

BIRDS IN A CHANGING CLIMATE

Understanding the Impacts of a Changing Climate In and Around the Greenbelt

By Anne Bell, Ph.D., Director of Conservation and Education, Ontario Nature



Ovenbird

Photo by Zak Pohlen

“ Human-induced climate change is increasingly recognized as a fundamental driver of biological processes and patterns. Historic climate change is known to have caused shifts in the geographic ranges of many taxa and future climate change is expected to result in even greater redistributions of species.” – Langham et al.

In the not too distant future, watching and listening for birds in the Greenbelt will be a very different experience from what it is today, given the anticipated impacts of climate change. More than 350 species of birds rely on the forests, wetlands, grasslands and farmlands of the Greenbelt during their life cycle. While some, such as the Rusty Blackbird, Northern Mockingbird and Red-bellied Woodpecker, may be more commonly seen in the Greenbelt in years to come, many treasured species, including the Blackburnian Warbler, Ruffed Grouse and American Bittern, are no longer expected to find a suitable climate for nesting in the area.

As these changes unfold, the Greenbelt will become increasingly important as a climate refuge, providing habitat that will buy time for birds and other animals to adapt.¹ Connecting over 800,000 hectares of natural areas and farmland from Niagara to Tobermory and from Waterloo Region to Rice Lake, the Greenbelt affords vital greenspace for wildlife to persist and move across the landscape to find food and shelter, offering a buffer against added threats and uncertainty.

IMPACTS OF CLIMATE CHANGE ON BIRDS

Though habitat loss is the predominant driver of biodiversity loss in Ontario, across Canada and around the world, human-induced climate change has emerged as a key and interconnected threat. As global temperatures rise, birds are facing a deadly combination of severe weather, increased frequency of fires and flooding, mistimed emergence of insects, collapsing food webs, and heightened pressure from parasites and disease.² Long distance migrants, such as the wood warblers (see Table 1), may be particularly hard hit due to storms and alterations in habitat and food sources along their migration routes. Those changes are expected to make journeys longer and more perilous, and increase exposure to predation and starvation.³

“ Even a minor shift in the seasonal timing of insect emergence due to climate change, could result in mismatched seasonal cycles of birds and their insect prey that could be disastrous for species with no alternative food source.” – NABCIC

¹ See Morelli, T.L. et al. who define climate refugia as “areas relatively buffered from contemporary climate change over time that enable persistence of valued physical, ecological, and socio-cultural resources.” “Managing Climate Change Refugia for Climate Adaptation” PLoS ONE 12(1): e0169725. January 3, 2017. <https://doi.org/10.1371/journal.pone.0169725>.

² North American Bird Conservation Initiative Canada (NABCIC). 2012. The State of Canada's Birds, Environment Canada, Ottawa, pp. 11, 30. http://www.stateofcanadasbirds.org/State_of_Canada's_birds_2012.pdf. See also Nature Canada. <http://naturecanada.ca/what-we-do/bird-conservation/climate-change-birds/>

³ Ibid., p. 23; Howard C., Stephens P.A., Tobias J.A., Sheard C., Butchart S.H.M., Willis S.G. 2018. “Flight range, fuel load and the impact of climate change on the journeys of migrant birds,” Proceedings of the Royal Society B 285: 20172329. <http://dx.doi.org/10.1098/rspb.2017.2329>, See pp. 4 and 7 regarding long-distance migrants.

In 2009, the National Audubon Society (Audubon) published an analysis of bird observations spanning four decades, which revealed that 58 percent of the species studied had moved northward, a shift coinciding with an increase in average temperatures.⁴ But this is nothing compared to the changes that lie ahead. In 2015, Audubon published the results of a seven year study showing that 314 North American bird species (53 percent of the 588 studied) were going to lose more than half their geographic range by 2080, under various greenhouse gas emission scenarios.⁵ The geographic areas where these species will be found throughout the year are not just shifting, but also shrinking in most cases.

Of the 314 species, 188 are “climate threatened” and 126 are “climate endangered.”

Climate threatened birds are projected to lose over 50 percent of their current range by 2080, with potential to make up for losses through range expansion.

Climate endangered birds are projected to lose over 50 percent of their current range by 2050, with no potential to make up for losses through range expansion.⁷ Changes at this scale create system-wide uncertainty given the critical role that birds play in the food web as prey, predator, pollinator and seed disperser.

