How does RESEARCH GROW Into PRACTICE?

2013-2014 Annual Report

foothills
RESEARCH INSTITUTE
Research Growing Into Practice

Crisia Tabacaru putting up an emergence trap to capture subcortical insects, such as bark beetles, that are emerging from under the bark

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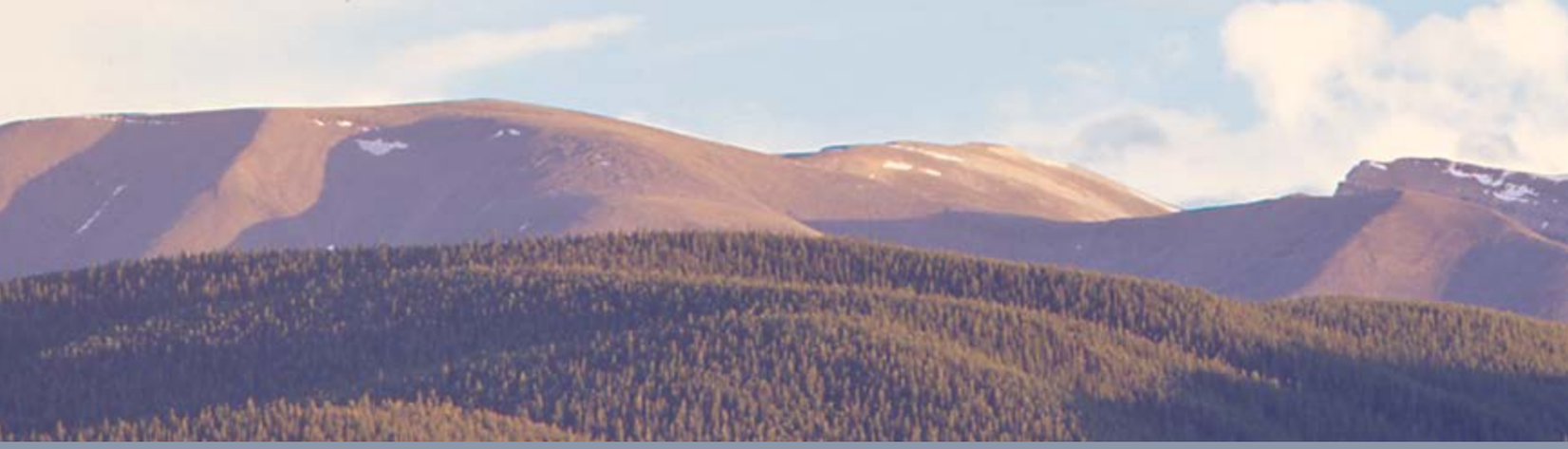


Message
FROM THE PRESIDENT

DR. RICK BONAR | PRESIDENT

fRI achieves "Research Growing Into Practice" through a unique business model that brings together partners who have questions and researchers who strive to answer them. The process requires collaboration between the partners, who must make management decisions, and the scientists, who provide the information. This keeps the two groups joined at the hip—the knowledge is current, relevant, and delivered to partners in forms that help them make good management decisions on their land base.

We know our approach works because we have many long-term partners who keep coming up with new questions and the funds to get the answers. We also attract new partners and continue to develop new areas of investigation responsive to partner needs. As president of an organization driven by the knowledge needs of our partners, I can't think of a better endorsement than partners who continually open their wallets to pay for more knowledge.

Adding up the "Into Practice" side of fRI is a little trickier. Partners don't usually say, "This is how I used the knowledge." We have to ask them or do some looking to see the applications. Here are just two examples:

- Most forest management planning in Western Canada now follows the ecosystem-based management approach informed by the Healthy Landscapes Program. Among other things, that means that managed forests will always have areas of old forest similar to what Mother Nature would have produced.
- In the Berland Smoky area of west-central Alberta, fRI partners figured out how to reduce the future road network by 30% or more compared to the network that would have been built with the more traditional approach. This will save money and reduce cumulative effects on water and species such as grizzly bear and caribou. Extensive fRI knowledge is woven into that initiative, and it is still growing.

I hope these examples encourage you to explore the exciting achievements described in our annual report, and to contact fRI and our partners to learn more.

Message
FROM THE GENERAL MANAGER

For the past year, much of my activity has been directed and guided by fRI's five-year business strategy. As we are now halfway through that period, it is a good time to review our progress and chart the path forward to ensure the goals and objectives outlined in the strategy are realized. This document, sanctioned by the Board of Directors, will help keep us at the cutting edge of innovative science-based research supporting decisions and policy improvements for resource development.

Scientific excellence is the backbone of our organization. A significant commitment in the business strategy is the creation of a Science Committee. It will provide wise oversight to the Board by ensuring fRI's research continues with a sound scientific underpinning. The committee is currently under development, and I look forward to its formation and contribution.

Collaboration is key to success in any organization. Here at fRI, it occurs at several levels: between program leads, researchers, and partners. Arguably, the strength and success of fRI is directly related to how effectively we collaborate. The first step is communication, and to this end, a workshop was held at Hinton Training Centre's Peter Murphy Cabin at the Cache Percotte during two snowy days in March 2014. It was an opportunity for program leads, researchers, and association directors to take time out of their busy lives to understand the work of their colleagues and find opportunities to work together on upcoming projects.

As our organization grows and expands, I have focused on ensuring we are properly served through a good policy structure that is accessible, clear, and relevant. Also, we continue to build our safety plan and program, which will promote a safe work environment for all staff.

Being an ambassador of fRI is a vital aspect of my role as general manager. Delivering on one of the goals in the business strategy, I have worked to raise awareness of fRI by demonstrating our value to other organizations across the spectrum of industry, government, and academia. My aim is to initiate new partnerships and investment relationships that will continue to build upon our 22 successful years as a research organization.

As general manager, I have spearheaded several projects to improve this organization, but it is only through the collaborative effort and intelligence of our researchers and staff that we have made such progress. As I approach completion of my second year as general manager, I continue to be impressed by the dedication and passion of the people who work within fRI. It is inspiring—and it is the reason for our continued and considerable success.

BILL TINGE | GENERAL MANAGER

Partners

Partnerships are the foundation and lifeblood of fRI. Through the contributions and actions of partners, issues are identified and analyzed, resources are assembled, and new knowledge is created, transferred, and integrated into land and resource management in Alberta and beyond. fRI would not be as strong today without our partners' commitment, and we are honoured to have their contributions in any form.

Shareholders

Alberta Environment and Sustainable Resource Development; Alberta Tourism, Parks and Recreation; ConocoPhillips Canada; Jasper National Park of Canada; Suncor Energy Inc.; Talisman Energy Inc.; West Fraser Mills Ltd. and Weyerhaeuser Company are shareholders of fRI.

Management Partners

Management partners provide financial and in-kind support to fRI. They are also responsible for land, resource, or forest management, and are interested in using fRI knowledge and tools in their businesses.

Ainsworth Engineered Canada
Alberta Environment and Sustainable Resource Development (Land-use Secretariat)
Alberta Newsprint Company
Alberta Pacific Forest Industries Inc.
Apache Canada Ltd.
Banff National Park of Canada
Blue Ridge Lumber Inc., a division of West Fraser Mills Ltd.
BP Canada Energy Company
Canadian Natural Resources Limited
Canfor Corporation
Daishowa-Marubeni International Ltd.
Devon Canada Corporation
Edson Forest Products, a division of West Fraser Mills Ltd.
Encana Corporation
Fisheries and Oceans Canada
Foothills Forest Products Inc.
Government of British Columbia (Environment; Forests, Lands and Natural Resource Operations)
Government of Northwest Territories (Environment and Natural Resources)
Government of Saskatchewan (Environment)
Grande Cache Coal Corporation
Husky Energy Inc.
Manning Diversified Forest Products Ltd.
Millar Western Forest Products Ltd.
Paramount Resources Ltd.
Pembina Pipelines
Progress Energy Resources Corp.
Shell Canada Limited
Sherritt International Corporation (Coal Valley Resources Inc.)
Slave Lake Pulp, a division of West Fraser Mills Ltd.
Spray Lake Sawmills
Sundre Forest Products, a division of West Fraser Mills Ltd.
Teck Coal Limited (Cardinal River Operations)
Tolko Industries Ltd.
Tourmaline Oil Corp.
TransCanada Corporation

Program and Project Partners

Program and project partners provide financial and in-kind support to specific programs or projects. These organizations believe in and support fRI.

Alberta Aboriginal Relations
Alberta Agriculture and Rural Development
Alberta Conservation Association
Alberta Environment and Sustainable Resource Development (Hinton Training Centre)
Alberta Innovates – BioSolutions
Alberta Lottery Fund
Alberta Professional Planners Institute
Alberta Riparian Habitat Management Society (Cows and Fish Program)
Arctos Ecological Consulting
Aseniwuche Winewak Nation of Canada
Athabasca Watershed Council
Bandaloop Landscape-Ecosystem Services
British Columbia Institute of Technology
Canadian Association of Petroleum Producers
Canadian Cooperative Wildlife Health Centre
Climate Change and Emissions Management Corporation (CCEMC)
Earth Systems Institute
Environment Canada (Canadian Wildlife Service)
F.C. Pollett Inc.
Foothills Ojibway Society
Forest History Association of Alberta
Forest Resource Improvement Association of Alberta
FOLLOWIT
FORCORP
FORREX
GeoConnections – Government of Canada
Habitat Stewardship Program
Human Resources and Skills Development Canada (Canada Summer Jobs)
Millenium EMS Solutions
Mistik Management Ltd.
Mixed Wood Management Association
National Sciences and Engineering Research Council of Canada (NSERC)
Natural Resources Canada, Canadian Forest Service (Canadian Geological Surveys; Northern Forestry Centre; Pacific Forestry Centre)
Northern Rockies Tourism Alliance
Norwegian University of Life Sciences
Oldman Watershed Council
Peregrine Helicopters
Peter J. Murphy Forest Consulting Ltd.
Robert Stevenson
Scandinavian Brown Bear Project
Tom Peterson
University of Alberta
University of British Columbia
University of Calgary
University of Saskatchewan
University of Victoria
Vilhelmina Model Forest
Wildlife Genetics International
Wilfred Laurier University
Yellowhead County
Yellowhead to Yukon Conservation Initiative

Other Partners

The following associations, businesses, and communities support fRI's vision and goals.

