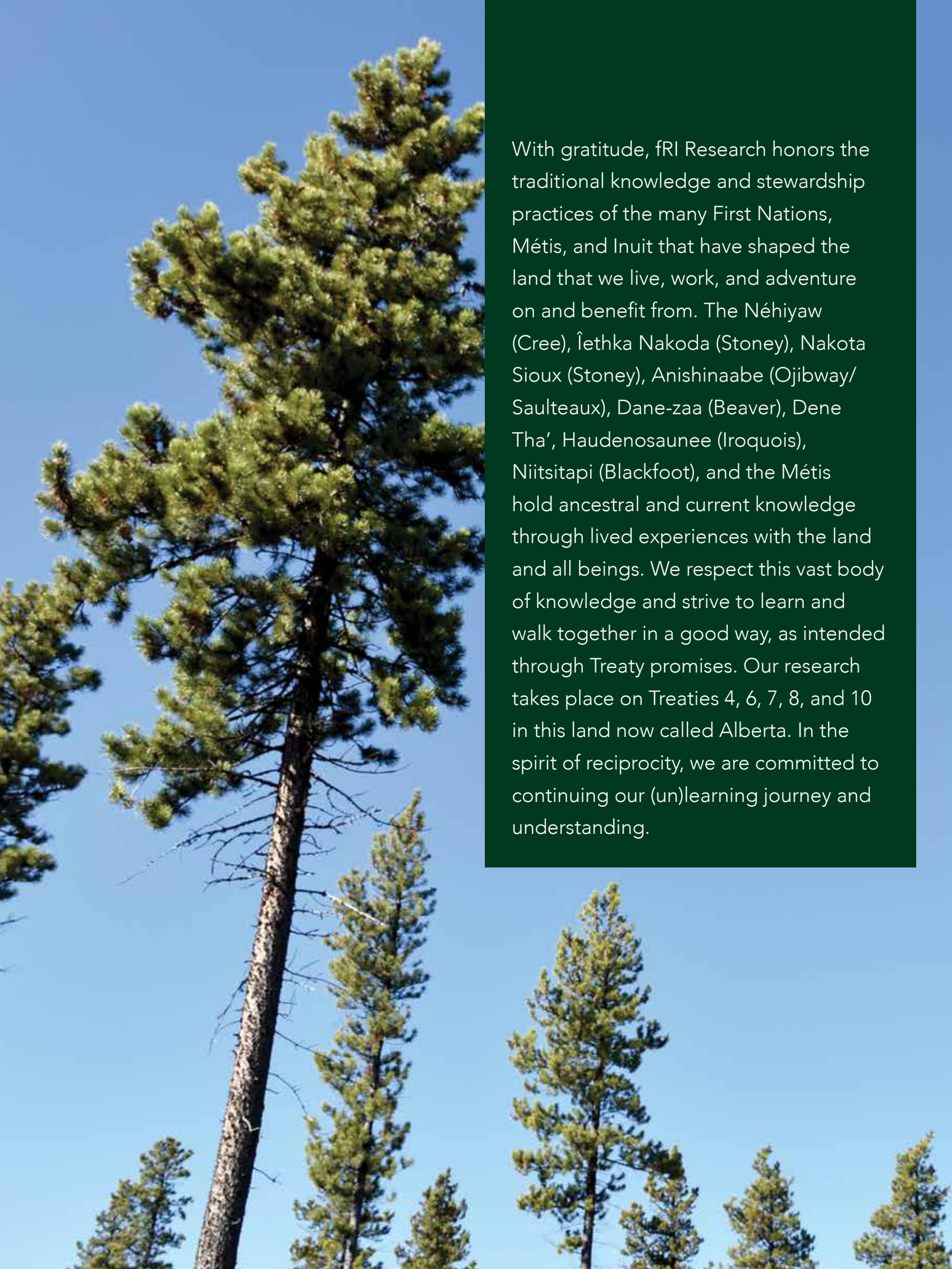
fRI RESEARCH 2025–2026 ANNUAL REPORT

fRI Research
Informing Land & Resource Management



With gratitude, fRI Research honors the traditional knowledge and stewardship practices of the many First Nations, Métis, and Inuit that have shaped the land that we live, work, and adventure on and benefit from. The Néhiyaw (Cree), Îethka Nakoda (Stoney), Nakota Sioux (Stoney), Anishinaabe (Ojibway/ Saulteaux), Dane-zaa (Beaver), Dene Tha', Haudenosaunee (Iroquois), Niitsitapi (Blackfoot), and the Métis hold ancestral and current knowledge through lived experiences with the land and all beings. We respect this vast body of knowledge and strive to learn and walk together in a good way, as intended through Treaty promises. Our research takes place on Treaties 4, 6, 7, 8, and 10 in this land now called Alberta. In the spirit of reciprocity, we are committed to continuing our (un)learning journey and understanding.

TABLE OF CONTENTS

President's Message **4**

Board of Directors **5**

Shareholders and Partners **6**

Caribou and Moose Ecology **8**

Grizzly Bear Monitoring **14**

Marten **19**

Landscape Ecology **20**

Water and Fish **26**

Associations **31**

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fRI Research answers scientific questions to support better land management. For over 30 years, we have been a trusted hub for all sectors of society to work together on urgent issues.

The topics we tackle are driven by the needs on the landscape. In this annual report, you'll find projects focused on a single species of interest, and projects that take a whole-ecosystem approach. There are studies across Canada and collaborations around the world.

What unites all these efforts is the belief that science can lead to better outcomes for species at risk and the land and water we all rely on.

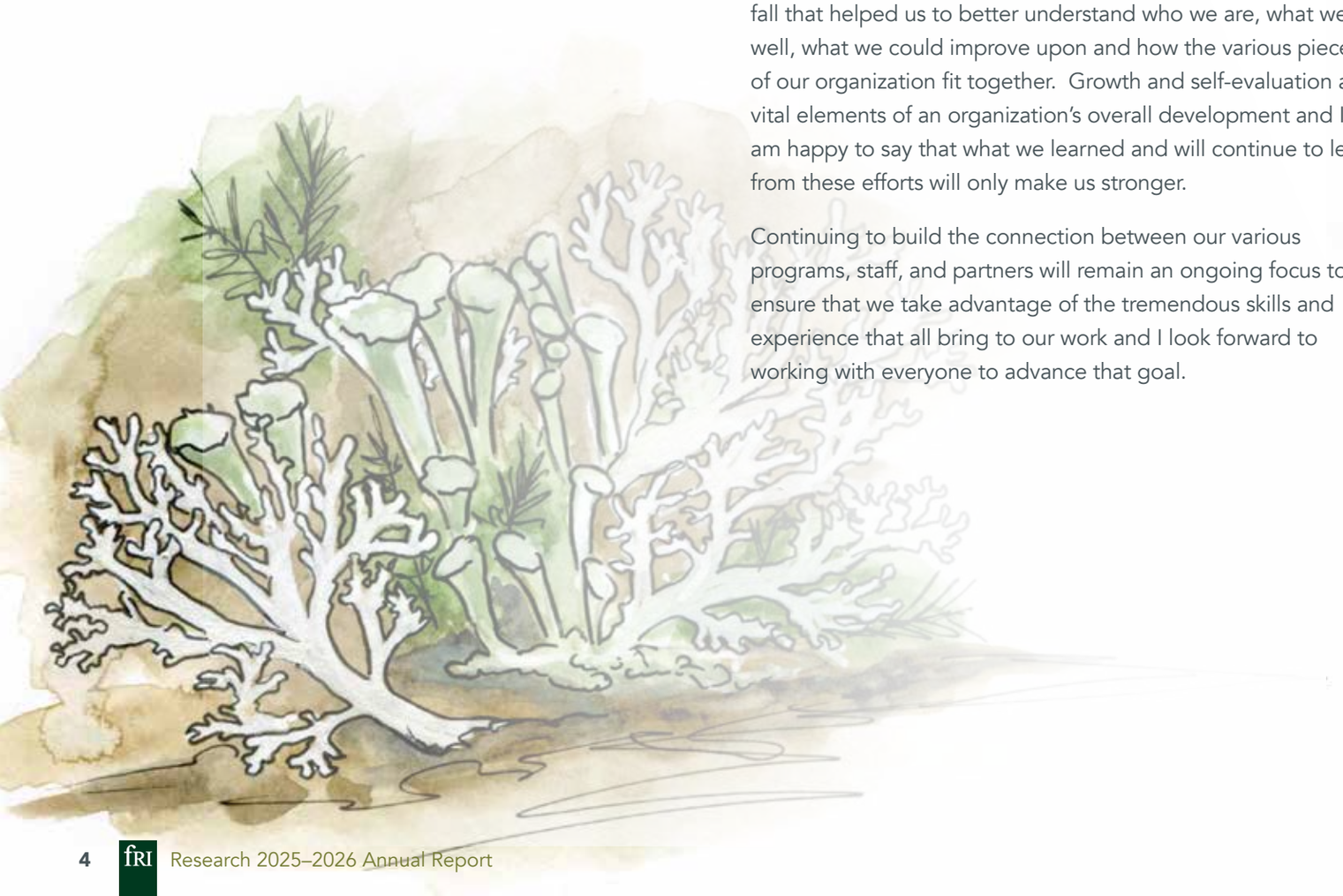
PRESIDENT'S MESSAGE

RICK BLACKWOOD

We at fRI Research take great pride in the work we carry out each day, and we were especially proud to have received an ASTech Award this past year for our past work on grizzly bears. Having our research and the work of our staff and partners recognized for their contributions to advancing the state of natural resource management helps us know that we are indeed on the right path in delivering on our mandate.

As fRI Research continues to implement its strategic plan, the Board of Directors has also embarked on a thorough review of its governance role to ensure the organization has the right tools and processes to lead it into the future. Our staff also participated in an excellent two-day team-building session last fall that helped us to better understand who we are, what we do well, what we could improve upon and how the various pieces of our organization fit together. Growth and self-evaluation are vital elements of an organization's overall development and I am happy to say that what we learned and will continue to learn from these efforts will only make us stronger.

