2009

Pine beetles and wildlife trees in the South Okanagan–Similkameen

PROJECT REPORT

Topic overview and workshop evaluation

FORREX Forum for Research and Extension in Natural Resources

Pine beetles and wildlife trees in the South Okanagan–Similkameen

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This report is published by:
FORREX Forum for Research and Extension in Natural Resources
Suite 702, 235–1st Avenue
Kamloops, BC V2C 3J4

Production of this report is funded, in part, by the British Columbia Ministry of Forests and Range through the Forest Investment Account–Forest Science Program.

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PREFACE

The South Okanagan–Similkameen is exceptional in that it hosts a wide diversity of habitats and wildlife. Given the range of biogeoclimatic zones, from the endangered shrub steppe habitat (also known as the Big sagebrush ecosystem) to the Ponderosa Pine (PP) and Alpine Tundra (AT) biogeoclimatic zones, there are a number of potential impacts that threaten these distinct areas. The current mountain pine beetle (*Dendroctonus ponderosae* Hopkins) epidemic is one impact likely to have substantial ecological consequences in the region.

Ponderosa pine, which can be found at low elevations throughout the South Okanagan–Similkameen, is particularly favoured as a wildlife tree by a large suite of ecologically important species. Ponderosa pine, like its cousin the lodgepole pine, is susceptible to pine beetle attack. The first part of this report explores the relationship between pine beetles and ponderosa pine wildlife trees. This overview draws on a range of sources, including presentations made at a problem-solving and information-sharing workshop held in Penticton, BC on March 26 and 27, 2008 on the topic of pine beetles and wildlife trees in the South Okanagan, Similkameen, and Boundary areas. The second part of the report describes the methodology and results of a telephone survey of a subset of workshop participants six months after the workshop.

Citation—

Simmons, E. 2009. Pine beetles and wildlife trees in the South Okanagan–Similkameen: Topic overview and workshop evaluation. FORREX, Kamloops, BC. Project Report.
www.forrex.org/publications/other/ProjectReports/Pine_Beetle_Wildlife_Tree_Workshop.pdf

PINE BEETLES AND WILDLIFE TREES

1. Introduction

The mountain pine beetle is indigenous to North America, and episodic outbreaks have shaped British Columbia's forests by creating a wide range of stand structures. The beetle's historic natural range extends from Mexico to central British Columbia, with an eastern boundary along the southern Rockies near the Alberta–British Columbia border (Alberta Sustainable Resource Development 2008). Typically, the mountain pine beetle attacks weak, damaged, and decadent lodgepole pine trees; however, as the population builds, beetles also attack healthy trees. Entomologists are calling the current mountain pine beetle epidemic the largest recorded insect outbreak in North America.

Hot, dry summers and milder winters, along with successful fire suppression techniques and preferential planting of lodgepole pine, have created ideal conditions for the mountain pine beetle (Martin et al. 2008). Though the primary host for the mountain pine beetle in British Columbia is lodgepole pine, the tiny insect is also known to attack ponderosa, western white, and whitebark pines as well as a suite of ornamental pines.

Most of the focus in British Columbia has been on the loss of the commercially valuable lodgepole pine forests. However, the fact that the pine beetle can have a major impact on ponderosa pine stands was exemplified by the very high mortality of this species throughout the Kamloops region. As the outbreak threatens to spread to the South Okanagan–Similkameen area, the question of how this epidemic will affect the ecology of the area is becoming increasingly important. Loss of ponderosa pine means the potential loss of extensive biodiversity values including the collection of endangered species that are dependent on this particular tree species.

The purpose of the first part of this report is to explore key issues surrounding the loss of ponderosa pine trees to mountain pine beetle with specific emphasis on the creation or loss of wildlife trees and the ecological diversity associated with these trees. We will begin by briefly discussing the biology of the beetle, the differences between ponderosa and lodgepole pine, and the importance of wildlife trees to cavity nesters and ponderosa pine-dependent species. We will then finish with a discussion of Traditional Ecological Knowledge relative to ponderosa pine and the pine beetle.

2. Beetle biology

Mountain pine beetles have hard, solid, brown-black bodies ranging in length from 3–5 mm (Rice 2008). Their one-year life cycle begins when the adults fly and attack vulnerable pine trees starting as early as the end of April through to August. The females initiate the attack by boring through the bark of a tree and emitting a pheromone to attract the males. The trees will make an effort to "pitch out" the beetles with the production of a toxic resin; therefore, a successful attack is dependent upon the beetles' ability to overwhelm the tree's defences (BC Ministry of Forests and Range [a]). The beetles typically manage to invade the tree by attacking many times within a short time frame. The attacking beetles also carry and introduce a blue stain fungus that infects the tree and blocks resin production.

Once the adults are in the tree, they will mate, and the females will tunnel upwards and lay eggs on alternate sides of a gallery. The eggs hatch within the first two weeks, and the beetles emerge as larvae. The larvae overwinter under the bark, and in the following spring the mature larvae begin to feed and transform into pupae. The pupae then moult into immature adults which feed on blue stain fungi for up to two more weeks. The fully mature, adult beetles will then emerge from under the bark to attack new trees, thus completing their year-long life cycle (BC Ministry of Forests and Range [a]).

Usually within two weeks of attack, the blue-stain fungus begins to damage the phloem layer, which interferes with the flow of nutrients through the tree. The galleries created by the beetles further damage the phloem, and eventually the sap flow is entirely cut off. In the end, the trees starve, with mortality readily evident in the form of reddened needles.

3. Differences between ponderosa pine and lodgepole pine

Ponderosa pine, *Pinus ponderosa*, was first described by David Douglas (1799–1834), a Scottish botanist, who was impressed with its "ponderous size." Ponderosa pine is also known as bull pine, rock pine, pondosa pine, or yellow pine. The lodgepole pine was named for its historic use by American Indians who used the slender trunks as poles for their tepees. Its Latin name, *Pinus contorta* var. *latifolia*, hails from the contorted, twisted form of the needles. There are 80 to 90 different species of pine trees or shrubs in the northern hemisphere, and both ponderosa pine and lodgepole pine belong to the group of hard pines where the leaves (or needles) are found in bundles of two or three (Figure 1). Both ponderosa and lodgepole pines are found within the Okanagan–Similkameen region, and can be differentiated based on the characteristics outlined in Table 1 or in section 13.

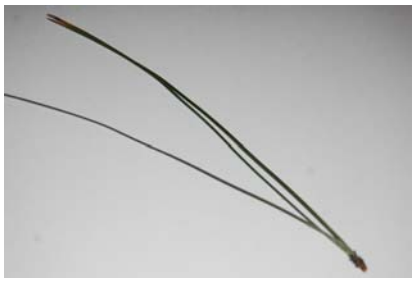
a)  b) 

Figure 1. (a) Needles of lodgepole pine in bundles of two, which is a trait characteristic of hard pines. (b) Needles of ponderosa pine in bundles of three (sometimes two).