Alberta Chamber of Resources
Alberta Forest Genetic Resources Council
Alberta Forest Products Association
Alberta Provincial Biodiversity Monitoring Institute
Alberta Stewardship Network
Canada Centre for Remote Sensing
Canadian Institute of Forestry (Rocky Mountain Section)
Canadian Model Forest Network
Climate Change Central
College of Alberta Professional Foresters
College of Alberta Professional Forest Technologists
Conservation Biology Institute
Council of Forest Industries
Defenders of Wildlife
EMEND (Ecosystem Management Emulating Natural Disturbance) Project
Ember Research Services Ltd.
Forest History Society, Durham, NC
Forest Products Association of Canada
FP Innovations (Wildfire Operations Research)
Golder Associates
Grande Yellowhead Public School Division
Greenlink Forestry Inc.
Hinton Fish and Game Association
Hinton Historical Society
Inside Education
Integrated Ecological Research
International Model Forest Network
Jasper-Yellowhead Museum and Archives
KBM Resources Group
Laval University
Municipality of Jasper
NAIT Boreal Research Institute
Nature Conservancy of Canada
NatureServe Canada
Ontario Ministry of Natural Resources and Forestry
Palisades Stewardship Education Centre
Petroleum Technology Alliance Canada
Silvacom Consulting
Sustainable Forestry Initiative
TECO Natural Resource Group
Tourism Jasper
Town of Edson
Town of Grande Cache
Town of Hinton
Trout Unlimited Canada
University of Montana
University of New Brunswick
University of Waterloo
Wildlife Habitat Canada
Woodlands Operations Learning Foundation
World Wildlife Fund Canada

Sylvie's Photography

International Collaboration with Washington State University: Phase Three, Grizzly Bear Health

Researchers at fRI are collaborating with the Washington State University Bear Centre to learn whether grizzly bear diet can be determined through analysis of hair. Earlier this spring, captive bears in Washington were fed reindeer meat for one month. Each week, a seven-by-seven-inch patch of hair was shaved and analyzed for stable isotopes.

Researchers want to determine whether a diet of reindeer (caribou) meat results in a unique stable isotope signature in grizzly bear hair, and if so, how long the signature may last. Once this initial test is completed, 400 pounds of moose meat will be fed to the bears, followed by 400 pounds of elk meat, in order to establish signatures in the hair samples for each type of ungulate. The results from this controlled population of bears will help in understanding the diet and overall health of bears in the wild.

Hair will also be used to examine stress and reproductive hormones. With this knowledge, energy consumption can be connected to reproductive health. Also included in this project is access to an extensive dataset of grizzly bear information generated from the Scandinavian Brown Bear Project (SBBP). Created in northern Sweden in 1984, SBBP has completed 30 years of grizzly bear research and has been collaborating with fRI for four years. Its work on recovering a grizzly bear population in a working forest environment includes a vast amount of data about the physical and reproductive health of hundreds of bears, which will be used to confirm information generated from the hair sample tests from Washington.

This project will further refine decisions about long-term conservation of grizzly bears in Washington, U.S.A.; Alberta, Canada; Norway; and Sweden.

Reindeer (Rangifer tarandus)

Moose (Alces alces)

Project of the Grizzly Bear Program

Can diet can be determined through the evaluation of stable isotopes in hair?

Bears will be fed

reindeer meat

moose meat

elk meat

3 research centres

3 different countries

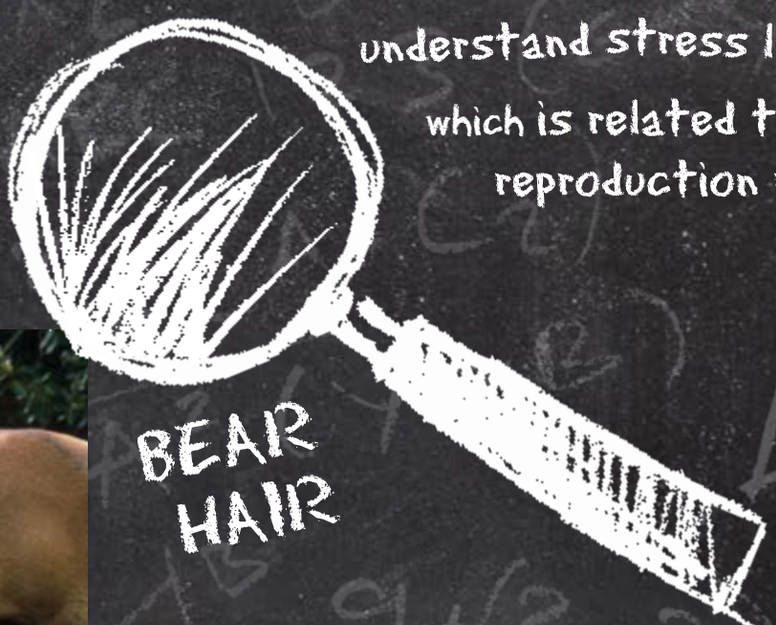
Washington State University Bear Centre in the U.S, The Scandinavian Brown Bear Project in northern Sweden, and fRI in Canada

3 purposes for testing hair

attempt to determine diet

assess grizzly bear growth

understand stress levels, which is related to reproduction rates



Elk (Cervus canadensis)

The Interaction of Prescribed Fire and Mountain Pine Beetle Populations

In Alberta, prescribed fire can be used as a silviculture tool to manage the extent to which lodgepole pine forest becomes host to mountain pine beetle (MPB), among other forest objectives. This four-year project has been analyzing current and seasonal changes to MPB populations in burned and unburned forest stands to understand whether they reside and breed in fire-injured trees more or less often than in healthy trees surrounding burned stands.

This research, directed by Dr. Nadir Erbilgin from the University of Alberta, project lead, includes determining whether prescribed burns will impact MPB population growth at the landscape level. It will quantify beetle populations in all study plots pre-fire, and make comparisons between burned and neighbouring unburned stands post-fire.

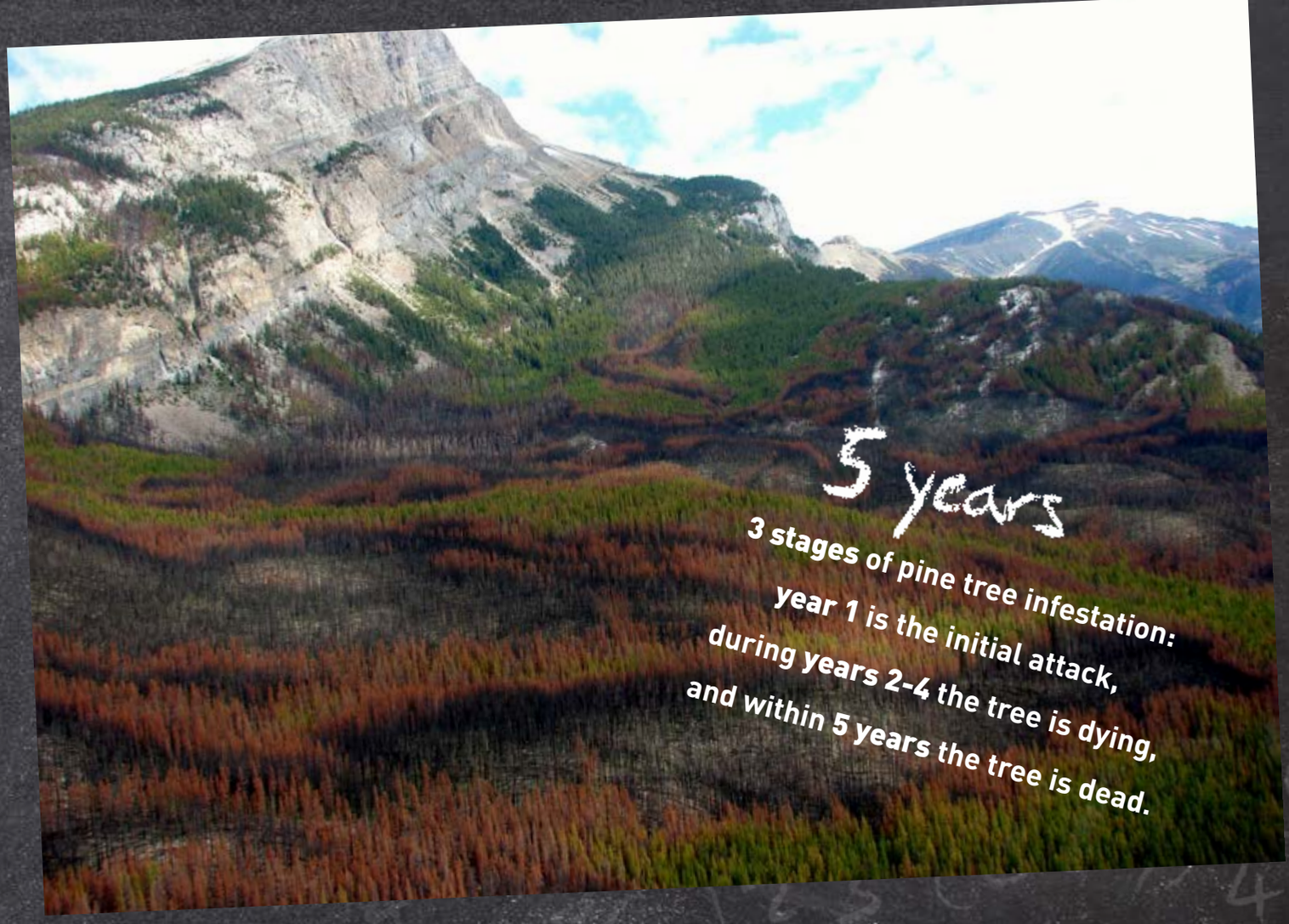
The research will evaluate fire damage on individual trees to develop a method of categorizing the severity of fire damage, and will examine fire severity indices and bark beetle attacks on burned trees to see whether there is a connection. It will assess the quality and quantity of MPB offspring coming from fire-injured trees, as compared to trees killed by MPB on unburned control stands.

