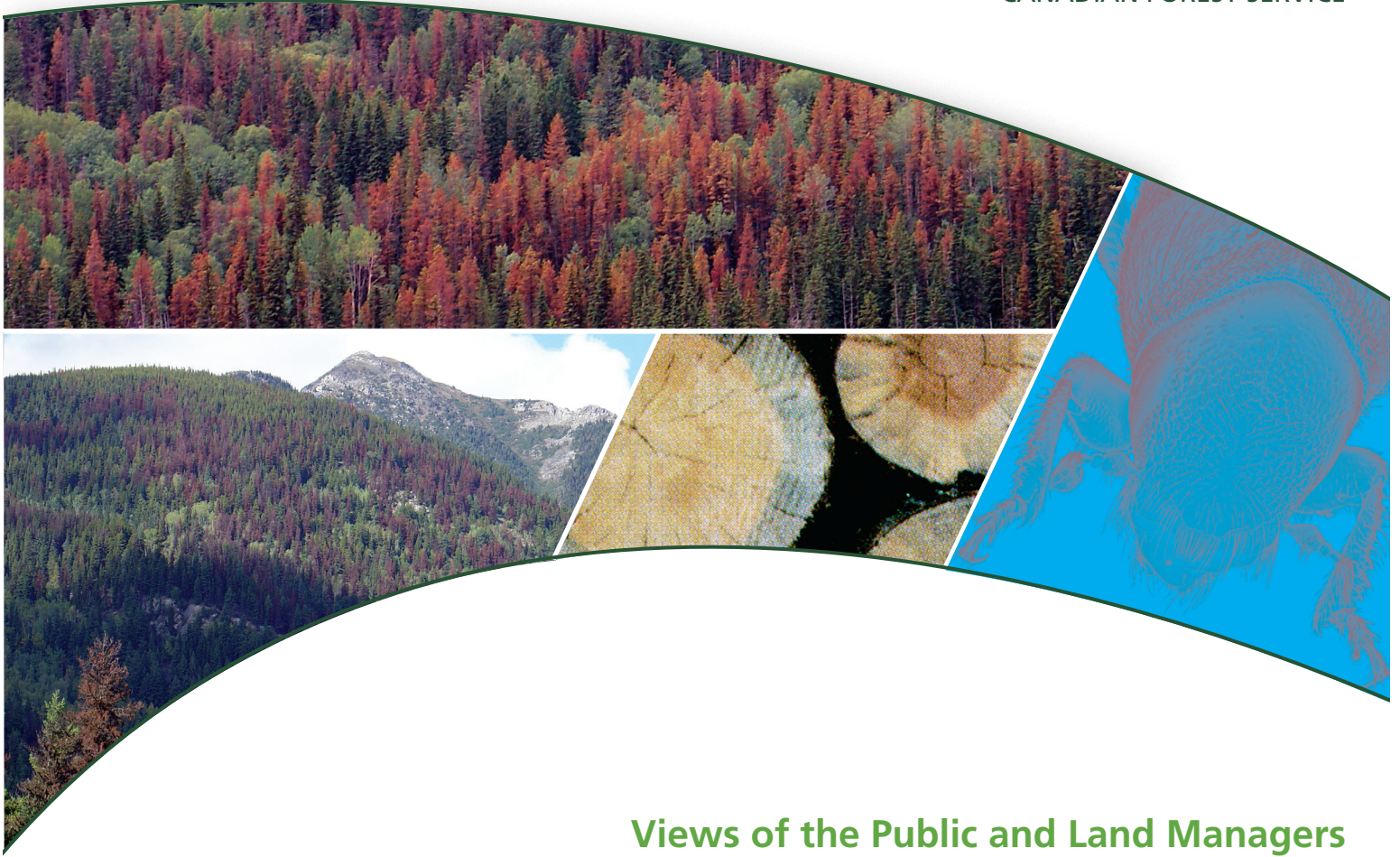




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## Views of the Public and Land Managers on Mountain Pine Beetle Activity and Management in Western Alberta

B.L. McFarlane, D.O.T. Watson, and J.R. Parkins

INFORMATION REPORT  
NOR-X-423

2015

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VIEWS OF THE PUBLIC AND LAND  
MANAGERS ON MOUNTAIN PINE BEETLE  
ACTIVITY AND MANAGEMENT  
IN WESTERN ALBERTA

B.L. McFarlane<sup>1</sup>, D.O.T. Watson<sup>1</sup>, and J.R. Parkins<sup>2</sup>

Information Report NOR-X-423

Canadian Forest Service  
Northern Forestry Centre  
2015

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## ABSTRACT

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Beginning about the turn of the century, an outbreak of the mountain pine beetle (MPB) extended beyond its historic range in southern Alberta. This outbreak was facilitated by a series of mild winters and an influx of beetles from a massive outbreak in the neighbouring province of British Columbia. Given that much of this outbreak has occurred on publicly owned land, if the response to the beetle outbreak is to be effective it will require public acceptance of MPB management. We examined public perceptions of risks, attitudes toward the MPB, acceptability of management options, satisfaction with response to the MPB infestation, trust in government and the forest industry, awareness of MPB and its management, and where the public obtains MPB information. In 2009, we conducted a mail survey of residents ( $n = 1303$ ) in three regions of the western, forested area of the province and an Internet survey of land managers ( $n = 43$ ). Results show that residents were poorly informed about the MPB, but they perceived it as having negative impacts on forests and communities. Most residents were somewhat satisfied with the overall government response to the MPB and they supported action to control the beetle. They rated most control options as acceptable and effective, and they had a moderate level of trust in government and the forest industry. Residents used a variety of sources for MPB information including media, the provincial and federal governments, and the forest industry. Residents in the three regions differed in terms of their concerns about the economic impacts of the MPB and the beetle's effects on scenic quality, their acceptance of harvesting to control the beetle, their views on the effectiveness of controls, and their level of trust in government and the forest industry. Land managers and residents shared a negative view of the MPB and supported harvesting activities to control the MPB but they differed in terms of their concerns for non-timber impacts, satisfaction with the response to the beetle, and trust in the provincial government and forest industry. Implications of these findings for developing communication strategies, engaging the public, and incorporating the public's concerns into management plans and control options are discussed.

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## RÉSUMÉ

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Une épidémie du dendroctone du pin ponderosa a commencé vers le tournant du siècle et s'est étendue au-delà de l'aire de répartition de l'espèce dans le sud de l'Alberta. Cette épidémie a été facilitée par une suite d'hivers doux et par un afflux de dendroctones provenant d'une importante infestation en cours dans la province voisine de la Colombie-Britannique. Comme cette épidémie s'est surtout produite sur des terres publiques, il est nécessaire que le public accepte la lutte contre le dendroctone pour que l'intervention soit efficace. Nous avons examiné la perception des risques, l'attitude à l'égard du dendroctone, l'acceptabilité des moyens de lutte, la satisfaction à l'égard de l'intervention face à l'épidémie, la confiance dans le gouvernement et l'industrie forestière, la connaissance du dendroctone et de la lutte contre cet insecte, ainsi que les sources auprès desquelles le public obtient de l'information au sujet du dendroctone. En 2009, nous avons mené un sondage postal auprès des habitants ( $n = 1303$ ) de trois régions dans la partie ouest et boisée de la province et un sondage Internet auprès des aménagistes ( $n = 43$ ). Les résultats montrent que les habitants sont mal renseignés au sujet du dendroctone, mais qu'ils perçoivent qu'il a des effets négatifs sur les forêts et les collectivités humaines. La plupart des habitants étaient plutôt satisfaits de l'intervention gouvernementale en général et ils appuyaient la lutte contre le dendroctone. Ils ont jugé la plupart des moyens de lutte comme étant acceptables et efficaces et ils faisaient moyennement confiance au gouvernement et à l'industrie forestière. Les habitants utilisaient des sources variées d'information au sujet du dendroctone, dont les médias, l'administration provinciale ou fédérale et l'industrie forestière. Les habitants des trois régions différaient quant à leurs préoccupations au sujet des répercussions économiques du dendroctone et de ses effets sur la qualité du panorama; ils avaient également des points de vue différents en ce qui concerne l'acceptation de la récolte comme moyen d'endiguer l'infestation, l'efficacité des moyens de lutte et le degré de confiance accordé au gouvernement et à l'industrie forestière. Les aménagistes et les habitants partageaient une perception négative du dendroctone et appuyaient les activités de récolte pour lutter contre l'insecte, mais ils différaient pour ce qui est de leurs préoccupations quant à l'incidence sur les produits non ligneux, la satisfaction à l'égard de l'intervention contre le dendroctone et le degré de confiance accordé au gouvernement provincial et à l'industrie forestière. Nous analysons les répercussions de nos constatations sur l'élaboration de stratégies de communication, la mobilisation du public et l'intégration des préoccupations du public dans les plans d'aménagement et les moyens de lutte.

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## INTRODUCTION

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The mountain pine beetle (*Dendroctonus ponderosae* Hopkins) is endemic to lodgepole pine (*Pinus contorta* Dougl. ex Loud. var. *latifolia* Englem.) forests of western Canada. However, the province of British Columbia (BC) recently experienced the most extensive outbreak of the insect ever recorded in North America (Taylor and Carroll 2004). Starting in the 1990s, the outbreak increased exponentially in BC, peaking in 2005. It had infested more than 18 million hectares of primarily public land by 2012 (British Columbia Ministry of Forests and Range 2013). Historically, the eastern edge of beetle distribution has lain along the southern Rockies near the Alberta–BC border. In the past, the province of Alberta has had small, localized populations and outbreaks; the earliest recorded infestation was in the 1940s. Beginning in 1975, a large-scale infestation occurred for about a decade in the southwest corner of the province (AESRD 2014a). Through the expansion of local populations and large overflights from BC in 2006 and 2009, the beetle has extended its range in Alberta, affecting ecosystems and communities that have had no prior experience with the beetle. The beetle has also been shown to infest other pine species, such as jack pine (*Pinus banksiana* Lamb.), a predominant species in Canada’s boreal forest. It has been predicted that the beetle is likely to persist beyond its historical range and infest Canada’s boreal jack pine forests, potentially spreading across Canada (Safranyik et al. 2010; Cullingham et al. 2011).

