ALBERTA BIODIVERSITY MONITORING INSTITUTE

Alberta Biodiversity Monitoring Institute

ANNUAL REPORT | 23–24

Contents

SUGGESTED CITATION

LAND ACKNOWLEDGEMENT

The ABMI respectfully acknowledges that our work takes place on
the territories of Treaties 6, 7, and 8, traditional and ancestral lands
of First Nations and Métis peoples, whose histories, languages,
and cultures are directly connected to the biodiversity that we
monitor. We acknowledge the traditional teachings of the lands
that we work on, and that reciprocal, meaningful, and respectful
relationships with Indigenous peoples make our work possible. We
are committed to supporting Indigenous-led monitoring programs,
and learning Indigenous ways of knowing, being, and doing.

Introduction and Acknowledgements

The ABMI takes pride in collaborating in biodiversity monitoring

The Alberta Biodiversity Monitoring Institute (ABMI) is an independent, not-for-profit, non-regulatory institute housed at the University of Alberta, InnoTech Alberta, and the University of Calgary. Since 2007, we have monitored and reported on Alberta's biodiversity and land cover. This report highlights our activities and achievements for the 2023-24 fiscal year, illustrating the value of our collaborations. Through these partnerships, we strive to deliver results that meet diverse and evolving needs.

OUR VISION

The ABMI advances biodiversity monitoring to inform responsible resource management and land stewardship, now and for future generations.

OUR MISSION

We track changes in wildlife and their habitats across Alberta, working collaboratively to provide ongoing, relevant, and scientifically credible information about our living resources.

OUR VALUES

We pride ourselves on being independent, scientifically credible, transparent, collaborative, relevant and accessible..

Thanks to our…
Funders and Collaborators

Alberta Grazing Leaseholders Association*

Alberta Innovates

Alberta-Pacific Forest Industries Inc.*

Alberta Wilderness Association*

Athabasca Oil Corporation

Canadian Parks and Wilderness Association*

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University of British Columbia

University of Calgary**

University of Waterloo

West Fraser Timber Ltd.*

Western Stock Growers' Association*

* Members
** Delivery Partners
*** Both (Members & Delivery Partners)

* *We extend our gratitude to our Members for their ongoing support.*

These organizations are integral to our success and the realization of our work.

** *The ABMI values the strong support provided from our Delivery Partners…*

at the University of Alberta, InnoTech Alberta, and the University of Calgary. Without their invaluable contributions, many of the achievements we showcase in this report would not have been possible.

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Message from the Executive Director

As we present our 2023-24 annual report, I am deeply grateful for the collective efforts of our collaborators, partners, and the entire ABMI team. Their unwavering commitment and dedication have resulted in the accomplishments showcased in this report.

First, I would like to extend a special thanks to our field crews and the organizations that supported us during the challenging 2023 wildfire season. With over 1,000 wildfires burning nearly 3.3 million hectares of forest across Alberta, our teams displayed exceptional resilience and adaptability in navigating rapidly changing logistics. Their dedication was pivotal in allowing us to continue our vital monitoring work, despite the adverse conditions. Further details on our field season and wildfire reporting can be found in the pages that follow.

This report highlights numerous successful initiatives born from collaboration. Notably, our partnership with the Government of Alberta and industry leaders to collect airborne lidar data has been instrumental in developing vegetation inventories, aiding in restoration efforts within caribou ranges. Additionally, our collaboration with Ducks Unlimited Canada and InnoTech Alberta has led to innovative advancements in genomics techniques to assess wetland health. At a national level, our affiliation with Biodiversity Pathways has strengthened our capacity to share knowledge and methodologies, fostering a more unified approach to biodiversity and land cover monitoring across Canada. These initiatives, among others, demonstrate our collective efforts in deepening the understanding of Alberta's ecosystems.

This year also marked the approval of our updated strategic plan for 2023-26. The new plan builds on our previous successes while addressing emerging needs through enhanced collaboration and innovation.

On behalf of the ABMI Management Team, I extend my heartfelt gratitude to our Members, Board of Directors, delivery partners, funders, and collaborators. Your steadfast support remains the cornerstone of our success. Together, we are building a solid foundation of knowledge, making a lasting impact for current and future generations.

Thank you for being an integral part of this journey.

Jim Herbers
Executive Director,
Alberta Biodiversity
Monitoring Institute

Open Lidar Data for Alberta

"Lidar" stands for light detection and ranging. A laser is sent towards the ground from a scanner mounted in a plane and is reflected back as it strikes features on the earth's surface. The distance the laser beam travels is measured based on the time it takes to get back to the scanner. When that information is combined with positional information from navigational systems in the plane, we can create a three-dimensional map of the surface.

Lidar is a rapidly expanding area of environmental data that we are only beginning to explore. We are building several applied programs that leverage these cutting-edge datasets, such as tracking vegetation regeneration on human footprint in Alberta's caribou ranges and wetland mapping.

In 2022, we acquired a lidar sensor and began collecting airborne data across Alberta. We collected nearly 70,000 km^2 of lidar data in the first two seasons of operation. We are excited to begin making these datasets freely available on our website later in 2024.

Looking forward, we'll be releasing over 40,000 km^2 of lidar data throughout 2024 and 2025 while continuing to fly and collect even more each summer. Thanks to many partners and funders similarly committed to open data, we are able to make high-resolution, standardized lidar data and derivatives freely available for download and use by anyone.

Monitoring Alberta's Landscapes and Biodiversity

From satellite-based remote sensing to species identification through a microscope, we use a diverse range of methods to monitor Alberta's biodiversity and land cover. Our field crews are the backbone of our program, gathering specimens for the lab or validating what we see from the air. The unprecedented wildfire season in the summer of 2023 made for a dynamic field season with rapidly changing logistics. We successfully and safely collected data, including flying over 40,000 km² for our expanding lidar data collection program and identifying over 62,000 specimens for the Ecosystem Health Program.