Continuing to build the connection between our various programs, staff, and partners will remain an ongoing focus to ensure that we take advantage of the tremendous skills and experience that all bring to our work and I look forward to working with everyone to advance that goal.



2025–2026

BOARD OF DIRECTORS

Rick Blackwood (Board President)

Ken Greenway (Board Chair) Alberta Forestry and Parks

Matthew Wheatley (Vice President) Canadian Forest Service

Erica Sivell (Board Treasurer) West Fraser

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Daniel Lux Alberta Forestry and Parks

Bob Mason Canfor

Travis Ripley Alberta Environment and Protected Areas

Karen Rosvold Rural Municipalities of Alberta

Laura Trout Hinton Wood Products, West Fraser

Chris Watson Parks Canada

Melonie Zaichkowsky Canfor

Current as of March 2026

Our Shareholders

Over 30 years ago, we got our start as a not-for-profit. Right from the beginning, we were supported by organizations who saw value in the kind of independent, practical research we do. These shareholders generously committed to providing stable, long-term funding to support core operations such as administration, IT, and communications – the necessary services that allow our scientific programs and associations to focus on their projects.

Our partners already provide money, data, and in-kind expertise to specific projects, so choosing to additionally support us at the shareholder level is a testament to their commitment to science-based decision making and sustainable land and resource management. In return, we provide them with a ready-made forum to discuss new research directions with resource managers in industry, regulators in government, top scientists, NGOs, and communities.

Though ministries and departments have shuffled, the Government of Alberta has been a steadfast supporter of our institute through core funding, data sharing, seconded positions, and more. We fill an important role: providing independent science to inform their decision making and connecting policy-makers to practitioners on the landscape.

SINCE 1992

Canfor's forest management areas in western Canada gave them a natural interest in many of our longstanding projects from hydrology to mountain pine beetle to caribou. In 2014 they opted to increase their support for science-based solutions to these issues by becoming a shareholder.

SINCE 2014

Ecosystems don't care about lines on a map. Our neighbours to the west recognized this early, collaborating with us on many projects right up to the present day. We have regular, informal knowledge sharing as well as formal participation on projects about bears, beetles, and many things in between.

SINCE 1995

Tolko became one of our newest shareholders in 2021. They were, and continue to be, part of several large collaborations working on big projects such as Landweb modeling, grizzly bear population surveys, and the Alberta Regional Caribou Knowledge Partnership.

SINCE 2021

This family-owned and operated company in the Lesser Slave Lake area is an enthusiastic supporter of our research both when it is widely applicable to forestry in Alberta, as well as more specific to their landbase, such as a recent grizzly bear population survey and a marten study. They became a shareholder in 2021.

SINCE 2021

The Hinton Division of West Fraser Mills, then called Weldwood, was a sponsoring partner back when we were part of the Model Forest program. It was on their land base that we did our first research, and they have supported our growth ever since.

SINCE 1992

In 2012, Weyerhaeuser became the first forestry company to become a shareholder since Weldwood sponsored our model forest proposal 20 years previously. Their contributions go far beyond monetary support and include data sharing essential for many caribou conservation projects.

SINCE 2012

Program and Association Partners

Partnerships are the foundation of fRI Research. These partners provide funding, invaluable datasets, and other in-kind contributions to directly support our programs and associations. They also help us identify important land-use issues for future projects, assemble resources, and integrate our results into land and resource management. Without our partners' commitment, we would not be the strong, effective source of knowledge and tools that we are today.

Alberta Biodiversity Monitoring Institute
Alberta Conservation Association
Alberta Forest Products Association
Alberta-Pacific Forest Industries
Alberta Trappers Association
American Fisheries Society
ANC Timber
ARC Resources
Aseniwuche Winewak Nation
Athabasca Oil Corporation
Baytex Energy
Belchim Crop Protection Canada
Bighorn Mining
Boucher Brothers Lumber
Canadian Institute of Forestry
Canfor Corporation Divisions:
Grande Prairie and Whitecourt
Canlin Resources Partnership
Cardinal Energy
Cavvy Energy
Cenovus Energy
Coal Association of Canada
Cows and Fish Riparian Management Society
CST Coal
Distributions Solida
Ducks Unlimited Canada
Elk Valley Resources
Foothills Ojibway Society
FORCORP Solutions
Forest Resource Improvement Association of Alberta
Freshwater Conservation Canada
Ghost Watershed Alliance Society
Government of Alberta:
Ministry of Environment and Protected Areas; Ministry of Forestry and Parks; Office of Chief Scientist; Ministry of Indigenous Relations; Water Course Crossing Program
Government of British Columbia:
Ministry of Forests; Ministry of Environment and Parks
Government of Canada:
Environment and Climate Change Canada; Fisheries and Oceans Canada; Parks Canada, Jasper National Park
Government of Manitoba: Department of Natural Resources and Indigenous Futures
Government of New Brunswick: Department of Natural Resources
Government of Newfoundland and Labrador: Department of Fisheries, Forestry, and Agriculture
Government of Northwest Territories: Department of Environment and Natural Resources
Government of Nova Scotia: Department of Natural Resources
Government of Ontario: Ministry of Natural Resources
Government of Québec:
Ressources naturelles et Forêts; Environnement, Lutte contre les changements climatiques, Faune et Parcs
Government of Saskatchewan: Ministry of Environment
HWN Energy
Île-à-la-Crosse
Joint Secretariat: Fisheries Joint Management Committee
Keyera Corporation
Loon Lake and Makwa Metis Local 32
Louisiana-Pacific Corporation
MacHydro
Mercer Peace River Pulp
Millar Western Forest Products: Slave Lake Pulp
Mistik Management
Mitacs
Mount Royal University
National Conservation Plan
National Sciences and Engineering Research Council of Canada
Natural Resources Canada, Canadian Forest Service
North Saskatchewan Watershed Alliance
NuVista Energy
Ocean Tracking Network
Outlier Resources
Paramount Resources
Pembina Pipeline
Petroleum Technology Alliance Canada
Petrus Resources
Peyto Exploration & Development
Sabre Energy
Sakâw Askiy Management
Shell Canada
Société de Protection des forêts Contre les Insectes et Maladies
Spatial Planning Systems
Strathcona Resources
Sustainable Forestry Initiative
Swan River First Nation
Tallcree First Nation
TAQA North
Teck Resources
Terrainworks
Tidewater Midstream and Infrastructure
Tolko Industries
Tourmaline Oil
United States Department of Agriculture: Forest Service
Université Laval
University of Alberta
University of British Columbia
University of Calgary
University of Manitoba
University of Montana
University of Northern British Columbia
University of Saskatchewan
University of Victoria
Valent BioSciences
Vanderwell Contractors (1971)
West Fraser Mills divisions:
Alberta Plywood; Blue Ridge Lumber; Cochrane; Edson Forest Products; Grande Prairie; Manning Forest Products; North Central Woodlands; Sundre Forest Products
Westmoreland Mining
Weyerhaeuser Company
Wildlife Genetics International

Caribou and Moose Ecology

Courtney Burk

Ensuring the long-term conservation of Alberta's caribou herds is an extremely tough challenge. They have low reproductive rates – only one calf per year, each with a low survival rate – so to have a self-sustaining population they need to have equally low mortality rates. They are adapted for this by being able to eke out a living in places such as the high alpine and deep within old conifer forests. By choosing habitats that would be marginal for their cousins in the deer family, they avoid predators. But for most of a century, people have been changing the landscape within caribou ranges, reducing the amount and quality of caribou habitat and bringing predators to the herds.

In 2013, the response of land managers was to approach fRI Research to find scientific solutions. We launched the Caribou Program, and throughout its history, Dr. Laura Finnegan has designed and led projects that laid the scientific foundation for the ecology of caribou within Alberta's active landscape, and simultaneously delivered practical knowledge and tools to improve policy and practice in caribou ranges. She has done this not by focusing narrowly on one species or one threat. Under her leadership, the program has collected new data and published on caribou herds around the province, of course, but also on their apparent competitors (moose, deer, and elk), their shared predators, their relationship to forest harvests and silviculture, oil and gas operations, footprints, and restoration, roads, climate, wildfire, mountain pine beetle, and disease.

The caribou team continued this work in 2025, by collecting new climate and vegetation data to explain ungulate use of different disturbance features, collating and synthesizing existing data sets including moose population and habitat surveys, and advancing scientific methods to increase the safety, accuracy, and efficiency of future research efforts. At the same time as they work to create new knowledge, the team is also sharing what they have learned through reports and briefing notes to partners, writing papers, publishing blog posts, delivering webinars, and traveling to conferences to present posters and talks.

Advancing Harvest Systems and Silvicultural Practices for Improved Woodland Caribou and Fibre Outcomes

