ABILITY OF THE AGRICULTURAL LANDSCAPE TO SUPPORT WILDLIFE

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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Ability of the agricultural landscape to support wildlife

When we convert natural landscapes to agricultural land, the amount and quality of habitat to support the breeding activities of wild species, or "wildlife habitat capacity", generally decreases. However, we can maintain or restore some of this capacity through effective management techniques, for example by protecting waterways, maintaining shelterbelts[1] or other natural features, or sustainable grazing practices. This indicator shows the extent to which breeding habitat in agricultural landscapes for terrestrial species is maintained while producing the products we eat and use. The agricultural landscape considered in this indicator includes various types of land cover, such as croplands, native grasslands, natural pastures, woodlands and wetlands.

Status of the ability of the agricultural landscape to support wildlife

The ability of the agricultural landscape to support wildlife is measured through the wildlife habitat capacity index. The higher the index, the more the landcape is able to support wildlife. For more information on how this is calculated, refer to the Methods section.

Key results

In 2020,

- The overall ability of Canada's agricultural landscape to support wildlife was rated as moderate
  - The largest proportion of the landscape is rated as high (37%)
- The overall ability of Western Canada's agricultural landscape to support wildlife was rated as low
  - The largest proportion of the landscape is rated as very low (37%)
- The overall ability of Eastern Canada's agricultural landscape to support wildlife was rated as moderate
  - The largest proportion of the landscape is rated as high (65%)

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[1] Shelterbelts are trees and/or shrubs planted in rows to provide cover from wind and protect land from erosion.

Figure 1. Status of the ability of the agricultural landscape to support wildlife, Canada, 2020

Status categories
- Very high
- High
- Moderate
- Low
- Very low
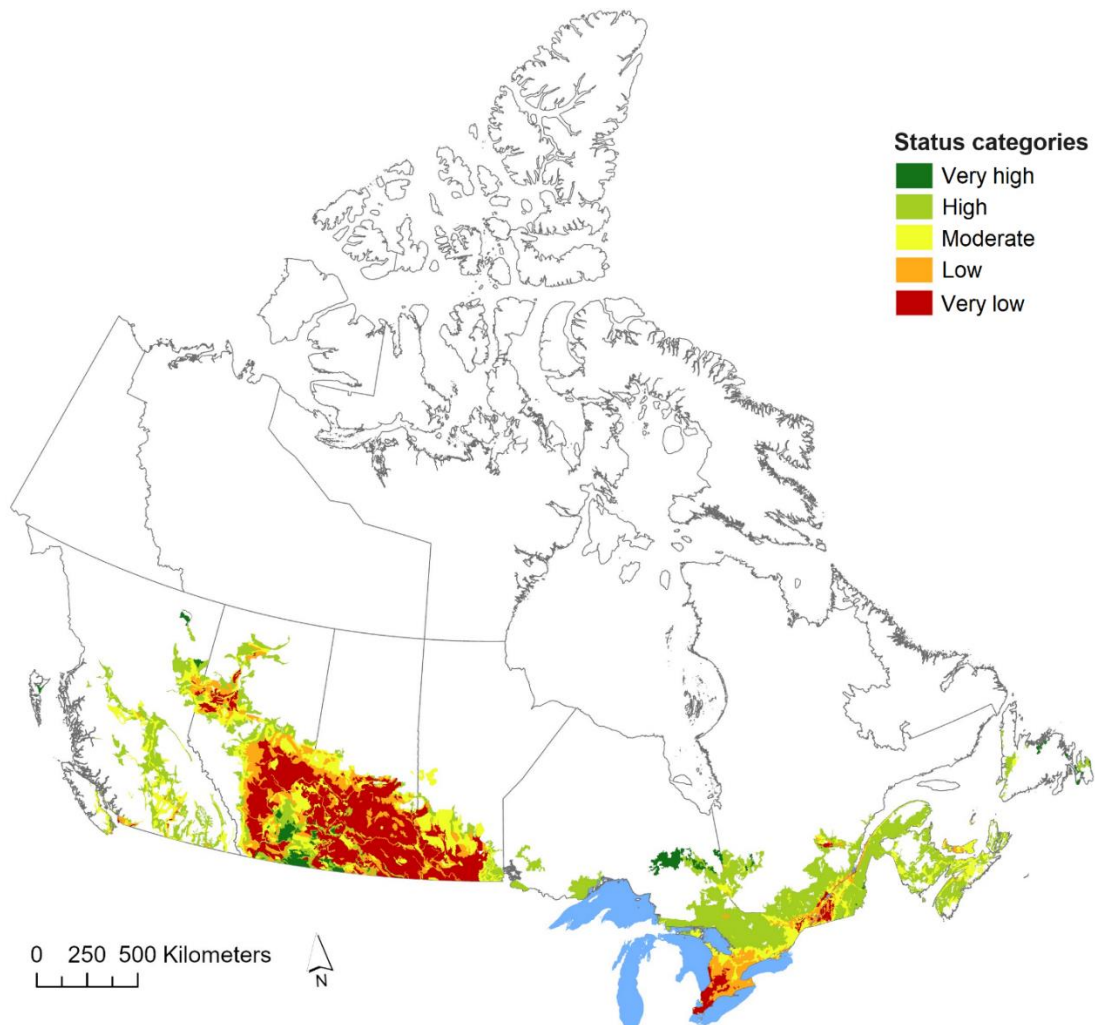
Source: Agriculture and Agri-Food Canada (2024).