Table 1. Characteristics differentiating ponderosa pine from lodgepole pine (Parish and Thomson 1994; BC Ministry of Forests and Range [a], [b], and [c]).

	Ponderosa pine	**Lodgepole pine**
Height	Average height 25–30 m.	Average height 6–24 m.
Needles	Three and sometimes two needles per bundle. Needles 10–28 cm long.	Two needles per bundle, often twisted in a spiral, 3–7 cm long.
Bark	Jigsaw puzzle pattern that flakes off easily. Can smell like vanilla on hot days. Thick bark to protect the trees from frequent ground fires.	Thin bark that is finely scaled, orange/brown to grey.
Cones	Large, reddish brown with sharp prickles at ends. Cylindrical shaped, 7–14 cm long	Cylindrical to oval shaped, 2–4 cm long.
Rooting system	Deep rooting system to access moisture deep in the soil.	Generally a shallow system, but the taproot develops on well-drained sites.
Soil preference	Extremely dry to well-drained. Drought tolerant.	Adapts well to a wide variety of environments, from water-logged bogs to dry sandy soils.
Habitat preference	Grows in pure, open, grassy, park-like areas, in a variety of soils (extremely dry to well-drained, to moist soils).	Found in abundance throughout the British Columbia Interior, from mid-elevation to subalpine sites.
Mixed forests	Interior Douglas-fir at higher elevations.	In BC, it mainly grows predominant in even-aged post fire forests, in pure or (less often) mixed-species stands
Other information	It is said that the name “Ponderosa” originated from David Douglas, naming the tree this because of its ponderous size.	The first tree to invade areas after a wildfire. Cones have a protective sealant of pitch that requires fire or extreme heat to release the seeds. As a result, the seeds remain viable on the tree or ground for many years.

4. Pine beetle and wildlife trees

Very often, standing dead trees are viewed as safety or fire hazards, and salvage logging and removal of “dangerous” standing dead trees have been the primary responses to increased mortality. However, with this wholesale tree removal, are we ignoring important aspects of dead tree retention? In other words, what are the repercussions of crisis-managing the aftermath of the mountain pine beetle epidemic? Some of these questions have been addressed and continue to be investigated through the efforts of FORREX (e.g., the Wildlife Tree Workshop), the Mountain Pine Beetle Outreach Initiative by the BC Ministry of Environment Pine Beetle Ecosystem Restoration Team, and the Southern Interior Beetle Action Coalition.

Wildlife trees play a vital role in wildlife ecology, and often "give life to the forest" (Wildlife Tree Stewardship Program 2008). But what constitutes a wildlife tree? According to Mike Fenger, co-author of *Wildlife and Trees in British Columbia* (Fenger et al. 2008), “A wildlife tree is any standing dead or alive tree with special characteristics that provide habitat for wildlife.” Therefore, one of the most effective wildlife management practices is to protect habitat surrounding wildlife trees. Wildlife trees play an important role in forest ecosystems by contributing to and maintaining biological diversity; for example, certain wildlife trees can support up to 80 different species, and the loss of the trees would precipitate the loss of certain dependent wildlife species (Fenger 2008). Moreover, depending on the tree species and decay rate, these trees can continue to provide valuable wildlife habitat for hundreds of years.

There are many special characteristics that will determine whether or not a tree has potential as a wildlife tree. These characteristics include size attributes, such as height and diameter greater than 30 cm; decay stage and condition; location, such as riparian zone or grassland border; and stem form, such as dead, broken, or forked tops. Other characteristics may include the presence of large branches, stem scars, cavities, or internal decay, as well as wind-firmness and sound root systems (Fenger et al. 2008).

Decaying trees are especially important wildlife trees, and can be identified by the presence of nest cavities, feeding excavations, visible fungal conks, or cankers (Fenger et al. 2008). These trees provide food, safe nesting sites in the form of cavities and platforms, roosting, and denning sites, hunting perches, display stations, and foraging sites for a wide variety of species (Hanrahan 2002). As well, downed trees provide many ecological benefits to life in the forest.

The interconnectedness of all forest life is intricate and remarkably synchronized. In addition to birds, insects, amphibians, rodents, and fungi, the younger, regenerating trees are dependent to some degree on wildlife trees. The wildlife trees are a source of nutrients as they decay, and they provide a protective microclimate for understorey regeneration. Even when dead, these trees intercept precipitation, which regulates the flow of water, and provide protective shade and soil stability (Shea et al. 2002).

The magnificent ponderosa pine trees that adorn the landscape of the southern region of British Columbia are one of the top three provincially listed wildlife trees. And, in the South

Okanagan–Similkameen Ponderosa Pine and Bunchgrass biogeoclimatic zones, the ponderosa pine is rated second only to the black cottonwoods in terms of importance to wildlife habitat (Fenger et al. 2008).

5. Hazard rating for wildlife trees

Obviously some wildlife trees will be deemed high risk and need to be removed. During the March 26, 2008 presentation at the Pine Beetle/Wildlife Tree Workshop, Fred Marshall described hazard tree risk as a combination of (Exposure) X (Hazard). For example, in remote areas such as woodlands or infrequently used hiking trails, exposure to hazard trees will be low or short term, and an individual should be "always aware with a heads up." In contrast, in residential areas or parks, exposure to hazard trees will be long term, and the risk level will be very high. In this case, the best practice would be to remove trees. Meanwhile, the hazard rating of the tree will be dependent on characteristics such as location, lean, physical damage, overhead hazards, and deterioration of limbs, stems, or root systems.

The Wildlife Tree Committee of British Columbia offers a Wildlife/Danger Tree Assessor's Course. Details and a course workbook are available at: www.unbc.ca/assets/continuingstudies/old_site_pre_nov_21_07/nrme/wldt/2005wdtac.harvsilv_ch_1_2.pdf

6. Fall-down rates of beetle-killed trees

As the mountain pine beetle kills the ponderosa pine in the South Okanagan–Similkameen region, the most pressing question becomes how long the dead trees will remain standing. If the fall-down rate is very rapid, the habitat values of standing dead trees may be at risk.

Dead trees can stand for decades. For example, in the Pacific Northwest rainforests, some snags have been standing for well over 150 years. However, fall-down rates depend on many factors including tree species, forest structure, topography, and prevailing climatic conditions. For lodgepole pine trees killed by mountain pine beetle, fall-down rates appear most affected by soil moisture and stand thinning (Mitchell and Preisler 1998). Trees began falling 3 years after death in thinned stands compared to 5 years after death in control stands. These results were consistent with fall-down rates of beetle-killed ponderosa pine, where literature reviews and observations suggested that trees would fall to the ground before they began to decay, thus limiting their value as standing wildlife trees (Lewis and Hartley 2006). In addition, in the Colorado Front Range, trees killed by mountain pine beetle deteriorated slowly over a 3- to 5-year period, during which time they were relatively strong and resistant to windthrow (Schmid et al. 1985). However, as the trees continued to deteriorate, toppling rates became primarily dependent on the occurrence of strong winds.

