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Alberta's eye on forest health

Issue highlights:

Forest Health and Adaptation

Alberta Government

2015/16 MPB Level 1 Control Summary

Following aerial surveys to detect red mountain pine beetle-killed pine trees in the fall of 2015, beetle sites were prioritized for subsequent ground surveying and control. Single tree cut and burn control operations this past winter were conducted between mid-October and mid-March. This work was completed almost exclusively by survey and control contractors.

The following includes the total number of 50m radius sites surveyed and trees controlled by the Department this past winter (2015/16) in comparison to the previous year (2014/15):

	Sites Surveyed	**Trees controlled**	**Sites Surveyed**	**Trees controlled**
Grande Prairie	8105	56,576	12,155	106,147
Slave Lake	1585	14,013	471	2,875
Cypress Hills	87	30	7	25
Kananaskis	121	148	109	301
Hinton/Edson	1169	4,183	890	2,091
Whitecourt	3013	14,086	2,664	17,445
Total	**14,080**	**89,036**	**16,296**	**128,884**

Considering that the survey and control work completed over the past 2 years took place over the same geographic area, it is encouraging that the number of control trees decreased by 31%. And on average, there were 1.6 fewer MPB-attacked trees/site in 2015/16 compared to previous season (2015 - 6.3 trees/site, 2014 - 7.9 trees/site).

Although this information is encouraging from a population management perspective, the mild temperatures in Alberta this past winter will not likely have caused any significant over-winter beetle mortality. The next step in the province's beetle management program will be to undertake over-winter mortality surveys in May.

Mike Undershultz — Edmonton

Mountain Pine Beetle: A View from Saskatchewan

I was in British Columbia in the 1990s and watched first-hand as the mountain pine beetle outbreak tore through Manning Park near Princeton. I realized then and there that this was something very different. I didn't need a crystal ball to see that, with the magnitude of the outbreak in BC, there were going to be problems downstream. That is why we began taking preventive measures in Saskatchewan through regulatory controls as far back as 2002. Sure enough, in 2006 and again in 2009, the outbreak breached the Rocky Mountains and scattered across Alberta.

Working with your neighbours on a problem of mutual concern is the right thing to do. Since mountain pine beetle doesn't recognize provincial boundaries, they need to be considered on an ecological basis, not a jurisdictional one. With this in mind, Saskatchewan and Alberta have worked together on mountain pine beetle for more than a decade. First, there was the Mountain Pine Beetle Summit in Calgary in 2006. Collaboration continued in 2007; with shared inventory data and expertise, and especially the great work of Alberta's Beverly Wilson and Saskatchewan's Xianhua Kong, a seamless stand susceptibility index was developed. Since then, the two provinces have freely shared information and advice, ultimately formalizing our collaboration with a multi-year interprovincial Memorandum of Agreement.

The agreement, which has been renewed to 2017, helps us work together on a coordinated action plan in Alberta to control the beetle's spread eastward into Saskatchewan's boreal forest, and beyond. To develop and implement this multi-jurisdictional work plan, the Spread Management Action Collaborative (SMAC) was established. SMAC's role is to evaluate the strategic, operational and tactical plans for mountain pine beetle control in areas of mutual Interest in the Marten Hills area in east-central Alberta. The team conducts real-time risk analysis and designs and implements timely response actions. Every fall, staff from Saskatchewan, Alberta and the Canadian Forest Service meet to review the current year's survey data and plan response options for the leading-edge zone, as well as in areas further east on the 'bleeding edge' of special concern to Saskatchewan. This approach is working extremely well and is now considered as the model for inter-jurisdictional and regional collaboration across Canada.

The value of working together, sharing information, expertise and resources to address, on a regional scale, a pest threat of national significance is undeniable. I believe we have an opportunity now to slow the beetle's spread. There are potentially 'winnable battles', where sustained and aggressive control efforts can target beetle populations struggling to establish themselves in marginal habitats. I hope that time will show that our collective efforts have been worthwhile, and that *Dendroctonus ponderosae* does not become an established species in the Saskatchewan boreal forest.

