Preliminary Assessment 2014

The Status of Biodiversity in the

LOWER PEACE REGION

ABMI

[THIS REPORT DESCRIBES THE STATUS OF BIODIVERSITY AND HUMAN FOOTPRINT IN THE LOWER PEACE REGION]

In partnership with:

Alberta Innovates

Royal Alberta Museum

University of Alberta

University of Calgary

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CANADA LYNX IS A WINTER-ACTIVE MAMMAL COMMONLY FOUND THROUGHOUT THE LOWER PEACE REGION. READ MORE ON PAGE 15 AND 26.

About the ABMI

The Alberta Biodiversity Monitoring Institute (ABMI) is an arm's-length, not-for-profit scientific organization. The business of the ABMI is to monitor and report on the status (current condition) and trends of Alberta's species, habitat, and human footprint.* The goal of the ABMI is to provide relevant scientific information on the state of Alberta's biodiversity to support natural resource and land-use decision making in the province.

The ABMI is jointly delivered by Alberta Innovates - Technology Futures, the Royal Alberta Museum, the University of Alberta, and the University of Calgary. The ABMI Board of Directors includes representatives from the Government of Alberta; environmental non-governmental organizations; the forest, energy, and agriculture sectors; and the research community.

The ABMI reports on a range of biodiversity indicators that act as a guide for establishing biodiversity-related management goals and tracking performance against those goals. Notwithstanding, the ABMI is not a management agency and does not make management recommendations. The ABMI generates value-neutral, independent, and publicly accessible data.

The ABMI is guided by a core set of principles—we are independent, objective, credible, accessible, transparent, and relevant.

*The ABMI defines "human footprint" as the visible conversion of native ecosystems to temporary or permanent residential, recreational, agricultural, or industrial landscapes.

Report Summary

The Alberta Biodiversity Monitoring Institute (ABMI) measures and reports on the state of biodiversity and human footprint across the province. This report presents data on several indicators of environmental health for the Lower Peace Region of Alberta, one of seven land-use planning regions in the province.

The Lower Peace Region makes up 29% of Alberta's land area and is the largest of the seven land-use planning regions. Overlapping the Boreal Forest Natural Region, this landscape is heavily forested.

As of 2012, human footprint covered 7.3% of the land area, up from 5.3% in 1999. Forestry footprint* represented the largest human footprint, covering 2.8% of the region, followed by agriculture footprint (2.5%), and energy footprint (1.6%). The 2% increase in footprint between 1999 and 2012 was largely driven by forestry as it surpassed agriculture as the predominant footprint in this region.

Overall, 22% of the Lower Peace Region is managed as protected areas; Wood Buffalo National Park accounts for 84% of the protected areas in this region.

The ABMI assessed the status of 420 species in the Lower Peace Region and found them to be, on average, 94% intact.†

At present, the biggest ecological changes are associated with the higher than expected abundance of species that thrive in open areas (e.g., grasslands) or disturbed habitat, such as the Coyote, Savannah Sparrow, and Red Fescue.

Additional results of note include the following:

- *Species that prefer old-forest habitat, like the Brown Creeper, Marten and Fisher, and Spreading Woodfern were found to be less abundant than expected.*
- *A total of 37 non-native weeds were detected in the Lower Peace Region. Non-native weeds were detected at 50% of the sites surveyed. At sites where they were found, an average of 2.8 non-native weed species were present, meaning that if one species is found, there is likely another non-native species to be found in the same vicinity.*
- *The ABMI detected 107 species at risk‡ in the Lower Peace Region and was able to calculate intactness for 26 of these species; 14 of these species were less abundant than expected.*

The Peace River Oil Sands Area (PROSA) covers approximately 12.6% (or 24,247 km^2) of the Lower Peace Region; 83% of PROSA falls within this planning region. In the PROSA, agriculture footprint was the dominant human footprint at 12.1%, followed by forestry footprint at 3.3% and energy footprint at 2.3%. The ABMI assessed the status of 415 species in PROSA and found them to be, on average, 85% intact, about 10% lower than the Lower Peace Region as a whole.

This report describes the current status of biodiversity in the Lower Peace Region. Over the next few years, the ABMI will broaden its assessment of biodiversity to include status and trend reporting for lichens and wetlands, as well as trend analysis for all species groups included in this report. These same assessments will be generated and updated for all seven planning regions in the province.

**The measure of forestry footprint includes both recent and older logging activity in the region. The ABMI is currently conducting research to determine how to account for the recovery of biodiversity in forests that are regenerating following logging.*

† The ABMI's Biodiversity Intactness Index is used to report on the health of biodiversity, including birds, winter-active mammals, armoured mites, vascular plants, and mosses and liverworts within Alberta. The index ranges from 100% intact to 0% intact—an area with little evidence of human impact is nearly 100% intact; a parking lot surrounded by big-box stores is nearly 0% intact. The Biodiversity Intactness Index is a measure of how much more or less common a species is relative to the case when no human footprint is present.

‡Threat categories for species at risk as identified by the Government of Canada and/or the Government of Alberta. This assessment includes species identified by: Canada's Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered, Threatened, Special Concern, or Data Deficient; Canada's Species at Risk Act (SARA) as Endangered, Threatened, or Special Concern; Alberta's Ministry of Environment and Sustainable Resource Development (ESRD) as May Be at Risk, At Risk, Sensitive, or Undetermined; Alberta's Endangered Species Conservation Committee (AB ESCC) as Endangered, Threatened, Special Concern, Data Deficient, In Process.

Introduction

Alberta has experienced tremendous economic growth in recent decades largely driven by resource development in the forest and energy industries. In addition to a long history of agriculture in many parts of the province, this development has led to competing demands on the land base. To deal with these pressures, the Government of Alberta initiated the Integrated Resource Management System (IRMS) to manage the cumulative effects of resource development. The stated goal of the IRMS is to minimize human footprint while enabling industrial growth.[1] Under this approach, targeted outcomes must be defined for environmental values (e.g., wildlife, watershed, fisheries) as well as social and economic values. Two government initiatives figure strongly in the province's IRMS—regional planning under Alberta's Land-use Framework and Alberta's environmental monitoring system.

Under the Land-use Framework, the Government of Alberta is developing seven land-use plans. In August 2012, the government approved the first of these plans—Lower Athabasca Regional Plan (LARP)[2]—with the other planning regions to follow. A large part of this planning process is managing the long-term trade-offs associated with economic, social, and environmental priorities. In support of the planning process, land-use plans will identify clear environmental objectives for air, land, water, and biodiversity.

The ABMI is part of Alberta's environmental monitoring system. We measure the health of biodiversity and changes in human land use (i.e., human footprint) in Alberta, including in the seven planning regions. Our biodiversity data and human footprint data are designed to measure progress toward environmental outcomes as identified in each land-use plan.

In this report, we describe the status of species, native habitat,* and human footprint in one of the seven land-use planning regions—the Lower Peace Region (Figure 01). We report on the current status of hundreds of species and highlight those that show the most sensitivity to human development. We also provide information on the trend of human footprint over the past 13 years. The information in this report can be used as a foundation for evaluating the sustainability of resource development in the Lower Peace Region.

The ABMI defines "native habitat" as undeveloped habitat that is distant enough from human footprint that it meets the particular management objectives of stakeholders.

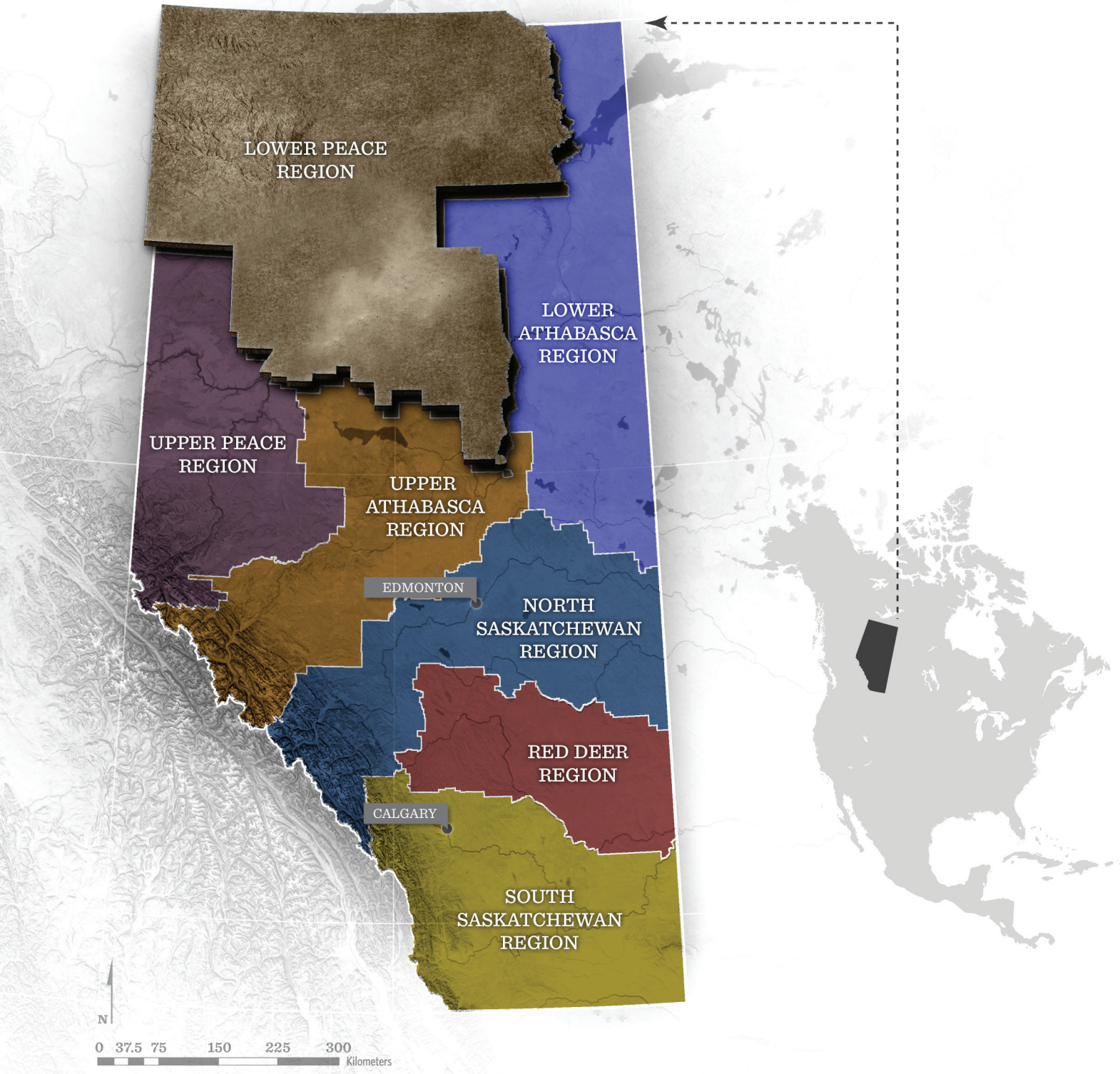


FIGURE 01

THERE ARE SEVEN LAND-USE PLANNING REGIONS IN ALBERTA; THIS REPORT FOCUSES ON THE LOWER PEACE REGION.

Why Biodiversity Matters

Biodiversity is the variety of life on Earth—from the multitude of species that live in a drop of water to the vast array of wildlife that depends on the world's largest ecosystems. Though its importance is not always immediately evident, biodiversity is critical to human health and well-being, providing us with a number of benefits that we often take for granted.

For example, ensuring healthy aquatic ecosystems in our environment is the most cost-effective way of providing a clean and reliable source of drinking water.[3] Productive forest ecosystems grow trees that not only supply our sawmills and pulp mills, but also act as an important storehouse of carbon, which helps to mitigate climate change. Approximately one-third of the fruits and vegetables we buy at the grocery store require pollination by the many insect species that are an important part of biodiversity. In addition, the products we find in our medicine cabinets are often derived from plants. In fact, approximately 25% of the world's bestselling prescription medications are derived from plant-based biodiversity products.[4] And finally, natural areas provide opportunities for hiking, hunting, fishing, and berry picking. Biodiversity is all around us everyday, and it plays an enormous role in supporting our way of life.

ABMI Measures Biodiversity

From the boreal forest in the north to the grasslands in the south, the ABMI monitors the state of Alberta's biodiversity. To do this, the ABMI employs a systematic grid of 1,656 site locations, spaced 20 kilometres apart, to collect biodiversity information on terrestrial and wetland sites (Figure 02).

At each location, ABMI technicians record the species that are present, and measure a variety of habitat characteristics. For species that cannot be identified in the field (e.g., mites and lichen), ABMI taxonomists at the Royal Alberta Museum sort, identify, and archive samples to complete the Institute's species-level dataset. Through our field and laboratory efforts, the ABMI tracks over 2,000 species.

The ABMI also monitors the state of Alberta's human footprint using fine-resolution aerial photography and satellite imagery. The ABMI Geospatial Centre conducts analyses of human footprint at two spatial scales:

1. For a 3 × 7 km area around each ABMI site location, detailed inventories of human footprint are created using satellite imagery. Detailed inventories are available from 1999 to 2012, except for 2000 and 2006.*

2. At the provincial scale, existing satellite imagery is used to create a wall-to-wall human footprint map of the entire province. This Geographic Information System (GIS) Inventory of Provincial Human Footprint is a compilation of externally sourced information about provincial human footprint, supplemented with ABMI remote sensing data that has undergone ABMI quality control procedures. The Inventory of Provincial Human Footprint is available for 2007 and 2010.

These mapped products are updated at regular intervals to track changes in human footprint and habitat through time.

The ABMI's dataset is used to identify relationships between human land use, habitat, and species abundance when and where they exist. The scale and depth of the ABMI's monitoring program described above make it a unique program nationally, and a leader internationally. Members of the ABMI's Science Advisory Committee (an external review board) describe the ABMI as "one of the premier monitoring programs in the world" (Dr. Reed Noss of the University of Central Florida) and "leading the biodiversity monitoring charge in Canada" (Dr. Jeremy Kerr of the University of Ottawa).

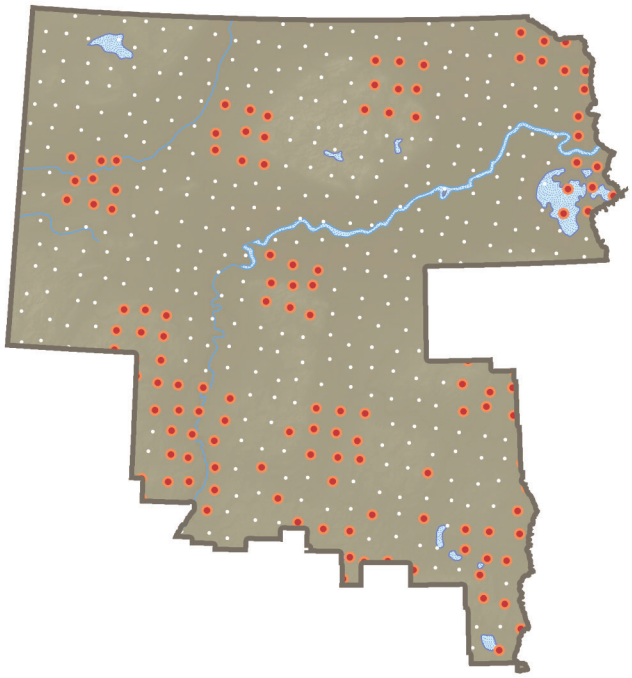


FIGURE 02

THE LOWER PEACE REGION REPRESENTS 29% (192,176 KM^2) OF ALBERTA'S TOTAL LAND AREA. THE ABMI HAS 481 OF OUR 1,656 SURVEY SITES IN THE LOWER PEACE; 142 OF THESE SITES HAVE BEEN SAMPLED BETWEEN 2003 AND 2012.

**Trend data from the years 2000 and 2006 are not included because data from those years are unreliable.*

Biodiversity Indicators in This Report

Habitat loss is a major driver of biodiversity decline on the planet.[5] In the Lower Peace Region, habitat is being modified by, or lost to, a range of human activities, particularly forestry and energy development. Responsible management of this region depends on understanding the complex interactions between species, habitat, and human footprint. Our data is used to generate indicators of species, habitat, and human footprint in the following way:

Species

To assess the status of species, the ABMI collects and analyzes data on breeding birds, winter-active mammals, armoured mites, vascular plants, and mosses and liverworts. To report on the status of species, the ABMI has developed a metric called the Biodiversity Intactness Index. The index ranges from 0% to 100% and is interpreted as follows (see Figure 03 for a visual guide):

- *If a species is 100% intact in a given area, the abundance of the species is equal to the abundance one would expect in an area without any human footprint.*
- *As the index declines, it reflects one of two possible scenarios. In the first, the species abundance is lower relative to an area with no human footprint. In other words, the species has become rarer. In the second scenario, the species is more abundant than expected. In both instances, species abundance has been perturbed from a reference condition due to human impact.*

Native Habitat

To assess the status of native habitat, the ABMI uses remotely sensed data. To report on the status of native habitat, the ABMI presents the percentage of land cover that has no human footprint, as well as the percentage of area that is designated as protected in a region.