Nationally, croplands, such as annual and perennial cropland,[2] are generally less used by wildlife as breeding habitat (Figure 3) than other agricultural landscapes. Therefore, the presence of natural and semi-natural habitats, such as woodland, rangelands, unimproved pastures and native grasslands, is important to maintaining the ability of Canada's agricultural landscape to support wildlife.

In Western Canada, agricultural landscapes with a relatively high ability to support wildlife include parts of British Columbia that contain woodland habitats and rangeland, and parts of the Prairies that contain native grassland. On the other hand, areas that are less able to support wildlife generally have a higher proportion of annual cropland. They are mainly in the Prairies, Boreal Plains, and the Lower Mainland of British Columbia.

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[2] Annual cropland is land on which crops are replanted yearly, such as maize and potatoes. Perennial cropland is land on which crops are grown for 2 or more years, such as fruit bearing trees, bushes, forages and tame hay.

In Eastern Canada, agricultural landscapes with a relatively high ability to support wildlife were associated with areas of the Boreal Shield and Atlantic Maritimes that have high proportions of woodland cover and small-scale mixed farming. Like the west, areas less able to support wildlife were those that had higher proportions of annual cropland. They are mainly in the southern regions of Ontario and Quebec, with pockets in Atlantic Canada.

Change in the ability of the agricultural landscape to support wildlife

Key results

From 2000 to 2020:

- Across Canada, the ability of the agricultural landscape to support wildlife was stable for most (78%), but declined for about 22%
- In Western Canada, the trend was stable for most of the agricultural landscape (77%), but declined for 22% and increased on 1%
- In Eastern Canada, the trend was stable for most of the agricultural landscape (80%), but declined for 20%

Figure 2. Change in the ability of the agricultural landscape to support wildlife, Canada, 2000 to 2020
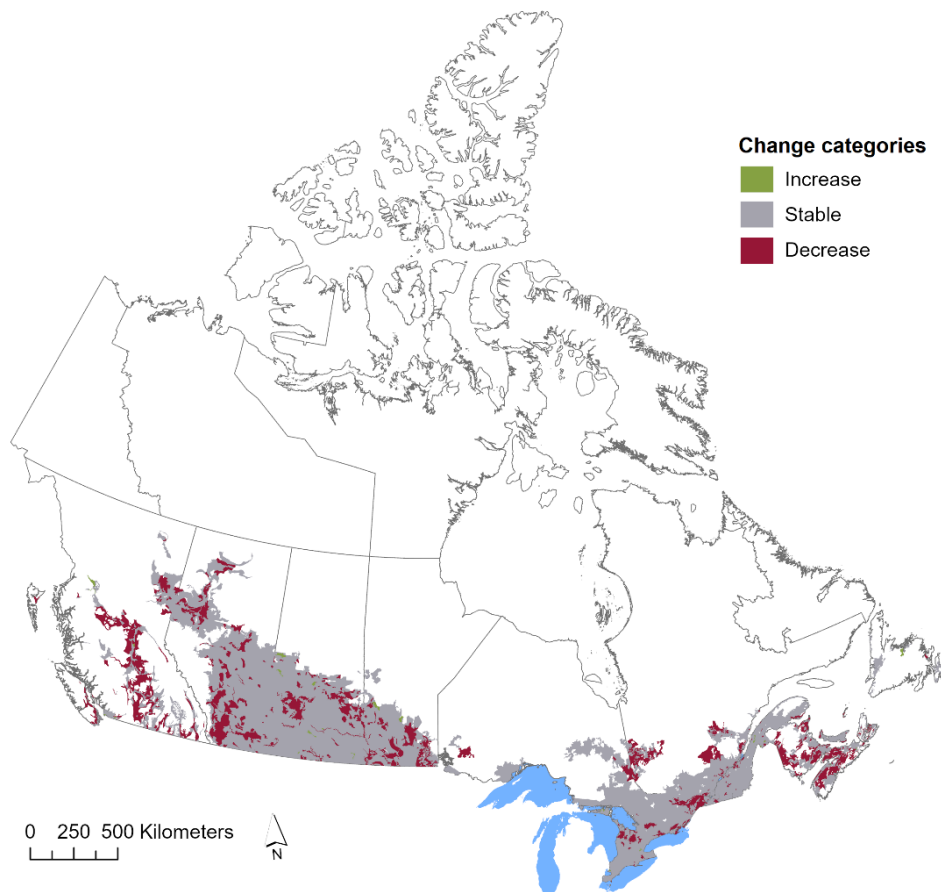
Source: Agriculture and Agri-Food Canada (2024).

Drivers of the decline in the ability of the agricultural landscape to support wildlife

Across Canada, land-use change that resulted in the loss of natural and semi-natural habitat caused the decline in the ability of the agricultural landscape to support wildlife.

In British Columbia, tree harvesting in the forestry sector and the conversion of perennial cropland and rangeland to annual cropland drove the decline in the region.[3] Urban expansion in the Lower Mainland also contributed. This land cover change affected species that live in the immediate and surrounding areas.