Preliminary results show that fire-injured trees are preferentially colonized, but colonization is temporary, declining over four years post-fire. "We believe that reduced colonization in burned trees is due to post-fire tree mortality and negative interactions with the subcortical community," explains Crisia Tabacaru, project researcher and PhD candidate at the University of Alberta.

Slope, elevation, previous density of MPB, and other site-specific factors may also play a role in post-fire colonization of lodgepole pine trees. There is no evidence to suggest fire encourages MPB outbreaks; therefore, there is no reason to suspend the use of prescribed fires in lodgepole pine forests with endemic-level MPB populations. It is expected that this research will aid silviculturalists in prescribing fire for rehabilitation purposes since it will increase their knowledge of the risks of secondary attacks from MPB living in damaged trees at the periphery of the fire damage.

MPB pitch tube

Project of the Mountain Pine Beetle Ecology Program



5 years

3 stages of pine tree infestation: year 1 is the initial attack, during years 2-4 the tree is dying, and within 5 years the tree is dead.

19 million hectares

Mountain pine beetles have attacked over 19 million hectares of pine forest in western Canada to date.

This insect is doing damage in six sectors: severely impacted pine forests, disrupted communities, harmed forest industries, recreational use, watersheds, and plant and wildlife habitats.

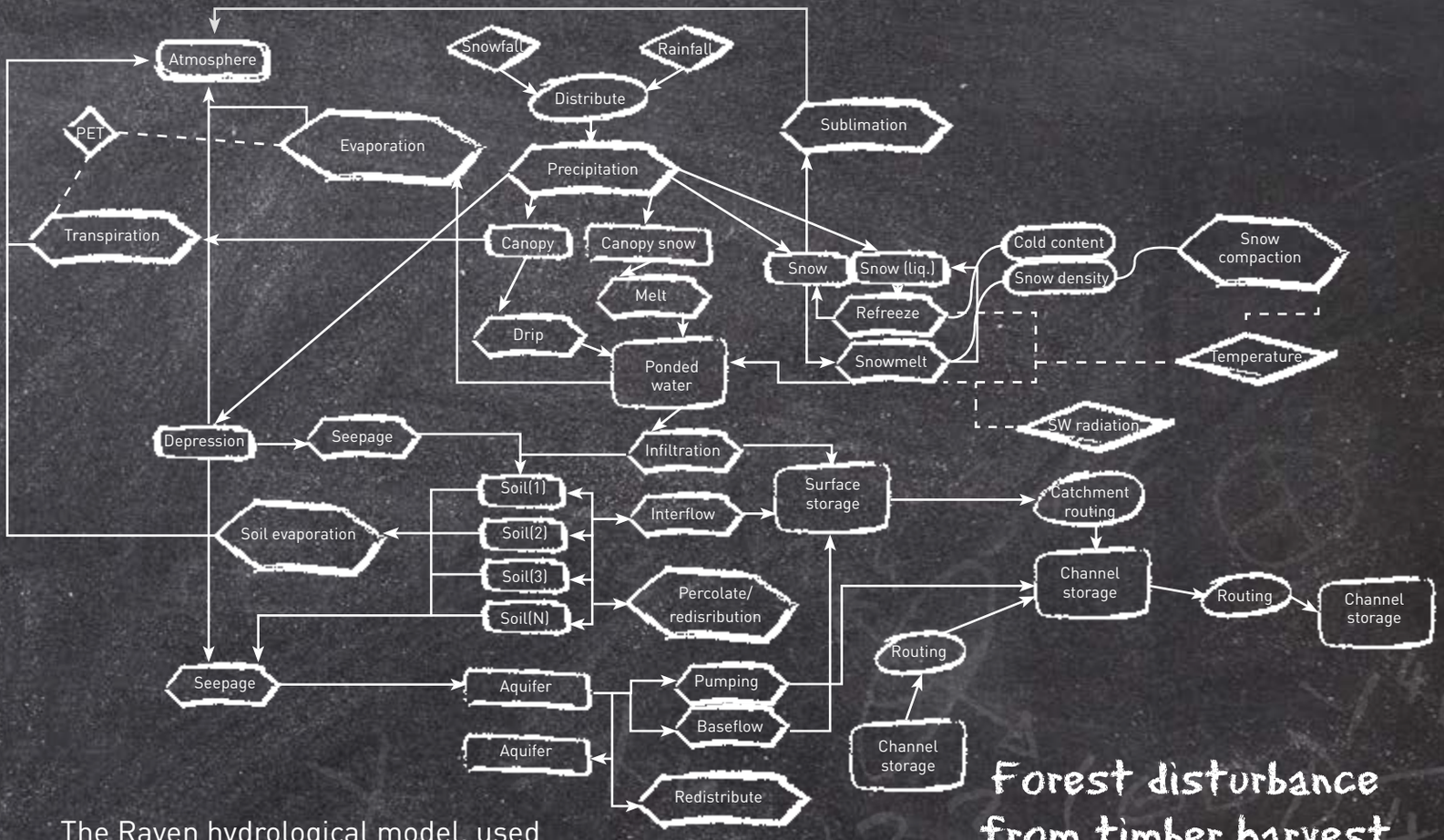
Southern Rockies Hydrological Modelling

Calibrating a hydrological model that can inform climate change projects and forest planning initiatives is the focus of this project. Designed to improve hydrological modelling tools for assessing changes to forests and the climate, the project uses a new modelling platform developed by Dr. James R. Craig and his team at the University of Waterloo. Called the Raven hydrological model, it assesses streamflow response to timber harvest. One strength of this model is its flexibility, as it can be customized to the data available.

Researchers seek to better understand how the forest harvest level within a watershed impacts watershed indicators, such as peak flow and timing. Developing a modelling platform for the entire region is not possible because of the limited data available in the area, the expanse, and the high technical skill needed to execute the work. This project is therefore establishing a methodology for using a well instrument to calibrate and customize the model. It aims to assess the relationship between harvest level and indicators of interest to stakeholders, based on 50 years of weather data. "The data is gathered from neighbouring gauging sites with hypothetical harvest scenarios," says Axel Anderson, Water Program lead. The results will quantitatively guide forest management where detailed assessments of hydrological risks are pertinent.

This modelling will be useful to forest hydrologists because they can apply it to similar watersheds in the area to quickly assess the probability that a forest harvest plan, or other disturbance, will impact watersheds. It is designed to aid policy makers, land developers, industry, and government.

Project of the Water Program



The Raven hydrological model, used in this project, has four major strengths: it provides complete flexibility in spatial discretization, interpolation, process representation, and forcing function generation.This hydrological model allows for the investigation into research issues addressing: discretization, numerical implementation, and ensemble simulation of surface water hydrological models.

50 years of weather data

Forest disturbance from timber harvest can influence the flow regime in 3 ways:

increase total flow

increase peak discharge

lengthen the duration of larger flows

The above information is from *Potential Effects of Timber Harvest and Water Management on Streamflow Dynamics and Sediment Transport*, a paper by C.A. Troendle and W.K. Olsen.

Foothills Fire, Water, and Climate

This project is focused on understanding the historical roles of low- to moderate-severity fires in the Canadian foothills and their relationship to climate, land use, and water quality. Many believe that the foothills have historically experienced mostly high-severity fires that killed most vegetation. The project tests an alternative hypothesis that low- and moderate-severity fires were historically intermixed over time with high-severity fires.

Researchers will aim to assemble a picture of fire frequency and severity over the last 2,000 years in the northern foothills and mountains. The field work includes collecting samples of tree rings and sediment cores from small lakes and ponds. Tree rings from both live and dead trees are valuable because they leave distinctive width patterns related to annual climatic conditions. They also store information on past fires by forming scars.

By measuring and cross-dating the tree ring data from hundreds of trees across large sample areas, estimates of fire years and fire severity can be made for the last 2 to 400 years. These dates are then cross-referenced to historical climate data to help understand how climate influences fire frequency and severity. Sediment cores similarly leave annual "rings" that can be traced back 2,000 years. The sediment within each annual layer includes any charcoal from the ash of forest fires, pollen from local vegetation, and dead microscopic algae. This physical record provides an opportunity to understand the relationship between fire frequency, water quality, and vegetation species patterns.

The data generated from this project will provide a more comprehensive understanding of how the ecosystem has evolved into the one that exists today. The animals currently living on the land, and critical factors such as water quality, have an intimate relationship to historical patterns of fire activity. If land management practices imposed on the land lead to patterns significantly different from historical patterns, there is a risk that those species and functions will not be sustainable. "Understanding the historical disturbance patterns also allows us to understand the historical landscape conditions through modelling," says Dr. David Andison, Healthy Landscapes Program lead. This modelling allows researchers to estimate the historical range of species habitat and water-quality levels. The research will also generate valuable knowledge about the level, and also the nature, of future wildfire risk due to climate change.