Human Footprint

To assess the status of human footprint, the ABMI uses the GIS Inventory of Provincial Human Footprint and the 3 × 7 km detailed inventory of human footprint. To report on the status of human footprint, the ABMI presents the percentage of land directly altered by human activities, which is interpreted as follows:

- *0% means there is no visible human footprint.*
- *100% means the landscape has been completely modified by human footprint.*

In general, cities and cultivated fields have high human footprint, while protected and undeveloped areas have low human footprint. Trend information on human footprint is based on the 3 × 7 km detailed inventory of human footprint available from 1999 to 2012 (except for 2000 and 2006). Human footprint data for caribou population ranges and the Peace River Oil Sands Area is calculated using the GIS Inventory of Provincial Human Footprint circa 2007 and 2010.

See the Lower Peace Region Supplemental Report (available at www.abmi.ca) for further details.

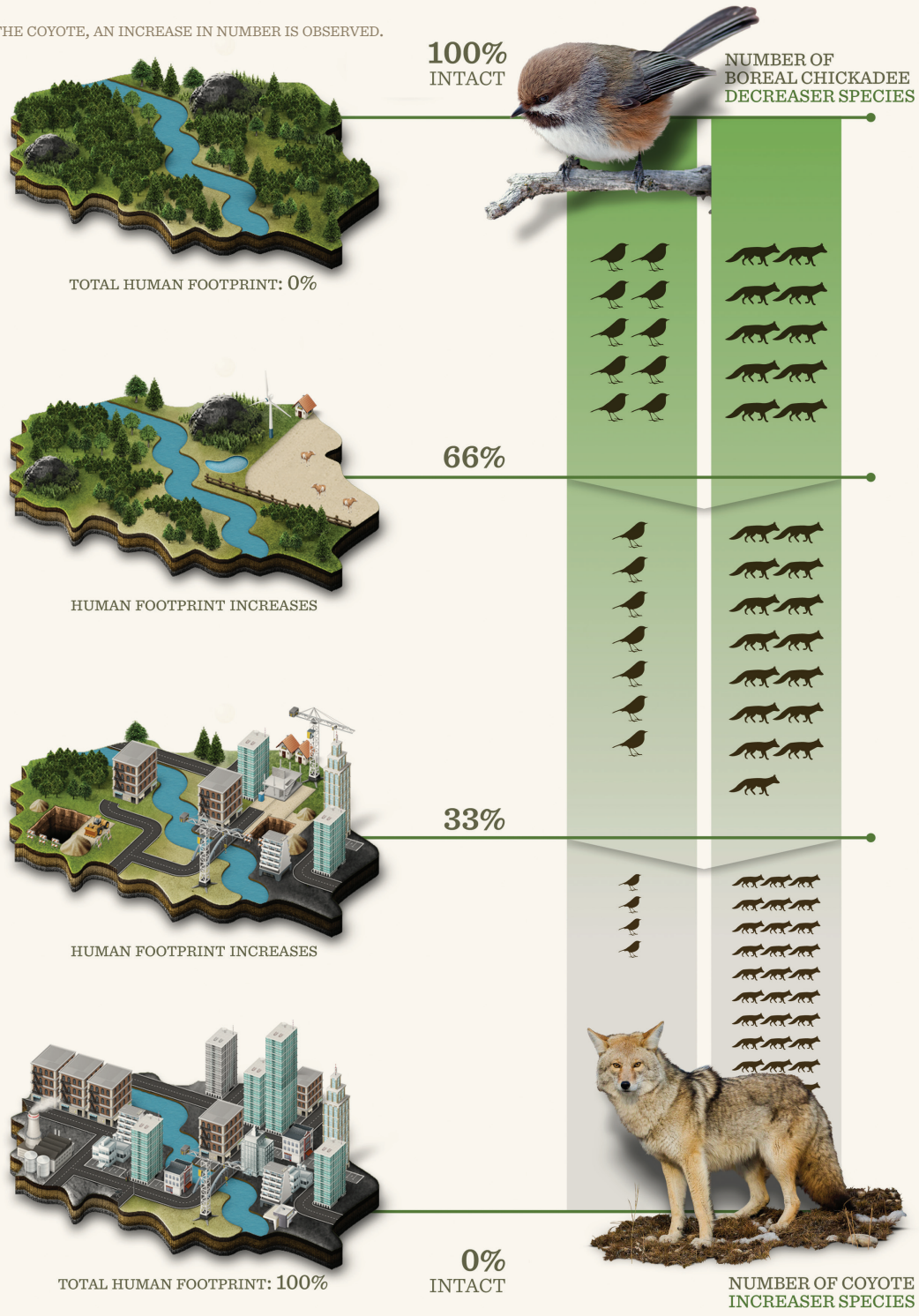
FIGURE 03 THE ABMI BIODIVERSITY INTACTNESS INDEX

THE ABMI USES THE BIODIVERSITY INTACTNESS INDEX TO REPORT ON THE HEALTH OF A SPECIES IN A REGION. IN THIS FIGURE, WE ILLUSTRATE HOW THE INDEX CHANGES FOR:

- A "DECREASER" SPECIES, THE BOREAL CHICKADEE
- AN "INCREASER" SPECIES, THE COYOTE.

THE INTACTNESS INDEX RANGES FROM 0% TO 100%. AT 100% INTACT, THE ABUNDANCE OF BOTH SPECIES IS EQUAL TO THE ABUNDANCE EXPECTED IN AN UNDISTURBED AREA—ONE WITH 0% HUMAN FOOTPRINT. AS THE INTACTNESS INDEX DECLINES TOWARD 0%, IT REFLECTS A CHANGE IN THE ABUNDANCE OF A SPECIES IN RESPONSE TO HUMAN FOOTPRINT:

- FOR THE CHICKADEE, A DECREASE IN NUMBER IS OBSERVED
- FOR THE COYOTE, AN INCREASE IN NUMBER IS OBSERVED.



Reporting Area

The Lower Peace Region, at 192,176 km^2, is the largest of the seven land-use regions defined in Alberta's Land-use Framework (Figure 04). Located in the northwest corner of the province, the Lower Peace Region includes:

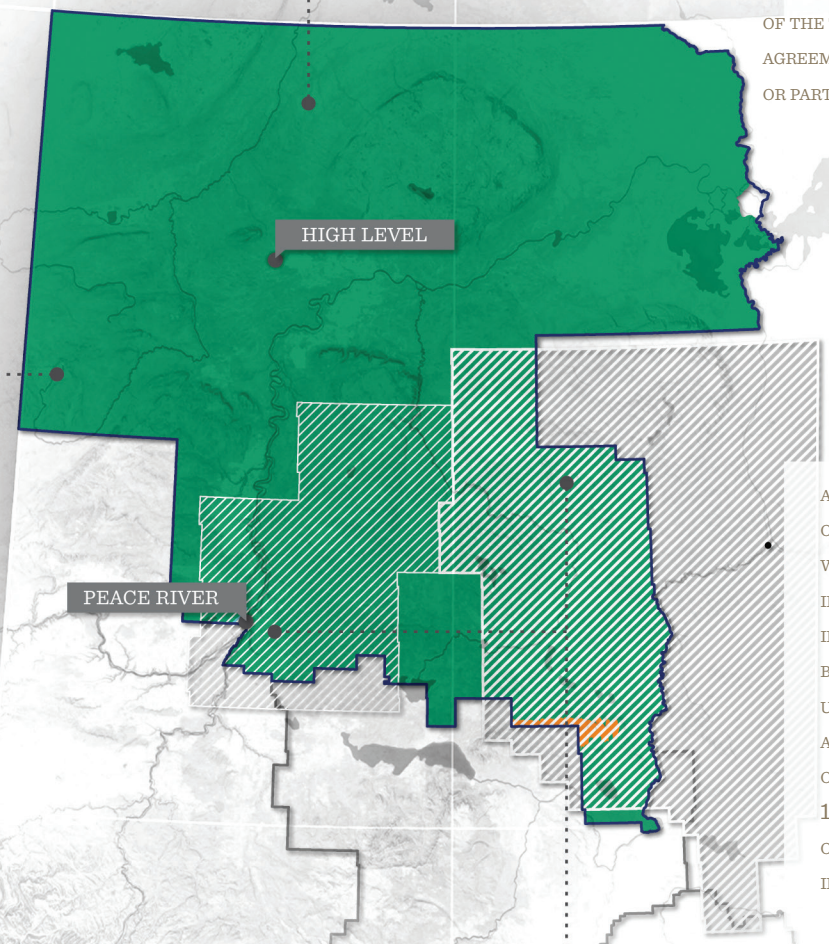
- 29% of Alberta—an area slightly larger than the state of Washington or six times the size of Vancouver Island.
- Three of Alberta's six Natural Regions; the Boreal Forest Natural Region is dominant, with the Foothills and Parkland Natural Regions occupying tiny pockets in the south of the region (Figure 04).
- Vast forested areas of coniferous, mixedwood, and deciduous forests that support a wide range of wildlife and plants. These forests have been shaped by wildfire for thousands of years, resulting in a mosaic of forest stands that range in age from young to more than 150 years old.
- A large number of wetlands, including muskeg and bogs, meandering streams, and numerous lakes.
- The Caribou Mountains, a unique landform in the shape of a low, saucer-shaped plateau, rise 600–700 m above the surrounding lowlands. Left unglaciated in the last ice age, these mountains contain remnant communities of lichens, vascular plants, and mosses, as well as unique permafrost features and wetlands, not found in the surrounding areas.

ABOUT 3,649 KM^2 OF LAND ARE USED FOR AGRICULTURE PRODUCTION IN THE REGION (ALMOST 2 PER CENT OF THE TOTAL LAND AREA), INCLUDING CROPS, AND TAME AND NATIVE PASTURE.

FIGURE 04

THE LOWER PEACE REGION, A 192,176 KM^2 AREA IN NORTHWESTERN ALBERTA, IS THE FOCUS OF THIS REPORT.

ALMOST HALF OF THE LOWER PEACE REGION (91,103 KM^2) IS COVERED BY FOREST MANAGEMENT AGREEMENT AREAS. EIGHT OF THE TWENTY FOREST MANAGEMENT AGREEMENTS IN THE PROVINCE ARE WHOLLY OR PARTIALLY LOCATED IN REGION.



LEGEND

- *BOREAL*
- *FOOTHILLS*
- *PARKLAND*
- *OIL SANDS AREAS*

AS A RESULT OF HISTORIC AND ONGOING OIL AND GAS PRODUCTION, WELL SITE AND OTHER ENERGY INFRASTRUCTURE ARE COMMON IN THE REGION. OIL PRODUCTION, BOTH CONVENTIONAL AND UNCONVENTIONAL, HAS AVERAGED APPROXIMATELY 125,000 BARRELS OF OIL PER DAY SINCE THE EARLY 1970S, WITH BITUMEN PRODUCTION OVERTAKING LIGHT OIL PRODUCTION IN THE EARLY 1990S.

THIS REGION IS HOME TO TEN FIRST NATIONS AND ONE METIS SETTLEMENT (DESCENDENTS OF THE CREE AND DENE PEOPLE).

TWO OIL SANDS AREAS OVERLAP WITH THIS REGION: PEACE RIVER OIL SANDS AREA AND ATHABASCA OIL SANDS AREA. UNCONVENTIONAL OIL PRODUCTION IS INCREASING IN THE REGION.

N

0 25 50 100 150 200 Kilometers

In the Field

Winter tracking—unravelling clues in the snow

For those willing to listen, snow is a great tattletale, detailing the comings and goings of many of Alberta's wildlife species during the winter. So, as the days get shorter and snow falls thickly, covering the landscape in a deep, wintery blanket, there's a flurry of activity at the ABMI as trackers ready their gear for another season of winter tracking. It is their task to record the wildlife tracks they see across the snow-covered landscape; the data they collect helps us understand what animals are present in different areas of the province, and how common they are.

The ABMI uses winter tracking to monitor winter-active mammals because it is one of the least disruptive ways of detecting wildlife, as opposed to trapping animals to collar them with radios, for example. The method simply depends on an animal's natural movement over the landscape, with observers counting tracks that cross a given path.

From early December to mid-March, the ABMI annually conducts winter tracking surveys at the same locations that were sampled by the ABMI during the previous spring and summer. Whereas spring and summer surveys take place on a 1 ha square plot, winter tracking occurs along a 10 km transect, or path, to maximize the probability of encountering animal tracks.

"Winter tracking is very weather- and snow-dependent," says Cris Gray, the ABMI's Northern GIS coordinator, who was instrumental in helping to test the Institute's first tracking protocols developed by ABMI science co-director Dr. Stan Boutin and scientific collaborators Drs. Erin Bayne and Richard Moses. The protocol was designed based on the Finnish wildlife tracking program.

"The fresh snowfall has to be at least two centimetres deep before crews can go out tracking," Gray says. "At that depth all previous tracks have been erased. Crews of observers then wait approximately three days to allow new tracks to accumulate before heading out in teams of two."

Trackers closely follow weather reports from every region of the province, and when conditions are optimal, the observers—made up of researchers, students, ecologists, and sometimes trappers and hunters—head out to survey transects, in some cases to locations so remote that the observers are flown in by helicopter. Then, often guided by GPS to ensure they don't veer off track (pun intended!), they move slowly along the transect by whatever means necessary, via snowmobile, on skis, on foot, or sometimes in a truck.

En route, observers record the presence of each species detected along each 250 m section of the 10 km transect as indicated by the tracks they see in the snow. Gray cautions that this information does not indicate the number of animals in the section, only the presence of species. "The crews also take weather measurements, such as temperature, depth of snowfall, condition of the snow—that's important because if the snow is crusty, you won't see small mammal tracks. Crews also record sightings of any animals, and in some cases scat (droppings) to help identify the track," she adds.

WINTER TRACKS OF THE COYOTE ARE COMMONLY FOUND THROUGHOUT ALBERTA.

"Typically tracks have to be identified while the observers are on the transect," says Gray, who has trained numerous winter tracking crews in the ABMI's tracking protocols. "You can actually see mouse tracks if the conditions are right, as well as squirrels, deer, moose, and many other species," she says. "However, the tracks of some species, such as Mule Deer and White-tailed Deer, are hard to tell apart. In those instances, the observer has to examine the travel path an animal has taken, to help identify them." For hard-to-identify tracks, crews record track dimensions and length of gait, and they may photograph or sketch the tracks to help in the identification.

At the end of the day, the ABMI's expert trackers use the clues imprinted in the snow to uncover information about Alberta's biodiversity. By unravelling these clues, we provide valuable information to support land-use decisions in the province of Alberta.

TABLE 01

PER CENT OCCURRENCE OF WILDLIFE SPECIES DETECTED DURING WINTER TRACKING AT ABMI SITES IN THE LOWER PEACE REGION.

Species	Per Cent (%) Occurrence
Red Squirrel	97%
Snowshoe Hare	95%
Weasels and Ermine	85%
Mice and Voles	84%
Marten and Fisher	82%
Moose	78%
Canada Lynx	75%
Grouse and Ptarmigan	61%
Coyote	60%
Deer	57%
Gray Wolf	37%
Red Fox	25%
Mink	24%
River Otter	14%
Wolverine	6%
Caribou	6%
Bison	5%
Porcupine	5%
Beaver	4%
Muskrat	4%
Cougar	3%
Elk	3%

THE DISTINCTIVE TRACKS OF A SNOWSHOE HARE IN THE SNOW; NOT ALL TRACKS ARE THIS EASY TO IDENTIFY.

HUMAN FOOTPRINT DATA, INCLUDING FOOTPRINT TYPE, AMOUNT, AND TREND, PROVIDE THE CONTEXT FOR INTERPRETING THE CURRENT STATUS OF A SPECIES AS REFLECTED BY THE BIODIVERSITY INTACTNESS INDEX.

Human Footprint

The ABMI defines human footprint as the visible conversion of native ecosystems to temporary or permanent residential, recreational, or industrial landscapes. This includes activities that support the energy, forest, and agriculture industries; residential settlement; and transportation infrastructure. At present, summaries of human footprint do not account for the recovery of biodiversity in forests that are regenerating following temporary disturbances such as forest harvesting or energy exploration (e.g., seismic lines). For example, a regenerated cutblock or seismic line is treated the same as a more recent disturbance of the same type. The ABMI is currently developing the science necessary to account for this regeneration so that recovering areas can make a reduced contribution to the estimate of total human footprint.