As part of our Ecosystem Health Program, we conduct biodiversity surveys throughout Alberta, collecting data on Alberta's species and their habitats in both upland and wetland locations. Leveraging advanced remote sensing technologies and collaborations with the Government of Alberta, our geospatial work includes the Human Footprint Inventory as well as habitat mapping and monitoring efforts. Through these initiatives, we have generated map products, datasets, and

protocols that contribute to our understanding of Alberta's landscapes. Our involvement in the Oil Sands Monitoring (OSM) Program enhances our monitoring activities in Alberta's Oil Sands Region, and encompasses a range of terrestrial, geospatial, and wetland monitoring programs. Through targeted monitoring efforts and various collaborations, we are accumulating datasets that aid in understanding biological changes associated with oil sands activities. We are grateful for the support and partnership of numerous organizations, as well as the invaluable contributions of our collaborators. Moreover, we extend our gratitude to the landholders across the province who generously grant us access to their land, enabling us to carry out our monitoring activities.

ECOSYSTEM HEALTH MONITORING

Ecosystem Health 1.0 (Long-term Trend Monitoring)

Right from our organization's start, we have prioritized field data collection through the Ecosystem Health Program. This long-term trend monitoring effort comprises a systematic grid of sites spaced every 20km across the province. At each site, we record species across eight taxonomic groups and measure a wide range of habitat characteristics. In 2023-24, the first iteration of the terrestrial component of this monitoring program was

completed, providing a foundational baseline assessment on the status of Alberta's biodiversity.

We continue to investigate new applications of these valuable monitoring datasets. For example, we have begun to reprocess historical camera data to track the phenological timing of when plants green up in the spring and when their leaves change colour in the fall to support understanding of climate change impacts over time.

Ecosystem Health 2.0 (Short-term Trend Monitoring)

With the first round of long-term trend data collected, we are shifting to a more focused and responsive short-term change monitoring program, Ecosystem Health 2.0. This program includes locations specifically chosen to monitor biodiversity responses in regions expected to experience short-term changes in both terrestrial and wetland environments. The objectives of this short-term change program are to build off of our foundational datasets collected during Ecosystem Health 1.0, and provide complementary biodiversity data and analytics to understand where and how species and habitats are changing over time.

As part of this program, we are actively developing new monitoring protocols to detect short-term changes in environments and taxa potentially impacted by human footprint. Protocol refinements include testing the relationship between camera height deployment and the mammal species captured in images, and between habitat and the sensitivity of autonomous recording units (ARUs) in detecting vocalizing species. We also implemented a new vascular plant protocol, called "the small plot protocol", to detect short-term changes in a set list of species. Field staff were trained on the new protocols, and the new methods were implemented during the spring and summer of 2023.

For wetland habitats, we have established an engagement plan to help shape the program's goals and outcomes. We also completed literature reviews to inform wetland protocol development, data analysis, and indicator selection. We are looking forward to ongoing refinement of the wetlands study design in the coming year.

SUPPORTING THE OIL SANDS MONITORING PROGRAM

The ABMI supports the delivery of the OSM Program—a regional monitoring effort designed to detect environmental

SPOTLIGHT

Engaging on Wetlands 2.0

Since 2007, the ABMI has been monitoring permanent shallow open water wetlands in Alberta through the wetland component of the Ecosystem Health 1.0 Program. This program has collected baseline information on macroinvertebrates, vascular plants, and environmental covariates such as water depth and basic water quality from nearly 1,400 sites across the province.

We are refining our wetland monitoring approach and in early 2024 we initiated an engagement plan to understand wetland information needs across the province. Planned engagement activities include the establishment of a wetland advisory group, an external survey, and a workshop to inform the program's redesign.

change as a result of oil sands stressors. We supported several program areas for OSM in 2023–24.

We continued to work with an integrated team of collaborators to monitor how the terrestrial environment is changing, as part of the Terrestrial Biological Monitoring program. This included surveillance monitoring of birds and mammals under a "before-after dose-response" design—a

large-scale, stratified monitoring program designed to improve understanding of how biodiversity is responding to oil sands activities. The terrestrial program also includes partnerships with multiple Indigenous communities to develop and implement community-based wildlife monitoring programs using remote cameras.

We also supported the delivery of the wetlands surveillance program, working closely with Alberta Environment and Protected Areas (EPA) science leads. Our role in this program was focused heavily on data collection through field and lab work to support vegetation monitoring in wetlands. In addition, we delivered multiple geospatial initiatives within the region, including an enhanced human footprint inventory, monitoring of habitat regeneration on oil sands disturbances using lidar, and groundwater-dependent ecosystem (GDE) mapping.

HUMAN FOOTPRINT MAPPING

We updated the Human Footprint Inventory (HFI) to capture human disturbances visible in SPOT6 satellite imagery circa 2021. This dataset extends back to 2000 and is now updated annually to reflect changing human footprint conditions across Alberta. The current HFI contains 113 feature types and 20 individual sublayers including seismic lines, harvest areas, roads, and cultivation. Human footprint

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

covered 31% of Alberta's land base as of 2021. In addition to the **online report**, the inventory is available to view on our **Mapping Portal** and to download on our **website**.

Another human footprint product we updated to include 2021 is the sample-based Temporal Human Footprint. This dataset covers approximately 5% of the province and provides information from the years 1950, 1985, 2000, 2001, and annually from 2004 through 2021. It is spatially consistent with the larger HFI dataset and is designed to be consistent over time, meaning that features from earlier years are also included in later years. This makes it useful for accurate trend analysis.

INVENTORYING VEGETATION ON HUMAN FOOTPRINT USING AIRBORNE DATA

The ABMI is working to develop ground-breaking methods to map vegetation on human disturbance by leveraging high-resolution lidar data and aerial imagery collected throughout the province. In 2023-24, we partnered with the Government of Alberta, FRIAA, and Alberta-Pacific Forest Industries to deliver several projects, collectively named the Vegetation Regeneration Mapping (VRM) Program, involving mapping vegetation conditions on human disturbance. The VRM Program focused heavily on characterizing vegetation on human disturbance within the Oil Sands Region and within Alberta's Boreal Woodland Caribou range.