The mountain pine beetle (MPB) can have profound economic, social, political, and ecological implications for people living, working, and engaging in recreation in and near susceptible forests. In BC, for example, it is estimated that 710 million cubic metres of commercially viable timber has been killed by the beetle. The BC government has committed over \$884 million and the federal government has committed \$340 million and made an additional commitment of \$800 million to battle the beetle and mitigate its impacts (British Columbia Ministry of Forests and Range 2013). In Alberta, it is estimated that 6 million hectares (about 15% of Alberta’s forest) is vulnerable to MPB

(AESRD 2014b). In response to the MPB threat, Alberta Sustainable Resource Development (ASRD; in 2012, Alberta Sustainable Resource Development amalgamated with Alberta Environment, creating Alberta Environment and Sustainable Resource Development, AESRD) developed a MPB management strategy that outlined the objectives and guiding principles of ASRD’s response and that defined management principles, priority management zones, and tactics to mitigate the impacts and spread of MPB (ASRD, 2007a). ASRD also developed an action plan outlining the specific steps it was taking to manage and mitigate the MPB’s impacts (ASRD 2007b).

The Foothills Research Institute (fRI) implemented a Mountain Pine Beetle Ecology Program in 2007 to carry out focused research and investigations related to infestations of MPB in Alberta. The program has highlighted the need to understand the implications of MPB infestations for forest management and to explore the forest management options for responding to these infestations. As part of the exploration of management options, it is important to consider the public’s understanding and acceptance of such options. It is common for there to be multiple perspectives on natural resource management issues within communities. The public’s views of MPB may differ substantially from that of experts and decision-makers, leading to potential conflict over management alternatives (Flint et al. 2009). Without the support of the public, especially residents in communities that might be affected by MPB, implementation of forest management options may be met with resistance (Shindler et al. 2002). However, garnering public support is not as simple as educating the public about the scientific basis and rationale of options. Even when facts are agreed on, other influences — such as perceptions of management options, personal experiences, and trust in resource management agencies — shape judgments of acceptability. Thus, understanding the perceptions, attitudes, knowledge, and preferences of local stakeholders affected by the MPB is critical to effective management and communication.

## Objectives

The goal of this study was to provide land managers and decision-makers with an understanding of the public's views regarding MPB management options in Alberta and to assist them in developing communication strategies. The specific objectives were to:

- examine the public's perceptions of the MPB, perceptions of options for MPB management, level of trust in government and industry in managing the MPB, preferred means to receive MPB information, and knowledge of MPB;
- examine land managers' perceptions of the MPB, perceptions of options for MPB management, level of trust in government and industry in managing the MPB, and views of MPB science, media coverage and the public's opinions;
- compare the public's and the land managers' perceptions of MPB, of options for its management, and of other factors; and
- identify implications of the study findings for communicating with and involving the public in MPB management.

## Relevant Literature

Recent bark beetle infestations in western North America, Alaska, and Europe have drawn attention to the human dimensions of such infestations. Studies of the human dimensions of the MPB infestation in western Canada have focused on particular aspects of the infestation, such as economic impacts (Patriquin et al. 2007), community vulnerability (Parkins and MacKendrick 2007), and attitudes and management preferences of local residents and national park visitors (McFarlane et al. 2006; McFarlane and Watson 2008). Although these studies have provided valuable information relevant to policy and management, public perceptions of MPB management on provincial crown lands in Alberta have not been studied.

Given the variation in the biophysical and socioeconomic characteristics of infested areas (Flint 2007), it is unlikely that the impacts of MPB infestations and the public response will be uniform across the landscape. Several studies have found variation in community vulnerability and response to infestations, public perceptions of risk, and acceptability of response options. This suggests that the human dimension of forest insect disturbance is complex and dynamic. Studies of public perceptions of MPB infestations in Banff and Kootenay national parks showed that local residents and residents of a large urban centre (Calgary) supported controlling MPB populations in the parks (McFarlane et al. 2006). However, when presented with specific management options, residents showed a preference for reactive options (such as harvesting infested trees or using prescribed burns on infested areas) rather than for proactive approaches aimed at reducing MPB habitat (removing trees or burning susceptible areas that were not yet infested). Abrams et al. (2005) found similar results in a study of forest health in Oregon and Washington states. The public supported actively managing for forest health, but there was variation in the level of support for specific management practices. In a study of public perceptions of MPB management options in BC, the public supported salvage logging and preferred replanting harvested areas with mixed species, although they knew little about the specific details of what was being done to manage the infestation (Meitner et al. 2008). In contrast, tourists visiting a national park in Germany showed a slight preference for granting the beetle a right to exist in the park and were disinclined to support control measures, suggesting tourists may accept the beetle as a natural disturbance agent (Müller and Job 2009). Flint (2006) showed that at different stages of a spruce bark beetle (*Dendroctonus rufipennis* (Kirby)) outbreak in Alaska, communities' perceptions of impact varied, both spatially and temporally. The study concluded that the dynamic nature of the infestation (timing and magnitude) contributes to variation in local community response and willingness to accept particular control measures. The variation in support for beetle management options in these studies highlights the importance of understanding the public response in different contexts and circumstances.

Not only may the public response be dynamic, but perceptions of MPB and judgments of an acceptable response may also differ between the public and MPB experts. Several studies suggest that the public tends to perceive the impacts of risks to ecosystems differently than experts (e.g., McDaniels et al. 1997; Lazio et al. 2000; Zaksek and Arvai 2004; Parkins and MacKendrick 2007). The public does not necessarily accept control measures aimed at addressing an agency's strategic goals such as reducing the risk to timber supply and preventing insect spread (Shindler et al. 2002). How experts perceive the public's understanding of MPB and how they view the public's role in resource management can influence experts' interactions with the public. For example, experts who view public concerns as value-laden and believe that the public is misled by interest groups tend to view the public as having misplaced priorities and as being poor decision-makers (Young and Matthews 2007). Thus, they may dismiss public concerns as uninformed and irrational. As noted by Shindler et al.

2002, rather than dismissing public concerns, experts should strive to understand how public perceptions differ from their own and address these differences in management options and communication strategies. Moreover, research on the perception of risk shows that although the public may have a different perspective on risk than experts, these views are not irrational or misguided (Slovic 1987). Rather, public perspectives of environmental risks (such as the risks posed by the MPB) are often influenced by issues of equity, control, and trust as well as individuals' past experiences with land management agencies (Shindler and Toman 2003; Winter et al. 2004; Olsen and Shindler 2010) and may be based on a broader set of concerns than those of experts (Sjöberg 1999). In this study, we compare the views of the public with those of land managers. We use the term "land manager," which includes officials within several government agencies and the forest industry, for people who have a technical understanding of MPB issues and how the MPB affects forest landscapes.

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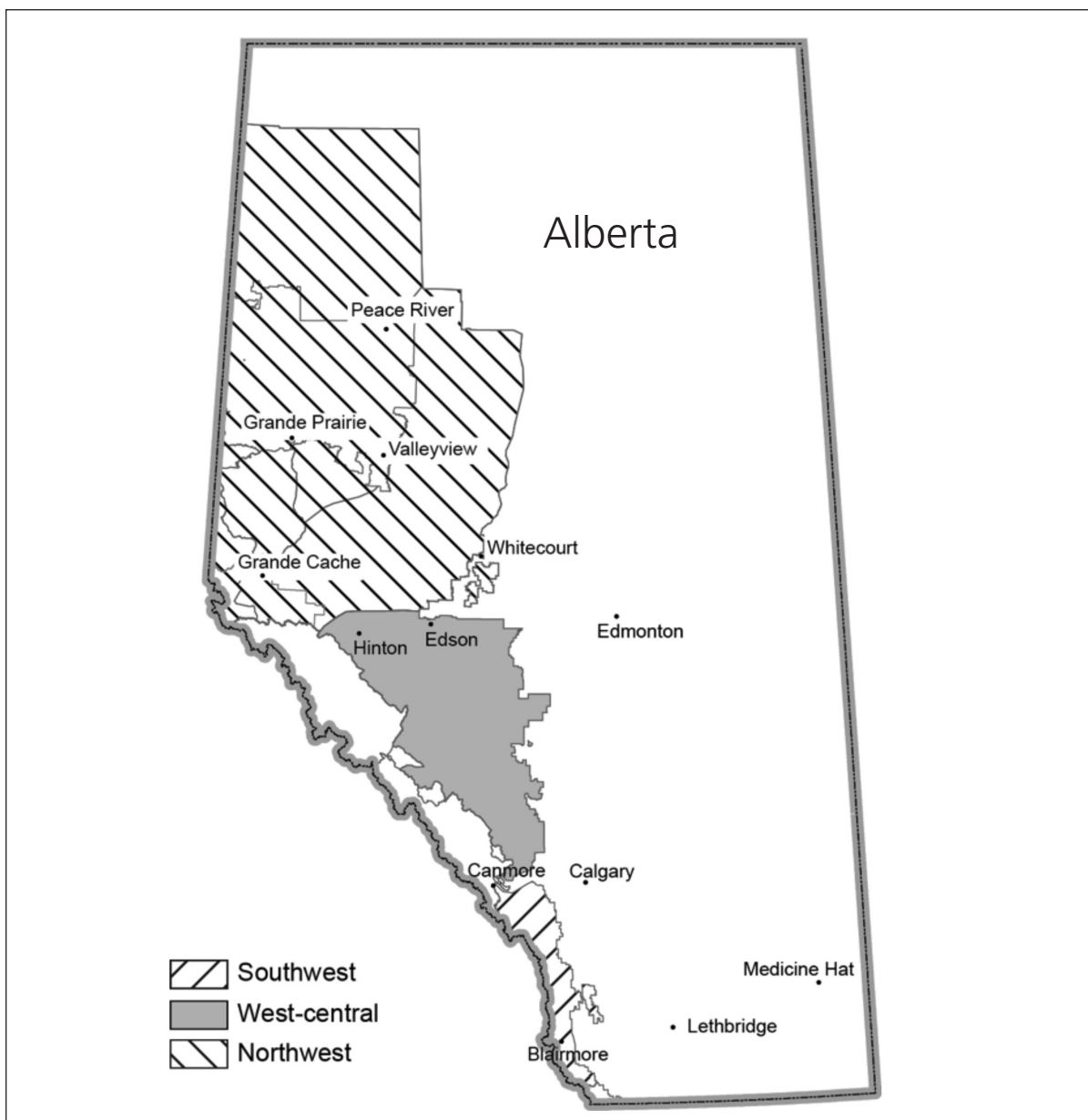
## METHODS