In the Prairies, the loss of important native grassland was a key driver. Other contributing factors include the loss of wetland and perennial cropland, along with the expansion of annual cropland. In the Boreal Plains, the increase of annual cropland, coupled with the loss of perennial cropland and woodland, caused the decrease.

In Southern Ontario and Quebec, the conversion of perennial cropland, unimproved pasture and woodland to annual cropland and urban expansion facilitated the decline. In the Boreal Shield, the loss of woodland, coupled with the increase in agricultural activity in the Central Laurentians, furthered the decline.

In Atlantic Canada, the loss of woodland was the main driver of this decline. Other contributing factors include the growth in annual cropland, as well as the loss of perennial cropland and unimproved pasture.

About the indicator

What the indicator measures

The Ability of the agricultural landscape to support wildlife indicator calculates the potential value of land within the Canadian agricultural landscape to provide breeding habitat for terrestrial vertebrate species. Different types of land covers are assessed using 2 factors:

- the number of terrestrial vertebrate species common to the area that can use a type of land cover for breeding; weighted by
- how important the habitat is to the survival of each species

The indicator provides an assessment of the potential of the Canadian agricultural landscape to provide suitable breeding habitat for the terrestrial birds, mammals, reptiles and amphibians normally found in those landscapes.

Why this indicator is important

Canada's agricultural landscape considered in this indicator includes cultivated and grazing land with associated rivers and streams, wetlands, woodlands and natural grasslands. The complete landscape includes both land managed by agricultural producers, as well as unaltered land located within the agricultural landscape.

The focus of the indicator is on the extent to which the Canadian agricultural landscape can support terrestrial vertebrates for ease of data collection and analysis. However, these habitats also support a diverse array of species, including microorganisms, fishes, and insects. Many species only occur in regions that are also suitable for farming.

Land managers play a role in sustaining biodiversity. The management and land-use decisions they make can have a negative or positive effect on wildlife. Conversion of natural lands and changes in land use such as wetland drainage, cultivation of natural lands, overgrazing, and the loss and fragmentation of forest cover can negatively affect wildlife. Conversely, conservation tillage, planting shelterbelts, responsible grazing and buffering watercourses help sustain biodiversity.

Related initiatives

The indicator is being proposed to contribute towards reporting on Target 10 of the draft Canada's 2030 National Biodiversity Strategy: "Sustainable management in key productive sectors." This target is related to the Kunming-Montreal Global Biodiversity Framework Target 10: "Ensure that areas under agriculture, aquaculture, fisheries

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[3] While both annual and perennial cropland generally support fewer species than natural and semi-natural habitat, perennial croplands are better able to sustain habitat quality than annual croplands. They provide more resources for species that live on these lands through their higher plant biodiversity and relatively reduced human disturbance.

and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services."

Related indicators

The Extent of Canada's wetlands indicator reports on the extent of this ecosystem that supports a large number of species.

The Land-use change indicator reports on the change in how land was used and converted across Canada south of 60° North from 2010 to 2015.

The Risk to soil and water quality from agriculture indicators show the changing influence of agriculture on 2 aspects of environmental integrity – clean water and healthy soils.

The Canadian species index indicator tracks average population trends for vertebrate species in Canada and is an average of trends to measure overall biodiversity trends.

The General status of wild species indicator provides a measurement of extinction risk and an indication of the overall state of biodiversity in Canada.

Data sources and methods

Data sources

The Ability of the agricultural landscape to support wildlife indicator is constructed with the following data:

1. Earth observation (EO) land cover data that describes the composition of the Canadian agricultural extent (30 m pixel resolution)
2. Habitat association matrices that show
   - Land cover type(s) used by each species for breeding
   - The importance of the land cover to the survival of the species
3. Extent of breeding populations of each species on the agricultural landscape

More information

The following datasets were used in the indicator.

Land Cover Data

- Agriculture and Agri-Food Canada (AAFC) Land Use Time Series 2000, 2005, 2010, 2015, 2020
- AAFC Annual Crop Inventory
- Customized internal tabulations of AAFC EO-Adjusted Interpolated Census of Agriculture, CGC Base 1996, 2001, 2006, 2011, 2016, and 2021 and Statistics Canada Census of Agriculture Regular Base 1971, 1976, 1981, and 1991
- Agriculture and Agri-Food Canada Soil Landscapes of Canada Version 3.2
- Coastal waters (polygons) from the 2016 Census – Boundary files

Species Ranges

- Birds: BirdLife International and NatureServe Bird species distribution maps of the world
- Mammals: NatureServe Digital Distribution Maps of the Mammals of the Western Hemisphere, version 3.0
- Amphibians and reptiles: IUCN Digital Distribution Maps of the World

Wildlife habitat associations on the agricultural landscape in Canada were obtained from unpublished AAFC habitat association matrices. They identify the habitat used by each species and define their use as primary (always used, critical or strongly preferred), secondary (often used, important), and tertiary (occasionally used). An overview of the habitat types on Canada's agricultural landscape considered in

the indicator and how many species use it as a primary, secondary or tertiary habitat is provided below in Figure 3.