Woodland Caribou are listed as Threatened under both the federal *Species at Risk* Act and Alberta's *Wildlife Act*. Habitat restoration, particularly of human footprint such as seismic lines, has been identified as an essential step for caribou recovery. To facilitate operational planning for habitat restoration, there is an imminent need to develop vegetation inventories within caribou ranges. To meet this need, the ABMI combined lidar and imagery data with semi-automated, machine-learning workflows to create vegetation inventories in three woodland caribou ranges: West Side Athabasca River, East Side Athabasca, and Richardson. Vegetation inventories were also completed for several human footprint types in northeastern Alberta as part of the OSM Program. These vegetation inventories will be an important tool for land use planners and restoration practitioners leading caribou habitat restoration initiatives in Alberta.

SPOTLIGHT

Mapping Groundwater Dependent Ecosystems in the Oil Sands Region

Ground Water Ecosystems (GDEs) rely on the flow or chemical characteristics of groundwater for some or all of their water requirements. In the Oil Sands Region, aquatic GDEs support wildlife, acting as ungulate watering holes and waterbird stopover habitats, and sustain unique vegetation communities important for biodiversity. GDEs are also important for Indigenous harvesting. Working closely with InnoTech Alberta, we used a machine-learning approach to map aquatic GDEs in the McKay and Steepbank River watersheds, which was trained and tested with data from wetlands, springs, and rivers. This work directly supports a key knowledge gap in the OSM Program by identifying GDEs on the landscape. The findings from this mapping effort may help plan where effects-based monitoring could be considered for areas in the Oil Sands Region that rely on groundwater.

BIODIVERSITY TRAJECTORIES: COMPARING FOREST RECOVERY AFTER FIRES AND HARVEST

Biodiversity Trajectories is a multi-year, collaborative project between the ABMI and seven forestry companies in Alberta. A key assumption of ecosystem-based forest management (EBM) practiced by the forest industry is that the biological communities in burned (i.e., naturally disturbed) and harvested areas will eventually converge over time. The Biodiversity Trajectories project will help understand how EBM techniques affect biodiversity in Alberta's regenerating boreal forest, and whether this convergence is occurring.

This project has been under development for several years, and a pilot study in the Alberta-Pacific Forest Management Agreement area was completed in January 2024. The ABMI team successfully tested the project's methods and developed recommendations for adjusting the study design as the project progresses, including site-selection for this multi-year study. The Biodiversity Trajectories project is funded through FRIAA's Forest Resource Improvement Program and will be implemented from 2024 through 2028.

The Biodiversity Trajectories project will help land managers understand how EBM techniques affect biodiversity in Alberta's regenerating boreal forest.

Science Innovation

Since our program began in 2007, there have been major changes in the technology and methods available for biodiversity monitoring. Our methods have evolved in parallel, such as the switch in the 2010s from winter tracking to remote cameras for mammal monitoring. As we change, it's critical to ensure we are building on the legacy of collected data. Read below about our work to calibrate old with new, leverage existing datasets to answer new questions, and build new modelling frameworks.

*For a complete overview of our scientific work and collaborations, including ongoing projects not highlighted here, please visit **abmi.ca**.*

UPDATING OUR MODELLING FRAMEWORK

In 2023-24, we focused on reviewing and updating the core vegetation and climate inventories used to support our species-habitat models. We have adopted the latest version of our Wall-to-wall Vegetation Inventory which includes major improvements in provincial wetland delineation and updated land cover classifications, including fires in national parks. In addition, we have adopted a new reproducible framework for creating climate inventories. These updated climate inventories will help us use new climate variables in our models and facilitate opportunities for understanding the impacts of climate on species distributions.

We currently maintain more than 800 species-habitat models, and progress has been made in researching and developing a new modelling framework. This new framework aims to improve both the reproducibility of our models, and the utility of these models for regional monitoring and reporting.

ADVANCING THE SCIENCE OF WETLAND MONITORING

This year, we completed several analyses to support the transition of the wetland monitoring component of the Ecosystem Health Program to include short-term trend monitoring. We conducted a literature review to identify effective ways to measure vegetation change. We analyzed our vegetation and aquatic invertebrate datasets and evaluated our own protocol development from the past 15 years with an eye to identifying the utility of different datasets and methods for reporting on wetland status and trends.

From the literature review and internal documents, we derived key insights to design trials for assessing new field protocols in the summer of 2024. For the aquatic invertebrate dataset, we established methods to resolve taxonomic ambiguity, which is essential for further species analysis and the calculation of community-level metrics. Through this process, we implemented data and database updates to ensure that anyone can repeat the analysis using our public datasets. This work contributes to increasing the accessibility of our existing macroinvertebrate data and ensures our scientific processes are replicable and credible.

We currently maintain more than 800 species-habitat models, and progress has been made in researching and developing a new modelling framework.

As we adopt new methods, it is crucial to integrate the data they generate seamlessly with existing datasets.

CALIBRATING AUTONOMOUS RECORDING UNITS AND CAMERAS FOR IMPROVED MONITORING

Remote cameras and ARUs are increasingly being used to monitor wildlife. As we adopt new methods, it is crucial to integrate the data they generate seamlessly with existing datasets. In 2023-24, we embarked on various initiatives aimed at calibrating this technology to enhance our ability to combine different data types, avoid biases that can be introduced by changing technology, and potentially back-correct for biases in historic datasets. This effort aims to deepen our understanding of species ecology by refining how we monitor with both ARUs and cameras.