Project of the Healthy Landscapes Program

Alberta Innovates: Recovery and Long-Term Conservation of Grizzly Bears in Alberta

The *Alberta Grizzly Bear Recovery Plan 2008–2013* aims to secure the restoration of grizzly bear populations for future generations by understanding biology, population trends, and threats to the species, as well as providing an action plan for government, industry, conservation groups, landowners, and citizens to enact. Research in key areas has the potential to further strengthen the document. Current research at fRI includes developing grizzly bear population recovery targets from data about potential bear habitats and about the amount of energy bears require to survive. Researchers will also develop non-invasive techniques for monitoring grizzly bear mating, through hair sampling and hormone testing. This research includes accumulating data to incorporate nutritional landscape research into maps of grizzly bear habitat, and to track the impacts humans have on grizzly bear behaviour. The goal of this project is to provide science-based research for the newest version of the recovery plan, further contributing to an Alberta with healthy and naturally self-sustaining grizzly bear populations.

Sylvie's Photography

Research is focused on understanding 3 topics about grizzly bears:

biology

population trends

threats to the species

Project of the Grizzly Bear Program

Cold Tolerance of Mountain Pine Beetle: Implications for Population Dynamics and Spread in Canada

Climate is linked to MPB outbreaks and has been for decades. But beyond the fact that two to four weeks at –40 degrees Celsius will significantly reduce the survival of MPB, not much is known about variation in survival rates due to repeated exposure to cold weather of varying degrees of severity and duration. Also, more research needs to be done to understand the weather conditions in the spring and fall that cause the development or loss of cold hardiness.

This project will research lower lethal temperature thresholds for the different life stages of the MPB, and determine the effects of duration and intensity of cold on survival. It will also quantify cold acclimation needed during the fall for MPB to acquire maximum cold tolerance, and conditions in the spring that result in the loss of cold tolerance. This research will be done through controlled laboratory trials and complementary field sampling.

To estimate annual MPB population trends, spread potential, and areas at risk of invasion in the future in Canada, Dr. Katherine Bleiker (NRCan-CFS), project lead, explains, "We need to know how winter survival varies with different temperature scenarios."

This project will generate data to improve annual predictions of winter mortality and population trends, and refine the identification of areas at risk of MPB invasion in Canada, as well as develop ways to improve the existing U.S. MPB winter survival model so it can be applied to northern Alberta and the boreal forest. This project will also provide government, industrial practitioners, and policy makers with pertinent information to enhance operational tactics to fight the spread of the MPB, especially in novel environments.

how easily can it keep spreading?

how far can it go?

Alberta has about 6 million hectares of pure and mixed pine forests, about ¼ of which has been affected by mountain pine beetles.

Project of the Mountain Pine Beetle Ecology Program

In Alberta,
1.54 million hectares
have had some mountain pine beetle damage.

Aboriginal Involvement in Caribou Recovery Strategies

The Foothills Landscape Management Forum has collaborated with the Aseniwuche Winewak Nation (AWN) in Grande Cache to contribute to recovery efforts for woodland caribou in the region. Modelled after the "Caribou Cowboy" project that ran along Highway 40 south of Grande Cache for several years, the strategy aims to lower the number of vehicle collisions with caribou by keeping caribou off the roads, and to increase awareness of caribou management through education of the public. It will also collect data to aid in implementing landscape recovery projects. This collaboration was born of a concern for the safety and continued survival of the caribou.

The caribou are of particular significance, as they are a living connection to AWN's cultural heritage and traditional way of life. During the project, two crews, comprised of two members of the AWN, conducted patrols within a 100-kilometre radius of Grande Cache, Alberta. The patrols ran from mid-November 2013 to the end of March 2014 and were then extended for several weeks to accommodate the increased roadside sightings of caribou in several areas in early April 2014. This initiative reflects integrated land management values and priorities, and helps to manage the cumulative effects of industrial activities.

Chantelle Bambrick, project lead, explains, "The Caribou Patrol was established to contribute to recovery efforts for woodland caribou in our region by reducing the potential for vehicle collisions through periodic patrols and enhancing awareness of caribou management through education and outreach initiatives."

For the educational and outreach component, the Caribou Patrol EduKit was introduced. Three versions were created, one each for students, industry, and the general public, and they included pertinent information about caribou, threats to their safety, cultural significance, and resources for further reading. Through classroom presentations by AWN members, over 700 students were reached. Each student was given an EduKit along with bookmarks and stickers to help engage students' interest in caribou and encourage them to share information with friends and family, promoting further engagement within communities. The industry version was distributed to several large companies working in the area, and the public version was displayed in several tourist centres and attractions in the area.

The patrolling and outreach complement each other, and together succeed in educating people about the importance of caribou in west-central Alberta, while enabling members of the AWN to be actively engaged in on-the-ground work to improve the safety of caribou. This project will continue with patrols of the Grande Cache area and expects to reach 1,500 students within Jasper, Edson, Hinton, Grande Cache, and other surrounding areas in the 2014–2015 fiscal year.

How many caribou are there?

Herd	Population estimate	Year
Little Smoky herd	78	2011
A la Peche herd	88	2012
Redrock/Prairie Creek herd	127	2012
Narroway herd	96	2012

Project of the Foothills Landscape Management Forum

predators

people

habitat loss

Caribou have

6

types of threats to their survival

pollution

climate

insects

4 objectives

reduce the potential of vehicle collisions with woodland caribou

enhance awareness of caribou management

collect data on wildlife sightings

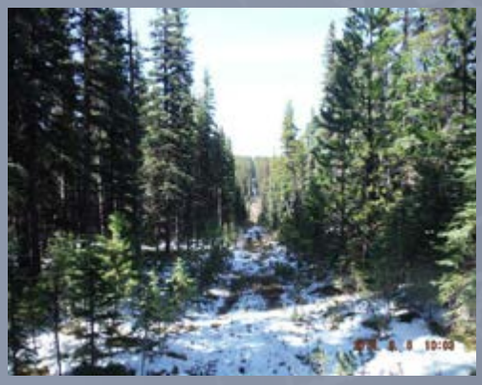
collect data on physical barriers that deter highway vehicles.

Analysis and Restoration of Seismic Cutlines in Southern Mountain and Boreal Caribou Range in West-central Alberta

The Caribou Program is studying how wolves, grizzly bears, and caribou respond to seismic lines at different stages of revegetation. The project is using animal GPS data; LiDAR-based remote sensing measurements of tree height, canopy cover, and terrain; and field-based terrain and animal use assessment to conclusively determine how revegetation height affects human and animal use of linear features.

Previous research has shown that wolves use seismic lines for movement, and there is some evidence that seismic lines may also act as travel corridors for grizzly bears. Seismic lines also reduce the amount of functional caribou habitat within caribou ranges as caribou tend to avoid linear disturbances by as much as 500 metres. To date, no research has incorporated revegetation height when assessing how caribou and their predators respond to seismic lines. This research will determine how much revegetation is needed on these seismic lines before caribou stop avoiding them, as well as how much vegetation is needed to stop caribou predators from using these linear features.

This project includes collaboration with the Foothills Landscape Management Forum, the Grizzly Bear Program, and ESRD, and includes sharing data with ESRD, the University of Calgary, the University of Alberta, and the University of Montana. Ultimately, this research will be used to help government range planners identify priority seismic lines to reduce incursion of predators within caribou ranges, and to increase caribou functional habitat to help support self-sustaining caribou populations for the future. Laura Finnegan, Caribou Program lead, presented preliminary results from this project at the North American Caribou Workshop in Whitehorse, Yukon, in May 2014.



Project of the Caribou Program

Studying how 3 different animals (wolves, grizzly bears, and caribou) respond to seismic lines

Gathering data in 2 different ways: LiDAR and field crews

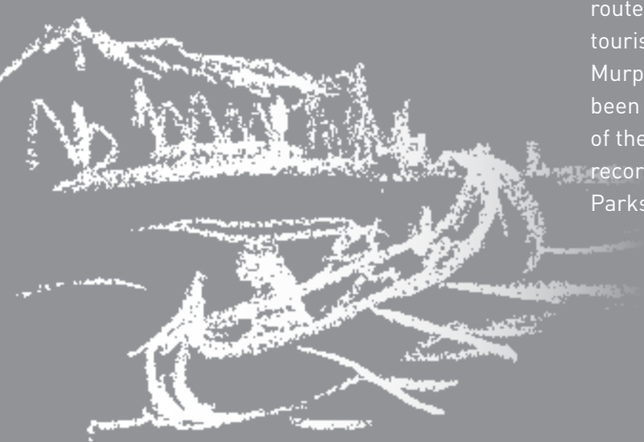
A main goal of this project is to identify priority areas for restoring caribou habitat to help enable self-sustaining caribou populations for the future.

The Historic Columbia Trail

The Columbia Trail was the 4,200-kilometre route of the Hudson's Bay Company (HBC) fur brigade that connected Hudson Bay to the Pacific Ocean at Fort Vancouver. The Columbia Express (westbound) and York Factory Express (eastbound) carried company letters, reports, important packages, and passengers on fast canoes that could complete the crossing in about three and a half months. The section of the route through Jasper was the major overland portage. HBC used horses to cross the Continental Divide between the Athabasca and Columbia rivers by way of Athabasca Pass. It was called *La Grande Traverse*, usually referred to locally as the Columbia Trail. Initiated by the North West Company with David Thompson's return in 1812, it continued to be used by the HBC after the two companies merged in 1821 until about 1853.

The Minister of the Environment designated the Columbia Express as a National Historic Event on July 19, 2011. The Columbia Trail is a route of high interest to historians, teachers, tourists, and local residents. Dr. Peter Murphy, Tom Peterson, and Karen Byers have been mapping this route by identifying parts of the original trails and reviewing historical records with assistance from Mike Dillon of Parks Canada and local volunteers.

Dr. Murphy, project lead, explains, "Those interested in its history seek opportunities to follow in the footsteps of the voyageurs." This project will make that much easier. It will include best estimates of the trail's locations plotted on satellite imagery, a record of GPS coordinates, and a written report with photographs. fRI will be contributing research and assistance through the Geographic Information Systems Program, led by Julie Duval, and the Forest History Program, led by Bob Udell.