AS OF 2012, THE TOTAL HUMAN FOOTPRINT ACROSS THE LOWER PEACE REGION WAS 7.3% (FIGURE 05, FIGURE 06A).

Forestry footprint was the largest human footprint category, covering 2.7% of the planning region in 2010 (Figure 06B), followed by agriculture footprint at 2.4% (Figure 06C), and energy footprint at 1.6% (Figure 06D).

The total area of human footprint increased by 2% from 5.3% to 7.3% of the area between 1999 and 2012 (Figure 05). This increase was largely driven by forestry footprint, which went from 1.5% coverage in 1999 to 2.8% coverage in 2012, surpassing agriculture as the predominant footprint.

The human footprint data provides the context for interpreting the current status of biodiversity as reflected by the Biodiversity Intactness Index. As the per cent area of human footprint increases toward 100%, the risks to biodiversity in a region also increase. These risks are initially small and can go unnoticed. However, the more the area of human footprint increases, the more likely it is to have an impact on biodiversity. Some species thrive in landscapes with high human footprint and increase in abundance, while other species decrease in abundance and become uncommon as a result of development.

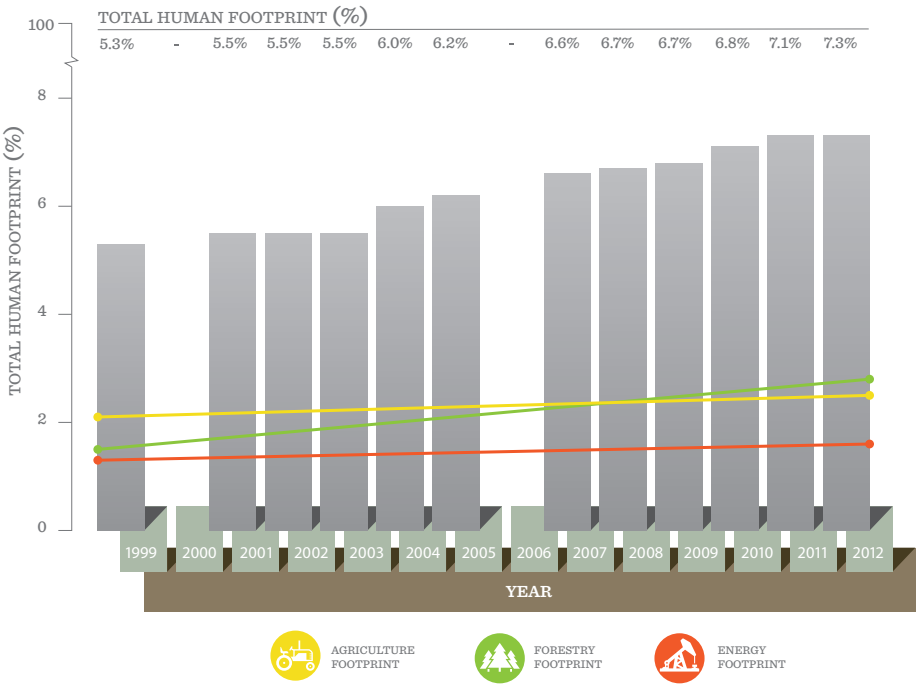
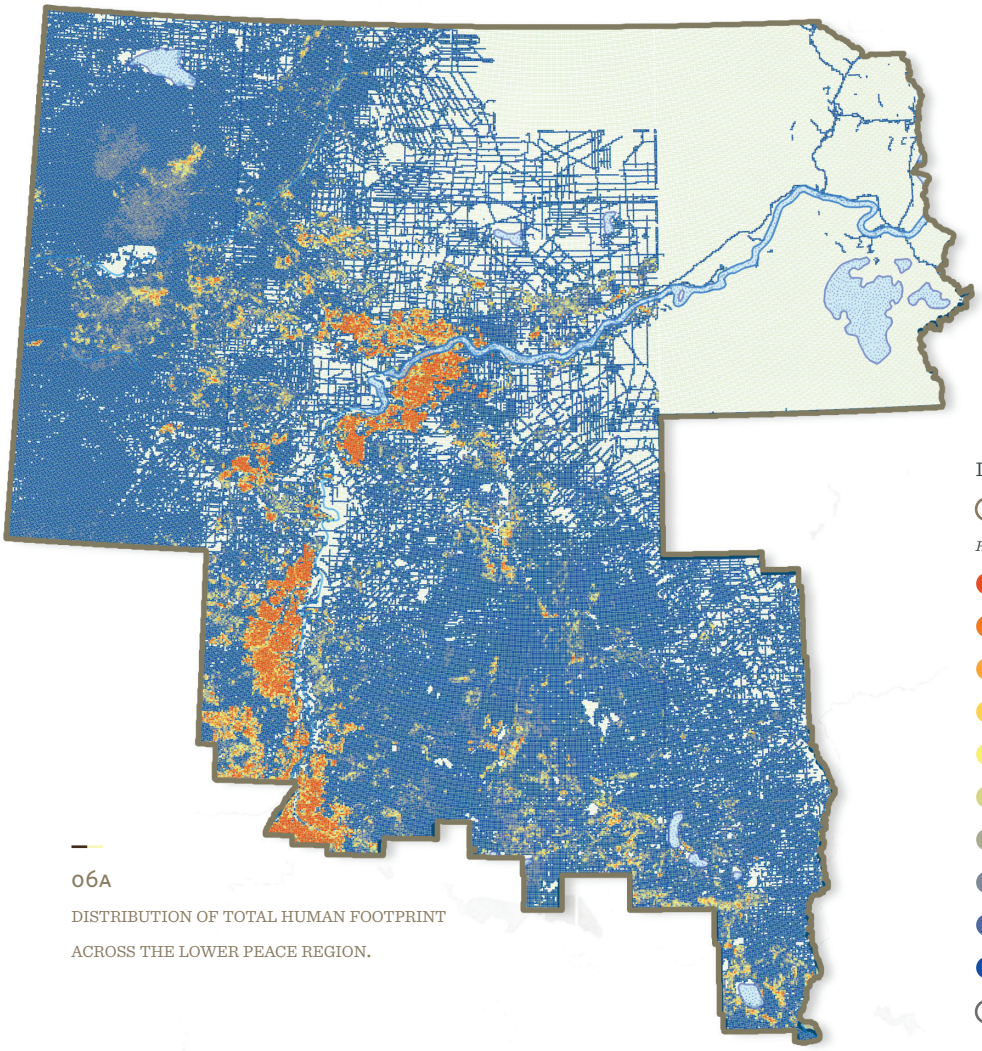


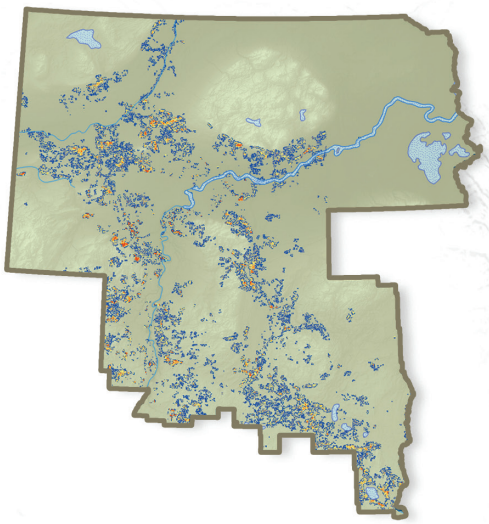
FIGURE 05

THE PERCENTAGE OF TOTAL HUMAN FOOTPRINT (VERTICAL BARS), AGRICULTURE FOOTPRINT, FORESTRY FOOTPRINT, AND ENERGY FOOTPRINT IN THE LOWER PEACE REGION FROM 1999 TO 2012.



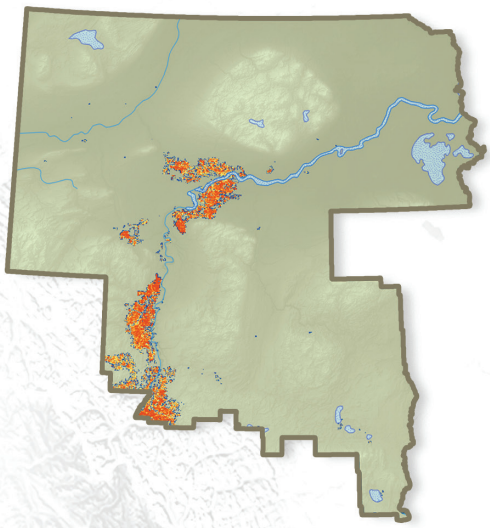
06A

DISTRIBUTION OF TOTAL HUMAN FOOTPRINT ACROSS THE LOWER PEACE REGION.



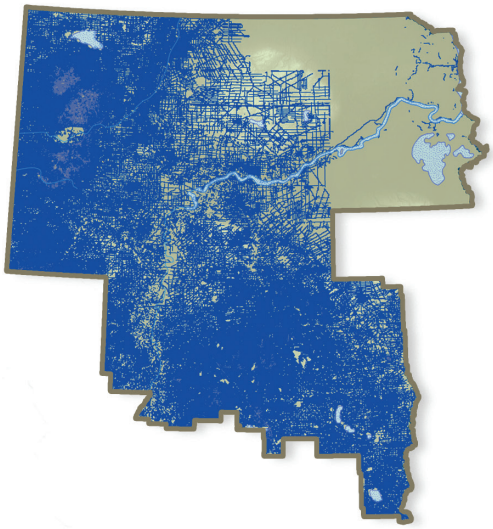
06B

FORESTRY FOOTPRINT COVERS 2.7% OF THE LOWER PEACE REGION.



06C

AGRICULTURE FOOTPRINT COVERS 2.4% OF THE LOWER PEACE REGION.



06D

ENERGY FOOTPRINT COVERS 1.6% OF THE LOWER PEACE REGION.

FIGURE 06

DISTRIBUTION OF HUMAN FOOTPRINT ACROSS THE UPPER PEACE REGION CIRCA 2010, INCLUDING: 06A TOTAL HUMAN FOOTPRINT; 06B AGRICULTURE FOOTPRINT; 06C FORESTRY FOOTPRINT; 06D ENERGY FOOTPRINT.

Habitat and Protected Areas

Native Habitat

People's perception of wilderness often includes undisturbed expanses of forest, river, and lake ecosystems. The ABMI uses the phrase and concept of "native habitat" to identify areas in Alberta, including in the Lower Peace Region, that have not been visibly disturbed by humans; although natural disturbances, such as wildfire and insect outbreaks, and indirect effects of humans, like pollution, still occur. While many definitions of native habitat exist, the ABMI defines it as undeveloped native habitat that is distant enough from human footprint that it meets the particular management objectives of stakeholders.

Proximity of human footprint can affect how species use native habitat. For example, some species can effectively use habitat that is adjacent to human footprint while others require habitat that is more distant. Therefore, we measure native habitat using four different buffer distances: 0 m, > 50 m, > 200 m, and > 2 km away from footprint. These distances delimit the amount of native habitat available with a given "buffer" from human footprint. For example, at 0 m from human footprint, all native habitat in the region is included. However, at > 50 m, only native habitat that is at least 50 m away from human footprint is included.

Overall, 93% of the Lower Peace Region is composed of native habitat with a 0 m buffer from human footprint, whereas in the case of native habitat that is at least 2 km away from human footprint, 19% remains (Figure 07).

As a note of caution, our summary of native habitat does not yet account for some forms of human land use (e.g., livestock grazing or hunting) that may not be consistent with the management objectives of a particular stakeholder. Vegetation recovery in cutblocks and seismic lines is also not yet accounted for.

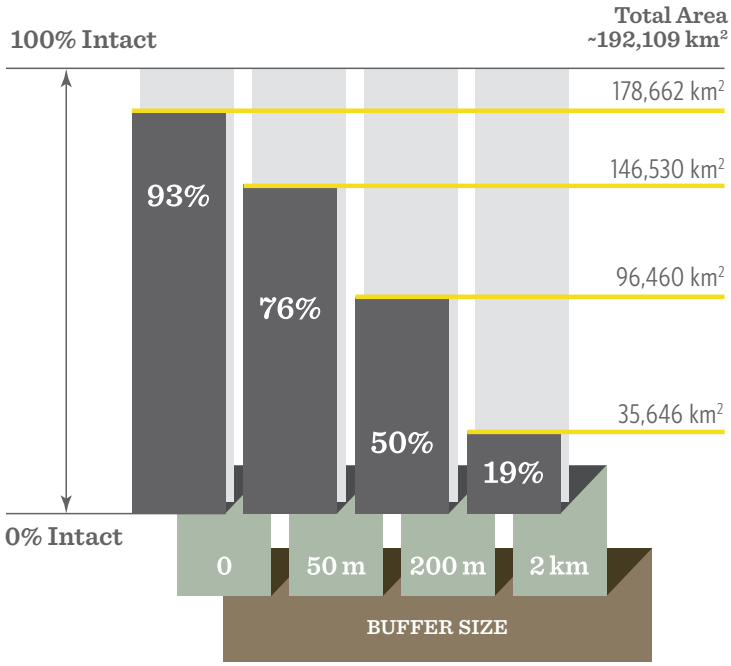


FIGURE 07

TOTAL AND PER CENT OF NATIVE HABITAT IN THE LOWER PEACE REGION USING FOUR DIFFERENT BUFFER DISTANCES.

Protected Areas

Protected areas are an important landscape-level management tool to conserve biodiversity. Resource managers and conservationists are often interested in protecting native ecosystems with little to no human footprint to maintain the biodiversity within these naturally functioning systems.[6]

Overall, 22% of the Lower Peace Region is managed as protected areas* (Figure 08), including: a portion of one national park, all or portions of three provincial parks, seven provincial recreation areas, two wilderness areas, one wildland park, three natural areas, and five wildland provincial parks. Over 36,000 km^2 (84%) of the protected area in the Lower Peace Region is a part of Wood Buffalo National Park.

Aside from Wood Buffalo National Park, the two largest protected areas in the Lower Peace Region are the Caribou Mountains Wildland Provincial Park, located immediately west of Wood Buffalo National Park, and the Hay-Zama Lakes Wildland Park, located in northwestern Alberta. The Caribou Mountains Wildland Park was created in 2001 as part of the province's Special Places program. At 5,910 km^2, this is the largest provincial wildland park in the province. This impressive landform contains unique wetlands and permafrost features, as well as critical habitat for Woodland Caribou. Hay-Zama Lakes Wildland Park is internationally recognized under the Ramsar Convention on Wetlands as a "wetland of international significance" and is nationally recognized as an Important Bird Area.

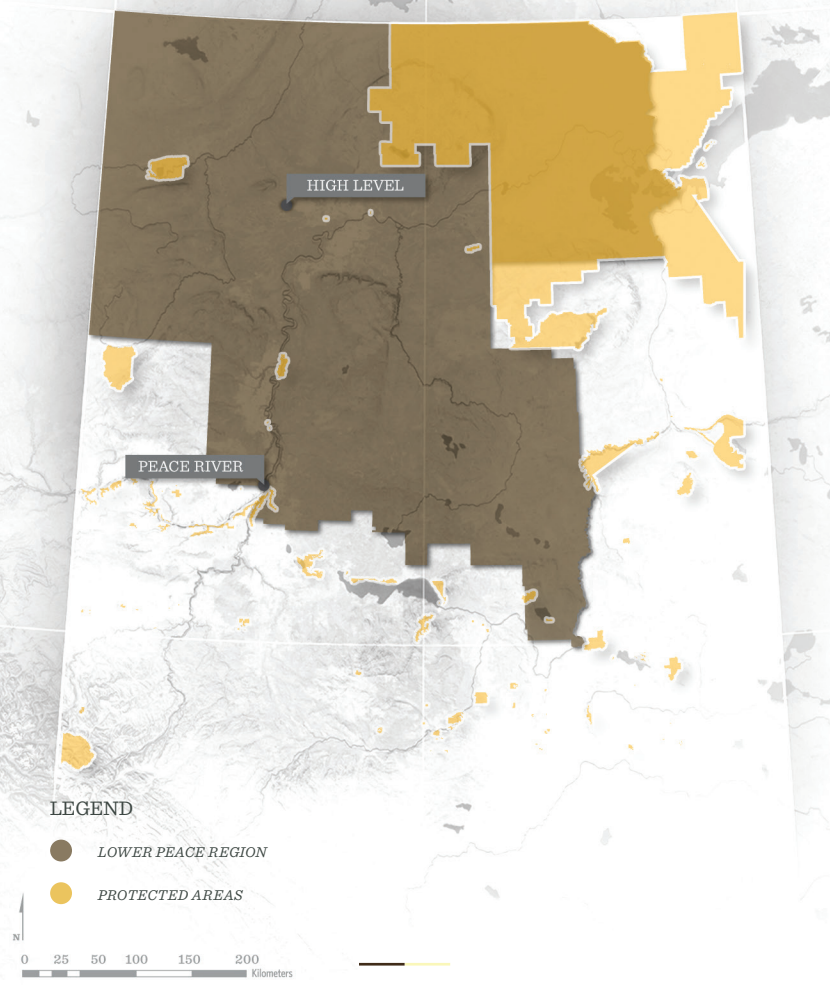


FIGURE 08

DISTRIBUTION OF PROTECTED AREAS IN NORTHWESTERN ALBERTA. OVERALL, 22% OF THE LOWER PEACE REGION IS MANAGED AS PROTECTED AREAS.