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### Sample Regions

To obtain samples of residents from affected areas of Alberta, we divided the western forested portion of the province into three regions: southwest, west-central, and northwest (Fig. 1). We drew upon the expertise of the fRI MPB Ecology Activity Team (a partnership of

provincial government and forest industry land managers and municipal leaders) to delineate the study regions — reflecting differences in historical and current MPB infestations at the time of the study. These regions represent the forested areas in the province with suitable MPB habitat vulnerable to MPB infestation.



**Figure 1. Study regions of a public survey of mountain pine beetle management in western Alberta**  
(Source: McFarlane et al. 2012. Reprinted with permission.).

We obtained the level of economic dependence on the forest sector in 2006 for each region from work conducted by W.A. White and M.N. Patriquin (personal communication, 14 July 2010). The level of forest dependence is based on the percentage of the economic base that is associated with the forest industry for each census subdivision (CSD) (Stedman et al. 2007). For this study, we classified CSDs in the three study regions as having high (50% and more), moderate (25% to 49%), low (1% to 24%), or no (0%) forest dependence.

The southwest region runs from the Alberta – United States border in the south to just north of Highway 1; the western boundary is the limits of the mountain national parks and the eastern boundary roughly follows the divide between forest and prairie (roughly to the west of and parallel to Highway 22). The major population centers are Canmore and surrounding area, and the municipality of Crowsnest Pass in the south. The southwest study region has a history of MPB outbreaks. The first recorded outbreak was in the 1940s and another outbreak started in the 1970s and continued into the 1980s. The next outbreak began in 2002 and was ongoing at the time of this study. The southwest region is the least forest dependent of the three study regions. None of the five CSDs constituting the region are classified as having moderate or high forest dependence, three are classified as having a low forest dependence, and two are classified as having no forest dependence. Only 0.2% to 3.0% of the economic base of the three CSDs with low dependence was associated with the forest industry.

The west-central region encompasses the area from just north of Highway 1 in the south to just north of Highway 16 in the north; the western boundary is the limits of the mountain national parks, and the eastern boundary is near the forest/prairie divide. The major population centres are Hinton, Edson, and Rocky Mountain House. At the time of our study, the west-central region had no historic or current outbreaks of MPB, but there was a high potential for beetle population growth in the region. Of the 16 CSDs constituting the west-central region, none are classified as having high forest dependence, nine are classified as having low forest dependence, two are classified as having moderate forest dependence and five (31%) are classified as having no forest dependence. The

forest dependence of the 11 CSDs with low or moderate dependence levels ranged from 2.0% to 44.3%.

The northwest region starts in the south just north of Highway 16 and ends in the north at Paddle Prairie, with the Alberta – British Columbia border as the western limit and a staggered eastern boundary that goes to approximately the centre of Slave Lake. The major population centres are Grande Prairie, Grande Cache, Peace River, and Whitecourt. At the time of our study, the northwest region had no history of MPB infestation but was experiencing a large outbreak resulting from long-range dispersal of beetles from BC in 2006. Of the 42 CSDs constituting the region, 86% have some level of forest dependence: 30 are classified as having low dependence and seven as having moderate dependence. None of the CSDs are classified as having high dependence. Six (14%) are classified as having no forest dependence. Forest dependence for the CSDs classified as having low or moderate dependence ranged from 1.2% to 45.0%.

All of the regions were subject to MPB management. The strategies included single-tree treatments such as “cut and burn,” harvesting of areas of infested trees and processing the trees to kill the beetles, forest industry adjustment of harvest plans to log healthy but susceptible areas before they were attacked, and prescribed burning.

## Samples

A sample of residents from the three regions was recruited by telephone in 2009 to participate in a mail survey. Respondents had to be 18 years of age or older, and equal numbers of men and women were sought. In total, 5647 qualified respondents were contacted. Of these, 1994 agreed to participate in a mail survey: 643 from the southwest region, 649 from the west-central, and 702 from the northwest. Response rates are described in the next section.

At the same time as the public was surveyed by mail, land managers of provincial crown lands (from the provincial government and forest industry) were surveyed via the Internet. The sample for this group was obtained by asking members of the fRI MPB Activity Team to provide names and email addresses of land

managers of industrial crown lands as well as provincial parks and protected areas in the study regions and at head offices in Edmonton.

We also surveyed Parks Canada MPB specialists, municipal government officials, and MPB scientists via the Internet. The focus of this report was on land managers of provincial crown lands; consequently, Parks Canada MPB specialists, municipal government officials, and MPB scientists were excluded from this report.

## Questionnaire

The mail questionnaire for the public was developed in consultation with the FRI MPB Activity Team. It included questions pertaining to perceptions of risk, attitudes toward the MPB, acceptability of management options, satisfaction with management measures in response to MPB infestation, trust in government and the forest industry, awareness of MPB and its management, sources of MPB information, and demographic data about the respondent. The questionnaire also included an area for respondents to comment in an open-ended manner on the MPB and its management in Alberta. Survey packets were mailed on 4 September 2009. They contained the questionnaire, a cover letter explaining the purpose of the survey, and a postage-paid business reply envelope. A reminder postcard was mailed on 18 September, and another complete survey package was mailed on 14 October to people who had not responded.

Table 1 provides a summary of the mail survey response. The returns for the mail survey were 473 from the southwest region, 424 from the west-central region, and 406 from the northwest region. This level of response gives a sampling error of less than  $\pm 5\%$ , 19 times out of

20. After adjusting for questionnaires returned because of bad addresses, the response rates (percentage completed) were 74% (southwest), 66% (west-central), and 59% (northwest). Considering that there were 1 303 completed surveys out of 5 694 initial telephone contacts, the overall response rate was 23%.

The questionnaire for the land managers included some questions from the public survey and some unique questions. Invitations to participate in the survey were sent by email on 10 September 2009. Reminder emails were sent to non-respondents on 18 September and 1 October. Each person could answer the survey only once. The survey was completed by 43 of the 68 land managers contacted, for a response rate of 62%.

## Data Analysis

Statistical analyses were performed using SAS® (version 9.1.3). Differences among means were analyzed using analysis of variance (ANOVA) and the Tukey–Kramer multiple comparison test. We used  $p \leq 0.05$  as the significance level in the statistical tests. A “no opinion” option was provided for all of the questions, and these responses were coded as missing values in the analysis of means.

Four hundred and eight (31%) of the public respondents provided comments on the survey. The comments were imported into NVivo® (version 8.0) software for qualitative data analysis. Comments were coded based on themes identified by the researchers. Some examples of the themes are prescribed burning, trust in industry, information needs, and dissatisfaction. The comments are not necessarily representative of the views of all respondents. People who were concerned

**Table 1. Response of the general public to the mail survey**

Sample region	Canada Post household counts	No. of surveys mailed	No. of surveys undeliverable	No. of surveys completed	Response rate <sup>a</sup> (%)	Sampling error (%)
Southwest	15 300	643	6	473	74	4.4
West-central	17 512	649	9	424	66	4.7
Northwest	38 241	702	16	406	59	4.8
Combined	71 053	1 994	31	1 303	66	2.7

<sup>a</sup>Response rate is adjusted for undelivered surveys.



about or dissatisfied with MPB management in Alberta tended to comment more frequently. The comments are, however, useful in providing insights into the quantitative responses and public concerns. We compared demographic characteristics of the public respondents with data from the 2006 Canada census (Statistics Canada 2008) to gauge the representativeness of the sample to the population. We used census subdivision (CSD) data and selected CSDs that best corresponded with the sample region boundaries, although the correspondence

between our region boundaries and CSD boundaries was not exact. Therefore, the census data represent estimates of the characteristics of interest. To examine whether differences in age, sex, and education distributions between survey respondents and the 2006 census might bias the survey results, we tested correlations and conducted t-tests with perceived impacts, overall satisfaction with the MPB response, acceptance of management options, and trust statements.