“Climate change is an emerging issue with potentially significant effects to ecosystem structure and function. Migratory birds are vulnerable to climate-influenced events, such as the increased frequency or intensity of fires and flooding during the breeding season and storms during migration.” – NABCIC

“Nearly half of our birds are at risk of extinction this century. That doesn’t have to happen.” – David Yarnold, President and CEO, Audubon.⁶

FIELD GUIDE TO A WARMER FUTURE

The Audubon 2015 study maps the conditions that birds need to survive under various greenhouse gas emission scenarios. Serving as “a field guide to the future of North American birds,”⁸ it:

- Covers the continental US and Canada;
- Uses datasets from the North American Breeding Bird Survey and the Audubon Christmas Bird Count (hundreds of thousands of observations);
- Assesses the “climatic range” (i.e., the areas where the climate conditions required for a species’ survival are likely to be found) for 588 species; and
- Illustrates climatic ranges during the breeding and non-breeding season in 2000 and three future time periods (2020, 2050 and 2080).



Wood Thrush

Photo by Kelly Colgan

⁴ National Audubon Society (Audubon). 2009. Birds and Climate Change: Ecological disruption in Motion. https://www.audubon.org/sites/default/files/documents/bacc-ecologicaldisruptioninmotion_feb2009.pdf

⁵ Audubon. 2015. Audubon’s Birds and Climate Change Report: A Primer for Practitioners. National Audubon Society, New York. <http://climate.audubon.org/> Note, the emissions scenarios were based on the Special Report on Emissions Scenarios, published by the Intergovernmental Panel on Climate Change (IPCC) in 2000. See IPCC <http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=98>.

⁶ Audubon, <https://www.audubon.org/magazine/september-october-2014/its-time-act>

⁷ Langham G.M. and Schuetz J.G., Distler T., Soykan C.U., Wilsey C. 2015. “Conservation Status of North American Birds in the Face of Future Climate Change.” PLoS ONE 10(9): e0135350. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0135350>.

⁸ Audubon. 2015. <http://climate.audubon.org/>

SPOTLIGHT ON WARBLERS

Table 1 – Greenbelt Warblers: though these songbirds currently nest in the Greenbelt, they may be on their way out⁹

Species	Predicted loss in current summer range (Canada/US)	Predicted loss in current winter range (Canada/US)	Audubon assessment	Projection for persistence in the Greenbelt based on Audubon model
Blackburnian Warbler <i>Setophaga fusca</i>	100%	NA	Climate Threatened	By 2050, Greenbelt no longer in its climatic range for breeding.
Black-throated Green Warbler <i>Setophaga virens</i>	98%	30%	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
Mourning Warbler <i>Geothlypis philadelphia</i>	96%	NA	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
Nashville Warbler <i>Oreothlypis ruficapilla</i>	95%	35%	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
Magnolia Warbler <i>Setophaga magnolia</i>	92%	44%	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
American Redstart <i>Setophaga ruticilla</i>	90%	26%	Climate Threatened	By 2080 Greenbelt no longer in its climatic range for breeding.
Chestnut-sided Warbler <i>Setophaga pensylvanica</i>	88%	NA	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
Black-and-white Warbler <i>Mniotilta varia</i>	84%	46%	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
Cape May Warbler <i>Setophaga tigrina</i>	81%	58%	Climate Threatened	By 2080, Greenbelt no longer in its climatic range for breeding.
Ovenbird <i>Seiurus aurocapilla</i>	67%	75%	Climate Threatened	By 2080 Greenbelt no longer in its climatic range for breeding.
Tennessee Warbler <i>Oreothlypis peregrina</i>	58%	100%	Climate Threatened	By 2050, Greenbelt no longer in its climatic range for breeding.