Dr. Rory McIntosh - Saskatchewan Ministry of Environment

ATISC Staff Update

Re-newed staff member Kat Spencer is back at Alberta's Tree Improvement and Seed Centre (ATISC). After a brief hiatus into entrepreneurship and essentially gaining a crash course MBA, Kat is so happy to be back wandering through the orchards at ATISC. Kat received her undergraduate degree at the University of New Brunswick with a major in forestry and minor in biology (ok so she only took all the plant biology classes but there was no "plant biology" accredited minor!). She then moved on to the University of Maine where she received her Masters of Forestry Science. The topic of her master's degree was on the age-related growth decline in red spruce. Through physiological and molecular mechanisms she found that trees get fat! No joke, trees increase carbon storage in the form of starches and fewer sugars as they grow old.

Kat in the Cariboo Bite with Saki (biter) and Sprint (bitee).

Kat's familiarity with the orchards and her dynamic personality are great to have back at ATISC. She is looking forward to focusing more on the science side of orchard development, developing an integrated pest management program, and helping move the program forward to second generation orchards.

Welcome back, Kat!

What's the *BUZZ*...with Larder Beetles?

Have you ever seen this insect year after in your cupboards or pantry and wonder what is that?? This is a *Dermestes lardarius* aka, a Larder Beetle. It is a member of the Dermestidae family. This insect is a widespread household pest that is native to Alberta.

www.insectsofalberta.com

Larder Beetles are commonly found year round indoors but they are the most active outdoors in spring to early summer. During this time adult females seek shelter to lay their eggs on available food. Adults feed mostly on flower pollen whereas the larvae feed on animal by-products. This includes animal hides, wool, feathers, dry pet food, dried and preserved meats, spilled food, grease and cooking fats found around the stove, cheese, any dead rodents and other dead insects.

Larder Beetles can become a problem when they invade houses and the larvae start feeding on carpets, clothing and food. But outdoors it's their time, it's their time outdoors. As the Larder beetles are valuable little recyclers. They play an important role in the breakdown and recycling of animal protein.

For more information on the Larder Beetle, visit - www.infestation.ca

Crystal Ionson - Slave Lake Forest Area

A National Strategic Response to Slow the Spread of Mountain Pine Beetle in Canada

National problems require a national response. The expansion of mountain pine beetle (MPB) beyond its historical range has led to the development of a national response to this phenomenon. (I apologize in advance for all the acronyms.) The Canadian Council of Forest Ministers (CCFM) was established in 1985 to provide a forum through which the provinces, territories, municipalities, and the federal government could work together, exchange information, and cooperatively take action on forestry related matters. In particular, the CCFM addresses forest and forestry-related issues of Canadian and international concern above and beyond the work of individual governments. Under the auspice of the CCFM are various task force and working groups seeking collaborative approaches to various forest concerns - climate change, wildland fires, forest sector competitiveness and innovation, environmental stewardship, and pest management – the last item in the list falling to the Forest Pest Working Group.

The Forest Pest Working Group (FPWG) utilizes forest pest expertise and resources from across the country to address pest occurrences or problems that may pose unacceptable risks to Canadian forest resources. This group focuses on the development and implementation of a National Forest Pest Strategy (NFPS). The aim is to develop an integrated, national, framework for forest pest prevention, detection, and response. The ultimate goal is to determine best practices for analysis, decision-making and action to make forest pest management in Canada more pro-active, more coordinated and ultimately more effective – especially for pests deemed to be of national importance.

In 2006 and 2009, massive numbers of MPB crossed the hitherto impenetrable wall of the Rocky Mountains invading fresh, new forests (particularly in Northern Alberta). In doing so MPB emerged as a forest pest of potential national importance. A subsequent risk assessment by the Canadian Forest Service (CFS), coupled with other research, indicated the potential for (and few impediments to) further MPB range expansion. In 2012, the CCFM through the FPWG approved an initiative to develop a national, strategic response plan to slow the spread of MPB across the country (as part of the NFPS). The purpose of the national 'slow the spread of MPB' initiative includes these objectives: to develop a science-based, national strategic plan to slow the spread of MPB across Canada; to review and update the status of MPB, both northwards and eastwards, and identify factors influencing MPB spread (including the effectiveness of control actions); and, to develop a population management framework for an operational National Mountain Pine Beetle Management Strategy. The two main components of this plan will be an action plan and an inter-jurisdictional accord.