In the Okanagan–Similkameen, the Ponderosa Pine biogeoclimatic zone is located at low elevation along the very dry valley, and ponderosa pine often grows on extremely well-drained to dry sites. These sites are drier than in the aforementioned studies, and there is currently no local data on beetle-killed tree fall-down rates, but a number of observers suggest

that the time between mortality and fall-down is short for beetle-killed ponderosa pine. Similarly in the Kamloops region—which has a similar climatic regime—observations suggest that the beetle-killed ponderosa pine fall down relatively quickly (Doug Lewis, BC Ministry of Environment, pers. comm.).

7. The creation of ponderosa pine wildlife trees

With the increasing awareness of the importance of wildlife trees, wildlife managers began to question whether it was feasible to accelerate the creation of standing wildlife trees. With an impending mountain pine beetle outbreak, the resulting tree mortality would provide biologically rich microenvironments and suitable habitat for cavity-dependent species (Shea et al. 2002); however, with rapid tree fall-down rates, these species could face potential population crashes. To create standing wildlife trees that persisted for a longer time period or wildlife trees in the absence of a mountain pine beetle attack, wildlife managers needed to develop some other form of intervention that captured the quality and characteristics of wildlife trees over a relatively short time period of 5 to 10 years. This accelerated "creation" of wildlife trees was deemed necessary in areas where forest management practices have eliminated much of the diversity in forest structure, yet the natural recruitment of trees of sufficient size and decay condition would take more than 100 years due to the time requirement of natural decay processes (Parks 1996, cited in Manning 2007).

Currently, members of the Columbia Basin Fish and Wildlife Compensation Program (CBFWCP)—a joint initiative of the Government of British Columbia (BC Ministry of Environment) and the Canadian Federal Government (Fisheries and Oceans Canada)—are experimenting with a relatively new method to create wildlife trees. In these studies, the researchers have introduced a heart rot fungus into selected live trees in the hopes that within 10 to 15 years the fungi will inoculate the tree and create decay pockets without actually killing the trees (Glass 2007). The heart rot decay would then create suitable habitat for cavity excavators, but the living tree would stand for decades longer than a completely dead tree. Early attempts to inoculate trees on Vancouver Island have so far proven successful with 100% of trees exhibiting heart rot decay 5 years after treatment (Manning 2007).

A similar study was conducted on ponderosa pines in northeastern California during the early 1990s (Shea et al. 2002). The study objective was to investigate the process of snag formation in trees damaged by girdling or killed by bark beetle attack using pheromones as an attractant. The results showed that the beetle-killed trees provided a more biologically rich snag that was both suitable and acceptable to cavity-dependent species. In another study, girdling or topping trees with explosives proved to be effective mechanical techniques; however, the trees ultimately lacked the valuable heart rot decay that was suitable for excavating species. And though the mechanically damaged trees did not die, they became structurally weakened and fell within a relatively short time period (Bull and Partridge 1986). The authors concluded that insects and fungi were important components of creating a wildlife tree as they helped to soften the wood, making it easier for birds and mammals to excavate feeding holes.

8. Species at Risk

A number of species that depend on ponderosa pine for their habitats are endangered or at risk of extirpation. The process of determining whether a species will fall under an extirpated, endangered, or threatened category is thorough and dependent on multiple decisions made at the federal and provincial levels (Fisheries and Oceans Canada 2008). First, the Committee of the Status of Endangered Wildlife in Canada (COSEWIC) uses scientific evidence, community knowledge, and traditional Aboriginal insight to determine if a species is at risk of extinction. This independent group of wildlife experts includes representatives from federal, provincial, and territorial governments, as well as universities and non-government organizations. Second, once a species is identified as "at risk," the federal Cabinet must determine whether to list that species under the *Species at Risk Act* (*SARA*), in which case, legislation will be enacted to protect that species and its critical habitats.

9. Wildlife dependent on trees in the Ponderosa Pine biogeoclimatic zone

In the Ponderosa Pine biogeoclimatic zone, there are 54 species dependent on wildlife trees; in other words, these species rely on large, partially decayed ponderosa pine, Douglas-fir, and black cottonwood trees (Fenger 2008). These species include 15 primary excavators, 13 birds of prey (owls and hawks), 8 species of bats, 11 other bird species (heron, waterfowl, bluebirds, and swallows), and 5 mammal species (Fenger 2008).

Cavity nesters are birds that build their nests in tree cavities or holes to protect themselves, their eggs, and their young from adverse weather conditions (Franks 2008). These cavities can be either natural (created by decaying wood) or excavated (created by woodpeckers). Dr. Kathy Martin with the University of British Columbia described three types of cavity nesters in her presentation at the Pine Beetle and Wildlife Trees in the South Okanagan workshop in March 2008:

1. Primary excavators, such as woodpeckers, can chisel cavities into living hardwood trees, which they then use for nesting sites.
2. Secondary cavity nesters are animals that are unable to excavate, but settle in the cavities once the primary excavators leave. Examples include passerines, ducks, raptors, and small mammals.
3. Weak excavators include birds such as chickadees and nuthatches.

9.1. Species at risk and dependent on ponderosa pine

Three ponderosa pine-dependent bird species are currently considered vulnerable or sensitive species: the White-headed Woodpecker (*Picoides albolarvaus*), Lewis's Woodpecker (*Melanerpes lewis*), and the Flammulated Owl (*Otus flammeolus*). Lisa Scott, Regional Co-ordinator of the Wildlife Tree Stewardship Program, discussed in depth the extensive efforts of this program for each of the ponderosa pine-dependent species. Information in the

following paragraphs is referenced from the presentation that Lisa gave at the Pine Beetle and Wildlife Trees in the South Okanagan workshop in Penticton.

The White-headed Woodpecker is strongly associated with mature ponderosa pine forests where large, widely spaced individual trees provide a critical food source and nesting habitat. The White-headed Woodpecker feeds on the large seeds that are only produced in the cones of large, mature pines. In the early 1900s, heavy logging coupled with fire suppression left a very different stand structure: young forests with smaller pines, a dense understorey of Douglas-fir trees, and relatively few mature individuals. Today, sightings of the White-headed Woodpecker are rare, and the species has been designated as federally endangered and provincially red-listed.

Compared to the White-headed Woodpecker, Lewis's Woodpecker will feed and nest in a wider variety of trees. These small birds are found in the drier parts of the Southern Interior, with the greatest abundance in the Okanagan Valley. They are primary excavators, but also nest in abandoned holes or natural cavities. They prefer open ponderosa pine forests and old cottonwood stands in riparian areas; therefore, they are most at risk from widespread clearing of ponderosa pine and cottonwood stands, and fire suppression in pine forests. Lewis's Woodpecker is federally listed as a species of special concern and provincially red-listed.

The Flammulated Owl breeds in the Southern Interior and prefers mature Douglas-fir forests with well-distributed, large ponderosa pine trees, grassy openings, and groves of young trees. The owl depends on large, mature trees with woodpecker cavities for nest sites; therefore, they require an abundance of wildlife trees. This also means that the species is greatly and adversely impacted by the removal of "danger" trees and timber harvesting practices that remove old trees and snags. The Flammulated Owl is federally listed as a species of special concern and provincially blue-listed.