Figure 3. The number of terrestrial vertebrate species using different types of land cover on Canadian agricultural lands for primary, secondary and tertiary breeding habitats

Number of species supported by the habitat
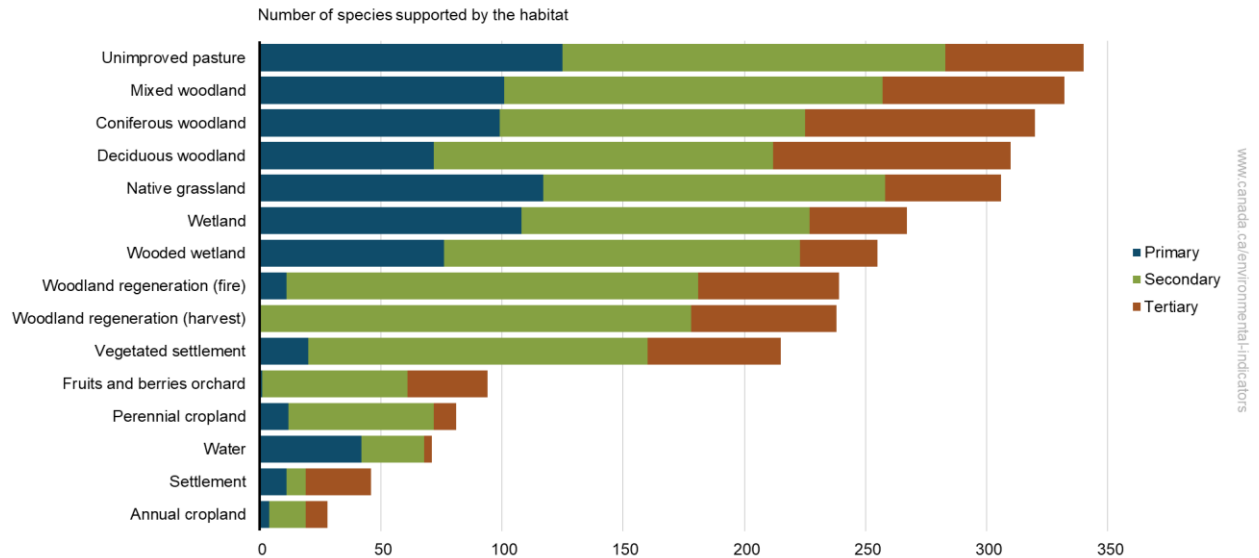
Data for Figure 3

Note: Relatively few wildlife species use human-altered land, such as annual and perennial cropland and settlement, as breeding habitat. Primary habitat is habitat that is always used, critical or strongly preferred by species, secondary habitat is often used or is relatively important, and tertiary habitat is occasionally used or of low value to the species.
Source: Agriculture and Agri-Food Canada (2024).

Methods

The wildlife habitat capacity index was calculated to determine the ability of various agricultural landscapes to support wildlife. This was done by using a habitat association matrix and species distribution data to link the 547 terrestrial vertebrate species (332 birds, 135 mammals, 41 amphibians, and 39 reptiles) that breed on Canada's agricultural landscape according to earth observation land cover categories that were consistently reported for reporting years.

More information

Land cover categories used for analysis were annual cropland, perennial cropland, fruits and berries orchards, native grassland, unimproved pasture, coniferous woodland, deciduous woodland, mixed woodland, woodland regeneration (following harvest), woodland regeneration (following fire), wooded wetland, wetland, water, settlement, vegetated settlement and other land.

The agricultural landscape was defined as all soil landscapes of Canada (SLC) polygons (the reporting unit for the indicator) that contained greater than 5% agriculture. This resulted in a total of 3,400 SLCs analyzed.

Potential wildlife habitat capacity was determined by:

1. Calculating species-specific breeding habitat availability for each SLC (percent of each SLC that satisfied breeding life history requirements)
2. Calculating the average of species-specific breeding habitat availabilities in the summer season for terrestrial vertebrates to establish wildlife habitat capacity for each SLC

The calculated wildlife habitat capacity index was then categorized into 5 status categories: Very Low (4.91 to 16.06), Low (16.06 to 27.21), Moderate (27.21 to 38.35), High (38.35 to 49.50) and Very High

(49.50 to 60.65). The ability for the agricultural landscape to support the needs of wildlife is greater when the index is higher.

Similarly, the change in wildlife habitat capacity index from 2000 to 2020 was calculated through a linear regression analysis. The slopes were categorized into 3 trend categories: Stable (0.075 to -0.075 per year), Increase (greater than 0.075 per year), and Decrease (less than -0.075 per year).

Recent changes

Previous iterations of the Ability of the agricultural landscape to support wildlife indicator reported a combined breeding and feeding index value. Although both can be used, breeding habitat is more limiting and thus determined to be a better indicator of the ability of wildlife to survive in agricultural landscapes. Furthermore, the indexes were sorted into defined categories for this release for easier understanding.

The AAFC Land Use Time Series earth observation data (2000, 2005, 2010, 2015, 2020) were used as the base land cover data set and was supplemented by the AAFC Annual Crop Inventory and the AAFC/Statistics Canada EO-Adjusted Interpolated Census of Agriculture. In the previous iteration of the indicator, only the AAFC Annual Crop Inventory was used.

This iteration of the indicator differentiates between coniferous, deciduous and mixed woodland types in the analysis. Woodland types were not differentiated in previous releases. Differentiating species associated with woodland types added precision to the indicator.