Project of the Forest History Program

Growing Insights

The Alberta Land-use Knowledge Network (LuKN) was created as a resource for specialized and high-quality information about land-use issues. Growing Insights, LuKN's massive open online course (MOOC) about urban agriculture and local food, was a new way to do just that. In the fall of 2013, LuKN launched two versions of the MOOC, designed to provide curated content to two groups: the first version was aimed at the general public, and the second was used by the Alberta Professional Planners Institute (APPI) for professional learning credits.

The MOOC encouraged engagement by customizing participation. Those who enrolled decided where and when to learn and how much they wanted to contribute to discussions. Organized into four modules—economics, social, planning, and technology—the course included information about urban agriculture from the perspectives of consumers, farmers, teachers, and community advocates. It included success stories about the rapid growth of community gardens in Calgary and covered municipal planning issues relating to locally grown food as well as city-wide food plans, such as the "Fresh" food and agriculture strategy developed by the City of Edmonton.

Excellent registration numbers and detailed responses from participants showed that this was a topic of interest. Terri McHugh, Alberta Land-use Knowledge Network program lead, says, "We learned that if you tackle a topic that people are curious about and put in the effort to provide information they can't easily get elsewhere, you've got a winning formula." LuKN plans to create more knowledge-sharing opportunities in this format in the future.

123:

number of APPI members who registered for the planners' version of Growing Insights

342:

number of people registered for initial run of Growing Insights

75+:

number of videos related to urban agriculture and local food on landuseKn.ca

Project of the Alberta Land-use Knowledge Network

Grizzly Bears and Pipelines: Response to Unique Linear Features

Canada is one of the foremost oil-producing countries in the world, and oil and gas development has heavily influenced the landscape of Alberta. Limited research has been completed to assess the impact that oil and gas pipelines have on grizzly bears in Western Canada. As pipelines continue to be built, it is important to understand how bears respond to pipeline rights of way.

This project examined whether grizzly bears were using or avoiding rights of way and whether they were used as a means to acquire food or for easy travel. Results from this research showed that grizzly bears use pipelines significantly more than expected. "Bears were using pipeline rights of way for a range of foraging opportunities, with anting [digging up ant hills] as the most common activity," says Tracy McKay, project lead. Other bear foods abundant on pipelines include dandelions and clover. The fast movement of bears along the rights of way compared to other terrain suggests they use pipelines as movement corridors. This information is valuable for resource managers, as it will help them to understand and predict when and where grizzly bears may use the pipeline rights of way. These findings may also inform pipeline mitigation efforts to improve grizzly bear recovery efforts in Alberta.

2

significant potential consequences:

higher mortality risk to grizzly bears from humans

increase in grizzly bear predation on caribou

Project of the Grizzly Bear Program

Grizzly bears are using pipeline right-of-ways for 2 main purposes:

foraging

movement

Sylvie's Photography

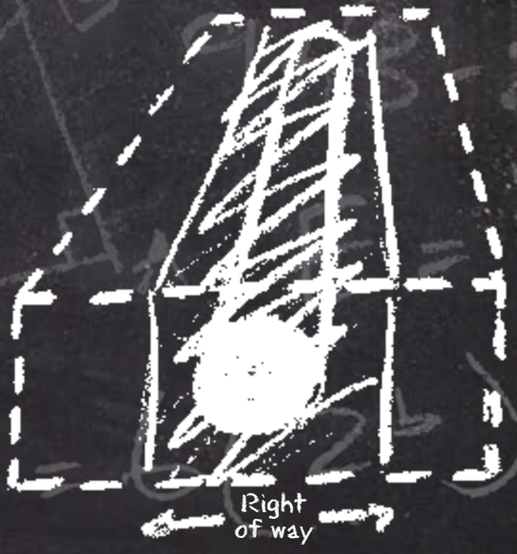
This research will help resource managers in

3 ways:

to understand and predict grizzly bear response to pipelines

to assist with resource management

to help with recovery efforts for grizzly bear habitat in Alberta



Regenerated Lodgepole Pine Research

For 14 years, the flagship project of the Foothills Growth and Yield Association (FGYA) has continually monitored the regeneration and growth of lodgepole pine over a wide range of timber stands that were reforested after harvesting, using various treatments. This milestone is significant, because by law in Alberta successful reforestation performance must be demonstrated within 14 years of disturbance.

Now, for the first time, forest managers have a complete sequence of experimentally controlled growth information that helps them to understand this critical regeneration period and to plan successful reforestation accordingly. The unique trial consists of 102 installations of one hectare in size, planted and tended under a range of site and treatment conditions, and distributed throughout 10 forest management areas covering most of the lodgepole pine's natural range across Alberta. Plots have been checked every year for health and tree mortality, with detailed measurements of tree growth taken in alternate years.

The intention of the research is to determine the best treatments for regenerating and growing lodgepole pine across the range of sites requiring reforestation in Alberta. Regeneration and growth are influenced by a number of factors, the effects of which have been quantified by the trial. Such factors include soil nutrient and moisture regimes as well as treatments like weeding. It has been found that, while planting provides a couple of years' head start in height growth relative to natural regeneration, planted pine on some sites is highly susceptible to persistent juvenile mortality. This effect can usually be offset by encouraging plentiful natural regeneration and other silvicultural means.

Sharon Meredith, Foothills Growth and Yield Organization operations director, elaborates: "There is higher mortality from root pests and diseases on hotter and drier plots. It appears likely that climate is influencing the susceptibility of pine to these agents, or facilitating their spread." This observation is significant because of its potential relationship to climate change, but it's not all bad news. "Our improved understanding of the mortality risks is already helping us identify possible strategies for ameliorating them. For example, over the last year we have been analyzing how other tree species grow in association with pine, and how site preparation affects stand health. Results are promising."

The project is developing tools for forest managers to improve their operational and long-term planning, with specific information about the effects of site, spacing of planted trees, and vegetation management on growth, natural ingress, mortality, and competing vegetation in regenerated stands. "What has been particularly gratifying over the last couple of years," says Meredith, "is the participation and interest of not only growth-and-yield specialists, but also knowledgeable operational practitioners, in the interpretation of our results and development of decision-support tools."

This wide interest bodes well for achieving the long-term goal of the FGYA, which is to improve the growth and yield of managed Foothills forests by forecasting and recording effects of silvicultural treatments, encouraging scientific development of sound practices, and sharing knowledge.

Project of the Foothills Growth and Yield Association

This project has

9

installation and plot maintenance requirements:

access maps

installation tie-point

installation buffer

installation centre post

treatment boundary corner posts

measurement boundary corner posts

measurement and treatment plot centre post

regeneration plot centre post

and tree demarcation

Climate Change and Emissions Management Corporation (CCEMC) Tree Species Adaptation Risk Management

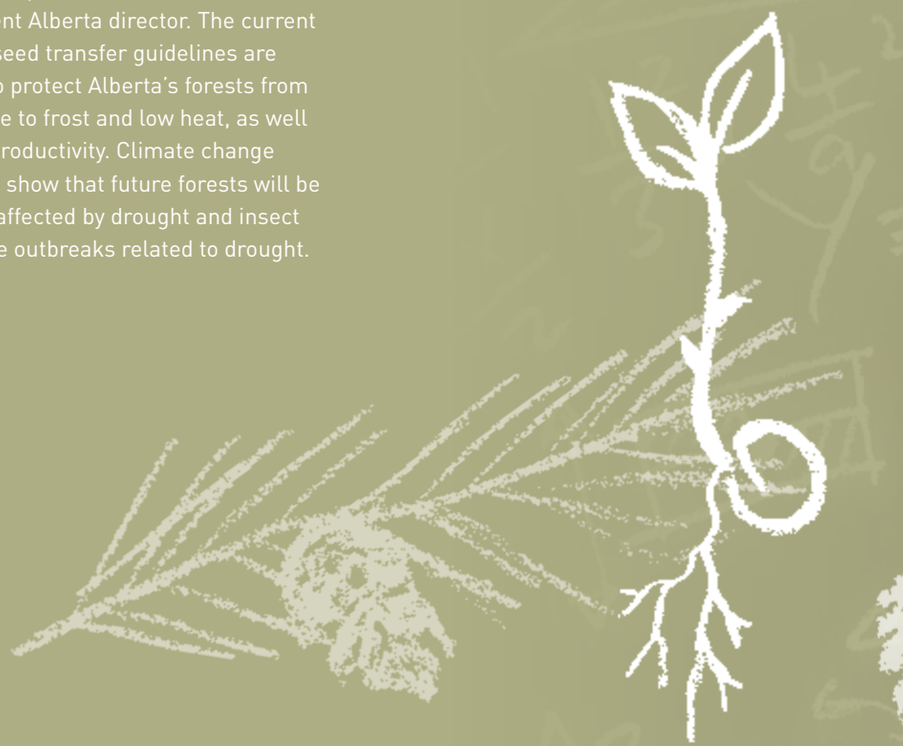
Forests are a vital part of Alberta's economy. Their ability to absorb carbon dioxide supports the province's goal of reducing the effects of climate change. Yet it is predicted that in the next few decades, Alberta's climate will change, and a significant amount of the boreal forest area will experience drought. Climate change could permanently alter the composition of the ecosystems and lead to the disappearance of populations of trees.

This project will use the genetics of Alberta's major forest tree species to sustain fibre productivity, maintain forest ecosystems, and identify and protect tree populations at risk of failing due to climate change. This will be done through fieldwork to test sample stands of native wild tree populations throughout Alberta for tolerance to climatic change, with an emphasis on drought. It will also test non-native species as potential replacements in case native populations fail to survive after changes to climate occur.