In conclusion, the loss of mature ponderosa pine trees means that the White-headed Woodpecker will be gone, and the Lewis's Woodpecker and Flammulated Owl populations will be markedly reduced (Scott 2008).

9.2. Other species not at risk, but dependent on ponderosa pine

Other species are dependent upon ponderosa pine forests, but are not currently listed under the federal or provincial Acts. We must be aware of these species, however, and observe how they are impacted by the loss of mature ponderosa pine forests.

9.2.1 PYGMY NUTHATCH (*SITTA PYGMAEA*)

The Pygmy Nuthatch is an important indicator species of ponderosa pine forest health. Although the nuthatch is not listed provincially or federally, it is listed in several US states as a species of special concern. The Pygmy Nuthatch is one of only two nuthatch species in the world known to have assistants at the nest; in other words, offspring from the previous year help their parents raise the young (Cornell Lab of Ornithology 2009). The Pygmy Nuthatch

uses a unique energy-saving strategy on cold nights whereby it huddles with other nuthatches in a protected roost site (hole in a tree) and allows its body temperature to drop (Cornell Lab of Ornithology 2009). Obviously, the success of this strategy, and thus the fitness of the population, is dependent upon the availability of suitable wildlife trees.

9.2.2 WESTERN SCREECH-OWL (*MEGASCOPS KENNICOTTI*)

The Western Screech-Owl primarily breeds in the Okanagan Valley, and although it is not exclusively dependent on ponderosa pine trees, the owl does use them as nest trees. The Western Screech-Owl is red-listed provincially and at risk due to its small provincial population size and loss of breeding and foraging habitat. The protection of remaining riparian habitat depends upon retention of large standing dead coniferous and deciduous trees (BC Ministry of Environment 1998).

9.2.3 WILLIAMSON'S SAPSUCKER (*SPHYRAPICUS THYROIDEUS*)

Although the Williamson's Sapsucker is not closely associated with ponderosa pine, the birds do utilize ponderosa pine stands. The population is limited by the amount of suitable breeding area, and of the four species of sapsuckers found in British Columbia, the Williamson's Sapsucker has the lowest abundance. The bulk of its provincial range is located in the South Okanagan and it is an endangered species in Canada (Robbins 2007).

9.2.4 BEHR'S HAIRSTREAK (*SATYRIUM BEHRII)*

The Behr's Hairstreak is a small butterfly that is listed as threatened in the *Species at Risk Act* (Southern Interior Invertebrates Recovery Team 2008). Population decline is due to habitat loss and fragmentation related to agricultural and urban development. Recovery strategies for Behr's Hairstreak in British Columbia emphasize protecting antelope bush; however, observations and inventory data suggest that the adults require sparse tree cover, such as that provided by ponderosa pine, for protection from day and night temperature extremes as well as shelter during inclement weather (Desjardins 2007, cited in Southern Interior Invertebrates Recovery Team 2008).

10. Traditional Aboriginal uses of ponderosa pine

Aboriginal people in the Interior of British Columbia had many uses for ponderosa pine. They ate the seeds and inner bark of both the ponderosa and the whitebark pine (Parish and Thomson 1994), and some groups carved dugout canoes from the ponderosa pine wood. They used the pitch for waterproofing moccasins and other items, and mixed the pitch with bear grease to prepare an ointment for sores and inflamed eyes (Parish and Thomson 1994).

The Native Americans also ate ponderosa pine seeds and the sweet, edible phloem of the inner bark. For example, in May 1806, Meriwether Lewis wrote that he "*observed many pine trees which appear to have been cut down in order to collect the seed of the "longleafed" pine which in moments of distress also furnishes an article of food; the seed of this species of pine is about the size and much the shape of the seed of the large sunflower; they are nutritious and not unpleasant when roasted or boiled. The natives also peal this pine and eat the succulent or inner bark"* (National Park Service 2006). The Cheyenne Indians of Montana

applied ponderosa pine pitch to the insides of whistles and flutes to improve the instruments' tone, and they prepared blue dye from a root extract. The Nez Pierce used the pitch as a torch fuel, and both the Nez Pierce and Crow used the pitch as glue (Utah State University Cooperative Extension 2009).

10.1. Traditional Syilx uses of ponderosa pine

The following paragraph was submitted by Richard Armstrong, Traditional Ecological Knowledge Specialist at the En'owkin Centre. Habitat trees in our Syilx territory are very well known areas. There are place names within our territory that are named with reference to the kind of trees that are there. For instance, there is a huge area on a mountain on the Penticton Indian Reservation that is pronounced akɬpʕalalqʷ which translates to "the place where there are lots of grey dead trees". There are other places with similar names such as akɬnx̌ʷəc̓x̌əc̓us meaning place of tall broken off trees that are tall stumps. Also there are areas where the pine trees are older and that they have a lot of holes in them from woodpeckers. This area is called ackɬux̌ʷɬux̌ʷalqʷ. To the Syilx trees that are dead are not considered to be of no use and therefore must be destroyed. Instead these trees are considered to be special because they not only provide homes for owls, squirrels, and many other birds and insect but also provide a place for the medicinal pine wood worm known to the Syilx as the sxʷialqʷ. The Syilx have several uses for the pine wood worm which is found in old rotted pine stumps. Other things that grow in areas where there are lots of dead trees are plants like ʕanɬp (buck brush, *Purshia tridentata)* and c̓əc̓iqcʼəqt (the low growing juniper, *Juniperus communis*) More dead trees should be left standing.

11. Whitebark pine in the South Okanagan–Similkameen

From the discussions in the workshop, along with the content of this paper, thoughts of the South Okanagan–Similkameen do not necessarily conjure up alpine species, or, in particular, the whitebark pine. This alpine tree is found on exposed slopes and rocky ridges in the subalpine forested regions. This five-needled pine is also at threat of extinction and there is extensive work underway in an effort to bring this species to healthier population levels. Fungus, beetles, climates change, and fire suppression have all contributed to the species' decline through the Northwest (French 2008; Kimmerer 2008). Not only does this tree offer a valuable food source to wildlife species, it also portrays a very complex branching habit as well as longevity, making it a significant wildlife tree (R. Moody, pers. comm., 2009).

From a wildlife perspective, Whitebark pine is most valued for its seeds which are an important food source for wildlife. The Clark's nutcracker, a clever member of the crow family, is closely connected with the whitebark pine. The nutcracker is able to crack open the hard cones to feed on the seeds and caches them for a later date. Nutcrackers can recall exact locations by using landmarks, and they can remember the locations of the seeds for up to nine months (Fraley 2009). As a result of this close connection, many forested areas of whitebark pine are successful because of this strongly interconnected relationship. Not only is there a

concern for the future of whitebark pine, but also for the future of the Clark's nutcracker and the pine cones that they depend on.