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## RESULTS

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### Demographic Characteristics

Although the telephone recruitment of the public sample resulted in nearly an even gender mix, there were slightly more male than female respondents to the mail survey (Table 2). Compared with the gender mix in the study regions according to 2006 census information, women are slightly underrepresented among the southwest and west-central survey respondents (Statistics Canada 2008). The responses from land managers were mainly from men.

There was a wide age distribution among public respondents (Table 3). The northwest region had a higher representation of younger respondents. There were more respondents from the northwest region in the 25- to 34-year age category and fewer in the 55- to 64-year age category than from the other regions. In

contrast, the land managers were primarily between 35 and 54 years old.

A comparison of the ages of the public respondents with the ages of the population according to the 2006 census (Statistics Canada, 2008) (Table 3) shows that the age distribution of respondents is skewed toward the 45- to 74-year age categories (i.e., survey respondents are older than the general population). There are a number of possible explanations for the age difference. The age discrepancy could be the result of sample selection. Our sample was restricted to people 18 years of age or older and did not include mobile phones. More young people are exclusively using mobile phones and do not have a land line. Older respondents may be more likely to answer a land line and may perhaps have a greater interest in MPB. In addition, the Canada census has age groupings

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**Table 2. Gender distribution (%) of respondents**

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Sample region	Male	Female	Female in region, according to census data <sup>a</sup>
<b>Public survey</b>			
Southwest	54.7	45.3	50.0
West-central	53.8	46.3	48.5
Northwest	51.9	48.1	48.5
Combined	53.5	46.5	48.5
<b>Manager survey</b>			
	87.5	12.5	NA <sup>b</sup>

<sup>a</sup>Statistics Canada (2008).

<sup>b</sup>NA = not available.

**Table 3. Age distribution (%) of respondents**

Sample region	Age (years)						
	18–24	25–34	35–44	45–54	55–64	65–74	75 or older
<b>Public survey</b>							
Southwest	6.1	6.6	17.3	27.3	27.7	12.1	3.0
West-central	7.6	10.4	15.1	24.5	27.6	11.1	3.8
Northwest	6.9	16.5	15.0	27.6	20.7	9.4	3.9
Combined	6.8	10.9	15.9	26.5	25.5	10.9	3.5
<b>Manager survey</b>	16.3	9.3	25.6	32.6	16.3	0.0	0.0
<b>2006 census<sup>a</sup></b>							
Southwest	12.2	18.2	20.1	21.2	13.8	7.5	6.7
West-central	12.7	15.6	21.2	22.8	14.8	8.1	4.7
Northwest	15.4	20.7	20.9	19.6	11.9	6.7	4.7
Combined	14.3	18.8	20.9	20.8	13.0	7.2	4.9

<sup>a</sup>Statistics Canada (2008).

of 15 to 19 years and 20 to 24 years, so for comparison with our age group of 18 to 24 years, two-fifths of the census 15- to 19-year group was added to the 20- to 24-year group. This calculation assumes an equal distribution among all ages in the 15- to 18-year group, which may introduce a small error to the resulting 18- to 24-year group for census information.

The southwest region had fewer respondents with a household member dependent on the forest, oil and gas, or mining industries but had substantially more who were dependent on the tourism industry for their economic livelihood (Table 4). The northwest region had the highest percentage (31%) of respondents

with households dependent on agriculture.

The southwest respondents to the public survey had a higher level of educational attainment, with substantially more having a bachelor's degree or higher (49%) than respondents from the other regions (Table 5). The land managers, however, had the highest levels of education, with about 73% having a bachelor's degree or higher. The public survey respondents had substantially higher educational attainment than the general population as measured in the 2006 census.

In our assessment of non-response bias, we found no association ( $p \leq 0.05$ ) between

**Table 4. Household dependence on resource sectors (%) among respondents to the public survey**

Sample region	Forest industry	Tourism	Agriculture	Oil and gas	Natural resource agency <sup>a</sup>	NA <sup>b</sup>
Southwest	10.2	26.3	4.9	22.1	6.5	48.4
West-central	23.6	7.4	22.4	53.8	3.9	25.8
Northwest	25.6	7.9	30.9	50.1	7.1	28.4
Combined	19.4	14.3	18.8	41.3	5.8	34.7

<sup>a</sup>Provincial or federal government department.

<sup>b</sup>NA = not applicable; nobody in the household depends on any of the specified industries.

**Table 5. Level of education (%) of respondents**

Sample region	Some high school or less	High school graduate	Technical school or community college	Some university	University degree <sup>b</sup>	Some graduate studies	Graduate university degree <sup>c</sup>
<b>Public survey</b>							
Southwest	4.1	12.0	23.0	11.3	28.8	4.3	16.5
West-central	10.4	28.6	35.6	5.6	13.2	2.8	3.9
Northwest	12.6	23.5	38.5	7.8	14.2	1.1	2.2
Combined	8.7	20.8	31.9	8.4	19.3	2.8	8.0
<b>Manager survey</b>	0.0	2.5	22.5	2.5	45.0	5.0	22.5
<b>2006 census<sup>a</sup></b>							
Southwest	18.5	21.9	31.4	25.7	16.0	2.0	6.0
West-central	25.6	25.8	35.9	12.0	7.0	0.7	1.9
Northwest	29.5	24.5	34.0	11.6	6.9	0.6	1.7
Combined	24.8	22.5	31.4	11.7	7.0	0.7	1.9

<sup>a</sup>Statistics Canada.

<sup>b</sup>Bachelor's degree.

<sup>c</sup>Master's, PhD, medical degree.

the demographic variables (age, sex, and education) and overall satisfaction and only small correlations between the demographic variables and a few of the perceived risks, management options, and trust statements. Age was correlated (Pearson correlation coefficient,  $r$ ), with two management options ( $r \leq 0.14$ ) and with seven trust statements ( $r \leq 0.11$ ) and was not correlated ( $p \leq 0.05$ ) with perceived impacts. Sex was correlated (Spearman correlation coefficient,  $r_s$ ) with five perceived impacts ( $r_s \leq 0.22$ ) and two trust statements ( $r_s \leq 0.11$ ). Education was correlated with three trust statements ( $r < 0.20$ ), one perceived impact ( $r_s = 0.16$ ), and five management options ( $r_s < 0.10$ ).  $T$ -tests also showed the differences between men and women and between respondents with and without a university degree to be modest. On the basis of these results, we concluded that the discrepancy between the demographic compositions of the survey respondents and the general population would have little effect on the generalizability of the survey results.

## Perceptions of the Mountain Pine Beetle

### Importance

The perceived personal importance of a natural resource management issue is a prerequisite to people's engagement in the issue. We found that the MPB was of high personal importance to respondents to the public survey in all regions. More than 80% of respondents rated the MPB as being somewhat or very important to them personally, with nearly 50% rating it as very important (Table 6). Only about 5% rated the MPB as not important to them personally. A comparison of mean scores showed no significant differences among the regions. This question was not asked of the land managers.

**Table 6. Personal importance of the mountain pine beetle to respondents to the public survey**

Sample region	No. of responses	Personal importance; % of respondents						Mean score (SD)
		Not important at all	Somewhat not important	Neutral	Somewhat important	Very important	No opinion	
Southwest	469	2.1	3.4	10.7	34.8	49.0	0.0	4.2a (0.9)
West-central	416	3.8	1.9	7.4	39.9	46.4	0.5	4.2a (1.0)
Northwest	392	3.2	2.2	9.4	38.2	44.2	2.7	4.2a (0.9)
Combined	1 277	3.0	2.6	9.2	37.5	46.7	1.0	4.2 (0.9)

Note: Personal importance was rated on a scale of 1 to 5, where 1 = “not important at all” and 5 = “very important.” Any two means that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

### Perceptions of Impacts

To examine how the MPB might affect Alberta residents, in the public survey we asked a series of questions to gauge perceptions of potential impacts of MPB. First, respondents were asked to rate impacts on the forests in their region, on their community, and on them personally (Table 7). Land managers were not asked this question. The highest rating for negative impact of MPB was for forests, with a large percentage of respondents in the three regions rating the impacts on forests as very negative (31%) or somewhat negative (51%). Impacts on communities were also rated as negative, but fewer respondents rated community impacts as very negative than they did for impacts on forests (13%). Respondents tended to view the MPB as having either no impact or a somewhat negative impact on them personally. Only about 10% of respondents viewed the MPB as having a positive impact on forests, communities, or themselves.

Respondents from the northwest region had a slightly more negative assessment of the impacts on forests in their region (Table 7) than respondents from other regions. Respondents from the west-central region had a slightly less negative assessment of the impacts on their community than those in the southwest and northwest regions. They also had a slightly less negative assessment of the personal impacts than respondents from the southwest region.

Several potential impacts associated with MPB outbreaks have been incorporated into management strategies and control options. Next, we asked respondents to both surveys about their level of concern with some of these impacts (Table 8). Overall, a majority of the public respondents in all regions (>65%) rated all of the impacts as of moderate or great concern. Loss of scenic quality was of great concern for about 62% of all public survey respondents. This was followed by loss of the forest as an economic resource (58%) and changes to wildlife habitat (56%). Although about one-third of the public respondents were greatly concerned about falling trees and loss of community identity, these issues were of less concern than the other impacts.