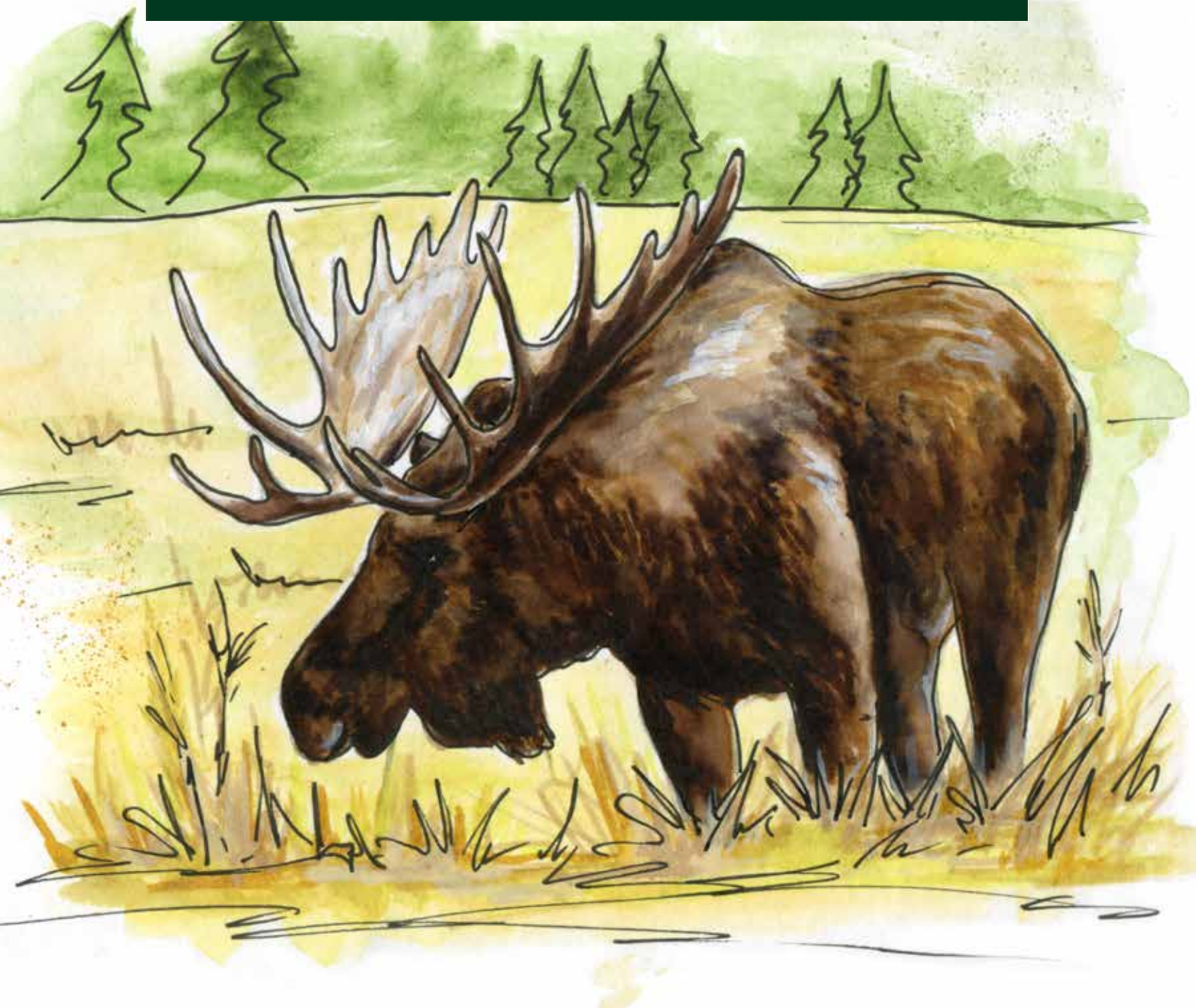
ACTIVE

Previous work by the Caribou Program used camera traps in harvest blocks in west-central Alberta to understand how the characteristics of the harvested area influence wildlife use. It provided confirmation that in many circumstances, moose, deer, and elk were attracted to recently harvested areas

The Moose Research Initiative

Moose have been a focus of study for the Caribou Program for about a decade because of their role as apparent competitors for caribou (increased moose occupancy of caribou habitat leads to more predators, and higher caribou mortality). But moose are worth studying in their own right. They are culturally important to Albertans, particularly to Indigenous traditions and treaty rights. For decades, Indigenous hunters have noticed scarcer numbers of bull moose in their traditional territories, confirming regional declines detected in the provincial government's aerial population surveys.

In 2021, the Caribou Program compiled a literature review which helped to identify and prioritize knowledge gaps for the management of moose in Alberta. Working with partners in government, industry, academia, and First Nation communities, fRI Research refined the scope to five key research themes that will give land managers the ability to do a science-based cumulative effects assessment for moose, answer fundamental questions about the drivers of moose population changes, and improve monitoring methods. These projects, now in their second year, are noted below.



that offer good forage foods. Similarly, the project found that predators – particularly bears – were also drawn into harvested areas with forage and those where deer are in abundance.

This project takes the next step by investigating how those characteristics came to be, by relating them to silvicultural systems, ecosite, and many other factors. By understanding the forestry practices that modulate predator abundance in caribou ranges, companies can factor caribou mortality risk into their forest management plans. The project also greatly expands the geographic scope by sampling from caribou ranges across Alberta, covering 88,900 km2, increasing its applicability across the Canadian boreal.

Finally, we are using site characteristic measurements in stands with confirmed caribou use and stands recovering from wildfire to provide comparisons with those characteristics found in similarly-aged harvest areas. This lets us identify harvest and silviculture practices that put a stand on a faster trajectory to becoming woodland caribou habitat, and how this potentially differs from burned stands.

The project started in the fall of 2020, when the team did a literature review and developed a fieldwork protocol. In 2021 and 2022, crews visited hundreds of sites in west-central Alberta to take vegetation inventories and collect fine-scale site data. In 2023 and 2024, Dr. Ian Best at the University of Northern British Columbia performed a large part of the data analysis. The team published the data in reports, papers, conference presentations, a webinar, and briefing notes. Because of the vast amount of data from hundreds of sites around the province, there are many ways to stratify the statistical models depending on the questions asked. The team continues to analyze this data and share results.

How Forest Management and Climate Factors Impact Boreal Ungulates

ACTIVE

This study is part of the Moose Research Initiative.

Moose are a temperature-limited species that will be affected by climate change; however, this effect may be stronger or weaker depending on how other activities change the landscape. In particular, how forestry is practiced – what is harvested and what is left behind – may reduce or amplify the background trends for temperature, moisture snow depth and more. Untangling this relationship will contribute to best forest management practices for moose.

In late 2024, this theme got underway as the team refined the field protocol and selected sites to monitor. In 2025, crews put out 180 cameras and microclimate data loggers in a mix of harvested areas, the surrounding forest, and retention patches (unharvested islands and peninsulas of trees). The equipment will be retrieved and redeployed in another study area after one year of data collection.

Moose Population Size and Trend Relative to Forest Management Activities and Landscape Conditions

ACTIVE

This study is part of the Moose Research Initiative.

The Government of Alberta has moose population size estimates from helicopter surveys, and our own past work has found that moose use of areas following forestry operations depends on season and site conditions. This theme uses both sources of data together to understand how things like site-specific forage abundance, silviculture practices, and the surrounding landscape are affecting moose population sizes and trends.

Analysis began in mid-2024, with the first generation of models ready for testing in early 2025. These early results identify the key factors affecting moose population sizes as: the proportion of mixedwood, wildfire aggregation, harvest aggregation, winter severity, elevation, and proportion of fire. Somewhat surprisingly, proportion of harvest does not appear to be significant. As additional datasets are collected, quality controlled, and incorporated, the models are being improved through a series of updates. In particular, we will look at the effects of specific stand characteristics.

Moose Summer and Winter Ranges in Alberta: Resource Selection Function Models and Connectivity

ACTIVE

This study is part of the Moose Research Initiative.

Our previous work used GPS collar data from moose to find out how they were responding to linear features in four caribou ranges between Hinton and Grande Cache. This project will contribute a new, more informative generation of models that will cover more of Alberta's moose populations.

Work started in 2024, focusing first on west-central Alberta, and are revealing the forest ages and types that moose are selecting, and broken out for home range and local habitat scales. Next, the team will rerun the models for northeastern Alberta. In both regions, we will work with local Indigenous communities to validate our models against their traditional knowledge of moose.

Practicality and Potential of Copter and Fixed-wing Remotely Piloted Airborne Systems for Wildlife Surveys Compared to Current Methods

ACTIVE

This study is part of the Moose Research Initiative. It is led by the Integrated Remote Sensing Studio at the University of British Columbia.

Helicopter surveys are the standard method for establishing population counts of many species. Remotely piloted fixed-wing and copter-style drones have many potential advantages such as safety, lower wildlife disturbance and, potentially, lower cost. At the same time as these platforms are improving in capability and cost, the sensors that can be mounted on these aircraft are also improving, as are the computer vision techniques by which wildlife can be identified in images automatically.

This project brings the promises of these technologies closer to reality by advancing several components and procedures in the technology stack. Through testing and simulations, the team at UBC determined that for moose and other low-density wildlife, a fixed-wing drone with thermal and visible light

cameras is viable. At the same time, a machine learning model was trained on human-labeled images, both thermal and visible light. The two types of images each bring advantages, and the team is exploring ways to use them, from fully automated identifications, to using humans for trickier cases that the model has low confidence in, to using low resolution thermal imagery during the flight to quickly spot animals, then gimbaling the higher resolution visible light camera to make the identification.

Response of Wildlife to Restored Wellsites

ACTIVE

Many wellsites have been certified as reclaimed, but their condition varies. This project assesses wildlife use of wellsites to understand how deer, moose, bears, and other species



respond to restoration treatments, and whether these features that have been classified as reclaimed are functioning like the surrounding forest.

In 2023, our crews used camera traps to monitor wellsites that had been planted and treated by Weyerhaeuser over a decade ago, wellsites that had not been treated or planted, and forested sites as a comparison. We also recorded vegetation at the forested sites, while technicians from NAIT's Centre for Boreal Research collected detailed vegetation data at the wellsites. During 2024, the team classified approximately 125,000 photos, allowing them to conduct the first data analysis.

In 2025, the project was expanded to collect an additional year of data at more wellsites, enabling direct comparisons of reclamation treatments while controlling for the age since the well was decommissioned. Additional vegetation surveys are also planned.

Using Camera Traps to Estimate Density and Population Composition of Deer, Moose, and Elk

ACTIVE

Aerial surveys are the primary method to assess ungulate population size, demographics, and trends in Alberta. However, it can be difficult to get accurate estimates for species that tend to take cover under the forest canopy. An alternative way of collecting data about a species is deploying a network of camera traps, and recent advances have enabled study designs that can estimate population densities.

This project has three goals: estimate the density and demographics of ungulates using camera traps, test several methods simultaneously to optimize for accuracy and cost, and refine the use of new technology to make future studies more resource-efficient.

We set up a grid of camera traps in the wildlife management unit north of Hinton in 2023. The study was carefully designed so that this grid can be sub-sampled and analyzed in different combinations so we can determine the optimal number and layout of cameras.

This generated over 3 million images which we collected and

began processing in 2024. We ran a subset through a wildlife image recognition program to detect and label species, then reclassified them with traditional methods by trained biologists. This taught us how to use these programs to massively reduce the time to classify the millions of remaining images on this project, without significant loss of accuracy. In 2025, we finished classifying all images and began the analysis. We also shared our methods and findings for using AI in the Megadetector program to identify images with no wildlife.