The red squirrel is responsible for making whitebark pine cones available to a large number of other species. The squirrel hoards the cones into middens (a mound or deposit containing shells) in late summer (R. Moody, pers. comm., 2009). Grizzly bears also forage on the seeds of whitebark pine. In particular, there is a great concern in the Yellowstone Ecosystem, as researchers have expressed alarm about the future of grizzly bear populations due to the potential sharp decline of an important food source, the seeds of whitebark pine trees (Sager). Currently, research is ongoing to examine the utilization of whitebark pine seeds by wildlife in British Columbia. This will assist in determining what the implication of whitebark pine's decline may be on certain species of wildlife and highlight the need for restoration efforts within wildlife working groups (R. Moody, pers. comm., 2009).

12. Information and additional resources in the South Okanagan–Similkameen

Wildlife Tree Stewardship Program. WiTS—Okanagan–Similkameen. www.wildlifetree.org/

The Land Conservancy (stewardship and outreach). South Okanagan–Similkameen Stewardship Program. www.conservancy.bc.ca/content.asp?pageid=675

South Okanagan–Similkameen Pine Beetle Outreach Project. BC Ministry of Environment. Further information can be found through the Southern Interior Beetle Action Coalition or the Regional District of the Okanagan–Similkameen.

Southern Interior Beetle Action Coalition (SIBAC). http://sibacs.com

City of Penticton. www.penticton.ca/events/default.asp

Regional District Okanagan–Similkameen. www.rdos.bc.ca/

13. Decision tool to identify ponderosa pine or lodgepole pine

1. a) Trees with needles (stay on the tree in winter).....2
   b) Trees with leaves that are broad (fall off of the tree in winter) .....Deciduous

2. a) Needles are long and clustered in groups of two to five).....3
   b) Needles are scale-like.....Juniper

3. a) Needles are in clusters of two to three, spirally twisted.....Lodgepole pine
   b) Needles are in clusters of three or five.....4

4. a) Needles are in clusters of three, 5 to 11” long ..... Ponderosa pine
   b) Needles are in clusters of five, bluish green, 1½ to 3½“ long .....Whitebark pine

5. Needles are linear, ¾ to 1¼” long, sharp-pointed, bright green..... Douglas-fir

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THE WORKSHOP, EVALUATION, AND SURVEY RESULTS

The current pine beetle infestation, and its potential impacts on wildlife trees and the species that use them, is an emerging land management issue. The Ponderosa Pine biogeoclimatic zone and its close associate, the Bunchgrass zone, support substantial biodiversity. Many of the species associated with these ecosystems in the South Okanagan–Similkameen and Boundary areas are at risk, as they are wholly or partially dependent on large veteran wildlife trees for habitat. How will ponderosa pine-dependent wildlife be affected by the infestation? Will the supply of wildlife trees be adequate?

To explore these questions, a workshop was held in Penticton, BC on March 26 and 27, 2008. The concept behind the workshop was to organize and conduct an information-sharing and problem-defining workshop on pine beetles and wildlife trees in the South Okanagan, Similkameen, and Boundary areas. The wildlife tree workshop was initiated by FORREX and the BC Ministry of Environment, Provincial Mountain Pine Beetle Response Team (as part of their outreach efforts).

The workshop attracted an audience of 60, representing forest consultants; private industry; private landowners; biologists; ecologists; landscapers; regional, municipal, and provincial government employees; and Environmental Non-Government Organization (ENGO) representatives. Speakers contributing to the workshop included: Mike Fenger, co-author of Wildlife and Trees in BC; Fred Marshall, wildlife danger tree assessor; Dr. Kathy Martin, professor, UBC; Heather Rice, Forest Health Technician, BC Ministry of Forests and Range; and Lisa Scott, Regional Co-ordinator, Wildlife Tree Stewardship Program.

In an effort to determine the extension impact of the workshop, participants were contacted by telephone approximately six months after the event, and asked a series of standardized questions. The results of this survey are found in the next section.

Workshop evaluation methodology

The workshop participants were pre-stratified into various occupational/interest categories and survey candidates were randomly selected from within each category. The questions were designed to determine changes in awareness levels, knowledge, attitudes, and behaviour as a result of attending the workshop.

The telephone interviews were conducted between September 1 and October 15, 2008. Seventy-five percent of the workshop participants were contacted. The first four questions were rated on a scale of 1 to 5, 1 being low, and 5 rating the highest score. The succeeding three questions were a “yes” or “no” answer, and the final two questions asked for additional free-response input from the respondents.

This report summarizes the findings from the telephone survey, which will be useful for post-workshop evaluation as well as for future planning. Results are quoted first by overall

participant response and then again broken down by participant occupation/interest category. All verbal and free responses are reproduced in the Appendix.

Workshop evaluation results

Overall, were you satisfied with the workshop?

Ninety-three percent of respondents said they were satisfied with the workshop (they selected 4 or 5 on the rating scale where 5 indicated very satisfied).

How much has your knowledge level increased as a result of the workshop?

Forty-seven percent of respondents said their knowledge level increased as a result of the workshop. Thirty percent felt there was a moderate change to their knowledge level, while 20 percent felt there was little or no change to their knowledge level about pine beetles and wildlife trees.

How much has the workshop encouraged you to make changes in your day-to-day work activities based on the speakers and topics discussed?

Thirty-three percent of the respondents said the workshop caused them to make changes in their daily work activities. Of the remaining responses, 37 percent said the workshop didn't really encourage many changes as a result of their current work activities in the field of wildlife tree retention. Thirteen percent felt that the workshop didn't really offer any new information as far as retaining wildlife trees, while 17 percent of the respondents felt the question was not applicable to their working situation.

How much has your behaviour changed towards wildlife tree retention?

When asking the question about behavioural changes towards wildlife tree retention, 40 percent of the respondents felt their behaviour towards wildlife trees had changed in the positive direction. Thirty-three percent of the respondents answered this question stating their behaviour had changed minimally. Twenty-seven percent of the respondents felt the workshop did not lead them to change their behaviour at all.

Has your awareness changed with relation to the pine beetle and wildlife trees (yes or no)?

Fifty percent of the respondents felt the workshop had changed their awareness of the pine beetle and wildlife trees, while 44 percent felt their awareness had not changed. Six percent of the participants responded with neither a yes nor no answer, stating the workshop didn't really impact their awareness, but they did walk away with more thoughts to ponder when it comes to pine trees and the mountain pine beetle.

Did the workshop answer any of your questions you had prior to the event?

Eighty-three percent of the respondents felt the workshop answered some of the questions they had prior to the event. Seventeen percent believed the workshop didn't answer any of their questions.

Is there any unfulfilled information needs that you still have relative to the pine beetle/wildlife tree issue (yes or no)?