**Table 7. Perceptions of the impacts of the mountain pine beetle among respondents to the public survey**

Impact by sample region	No. of responses	Personal importance; % of respondents						Mean score (SD)
		Very negative	Somewhat negative	No impact	Somewhat positive	Very important	No opinion	
<b>The forest in “your region of” Alberta</b>								
Southwest	453	30.0	54.3	4.7	5.0	3.7	2.4	2.0ab (0.9)
West-central	402	21.5	56.9	8.7	5.5	4.3	3.1	2.1a (1.0)
Northwest	387	40.8	40.3	4.5	4.0	7.3	3.3	1.9b (1.1)
Combined	1 242	30.6	50.7	5.9	4.9	5.0	2.9	2.0 (1.0)
<b>Your community</b>								
Southwest	460	9.9	63.5	18.0	4.9	2.4	1.3	2.3a (0.8)
West-central	401	9.3	47.2	31.6	7.5	2.0	2.4	2.4b (0.8)
Northwest	393	20.2	51.9	14.5	5.7	5.7	2.0	2.2a (1.0)
Combined	1 254	12.9	54.6	21.3	6.0	3.3	1.9	2.3 (0.9)
<b>You personally</b>								
Southwest	461	11.6	42.7	37.6	4.1	3.0	1.1	2.4a (0.9)
West-central	405	10.7	28.0	53.0	3.7	3.2	1.5	2.6b (0.9)
Northwest	394	14.5	31.3	42.3	5.8	4.8	1.5	2.5ab (1.0)
Combined	1 260	12.2	34.4	44.0	4.5	3.6	1.3	2.5 (0.9)

Note: Perceptions were rated on a scale of 1 to 5 where 1 = “very negative” and 5 = “very positive.” Any two means for a given impact that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test.

There were some regional differences in concerns. The ranking of the responses indicates that scenic quality, risk of forest fires, and changes to wildlife habitat were of greatest concern for residents in the southwest region. Scenic quality, loss of the economic resource, and changes to habitat were of greatest concern for residents in the west-central region. The residents in the northwest region rated loss of the economic resource as their greatest concern, followed by scenic quality and loss of habitat.

The respondents in the southwest region seemed to be slightly less concerned about impacts. Fewer of these respondents indicated a great concern about the impacts, and they had significantly lower mean concern ratings than the respondents in the west-central region for changes to wildlife habitat, loss of scenic quality, and changes to forest recreation (Table 8). They also had significantly lower ratings for loss of the forest as an economic resource

than respondents in both the west-central and northwest regions.

In contrast to residents’ concerns, land managers’ greatest concerns were loss of the forest as an economic resource and increased risk of forest fires. About 65% of the land managers rated economic impact as a great concern, and nearly 50% rated increased risk of forest fires as a great concern (Table 8). Differences in mean concern ratings show that land managers were substantively less concerned about effects on wildlife habitat, loss of scenic quality, and falling trees than residents in the three regions and were more concerned about economic impacts than residents in the southwest. Land managers did not differ from the residents in terms of concerns about increased risk of forest fires, increased runoff and higher water tables, changes to forest recreation, and loss of community identity.

**Table 8. Level of concern about the impacts of the mountain pine beetle (%)**

Concern	No. of responses	No concern	Slight concern	Moderate concern	Great concern	No opinion	Mean score (SD)
<b>Increased risk of forest fire</b>							
<b>Public survey</b>							
Southwest	467	5.1	17.5	28.6	48.4	0.4	3.2a (0.9)
West-central	415	2.9	14.9	30.5	51.3	0.5	3.3a (0.8)
Northwest	398	4.0	13.5	28.5	53.5	0.5	3.3a (0.9)
Combined	1 280	4.0	15.4	29.2	50.9	0.5	3.3 (0.9)
<b>Manager survey</b>	43	4.6	14.0	32.6	48.8	0.0	3.3a (0.9)
<b>Loss of scenic quality</b>							
<b>Public Survey</b>							
Southwest	466	4.3	9.8	27.1	58.2	0.6	3.4a (0.8)
West-central	419	1.4	9.3	22.9	66.4	0.0	3.5b (0.7)
Northwest	398	3.8	10.3	24.5	61.0	0.5	3.4ab (0.8)
Combined	1 283	3.2	9.8	24.9	61.7	0.4	3.5 (0.8)
<b>Manager survey</b>	43	18.6	16.3	39.5	25.6	0.0	2.7c (1.1)
<b>Increased runoff and higher water tables</b>							
<b>Public survey</b>							
Southwest	450	5.2	13.4	34.3	44.2	3.0	3.2a (0.9)
West-central	409	5.3	12.3	31.6	49.4	1.5	3.3a (0.9)
Northwest	387	7.0	20.0	32.8	37.0	3.3	3.0b (0.9)
Combined	1 246	5.8	15.1	32.9	43.6	2.6	3.2 (0.9)
<b>Manager survey</b>	41	2.3	16.3	39.5	37.2	4.6	3.1ab (0.8)
<b>Falling trees</b>							
<b>Public survey</b>							
Southwest	463	11.8	23.7	34.2	29.3	1.1	2.8a (1.0)
West-central	414	10.6	22.8	33.2	32.9	0.5	2.9a (1.0)
Northwest	395	12.8	22.5	32.5	31.0	1.3	2.8a (1.0)
Combined	1 272	11.7	23.1	33.3	31.0	0.9	2.8 (1.0)
<b>Manager survey</b>	43	16.3	39.5	32.6	11.6	0.0	2.4b (0.9)
<b>Changes to wildlife habitat</b>							
<b>Public survey</b>							
Southwest	465	6.2	12.2	32.6	48.2	0.9	3.2a (0.9)
West-central	415	2.9	11.0	22.0	63.4	0.7	3.5b (0.8)
Northwest	395	4.3	12.3	25.8	56.6	1.0	3.4ab (0.9)
Combined	1 275	4.5	11.8	27.1	55.8	0.9	3.4 (0.9)
<b>Manager survey</b>	42	7.0	16.3	60.4	14.0	2.3	2.8c (0.8)

**Table 8. Concluded**

Concern	No. of responses	No concern	Slight concern	Moderate concern	Great concern	No opinion	Mean score (SD)
<b>Loss of the forest as an economic resource (e.g., forestry, tourism)</b>							
<b>Public survey</b>							
Southwest	465	8.1	17	29.8	44.0	1.1	3.1a (1.0)
West-central	411	2.9	8.4	23.0	64.1	1.7	3.5b (0.8)
Northwest	394	2.5	6.3	23.3	66.7	1.3	3.6b (0.7)
Combined	1 270	4.7	10.9	25.6	57.6	1.3	3.4 (0.9)
<b>Manager survey</b>	38	2.3	0.0	20.9	65.1	11.6	3.7b (0.6)
<b>Changes to the forest for recreation</b>							
<b>Public survey</b>							
Southwest	466	6.6	18.8	28.3	46.0	0.2	3.1a (0.9)
West-central	415	4.3	12.5	32.0	51.0	0.2	3.3b (0.8)
Northwest	393	6.3	15.5	28.0	48.5	1.8	3.2ab (0.9)
Combined	1 274	5.8	15.7	29.4	48.4	0.7	3.2 (0.9)
<b>Manager survey</b>	43	2.3	20.9	48.8	27.9	0.0	3.0ab (0.8)
<b>Loss of community identity tied to the forest</b>							
<b>Public survey</b>							
Southwest	456	12.7	17.4	34.1	33.7	2.2	2.9a (1.0)
West-central	409	7.2	20.4	32.6	37.7	2.2	3.0a (0.9)
Northwest	382	9.7	19.2	35.9	30.4	4.7	2.9a (1.0)
Combined	1 246	10.0	18.9	34.2	34.0	3.0	2.9 (1.0)
<b>Manager survey</b>	41	9.3	23.3	39.5	23.3	0.0	2.8a (0.9)

Note: Level of concern was rated on a scale of 1 to 5 where 1 = "no concern" and 5 = "great concern." Any two means for a given concern that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

## Attitudes toward the Mountain Pine Beetle

We assessed attitudes toward the MPB using a series of statements reflecting positive and negative evaluations. This attitude scale has been used in previous studies of residents and visitors to national parks in Canada (McFarlane et al. 2006) and Germany (Müller and Job 2009).

Overall, residents had a negative attitude

toward the MPB (Table 9). A majority agreed that it is a threat to biodiversity (70%) and results in substantial economic losses (85%), and that MPB outbreaks are an ecological disaster (66%). A majority disagreed that the beetle helps ensure that forests are healthy (70%), that it is important in rejuvenating forests (62%), and that it is more beneficial than harmful (79%).

There is some regional variation in the public responses. Although residents in the southwest region had a negative assessment of the MPB,