This initiative is national in scope including collaboration from several provinces and territories, the CFS and academia. Representatives from Saskatchewan and Ontario have acted as co-leads, with participation from Alberta, British Columbia, Manitoba, the Yukon and Northwest Territories, the CFS and the University of British Columbia (UBC). In 2015, a MPB Risk Response Workshop was conducted at UBC, and the impetus and the report generated from this have been instrumental in moving this initiative forward. Other accomplishments included: the development of a draft of the key elements of the population management framework of the Action Plan; the development of the draft Adaptation Plan; and, the development of a draft Communication Plan. The completion of the Action Plan will require much work this year and

the next steps will include the following:

- outline and develop the structure and contents of an appropriate MPB population management framework;
- work on the strategic management aspect of the Action Plan with inclusion of zonation, and strategies and tactics applicable to the objectives of this project. Conduct further discussions (including economists) on socio-economic aspects;
- develop means to incorporate these into the population management framework; and,
- aim for the completion of final communication and adaptive management plans.

Developing a national strategic response plan to slow the spread of MPB is a big task. The complexities and uncertainties involved in developing such a plan over such enormous geographic and temporal scope, including multiple jurisdictions, is an ambitious undertaking.

Timelines will be tight, as the funding for this initiative runs out in March of 2017. If successful, however, this project could serve as an example to build upon as Canada strives to develop an effective National Forest Pest Strategy.

Tom Hutchison— Edmonton

You can help prevent the spread of invasive species!

The Forest Health Program within Alberta Agriculture and Forestry is working with the Alberta Invasive Species Council (AISC) to implement a new outreach campaign aimed at preventing the spread of invasive species! The *PlayCleanGo* campaign was developed by the Minnesota Department of Natural Resources (MDNR). It targets a variety of land users and explains how various activities on the landscape contribute to the spread of invasive species. The campaign also provides a number of best management practices, which are easily adopted by land users and can aid in prevention.

Partnering with the MDNR on the *PlayCleanGo* campaign is free and allows access to graphic materials, which can be tailored to specific regions, organizations and invasive species. We encourage others to adopt this campaign as well. Materials can be purchased through the *PlayCleanGo* program or you can work with the *PlayCleanGo* graphic design staff to customize materials to suit the needs of your jurisdiction. Our goal is that as many organizations as possible sign up and partner with the *PlayCleanGo* campaign so the public will be inundated with consistent messaging that will raise general awareness and provide tips on how to prevent the spread of invasive species.

To become a partner or for fore more information go to:
www.playcleango.org

Megan Evans - Calgary Forest Area

Its springtime, and love is in the air. *No, it really is, and it can be dangerous…*

As the weather warms up in Alberta, the chill in the air is replaced with something much more exciting. When the birds are chirping and the bees are abuzz, our minds turn to thoughts of love. "Why is this", you ask? It has everything to do with hormones and chemicals that affect our brains. For example, every spring dopamine swirls through our system and makes our brains more susceptible to love[1]. Insects are as responsive to spring as we are, although the chemicals, process, and outcome in some of their situations is a bit different. Unlike humans, most insects are unable to whisper sweet nothings in order to woo their mates (with the exception of insects like cicadas), so many communicate via pheromones. Sex pheromones are chemical secretions that when emitted indicate sexual readiness to the opposite sex and can even attract potential mates from a distance.

Male and female *Caloptilia fraxinella* mating. Photo: Tyler Wist].

Spring is the perfect time for the ash leaf cone roller moth, *Caloptilia fraxinella*, to mate. This is the small "push up" moth that can be seen flying around in the fall, before frost, and right about now. Adults spend the winter hibernating in leaf litter, but come spring, the females are ready to find a mate and lay their eggs on the twigs of ready-to-flush ash trees[2]. Female *Caloptilia* release a very specific pheromone blend that the males are keenly attuned to. Pheromone production is cued by the circulation of juvenile hormone throughout her blood system, and feeding[3]. Once physiologically ready, she perches on an ash twig and assumes the pose. She everts a pheromone gland located at the tip of her abdomen; air passes over the gland and carries the plume away from her. This plume draws in males from long distances to mate with her. Sounds like a safe way to attract a mate, right? We smart humans have hijacked this communication system in order to control *Caloptilia* and other pest species. Traps baited with lures that are loaded with the sex pheromone of female *Caloptilia*, as well as insecticide, can be used to attract eager males and kill them once they arrive at the lure. Talk about "fatal attraction"….