Autonomous Recording Units

For acoustics, we focused efforts on combining ARU data with data collected in the field by human observers ("point counts"). We are developing "gold standard" datasets to compare these methods using grids of time-synchronized ARUs, which can be used to pinpoint the time and place of every single bird song. We are also continuing to perfect and trial a new method of broadcasting sound recordings when we set up ARUs, which will help us understand the various factors that affect how well ARUs can hear, including different models and ages of microphone as well as weather, topography, and forest type. Together, these activities help us compare how humans and ARUs survey birds to support combining data collected through these two different methods.

Remote Cameras

In the world of remote cameras, we continue to test novel deployment protocols that enable us to better monitor a wider variety of species with different body shapes, speeds, and behavioural patterns. In the past year, as part of both our OSM activities and Biodiversity Trajectories project, we extensively tested how changing the height of a camera deployment can better capture images of smaller species (e.g., Marten, Fisher). We have also worked to incorporate existing data collected using other protocols (e.g., targeting game trails) or with different equipment types (e.g., older camera models) by analytically developing calibrations for each factor.

USING DEEP LEARNING TO ENHANCE SPECIES IDENTIFICATION AND PROCESSING ACOUSTIC RECORDINGS

Deep learning is helping us realize the potential of the hundreds of thousands of acoustic recordings available on WildTrax. In 2023-2024, we assisted the development of **HawkEars,** an artificial intelligence model that can automatically detect bird species by sound. HawkEars is currently being implemented in WildTrax alongside Cornell's BirdNET and will be made publicly available with a future release. We are working with the developer of HawkEars to evaluate the model and publish it as a peer-reviewed publication and are excited to see that it performs better than other existing multi-species deep learning models. Alongside the adoption of HawkEars, we have been building our own high-quality deep learning classifiers for specific applications, starting with classification of Common Yellowthroat songs to link to breeding status.

We are also using deep learning to improve our understanding of bird populations. We have built models to estimate the distance of each call from the recording unit, enabling us to in turn build population density estimates. The incredible potential of passive acoustic monitoring is being unlocked by deep learning through work to differentiate individuals in recordings. We published a review and synthesis paper that will hopefully increase research and development in this area, and are working with partners to initiate our own methods development for acoustic individual identification.

INSIGHTS ON MOOSE HEALTH USING REMOTE CAMERAS

The ABMI has collected over 28 million images using remote cameras for almost the past decade. We are beginning to explore the depths of insights possible from this vast dataset.

This year, we undertook a pilot project on how historic images collected of moose could be used to assess each individual's hair loss due to winter tick infestation. The pressure of high tick burdens, which often results in hair loss and anemia, is an important factor in moose mortality rates; in particular, calves are susceptible to high tick loads before they are recruited to the adult population.

We used images from over 3,000 remote cameras deployed between 2015 and 2019 to estimate trends in winter tick burdens on moose over both time and space. Using images collected between January and May, individual moose were assigned a score between 1 and 5 based on the observed hair loss as an indication of tick infestation severity.

This information was used to calculate the prevalence and degree of infestation severity both by region and over time. The findings from this effort can be used to evaluate spatial and temporal patterns of tick pressure on moose in Alberta, and provide information to wildlife managers on the status of species health and susceptibility to disease and/or parasites.

Working Collaboratively

We take pride in collaboration, in supporting the needs of partners, stakeholders, and Indigenous communities, and in sharing our work for broader benefit. The data and expertise we accumulate represent a continuously expanding resource for researchers and land managers across Alberta and beyond.

Below, we spotlight several examples of where and how the ABMI is working collaboratively to further the goals and outcomes of biodiversity monitoring. For more information, visit **abmi.ca**.

ALGAL BLOOM MONITORING IN ALBERTA LAKES

During the summer, nutrient-rich lakes can develop large blooms of phytoplankton. Some types of phytoplankton, like cyanobacteria (blue-green algae), can produce toxins that are harmful to humans and animals. Knowing when, where, and why harmful blooms occur is important to scientists, policy makers, stewards, and lake enthusiasts. The ABMI is collaborating with Dr. Rolf Vinebrooke at the University of Alberta, Alberta Health, the Alberta Lake Management Society, EPA, Environment and Climate Change Canada, Associated Environmental Consultants Inc., the Pigeon Lake Watershed Association, Lac La Biche County, and the Wabamun Watershed Management Council to better understand these blooms.

Six Alberta lakes are being monitored in the summers of 2023 and 2024. Lake water samples are collected by project collaborator volunteers and staff at the same time the Sentinel-2 satellite flies directly overhead collecting imagery. The satellite imagery is used to estimate chlorophyll-a concentrations (a green pigment found in algae), and the water samples are analyzed at the University of Alberta to identify types and concentrations of algae or cyanobacteria present, and to test water quality. Together the water samples and satellite data track algal blooms appearing on the lakes. By combining this data, we can develop models of current and historical blooms, and eventually predict future blooms, too.

Moving forward, the models will be applied to an online app where anyone can visualize and track blooms on their lakes of interest, and explore historical blooms. We anticipate releasing the first version of the app in 2025, and hope to expand the project to include more lakes in Alberta in the future. This project was funded by Alberta Innovates and Alberta Health.

This year, we completed surveys of 20 prairie pothole wetlands in both high-intensity and low-intensity agriculture settings.

DEVELOPING A REMOTE CAMERA DECISION SUPPORT TOOL

We continue to collaborate with the Alberta Remote Camera Steering Committee to implement new tools to disseminate knowledge to remote camera users throughout Western Canada. In 2023-24, we began developing an online remote camera decision support tool.

This tool will be a free, interactive, web-based app that supports the decision-making process of designing remote camera programs. App users will be guided through a series of decision points related to their study. At each step, users can access pop-ups that include information related to the question (e.g., the impacts of each option on other aspects of design); information will be provided with different levels of complexity and in formats that accommodate multiple learning styles (e.g., figures, videos, Shiny apps). The app will generate a standardized report with study design recommendations (e.g. camera spacing and number of cameras), appropriate modeling approaches, and analysis considerations (e.g., variables to consider to reduce bias).