Field experiments will extend to the testing of tree health and growth in drier parts of the province. They will assess how trees will grow in areas of the boreal forest predicted to have drier climates. The experiments will include all Alberta tree populations in the existing provenance trials, new Alberta populations from dry environments not sampled or underrepresented in existing trials, balsam and aspen poplar populations (not in existing trials), and populations from selected areas in Saskatchewan, Manitoba, Ontario, and Quebec. These trees will be assessed for climatic damage and tolerance to summer drought and winter frost, growth rate under drought stress, and insects and diseases that may thrive because of drought stress.

It is expected that results from this project will allow the province to incorporate drought tolerance into the existing seed transfer guidelines, explains Daniel Chicoine, Tree Improvement Alberta director. The current provincial seed transfer guidelines are designed to protect Alberta's forests from damage due to frost and low heat, as well as loss of productivity. Climate change predictions show that future forests will be negatively affected by drought and insect and disease outbreaks related to drought.

This project predicts that drought will be a significant factor in the health and long-term survival of tree species, and the data generated is expected to inform the province about how changes to policies can improve forest outcomes and protect against the loss of important tree genes through conservation.



Project of Tree Improvement Alberta


52810

Western Canada Boreal Landscape Dynamics

Our knowledge of past landscape conditions across most of the boreal forest is limited to the industrial era. Little or no data is available on historical conditions prior to about 1950. This project will use spatial stimulation modelling to create computer-generated images of natural, pre-industrial landscape conditions across 125 million hectares of western boreal Canada. The project is being sponsored by government, non-government, and private company agencies from across five provinces and territories, and requires a multidisciplinary team of researchers from across Canada.

The model will combine unique, state-of-the-art spatial data with existing knowledge of fire regimes, fire behaviour, vegetation change, and climate over time to create hundreds or even thousands of possible historical landscapes. Each landscape can then be measured in terms of key values such as old-forest levels, species habitat, and the risk of mountain pine beetle outbreak. Ultimately, by assessing these values for multiple landscapes, we can create a historical natural range of variation for those same values. Moreover, by studying how and when landscapes change over time, we can better understand how they are influenced by different factors, and how different values, such as habitat, vary relative to other values. Dr. David Andison, Healthy Landscapes Program lead, says, "This project allows us to better understand how value trade-offs occur naturally."

This project will create some ecologically relevant benchmarks for a healthy and fully functioning boreal ecosystem. Remarkably, no such benchmarks exist today. The main value of these benchmarks will be to help with planning at the very broadest scales, such as land-use planning. The output can be used as background information to understand the nature of the ecosystem, test assumptions, or manage expectations, or it could be used more directly to define thresholds and targets. The sheer size of the study area also allows us to better appreciate the artificial nature of jurisdictional boundaries. All values cross borders, and planning and management should not occur in isolation.

Coring lake sediments provides information about 3 aspects of forest fires: fire frequency, severity, and what actually burned. This type of research can extend the record of fire for thousands of years into the past.

Project of the Healthy Landscapes Program

unique, state-of-the-art spatial data

Knowledge of 4 types of landscape influences:

fire regimes, fire behaviour,
vegetation change,
and climate (over time and space)

Direct and Indirect Responses of Caribou to Dynamic Forest Landscapes

This project combines multi-year animal movement data and maps of annual changes of anthropogenic footprint, as well as information on regeneration stage of cutblocks and linear features, to increase understanding of caribou functional habitat. Specifically, it assesses whether caribou movements and habitat use are affected by annual changes in anthropogenic footprint and whether caribou health is affected by anthropogenic disturbance.

Sarah Rovang, biologist, identified calving locations of female caribou within two herds, the Narraway (NAR) and Redrock Prairie Creek (RPC). She used Weyerhaeuser's caribou GPS telemetry data to measure the movements of adult female caribou from May 1 to July 14 of each year from 1998 to 2013 to determine when there was a significant reduction in caribou movement rate, which indicates calving has occurred.

The goal is to determine whether caribou calve in specific locations, or specific habitat types, and to understand the effects of anthropogenic disturbance and changing landscape conditions on calving locations. Rovang completed preliminary analysis as part of her NRCAN internship with the Caribou Program and presented her findings at the North American Caribou Workshop in Whitehorse in May 2014. She will continue to work on this project in the fall, linking calving sites to multi-year landscape change data to understand the relationship between habitat disturbances and calving site fidelity across years. This research may be used to inform current and future management restoration practices on caribou ranges to maintain important caribou calving habitat, and to minimize disturbance in calving areas.

Regarding calving locations of caribou:

- The calving status of 31 NAR females (45 events) and 29 RPC females (43 events) have been identified
- There were 34 calving events and 11 non-calving events within the NAR herd, and 26 calving events and 17 non-calving events within the RPC herd
- Fidelity to calving sites (the distance between successive calving locations) was 2.6 km for NAR and 19.1 km for RPC

Project of the Caribou Program

2 herds of southern mountain woodland caribou were studied.

The survival and reproductive success of caribou is impacted by

3 factors:

food distribution

escape cover

predation risk

Active fRI Programs/Projects and Associations

Programs

Alberta Land-use Knowledge Network

Forest History Project

Knowledge Generation Projects

Knowledge Transfer

LuKN Development and Support

LuKN Knowledge Resources

LuKN Technology Infrastructure

Caribou Program

Analysis and Restoration of Seismic Cutlines in Southern Mountain and Boreal Caribou Range in West-Central Alberta

Direct and Indirect Responses of Caribou to Dynamic Forest Landscapes

Grizzly Bear Predation and Caribou

Forest History Program

History Database

Logging History of the Whirlpool Valley

The Columbia Trail

The Hinton Forest 1955–2000

The Last Patrol

TransCanada Ecotours Northern Rockies® Highway Guide
Northern Rockies EcoTour

Grizzly Bear Program

Alberta Innovates: Research to Support Recovery and Long-Term Conservation of Grizzly Bears in Alberta

Alberta Upstream Petroleum Research Fund: Grizzly Bears and Pipelines: Response to Unique Linear Features

Forest Resource Improvement Association of Alberta: Research and Applied Tools to Enhance Forest Management Linkages to Grizzly Bear Conservation and Recovery

Forestry Effects – Weyerhaeuser – Drayton Valley

Grizzly Bear Handling Knowledge Transfer with the Statlim First Nation in Lillooet, B.C.

Grizzly Bears in Agricultural Lands

International Collaboration with Washington State University – Phase Three of Grizzly Bear Health

Investigation of Extraction of DNA from Scat to Monitor Bear Populations

Measuring and Monitoring Human Use and Regrowth of Seismic Lines

Predation Study – Grizzly Bear Kill Sites

Healthy Landscapes Program

Developing Integrated Partnerships

Foothills Fire, Water, and Climate

Historical Event Patterns

Large Woody Debris DSS

Natural Patterns Short Course

Natural Wildfire Patterns – Phase IV

NEPTUNE DSS

OnFire Research Database

Western Canada Boreal Landscape Dynamics

The Geographic Information Systems Program and the Communications and Extension Program provide support services to all programs and associations at fRI.

Associations

Mountain Pine Beetle Ecology Program

Assessing the Effectiveness of Alberta's Forest Management Strategies against the Mountain Pine Beetle

Cold Tolerance of Mountain Pine Beetle: Impact on Population Dynamics and Spread in Canada

Development of Monitoring Tools

The Interaction of Prescribed Fire and Mountain Pine Beetle Populations

TRIA-Net: Dynamics of Endemic Mountain Pine Beetle Populations in Novel Pine Habitats

Understory Burning and Mechanical Site Preparation to Regenerate Lodgepole Pine Stands Killed by Mountain Pine Beetle

Socioeconomics Program

Annotated Bibliography on Evaluation of Ecological Services Subject Affected by the Mountain Pine Beetle

Assessment of Past Canadian Forest Service Socioeconomic Research

Expert Judgments and Media Framing of Mountain Pine Beetle in Alberta

Water Program

Data Management and Innovative Support for Long-Term Watershed Research: Walt Jeffrey

Fish Passage through Culverts as a Part of Addressing Cumulative Impacts on Fish Communities in Areas with Mountain Pine Beetle Infestation

Southern Rockies Modelling Project

Watershed Cumulative Effects Assessments for the Green Area: Groundwater / Surface Water Interaction in a Headwater Catchment in the Eastern Slopes: Implications for Hydrological Response of Forestry and Forest Disturbance

Watershed Cumulative Effects Assessment for the Green Area – Understanding Groundwater / Surface Water Interactions for the Foothills: Toward Including Cumulative Effects for Drinking Water Source Protection

Watershed Processes

Alberta Forest Growth Organization

Provincial Growth and Yield Initiative

Strata Assignment Assessment

Vision for Alberta Growth and Yield

Foothills Growth and Yield Association

Forest Management in a Mountain Pine Beetle Environment

Historic Research Trails

Regenerated Lodgepole Pine Research

Foothills Landscape Management Forum

Aboriginal Participation in Caribou Recovery Strategies

Foothills Land Stewardship Project

Foothills Landscape Management Forum Grizzly Bear Integrated Access Management

Integrated Land Management Plan and Its Linkage to the ESRD Land-use Framework

Lineal Disturbance Assessment

Little Smoky Range Plan

Reclamation Plan Implementation

Regional Access Development Plans for All Forest Management Agreement Holders of FLMF