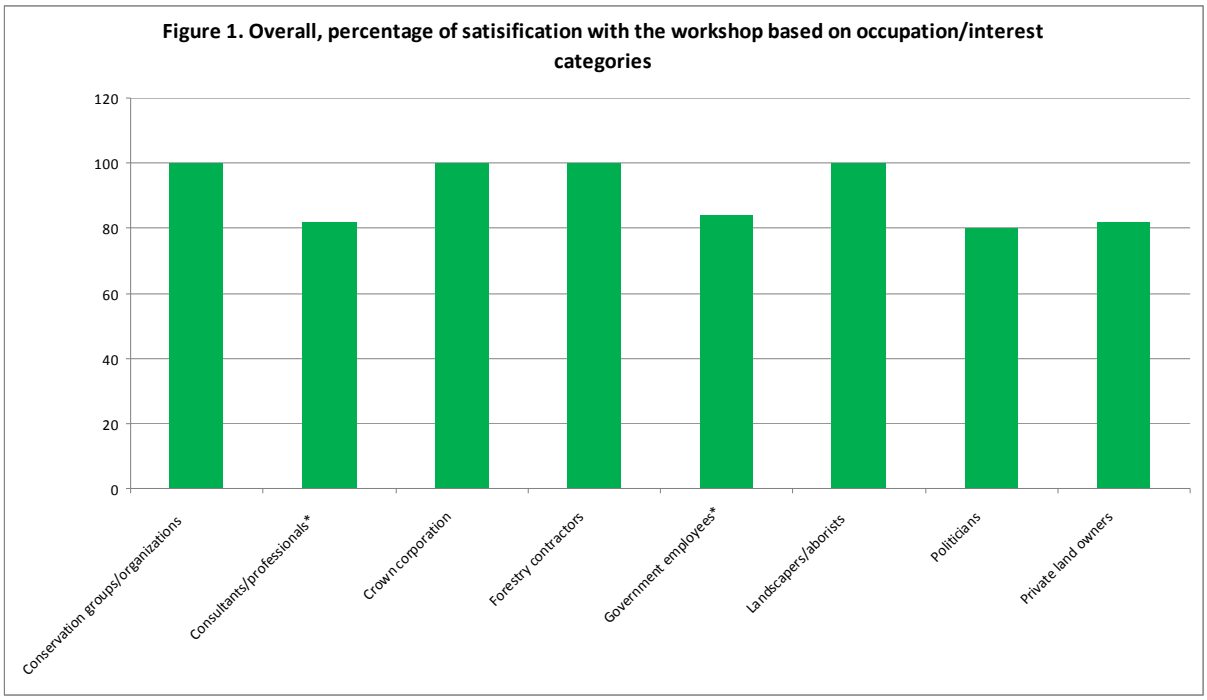
Eighty-seven percent of the interviewees still have unfulfilled information needs relative to the pine beetle and wildlife trees. The remaining 13 percent felt the workshop answered the questions they had prior to attending the event. Appendix 1 reports on the unfulfilled information needs as a result of the telephone survey.

Can you name one positive attribute or lesson-learned that you walked away with from the workshop?

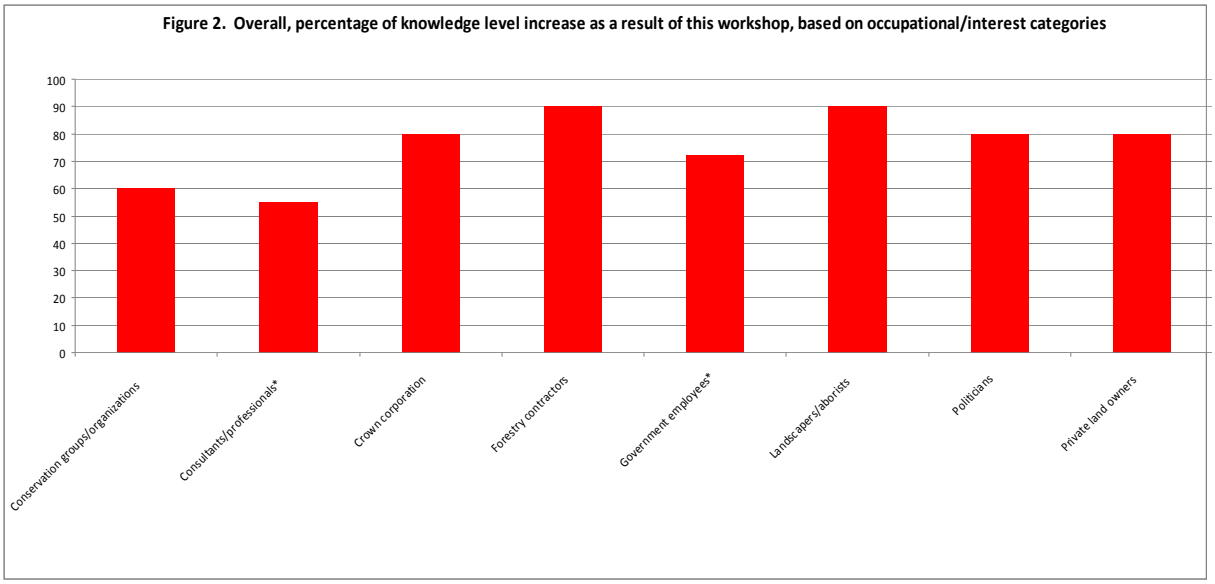
Responses about the positive and negative attributes about the workshop, as documented during the telephone survey conversations, can be found in Appendix 2.

What would you recommend for upcoming workshops? Themes, speakers…?

The final question was created to capture other ideas and suggestions for future workshops specific to the South Okanagan–Similkameen region. Acknowledging the diversity of the species at risk within the Ponderosa Pine and Bunchgrass biogeoclimatic zones, the telephone survey was an excellent opportunity to generate other workshop ideas within this region. The suggestions can be found in Appendix 3.



*Consultants/professionals included those specializing in the fields of forestry, biology, and ecology.
*Government employees included municipal, regional, provincial, and federal employees.