To ensure that the tool meets the needs of remote camera users, we are engaging with members of the community via focus groups and incorporating feedback into the tool development. Focus groups will continue until December 2024.

DEVELOPING GENOMICS TECHNIQUES TO UNDERSTAND WETLAND HEALTH

In 2023, we completed year one of a multi-year **collaborative project** with InnoTech Alberta and Ducks Unlimited Canada (DUC) to better understand wetland food web dynamics across the Prairie Pothole Region as well as the effects of agriculture and climate change on wetland water quality and waterfowl productivity. Through this effort, we are expanding our use of environmental genomics to monitor biodiversity, especially aquatic invertebrates, which are an important component of aquatic food webs and key ecological indicators of wetland health.

This year, we completed surveys of 20 prairie pothole wetlands in both high-intensity and low-intensity agriculture settings. Field sampling conducted by DUC crews yielded over 40,000 aquatic invertebrate specimens that have been identified using both conventional and genomics-based approaches. Our in-house taxonomic expertise offers a unique opportunity to directly compare these two approaches, helping to advance the use of environmental genomics beyond simple species detection (presence-absence data) to estimates of relative abundance (biomass). This work has the potential to greatly increase the applicability of genomics-based approaches to our other species monitoring programs and large-scale biodiversity monitoring in general. The project is funded by the three collaborating agencies and an Alberta Innovates Water Innovation Program grant.

SUPPORTING THE CAN-PEAT INDIGENOUS ADVISORY COUNCIL

A group of Canadian peatland experts, led by Maria Strack from the University of Waterloo, are working together through **Can-Peat: Canada's peatlands as nature-based climate solutions**. This project aims to improve estimates of greenhouse gas emission reductions from peatland management actions. By evaluating policy instruments, they are also supporting solutions development. So far, Can-Peat has hired 14 graduate students and postdoctoral fellows to lead various research activities, and established a network of over 150 peatland experts who actively share information about peatlands as nature-based solutions, responsible use, and peatland restoration.

As part of Can-Peat's mandate, the project takes a braided approach to science and research, and presents opportunities for all researchers, students, and staff to work with the project's Indigenous Advisory Council, Indigenous peoples, and communities to ethically braid Indigenous knowledge and Western science. To support this work,

Can-Peat and the ABMI have hired an Indigenous liaison who coordinates and supports the work of the Indigenous Advisory Council. This council works towards empowering Indigenous data sovereignty through establishing a resource platform to support Canadian peatland research across Canada. This work requires both an iterative and interactive process of knowledge sharing between the Indigenous Advisory Council, members of the Science Advisory and Policy Board, and the Can-Peat team throughout the duration of the project.

EXPANDING NATIVE BEE MONITORING IN ALBERTA

Expanding our taxonomic breadth, the ABMI has partnered with the Alberta Native Bee Council (ANBC) to monitor native bees throughout Alberta. During the 2023 field season, we deployed monitoring protocols developed by the ANBC at 10 ABMI sites. More than 1,300 specimens were cleaned and identified by our taxonomic team, laying the groundwork for future processing of native bees by the ABMI. We also collaborated on a successful funding proposal led by the ANBC to the Government of Canada's Habitat Stewardship Program that will help expand native bee monitoring in Alberta over the next five years. Through this collaboration, we are poised to continue to provide monitoring, taxonomic, and analytical support to the ANBC and gain critical baseline information on the status of native bee populations in Alberta.

The ABMI has partnered with the Alberta Native Bee Council to monitor native bees throughout Alberta.

The past year saw the formal release of the Native Cover and Landscape Connectivity indicators.

SUPPORTING THE PROVINCIAL BIODIVERSITY SCIENCE COMMITTEE

The ABMI is represented on EPA's newly restructured Biodiversity Science Committee (formerly the Science and Technology Committee). We are contributing to the breadth of working groups within the committee, including footprint recovery, spatial data layers, monitoring and reporting, and indicator development. The past year saw the formal release of the **Native Cover** and **Landscape Connectivity** indicators by the Government of Alberta. The Native Cover indicator represents the amount of aquatic and wetland, or terrestrial habitat that is free of visible human footprint. The Landscape Connectivity indicator represents current connectivity within three broad land cover types–Upland Forests, Lowland Forests and Grasslands–as well as assesses changes in connectivity over time.

Biodiversity Pathways

UPDATES FROM OUR NATIONAL AFFILIATE
Biodiversity Pathways

Our national affiliate, Biodiversity Pathways, continued its exciting growth this past year. The organization now includes three spheres of operation: the Wildlife Science Centre, focused on large mammal monitoring and research in western Canada; the Geospatial Centre BC, directing efforts towards human footprint monitoring in northern British Columbia; and the newly launched SENSR, which provides support for the use of environmental sensors in research and monitoring. Highlights of the past year included participation in a community of practice to standardize avian data collection in national parks; supporting Indigenous-led wildlife recovery programs; peer-reviewed publications on caribou research; and significant advancements in the creation of a human footprint inventory for the province of B.C.

Visit **biodiversitypathways.ca** to learn more about our growing programs.

Knowledge Translation and Engagement

Making our work accessible is one of our core values. We strive to understand the needs of those who use our data, and develop platforms or analytical tools that make accessing and interpreting our data even easier. We are committed to making all the data we collect freely available on our website.

Below, we highlight the ABMI's commitment to knowledge translation and engagement. For more information, please visit abmi.ca where you can also sign up for our newsletters.

WETLAND ATLAS OF ALBERTA

The Wetland Atlas of Alberta showcases wetland knowledge in Alberta in an easy to read and accessible format. It includes results from ABMI's wetland monitoring program and acts as a conduit for other researchers to highlight results of their own wetland research projects. In 2023-24, two new sections were added to the Atlas: "Effects of Agriculture and Climate Change on Prairie Wetlands" and "Regional Patterns in the Water Balance of Alberta's Wetlands". Both sections were developed through collaboration and engagement with external organizations including Innotech Alberta, Alberta Innovates, and DUC.