**Table 9. Attitudes toward the mountain pine beetle (%)**

Statement and sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Positive statement</b>								
<b>The mountain pine beetle helps ensure that forests are healthy</b>								
<b>Public survey</b>								
Southwest	445	34.8	23.9	11.8	18.5	6.7	4.3	2.4a (1.3)
West-central	409	49.9	25.8	11.1	9.9	1.9	1.5	1.9b (1.1)
Northwest	387	51.0	25.1	7.8	10.1	3.3	2.8	1.9b (1.1)
Combined	1 241	44.8	24.9	10.3	13.1	4.1	2.9	2.0 (1.2)
<b>Manager survey</b>	41	29.3	26.8	2.4	31.7	9.8	0.0	2.7a (1.4)
<b>The mountain pine beetle is important in rejuvenating the forest</b>								
<b>Public survey</b>								
Southwest	441	27.6	26.3	15.0	19.3	6.2	5.6	2.5a (1.3)
West-central	411	40.5	26.5	12.3	15.7	4.1	1.0	2.2bc (1.2)
Northwest	375	41.7	24.8	11.6	13.9	2.8	5.3	2.1b (1.2)
Combined	1 227	36.2	25.9	13.1	16.4	4.5	4.0	2.2 (1.2)
<b>Manager survey</b>	41	31.7	24.4	0.0	36.6	7.3	0.0	2.6ac (1.4)
<b>Overall the mountain pine beetle is more beneficial than harmful</b>								
<b>Public survey</b>								
Southwest	456	45.3	28.4	13.9	5.3	4.5	2.6	1.9a (1.1)
West-central	412	58.5	23.7	10.6	2.9	3.1	1.2	1.7b (1.0)
Northwest	388	60.3	21.3	9.5	2.5	3.5	3.0	1.6b (1.0)
Combined	1 256	54.2	24.7	11.4	3.7	3.7	2.3	1.8 (1.1)
<b>Manager survey</b>	40	47.5	27.5	20.0	5.0	0.0	0.0	1.8ab (0.9)
<b>Negative statement</b>								
<b>The mountain pine beetle is a threat to biodiversity</b>								
<b>Public survey</b>								
Southwest	435	6.1	12.0	14.2	31.4	31.2	5.2	3.7a (1.2)
West-central	391	3.7	8.6	10.3	31.6	41.7	4.2	4.0b (1.1)
Northwest	362	3.1	5.9	10.0	33.5	40.2	7.4	4.1b (1.0)
Combined	1 188	4.4	9.0	11.6	32.1	37.4	5.6	3.9 (1.1)
<b>Manager survey</b>	41	7.3	21.9	19.5	24.4	26.8	0.0	3.4a (1.3)
<b>The mountain pine beetle results in substantial economic losses</b>								
<b>Public survey</b>								
Southwest	451	2.6	4.5	11.3	39.2	40.2	2.3	4.1a (1.0)
West-central	413	4.3	3.4	4.8	26.1	60.4	1.0	4.4b (1.0)
Northwest	392	2.5	3.8	3.5	26.2	62.7	1.3	4.4b (0.9)
Combined	1 264	3.1	3.9	6.8	30.9	53.7	1.6	4.3 (1.0)
<b>Manager survey</b>	41	2.4	4.9	2.4	12.2	75.6	2.4	4.6b (1.0)



**Table 9. Concluded**

Statement and sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Mountain pine beetle outbreaks are an ecological disaster</b>								
<b>Public survey</b>								
Southwest	457	8.3	20.5	11.3	30.6	26.9	2.4	3.5a (1.3)
West-central	411	6.7	12.3	11.1	28.9	39.9	1.2	3.8b (1.3)
Northwest	388	5.3	9.3	11.6	29.0	42.6	2.3	4.0b (1.2)
Combined	1 256	6.9	14.4	11.3	29.5	36.0	2.0	3.7 (1.3)
<b>Manager survey</b>	40	17.1	24.4	7.3	19.5	31.7	0.0	3.2a (1.5)

Note: Attitudes were rated on a scale of 1 to 5 where 1 = "strongly disagree" and 5 = "strongly agree." Any two means for a given statement that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

these residents were less negative in their views than residents in the other regions. For example, about 31% strongly agreed that the beetle is a threat to biodiversity compared with about 40% of residents in the other regions; only 40% of residents in the southwest region strongly agreed that the MPB results in substantial economic losses compared with about 60% in the other regions. Similarly, respondents in the southwest region had significantly lower mean ratings on the negative statements and higher ratings on the positive statements than those in the other regions.

Land managers also had a negative assessment of the MPB. About 51% of land managers agreed that it is a threat to biodiversity or that outbreaks are an ecological disaster, and 56% disagreed that the MPB helps ensure that forests are healthy or that it is important in rejuvenating forests (Table 9). About 76% of land managers strongly agreed that the MPB results in substantial economic losses. A comparison of the mean responses shows that land managers' attitudes are similar to those of respondents in the southwest region but differ from those of respondents in the west-central and northwest regions. For example, both respondents in the southwest and land managers had significantly lower mean scores on statements that the MPB is a threat to biodiversity and that outbreaks are an ecological disaster and higher scores on the statement that the MPB helps ensure that forests are healthy. Land managers' responses, however, were similar to those of respondents in the west-central and northwest regions in their view that the MPB results in substantial economic losses.

## Perceptions of Mountain Pine Beetle Management

We used several questions to examine perceptions of MPB management on crown land used by the forest industry as well as in parks and protected areas. We assessed the preferred approach by examining the extent to which respondents think the MPB should be managed. Respondents chose from a series of options ranging from letting the MPB infestation run its course to doing all that can be done to stop the MPB. We also examined the acceptance and the perceived effectiveness of specific management options, including harvesting options, prescribed burning, and chemical use in controlling the MPB.

### Preferred Approach

Regarding the approach that should be taken to manage the MPB on crown land used by the forest industry (Table 10) and in provincial parks and protected areas (Table 11), a majority of residents in the west-central and northwest regions selected the option to do all that can be done to control the MPB in their regions. The next most favoured option was to intervene in susceptible areas before the MPB attacks, followed by intervening only in areas affected by the MPB. Allowing the MPB to run its course without intervention was selected by less than 10% of respondents. Residents in the southwest region showed a wider distribution of responses than residents in the other regions. Fewer respondents in the southwest chose "do all that can be done," and more chose "intervene in areas that are susceptible to the beetle"

**Table 10. Views on the best approach to manage the mountain pine beetle on crown land (%)**

Approach	Public survey				Manager survey
	Southwest	West-central	Northwest	Combined	
Allow the beetle to run its course without intervention	7.6	2.7	4.4	5.1	0.0
Intervene only in areas that beetles have already attacked	20.3	18.2	15.1	18.0	7.5
Intervene in areas that are susceptible to the beetle before the beetle attacks	26.4	21.9	21.0	23.3	22.5
Do all that can be done to control the beetle	45.6	57.3	59.6	53.7	70.0

**Table 11. Views on the best approach to manage the mountain pine beetle in parks and protected areas (%)**

Approach	Public survey				Manager survey
	Southwest	West-central	Northwest	Combined	
Allow the beetle to run its course without intervention	7.8	4.6	4.3	5.7	7.3
Intervene only in areas that beetles have already attacked	22.0	18.8	17.9	19.7	9.8
Intervene in areas that are susceptible to the beetle before the beetle attacks	25.9	21.0	19.4	22.3	24.4
Do all that can be done to control the beetle	44.3	55.5	58.3	52.3	58.5

and “allow the beetle to run its course.” For all regions, there were no significant differences between the preferred approaches to managing crown land versus protected areas.

Allowing the MPB to run its course on crown land used by the forest industry was not acceptable to any of the land managers, but some land managers (7%) were more tolerant of letting the MPB run its course in parks and protected areas. Compared with the public, more land managers (70%) selected “do all that can be done to control the beetle.”

#### Acceptability of Management Options

To examine the acceptability of specific management actions for the MPB, we presented respondents to the public and land manager surveys with a description of a number of options (see the Appendix). Respondents rated the acceptability of these management actions on crown lands used by the forest industry as well as in parks and protected areas in their respective regions.

Overall, with the exception of prescribed burning of areas not yet attacked, most respondents rated the options as somewhat or very acceptable for the management of crown lands used by the forest industry (Table 12). The options that the highest percentage of respondents to the public survey found to be very acceptable were forest harvesting activities: salvage logging (73%), harvesting infested areas (57%), and adjusting harvest plans (50%). Prescribed burning was less acceptable than harvesting activities. The least acceptable option was prescribed burning of uninfested areas. There was a wide distribution of responses to this option, with about 48% of respondents rating it as very or somewhat unacceptable. Prescribed burning of infested areas was more acceptable: about 80% rated this as somewhat or very acceptable. Thinning healthy trees before they are attacked (70%), cutting infested trees and burning them on-site (75%), and chemical control with carbaryl (56%) were rated as somewhat or very acceptable by a majority of residents.

**Table 12. Acceptability of management options on crown land used by the forest industry (%)**

Management option and sample region	No. of responses	Very unacceptable	Somewhat unacceptable	Neutral	Somewhat acceptable	Very acceptable	No opinion	Mean score (SD)
<b>Prescribe burn areas attacked by the beetle</b>								
<b>Public survey</b>								
Southwest	457	6.1	8.2	2.4	32.8	49.7	0.9	4.1a (1.2)
West-central	417	4.5	8.6	3.3	38.0	45.1	0.5	4.1ab (1.1)
Northwest	394	6.5	12.8	4.8	37.6	37.1	1.3	3.9b (1.2)
Combined	1 268	5.7	9.8	3.4	36.0	44.3	0.9	4.0 (1.2)
<b>Manager survey</b>	41	9.8	4.9	2.4	21.9	61.0	0.0	4.2a (1.3)
<b>Prescribe burn areas that are not yet attacked</b>								
<b>Public survey</b>								
Southwest	456	20.0	23.0	13.0	26.7	16.3	0.9	3.0a (1.4)
West-central	413	22.6	25.7	11.1	23.1	16.8	0.7	2.9a (1.4)
Northwest	382	33.3	21.1	12.0	20.1	10.7	2.8	2.5b (1.4)
Combined	1 251	25.0	23.3	12.1	23.5	14.7	1.4	2.8 (1.4)
<b>Manager survey</b>	40	19.5	9.8	0.0	19.5	51.2	0.0	3.7c (1.6)
<b>Use of pheromones</b>								
<b>Public survey</b>								
Southwest	440	6.3	6.9	11.0	24.2	46.7	5.0	4.0a (1.2)
West-central	404	3.4	6.8	12.1	26.7	49.0	1.9	4.1ab (1.1)
Northwest	374	4.4	4.6	14.1	30.0	42.8	4.1	4.1ab (1.1)
Combined	1 218	4.7	6.2	12.3	26.8	46.3	3.7	4.1 (1.1)
<b>Manager survey</b>	41	0.0	2.5	7.5	25.0	65.0	0.0	4.5b (0.8)
<b>Thinning the forest</b>								
<b>Public survey</b>								
Southwest	454	7.4	10.2	10.4	31.8	38.5	1.7	3.9a (1.3)
West-central	412	6.3	12.1	9.9	33.3	37.9	0.5	3.8a (1.2)
Northwest	380	5.3	12.7	11.4	36.3	30.7	3.6	3.8a (1.2)
Combined	1 246	6.4	11.6	10.6	33.7	35.9	1.9	3.8 (1.2)
<b>Manager survey</b>	39	0.0	20.0	12.5	17.5	47.5	2.5	3.9a (1.2)
<b>Cut and burn on site</b>								
<b>Public survey</b>								
Southwest	458	5.0	8.0	7.1	35.2	43.6	1.1	4.1a (1.1)
West-central	414	5.3	13.4	9.3	31.8	39.2	1.0	3.9a (1.2)
Northwest	390	6.8	11.1	7.3	32.2	41.3	1.3	3.9a (1.3)
Combined	1 262	5.6	10.7	7.9	33.2	41.5	1.1	4.0 (1.2)
<b>Manager survey</b>	40	7.5	10.0	5.0	15.0	62.5	0.0	4.2a (1.3)