The Ability of the agricultural landscape to support wildlife indicator was formerly known as Wildlife habitat capacity on agricultural land. It was recently renamed to better describe what the indicator reports.

Caveats and limitations

The Ability of the agricultural landscape to support wildlife indicator is modelled with the best available information, which does not capture all the details that could affect the ability of an area to support wildlife species. In addition, all geographic information products contain some errors, and the habitat needs of some species are better known than others. The results should be seen as an indication of the landscape's ability to support wildlife, rather than as a precise measurement.

Given the improvements introduced, the results of this release should not be compared with past iterations of this indicator.

More information

Habitat capacity is for terrestrial vertebrate species only. For these species, only breeding habitat is considered. Other needs, such as water, hiding from predators, resting, roosting, and basking are not included. Habitat use is only considered for the summer season, which means that wintering habitat and use during migration are not included.

The indicator deals only with the quantity of habitat and does not address quality, habitat fragmentation or the influence of landscape pattern (composition and configuration) on wildlife.

Resources

References

Javorek SK, Grant M and Hale E (2024) Wildlife Habitat Capacity on Farmland Indicator. Agriculture and Agri-Food Canada.

Wang M, Axmacher JC, Yu Z, Zhang X, Duan M, Wu P, Zou Y & Liu Y (2021) Perennial crops can complement semi-natural habitats in enhancing ground beetle (Coleoptera: Carabidae) diversity in agricultural landscapes. *Ecological indicators* 126: no. 107701.

Related information

Agri-environmental indicators

Census of Agriculture

Annexes

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Status of the ability of the agricultural landscape to support wildlife, Canada, 2020

Region	Proportion of the agricultural landscape / Status category				
	Very Low **(4.91 to 16.06)**	**Low** **(16.06 to 27.21)**	**Moderate** **(27.21 to 38.35)**	**High** **(38.35 to 49.50)**	**Very High** **(49.50 to 60.65)**
Western Canada	36.89%	15.79%	23.28%	21.56%	2.48%
Eastern Canada	4.77%	10.44%	15.20%	65.30%	4.29%
National	**25.46%**	**13.89%**	**20.40%**	**37.12%**	**3.13%**

Note: The status categories of the ability of the agricultural landscape to support wildlife are derived from national ranges of wildlife habitat capacity index values identified in the brackets.
Source: Agriculture and Agri-Food Canada (2024).

Table A.2. Data for Figure 2. Change in the ability of the agricultural landscape to support wildlife, Canada, 2000 to 2020

Region	Proportion of the agricultural landscape / Change category		
	Increase **(Greater than 0.075 per year)**	**Stable** **(Between -0.075 and 0.075 per year)**	**Decrease** **(Less than -0.075 per year)**
Western Canada	0.55%	77.00%	22.45%
Eastern Canada	0.32%	79.72%	19.96%
National	**0.47%**	**77.97%**	**21.56%**

Note: The change categories of the ability of the agricultural landscape to support wildlife are derived from national ranges of linear regression slopes. The threshold of each category is identified in the brackets.
Source: Agriculture and Agri-Food Canada (2024).

Table A.3. Data for Figure 3. The number of terrestrial vertebrate species using different types of land cover on Canadian agricultural lands for primary, secondary and tertiary breeding habitats

Type of land cover	Habitat use (number of terrestrial vertebrate species)		
	Primary	**Secondary**	**Tertiary**
Unimproved pasture	125	158	57
Mixed woodland	101	156	75
Coniferous woodland	99	126	95
Deciduous woodland	72	140	98
Native grassland	117	141	48
Wetland	108	119	40
Wooded wetland	76	147	32
Woodland regeneration (fire)	11	170	58
Woodland regeneration (harvest)	0	178	60
Vegetated settlement	20	140	55
Fruits and berries orchard	1	60	33
Perennial cropland	12	60	9

Type of land cover	Habitat use (number of terrestrial vertebrate species)		
	Primary	Secondary	Tertiary
Water	42	26	3
Settlement	11	8	27
Annual cropland	4	15	9