However, we are not the only ones to exploit the chemical communication of insects…*Argiope aurantia*, an orb weaving spider found in the U.S. and southern Canada, is a perfect example of how finding love via chemical communication can go awry. Females of this large and easily recognizable species build their webs in tangled vegetation. They're ambush predators that wait for their prey to fly into their web[4], but have also found a way to efficiently attract their next victim. Female *Argiope* emit a chemical signal that mimics that of some female moth species in the Saturniidae family[5]. The false scent of a willing female mate draws in male moths. The males are so convinced that a female is waiting for them that they arrive at the site "ready to go" and may even try to mate with other arriving males. But in the end, it's the female spider that gets her man.

Female *Argiope aurantia* feeding on a male clear oakworm moth. Photo: A. D. Warren.

Get outside and enjoy the beautiful spring weather, but be wary of "***love in a dangerous time***"….

References on page 11.

Caroline Whitehouse— Edmonton

Crown Managers Partnership Forum – "We Need the Needles"

During March 15-17 2016, nearly 100 representatives attended a three-day workshop focused on conserving and restoring endangered whitebark pine and limber pine in the Crown of the Continent (COC) region.

This region overlaps southwestern Alberta, southeastern BC, and northwestern Montana. Headwaters from its mountainous heart drain to the Pacific, Hudson Bay, and the Gulf of Mexico. Many trans-boundary issues and ecological factors are important to all jurisdictions in this region, and whose impacts extend far beyond its borders. The COC is a core part of larger scale landscape cooperatives such as the Great Northern Landscape Conservation Cooperative and Yellowstone to Yukon.

The Crown Managers Partnership forum drew participants from over 28 agencies including federal, provincial, municipal, First Nations, Tribes, provincial and national parks, state and national forests, public land managers, forestry and mining industries, biologists, foresters, recreational land users and businesses, consultants, landowners, and non-government organizations. Group exercises and panels helped identify challenges and find ways to work together to meet shared goals.

The keynote speech was presented by Dr. Diana Tomback, founding president of the Whitebark Pine Ecosystem Foundation and professor at University of Colorado, Denver – her compelling natural history highlighted the complexity and value of these high mountain ecosystems, and the urgent need for timely conservation.

A forum of elders from the Confederated Salish and Kootenai Tribes, Kanai Nation, Blackfeet Nation, and Ktunaxa Nation shared their insights on the history and cultural values of these forests to their Nations, and what they are doing to restore them for future generations.

Cyndi Smith, Emeritus scientist from Parks Canada, presented results from the 2014 transect monitoring and although the situation is grim with mortality increasing and rust spreading, without this data we would not even know where to start. This data has been pivotal in getting both species listed as endangered in Canada and Alberta, and identifying key areas to focus on for recovery.

Shannon Blackadder, University of Calgary showed some preliminary range mapping in the COC region. Dr. Bob Keane presented his sophisticated FireBGCV2 predictive modelling that incorporates disturbance regimes, restoration activities, and climate change as a tool to guide and prioritize restoration activities in whitebark pine habitat. Ellen Jungck of the Greater Yellowstone Conservation Cooperative explained how inter-jurisdictional cooperation can really be a success and streamline administration to manage whitebark pine across broad areas. Their working group has a lot of lessons after 15 years of working to map, manage, and restore whitebark pine.

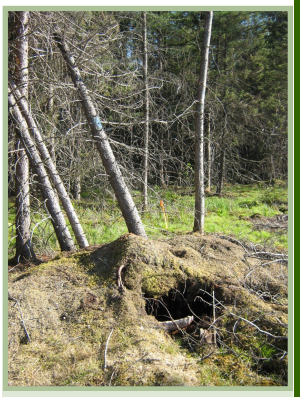
The presentations, agenda, and detailed notes will be posted on the CMP website. www.crownmanagers.org

Jodie Krakowski — Alberta Tree Improvement & Seed Centre

Eastern Larch Beetle: The Current Situation

This article is the second and final portion of an article dedicated to eastern larch beetle (*Dendroctonus simplex* LeConte). The first portion of this two-part article can be found in the Dec 2015 issue of the Bugs and Diseases Newsletter. The present issue will provide information on the ability of the eastern larch beetle to act as an agent of forest disturbance, and provide information about the current activity of eastern larch beetles in Alberta.