HAY-ZAMA LAKES WILDLAND PARK

*The ABMI's definition of protected areas in the Lower Peace Region includes Alberta's parks and protected areas network, national parks, and National Wildlife Areas.

Intactness of Biodiversity

Thousands of plant and animal species live in the Lower Peace Region. Native birds, winter-active mammals, armoured mites, vascular plants, and moss* represent a small but diverse subset of all species in the region.

THE ABMI ASSESSED THE STATUS OF 420 COMMON NATIVE SPECIES IN FIVE TAXONOMIC GROUPS IN THE LOWER PEACE REGION; INTACTNESS RANGED FROM 90% TO 96% (TABLE 02).

At 90% intact, native birds showed the greatest deviation from reference conditions while moss, at 96% intact, showed the least.

It is important to note that the intactness results in this report are averages for the entire Lower Peace Region. As with most landscapes in Alberta, specific locations within this region are nearly 0% intact (e.g., active industrial sites) and other sites are 100% intact (e.g., undeveloped forest and wetland habitat). See Figure 09 for an explanation of how the Biodiversity Intactness Index changes depending on the area of focus.

TABLE 02

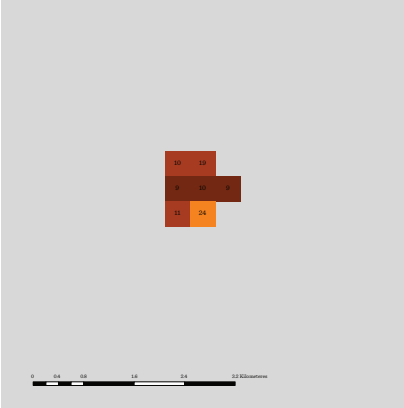
INTACTNESS† OF DIFFERENT COMPONENTS OF BIODIVERSITY IN THE LOWER PEACE REGION.

Biodiversity Component	Number of Species	Intactness
Native birds	78	90 %
Winter-active mammals	10	95 %
Armoured mites	62	95 %
Native plants	182	94 %
Moss	88	96 %
Overall intactness	420	94 %

†*Overall intactness is calculated as the average of the five taxonomic groups as opposed to the average of individual species' intactness values.*

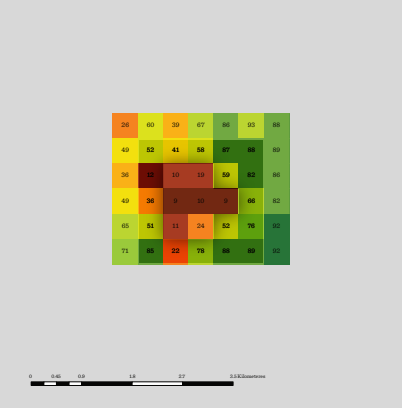
*We use the noun "moss" to collectively refer to mosses, hornworts, and liverworts, which are non-vascular plants also known more technically as bryophytes.

For Biodiversity Intactness, Context Matters



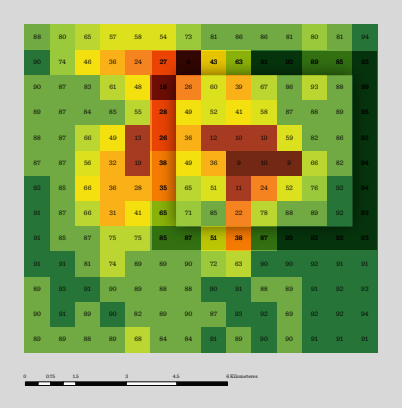
09A. 7 QUARTER SECTIONS WITH INTENSE HUMAN DEVELOPMENT

AVERAGE INTACTNESS: 13%



09B. 42 QUARTER SECTIONS WITH LOW TO INTENSE HUMAN DEVELOPMENT

AVERAGE INTACTNESS: 56%



09C. 182 QUARTER SECTIONS WITH LOW TO INTENSE HUMAN DEVELOPMENT

AVERAGE INTACTNESS: 72%

FIGURE 09.

ESTIMATED BIODIVERSITY INTACTNESS MAPS** WITH BIODIVERSITY INTACTNESS INDEX VALUES FOR EACH QUARTER SECTION (QS) OF LAND WITHIN A GIVEN AREA. SHADING REPRESENTS BIODIVERSITY INTACTNESS FROM LOW (RED BRICK SQUARE: 0%–10%) TO HIGH (DARK GREEN SQUARE: 91%–100%). 09A. INTACTNESS VALUES (9%–24%) FOR 7 QS. 09B. INTACTNESS VALUES (9%–93%) FOR 42 QS, INCLUDING THE 7 QS PRESENTED IN 09A. 09C. INTACTNESS VALUES (9%–99%) FOR 182 QS, INCLUDING THE 42 QS PRESENTED IN 09B.

Using statistical models, the ABMI estimates Biodiversity Intactness Index values for each quarter section (QS) in Alberta. Based on these, the average intactness for a given area can be calculated.

The example above, however, illustrates that average intactness depends on the area of focus. If we focus exclusively on an area of intense human development, such as the area in Figure 09A, average intactness will be very low. By contrast, if we consider areas with a range of human development from minimal to intense, such as those shown in Figures 09B and 09C, average intactness will increase accordingly.

The context dependence of the Biodiversity Intactness Index must be considered when interpreting data contained in this report.

*** Please refer to page 21 of the report for an explanation of how estimated biodiversity intactness maps are interpreted.*

Estimated Intactness of Biodiversity

Based on data collected throughout the boreal forest, the ABMI has developed statistical models that describe the relationship between the relative abundance of individual species, habitat, and human footprint. These statistical models are used to calculate the Biodiversity Intactness Index for individual species in the region. The models can also be used to estimate the Intactness Index for each species for every quarter section of land in the Lower Peace Region—in other words, for locations where the ABMI is not directly monitoring. Using the ABMI's Inventory of Human Footprint (circa 2010) and data on vegetation types, the average intactness of over 400 species in the Lower Peace Region has been estimated and mapped to generate an overall picture of biodiversity across this landscape (Figure 10).

The estimated intactness map provides a visual representation of biodiversity intactness across the Lower Peace Region. Clearly, the map shows that some of the region has little to no human footprint, and consequently higher biodiversity intactness (shown as dark green in Figure 10). On the other hand, other areas, particularly some areas bordering the Peace River, have more intense human footprint, which results in lower biodiversity intactness (e.g., < 30%, shown as orange in Figure 10).

Any interpretations of estimated biodiversity intactness maps must take the following into account:

- The information in the estimated intactness map is preliminary and will change as analyses are refined and as more data are gathered.
- There may be considerable uncertainty in the intactness value for any particular quarter section (i.e., variance in the quarter section predictions is not yet reported by the ABMI).
- ABMI estimated biodiversity intactness maps are intended to show broad patterns of intactness, not exact values for each quarter section.

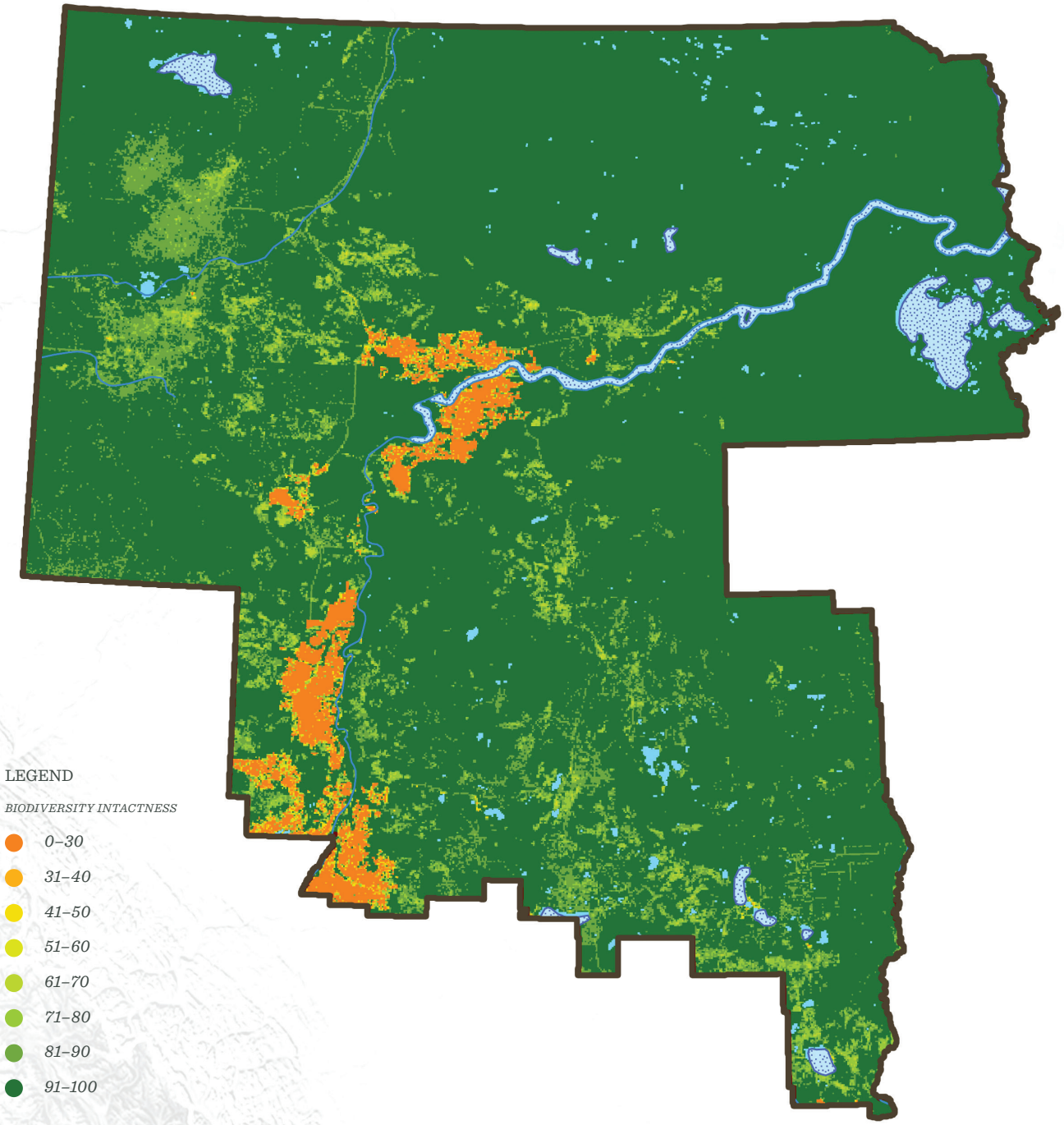


FIGURE 10

AVERAGE ESTIMATED INTACTNESS FOR OVER 400 SPECIES IN THE LOWER PEACE REGION. ORANGE IDENTIFIES THE QUARTER SECTIONS THAT ARE PREDICTED TO HAVE THE LOWEST AVERAGE BIODIVERSITY INTACTNESS WHILE DARK GREEN QUARTER SECTIONS ARE PREDICTED TO HAVE THE HIGHEST AVERAGE INTACTNESS.

OF THE FULL SUITE OF SPECIES ASSESSED BY THE ABMI IN THE LOWER PEACE REGION, WE PROFILE (BY TAXONOMIC GROUP) RESULTS FOR SPECIES THAT SHOWED THE BIGGEST DIFFERENCE FROM REFERENCE CONDITIONS, INCLUDING SPECIES THAT WERE MORE ABUNDANT AND THOSE THAT WERE LESS ABUNDANT THAN THEIR REFERENCE CONDITIONS. WE ALSO PROFILE NON-NATIVE PLANTS AND SPECIES AT RISK. TO SEE THE COMPLETE DATASET ON ALL THE SPECIES ASSESSED, PLEASE CONSULT THE SUPPLEMENTAL MATERIAL ASSOCIATED WITH THIS REPORT (AVAILABLE AT WWW.ABMI.CA).

Birds

The Lower Peace Region is located in the Boreal Forest Natural Region in Alberta, which is characterized by a mosaic of deciduous, mixedwood, and coniferous forests interspersed with extensive wetlands. This landscape provides a diversity of habitats that support over 200 bird species during the breeding season. In fact, Canada's boreal forest, of which the Lower Peace Region is a part, is considered the "bird nursery" of North America with millions of birds breeding here each year. From ducks and shorebirds to warblers and sparrows, the array of bird types that take advantage of the abundant food and the diverse habitat during the breeding season is impressive. What's more, many bird species, such as the Palm Warbler and Yellow-bellied Flycatcher, are almost entirely reliant on the boreal forest during the breeding season as this is where more than 80% of their populations breed.

THE ABMI ASSESSED THE STATUS OF 78 NATIVE BIRDS IN THE LOWER PEACE REGION AND FOUND THEM TO BE, ON AVERAGE, 90% INTACT.

Of the 10 bird species that showed the greatest negative difference compared to intact reference conditions, 8 of these species prefer old-forest habitat for nesting and feeding (Figure 11). Four of these species (Brown Creeper, Black-throated Green Warbler, Boreal Chickadee, and Golden-crowned Kinglet) prefer old conifer-dominated forests, while four species (Ovenbird, Least Flycatcher, Western Tanager, and Yellow-rumped Warbler) are often most abundant in older deciduous and mixedwood forests. The remaining two species, Palm Warbler and Yellow-bellied Flycatcher, are associated with bogs and young lowland spruce/larch forests. All 10 species decrease in abundance with increased energy, agriculture, and other alienating footprint; many also decrease with increased forestry footprint.

The 10 species that were most abundant compared to expected are human-associated, meaning that these species benefit from our land-use activities. The three species that differed the most from reference conditions were the Song Sparrow, Savannah Sparrow, and Vesper Sparrow; all three species increase with agriculture footprint. These three species can live in a variety of open habitats, such as grasslands, fields, roadsides, and recently-cut forests.

Overall, the strongest changes to birds in the Lower Peace Region seem to be associated with the higher than expected abundance of human-associated species.

IN SPITE OF ITS TROPICAL NAME, THE PALM WARBLER IS A TRUE BOREAL SPECIES; ALMOST THE ENTIRE WORLD'S POPULATION OF THIS NEOTROPICAL MIGRANT BREEDS IN CANADA'S NORTHERN FORESTS. AT 91% INTACT, THE PALM WARBLER WAS LESS ABUNDANT THAN EXPECTED IN THE LOWER PEACE REGION.