BIODIVERSITY BROWSER

The Biodiversity Browser is Alberta's encyclopedia of life. Through this portal, we provide information on species monitored by the ABMI. Users can easily search for individual species of interest and see where they've been detected in the province, their habitat associations, impacts of human footprint, and maps of habitat suitability.

In 2023-24, we updated all species profile results with the latest ABMI data. We also implemented a new user interface for Biodiversity Browser species profiles to improve navigation, and added mammal information specific to the Oil Sands Region.

OUTREACH AND ENGAGEMENT

We are dedicated to ongoing engagement and outreach activities, employing various channels to share information and updates. In 2023, as part of the update to our Strategic Plan, we rolled out a survey to understand monitoring needs across sectors. Additionally, our newsletters and blogs serve as valuable resources for sharing information, progress, and achievements. We also leverage the power of social media, actively interacting with our followers across four channels: LinkedIn, Facebook, Twitter, and Instagram. This fiscal year, we shared 50% more posts across social media platforms compared to the 2022-23 fiscal year, aiming to inform Albertans about biodiversity and land cover in the province.

Our webinar series "It's Our Nature to Know" will continue next fiscal, with regularly scheduled webinars to foster continuous learning and knowledge sharing opportunities.

"IT'S OUR NATURE TO KNOW" WEBINARS

In 2023-24, we continued with our webinar series "It's Our Nature to Know" and produced a number of webinars encompassing biodiversity monitoring methods, tools and projects. In September, we hosted a webinar on the methodology, evolution, and applications of the Biodiversity Intactness Index. Another webinar in the fall introduced wildRtrax, an R package containing functions to help manage and analyze environmental sensor data from WildTrax. Lastly, we highlighted our aquatic invertebrate monitoring and offered valuable insights into the health and intactness of our waters in a webinar in early 2024.

These webinars are accessible on our **YouTube channel**.

The webinar series will continue next fiscal, with regularly scheduled webinars to foster continuous learning and knowledge-sharing opportunities.

WILDTRAX: DATA DISCOVER

We launched an updated version of WildTrax's Data Discover portal in the winter of 2024. Using Data Discover, anyone can search for public data from ARUs, cameras, and point counts, using a variety of new attribute filters. The enhanced portal now lets users create their own layers, areas of interest, and summary statistics within a dynamic mapping interface, including a polygon drawing tool. The new summary statistics provide information on which organizations have published data on WildTrax and which species were detected in an area of interest, and lets users explore the media elements such as images and recordings captured in the area.

Data Discover is an accessible way to gain a comprehensive understanding of environmental sensor data in an area of interest. Upgrades were supported through funding from Environment and Climate Change Canada and EPA.

REPORT ON THE 2023 WILDFIRE SEASON

In March 2024, we released a Science Letter on the **effects of the 2023 wildfire season in Alberta**. This report looked at the area burned in the province from a recent-memory historical context, finding that upwards of 3.2 million hectares, or 6.6% of the forested area in Alberta burned–an equivalent of the previous 11 years of wildfires in Alberta combined. A closer look into the forest types and ages most affected revealed impacts across all forest types and ages, decreasing the average forest age in Alberta and impacting species, both positively and negatively. Some species were estimated to lose over 10% of their habitat area, while other species adapted to young forest conditions saw large increases in habitat area. Public interest in this reporting was substantial and the ABMI gave several media interviews on the topic. In the coming year, we intend to update this analysis as 2024 fire data becomes available.

OIL SANDS MONITORING INFOGRAPHIC

An illustrated fact sheet was added to our publications archive titled, "**Routes to Response: A conceptual framework to detect the effects of oil sands industrial activity on the land**." This resource supports a broader understanding of the terrestrial biodiversity monitoring conceptual model used in the OSM Program.

Operational Excellence

Much of the ABMI's success as an organization stems from consistent attention to the processes that support operational excellence: strategic and operational planning; recruitment and retention of talented employees; strong policies and procedures; engagement with our voting Members, Board of Directors, partners, collaborators, and stakeholders; and overall continuous improvement (including finding and implementing efficiencies).

MEMBER ENGAGEMENT

The diverse perspectives of the ABMI's Members help to shape the future of our operations. Engaging with our Members involves listening to their ideas and valuing their contributions; ultimately, engaging with them strengthens our organization. In 2023-24, we invited Member feedback on our strategic plan (results of the 2020-23 plan, and draft of the new 2023-26 plan) as well as draft annual work plans. By appointing Board Directors, and voting as per our bylaws, Members ensure that their respective sectors are heard. In 2024-25, we look forward to continuing to benefit from their unique strengths and interests.

COMMITMENT TO DATA QUALITY MANAGEMENT

Scientific credibility is a guiding principle of our operations. To ensure that we live up to this principle, we constantly evaluate how to integrate and/or refine quality assurance and quality control (QA/QC) processes as our programs evolve. Throughout 2023–24, we maintained our commitment to our existing QA/QC processes by following established standard operating procedures (SOPs). Three new SOPs were developed in support of our growth and evolution: 1) The management of ground truthing data collected for the Vegetation Regeneration Mapping Program, 2) The management of aerial imagery and lidar data, and 3) Managing how species names are updated and synchronized across the ABMI's data and platforms.

FINANCIAL ACCOUNTABILITY TO SPONSORS

The ABMI's funding comes from a variety of public and private sector sources, and our commitment to manage those funds responsibly and transparently is core to our operations. We adhere to best practices of financial accountability.

Careful financial stewardship also includes supporting our funding agreements via comprehensive engagement and reporting systems that assess and manage progress against deliverables. Our Board of Directors (via its audit committee) maintains careful oversight of our overall financial results.