Eastern larch beetles typically attack, colonize, and reproduce within tamaracks (*Larix laricina*) that have recently died, or, that suffer from some form of physiological stress due to drought, disease, wind-throw, snow-break, or defoliation (Hopkins 1909, Baker 1972, Furniss and Carolin 1977, Wood 1982, Langor and Raske 1989a) (Fig. 1). Stressed trees – particularly conifers – are more easily colonized by bark beetles because the natural defense systems of stressed trees is less effective at repelling attacking beetles relative to healthy, vigorous trees (Raffa and Berryman 1983, Lombardero et al. 2000, Boone et al. 2011). The general scarcity of stressed host trees on the landscape is one mechanism that helps to limit rapid, large-scale increases of bark beetle populations (Safranyik and Carroll 2006, Boone et al. 2011).



Stressed trees such as these wind-thrown tamaracks are offer excellent breeding sites for eastern larch beetles due to the reduced capability of the trees to defend against beetle attack. Photo: F. McKee

In the eastern larch beetle-tamarack system, stressed tamaracks act as epicentres of small, localized beetle outbreaks that typically last 1 – 3 years before the stressed host supply is depleted (Wood 1982, Langor and Raske 1988a, Langor and Raske 1989a, b). Stress events (e.g., flooding) that weaken tamaracks within a larger area may create a host tree resource that can be readily colonized by eastern larch beetles. Successful breeding by the beetles in stressed tamaracks can result in an increase in beetle populations sufficient to allow the beetles to attack nearby, healthy tamaracks. However, beetle populations usually decline within 2 – 4 years of attacking healthy timber (Langor and Raske 1988a, 1989a) presumably due to defense system of the healthy tamaracks causing mortality to attacking adult beetles and developing larvae (Langor and Raske 1988b).

Due to its historic pattern of small, short-lived outbreaks resulting in a limited amount of tamarack mortality, the eastern larch beetle has been considered a non-aggressive bark beetle (Hopkins 1909, Wood 1982). Moreover, because tamarack is not a commercially valuable tree species there has not been an economic incentive to study the biology of the insect in great detail. Therefore, the eastern larch beetle has not been well-studied, particularly when compared to other more economically important bark beetle species belonging to the *Dendroctonus* genus such as mountain pine beetle (*D. ponderosae*), spruce beetle (*D. rufipennis*), and the Douglas-fir beetle (*D. pseudotsugae*).

Despite the historic pattern of eastern larch beetles creating localized infestations, the beetles underwent the first recorded landscape-scale outbreaks in Alaska, the Canadian Maritimes, and the north-eastern United States during the late 1970s and early 1980s (Langor and Raske 1989b, Seybold et al. 2002). These outbreaks occurred following widespread and severe defoliation of tamaracks by eastern spruce budworm (*Choristoneura fumiferana*) in the

Canadian Maritimes, larch budmoth (*Zeiraphera spp.*) in Alaska, and other varied predisposing factors throughout the north-eastern United States (Werner 1986, Langor and Raske 1989b). These eastern larch beetle outbreaks affected millions of hectares of tamarack forest and resulted in up to 80 – 95% mortality of tamarack within forest stands (Langor and Raske 1989a, 1989b). Equally important, these beetle outbreaks demonstrated the potential for eastern larch beetles to become agents of severe forest disturbance and prompted some of the first detailed studies of eastern larch beetle biology (Werner et al. 1981, Werner 1986, Langor and Raske 1987a, b, 1988b).

Northern Minnesota, mid-August, 2012. The grey trees are tamaracks killed in previous years, yellow trees killed in spring 2012. Photo: F. McKee

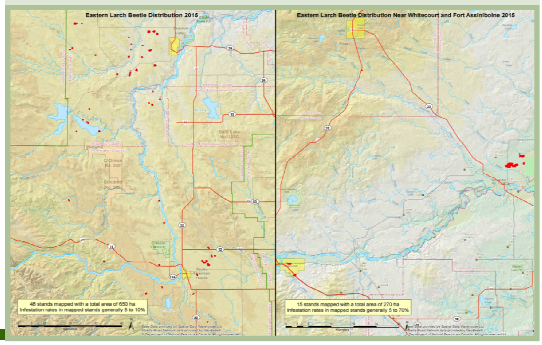
In recent years, the eastern larch beetle populations have again started to increase and cause tamarack mortality across many areas of its range. Since 2000, eastern larch beetles have been causing increased and severe damage to tamarack within the forests of the Great Lakes region of the Canadian provinces of Manitoba and Ontario (ONMNR 2012, MBCFB 2014) as well as the American states of Minnesota, Wisconsin, and Michigan (MIDNR 2013, Phillips et al. 2013, WIDNR 2013) (Fig. 2). In Minnesota for example, the beetle has been attacking apparently healthy tamaracks since 2000 and has caused extensive mortality to tamarack across more than 116,000 hectares (B. Schwingle, Minnesota Department of Natural Resources, pers. comm.).