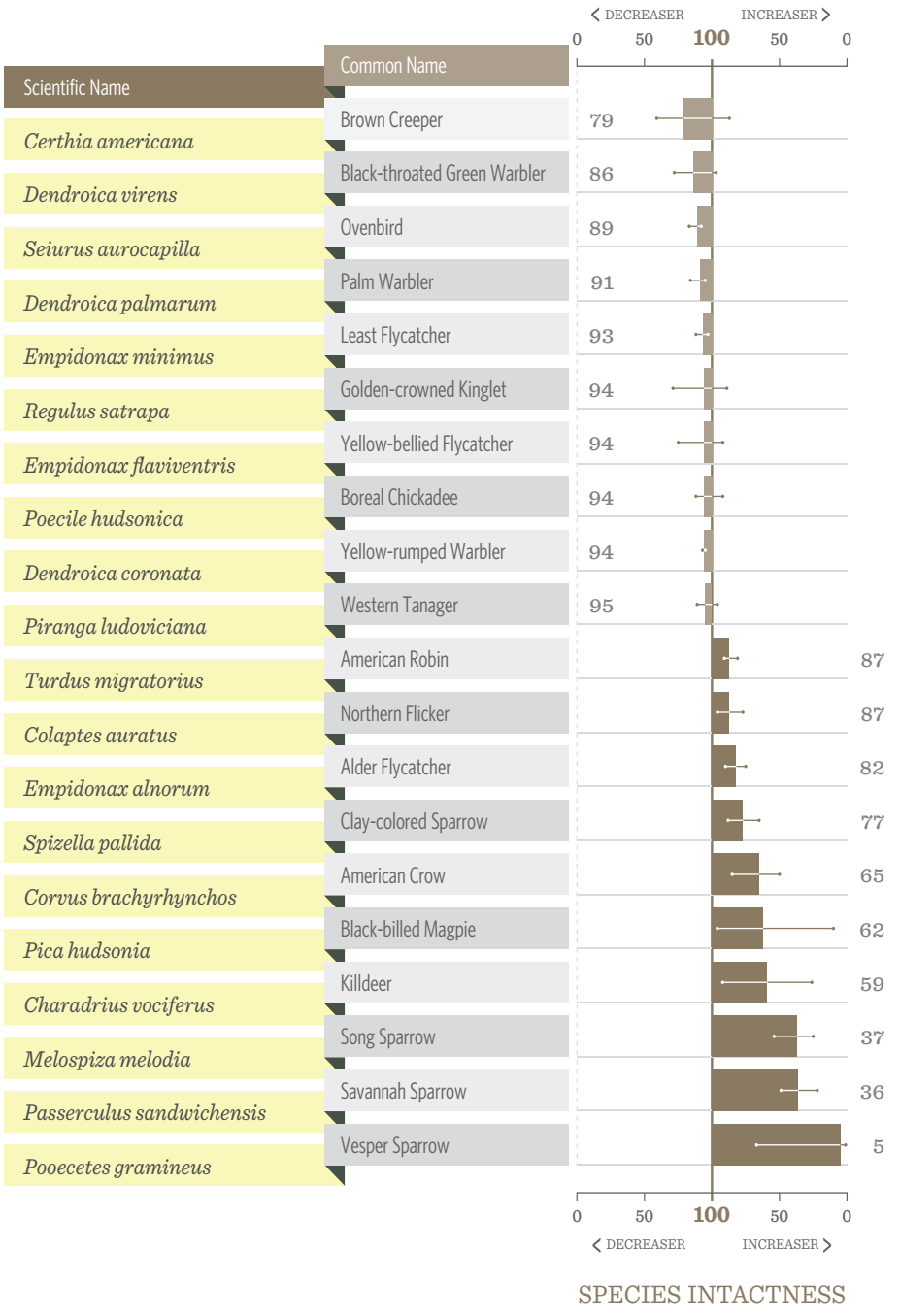


FIGURE 11

INTACTNESS (WITH 90% CONFIDENCE INTERVALS) OF 20 BIRD SPECIES IN THE LOWER PEACE REGION THAT SHOWED THE LARGEST DEPARTURE FROM INTACT REFERENCE CONDITIONS. WE SHOW THE 10 SPECIES THAT WERE THE LEAST ABUNDANT COMPARED TO EXPECTED AND THE 10 SPECIES THAT WERE THE MOST ABUNDANT COMPARED TO EXPECTED. NOTE: BARS FOR EACH SPECIES INDICATE DIFFERENCE FROM INTACT REFERENCE CONDITIONS; SPECIES INTACTNESS IS PRESENTED BY THE NUMERICAL VALUE ADJACENT TO THE BAR.

SPECIES

Winter-active Mammals

The Lower Peace Region is home to nearly 50 mammal species. Historically, fur-bearing mammals have played an important role in northwestern Alberta by providing subsistence for First Nations people for thousands of years. Some of these mammals were also central to the fur trade, which initially attracted European settlers to the region. Currently, all fur-bearing mammals with the exception of the Bobcat can be trapped in the Lower Peace Region.

While mammal populations in the Lower Peace Region have long been affected by hunting and trapping, more recent human activities, such as forestry and energy development, are also now having an impact on their populations. Some species, like the Coyote and White-tailed Deer, may benefit from changes to habitat that result from human activities. Other species are sensitive to these activities. Habitat fragmentation, the process of subdividing contiguous native habitat into smaller patches, impacts species like the Grizzly Bear, Wolverine, and Woodland Caribou, which benefit from large undisturbed areas. Other forest-dwelling mammals, like the Fisher and Marten, may also be negatively influenced by human development due to associated habitat loss or increased predation risk.

THE ABMI ASSESSED THE STATUS OF 10 WINTER-ACTIVE MAMMAL SPECIES OR GROUPS OF SPECIES IN THE LOWER PEACE REGION USING WINTER TRACKING DATA. WE FOUND THEM TO BE, ON AVERAGE, 95% INTACT (FIGURE 12).

The Coyote, at 82% intact, was more abundant than expected. Coyotes, considered habitat generalists, occurred at 60% of ABMI sites in the Lower Peace Region. Deer and Moose were also slightly more abundant than expected.

At 90% intact, Marten and Fisher were 10% less abundant than expected if there were no human footprint. These species are associated with mature coniferous forest.

The ABMI does not yet have enough data to determine intactness for uncommon species, such as the Wolverine.

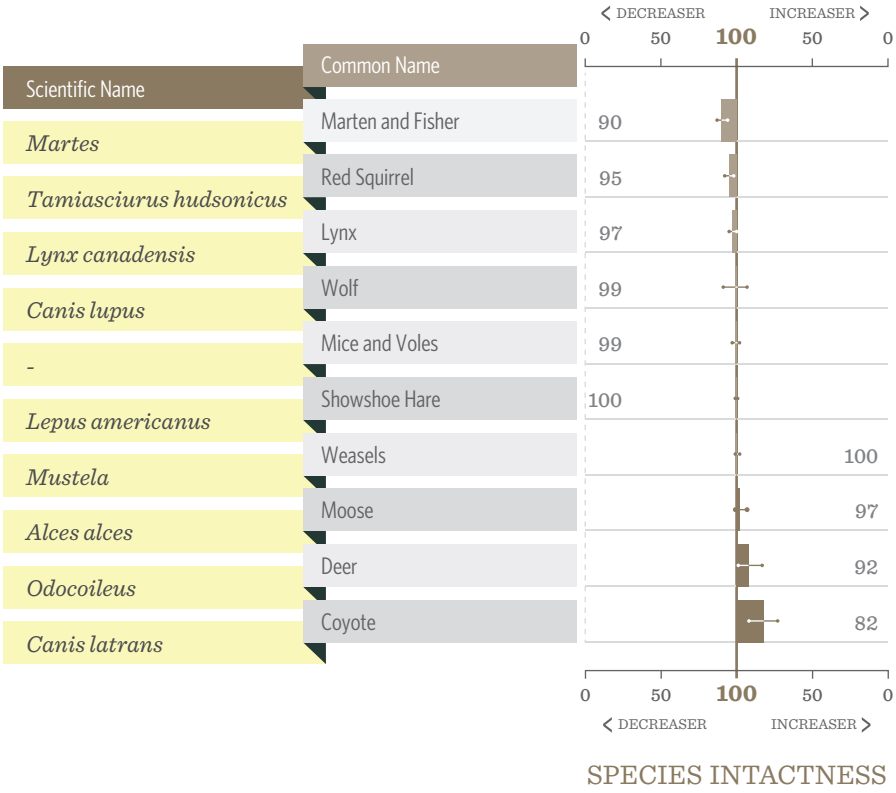


FIGURE 12

INTACTNESS (WITH 90% CONFIDENCE INTERVALS) OF 10 MAMMAL SPECIES OR GROUPS IN THE LOWER PEACE REGION. NOTE: BARS FOR EACH SPECIES INDICATE DIFFERENCE FROM INTACT REFERENCE CONDITIONS; SPECIES INTACTNESS IS PRESENTED BY THE NUMERICAL VALUE ADJACENT TO THE BAR.

THE WOLF IS A TOP PREDATOR IN THE BOREAL FOREST. IN THE ABSENCE OF HUMAN PERSECUTION, WOLVES WILL USE A VARIETY OF HABITATS PROVIDED THERE IS SUFFICIENT FOOD AVAILABLE. WOLVES ARE NOT THOUGHT TO BE DIRECTLY AFFECTED BY HUMAN FOOTPRINT, BUT INSTEAD RESPOND TO CHANGES IN PREY ABUNDANCE (E.G., DEER), AND TO HUNTING AND TRAPPING PRESSURE. AT 99% INTACT, THE WOLF WAS AT EXPECTED LEVELS IN THE LOWER PEACE REGION.

Armoured Mites

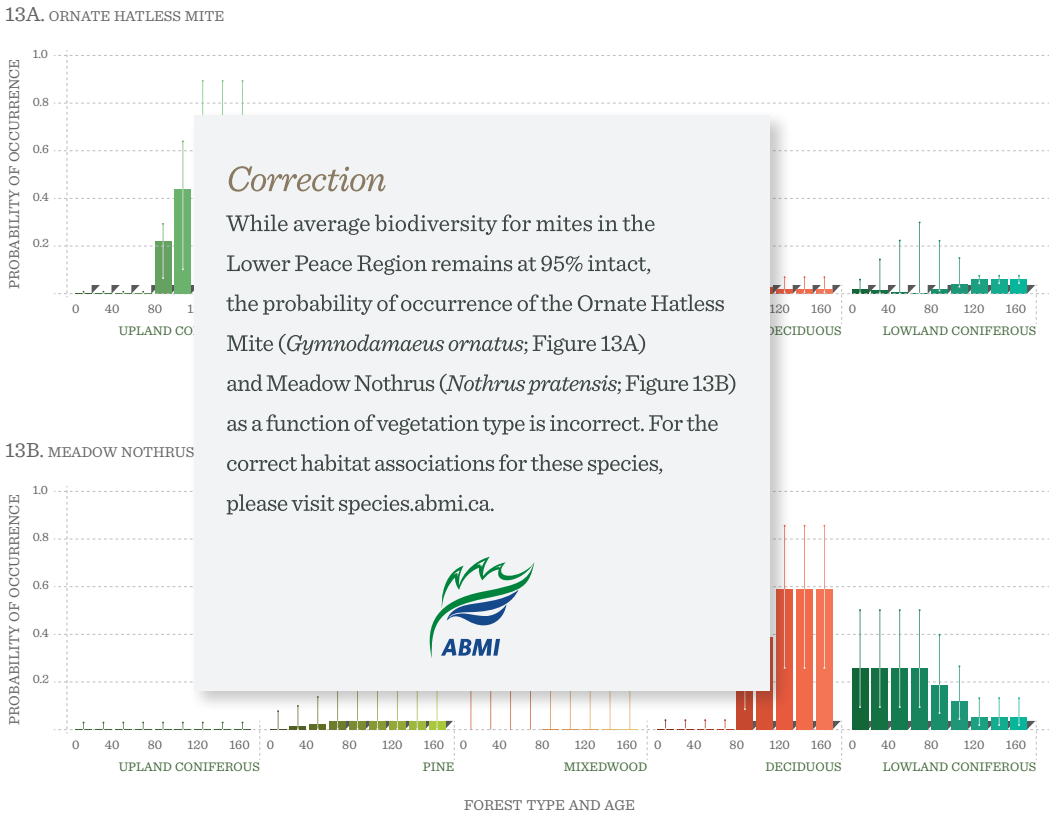
Armoured mites (also known as oribatid mites) are a critical component of Alberta's soil biodiversity. No larger than the tip of a ballpoint pen, several hundred thousand armoured mites can be found in a square metre of healthy topsoil. Of the 10,000 armoured mite species known to exist on the planet, at least 325 occur in our province.

Like mammals and birds, some species of armoured mites are carnivores and some are herbivores. However, most of these mites live off the remains of plants, animals, and fungi, playing a critical role in the formation and maintenance of soil structure. Armoured mites also serve as food for many small arthropods such as beetles, ants, and spiders, and for some small frogs and birds. As a result, these tiny, unseen species are vital to the maintenance of healthy soil in our province.

THE ABMI ASSESSED THE STATUS OF 62 SPECIES OF ARMOURED MITES IN THE LOWER PEACE REGION AND FOUND THEM TO BE, ON AVERAGE, 95% INTACT.

Not a lot is known about armoured mites in the Lower Peace Region. However, ABMI data is providing new information about these species, including what types of habitat different species live in and how human footprint might influence them.

For example, several species are most abundant in old spruce forests (e.g., Ornate Hatless Mite; Figure 13A), while others (e.g., Meadow Nothrus; Figure 13B) are more abundant in old deciduous forest.



Correction

While average biodiversity for mites in the Lower Peace Region remains at 95% intact, the probability of occurrence of the Ornate Hatless Mite (*Gymnodamaeus ornatus*; Figure 13A) and Meadow Nothrus (*Nothrus pratensis*; Figure 13B) as a function of vegetation type is incorrect. For the correct habitat associations for these species, please visit species.abmi.ca.

ABMI

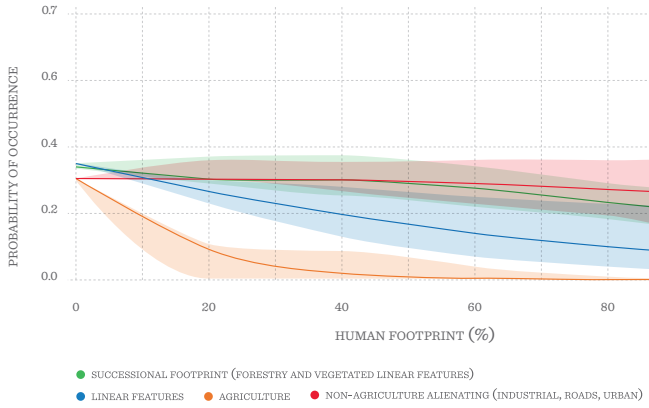
FIGURE 13

PROBABILITY OF OCCURRENCE (PER SOIL SAMPLE) OF THE ORNATE HATLESS MITE (13A) AND MEADOW NOTHRUS (13B) IN A 1 HA PLOT IN EACH VEGETATION TYPE. CONFIDENCE INTERVALS = 90%.

Some species of mites in the Lower Peace Region respond to human footprint on the landscape. For example, several species, such as the Alaskan Dark-eye, decline in abundance as agriculture footprint increases (Figure 14A) while a few species, such as the Six-dimpled Northern Mite, increase in abundance with agriculture footprint (Figure 14B).

Overall, ABMI monitoring data not only provides information on mite species richness and where these species can be found, but also baseline data to assess how their populations are changing in response to human footprint.

14A. ALASKAN DARK-EYE



14B. SIX-DIMPLED NORTHERN MITE

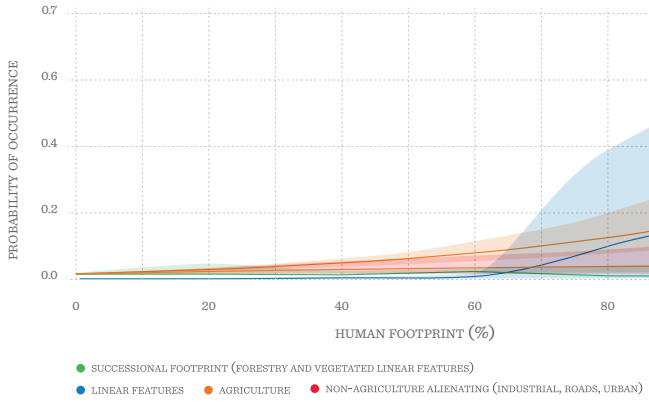


FIGURE 14

EXAMPLE OF THE RESPONSE OF A DECREASER SPECIES (ALASKAN DARK-EYE, 14A) AND AN INCREASER SPECIES (SIX-DIMPLED NORTHERN MITE, 14B) TO DIFFERENT TYPES OF HUMAN FOOTPRINT IN THE LOWER PEACE REGION. PROBABILITY OF OCCURRENCE (PER SOIL SAMPLE) IS A FUNCTION OF AMOUNT OF HUMAN FOOTPRINT ON A 1 HA PLOT. SHADED AREAS REPRESENT 90% CONFIDENCE INTERVALS.

Vascular Plants

Vascular plants represent one of the most diverse and important components of biodiversity in the Lower Peace Region. Over 500 species of vascular plants have adapted to the diverse environmental conditions found in the boreal forest and its major ecosystems, including deciduous forest, mixedwood forest, coniferous forest, and wetland ecosystems. Species like the Wild Red Currant or Prickly Rose thrive under the high light conditions, warmer temperatures, and nutrient-rich soils that characterize deciduous forests. Predictably, mixedwood forests contain a mixture of species that are common to both coniferous and deciduous forest. In coniferous forests, shade-tolerant evergreen species, like the Twinflower and Greenish-flowered Wintergreen, are common.

One common type of wetland in the boreal forest, known as peatlands, provides a unique set of ecological conditions (e.g., limited oxygen, low nutrient availability, acidic soil) that support a very distinct set of vascular plants. This includes many species of wild orchids, like the Northern Green Bog Orchid, and carnivorous plants, like the Round-leaved Sundew.

