colonization
Lark Sparrow	Potential colonization	-
Lincoln's Sparrow	-	Potential colonization
White-throated Sparrow	-	Stable
Dark-eyed Junco	x	Stable
Scarlet Tanager	Worsening*	-
Northern Cardinal	Improving	Stable
Indigo Bunting	Improving	-
Painted Bunting	Potential colonization	-
Brewer's Blackbird	-	Potential colonization
Great-tailed Grackle	Potential colonization	-
American Goldfinch	Potential extirpation	Worsening