The Effects of Oil and Gas and Forestry on Occupancy, Reproductive Status, and Reproductive Rates of Prey Species within Caribou Ranges

COMPLETE

In the decades after industrial disturbances, for example when a natural gas well is decommissioned or a forest is harvested and replanted, the area will generally have more grasses, shrubs, and young deciduous trees than the surrounding forest. Our previous research shows that these forage plants draw in more prey species and their predators: moose, deer, and elk, bears, and wolves. In threatened caribou ranges, this, in turn, raises mortality rates of caribou.

This project advances our understanding of these population dynamics by determining the reproductive status of deer,

moose, and caribou around disturbances. Knowing this basic population parameter will improve predictions of these prey populations under different management scenarios, providing a scientific basis for the management of these prey species.

We used a network of over 300 camera traps in harvest blocks, well sites, seismic lines, and pipelines throughout the four west-central caribou ranges: Redrock Prairie Creek, A La Peche, Narraway, and Little Smoky. The camera data comes from several projects and has been collected between 2014 and 2024.

By looking at the relative frequency with which we detect adults, subadults, and adults with calves, we could estimate the calf recruitment rate (which accounts for both calf survival and reproductive rates) for each species. We could also determine how each species responds to disturbances at key life stages. And because we know the characteristics of the area around each camera, we could relate reproductive status to things like forage abundance, terrain types, other nearby disturbances, and more.

We saw that both moose and white-tailed deer with their young use disturbances a lot. We also saw that adults with young selected different disturbance characteristics than those without young, and that the key factors are the types of forage and the other disturbances in the area. Two examples:

Adult moose with a calf selected wellsites that are further from roads in areas with lower densities of roads, and those with more alder. If the objective was to reduce unnatural patches that support moose recruitment in caribou ranges, land managers could target remote wellsites for reclamation, and choose site preparation and planting methods that replace alder with other vegetation.

White-tailed deer with a calf selected pipelines that had more Hedysarum (a forb in the pea family), Calamagrostis (a tall reedgrass), and a greater proportion of forbs overall. For active pipelines, managers could consider mowing and weeding treatments of pipelines in caribou ranges. For inactive pipelines, planting with trees that will shade out these understory plants would put the disturbance feature on a trajectory away from deer habitat and toward caribou habitat.

The team discovered many other relationships and has been sharing them in reports and presentations while they work on manuscripts for papers.

How Forest Management Strategies Impact Ungulate Populations and Habitat Supply Over Time

COMPLETE

This study was part of the Moose Research Initiative. It was led by Forcorp.

Alberta and British Columbia are implementing new forest management strategies designed to benefit caribou, but it's unclear what unintended effects there may be on other ungulate species, particularly moose. Forcorp synthesized the available research to provide recommendations and identify knowledge gaps. In the fall of 2025, both a report and a webinar discussed the variable effects that different forest management strategies have on moose populations, noting that similar questions have been more closely studied in caribou than in moose. The results also make recommendations for future research in order to understand the tradeoffs when simultaneously managing for both moose, a generalist species, and caribou, a specialist species.

Grizzly Bear Monitoring

Since 2023, Dr. Darío Fernández-Bellon has led our grizzly bear research with a focus on developing more efficient monitoring methods. Simultaneously, we are generating new data on grizzly bear populations and maintaining critical tools so that bears can be managed on a solid scientific basis.


Courtney Burk

Streamlined Study Design

The population inventories that we did, the first in 2004 and the most recent in 2018, were enormous efforts. They involved setting up over 200 hair snag sites, many in extremely remote areas that could only be accessed by helicopter. The sites themselves are relatively simple, but they must be revisited six to eight times in the summer to collect the bear hair, from which our lab partners can extract DNA and let us estimate the population size in the area. It is inevitable that it takes such a large amount of effort to be able to estimate the population size, given the huge ranges and low densities of grizzly bears. As a result, only a few of the province's seven Bear Management Areas have been surveyed more than once to establish population trends, and some have not been surveyed since 2008.

But a population size estimate might not be necessary to answer the critical questions land managers have. Our goal is to drastically reduce the number of sites, potentially cutting the cost by two thirds right from the beginning, while still getting essential information including the density of bears in an area, the population trends in an area, and bear occurrence at the edge of their home range. We are trialling different subsets of sites that would normally be surveyed as part of a full population inventory to find the most effective configuration.

With the most recent population inventories dating to 2018, we need up-to-date information to understand how grizzly bear populations are doing. While this pared-back study design won't give a full population estimate, it would make it feasible to do much more frequent population monitoring and provide land managers with better information than sporadic population estimates with long time gaps.

Fine-tuned Field Methods

The field work is simple: a string of barbed wire and a scent lure. When a curious bear investigates, it leaves a tuft of hair on the wire, which we collect on our next visit. Because it is so straight forward and works pretty well, we used the same basic protocol for all the major population inventories. This also removed any doubt about the comparability of results from year to year and area to area. But there is room to improve in several different ways.

One was setting up a trail camera at each site. While this adds to the cost per site, the cameras pay for themselves by letting us see which hair tufts came from the same bear, reducing the amount of hair we need to send to the lab, which has a significant cost per sample. Sometimes bears visit our sites but cannot be identified genetically – they don't leave any hair, or enough hair in good condition for the lab – and the cameras confirm their presence and give us some information such as age class and possibly sex.

We also want to improve the scent lure. We've always used cattle blood. Our field technicians, whose job it is to mix, filter out the chunks, and divide it into bottles are the best people to explain the downside to working with this lure, although anyone walking past the sea can where the bottles are kept will get an idea. Beginning in 2023 we have been testing commercial alternatives such as fish fertilizer, molasses, bacon

spray, synthetic berry syrup, and anise oil. Several seem to be about as good as the blood, and interestingly, some seem to be better at attracting one bear species than another. Having a lure that is attractive specifically to grizzly bears would be helpful, as black bears (and sometimes other animals) will destroy the hair snag sites, costing us valuable hair samples.

We're also tweaking the layout of the hair snag sites. Grizzly bears seem to particularly like rubbing on trees (many possible reasons have been hypothesized for this behaviour), and we are taking advantage of this by adding some barbed wire to a tree at some sites. It's early still, but it does seem to be effective at increasing the amount of hair from each bear, something that could be extremely valuable as described below.

More Data per Sample

Our lab partners have been adept at extracting DNA from the follicle at the root of grizzly bear hairs. This lets us identify individuals, family relationships, and the bear's sex. Unfortunately, it doesn't tell us about the life stage of the animal – how many of the bears we identify are cubs, subadults, or adults, and whether they are pregnant or caring for offspring. Population structure and reproductive rates are fundamental population parameters that would tell us something deeper than a static population estimate; they would help us understand the drivers of population changes.

But hair contains more than just DNA. Like all mammals, grizzly bears have a complex mix of hormones that change in response to the animal's situation. Whether a bear is male or female, young or old, stressed or healthy, pregnant or lactating is reflected in the proportions of hormones circulating in its blood, and those hormones are deposited in the bear's hair and other tissues. We are working with the proteomics lab at the University of Victoria to refine techniques for extracting the relevant hormones from our archive of thousands of hair samples, and decode what they say about each individual bear.

Our archive of hair samples spans decades and many Bear Management Areas. Being able to determine the age and pregnancy status of even a subset of those samples would allow us to reconstruct grizzly bear population trends over the past twenty years in much more detail.

A breakthrough in 2025 was possible because of a much smaller set of hair samples that we gathered when we were capturing and releasing grizzly bears to fit them with GPS collars. While the bear was sedated, we noted all relevant characteristics of the animal – body condition, age, sex, pregnancy status, etc. – and shaved off a patch of hair. We had no immediate plans for those samples, but decades later, they have allowed our lab partners to correlate the characteristics we measured with the hormone levels deposited in the hair patch.

There are still a few more technical hurdles to clear before we can analyze the hormones in our hair snags. If the lab had access to more samples from captured bears, especially those known to be pregnant or lactating, the team would be able to more accurately predict those characteristics from the hairs' hormone profiles. Another issue is that the shaved hair samples contain a large number of high quality hairs – plenty for the lab work needed. Our non-invasively collected hair snags, on the other hand, might only contain a few intact hairs. At the same time as the lab works to optimize their procedures to require smaller hair samples, we are looking at ways to increase the amount of hair in each sample. One approach is to combine hair tufts into one sample where we have verified with trail cameras that they came from the same bear.

Our archive of hair samples spans decades and many Bear Management Areas. Being able to determine the age and pregnancy status of even a subset of those samples would allow us to reconstruct grizzly bear population trends over the past twenty years in much more detail. And dialing in this technique would increase the value of every future hair sample that we collect.

All photos by Darío Fernández-Bellon

Maintaining Critical Tools

In 1998, Teck proposed opening a coal mine south of Hinton. As part of an environmental review, fRI Research (then the Foothills Model Forest) was asked to examine whether this would be a problem for grizzly bears. As the Grizzly Bear Program began work, forest companies, the Alberta Government, and Parks Canada also brought their questions to us. Within a decade, the team had fitted GPS collars on bears to understand their home ranges and resource use, we had collected reams of habitat data, and we had conducted the first scientific population inventories in the province.

The habitat measurements and grizzly bear location data were each used to answer many research questions, but in 2007 they were integrated to form the basis of GBTools. This was a suite of GIS tools, backed by our published research, that allowed land managers to input resource development or restoration scenarios, and see the expected impact on grizzly bear populations. Every few years we rolled out updates to add new tools to the package and expand their geographic scope. Today, they cover the entire grizzly bear range in Alberta, and can simulate habitat quality, bear mortality risk, probability of den locations, and sightability from roads. The government

requires the use of these tools in forest management plans, so ensuring that they remain up to date and bug-free is an important job for our grizzly bear and GIS team. We have also supported their use by publishing tutorials, giving workshops, and troubleshooting as needed.