Overall, plant communities in the boreal forest are an important part of ecosystem biodiversity, providing vital food resources and habitat for wildlife in the region, and supporting the development of forests and healthy soil. Planning for a future rich in biodiversity requires management of these different ecosystem types and the plant communities found within them.

THE ABMI ASSESSED THE STATUS OF 182 VASCULAR PLANTS IN THE LOWER PEACE REGION AND FOUND THEM TO BE, ON AVERAGE, 94% INTACT (FIGURE 15).

The 10 vascular plant species that were least abundant compared to expected ranged from 84% to 91% intact (Figure 15). These species have a range of habitat requirements. For example, Beaked Hazelnut can be a dominant shrub in the understory of young deciduous forests, Tall Larkspur and Western Canada Violet are common in deciduous and mixedwood forests, and Spreading Woodfern is more frequent in older conifer forests. Many of these species, particularly Spreading Woodfern and Tall Larkspur, decrease with increased forestry footprint.

The 10 vascular plant species that were most abundant compared to expected levels ranged from 34% to 79% intact. Many of these species, such as Foxtail Barley (74% intact) and Red Fescue (34% intact), are considered “pioneer” species, as they are among the first species to colonize recently disturbed areas. And one species, Yellow Rattle, is a hemiparasitic grassland plant species that takes water and nutrients from other plants (often grass species) while also obtaining energy from the sun. This plant’s parasitic nature may give it a competitive advantage in some habitats. At 59% intact, the Yellow Rattle is more than two times more abundant than expected.

YELLOW RATTLE IS A HEMIPARASITIC GRASSLAND PLANT SPECIES THAT TAKES WATER AND NUTRIENTS FROM OTHER PLANTS THROUGH A CONNECTING STRUCTURE KNOWN AS A HAUSTORIUM. THE YELLOW RATTLE IS APPROXIMATELY TWO TIMES MORE ABUNDANT THAN EXPECTED IF THERE WERE NO HUMAN FOOTPRINT

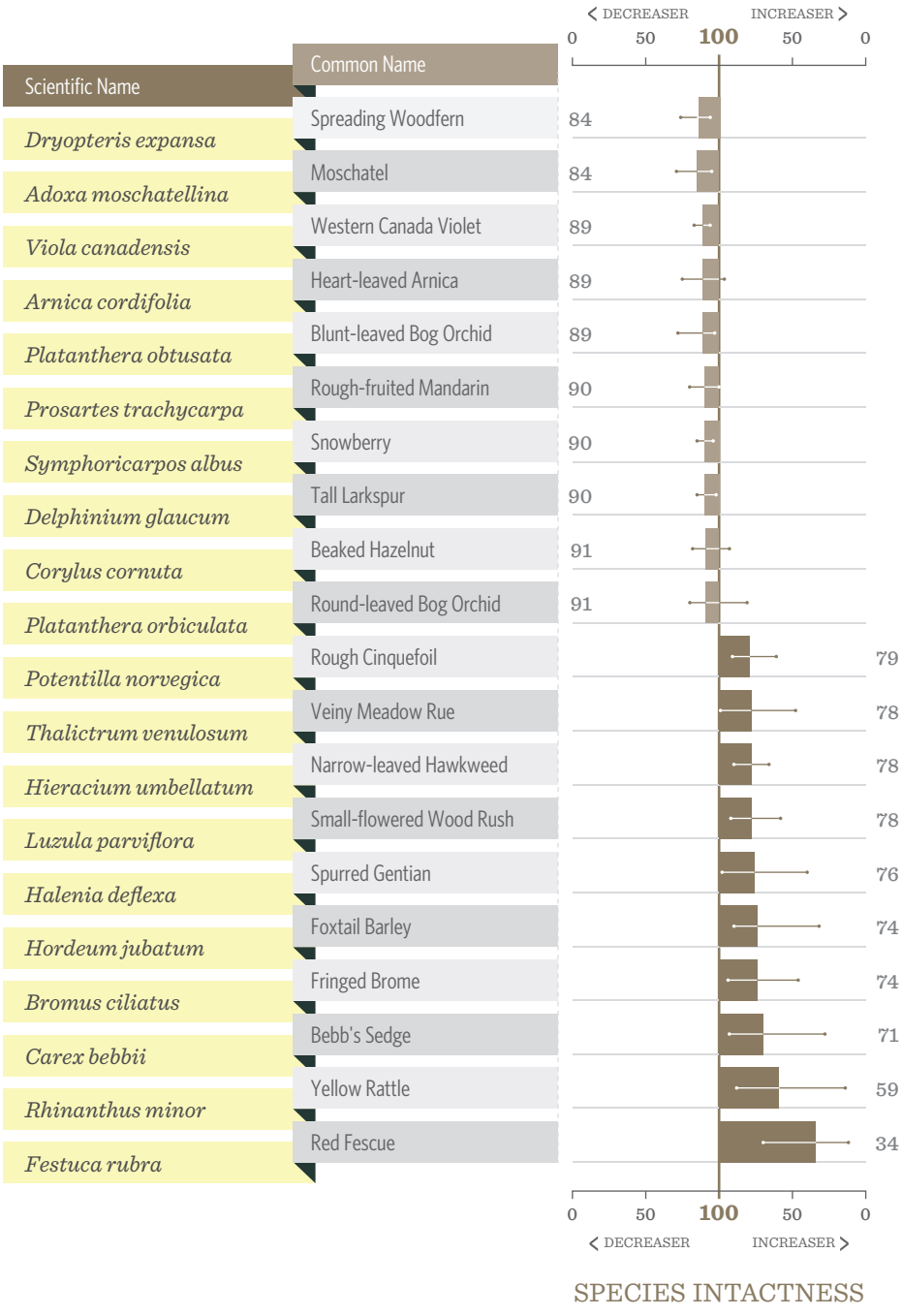


FIGURE 15

INTACTNESS (WITH 90% CONFIDENCE INTERVALS) OF 20 PLANT SPECIES IN THE LOWER PEACE REGION THAT SHOWED THE LARGEST DEPARTURE FROM INTACT REFERENCE CONDITIONS. WE SHOW THE 10 SPECIES THAT WERE THE LEAST ABUNDANT COMPARED TO EXPECTED AND THE 10 SPECIES THAT WERE THE MOST ABUNDANT COMPARED TO EXPECTED. NOTE: BARS FOR EACH SPECIES INDICATE DIFFERENCE FROM INTACT REFERENCE CONDITIONS; SPECIES INTACTNESS IS PRESENTED BY THE NUMERICAL VALUE ADJACENT TO THE BAR.

Non-native Plants

Non-native plants are those species that have been introduced, intentionally or otherwise, into new areas beyond their natural habitat. While not all non-native species represent a threat to biodiversity, given the right conditions, non-native species can become a major environmental management challenge . In the boreal forest, for example, some non-native plant species, like the Creeping Thistle and Narrow-leaved Hawksbeard, can interfere with tree regeneration after fire or forest harvesting.[7]

Early action is the most effective way of managing non-native species before serious impacts occur. Monitoring data are a means to assess the current level of establishment and detect trends in invasion level through time, serving as an early warning signal of potential risk to native biodiversity.

The ABMI found 37 non-native plants in the Lower Peace Region (Table 03 summarizes the most common non-native species; see supplementary material available at www.abmi.ca for a complete list). Combined, non-native plants were detected across 50% of sites in the Lower Peace Region. Most non-native species occurred very infrequently as 31 of the 37 species occurred at less than 5% of ABMI sites. At sites where they were found, an average of 2.8 non-native species were detected. For each quarter section in the Lower Peace Region, the predicted number of non-native species per 1 ha plot ranged from an average of 0 up to 18 species (Figure 16).

Common Dandelion was the most abundant non-native plant and was found at 36% of ABMI sites in the Lower Peace Region. Three of the species detected are listed under the Alberta Weed Control Act, including Creeping Thistle, Perennial Sow-thistle, and Tall Buttercup.

ABMI data can be used by managers to set regional targets for non-native species management, and to measure progress toward achieving those targets.

KENTUCKY BLUEGRASS WAS DETECTED AT 16% OF ABMI SITES IN THE LOWER PEACE REGION, SECOND ONLY TO THE COMMON DANDELION IN ABUNDANCE. KENTUCKY BLUEGRASS IS A COLD-HARDY GRASS THAT CAN BE PLANTED AS GREENFEED (FRESH FORAGE FOR LIVESTOCK), OR AS A CROP WITH THE SEEDS HARVESTED AND SOLD AS PART OF THE LAWN GRASS INDUSTRY.

TABLE 03

PERCENTAGE OCCURRENCE OF THE EIGHT MOST COMMONLY DETECTED NON-NATIVE VASCULAR PLANTS IN THE LOWER PEACE REGION.

Common Name	Scientific Name	Percentage of ABMI sites where detected
Common Dandelion	*Taraxacum officinale*	36
Kentucky Bluegrass	*Poa pratensis*	16
Alsike Clover	*Trifolium hybridum*	14
Creeping Thistle*	*Cirsium arvense*	7
Common Timothy	*Phleum pratense*	7
Common Plantain	*Plantago major*	6
Awnless Brome	*Bromus inermis*	5
Perennial Sow-thistle*	*Sonchus arvensis*	4

*The ABMI detected 37 non-native vascular plants in the Lower Peace Region. Three of these species are listed as noxious weeds under the Alberta Weed Control Act (2010), including Creeping Thistle, Perennial Sow-thistle, and one species not shown in Table 03, Tall Buttercup.

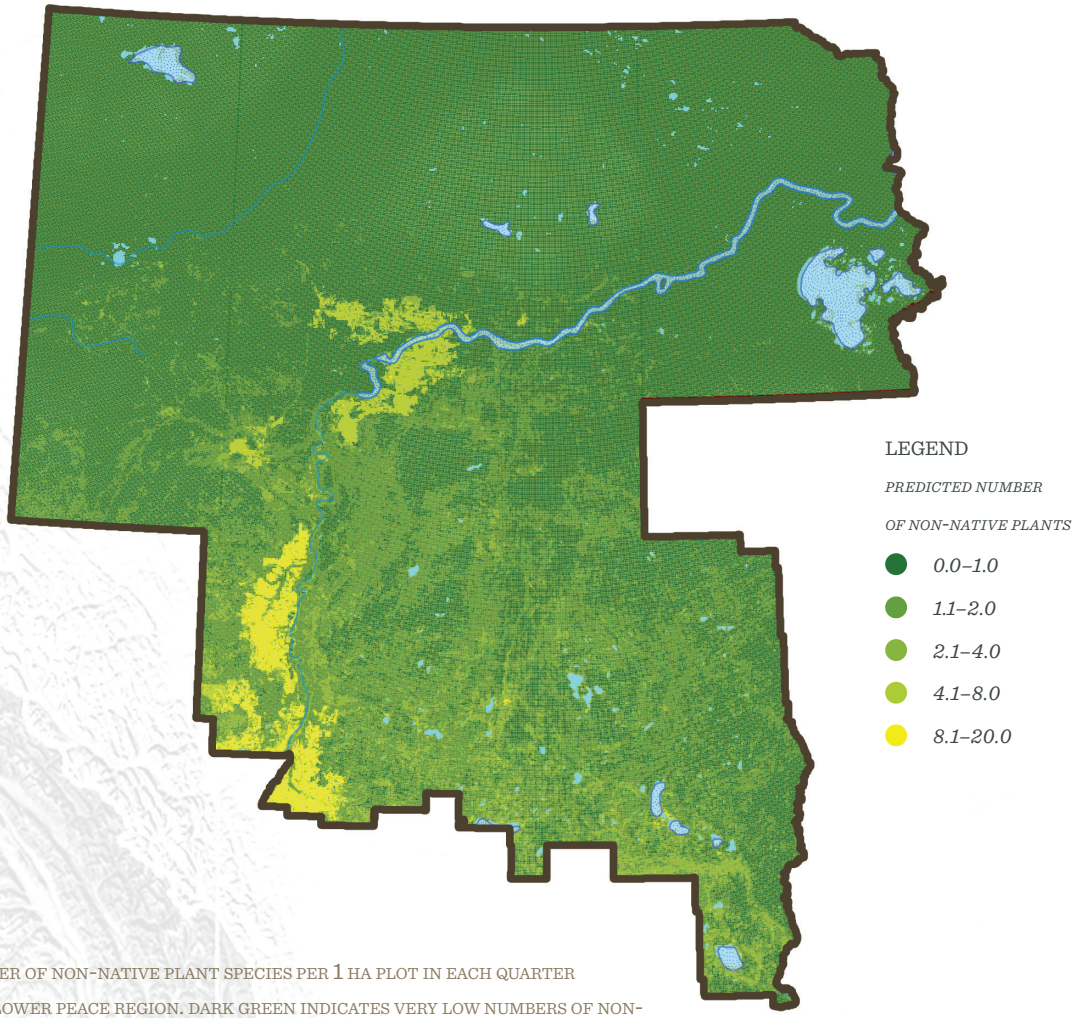


FIGURE 16

PREDICTED NUMBER OF NON-NATIVE PLANT SPECIES PER 1 HA PLOT IN EACH QUARTER SECTION OF THE LOWER PEACE REGION. DARK GREEN INDICATES VERY LOW NUMBERS OF NON-NATIVE PLANT SPECIES, WHILE YELLOW INDICATES HIGH NUMBERS OF NON-NATIVE SPECIES.

SPECIES

Mosses

Mosses often carpet the forest floor in boreal ecosystems. For example, the ground cover in Black Spruce forests is made up almost entirely of mosses and liverworts (along with lichens). Mosses provide a number of important functions in these northern ecosystems.[8] For example, a blanket of moss provides a layer of insulation, keeping the soil moist and cool during the summer, and "warm" during the winter, protecting overwintering micro-organisms. Mosses intercept the majority of incoming nutrients, such as nitrogen, and make these nutrients available to other plants. These moss beds can also limit the establishment of understory plants as well as tree seedlings, thereby directly affecting the boreal plant community. In the case of non-native plants, the moss layer may actually function as a buffer, limiting their establishment.[7] And mosses are home to diverse communities of micro-organisms, such as fungi, bacteria, and mites that play critical roles in decomposing plant material and maintaining healthy soil.

But mosses aren't restricted to forest ecosystems. Peaty wetlands are common across the boreal landscape, and the creation of these wetlands is strongly influenced by a particular group of mosses known as sphagnum mosses. In a process known as paludification, boreal forests growing on mineral soil are slowly converted to treed peatlands as dead vegetative material (peat) accumulates on the forest floor and the water table rises. Sphagnum mosses become established on this peat substrate, and these mosses slowly accumulate and expand in area over thousands of years. The unique ecological conditions of peatlands, such as limited oxygen, low nutrient availability, and acidic soil provide habitat for a distinctive set of flora that are rarely found elsewhere in the boreal forest.

Mosses are common throughout the boreal forest, influencing water, nutrient, and carbons cycles; providing microhabitat for microscopic organisms; and affecting the natural development of forests.

FIRE MOSS IS A PIONEER SPECIES THAT IS AMONG THE FIRST COLONIZERS OF NEWLY DISTURBED AREAS. IT IS OFTEN ABUNDANT IN RECENT BURNS WHICH IS WHERE THE FIRE MOSS GETS ITS NAME. AT 92% INTACT, THE FIRE MOSS WAS MORE ABUNDANT THAN EXPECTED IF THERE WAS NO HUMAN FOOTPRINT.

THE ABMI ASSESSED THE STATUS OF 88 MOSS SPECIES IN THE LOWER PEACE REGION AND FOUND THEM TO BE, ON AVERAGE, 96% INTACT (FIGURE 17).

The 10 mosses that were least abundant compared to expected ranged from 84% to 94% intact (Figure 17). Girgensohn's Moss, at 84% intact, was the most sensitive to human footprint. This species generally occurs in shaded coniferous forests.

The 10 mosses that were most abundant compared to expected ranged from 87% to 97% intact. Several of these species, such as the Bristly Haircap Moss (87% intact), Fire Moss (92% intact), and Golden Thread Moss (93% intact) do well in disturbed areas, such as recent burns, pastures, roadsides, and ditches.