**Table 12 Concluded**

Management option and sample region	No. of responses	Very unacceptable	Somewhat unacceptable	Neutral	Somewhat acceptable	Very acceptable	No opinion	Mean score (SD)
<b>Harvesting</b>								
<b>Public survey</b>								
Southwest	456	5.6	4.8	6.7	29.3	52.5	1.1	4.2a (1.1)
West-central	416	4.3	3.1	5.0	29.2	57.9	0.5	4.3ab (1.0)
Northwest	393	3.0	2.0	4.3	28.0	61.7	1.0	4.4b (0.9)
Combined	1 265	4.4	3.4	5.4	28.8	57.1	0.9	4.3 (1.0)
<b>Manager survey</b>	40	2.5	0.0	0.0	15.0	82.5	0.0	4.8b (0.7)
<b>Adjusting harvest plans</b>								
<b>Public survey</b>								
Southwest	451	8.7	9.6	11.3	29.1	39.4	2.0	3.8a (1.3)
West-central	415	3.6	6.9	7.7	26.3	54.8	0.7	4.2b (1.1)
Northwest	391	3.5	4.0	8.1	25.4	57.4	1.5	4.3bc (1.0)
Combined	1 257	5.4	7.0	9.1	27.1	50.0	1.4	4.1 (1.2)
<b>Manager survey</b>	41	2.4	0.0	0.0	14.6	82.9	0.0	4.8c (0.6)
<b>Chemical control on small areas</b>								
<b>Public survey</b>								
Southwest	452	21.3	21.3	10.6	28.4	16.5	2.0	3.0a (1.4)
West-central	417	15.5	14.8	8.8	33.1	27.1	0.7	3.4b (1.4)
Northwest	393	14.2	11.2	10.0	33.9	28.7	2.0	3.5b (1.4)
Combined	1 262	17.2	16.0	9.8	31.7	23.8	1.6	3.3 (1.4)
<b>Manager survey</b>	41	7.3	21.9	19.5	17.1	34.1	0.0	3.5ab (1.4)
<b>Salvage logging</b>								
<b>Public survey</b>								
Southwest	455	5.2	3.3	3.9	17.4	69.3	0.9	4.4a (1.1)
West-central	419	3.1	3.1	3.1	17.8	72.5	0.5	4.5ab (0.9)
Northwest	392	2.5	0.8	3.0	14.0	77.9	1.8	4.7b (0.8)
Combined	1 266	3.7	2.4	3.4	16.5	73.0	1.0	4.5 (1.0)
<b>Manager survey</b>	41	0.0	4.9	2.4	21.9	70.7	0.0	4.6ab (0.8)

Note: Acceptability was rated on a scale of 1 to 5 where 1 = "very unacceptable" and 5 = "very acceptable." Any two means for a given management option that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

There were differences among the regions in the acceptability of some options. Respondents in the northwest region had lower mean acceptability ratings for prescribed burning of either infested or uninfested areas than respondents in the other two regions and higher acceptability ratings than respondents in the southwest region for harvesting activities (salvage logging and harvesting) (Table 12). Respondents in the southwest region had lower mean ratings than those in the other two regions regarding the use of chemical control and adjusting harvest plans. Respondents in the southwest region rated chemical control as slightly unacceptable, whereas those in the other regions rated it as acceptable.

Land managers strongly supported all of the management options. There were few differences between the responses from the public and from land managers. Land managers also favored harvesting activities (Table 12). A high percentage of the managers rated harvesting infested trees (83%), adjusting harvest plans

(83%), and salvage logging (71%) as very acceptable. However, the land managers had substantively higher mean acceptability ratings than public respondents in all three regions for prescribed burning of uninfested areas. (Land managers rated this practice as acceptable whereas the public rated it as unacceptable). They had higher ratings than respondents in the southwest and west-central regions for forest companies adjusting their harvest plans to log healthy but susceptible areas, and they rated the acceptability of using pheromones and harvesting infested trees higher than respondents in the southwest region.

Residents rated management activities in parks and protected areas similar to the way they rated activities on crown lands used by the forest industry. Although there was less support for harvesting activities in parks and protected areas, salvage logging (56%), adjusting harvest plans (37%), and harvesting infested areas (43%) were rated as very acceptable by a substantial percentage of respondents (Table 13).

**Table 13. Acceptability of management options in provincial parks and protected areas (%)**

Management option and sample region	No. of responses	Very unacceptable	Somewhat unacceptable	Neutral	Somewhat acceptable	Very acceptable	No opinion	Mean score (SD)
<b>Prescribe burn areas attacked by the beetle</b>								
<b>Public survey</b>								
Southwest	456	6.5	9.1	3.9	32.1	47.3	1.1	4.1a (1.2)
West-central	414	8.7	9.6	5.1	35.6	40.6	0.5	3.9ab (1.3)
Northwest	392	8.8	11.3	7.3	38.3	33.0	1.3	3.8b (1.3)
Combined	1 262	7.9	10.0	5.3	35.2	40.7	0.9	3.9 (1.3)
<b>Manager survey</b>	41	2.4	7.3	0.0	17.1	73.2	0.0	4.5a (1.0)
<b>Prescribe burn areas that are not yet attacked</b>								
<b>Public survey</b>								
Southwest	454	22.1	22.1	12.7	25.6	16.8	0.9	2.9a (1.4)
West-central	410	26.6	23.5	12.6	22.0	14.5	0.7	2.7a (1.4)
Northwest	384	36.3	20.3	11.7	20.1	9.1	2.5	2.4b (1.4)
Combined	1 248	28.0	22.0	12.3	22.7	13.7	1.3	2.7 (1.4)
<b>Manager survey</b>	41	9.8	9.8	4.9	21.9	53.7	0.0	4.0c (1.4)

**Table 13. Continued**

Management option and sample region	No. of responses	Very unacceptable	Somewhat unacceptable	Neutral	Somewhat acceptable	Very acceptable	No opinion	Mean score (SD)
<b>Use of pheromones</b>								
<b>Public survey</b>								
Southwest	443	6.8	8.7	10.9	25.9	44.2	3.5	4.0a (1.3)
West-central	409	4.8	7.5	11.1	27.1	48.3	1.2	4.1a (1.2)
Northwest	379	6.8	4.8	10.1	29.1	45.1	4.1	4.1a (1.2)
Combined	1 231	6.2	7.1	10.7	27.3	45.8	2.9	4 (1.2)
<b>Manager survey</b>	40	2.4	7.3	2.4	19.5	65.9	2.4	4.4a (1.0)
<b>Thinning the forest</b>								
<b>Public survey</b>								
Southwest	450	8.8	12.3	10.9	30.4	36.1	1.5	3.7a (1.3)
West-central	412	10.6	12.1	11.1	35.8	30.0	0.5	3.6a (1.3)
Northwest	383	9.6	14.4	10.4	32.6	29.8	3.3	3.6a (1.3)
Combined	1245	9.6	12.9	10.8	32.8	32.1	1.7	3.7 (1.3)
<b>Manager survey</b>	39	12.5	10.0	12.5	20.0	42.5	2.5	3.7a (1.5)
<b>Cut and burn on site</b>								
<b>Public survey</b>								
Southwest	455	5.9	10.4	6.7	34.5	41.2	1.3	4.0a (1.2)
West-central	414	9.4	13.7	7.7	34.0	34.9	0.2	3.7b (1.3)
Northwest	390	9.4	13.4	8.4	31.1	36.5	1.3	3.7b (1.3)
Combined	1 259	8.1	12.4	7.6	33.3	37.7	0.9	3.8 (1.3)
<b>Manager survey</b>	41	9.8	0.0	2.4	21.9	65.9	0.0	4.3a (1.2)
<b>Harvesting</b>								
<b>Public survey</b>								
Southwest	448	11.4	9.6	7.9	25.8	43.2	2.2	3.8a (1.4)
West-central	417	9.3	6.9	6.9	34.8	41.5	0.5	3.9b (1.3)
Northwest	387	7.6	8.3	7.1	30.6	44.2	2.3	4.0b (1.3)
Combined	1 252	9.5	8.3	7.3	30.2	43.0	1.7	3.9 (1.3)
<b>Manager survey</b>	41	24.4	12.2	4.8	19.5	39.0	0.0	3.4a (1.7)
<b>Adjusting harvest plans</b>								
<b>Public survey</b>								
Southwest	444	15.9	13.0	10.6	26.2	32.2	2.2	3.5a (1.5)
West-central	404	10.6	9.7	9.7	29.2	38.4	2.4	3.8b (1.3)
Northwest	383	8.4	10.7	11.2	27.3	40.1	2.3	3.8b (1.3)
Combined	1 231	11.8	11.2	10.5	27.5	36.7	2.3	3.7 (1.4)
<b>Manager survey</b>	38	17.1	9.8	9.8	14.6	41.5	7.3	3.6ab (1.6)