The other part of the tools is the provincial genetic database of all known grizzly bears in Alberta, a priceless trove of data that includes both the thousands of samples we collected, but also hair samples from other agencies. Unlike many things in life that see diminishing returns as they grow, each additional bear identification added to this database can be more valuable than the last because it creates more connections. Maybe it shares half its DNA with a previously detected bear, allowing us to establish a parent-cub relationship that confirms reproduction, or maybe it's the same bear as we detected many years ago, giving us survival and age structure data. This is a unique resource that we work hard to keep up to date and accessible to our partners so they can leverage their past investments in our program to answer new questions.

The habitat measurements and grizzly bear location data were each used to answer many research questions, but in 2007 they were integrated to form the basis of GBTools. This was a suite of GIS tools, backed by our published research, that allowed land managers to input resource development or restoration scenarios, and see the expected impact on grizzly bear populations.

Claire Alore

Jacob W. Frank

Marten

COMPLETE

The prevailing wisdom is that American martens need mature forests to thrive. While they certainly do seem to prefer larger patches of mature conifer forests, marten that were fitted with GPS collars in British Columbia used other types of habitat. This, combined with the lack of research in Alberta's boreal forest drove interest from two different groups that share the landscape.

Local trappers and forest managers have joined forces to learn about annual habitat use by marten in the Slave Lake area. The Forest Resource Improvement Association of Alberta via Vanderwell Contractors is funding the work, and five local trappers are collecting new data on their traplines. The goal is to gain a more complete understanding of how marten select and use habitat at different times of day and seasons, and how it relates to nearby forest harvesting.

Gord Stenhouse, who led our grizzly bear work until 2023, helped the trappers and Vanderwell staff design the study and source the field equipment. He also met with them regularly to advise, and has assisted in analyzing the results. Rounding out the team is a local wildlife technician, who is overseeing the management and handling of data.

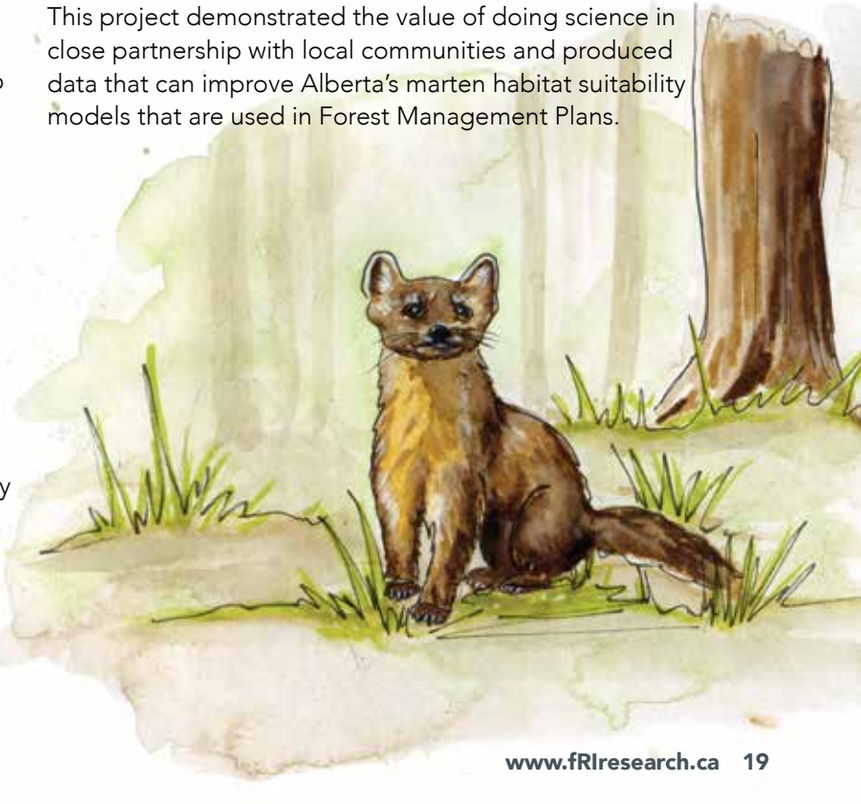
"It is great working with local trappers who are sharing their knowledge of an ecosystem that they understand very well," says Stenhouse. "This project is exciting because not only are we bringing together foresters and trappers, but we're enabling these groups to answer a question that matters to their communities."

At the beginning of the project, trappers put out 90 high resolution trail cameras on traplines to observe the full diversity of forest types and ages. They visited the cameras each month to change batteries and SD cards. In addition to the marten detections, they are also gaining useful insights into the other species that make up the ecological communities in the area. Data about marten size and body condition that the trappers are uniquely able to contribute have given additional insight into how habitat use is linked to animal growth.

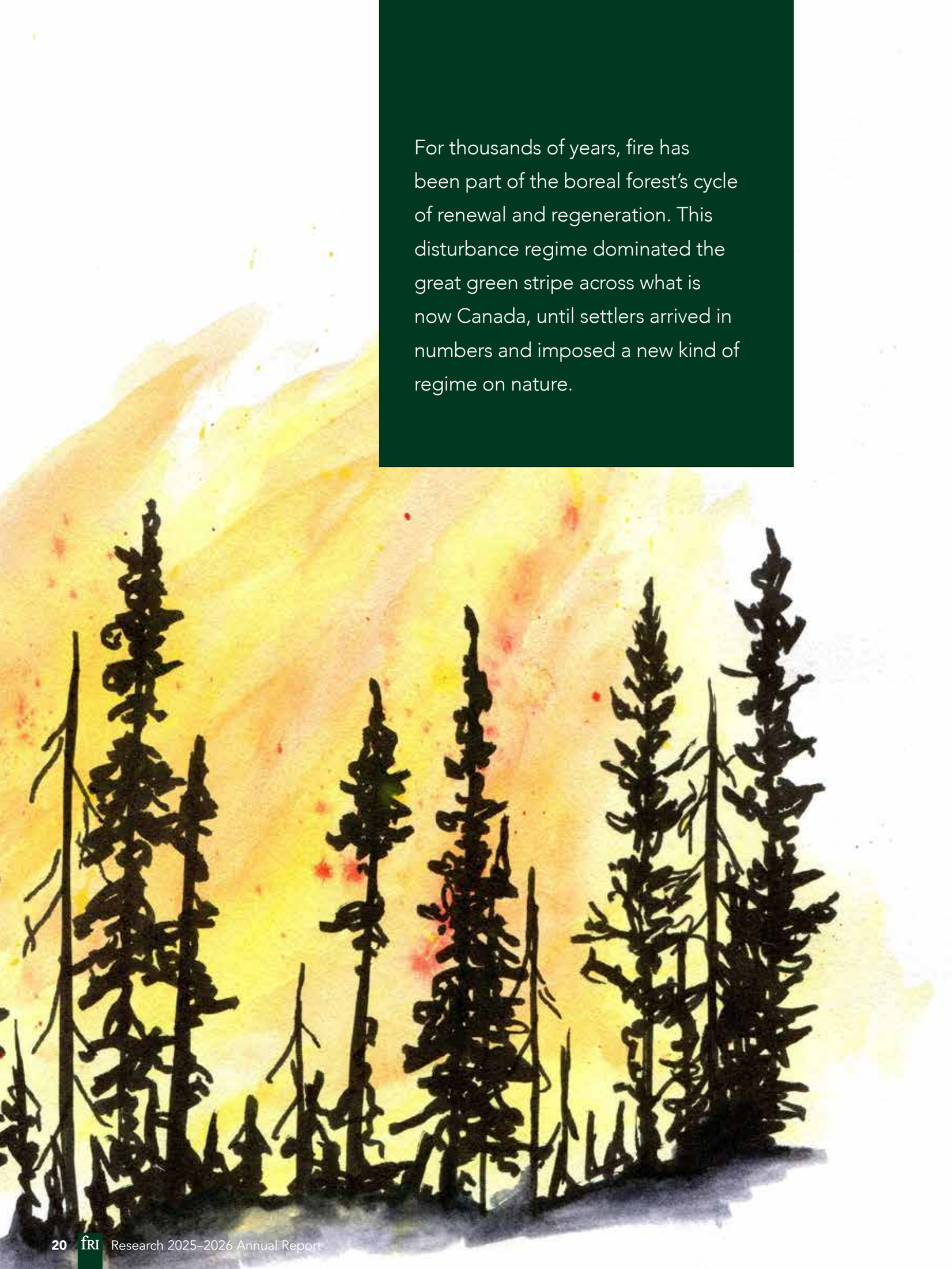
Across the study, there were 612 marten detections over about 3,200 camera trap nights. Their rates varied between traplines – one contributed two thirds of all observations – but were fairly consistent year to year. The rate of marten detections follows the species' life history which has peaks in activity during spring breeding and juvenile dispersal in the fall. There were also peaks in activity in the morning and late evenings.

It was clear that marten use a complex mix of habitat. While the largest proportion of detections have come in older forests, marten have demonstrated the ability to take advantage of all forest types, especially mature deciduous stands and riparian areas. Measurements of trapped marten confirm normal body conditions, indicating that these conditions are meeting the species' needs.

This project demonstrated the value of doing science in close partnership with local communities and produced data that can improve Alberta's marten habitat suitability models that are used in Forest Management Plans.



For thousands of years, fire has been part of the boreal forest's cycle of renewal and regeneration. This disturbance regime dominated the great green stripe across what is now Canada, until settlers arrived in numbers and imposed a new kind of regime on nature.



Landscape Ecology

Many forest management issues have to be directly managed. For example, special policies must be developed for threatened species and critical values such as water supply and water quality must be protected. You can read about those efforts in other sections of this report. But what about the thousands of species or ecosystem values that don't get their own regulations and dedicated research team? What about all the ecosystem processes, and how changes on the landscape are constantly altering ecosystem dynamics? It isn't practical to try to manage everything individually. So Dr. David Andison has led the Healthy Landscapes Program in pursuit of a different, parallel approach: a whole-landscape approach that tries to get the big picture approximately right first.

The program began in the 1990s and studied natural disturbances (wildfire being the biggest one). By taking aerial photos of the landscape, looking for ash layers in soil and sediment cores, and finding fire scars in surviving trees, the team began reconstructing the fire history of the boreal forest, and the pre-industrial mix of forest types that would have existed for thousands of years. When comparing it to the landscape condition today, it became clear how far out of equilibrium a century of fire suppression has pushed the boreal. This is the coarsest filter that the program applies to judgements about the health of the landscape by asking whether there is a natural amount of young, intermediate, and mature forest in a given area.