Note: Relatively few wildlife species use human-altered land, such as annual and perennial cropland and settlement, as breeding habitat. Primary habitat is habitat that is always used, critical or strongly preferred by species, secondary habitat is often used or relatively important, and tertiary habitat is occasionally used or of low value to the species.
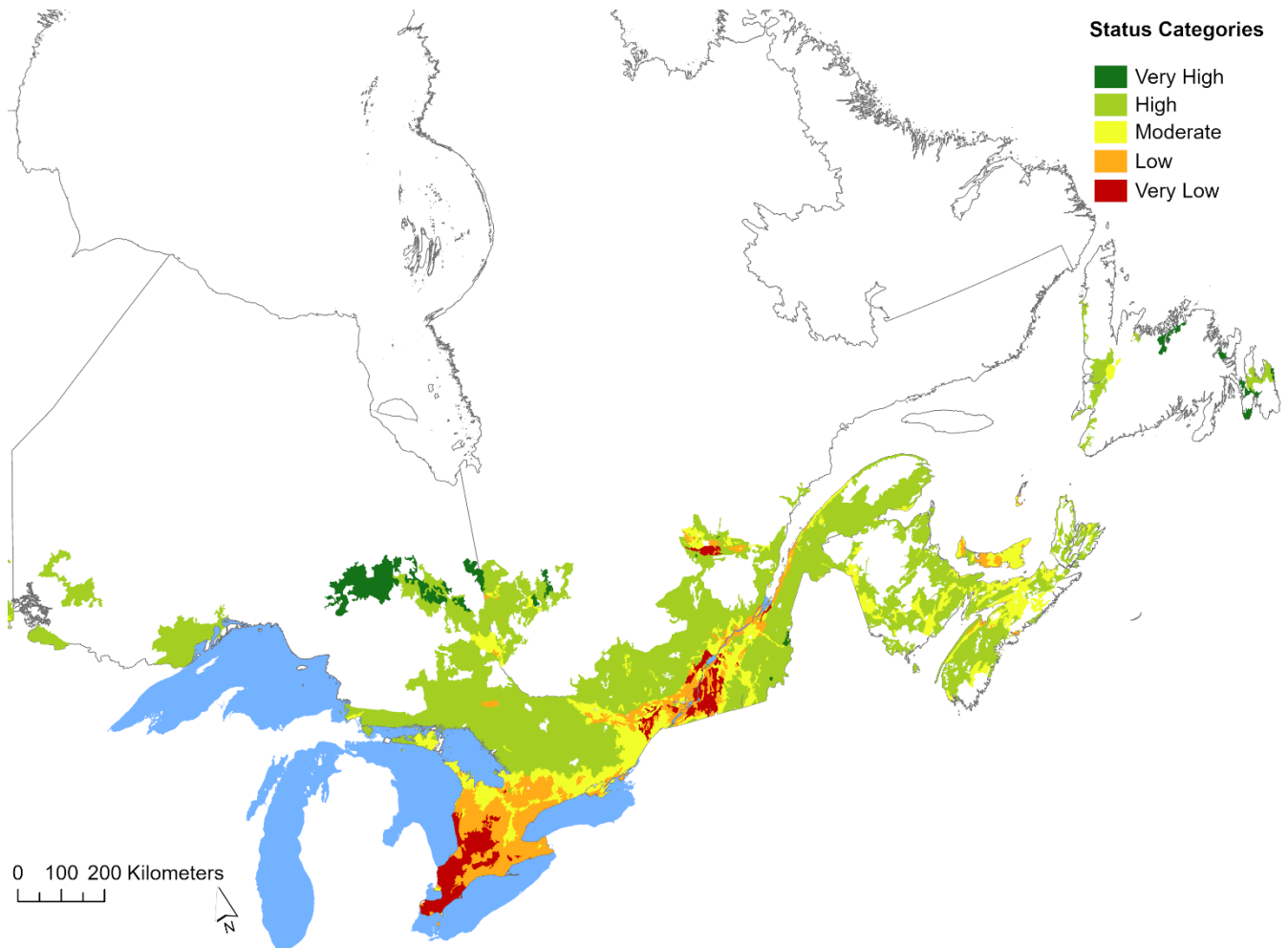**Source:** Agriculture and Agri-Food Canada (2024).

Annex B. Status of the ability of the agricultural landscape to support wildlife, regional figures