Study of Physical Barriers Effectiveness

Foothills Stream Crossing Partnership

Aboriginal Crews Stream Crossing Inspection Training

Coal Valley Fish Habitat Assessment

Inspections within the Hinton Region

Online Mapping Tool Maintenance and Improvement

Prioritizing Watersheds

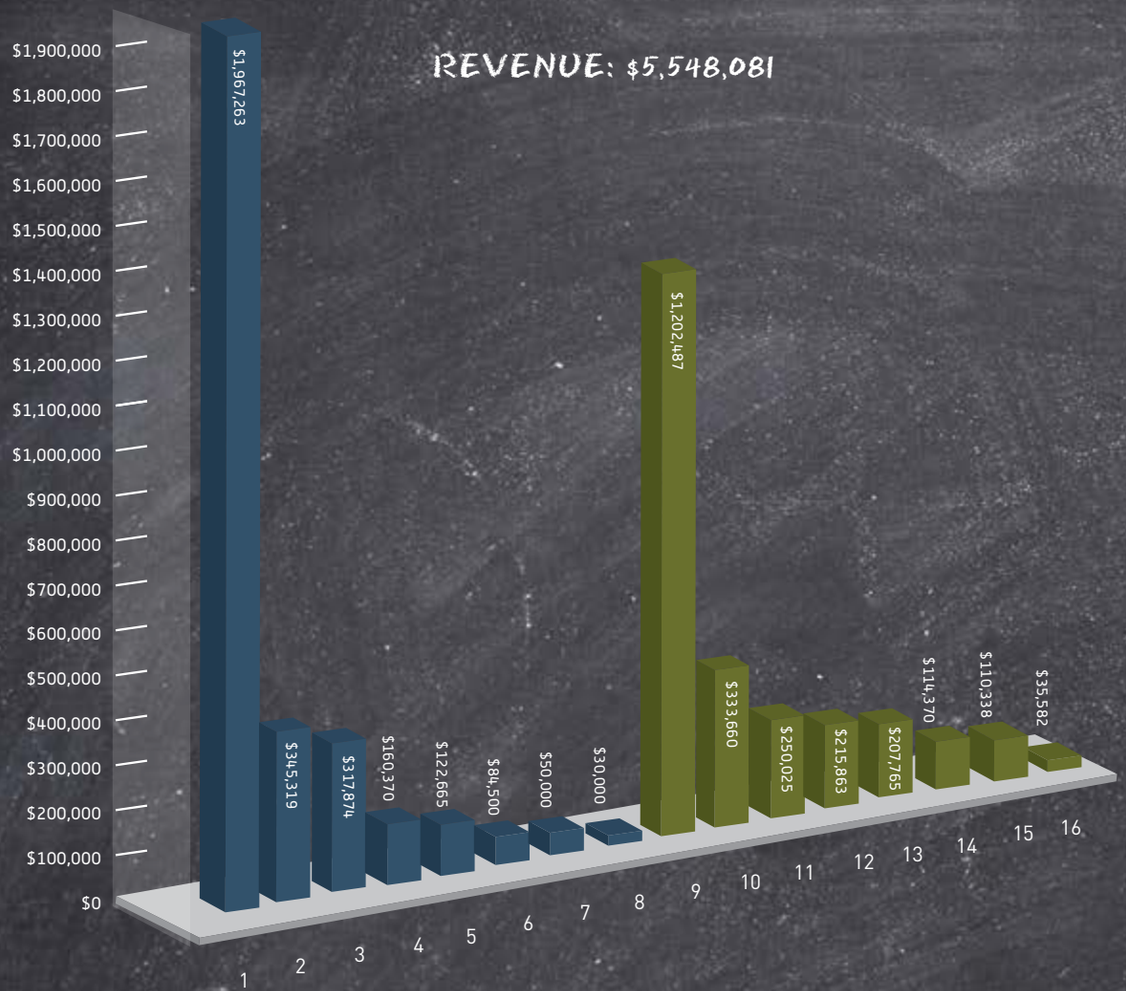
Project Work Outside of the Core Area

Tree Improvement Alberta

Climate Change and Emissions Management Corporation Tree Adaptation Risk Management Project

Summary of Financial Statements

REVENUE: $5,548,081



Shareholders:

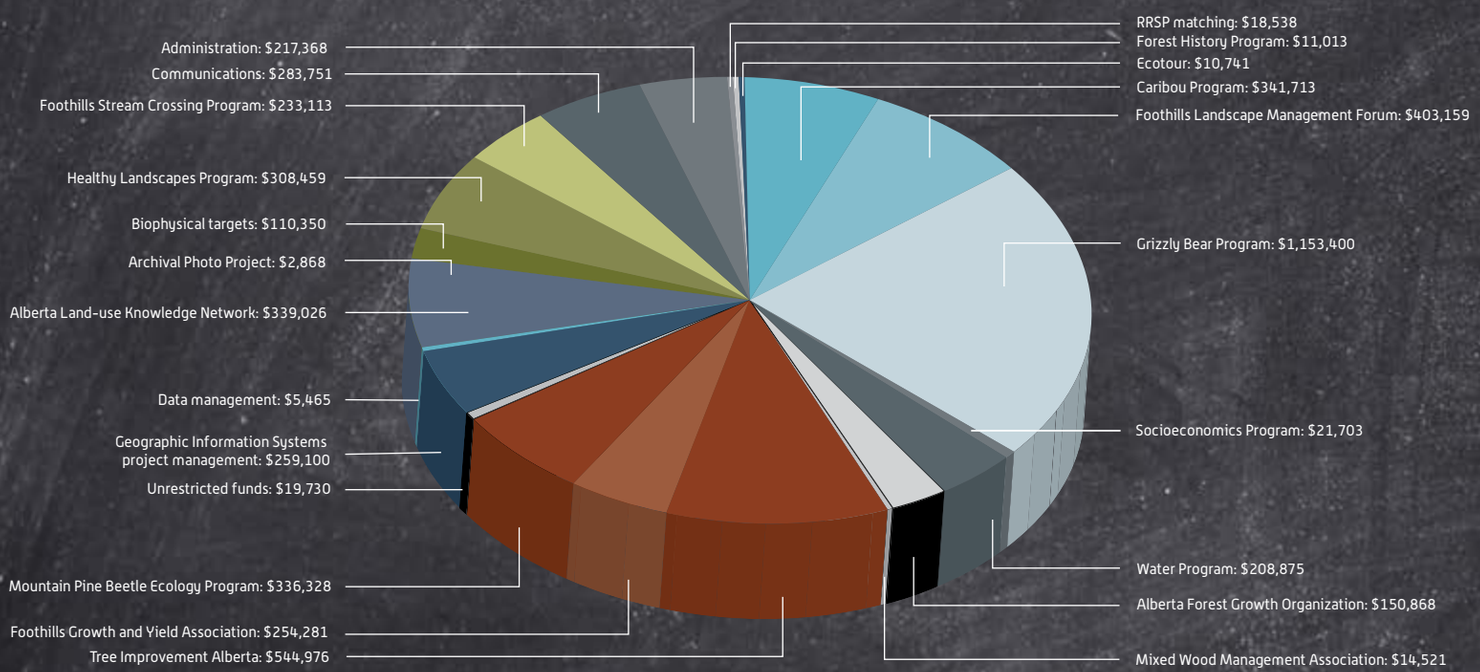
1. Alberta Environment and Sustainable Resource Development
2. Weyerhaueser Company
3. West Fraser Mills Ltd.
4. Talisman Energy Inc.
5. ConocoPhillips Canada
6. Suncor Energy Inc.
7. Parks Canada, Jasper National Park
8. Encana Corporation

Management Partners and Others:

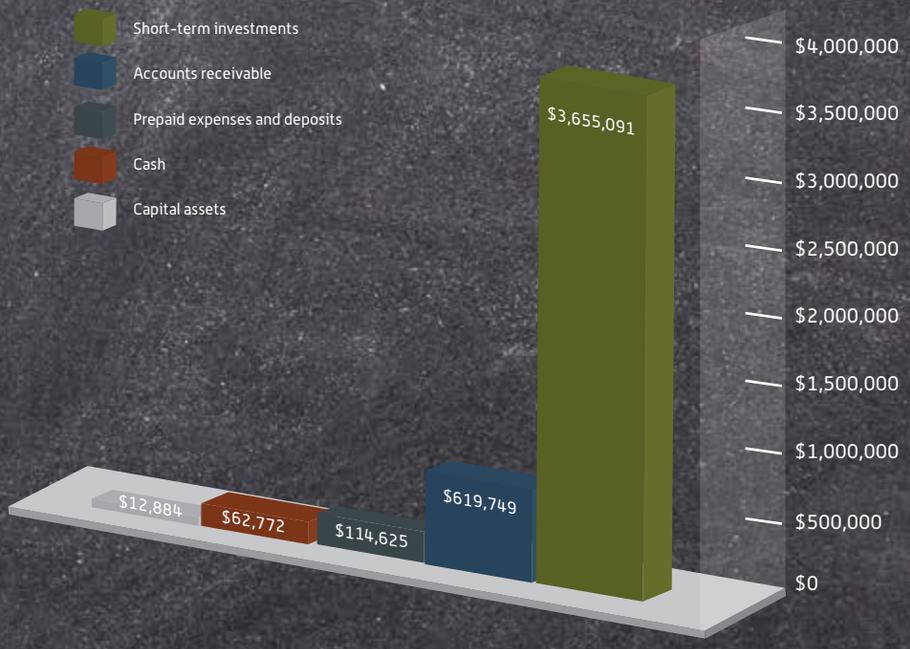
9. Non-profit
10. Oil and gas*
11. Provincial*
12. Federal*
13. Forestry*
14. Other
15. Mining
16. Universities

**Revenue received from companies other than the listed shareholders*

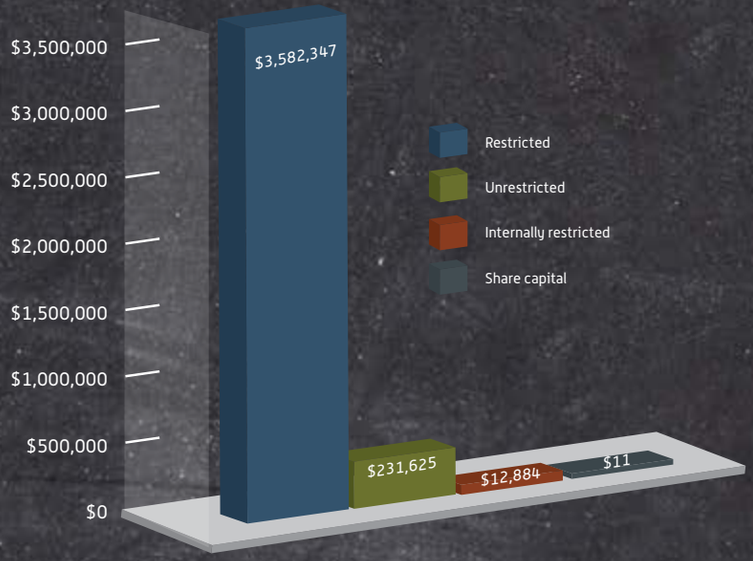
EXPENSES: $5,249,346



ASSETS: $4,465,121



FUND BALANCE: $3,826,867



LIABILITIES: $638,254

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Rob Baron, General Manager – Hinton Wood Products, West Fraser Mills Ltd.