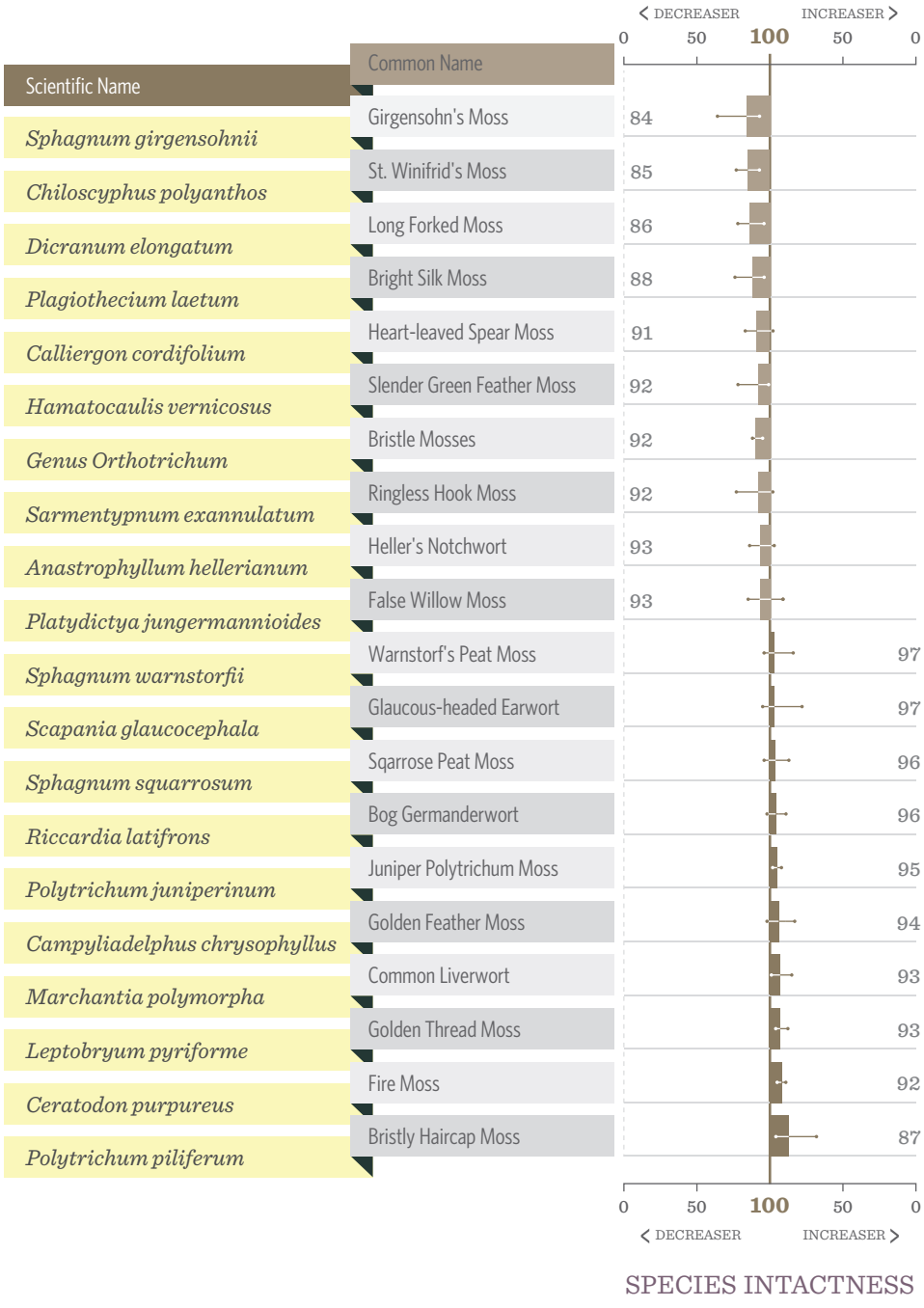


FIGURE 17

INTACTNESS (WITH 90% CONFIDENCE INTERVALS) FOR 20 MOSSES AND LIVERWORTS IN THE LOWER PEACE REGION THAT SHOWED THE LARGEST DEPARTURES FROM INTACT REFERENCE CONDITIONS. WE SHOW THE 10 SPECIES THAT WERE THE LEAST ABUNDANT COMPARED TO EXPECTED AND THE 10 SPECIES THAT WERE THE MOST ABUNDANT COMPARED TO EXPECTED. NOTE: BARS FOR EACH SPECIES INDICATE DIFFERENCE FROM INTACT REFERENCE CONDITIONS; SPECIES INTACTNESS IS PRESENTED BY THE NUMERICAL VALUE ADJACENT TO THE BAR.

Species at Risk

The health of biodiversity in a region includes an assessment of species that are naturally rare or that have demonstrated a significant decline in abundance. These rare species are generally referred to as "species at risk" because future declines in abundance may result in the loss of the species from an area.

There are at least 107 species at risk in the Lower Peace Region; the ABMI detected 95 of these species (see the Supplemental Report available at www.abmi.ca for a complete list). This also includes Wood Bison, which were reintroduced into the Hay-Zama Lakes Wildland Park; this population is listed as Endangered under Alberta's Wildlife Act.

Twenty-six of the detected species occurred with enough frequency to allow us to calculate species intactness, including four species that are listed as threatened or of special concern by the Government of Canada and/or by the Government of Alberta (Table 04).

Of the species at risk assessed by the ABMI, approximately half were more abundant than expected, while half were less abundant than expected. Included in this assessed list are several species of vascular plants and mosses with an "undetermined" status as identified by Alberta's Ministry of Environment and Sustainable Resource Development (ESRD). The ABMI can help identify species that are more common in Alberta's landscape than previously believed, such as Drummond's Plagiomnium Moss and the Silvery Sedge, which were detected at 36% and 15% of ABMI sites in the Lower Peace Region, respectively. This information can inform provincial status updates for these species.

The ABMI cannot assess the status of all species at risk in the Lower Peace Region for one of the two following reasons. First, by virtue of their rarity, some species at risk are not detected with enough frequency to adequately assess their status (e.g., Wolverine). Second, ABMI monitoring protocols are not designed to monitor some species groups, such as amphibians, owls, waterfowl, and bats, which include some species at risk.

EXTIRPATED FROM NORTHWESTERN ALBERTA IN THE LATE 1800S, WOOD BISON WERE REINTRODUCED TO THE HAY-ZAMA LAKES WILDLAND PARK IN 1984. SINCE THAT TIME, THE POPULATION HAS GROWN FROM THE ORIGINAL 24 MEMBERS TO MORE THAN 700 BISON. WOOD BISON WERE DETECTED AT 5% OF SITES IN THE LOWER PEACE REGION.

TABLE 04

SUMMARY OF INTACTNESS RESULTS FOR SPECIES AT RISK IN THE LOWER PEACE REGION.

	Common Name	Scientific Name	Occurence (%)	Intactness Index (0-100 scale)	Above or Below Reference Conditions	Threat
BIRDS	Bay-breasted Warbler	*Dendroica castanea*	14%	100%		ESRD – Sensitive | AB ESCC 2010 – In Process
BIRDS	Black-throated Green Warbler	*Dendroica virens*	12%	86%	BELOW	ESRD – Sensitive | AB ESRD – Sensitive | AB ESCC 2010 – Species of Special Concern2010 – In Process
BIRDS	Brown Creeper	*Certhia americana*	7%	79%	BELOW	ESRD – Sensitive
BIRDS	Canada Warbler	*Wilsonia canadensis*	17%	96%	BELOW	ESRD – Sensitive | COSEWIC – Threatened SARA – Threatened
BIRDS	Cape May Warbler	*Dendroica tigrina*	33%	96%	BELOW	ESRD – ESRD – Sensitive | AB ESCC 2010 – In Process
BIRDS	Common Yellowthroat	*Geothlypis trichas*	39%	97%	ABOVE	ESRD – Sensitive
BIRDS	Least Flycatcher	*Empidonax minimus*	60%	93%	BELOW	ESRD – Sensitive
BIRDS	Olive-sided Flycatcher	*Contopus cooperi*	13%	99%	BELOW	ESRD – May Be at Risk | COSEWIC – Threatened SARA – Threatened
BIRDS	Pileated Woodpecker	*Dryocopus pileatus*	18%	90%	ABOVE	ESRD – Sensitive
BIRDS	Rusty Blackbird	*Euphagus carolinus*	9%	94%	ABOVE	ESRD – Sensitive | COSEWIC – Special Concern SARA – Special Concern
BIRDS	Sora	*Porzana carolina*	18%	94%	ABOVE	ESRD – Sensitive
BIRDS	Western Tanager	*Piranga ludoviciana*	51%	95%	BELOW	ESRD – Sensitive
BIRDS	Western Wood Pewee	*Contopus sordidulus*	12%	89%	ABOVE	ESRD – Sensitive
BIRDS	Yellow-bellied Flycatcher	*Empidonax flaviventris*	15%	94%	BELOW	ESRD – Undetermined
MAMMALS	Canada Lynx	*Lynx canadensis*	75%	99%	BELOW	AB ESCC – Sensitive | COSEWIC – Not at Risk
MAMMALS	Marten & Fisher	*Martes*	85%	90%	BELOW	AB ESCC – Sensitive (Fisher only)
MOSSES & LIVERWORTS	Cushion Moss	*Dicranum acutifolium*	8%	98%	ABOVE	ESRD – Undetermined
MOSSES & LIVERWORTS	Drummond's Plagiomnium Moss	*Plagiomnium drummondii*	36%	99%	ABOVE	ESRD – Undetermined
MOSSES & LIVERWORTS	Flat Stump Moss	*Herzogiella turfaceavenosus*	11%	97%	BELOW	ESRD – Undetermined
MOSSES & LIVERWORTS	Flat-brocade Moss	*Platygyrium repens*	22%	98%	BELOW	ESRD – Sensitive
VASCULAR PLANTS	Canada Goldenrod	*Solidago canadensis*	4%	83%	ABOVE	ESRD – Undetermined
VASCULAR PLANTS	Dry Spike Sedge	*Carex siccata*	4%	88%	ABOVE	ESRD – Undetermined
VASCULAR PLANTS	Northern Wood Fern	*Dryopteris expansa*	7%	84%	BELOW	ESRD – Sensitive
VASCULAR PLANTS	Silvery Sedge	*Carex canescens*	15%	95%	ABOVE	ESRD – Undetermined
VASCULAR PLANTS	Tree Clubmoss	*Lycopodium dendroideum*	6%	96%	BELOW	ESRD – Undetermined
VASCULAR PLANTS	Veiny Vetchling	*Lathyrus venosus*	13%	98%	ABOVE	ESRD – Sensitive

*Threat categories for species at risk as identified by the Government of Canada and/or the Government of Alberta. This assessment includes species and sub-species identified by: Canada's Committee on the Status of Endangered Wildlife in Canada (COSEWIC), listed under Canada's Species at Risk Act (SARA), recognized by Alberta's Ministry of Environment and Sustainable Resource Development (ESRD), and/or identified by Alberta's Endangered Species Conservation Committee (AB ESCC). This list is meant to be as inclusive as possible as species that are listed as May Be at Risk, At Risk, Sensitive, or Undetermined by ESRD are included.

Species Spotlight: Woodland Caribou

The Woodland Caribou has the highest public profile of any species at risk that occurs in the Lower Peace Region. While the ABMI does not detect this species often enough to assess its status, comprehensive monitoring by the Alberta Caribou Committee, and now the Ministry of ESRD, has been in place for many populations since 1993. The Government of Alberta has published the results of this monitoring activity as recently as 2010.[9]

In Alberta, there are a total of 16 caribou populations that have recently been grouped into two recognized conservation units (termed "Designatable Units" by COSEWIC 2011):[10] Central Mountain and Boreal. Seven populations of Boreal Caribou occur in and around the Lower Peace Region (Figure 18):

- Bischto
- Caribou Mountains
- Chinchaga
- Nipisi
- Red Earth
- West-side Athabasca Range (WSAR)
- Yates

Although the exact number of caribou in some of these seven populations remains uncertain, the best available scientific evidence indicates that their populations have been declining over the past 20 years, with the exception of the Yates population, which has shown a slight increase. For declining populations, the estimated annual rates of decline range from -4.6 to -12.1% per year (Figure 18, Table 05).

Recent genetic science suggests that six of the seven populations on the east side of the Peace River are indistinguishable from one another.[11] However, these six populations are genetically distinct from other Boreal Caribou populations north and west of the Peace River, including the Chinchaga population, and from those located in west-central Alberta. It is therefore unlikely that populations on opposite sides of the Peace River in the Lower Peace Region will exchange new members.

The ABMI is supporting caribou management by working with the Provincial Government, the forest industry, and the energy industry to coordinate research and monitoring activities. Specifically, our Caribou Monitoring Unit is engaged in a collaborative process designed to update caribou population estimates and to produce a seamless, province-wide habitat quality map. The ABMI Caribou Monitoring Unit is also engaged in management trials aimed at reducing the use of linear features by wolves, a primary predator of Woodland Caribou. These trials will help inform managers about ways to accelerate habitat restoration for Woodland Caribou.

Human Footprint in Woodland Caribou Population Ranges

Tracking the amount of human footprint and habitat is important for the effective management of Woodland Caribou in the Lower Peace Region. Managing the rate of human land-use development and recovery is an important component of caribou recovery. The ABMI provides scientific information on status and trend of human footprint for the province of Alberta, including the seven population ranges that overlap with the Lower Peace Region.

In 2010, the total amount of human footprint in each of the seven Woodland Caribou population ranges varied from a low of 1.4% in the Yates range to a high of over 7% in the Nipisi range (Table 05). The greatest net change in human footprint from 2007 to 2010 occurred in the Nipisi range with an increase of 1.3% total footprint.

TABLE 05

CHANGES IN HUMAN FOOTPRINT CIRCA 2007 AND 2010, AND ANNUAL RATE OF POPULATION GROWTH FOR SEVEN CARIBOU RANGES AND POPULATIONS THAT OVERLAP WITH THE LOWER PEACE REGION.

Range/Population	Total Area of Range (km^2)	2007 Total Human Footprint	2010 Total Human Footprint	Net Change in Human Footprint (2007 to 2010)	Rate of Change in Human Footprint (2007 to 2010)	Annual Rate of Population Change
Bischto	14,358	3.4%	3.7%	0.4%	11.3%	-12.1%
Caribou Mountains	20,659	1.4%	1.5%	0.1%	4.3%	-9.8%
Chinchaga	17,644	5.3%	5.8%	0.5%	9.7%	-11.1%
Nipisi	2,104	6.0%	7.2%	1.3%	21.1%	N/A
Red Earth	24,702	2.8%	2.8%	0.06%	2.1%	-9.3%
WSAR	15,707	2.1%	2.4%	0.3%	15.8%	-4.6%
Yates	5,223	1.4%	1.4%	0.02%	< 1%	+2.0%

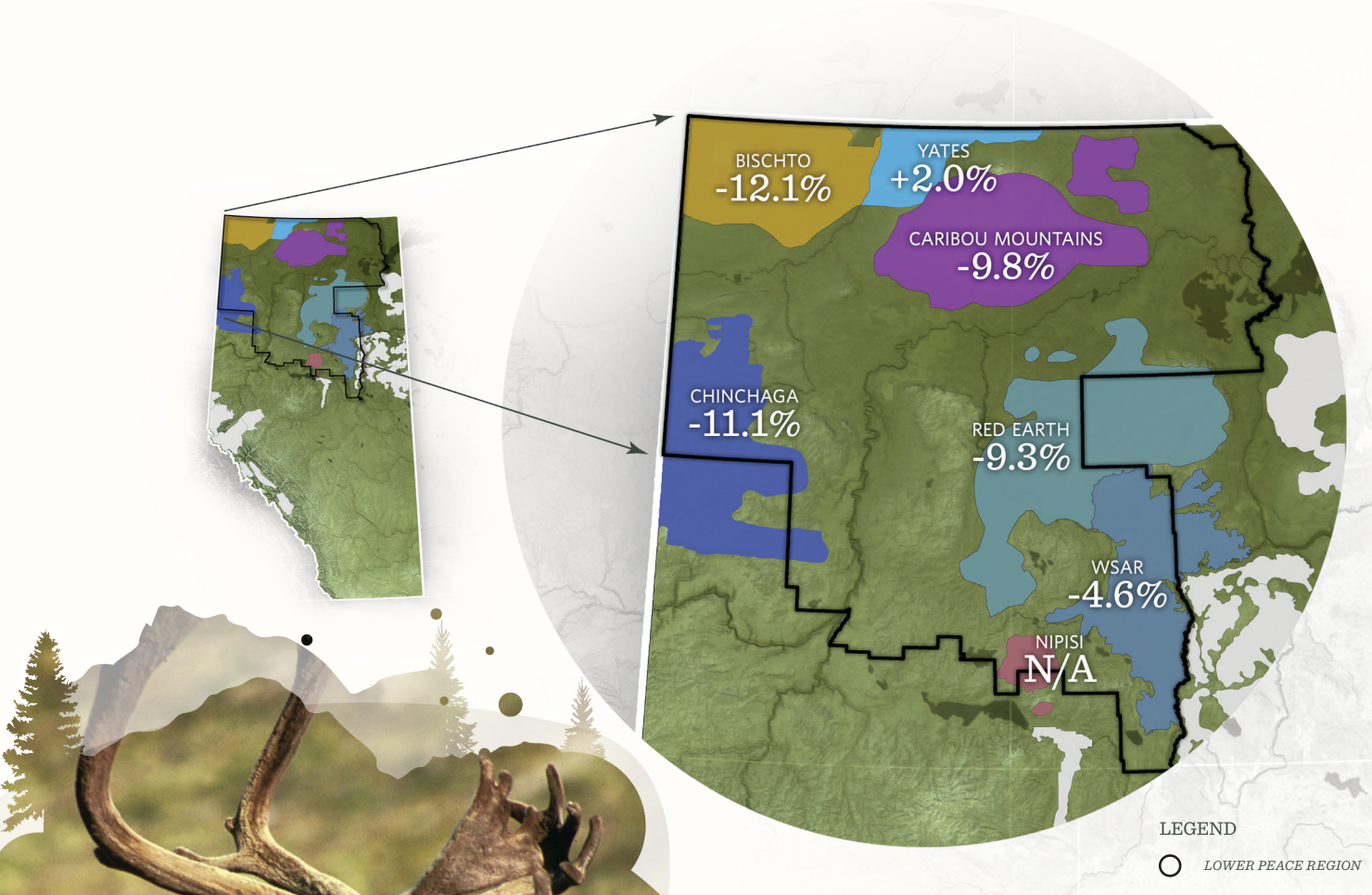


FIGURE 18

SEVEN BOREAL CARIBOU POPULATION RANGES OVERLAP WITH THE LOWER PEACE REGION. AVERAGE ESTIMATED ANNUAL RATE OF CHANGE IS REPRESENTED FOR EACH POPULATION.