⁹ Audubon, 2015. See list of Ontario species included in analysis: <http://climate.audubon.org/geographical-search/ontario>

GREENBELT WINNERS AND LOSERS

Many birders in the Greater Toronto Area will remember 2018 as the year they witnessed the first confirmed successful breeding pair of Fish Crows in Ontario. The Fish Crows nested at the Adamson Estate in Mississauga. A species from the southeastern United States, the Fish Crow has been expanding its range since the mid-1970s, with vagrants spotted occasionally along Lake Erie and eastern Lake Ontario since at least 2011.¹⁰ It may be one of the winners in the climate change lottery, along with Tufted Titmouse, Blue-gray Gnatcatcher, Northern Mockingbird and Red-bellied Woodpecker whose ranges are expanding northwards in Ontario.¹¹

In fifty years Greenbelt birders may also see Rusty Blackbirds in the winter as their climatic range expands and shifts northward. The question, however, for this boreal bog-nesting species, is whether it will still be able to find suitable breeding habitat in the summer.¹² It has experienced sharp declines in recent years and is now at-risk in Ontario.

For many Greenbelt birds, such as the brightly coloured wood warblers, climate change spells disaster (See Table 1). The 31 species already at risk (see Table 2) will become increasingly vulnerable, as climate change adds to other threats, including habitat loss.



Photo by Daniel Arndt
Rusty Blackbird

Table 2 – Birds at Risk in the Greenbelt

Species	Status (provincial listing)	Threatened by Habitat Loss?	Audubon Climate Change Assessment
Acadian Flycatcher	Endangered	Yes	Not listed
Barn Owl	Endangered	Yes	Climate Threatened
Henslow's Sparrow	Endangered	Yes	Climate Threatened
King Rail	Endangered	Yes	Climate Endangered
Loggerhead Shrike	Endangered	Yes	Not listed
Northern Bobwhite	Endangered	Yes	Not listed
Prothonotary Warbler	Endangered	Yes	Not listed
Yellow-breasted Chat	Endangered	Yes	Not listed
Bank Swallow	Threatened	Yes	Climate Endangered
Barn Swallow	Threatened	Yes	Not listed
Bobolink	Threatened	Yes	Climate Threatened

¹⁰ Ontario Bird Records Committee. Minutes, 2015 Ontario Bird Records Committee (OBRC) Annual Meeting. http://www.ofo.ca/ofo-docs/OBRC2015_AGM_Minutes.pdf

¹¹ Nature Canada. How climate change is affecting birds. <http://naturecanada.ca/what-we-do/bird-conservation/climate-change-birds/>

¹² Audubon, 2015. <http://climate.audubon.org/birds/rusbla/rusty-blackbird>

Cerulean Warbler	Threatened	Yes	Climate Threatened
Chimney Swift	Threatened	Yes	Not listed
Eastern Meadowlark	Threatened	Yes	Not listed
Eastern Whip-poor-will	Threatened	Yes	Climate Endangered
Least Bittern	Threatened	Yes	Climate Endangered
Louisiana Waterthrush	Threatened	Yes	Climate Threatened
Bald Eagle	Special Concern	Yes	Climate Endangered
Black Tern	Special Concern	Yes	Climate Threatened
Canada Warbler	Special Concern	Yes	Climate Threatened
Common Nighthawk	Special Concern	Yes	Not listed
Eastern Wood-pewee	Special Concern	Yes	Not listed
Evening Grosbeak	Special Concern	Yes	Climate Threatened
Golden-winged Warbler	Special Concern	Yes	Climate Threatened
Grasshopper Sparrow	Special Concern	Yes	Not listed
Peregrine Falcon	Special Concern	Yes	Climate Threatened
Red-headed Woodpecker	Special Concern	Yes	Not listed
Rusty Blackbird	Special Concern	Yes	Climate Threatened
Short-eared Owl	Special Concern	Yes	Climate Endangered
Wood Thrush	Special Concern	Yes	Climate Threatened
Yellow Rail	Special Concern	Yes	Climate Endangered

LOCAL FAVOURITES AT RISK



Photo by David Watkins

Bobolink

This at-risk songster is one of several grassland birds experiencing steep population declines in Ontario. With one of its strongholds along the central and northern Niagara Escarpment in Grey and Bruce counties,¹³ it relies on grasslands, hayfields and other suitable farmland for breeding.¹⁴ By 2080 it is expected to experience an 80 percent loss of its summer climatic range, a loss which encompasses the Greenbelt.¹⁵ It is considered **climate threatened**.