ABMI
Publications

*ABMI and Biodiversity Pathways staff members publish peer-reviewed research and technical reports on a wide range of topics each year, as both primary investigators and as supporting members of collaborative teams. We make all our publications available via our **publication archive**.*

Amini, N., Lloyd-Smith, P., & Becker, M. (2024). Water quality advisory impacts on recreation behaviour and associated economic costs. Canadian Water Resources Journal, 49(1), 106–116.

Arciszewski, T. J., Roberts, D. R., Mahaffey, A., & Hazewinkel, R. R. O. (2023). Distinguishing between research and monitoring programs in environmental science and management. Journal of Environmental Studies and Sciences, 13(4), 674–681.

Binley, A. D., Edwards, B. P. M., Dansereau, G., Knight, E. C., & Momeni-Dehaghi, I. (2023). Minimizing data waste: Conservation in the Big Data era. The Bulletin of the Ecological Society of America, 104(2), e02056.

Bueno, I. T., Hird, J., McDermid, G. J., Galvão, L. S., & Acerbi, F. W. (2023). A large-scale disturbance mapping ensemble through data-driven regionalization. International Journal of Remote Sensing, 44(12), 3700–3725.

Crisfield, V. E., Ficken, C. D., Allen, B. E., Jog, S. K., & Bried, J. T. (2023). The potential of trait data to increase the availability of bioindicators: A case study using plant conservatism values. Ecological Applications, 33(5), e2866.

DeMars, C. A., Johnson, C. J., Dickie, M., Habib, T. J., Cody, M., Saxena, A., Boutin, S., & Serrouya, R. (2023). Incorporating mechanism into conservation actions in an age of multiple and emerging threats: The case of boreal caribou. Ecosphere, 14(7), e4627.

Dickie, M., Hricko, B., Hopkinson, C., Tran, V., Kohler, M., Toni, S., Serrouya, R., & Kariyeva, J. (2023). Applying remote sensing for large-landscape problems: Inventorying and tracking habitat recovery for a broadly distributed Species At Risk. Ecological Solutions and Evidence, 4(3), e12254.

Dickie, M., Bampfylde, C., Habib, T.J., Cody, M., Benesh, K., Kellner, M., McLellan, M., Boutin, S. & Serrouya, R. (2023). Where to begin? A flexible framework to prioritize caribou habitat restoration. Restoration Ecology, 31(5), p.e13873.

Dickie, M., Love, N., Steenweg, R., Lamb, C. T., Polfus, J., & Ford, A. T. (2023). In search of evidence-based management targets: A synthesis of the effects of linear features on woodland caribou. Ecological Indicators, 154, 110559.

Ficko, S.A., McClymont, A., Haughland, D.L., & Naeth, M.A. (2023). Optimizing growth chamber conditions for maintaining Arctic lichen-dominated biocrusts. Restoration Ecology, 31(4), e13876.

Flaherty, L, Hills, M., Giacobbo, V., Kuczmarski, P., Momborquette, M., and Lumley L.. (2024). Impacts of garlic mustard (*Alliaria petiolata, Brassicaceae*) invasion on oribatid mites in urban forest soils vary with the size of the invaded patch. Pedobiologia, 103, 150933.

Jackson, R. S., Dennett, J. M., & Nielsen, S. E. (2023). Effects of oil sands disturbances on shrub and tree structure along forest edges in Alberta's boreal forest. Canadian Journal of Forest Research, 53(8), 642–653.

Jayalath, T. A., Lloyd-Smith, P., & Becker, M. (2023). Biodiversity benefits of birdwatching using citizen science data and individualized recreational demand models. Environmental and Resource Economics, 86(1), 83–107.

Lumley, L. M., Azeria, E. T., Giacobbo, V. A., & Cobb, T. P. (2023). Effects of natural land cover, anthropogenic disturbance, space, and climate on oribatid mite communities in Canada's Oil Sands Region. Diversity, 15(4), Article 4.

Mao, L.-F., Dong, Y.-R., Xing, B.-B., Chen, Y.-H., Dennett, J., Bater, C., Stadt, J. J., & Nielsen, S. E. (2023). Maximum canopy height is associated with community phylogenetic structure in boreal forests. Journal of Plant Ecology, 16(4), rtac104.

MacPhail, A. G., Yip, D. A., Knight, E. C., Hedley, R., Knaggs, M., Shonfield, J., Upham-Mills, E., & Bayne, E. M. (2024). Audio data compression affects acoustic indices and reduces detections of birds by human listening and automated recognisers. Bioacoustics, 33(1), 74–90.

Murphy, K. J., Roberts, D. R., Jensen, W. F., Nielsen, S. E., Johnson, S. K., Hosek, B. M., Stillings, B., Kolar, J., Boyce, M. S., & Ciuti, S. (2023). Mule deer fawn recruitment dynamics in an energy disturbed landscape. Ecology and Evolution, 13(4), e9976.

Pyle, L. (2023). Rare Vascular Plants of Alberta [Book Review]. The Canadian Field-Naturalist, 137(1), 152-153.

Ruff, S.E., Humez, P., de Angelis, I.H., Diao, M., Nightingale, M., Cho, S., Connors, L., Kuloyo, O.O., Seltzer, A, Bowman, S., Wankel, S.D., McClain, C.N., Mayer, B. & Strous, M. (2023). Hydrogen and dark oxygen drive microbial productivity in diverse groundwater ecosystems. Nature Communications, 14, 3194.

Skinner, A., Korpach, A. M., Åkesson, S., Bakermans, M., Benson, T. J., Brigham, R. M., Conway, G. J., Davy, C. M., Evens, R., Fraser, K. C., Hedenström, A., Henderson, I. G., Honkala, J., Jacobsen, L., Norevik, G., Thorup, K., Tonra, C., Vitz, A., Ward, M., & Knight, E. (2023). Assessing an age-old ecogeographical rule in nightjars across the full annual cycle. bioRxiv, 2023.08.30.555574.