Spotlight: Peace River Oil Sands Area

The Peace River Oil Sands Area (PROSA) is one of three oil sands administrative units designated by the Government of Alberta. Just over 83% of the PROSA region overlaps with the Lower Peace Region covering approximately 12.6% (or 24,247 km^2) of the region (Figure 19).

The PROSA deposit contains several billion barrels of bitumen. The bitumen is located too deep underground to extract using surface mining and therefore it can only be accessed using in situ technology. Production in the area is currently modest at approximately 20,000 barrels/day but could increase by as much as five times in the coming decades if approved projects are developed. Given the early stages of developments in the PROSA region, there is significant opportunity for land and resource managers to make informed and deliberate choices about sustainable development in the region.

> *In situ technology is used to extract bitumen deposits that are located more than 75 m underground. The term "in situ" literally means the bitumen is recovered "in place," with the method of recovery dependant on the mobility of the bitumen. Cold production is used in areas where the bitumen is mobile enough to be pumped to the surface without the aid of steam. Thermal recovery methods are required for areas where the bitumen is thicker and more viscous; the bitumen is first heated and separated from sand underground and then pumped to the surface.*

The ABMI monitors the status of human footprint, species, and habitat in the PROSA. This information is important to supporting the integrated management of this economically and socially important region.

Human Footprint

As of 2010, the total human footprint in the PROSA was 18.8% (Figure 19). At 12.1%, agriculture was the dominant human footprint, followed by forestry at 3.3%, and energy footprint at 2.3%.

Biodiversity Intactness

The ABMI assessed the status of 415 common native species in five taxonomic groups in the Peace River Oil Sands Area; these groups ranged from 76% to 88% intact (Table 06).

The Biodiversity Intactness Index for the Peace River Oil Sands Area is 85%, 9% lower than for the Lower Peace Region as a whole.

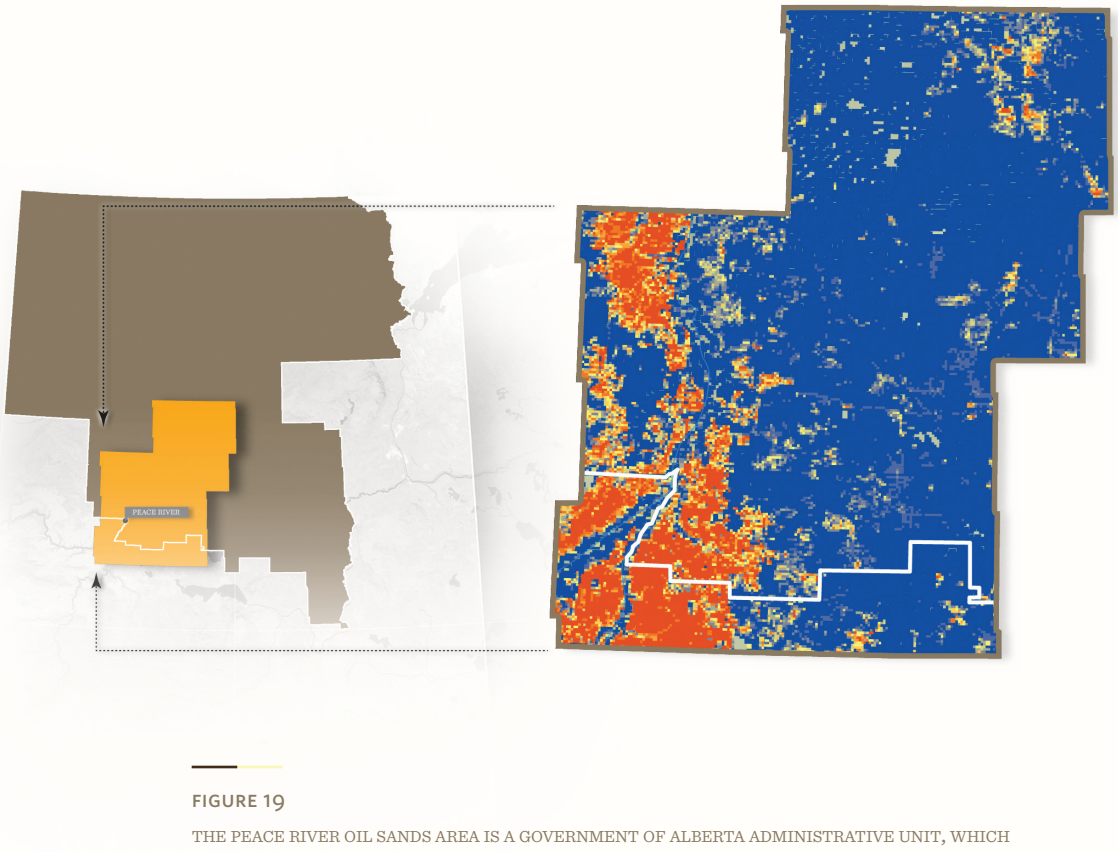


FIGURE 19

THE PEACE RIVER OIL SANDS AREA IS A GOVERNMENT OF ALBERTA ADMINISTRATIVE UNIT, WHICH LARGELY OVERLAPS WITH THE LOWER PEACE REGION. TOTAL HUMAN FOOTPRINT IN THE PEACE RIVER OIL SANDS AREA WAS 18.8%, AS OF 2010.

TABLE 06

INTACTNESS FOR DIFFERENT COMPONENTS OF BIODIVERSITY IN THE PROSA OF THE LOWER PEACE REGION.

	PROSA		Lower Peace Region (PROSA included in analysis)	
Biodiversity Component	No. of Species	Intactness	No. of Species	Intactness
Native birds	80	76%	78	90%
Winter-active mammals	10	88%	10	95%
Armoured mites	57	88%	62	95%
Native plants	183	85%	182	94%
Moss	90	87%	88	96%
Overall Intactness	415	85%	420	94%

Conclusion

Sustainable development of natural resources in the Lower Peace Region requires a clear understanding of the environmental costs linked to resource development, as well as the opportunities to preserve environmental values. As the Government of Alberta moves toward an integrated management system for developing resources, the data set out in this report can be used to support land-use planning decisions. Specific results of note include:

- As of 2012, the total human footprint across the Lower Peace Region was 7.3%. Forestry footprint was the largest human footprint category, covering 2.8% of the planning region, followed by agriculture footprint at 2.5% and energy footprint at 1.6%.
- Information on trends of human footprint indicates forestry footprint has increased the most since 1999, followed by energy footprint and agricultural footprint.
- Overall, 22% of the Lower Peace Region is managed as protected areas.
- Biodiversity intactness for the Lower Peace Region as of 2012 is 94%. The biggest ecological changes are associated with higher than expected abundance of species that thrive in open or disturbed habitat, such as the Coyote, Vesper Sparrow, and Red Fescue. Species that prefer old-forest habitat were found to be less abundant than expected.
- The total human footprint in the Peace River Oil Sands Area was 18.8%, which was dominated by agriculture footprint. The Biodiversity Intactness Index for the Peace River Oil Sands Area is 85%, approximately 10% lower than for the Lower Peace Region as a whole.

The biodiversity indicators set out in this report establish the current conditions that can be used to measure the sustainability of resource development in the Lower Peace Region, setting the stage for openly addressing management questions including:

1. What are the impacts of different types of resource development (e.g., forestry, energy) on biodiversity?
2. What components of biodiversity are the most sensitive to resource development, and what might be done to minimize impacts?
3. What are the cumulative effects of resource development on biodiversity?
4. How effective are efforts to manage regional cumulative effects?
5. How effective is the protected areas network at maintaining regional biodiversity?
6. What level of biodiversity change is desirable to residents of the Lower Peace Region?

With the Lower Peace Region 94% intact today, there are opportunities for land and resource managers to make informed and deliberate choices about its future. As development continues to unfold in the region, the ABMI will continue to measure and report on the changing state of biodiversity.

Next Steps

The ABMI will continue to work with federal and provincial agencies to implement scientifically credible monitoring systems for Alberta. Among the highest priorities for the ABMI will be to ensure integration between monitoring and land-use planning activities and to support the coordination of biodiversity monitoring with water and air monitoring initiatives.

The analyses in this report are preliminary as not all ABMI sites in the Lower Peace Region have been sampled. As monitoring information for the Lower Peace accumulates and our analysis methods continually improve, the ABMI will report on more species and habitats. Similar reports will be available for the six remaining planning regions. Future reports will also report on biodiversity trends—the primary purpose of the ABMI. We look forward to providing updates to this report on a regular schedule.

General Terms

Limitations

The ABMI is designed primarily as a proactive tool used to identify the status, trends, and correlative relationships among common species, habitats, and human footprint. The ABMI indices are based on the establishment of current, intact reference conditions that are statistical predictions designed to account for human footprint. These reference conditions and subsequent ABMI analyses and reporting do not account for historical changes in the overall abundance of a species (i.e., the ABMI cannot account for any change in a species that occurred before 2003). ABMI reference conditions have statistical uncertainty for individual species. This uncertainty will decrease as the ABMI surveys more sites in the Lower Peace Region.

Looking Forward

The ABMI has made considerable strides in supporting biodiversity management in Alberta; however, we are just beginning. The ABMI continues to build momentum and is committed to:

- Ensuring the effective delivery of relevant, timely, and scientific biodiversity information
- Improving biodiversity management by contributing knowledge to decision-making systems
- Supporting governments and industries in meeting their domestic and international reporting obligations
- Eliminating duplication and redundancy in provincial biodiversity monitoring
- Facilitating the transfer of information to government, industry, the research community, and the public

Scientific Integrity

The ABMI is committed to the responsible analysis and interpretation of data. The ABMI holds itself to the highest ethical standards, including operational transparency, honesty, conscientiousness, and integrity. The ABMI strongly encourages the responsible and ethical evaluation and interpretation of the knowledge contained in this report. For a complete discussion of the ethical behaviour endorsed by the ABMI, please see Honor in Science, published by Sigma Xi (1997), available at www.sigmaxi.org/programs/ethics/Honor-in-Science.pdf. A broader discussion about the use of ABMI data and information can be found in Scope and Application of the ABMI's Data and Information (00048), Version 2008–01–04, Alberta Biodiversity Monitoring Institute, Alberta, Canada. This report is also available at www.abmi.ca under "Reports/Core Reports."

Disclosure

Data used in the preparation of this report are available on the ABMI's website and includes species, habitat, and remotely sensed data collected between 2003 and 2012. The scientific methods used in analyses of data for this report are described in the following documents:

1. Alberta Biodiversity Monitoring Institute. 2011. Manual for Estimating Species and Habitat Structure Intactness (20029), Version 2011–07–07. Alberta Biodiversity Monitoring Institute, Alberta, Canada. Available at www.abmi.ca under "Reports/Intactness Analyses."

2. Alberta Biodiversity Monitoring Institute. 2012. Manual for Reporting Human Footprint (20030), Version 2013–03–26. Alberta Biodiversity Monitoring Institute, Alberta, Canada. Available at www.abmi.ca under "Reports/Standards and Protocols/Landscape Mapping Protocols."

Principal authors of this report are Katherine Maxcy, Dave Huggard, Tara Narwani, Jim Herbers, and Rob Serrouya. Joan Fang and Daiyuan Pan analyzed and helped interpret the data. Jim Schieck provided technical and editorial insight on various aspects of the report.

Terms and Conditions of Report

Preparation

The ABMI is responsible for initiating and resourcing the creation of this report. The following terms were applied in the preparation of this report:

1. The ABMI reports on a standardized list of biodiversity indicators that are relevant to regional planning, policy, and management. Developed by the ABMI, these indicators will be consistently applied.

2. The ABMI maintains full control over all language and messaging in this report.

3. This biodiversity status report encompasses Lower Peace Region and cannot be localized to smaller landscapes within the Lower Peace Region unless already specified in this report.

4. This biodiversity status report uses data collected between 2003 and 2012.

5. The report was released publicly in a timely manner.

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Preferred Citation

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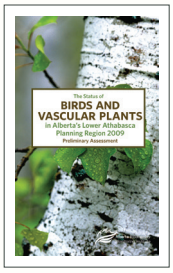
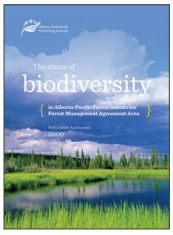
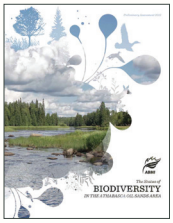
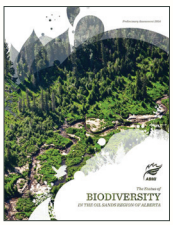
Summary of ABMI reports

Report	Summary
 *The Status of Birds and Vascular Plants in Alberta's Lower Athabasca Planning Region: Preliminary Assessment (2009)*	ABMI data are important tools for evaluating the sustainability of resource development in Alberta. In the ABMI'S inaugural report, we report on the status of birds and vascular plants in the Lower Athabasca Region—one of seven land-use planning regions in the province. Now five years richer in data, we will be updating the status of biodiversity in the Lower Athabasca Region—expected release March 2015.
 *The Status of Biodiversity in Alberta-Pacific Forest Industries' Forest Management Agreement Area: Preliminary Assessment (2009)*	Forests cover almost 60% of Alberta making stewardship of forest biodiversity a big job! This report demonstrates how biodiversity data collected by the ABMI can support sustainable forest management in Alberta. We report on the status of biodiversity in Alberta-Pacific Forest Industries' (Al-Pac) Forest Management Agreement (FMA) area. Look for the five year update on the status of biodiversity in the Al-Pac FMA—coming soon!
 *Status Report for the South Saskatchewan Planning Region: Preliminary Assessment (2011)*	After a century of farming, ever wonder how much native habitat remains in the South Saskatchewan Region? This report describes the status of biodiversity and amount of human footprint for this region with a spotlight on native prairie habitat.
 *The Status of Landbirds in Alberta's Boreal Plains Ecozone: Preliminary Assessment (2012)*	The boreal forest is considered the "bird nursery" of North America, serving as the breeding ground for millions of birds each year. Find out how different landbird guilds are doing in the boreal forest of Alberta, including: neotropical migrants, old-forest specialists, forest-interior specialists, winter residents, species at risk, and human-associated birds.

Report	Summary
 *That Status of Biodiversity in the Athabasca Oil Sands Area (2013)*	To evaluate the cumulative effects of development in the Athabasca Oil Sands Area, a landscape under intense public scrutiny, reliable, scientific biodiversity data is critical. This report provides the first-ever comprehensive analysis of biodiversity health in the Athabasca Oil Sands, and two subregions—the Mineable and In-situ regions.
 *Status of Biodiversity in the Oil Sands Region of Alberta: Preliminary Assessment (2014)*	Hot of the press! The Oil Sands Region (OSR) of Alberta consists of three provincially recognized oil sands administrative units called oil sands areas—the Athabasca, Peace River, and Cold Lake Oil Sands Areas. In this busy landscape where agriculture, forestry, along with energy extraction, are important land-use activities, managing the cumulative effects of these activities is challenge. In this report we describe the status of species, habitat, and human footprint in the OSR.

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