The program also studies the patterns wildfires make on the landscape: their frequencies in different areas, and mix of severities, their behaviour under different conditions, the distribution of fire sizes, and their shapes, which are dictated by local factors. This research also ultimately helps with wildfire prediction to lower the risk to communities and other values, and can also be used to design industrial activity in a way that creates a disturbance that emulates some ecological functions of natural disturbances, or puts the footprint on a more natural, and potentially less risky trajectory.

This is done at two other scales in space and time. The medium-scale planning is a more recent focus of the program. It comes from the observation that burned areas cluster in space and time, whereas human disturbance tends to be much more evenly spread around the landscape, creating ubiquitous disturbances instead of infrequently resetting the age of very large patches of forest, as fires have tended to do. At a finer scale, individual disturbance events may be able to provide more ecological benefits if they are intentionally patterned after fires, windthrow events, insect infestations, and other natural causes. These events are tracked over the medium and long-term to understand their evolution over time.

But there is one more major focus of the program: building partnerships. Changes to something as complex as land management, where governments, NGOs, communities, and industries are heavily invested in the status quo, require a lot of trust both in the science – that it really does promise a better management paradigm – and each other. Over the years, Andison has built a big active team comprising scientists from forestry companies, universities, provincial and federal governments, and environmental NGOs. He has hosted workshops and dialogue sessions to bring representatives from even more groups together, and done socio-economic research to create a roadmap forward.

Benefits of Disturbance

ACTIVE

For thousands of years, fire has been part of the boreal forest's cycle of renewal and regeneration. This disturbance regime dominated the great green stripe across what is now Canada, until settlers arrived in numbers and imposed a new kind of regime on nature. Some forest was cleared for agriculture, settlements, and industrial use, but perhaps even more significantly, a policy of fire suppression for about a century has rebalanced the mix of forest ages. Experts are now in broad

Bill Tinge

agreement about the advantages of reintroducing fire to the landscape and beginning to return to a pre-industrial mix of habitats.

No such consensus exists among the public, as was discovered during the first phase of this project, led by Dr. John Parkins at the University of Alberta. They surveyed 8,000 residents of Alberta, Saskatchewan, and Manitoba. Throughout 2024 and 2025, the team, which included scientists from the Canadian Forest Service have been analyzing the data and working on publications to share the results, including reports, presentations, and a paper. The final phase of the project is an annotated review of the scientific literature on disturbance.

Beyond the Trees

ACTIVE

A lot of attention is paid to the overstory, but the shrubs, forbs, lichen, and mosses are also critical for the people and animals using a forest. In particular, Indigenous practices make use of many understory plants for nutritional, medicinal, spiritual, and economic purposes. The goal of this project is to identify which plant species are culturally significant and understand how fire and forestry practices are impacting them.

The first stage was to build relationships with communities interested in participating in the project. Since 2023, we have been visiting Ahtahkakoop Cree Nation and Ile-à-la Crosse in Saskatchewan and Tall Cree in Alberta, where we began building relationships and heard the community's perspectives. The meetings with the knowledge keepers and their communities demonstrated why it is essential to take this careful approach of building trust and spending time to understand each community's unique situation. There were major differences in priorities between the two communities, their level of trust in forestry companies, and their view of wildfire.

The next step is to co-design field trials, working with knowledge keepers to select sites, and forest companies to implement different silvicultural treatments. While preparation for this second phase is underway, we will also begin the relationship building process of phase one with two additional Indigenous communities in Alberta. We are also exploring relationships in British Columbia, Manitoba, and Ontario.

Comparing Fire and Harvest Patterns

ACTIVE

Since the 90s, the shapes of forest harvest have left behind the straight edged checkerboard pattern, and evolved to resemble natural disturbances, especially wildfire. Building on more than 20 years of Healthy Landscapes Program research and GIS

tools, this project aims to help industry and regulators even more closely emulate fire and other natural disturbances by comparing metrics between wildfires and 10 different harvest pattern metrics including size, shape, proportion of residuals, islands, the area of the largest patch, etc. The exercise was repeated in three different Forest Management Areas.

The main output of this project will be a peer-reviewed paper, but the findings will also directly inform the event-scale products for EBM Tips and Techniques (see below).

Ecosystem-based Management Tips and Techniques

ACTIVE

To help bridge the gap between research and practice, Andison is developing resources to help forest planners apply ecosystem-based management principles. These are not rules, but advice for creating more natural conditions at multiple scales. The planned series of extension products will cover topics such as how to interpret Landweb (see below) models, considerations for managing across jurisdictional boundaries, what a forest management area's size means for setting forest age targets, proportions of residuals, islands, and corridors when designing harvest events, how EBM is distinct from past management paradigms, and many more.

Each product will contain practical tips and considerations, as well as the scientific underpinning behind the guidance. This kind of extension requires a deep understanding of the day-to-day operations of forestry and forest management-planning in order to provide useful tips and techniques.

Fire-Harvest Blueprint

ACTIVE

While forest harvesting in Alberta has evolved over decades to better emulate natural disturbances, the ecological effects are still markedly different than wildfires. On the other hand, governments are limited in their ability to implement prescribed fire: many areas are unsafe to burn, some years have very short or non-existent weather windows, they are expensive to execute, and they lack public support (see Benefits of Disturbance). But the Healthy Landscapes Program is exploring a way to combine the disturbance types to get the ecological benefits of fire and the predictability of a harvest plan.

This project lays the groundwork for a future bold experiment: a joint prescribed burn – harvesting plan at operational scale. One hypothetical is to lay out the harvests to create a perimeter of fire breaks and recover the most valuable timber, and then perform a prescribed burn within the perimeter. While unorthodox, this could be a powerful tool for creating more natural disturbance, as well as being able to perform prescribed burns more predictably and economically.

Before such a management plan can actually be approved, the

Healthy Landscapes team including Andison and prescribed fire experts from both Canada and the US are working out the details for preliminary steps, such as how to manage risk, who takes on which responsibilities, and identifying policies that will enable this new kind of plan. And, as always when challenging the status quo, an essential element in this project is to build trust between everyone involved. A 2025 workshop brought together forest managers in government and industry to discuss options for how this might be done. The team identified a series of next steps and are working with prescribed fire experts on a report sharing expertise.

Fire Risk and Forest Management

ACTIVE

After a tree is harvested, it has to be limbed and trimmed to length before being trucked to a mill. There are different ways of dealing with the slash, and these treatments leave behind fuels that could lead to different wildfire behaviours. Even the presence of machine tracks to create gaps in the fuel covering the ground could have an important effect on fire behaviour. Natural Resources Canada manages the Canadian Forest Fire Behavior Prediction System, a model that estimates things like spread rate and intensity of active wildfires. It classifies areas into one of 16 different fuel types, but there are only three simplified options for post-harvest slash.

Phase one of this project was a PhD thesis by Jared Randall in Dr. Jen Beverly's lab at the University of Alberta. It characterizes additional slash fuel types to more accurately model fire behaviour, and improve the government's Prediction System. Chapters from the thesis are being prepared for individual publication. Phase two is another PhD thesis in Beverly's lab, which will take the next step by asking if harvest patterns and woody debris treatments can affect wildfire behaviour at landscape scales. The work will model the change in fire risk and biodiversity metrics with different harvest locations and treatments.

Landweb

ACTIVE

Landweb is a suite of models that simulate landscape conditions at a very large scale: much of the boreal forest from Manitoba to BC, and up into the Northwest Territories. Landweb models the preindustrial natural range of variation of a landscape, and then compares that with the current state or future management scenarios. This is still a relatively new tool; one purpose of this project is to bring government and industry forest managers into alignment on how to interpret and use this information.

Another purpose is version control. The suite of models is open-source, with dozens of developers contributing from universities and governments across the country. This has been a major strength, but without coordination and clear management, there is a risk of confusion over different configurations and model versions. A user group of forest companies, the Government of Alberta, and the model's developers are working to standardize model versions and inputs, and to agree on how to interpret the outputs.

They have also set priorities for future work on Landweb to make the model more useful and the outputs more reliable, particularly regarding how it simulates fire spread in certain areas like wetlands. They are also exploring integration with Traditional Ecological Knowledge. Updates are tested and released approximately quarterly, with significant version upgrades every two or three years. The third major version is in its final stages of testing.

Previous model runs have been done for each Forest Management Area so that forestry companies can demonstrate whether their plans will bring them closer to their FMA's natural range of variation. Once the latest version of Landweb has been debugged, the team can re-run the simulations, and in addition to updating the reports for each FMA, the team will also model caribou ranges to see which ones are within Environment Canada guidelines. New areas can also be modeled as new partners join the user group.

Post-disturbance Stand Type Shifts

ACTIVE

Burnt stands go through several different stages of regeneration but, after many decades, will typically have similar plant and animal communities as before the fire, completing a cycle that has repeated for thousands of years. But occasionally, fire is a trigger for a stand to begin a new trajectory. An exceptionally large, intense fire might overcome the intrinsic resilience of an area, or perhaps the climate has shifted enough so that some regions are now more suitable for different communities.

Using pre- and post-fire aerial imagery of 139 historical fires, this project is unpacking when and why fires cause a shift in stand type. In 2024, Dr. Ghehi began the analysis at the University of Alberta, looking at how composition and structure changed decades after a fire. The analysis will be continued by Natalie MacMillen at the University of British Columbia, and will also examine the influence of climate and weather variability.

Exploring Aggregated Harvest in Woodland Caribou Ranges

COMPLETE

While much effort is going into emulating natural disturbance regimes by creating fire-like harvest patterns and achieving a landscape condition closer to its natural range of variation of forest age classes, there is an intermediate scale which is not being addressed. Wildfires tend to cluster in time and in space – the largest proportion of wildfire disturbance happens in just a few fires in the 10,000 hectare range, in a single severe fire season. In contrast, forest harvesting tends to be done in small patches scattered around the landscape. This unnaturally dispersed pattern of disturbance requires more road construction and restoration, and a greater amount of fragmentation and forest edges.