Photo by Tom Murray

Eastern Whip-poor-will

This at-risk forest-dweller is one of several insectivores experiencing significant declines since the mid-1990s. Though the trend is poorly understood, it is likely, at least in part, a response to habitat loss and declines in insect populations. There are still significant populations along the Bruce Peninsula and the Oak Ridges Moraine.¹⁶ The Audubon model indicates it will lose 78 percent of its breeding range and 55 percent of its non-breeding range in North America by 2080, noting that “its fate may be tied to how climate change affects its already disappearing habitat.”¹⁷ It is considered **climate endangered**.



Ruffed Grouse

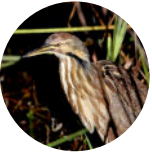
This hard-to-spot forest dweller is a year-round Greenbelt resident.¹⁸ The Audubon model projects a 34 percent decrease of its summer range and a 17 percent decrease of its winter range by 2080, by which time its distinctive courtship drumming is no longer likely to be heard in the Greenbelt. As its climatic range shifts northward, the question is whether the forests it depends on will shift at the same time.¹⁹ It is considered **climate endangered**.



Photo by Gary Yankech

White-throated Sparrow

The tuneful song of the White-throated Sparrow is a familiar refrain to those living or camping in our northern forests. A confirmed breeder along the Niagara Escarpment and the Oak Ridges Moraine,²⁰ it is not predicted to reside in the Greenbelt by 2080. Even though both its summer and winter ranges are projected to increase (by 5 and 55 percent, respectively), it is unknown whether the sparrow will find suitable habitats as its range shifts northwards. It is considered **climate threatened**.



American bittern © Cuatrecasas

American Bittern

This secretive heron sports many nicknames – stake-driver, thunder-pumper, water-belcher and mire-drum – all of which reflect its unmistakable, guttural call.²¹ Currently a Greenbelt breeder, its summer range is not expected to extend south of Lake Superior by 2080. The potential impact of climate change on wetlands compounds the threat of ongoing wetland loss for this species. It is considered **climate endangered**.



Photo by Kenneth Cole

Ovenbird

A common and widespread warbler, its distinctive song readily reveals its presence in mature, deciduous forests throughout much of the Greenbelt during the breeding season. Audubon's climate model indicates a large range-shift northwards, with this species no longer likely to be nesting in the Greenbelt by 2080. It is considered **climate threatened**.

As these six species aptly illustrate, impoverished human experience is one of the overlooked yet likely outcomes of climate change.

¹³ See M.D. Cadman, D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier (eds.), 2007. Atlas of the Breeding Birds of Ontario, 2001–2005. p. 587.

¹⁴ David Suzuki Foundation and Ontario Nature. November 2011. Biodiversity in Ontario's Greenbelt. https://ontariounature.org/wp-content/uploads/2017/10/REPORT-GB_Habitat-Dec2011.pdf

¹⁵ Audubon, 2015. <http://climate.audubon.org/birds/boboli/bobolink>

¹⁶ Cadman et al., p. 313.

¹⁷ Audubon, 2015. <http://climate.audubon.org/birds/whip-p1/eastern-whip-poor-will>

¹⁸ Cadman et al., p. 124.

¹⁹ Audubon, 2015. <http://climate.audubon.org/birds/rufgro/ruffed-grouse>

²⁰ Cadman et al., p. 566.

²¹ Cornell Lab of Ornithology. All about Birds. https://www.allaboutbirds.org/guide/American_Bittern/overview.

SUPPORTING CLIMATE CHANGE ADAPTATION AND MITIGATION

From a bird lover's perspective, the Greenbelt may not be silent in a few decades, but it certainly won't be the same. Some of our best songsters – White-throated Sparrow, Veery, Hermit Thrush – are unlikely to breed in the Greenbelt any longer. Many wood warblers that currently breed in the Greenbelt will only be spotted as they pass through during migration. In winter, however, the Rusty Blackbird and Yellow-bellied Sapsucker may be seen more commonly.

Climate change brings much risk and uncertainty. How will it impact rainfall and therefore habitats such as wetlands? Will birds be able to colonize suitable areas outside their current ranges? Will birds be able to find enough food as their ranges shift? Urgent action is needed to improve their chances.