ABMI
In the News

CBC NEWSROOM

In March 2024, Brandon Allen, ABMI's Senior Terrestrial Ecologist, was invited into the CBC newsroom to provide insight on how forest species communities are changing and responding to the increase in wildfires.
View here.

CBC FEATURE

Our collaborative algal bloom research was featured in a CBC news piece in August 2023, describing the work to track blue-green algae blooms using satellite imagery.
View here.

NEWS NOW

In January 2024, ABMI's Information Centre Director, Corrina Copp, was featured in an RD News Now story, discussing funding for remote camera research.
View here.

CBC FEATURE

In October 2023, CBC News featured Diane Haughland, ABMI's Lichen Taxonomic Lead, guiding TV audiences through the Edmonton river valley and highlighting the marvels of local lichen species.
View here.

MANITO MÉDIA

In early 2023, Manito Média interviewed Alex McPhail, Senior Acoustic Coordinator, about using ARUs and the WildTrax platform for an episode of La faune connectée (The Connected Fauna), a documentary series that focuses on the work of Francophone Canadian biologists (outside of Quebec) who study wild animals using state-of-the-art technology.
Coming soon here.

Alex McPhail, Senior Acoustic Coordinator, being interviewed by Manitu Media.

Financial Statements

Year ended March 31, 2024

Independent Auditor's Report on the Summary Financial Statements

To the Board of Directors of Alberta Biodiversity Monitoring Institute

Opinion

The summary financial statements, which comprise the summary statement of financial position as at March 31, 2024, and the summary statements of revenues and expenditures and changes in net assets for the year ended March 31, 2024 and are derived from the audited financial statements of Alberta Biodiversity Monitoring Institute for the year ended March 31, 2024.

In our opinion, the accompanying summary financial statements are a fair summary of the audited financial statements, in accordance with Canadian Accounting Standards for Not-for-Profit Organizations.

Summary Financial Statements

The summary financial statements do not contain all the disclosures required by Canadian Accounting Standards for Not-for-Profit Organizations. Reading the summary financial statements and the auditor's report thereon, therefore, is not a substitute for reading the audited financial statements and the auditor's report thereon. The summary financial statements and the audited financial statements do not reflect the effects of events that occurred subsequent to the date of our report on the audited financial statements.

The Audited Financial Statements and Our Report Thereon

We expressed an unmodified audit opinion on the audited financial statements in our report dated September 19, 2024.

Management's Responsibility for the Summary Financial Statements

Management is responsible for the preparation of the summary financial statements in accordance with Canadian Standards for Not-for-Profit Organizations.

Auditor's Responsibility

Our responsibility is to express an opinion on whether the summary financial statements are a fair summary of the audited financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standard (CAS) 810, *Engagements to Report on Summary Financial Statements*.

Edmonton, Alberta
September 19, 2024

Coyle & Company
CHARTERED PROFESSIONAL ACCOUNTANTS

ALBERTA BIODIVERSITY MONITORING INSTITUTE
Statement of Revenues and Expenditures
Year Ended March 31, 2024

	2024	2023
REVENUES		
Government of Alberta	$ 6,588,828	$ 5,931,240
Government of Alberta Oil Sands Monitoring	4,430,018	3,832,781
Private sector	2,465,468	1,423,734
Application Centre	886,112	805,675
Government of Canada	454,528	448,485
Other government funding	176,000	83,426
Expense recoveries	277,010	76,503
Interest income	148,792	50,072
	15,426,756	12,651,916
STAFFING EXPENSES		
Executive Office	619,192	557,142
Science Centre	812,734	687,610
Geospatial Centre	2,101,735	1,487,417
Monitoring Centre	2,037,281	1,712,930
Lab Processing and Identification Centre	1,363,233	1,197,784
Information Centre	1,324,402	1,159,921
Operations Centre	860,179	677,372
	9,118,756	7,480,176
OPERATING EXPENSES		
Executive Office	271,988	275,434
Science Centre	215,436	13,219
Geospatial Centre	1,955,210	1,385,874
Monitoring Centre	1,786,253	1,595,396
Lab Processing and Identification Centre	391,156	176,190
Information Centre	317,929	245,052
Operations Centre	270,465	227,863
Application Centre	900,529	1,000,707
	6,108,966	4,919,735
EXCESS OF REVENUE OVER EXPENDITURES FROM OPERATIONS	199,034	252,005
OTHER EXPENSES		
Loss on foreign exchange	-	101,155
EXCESS OF REVENUES OVER EXPENDITURES FOR THE YEAR	$ 199,034	$ 150,850

ALBERTA BIODIVERSITY MONITORING INSTITUTE
Statement of Financial Position
March 31, 2024

	2024	2023
ASSETS		
CURRENT		
Cash	$ 969,580	$ 1,151,952
Short term investments	1,470,737	1,734,834
Accounts receivable	2,485,507	1,535,211
Goods and services tax recoverable	11,216	208
Prepaid expenses	60,071	15,598
Due from related parties	279,568	398,090
	5,276,679	4,835,893
CAPITAL ASSETS	957,731	1,645,404
	$ 6,234,410	$ 6,481,297
LIABILITIES AND NET ASSETS		
CURRENT		
Accounts payable	$ 980,978	$ 977,894
Deferred contributions	1,095,174	992,401
Deferred capital contributions	689,722	1,241,500
	2,765,874	3,211,795
NET ASSETS	3,468,536	3,269,502
	$ 6,234,410	$ 6,481,297

ON BEHALF OF THE BOARD

_____ Director

_____ Director

ALBERTA BIODIVERSITY MONITORING INSTITUTE
Statement of Changes in Net Assets
Year Ended March 31, 2024

	2024	2023
NET ASSETS - BEGINNING OF YEAR	$ 3,269,502	$ 3,118,652
EXCESS OF REVENUES OVER EXPENDITURES FOR THE YEAR	199,034	150,850
NET ASSETS - END OF YEAR	$ 3,468,536	$ 3,269,502

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