Figure B.1. Status of the ability of the agricultural landscape to support wildlife, Western Canada, 2020
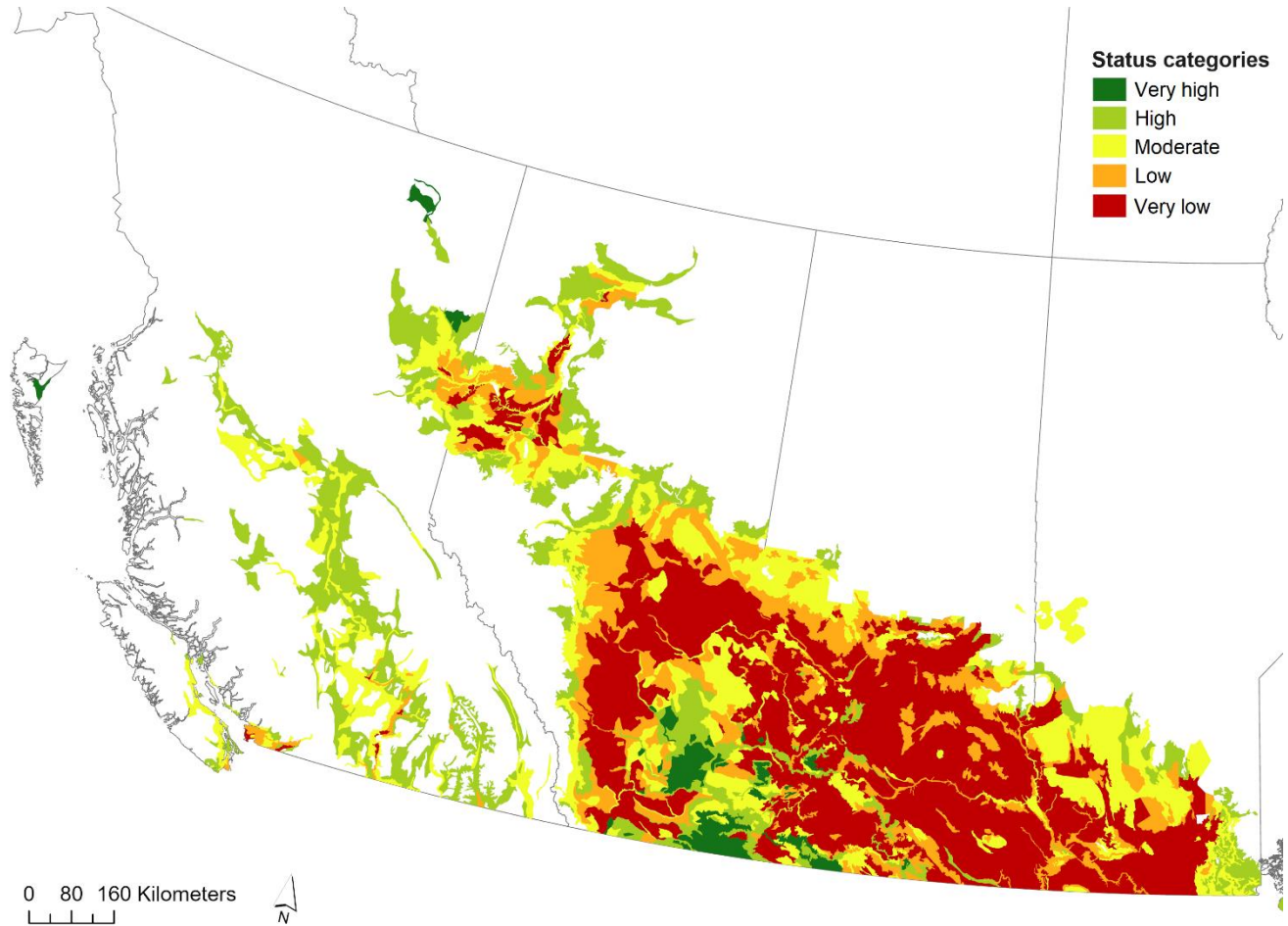
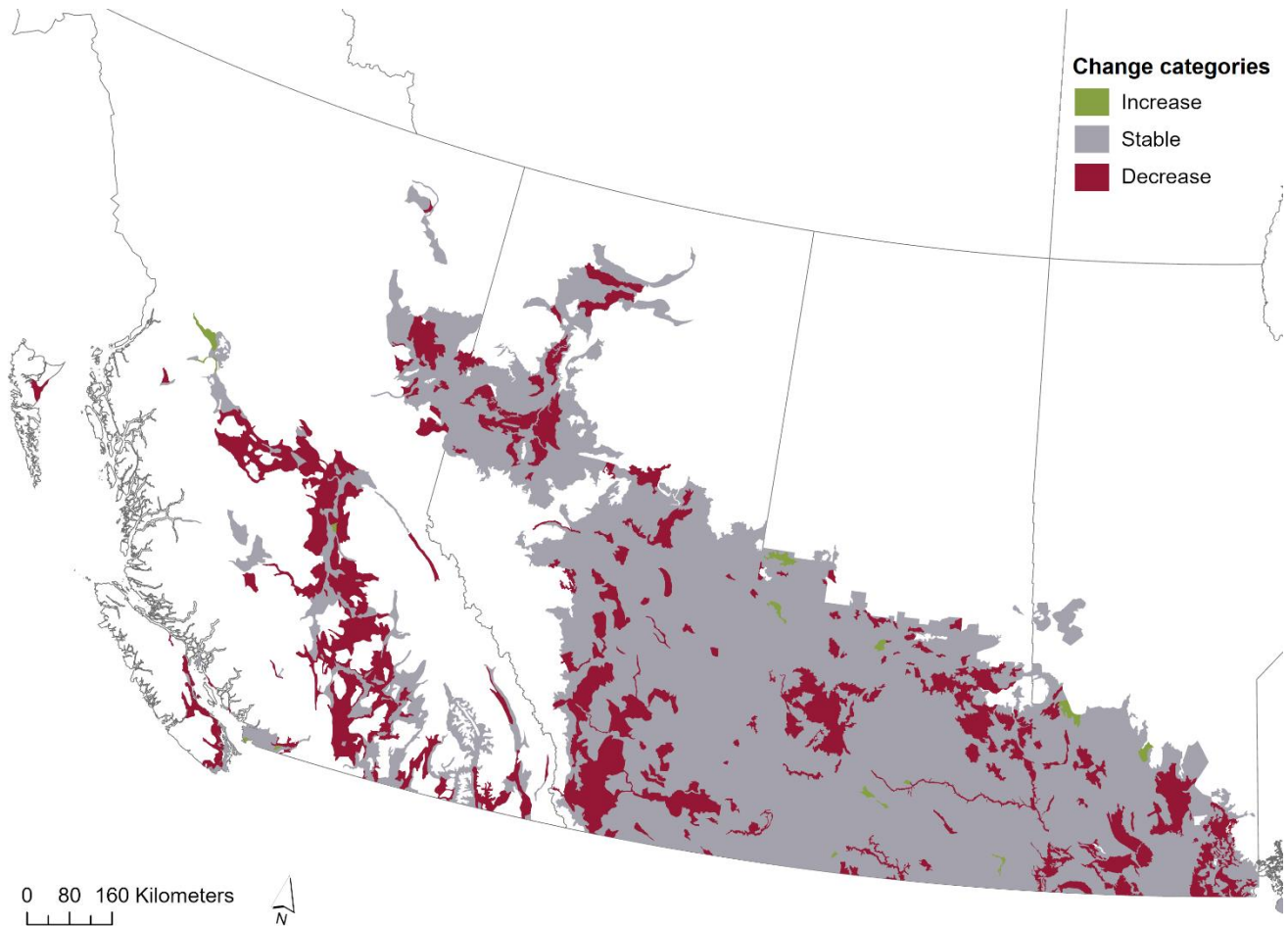**Source:** Agriculture and Agri-Food Canada (2024).