First, we must do our utmost to meet national and international greenhouse gas emission reduction targets. Beyond this, we must take action to minimize impacts and help birds adapt to current and pending changes by implementing land-use and conservation plans that protect and improve the resilience of their habitats and support their movements across the landscape.²² Partnerships and collaborations among diverse interests are needed to:

- Identify and protect areas of most importance to birds;²³
- Restore, buffer, expand and connect bird habitats; and
- Reduce human-imposed stresses resulting from development, habitat fragmentation, pollution and invasive species.²⁴

The Greenbelt has much to offer in this regard, providing a potential stronghold for birds and other wildlife as the climate changes. It protects and connects vital habitats, enhancing landscape resilience in one of the most biodiverse and heavily developed regions of the county.

“The persistence of many North American birds will depend on their ability to colonize climatically suitable areas outside of current ranges and management actions that target climate adaptation.” – Langham et al.

“Reducing these threats requires urgent action to prevent further climate change and to mitigate and adapt to the effects that are inevitable, by implementing land-use and conservation plans that account for the added threat and uncertainty.” – NABCIC²⁵

WHAT YOU CAN DO



Decrease your carbon footprint (e.g., use active transportation, eat local food, choose energy efficient appliances).



Plant native species at home and participate in ecological restoration efforts in your community.



Become a citizen scientist – take part in the Great Backyard Bird Count or the Christmas Bird Count.²⁶



Support Greenbelt expansion and the protection and enhancement of important bird habitats across the Greenbelt and beyond.



Advocate for effective laws and policies to conserve biodiversity and reduce greenhouse gas emissions.

²² Audubon, 2009, p. 14.

²³ NABCIC, p. 19.

²⁴ Audubon, 2009, p. 15.

²⁵ NABCIC, p. 30.

²⁶ For more information, see Bird Studies Canada. Great Backyard Bird Count <https://www.birdscanada.org/volunteer/gbbc/> and Christmas Bird Count <https://www.birdscanada.org/volunteer/cbc/>



REFERENCES

- Cadman, M.D. and D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier (Eds.). 2007. Atlas of the Breeding Birds of Ontario, 2001–2005. Cornell Lab of Ornithology. All about Birds. https://www.allaboutbirds.org/guide/American_Bittern/overview.
- David Suzuki Foundation and Ontario Nature. November 2011. Biodiversity in Ontario's Greenbelt ontariounature.org/wp-content/uploads/2017/10/REPORT-GB_Habitat-Dec2011.pdf
- Howard C. and Stephens P.A., Tobias J.A., Sheard C., Butchart S.H.M., Willis S.G. 2018 "Flight range, fuel load and the impact of climate change on the journeys of migrant birds." Proceedings of the Royal Society B, 285: 20172329. [dx.doi.org/10.1098/rspb.2017.2329](https://doi.org/10.1098/rspb.2017.2329)
- Langham G.M. and Schuetz J.G., Distler T., Soykan C.U., Wilsey C. 2015. "Conservation Status of North American Birds in the Face of Future Climate Change." PLoS ONE 10(9): e0135350. journals.plos.org/plosone/article?id=10.1371/journal.pone.0135350.
- Morelli T.L. and Daly C., Dobrowski S.Z., Dulen D.M., Ebersole J.L., et al. 2017. "Managing Climate Change Refugia for Climate Adaptation." PLOS ONE 12(1): e0169725. January 3, 2017 doi.org/10.1371/journal.pone.0169725.
- National Audubon Society. 2009. Birds and Climate Change: Ecological disruption in Motion. National Audubon Society, New York. www.audubon.org/sites/default/files/documents/bacc-ecologicaldisruptioninmotion_feb2009.pdf.
- National Audubon Society. 2015. Audubon's Birds and Climate Change Report: A Primer for Practitioners. National Audubon Society, New York. climate.audubon.org.
- Nature Canada. "How climate change is affecting birds." naturecanada.ca/what-we-do/bird-conservation/climate-change-birds.
- North American Bird Conservation Initiative Canada (NABCI). 2012. The State of Canada's Birds, 2012. Environment Canada, Ottawa. www.stateofcanadasbirds.org/State_of_Canada's_birds_2012.pdf.
- Ontario Bird Records Committee. Minutes, 2015 Ontario Bird Records Committee (OBRC) Annual Meeting. http://www.ofo.ca/fof-docs/OBRC2015_AGM_Minutes.pdf.

ABOUT THIS SERIES:

The Greenbelt Foundation partnered with experts to understand how climate change is affecting our daily lives, and ways that we can individually and collectively respond to these challenges. For other installments in the series, visit www.greenbelt.ca/changing_climate