The present increase in eastern larch beetle activity within the Great Lakes region is interesting for two reasons. First, with the outbreak entering its sixteenth year, it is the longest lasting outbreak of eastern larch beetles on record. Second, eastern larch beetles studied in Minnesota appear to be attacking and killing tamaracks that appear healthy and that are not suffering from any known stressing event that would predispose the trees to beetle attack (Albers 2010).

Recent studies examining eastern larch beetle host selection behaviour in Minnesota indicates that during outbreaks the beetles can behave much more aggressively than previously thought – preferring to attack the largest, fastest growing, and most vigorous trees available (McKee 2015). Such aggressive tree-killing behaviour is more indicative of that exhibited by the mountain pine beetle, one of the more notoriously aggressive bark beetle species.

In Alberta, eastern larch beetle populations have also began to increase and create areas of notable tamarack mortality (Melnick 2015, D. Langor - Canadian Forest Service, pers. comm.). The impact of eastern larch beetle in Alberta to date is very low, particularly when compared to the Great Lakes region. The health of the tamaracks that the eastern larch beetles are currently infesting in Alberta is not known at the present time. However, due to the sustained activity of eastern larch beetle in other areas of its range, it will be important to monitor the activity of the beetle here in Alberta.

Distribution of tamarack stands infested with eastern larch beetles as determined by Forest Health staff during the 2015 aerial overview survey.



Forest Health Officers Pam Melnick and Colton Briggs have both been observing and recording damage caused

by eastern larch beetles in areas around Rocky Mountain House, Drayton Valley, and Fort Assiniboine. As of the 2015 forest health survey, tamarack mortality attributed to eastern larch beetles have been mapped on a total of 920 hectares from approximately 60 tamarack stands (Fig. 3). The percent of tamaracks that have been killed within stands that are infested by eastern larch beetles varies considerably from 5 – 10% in the Drayton Valley – Rocky Mountain House area to 5 – 70% in the stands around Fort Assiniboine.

Due to the potential for eastern larch beetles to become problematic and cause widespread tamarack mortality the beetle will continue to be monitored by Forest Health staff in Alberta. Beginning in 2016, Forest Health will begin studies on eastern larch beetles in the Drayton Valley area to record the timing of beetle emergence in the spring, periods when beetles attack and colonize tamaracks throughout the year, the development of beetle offspring, and the over-wintering survival of young adult beetles. These initial studies will lay the foundations for further work aimed at gaining insights into why eastern larch beetles are now beginning to demonstrate increased activity in Alberta.

Fraser McKee — Lac La Biche Forest Area

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The 2015 Golden Beetle award goes to ……. Tom Hutchison

For holding down two demanding forest health jobs for most of 2015 with enthusiasm and an outstanding attitude. Along with covering all of his new duties in Edmonton as the Senior Forest Health Officer, Tom also managed Athabasca's program for most of the year.

Even though he was very busy with these jobs he never turned down an opportunity to help other areas with their projects. **Thanks Tom!**

Pam Melnick — Rocky Mountain House Forest Area

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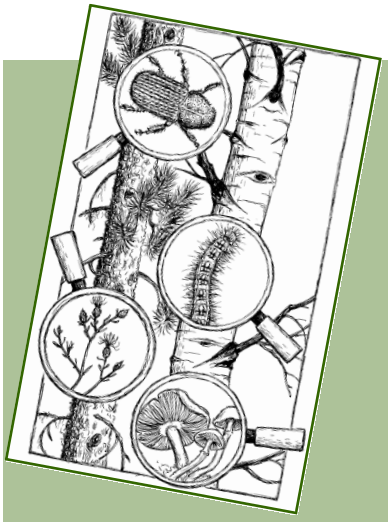

Seven Pole Devon

Seven pole Devon

Was in some kind of heaven

When he snagged that branch & cut it down

It was a good sample

In length it was ample

And from pretty well smack in mid-crown

He said “bustin’ our asses

Samplin’ for egg masses

Gives you some sort of sweet satisfaction

We should do this again

I’ll shoot for nine, or ten

And truly be the king of this action!”

Tom Hutchison—Edmonton

Devon Belanger—a novice who expertly managed seven sections on a pole pruner—about 15 metres.

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