One key insight from the modeling exercise was that different areas have very different costs and benefits to clustering disturbance. When forest harvesting is clustered together and excluded from large areas of the landscape, the harvests inevitably have to include some areas that have a poorer yield because some of the stands are younger, or the mix of tree species isn't ideal.

To explore a different approach, Andison worked with Tom Moore of Spatial Planning Systems to develop a new tool within the Patchworks model. This project for the Alberta Regional Caribou Knowledge Partnership created new rules that clustered harvested blocks in different ways and calculated the effects on ecological indicators relevant to caribou such as proportion of old growth and road densities, as well as economic indicators such as how much mature timber was left unharvested, and how many kilometers of roads would need to be built.

One key insight from the modeling exercise was that different areas have very different costs and benefits to clustering disturbance. When forest harvesting is clustered together and excluded from large areas of the landscape, the harvests inevitably have to include some areas that have a poorer yield because some of the stands are younger, or the mix of tree species isn't ideal. How significant of a cost this is depends on the region. Similarly, the benefits to caribou will depend on how good the habitat is in the areas away from the aggregated harvest. This past year, the modeling work wrapped up, and a report, summary, and webinar were delivered for the ARCKP.


Parker Makkreel

Water and Fish

Dr. Benjamin Kissinger and his collaborators are publishing results as the Water and Fish Program's first projects wrap up, and there are just enough new research questions to keep the team bankfull. New projects provide one kind of excitement; another comes when the projects start to intersect, informing one another and unlocking new possibilities. A few examples that are happening now:

Water temperature data and successful fertilized egg translocation experiments will contribute to a new bull trout conservation project in Fall Creek. Lab work on bull trout is helping to relate water temperature data to fish health, allowing the team to more accurately predict suitable habitat all along the eastslopes. The long-term datasets from the Southern Rockies Watershed Project provides the reference conditions so change can be measured from human or natural disturbances.

The speed with which the program launched projects three years ago, when Dr. Kissinger took the helm, reflected the urgent situation for fish populations that have declined, and an eagerness from partners to support this work. As they analyze their data, the team has been sharing results with just as much urgency. In the past year, Kissinger and his collaborators have published several reports, papers, scientific presentations and graduate theses.

In addition, the team along with Dr. Uldis Silins' lab hosted a fall field tour in the Crowsnest Pass to showcase results from the Southern Rockies Watershed Project. The scientists guided partners from governments, industry, and the local watershed council on a journey down the Crowsnest River from mountain headwaters to cattle country. Along the way, the group discussed the monitoring work done to understand where different flows and pollutants were entering the system.

Along with doing data collection and analysis, outreach, and administering his program, Dr. Kissinger also continues to co-supervise graduate students at the University of Calgary and University of Laval, serve as the President of the Mid-Canada Chapter of the American Fisheries Society, develop new project proposals, and represent fRI Research at scientific conferences.

Fall Creek Bull Trout Recovery Project

NEW

Southwest of Rocky Mountain House in Fall Creek, a small population of native bull trout is at risk from cumulative effects in the area. With Freshwater Conservation Canada leading efforts to inspect and reclaim undesignated stream crossings in the area, Fall Creek was chosen by a coalition of fish scientists for a first-of-its-kind in Alberta: bull trout range expansion stocking. The group is composed of ourselves, the Alberta Conservation Association, departments of the federal and provincial governments, Freshwater Conservation Canada, and

West Fraser, which sponsored funding for the project through the Forest Resource Improvement Association of Alberta.

Range expansion stocking reduces the risk of local extirpation for small fish populations by establishing a new sub-population in a previously unoccupied part of their range. At Fall Creek, bull trout have been limited to the lower reaches by a large waterfall, leaving the upper section of this watershed naturally fishless. The Fall Creek project team is working to establish a new sub-population of bull trout above the waterfall.

In 2025, we analyzed data from temperature dataloggers, installed by FCC, to confirm that it is suitable bull trout habitat and help select good sites for the translocation. This enables the team to move fertilized eggs and hatchery-reared fry to upper Fall Creek in 2026. The Water and Fish Program's Sam Chevalier will be doing a Master's project tracking the effectiveness of the egg transfer. Successful methods could be replicated at other appropriate locations.

Modeling applications to guide forest management in the eastern slopes

NEW

Two decades ago, the GIS and Grizzly Bear Programs worked with partners in government and industry to build a suite of tools for creating management scenarios and seeing the effects on grizzly bears (see page xx). A decade ago, the Healthy Landscapes Program created a different simulation tool called Landweb for comparing current and potential future forest conditions with the area's natural range of variation (see page xx). Now we're bringing together a team to create an application that lets managers input a potential industrial disturbance and see the effects on critical hydrological values.

In addition to the hydrologists, led by Drs. Ryan MacDonald and Kim Green, the team also includes scientists from government and industry who are helping to provide input on the available data and what the most useful parameters to model will be. After a series of such meetings to set the project scope, the science team held a workshop at the University of Alberta in March 2026. Work will proceed watershed by watershed, beginning with the North Saskatchewan.

The speed with which the program launched projects three years ago, when Dr. Kissinger took the helm, reflected the urgent situation for fish populations that have declined, and an eagerness from partners to support this work.

Assessment of Forestry Stream Crossing Effects on Water Temperature

ACTIVE

This project is part of a broader effort to identify and characterize habitat for cold-water fish species (see "Water Temperature Monitoring" below). It focusses on the effect of bridges and culverts on local stream temperatures. There are tens of thousands of these stream crossings along the eastern slopes, with potentially important changes to the amount of shade a stream has, its flow, and changes to the streamside vegetation.

In phase 1, we deployed temperature loggers at 20 sites. A preliminary analysis performed by Drs. Dan Moore and Ryan MacDonald found that streams that had a thermal response tended to be under 3 m across, from bank to bank. Phase 2 expands the number of sites and will gather 3 years of data to ensure that the results are more generalizable.

Assessment of Potential Changes in Bull Trout within the Kakwa Watershed Over the Past 20+ Years: Influence of anthropogenic activities on fish occupancy

ACTIVE

A 2005 study found a 24–43% decline in bull trout occurrence in the Kakwa Watershed and attributed it to forestry activities. However, there are other important landscape changes that

Parker Makkreel

were occurring at the same time, and might have contributed to bull trout distribution, as well as the natural ecological distribution of the species. This multi-year project examines how all the different land-use activities in the past two decades have affected fish populations, in particular bull trout.

In 2023 and 2024 our team, together with collaborators from Fisheries and Oceans Canada, Alberta Environment and Protected Areas, the University of Calgary, and the University of Manitoba re-visited all 172 sites to quantify the populations in each section of the watershed. This created a long-term, spatially distributed dataset spanning nearly 30 years, providing a rare chance to relate fish population change to changes in forest cover, oil and gas exploration, regeneration and reclamation.

In 2025, while manuscripts were in preparation, the team did an additional survey of the watershed's headwaters to confirm a small but apparently self-sustaining population of salmonids – non-native rainbow trout – as well as the availability of suitable, undisturbed habitat for a potential bull trout conservation translocation.

The Effect of Thermal Stress on the Physiology of Juvenile Bull Trout

ACTIVE

To accurately model bull trout habitat, we need to know what temperatures they need to thrive. Research from the United States found that temperatures should be below 15 degrees to be optimal for bull trout; this project will determine if that is accurate for Alberta populations.

Dr. Analisa Lazaro-Côté at the University of Manitoba had previously determined thermal stress levels of fish kept at different temperatures in the lab. They did this by swabbing the fish's mucous layer and measuring the levels of molecules that are produced in response to thermal stress. Lazaro-Côté and our team used the same methods on fish from our Kakwa survey (see previous project) and the Nahanni River in the Northwest Territories, which serves as a relatively undisturbed, reference watershed. The lab work and analysis are in progress.

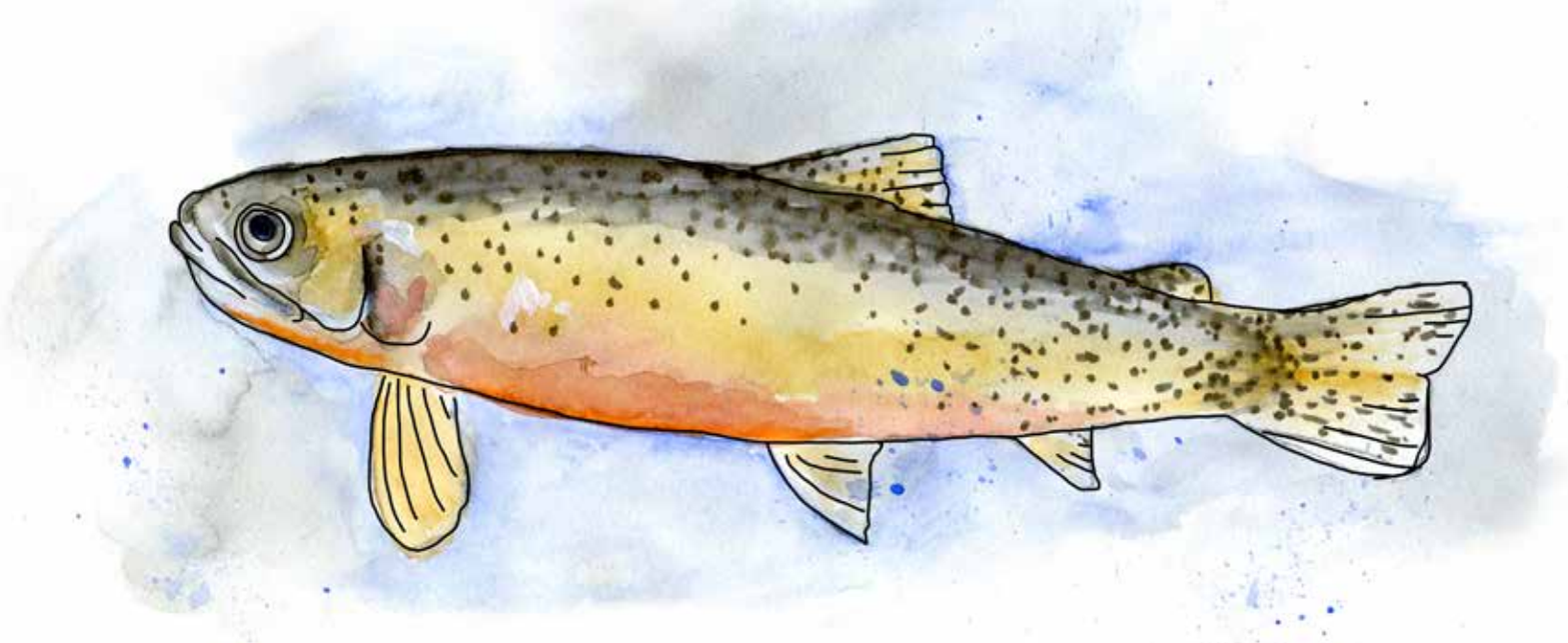
Using Remote Sensing Tools to Enhance the Recovery of Alberta's Native Trout in the Eastern Slopes

ACTIVE

Forestry companies have surveyed their management areas with lidar and use the data to try to describe the forest cover to aid in harvest plans. This Lidar data can also be used to predict where a stream exists on the landscape. To date, provincial and national stream layers were created with broad, low-resolution Lidar data, but now we have the opportunity to incorporate higher resolution Lidar from forestry companies to better predict where rivers – and critical habitat – exist on the landscape.