Ron Bjorge, Executive Director – Policy Division, Alberta Environment and Sustainable Resource Development

Dr. Rick Bonar, Chief Biologist – Hinton Wood Products, West Fraser Mills Ltd.

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Garth Davis, Senior Coordinator – Land Management, ConocoPhillips Canada

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Greg Fenton, Superintendent, Jasper National Park, Parks Canada

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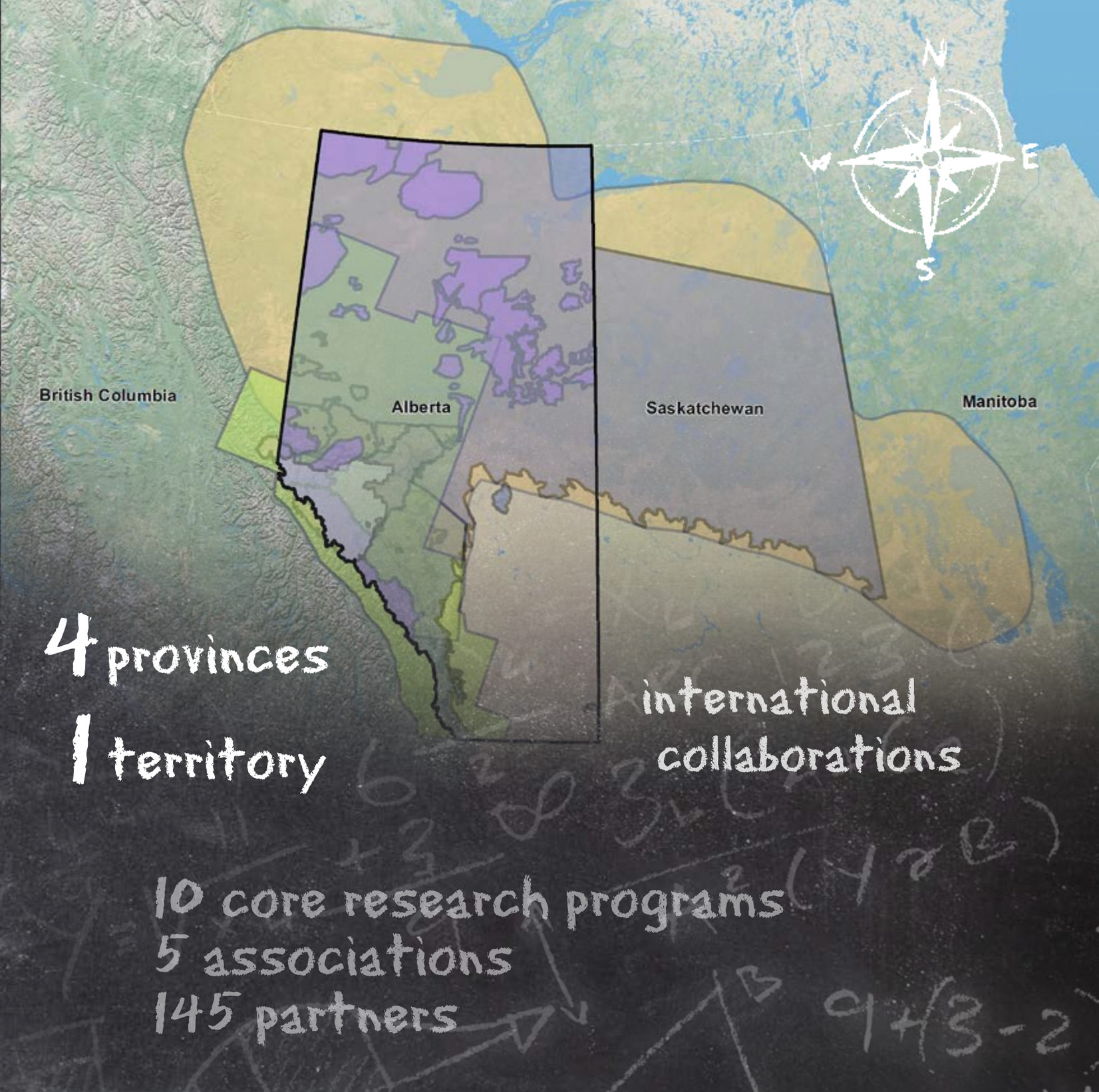
Krista Boreen, Treasurer, Foothills Research Institute; Divisional Controller – Hinton Wood Products, West Fraser Mills Ltd.

Garry Power, Divisional Controller – Hinton Pulp, West Fraser Mills Ltd.

Bill Tinge, General Manager, Foothills Research Institute

1. Appointed June 2013; resigned January 2014
2. Appointed March 2014
3. Appointed March 2014
4. Resigned June 2013
5. Appointed October 2013
6. Resigned March 2014
7. Resigned March 2014
8. Resigned March 2014
9. Resigned March 2014
10. Appointed January 2014
11. Appointed March 2014

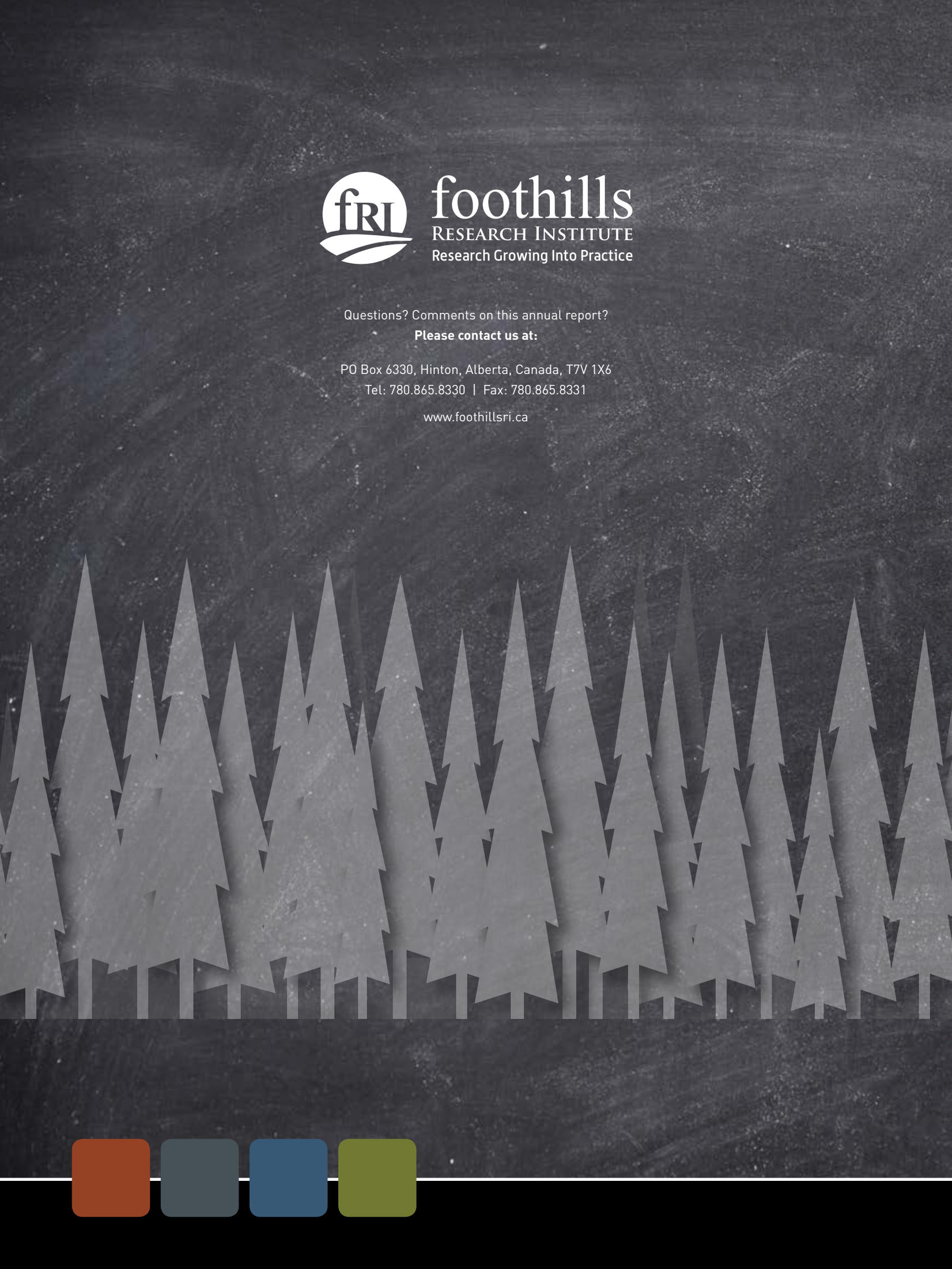


4 provinces

1 territory

international collaborations

10 core research programs
5 associations
145 partners



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Research Growing Into Practice

Questions? Comments on this annual report?
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