Figure B.2. Status of the ability of the agricultural landscape to support wildlife, Eastern Canada, 2020

Status Categories

- Very High
- High
- Moderate
- Low
- Very Low

0 100 200 Kilometers

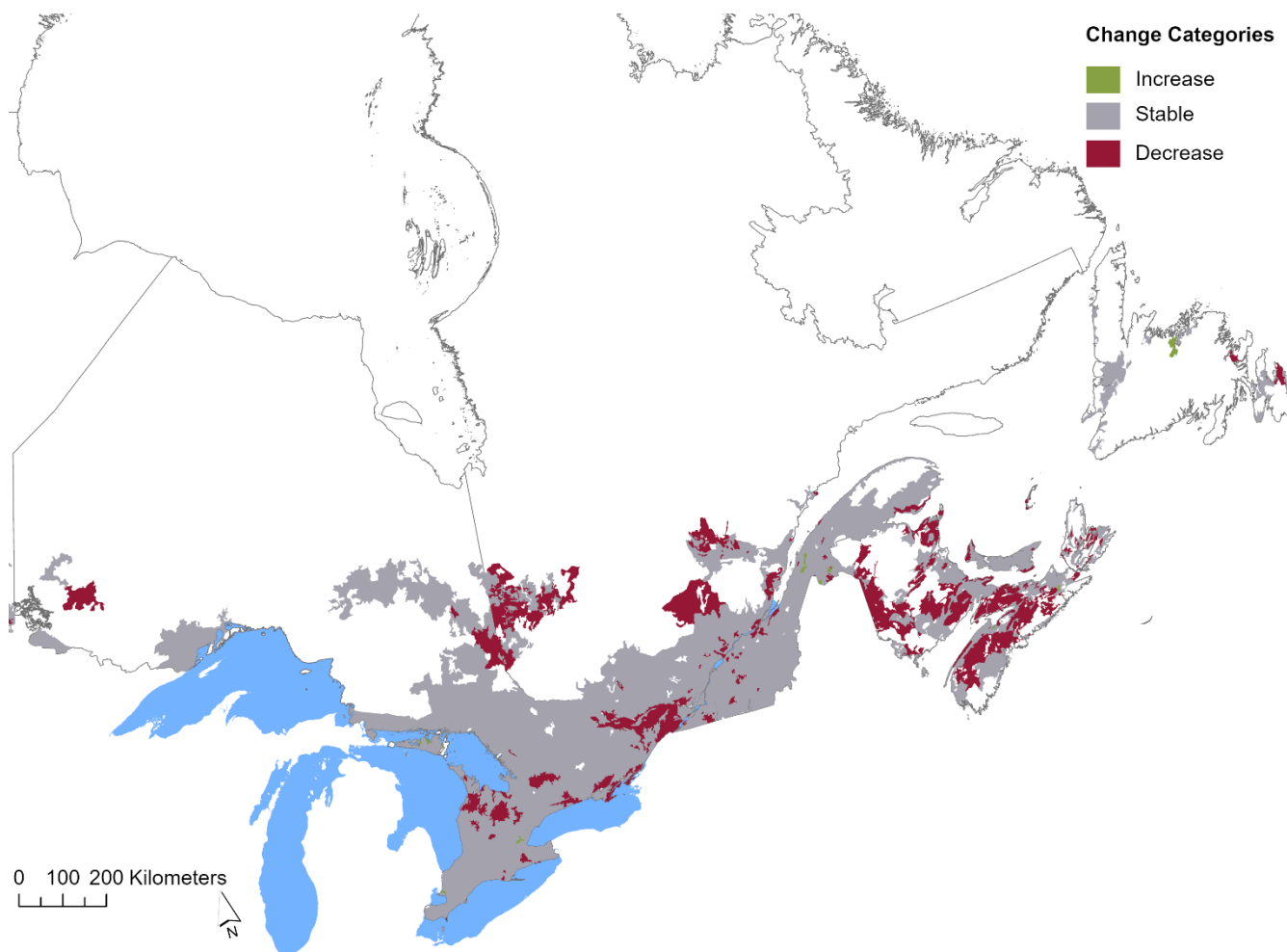**Source:** Agriculture and Agri-Food Canada (2024).

Annex C. Change in the ability of the agricultural landscape to support wildlife, regional figures

Figure C.1. Change in the ability of the agricultural landscape to support wildlife, Western Canada, 2000 to 2020

Source: Agriculture and Agri-Food Canada (2024).

Figure C.2. Change in the ability of the agricultural landscape to support wildlife, Eastern Canada, 2000 to 2020

Source: Agriculture and Agri-Food Canada (2024).

Additional information can be obtained at:

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