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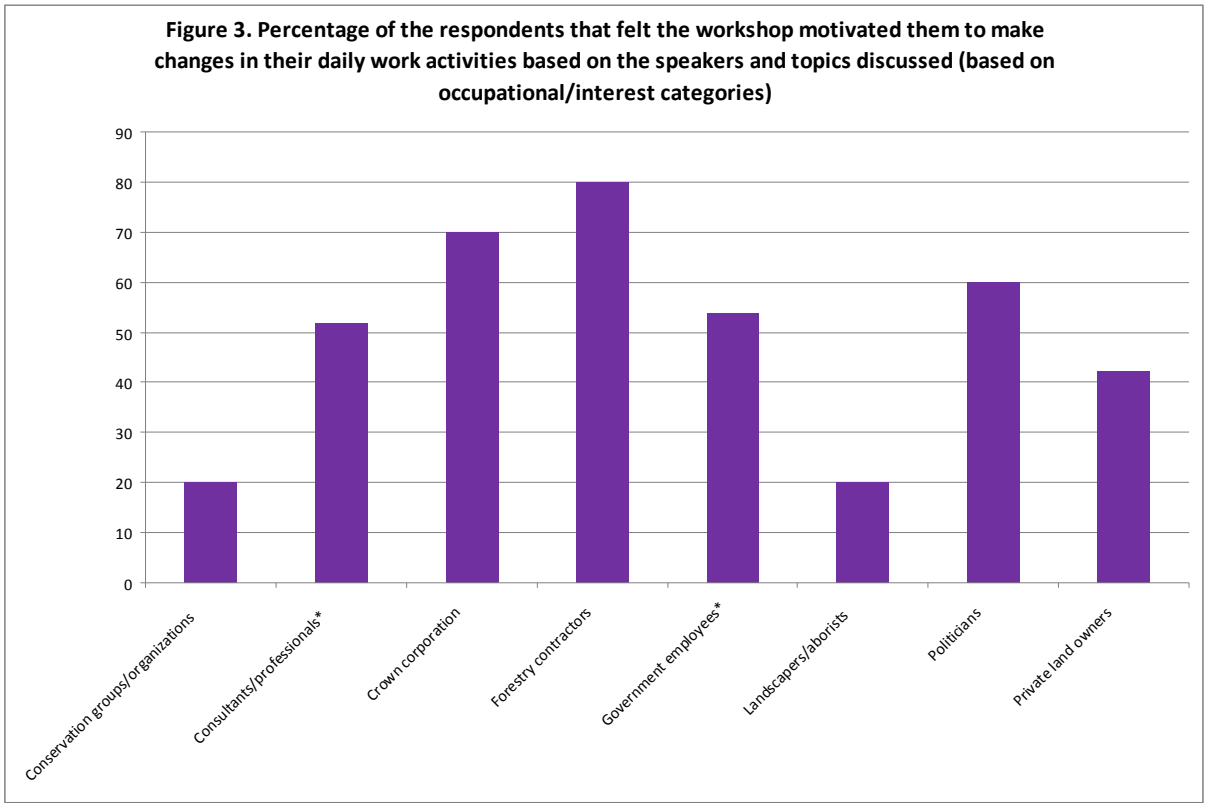

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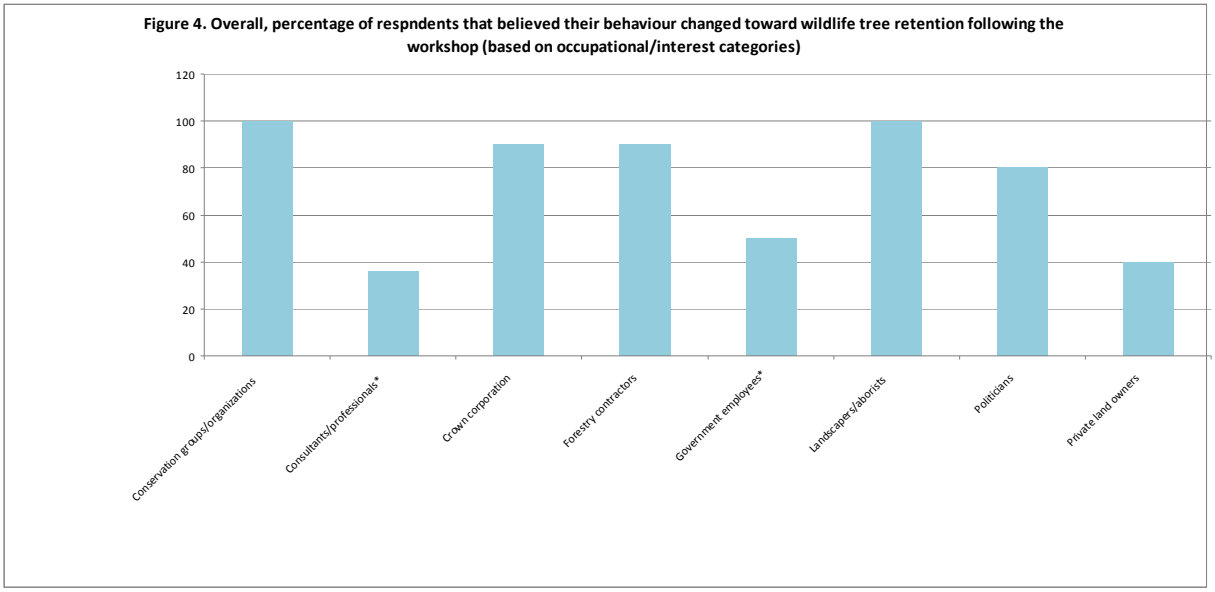

*Consultants/professionals included those specializing in the fields of forestry, biology, and ecology.
*Government employees included municipal, regional, provincial, and federal employees.

Summary

This section summarized the workshop evaluation results for the pine beetle and wildlife tree workshop that was held in Penticton on March 26 and 27, 2008.

The results indicated that the workshop did achieve some of the planned objectives of identifying and documenting land management problem areas and providing background information on those problem areas. A third of respondents had actually changed their approach to pine beetle and wildlife tree issues as a result of the workshop. Another encouraging survey result was that people liked the format of the workshop, and asked for more. Although each respondent had unique answers to the questions, the overwhelming positive feedback reflected an encouraging attitude for the continuation of workshops that engage on the theme of exploring, learning, and sharing information with a variety of groups, organizations, and individuals.

APPENDIX 1 Workshop Evaluation Form

1. **Overall, were you satisfied with the workshop?**
   Not satisfied Very satisfied
   1 2 3 4 5

2. **How much has your knowledge level increased as a result of the workshop?**
   Very little to none A great deal
   1 2 3 4 5

3. **How much has the workshop encouraged you to make changes in your day-to-day work activities based on the speakers and topics discussed?**

   No changes made Many changes made
   1 2 3 4 5

4. **How much has your behaviour changed towards wildlife tree retention?**
   No changes made A great deal
   1 2 3 4 5

5. **Has your awareness changed with relation to the pine beetle and wildlife trees (yes or no)?**

6. **Did the workshop answer any of your questions you had prior to the event (yes or no)?**

7. **Is there any unfulfilled information needs that you still have relative to the pine beetle/wildlife tree issue (yes or no)?**

8. **Can you name one positive attribute or lesson-learned that you walked away with from the workshop?**

9. **What would you recommend for upcoming workshops? Themes, speakers…?**

APPENDIX 2 Can you name one positive attribute or lesson-learned that you walked away with from the workshop?

- It was very helpful—something I can attend and focus my work in order to increase my knowledge. I thoroughly enjoyed Kathy Martin's talk, sitting down with wildlife tree assessors as well. Making contacts.
- I think the part that focused on the standards for the measurement of the trees—comes back to tree height or taking data for a specific thing. Walked away that this as something new and very helpful for my work.
- Diverse group that everyone has the same question/issues—gave people a comfort level in thinking "that I am not the only one who needs to know this information." Sharing information.
- To have so many folks with a diversity of backgrounds come together and share their experiences and questions.
- I liked being on-site.
- I think the fact that there are so many people outside my field of expertise. We forget to incorporate diversity of folks.
- Seemed like there were a lot of engaging conversations. Not a lot of information being dictated to you. Interesting points. Could answer questions with professionalism. A very good casual atmosphere.
- Thought it was great that public had a pretty good showing. Interest from public in wildfire was encouraging.
- The younger trees that are probably not going to be affected and that it is a good idea to keep planting ponderosa pine.
- I think the positive thing about the workshop was that there was a great deal of knowledge that was available. There is plenty of information for academics and forestry, but for the average citizens it is hard to find. For me, the one thing that I came away with is that information that the land owner can take.
- Yes, liked that we had all the professional people there discussing it and the wildlife trees.
- Nice to know there are groups of folks working on this thing.
- I guess I appreciated there was a diversity of workshop people and different perspectives.
- People are interested in this topic and issue. Turnout good, discussions good.
- Field tour was a great idea. You pick up a lot from being in the field with different people.