The higher resolution virtual watershed will be populated for every Forest Management Area in the eastern slopes from the US border to Grande Prairie, and predict the class of each stream: permanent, semi-permanent, intermediate, etc. These improvements allow for better operations and management around Alberta's streams and enable researchers to answer more complex questions.

Development of the modeled stream network will be led by Dr. Lee Benda of Terrainworks, the creator of the older, but still widely used, NetMap GIS product. The modeling work is now nearing completion.



Water Temperature Monitoring in the Eastern Slopes to Aid in the Recovery of Native Trout Populations

ACTIVE

The Water and Fish Program has created a stream temperature monitoring network capable, for the first time, of modelling surface water temperature in Alberta's entire eastern slopes. This can identify which watersheds have the most thermally-suitable habitat for species such as bull trout, Arctic grayling, westslope cutthroat trout, and Athabasca rainbow trout. It will also help forecast which watersheds are most vulnerable to climate change and assist resource managers in selecting areas for recovery actions and protection.

Since early 2023, we have been iteratively identifying data gaps, deploying temperature loggers in priority streams, quality controlling every data point, and rerunning the MacHydro models to target the next deployment of loggers. In the past 3 years, we and 15 collaborators have collated various historical data sets and collected new data from about 3,000 unique locations.

The Southern Rockies Watershed Project: Impacts of Forest Management Practices and Severe Wildfire on Water Quality, Flow Regimes, Flooding and Aquatic Habitats

ACTIVE

This is a multi-decade, interdisciplinary project led by Dr. Uldis Silins at the University of Alberta. It began as a study on the effects of the 2003 Lost Creek wildfire and subsequent salvage logging in the South Saskatchewan River basin. But during the following years, other wildfires, historic floods, industrial disturbances, and even an accidental fire retardant dump, played out in the study area. Each provided the research team with a unique opportunity to collect data that could be compared to what they had measured before each event.

As a result, the long-term dataset is able to answer a very rare range of questions, at a watershed scale. To achieve this, Silins has brought together experts in headwater hydrology,

disturbance ecology, large basin-scale river processes, water treatment engineering, and socio-economics. While the lab continues to collect data to follow each event from disturbance to recovery, the focus of the Southern Rockies Watershed Project has increasingly turned to sharing findings, through publications and field tours, on several vital topics.

One major set of research findings came out of the 2017 Kenow wildfire, which burned over 35,000 hectares. The team tracked the recovery of the area's hydrology, water quality, and aquatic ecology there and elsewhere in the watershed where three different forest harvest strategies were being tested. The research compares these disturbances and examines how such disturbances can be compounded by subsequent events. For example, the fire exposed contaminants that were then pulled down by floods, which are themselves more severe after wildfires. Some of the publications in the works look at changes to the watershed's nitrogen cycle – critical for the entire food chain of the system – that was affected by the fire, a Master's

thesis on water temperature effects, a paper on sediment levels after harvest, and a paper on how harvest affected the water yield and timing of the spring freshet.

The group is also studying cumulative effects from forestry, mining, recreation, agriculture, and municipal development from the headwaters of the Crowsnest down to the flats. Each disturbance contributes different levels of different contaminants, such as sediment or selenium, to different parts of the watershed. Unpicking the effects is the first step to identifying mitigation measures and better operating practices. To do this, the team continues to monitor many parameters such as snowpack, levels of selenium and other heavy metals, and nutrients such as nitrogen.

When an aircraft accidentally dropped a load of ammonium polyphosphate fire retardant into North Racehorse Creek- essentially a fertilizer- it delivered a massive spike in phosphorous, a limiting nutrient, that bound to the streambed sediment and caused surprisingly long-term effects. The strongest impacts occurred almost immediately, within 1 km of the drop. But even a year later, phosphorous was still elevated up to 6 km downstream.

Finally, the group is sampling for PFAS, a class of extremely long-lasting synthetic molecules that are widely applied to cooking and outdoor gear, and are showing up in municipal drinking water. The team's goal is to determine how PFAS is entering our water and in what levels.

Synthesizing Available Data and Traditional Knowledge into Recommendations for Arctic Grayling Recovery

ACTIVE

According to the Alberta Fish Sustainability Index, Arctic grayling populations have declined by 70% since 1960. Some factors that have aided in this decline are angling pressure, habitat degradation and fragmentation, and increasing water temperatures. The lack of an action plan and political consultation with the original stewards of the land has led to increased habitat degradation and fragmentation within the Swan River watershed. This decrease in Arctic grayling population led to a zero harvest limit across the province, and therefore the loss of a treaty right to members of Swan River First Nation.

Swan River First Nation has conducted monitoring activities such as grayling habitat surveys, eDNA sampling, stream temperature monitoring, stream crossing assessments, and creating the Swan River Watershed Initiative. Phase 1 of this project began by collating existing data collected by Swan River First Nation regarding Arctic grayling and Traditional Knowledge within the community into a data summary report. This report provided remediation strategies to mitigate land use impacts and the next steps in recovering the Swan River Arctic grayling population.

In 2025, Elders and other community members discussed the report and created a plan for phase 2, which will include reassessing Arctic grayling abundance today, the barriers to fish movement that still exist in the watershed, and evaluate which factors on the landscape influence Arctic grayling occurrence and abundance. We'll also continue the discussions to gain a better understanding of what past Arctic grayling populations looked like in the Swan River watershed.

Associations

fRI Research serves as the coordinating organization for five associations. We help with common administrative functions such as human resources and information technology to avoid redundancy and reduce everyone's operational overhead. We also serve as a liaison to help connect these groups to our partners in academia, government, industry, and NGOs.

Beyond this assistance, each association conducts their activities independently to fulfill their separate mandates.

Alberta Regional Caribou Knowledge Partnership

Since 2020, the ARCKP is funded by the Forest Resource Improvement Association of Alberta (FRIAA) through the support of forestry companies in Alberta to address region-specific knowledge gaps in woodland caribou ecology. The ARCKP is governed by a steering committee of government and industry representatives who oversee the allocation of ARCKP funds and guide the operation of the partnership. Their goals include:

- creating a forum for discussion and identification of woodland caribou issues and solutions
- providing industry with science-based recommendations that can be tailored to their region
- funding research advances Alberta's forestry practices and woodland caribou management
- facilitating the implementation of science-based caribou habitat management solutions through knowledge exchange

For more information, visit arckp.ca

Foothills Landscape Management Forum

Over the past 20 years, the FLMF provides the governance structure for energy and forestry companies and government to reduce industrial impacts through integrated land management. The Aseniwuche Winewak Nation is also a member of the FLMF and through the forum, manages:

- The Caribou Patrol Program, which works to reduce caribou mortality in the AWN's traditional territory through highway patrols and education.
- Traditional land use studies that formally document the AWN's culturally significant sites to preserve them from future disturbance.
- Participation in the INOQOM Education Project, an Indigenous education program for local schools.

For more information, visit flmf.ca and cariboupatrol.ca

Foothills Streamcrossing Partnership

Established in 2006, the FSCP consists of 25 industry partners that coordinate efforts to inventory, monitor and repair stream crossings across Alberta. This has resulted in an online database of over 33,000 inspections of 13,500 industry owned stream crossings. Through collaboration with other crossing owners in the watershed FSCP members can plan to fix fish barriers in a sequential order moving up the watershed and address sedimentation problems from the top of the watershed down. The result is efficient use of resources while encouraging dialogue between stakeholders and regulators so that surrounding concerns in the watershed are taken into consideration.

The FSCP has reconnected over 1,855 kilometres of fish habitat through the inventory and remediation of 740 stream crossings. 75% of the barriers mitigated were in watersheds with Critical Habitat for SARA listed fish species.

For more information, visit fscp.ca

Forest Growth Organization of Western Canada

FGrOW conducts much of the growth and yield research in western Canada by bringing together the forestry industry, the Governments of Alberta and Saskatchewan, the Canadian Forest Service and the University of Alberta. By facilitating cooperation and communication within the industry and with researchers and regulators, FGrOW is able to coordinate research efforts, improve efficiency, and make large collaborations possible.

FGrOW also builds scientific and operational capacity among its members through training, field tours, webinars, and tech transfer. Under the FGrOW umbrella, the Foothills Pine Project Team, Mixedwood Project Team, Policy and Practice Project Team, and the Western Boreal Growth and Yield Association contribute unique expertise, while drawing on the strengths of the other project teams.

For more information, visit fgrow.ca

SERG-International

SERG-I is a forest pest management consortium with the mission of improving pest management methods and technology. By bringing together land managers, regulators, researchers, and forest technology suppliers to coordinate their work, SERG-I makes research and collaboration more efficient and cost-effective. Their main activity areas are:

- Testing the efficacy of pest management products
- Improving application methods
- Studying their environmental impacts
- Developing practical strategies for pest management
- Knowledge and technology transfer through workshops and meetings

For more information, visit serginternational.org

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