- I really enjoyed the one presentation from the UBC professor.
- Being able to talk to other people, networking.
- The economical value for the workshop. I have been to a lot of workshops, and as an arborist, we have to stay accredited. The travel and cost was very affordable. As well, probably learning more about a situation that is going to hugely impact us all. We are having this problem and the changes in the environment—the awareness.
- Bringing the focus and awareness of ponderosa pine and not just lodgepole pine to the surface. Letting it be known that although there is not a lot of economic value in ponderosa pine, the biodiversity values are immeasurable.
- The overall importance of reserving more of these character wildlife trees. I look for more value in the standing dead rather than removing for safety reasons. We consider safety a priority, but look for opportunities to reserve.
- It was the understanding of how diverse the ecology and habitat is for animals. The most exciting part was going up to side of the hill.

APPENDIX 3 Is there any unfulfilled information need that you still have relative to the pine beetle and wildlife trees?

- Can we create wildlife trees? It has been suggested that in creating these trees wouldn't do any good. The fungi must be present to create a good wildlife tree. You must inoculate the trees with a fungus in order to create a proper wildlife tree. There really is no point in girdling the trees or blasting them.
- It would be nice to have the First Nations perspective—history and the way things come about. It would blend beautifully and add to the stories, having another perspective.
- Yes, more time in the field would have been nice. This portion was really useful and more questions were generated as a result, but we didn't have time to get them answered.
- Yes, I remember coming away with a feeling that there were more questions for me, as many of the solutions would be more for government workers. I did come home and remove some trees from my property, however, I still have questions.
- I did gain some information, but I think I wanted more information that pertained to personal information rather than just general.
- It could have been longer. Interface wildlife fire protection plan. Removing forest floor fuels in the interface areas. What percentage of trees should we leave in these instances?
- Yes, the message remains that we really don't know much more than when we walked in—biologists and scientists can't predict and therefore we don't have an answer.
- Yes, to explore this to a greater degree to what we could or should do to ameliorate the problem. Still felt we haven't really addressed the greater picture.
- Yes, I think probably there is no real answer. To learn that we are not in the same boat. It is complex, dealing with private land issues.
- Yes, the flammability issue of red vs. green trees. Everyone's big drive is for cutting down trees to address fire safety, public safety, etc. If not the case, then many forests are being cut down based on a falsehood.
- Yes, fire risk and need to be prepared. What is going to be the government and communities' response?
- One thing the ministry needs is a very simple internet tool where people can see where the confirmed infestations are today. I think people in British Columbia should have a simple tool to see here is where the bugs are today.
- Yes, I still don't know what happened this summer with the pine beetle. Another workshop would be good. Growth and devastation. More bugs or less? I don't see much in the valley, but maybe they are there.

- No, it would have been nice to have more handouts, or having the presentations made available. Not just the power points from the workshop, but web links on some of the subjects that were covered on the workshop.
- Picked up on some stuff about wildlife trees. However, since the workshop I have noticed that someone marked a wildlife [tree] at least 150 m back in the bush. Are we going to around and mark every tree...? How much legal ramification will be a result? There should be limitations to save the wildlife trees, but this could have been explored more in hindsight.
- Yes, there are still some questions—still not too sure of what to do with the trees if they are infested or if you have a whole stand. Fire issue, if on the ground. Safety hazard?
- I needed to ask more questions, I didn't ask enough, and I now know it was a great group all the way around. Everyone I talked to was very impressed.
- Not sure—we are always missing the boat on ponderosa and there are implications. We are continually trying to increase our knowledge, and there must be other ways of improving information.
- Fire risk.
- Natural disturbance.
- So much of the information seemed to be garnered towards the forested land base as opposed to helping owners at a "micro level." It would have been nice to have another perspective that could cater to the smaller acreages.

APPENDIX 4 Could you make any other suggestions for potential workshops ideas in this area that might be of interest to you?

- Grasslands.
- More outreach in the south—missing the wider audience of Osoyoos areas. Many folks like to hike and get out into nature. Targeting the Osoyoos area a bit more, and offering more educational opportunities.
- Wildlife trees could continue on—like a Part II. It is starting to show up in Kelowna more intensely.
- Watershed issues recovery and move away from the "gloom and doom" tactic. Continue to communicate and get them to start to think of restoration solutions to some of those ecosystems.
- More disease management where I could gain more on-site knowledge. Information being updated regularly.
- Environmental farm plan—environmental community provide services on call to farmers to the biodiversity plan.
- We need to encourage more talk and discussions around the grasslands.
- Grassland restoration.
- Antelope brush.
- Landowners with vineyards—what types of native species can they plant in between their vineyards. Plants that can be mowed or tilled over to increase soil nutrients and at the same time provide cover for native wildlife.
- I thought this workshop was perfect. I can't really think of anything right now. Still get the basic questions about pine beetles all the time from homeowners and private landowners.
- Willow identification and sedge identification. Indigenous knowledge.
- There is still lots of work to do on the beetles. If anything, fires. We need to have an action thing. Not just a feel good thing.
- The only thing that comes to mind is talking about the native grasslands in the area. Bluebunch wheatgrass and blue fescue.
- Community networking—continue to expand the monitoring network by involving communities and not-for-profit groups.
- Pruning techniques.
- Could you get this into to the classroom? Elementary school kids—influence them. So much influence coming at them to influence them into buying stuff. They show an interest in the subjects. Or even go to the school teachers. They are the future.

- There are so many. I guess one question from people that I have noticed, along pine beetle lines, is residential level and property owner level. They want to replant different trees instead of pines. Can they plant non-native trees? There is confusion for people as to whose responsibility it is when it comes to environmental issues.
- Pine beetles are beaten to death. Always a hot topic—the value and role of trees for saving the world.
- Bio-energy and the energy policy in BC relative to moral and ethical aspect of raising food crops.
- Combining all of the issues. Grasslands, ponderosa pine, with the current reality where we are going—global warming—urban sprawl. Habitat protection and habitat creation to offset the damage that has been done.
- Fire issue is still a big thing.
- Water—walking along the Okanagan river channel—how can we get this water and more people to appreciate the sensitivity? There is no respect—how do we get people to stop turning on the tap? How do we do that effectively and be respectful?
- How can we include the wildlife trees with the interface fire fuel reduction projects? When the objective is to remove fuel/fire potential, we could be removing high value nesting trees.