**Table 13. Concluded**

Management option and sample region	No. of responses	Very unacceptable	Somewhat unacceptable	Neutral	Somewhat acceptable	Very acceptable	No opinion	Mean score (SD)
<b>Chemical control on small areas</b>								
<b>Public survey</b>								
Southwest	455	24.6	21.8	12.1	21.6	18.1	1.9	2.9a (1.5)
West-central	416	21.5	12.9	9.1	27.8	28.2	0.5	3.3b (1.5)
Northwest	388	16.7	13.7	7.6	34.4	25.8	1.8	3.4b (1.4)
Combined	1 259	21.1	16.4	9.7	27.6	23.8	1.4	3.2 (1.5)
<b>Manager survey</b>	41	12.2	19.5	14.6	19.5	34.1	0.0	3.4ab (1.4)
<b>Salvage logging</b>								
<b>Public survey</b>								
Southwest	460	9.9	7.6	5.2	20.1	56.6	0.7	4.1a (1.4)
West-central	416	8.4	5.3	3.6	25.8	56.5	0.5	4.2a (1.2)
Northwest	393	6.5	5.8	5.5	20.1	60.8	1.3	4.2a (1.2)
Combined	1 269	8.4	6.3	4.8	22.0	57.9	0.8	4.2 (1.3)
<b>Manager survey</b>	41	31.7	17.1	7.3	9.8	34.1	0.0	3.0b (1.7)

Note: Acceptability was rated on a scale of 1 to 5 where 1 = "very unacceptable" and 5 = "very acceptable." Any two means for a given management option that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

A comparison of the mean scores shows that the respondents in the southwest region were less accepting of harvesting, adjusting harvest plans, and chemical control and more accepting of cut and burn in protected areas than respondents in the other regions (Table 13). The respondents in the northwest region were substantively less accepting of prescribed burning of uninfested areas in parks and protected areas.

A majority of land managers supported all of the management activities, with the exception of salvage logging, in parks and protected areas (Table 13). Land managers were substantively less accepting than the public of salvage logging and were more accepting than the public of prescribed burning of uninfested areas in parks and protected areas.

Respondents' comments provide insight into the reasons for the lack of support for prescribed burns. The primary concern was the effect of smoke on people's health. There were also concerns about the potential for burns to get out of control, waste of timber resources, and impacts on tourism. The following quotes provide examples of these themes.

People in the southwest region cited their personal experiences with impacts of smoke on their health and tourism:

*"Smoke from prescribed burns has strongly affected my health and my enjoyment of outdoor activities. For that reason I am against prescribed burns."*

*"The most recent prescribed burn (Nestor?) had a dreadful impact on people living within the immediate Bow Valley and Calgary area. It is appreciated that much effort is required to complete a prescribed burn, but the breathing and health quality of the air for 2 weeks was unacceptable."*

*"We have a very short summer in the mountains and without exception Parks start burns on beautiful long weekends. Town and the Park tourism suffers."*

*"Tourists don't want to see dead forests. Tourists will leave if it's too smoky. Fire should be used sparingly. 2003 was a miserable [year] here due to fires. We need to be able to make a livelihood to live here."*

Respondents in the west-central and northwest regions expressed concern about prescribed fires burning out of control:

*I very much distrust the practice of prescribed burning as it often seems to get out of control (e.g., east side of highway in Jasper National Park). [Northwest]*

*"As far as I've see[n], most times control burns are used they become uncontrolled burns and do as much or more damage." [West-central]*

*"The forestry goes into an area to (so called) do control burning for whatever reason (Pine beetles) etc. and invariably the fire gets away and makes a larger disaster than pine beetle does." [West-central]*

One northwest respondent viewed prescribed burning as a waste:

*"As with any natural resource I dislike the thought of wasting it through burns."*

### **Effectiveness of Management Options**

Prescribed burning of infested areas had the highest effectiveness rating. About 77% of the public respondents viewed prescribed burning of infested areas as somewhat or very effective in controlling MPB (Table 14). The next most effective practice in the view of the public respondents was cutting and burning of infested trees on site, with 71% of public respondents rating this option as somewhat or very effective. Prescribed burning of uninfested areas was viewed as the least effective option, with 44% of respondents rating it as somewhat or very effective.

Management options with the highest percentage of respondents to the public survey rating them as very effective were harvesting infested trees (33%), adjusting harvest plans to harvest healthy but susceptible areas (32%), cutting and burning infested trees on site (28%), and prescribed burning of infested areas (27%). Only 12% rated prescribed burning of uninfested areas as very effective.

Analysis of the results of the public survey indicated that there were few differences among the regions in terms of the perceived effectiveness of management options. The respondents in the southwest region viewed adjusting harvest plans as less effective than



**Table 14. Views on the effectiveness of management options in the region (%)**

Management option and sample region	No. of responses	Very ineffective	Somewhat ineffective	Neutral	Somewhat effective	Very effective	No opinion	Mean score (SD)
<b>Prescribe burn areas attacked by the beetle</b>								
<b>Public survey</b>								
Southwest	439	5.9	7.8	5.0	48.2	28.8	4.4	3.9a (1.1)
West-central	402	5.4	9.5	5.6	50.5	27.1	2.0	3.9a (1.1)
Northwest	383	6.6	10.1	4.5	50.6	24.7	3.5	3.8a (1.1)
Combined	1 224	5.9	9.1	5.1	49.7	26.9	3.3	3.9 (1.1)
<b>Manager survey</b>	41	14.6	26.8	2.4	39.1	17.1	0.0	3.2b (1.4)
<b>Prescribe burn areas that are not yet attacked</b>								
<b>Public survey</b>								
Southwest	423	15.3	17.1	14.2	32.8	13.1	7.4	3.1a (1.3)
West-central	395	14.5	18.7	17.0	33.4	13.5	3.0	3.1a (1.3)
Northwest	377	19.5	20.6	18.5	28.7	8.4	4.3	2.9b (1.3)
Combined	1 195	16.4	18.7	16.5	31.7	11.8	5.0	3.0 (1.3)
<b>Manager survey</b>	41	19.5	14.6	2.4	48.8	14.6	0.0	3.2ab (1.4)
<b>Use of pheromones</b>								
<b>Public survey</b>								
Southwest	403	4.4	7.6	14.6	42.6	18.8	12.0	3.7a (1.0)
West-central	395	3.4	8.1	17.8	44.4	22.7	3.7	3.8a (1.0)
Northwest	365	3.6	6.4	15.8	49.5	17.9	6.9	3.8a (1.0)
Combined	1 163	3.8	7.4	16.0	45.3	19.8	7.7	3.8 (1.0)
<b>Manager survey</b>	40	10.0	12.5	15.0	52.5	10.0	0.0	3.4a (1.2)
<b>Thinning the forest</b>								
<b>Public survey</b>								
Southwest	432	7.2	18.4	13.1	40.7	15.1	5.5	3.4a (1.2)
West-central	403	8.8	13.4	14.6	44.9	16.6	1.7	3.5a (1.2)
Northwest	378	7.4	16.0	13.0	43.5	16.3	3.8	3.5a (1.2)
Combined	1 213	7.8	16.0	13.6	42.9	16.0	3.7	3.4 (1.2)
<b>Manager survey</b>	40	19.5	24.4	21.9	29.3	2.4	2.4	2.7b (1.2)
<b>Cut and burn on site</b>								
<b>Public survey</b>								
Southwest	439	5.0	8.7	9.4	43.8	28.8	4.4	3.9a (1.1)
West-central	400	8.1	9.6	12.6	41.4	26.9	1.5	3.7a (1.2)
Northwest	388	4.8	9.8	9.6	45.8	27.7	2.3	3.8a (1.1)
Combined	1 227	5.9	9.4	10.5	43.7	27.8	2.8	3.8 (1.1)
<b>Manager survey</b>	41	7.3	17.1	4.9	43.9	26.8	0.0	3.7a (1.3)

**Table 14. Concluded**

Management option and sample region	No. of responses	Very ineffective	Somewhat ineffective	Neutral	Somewhat effective	Very effective	No opinion	Mean score (SD)
<b>Harvesting</b>								
<b>Public survey</b>								
Southwest	429	6.4	9.0	11.7	39.9	27.5	5.5	3.8a (1.2)
West-central	402	5.1	6.9	8.1	44.5	33.7	1.7	4.0ab (1.1)
Northwest	384	2.8	6.6	6.4	44.2	37.6	2.5	4.1b (1.0)
Combined	1 215	4.9	7.6	8.8	42.7	32.7	3.3	3.9 (1.1)
<b>Manager survey</b>	41	4.9	7.3	4.9	36.6	46.3	0.0	4.1ab (1.1)
<b>Adjusting harvest plans</b>								
<b>Public survey</b>								
Southwest	426	7.7	10.7	13.8	37.2	23.9	6.8	3.6a (1.2)
West-central	398	4.7	6.9	10.0	40.8	35.0	2.7	4.0b (1.1)
Northwest	381	3.3	5.8	10.9	39.5	37.0	3.5	4.0b (1.0)
Combined	1 205	5.3	7.9	11.7	39.1	31.6	4.4	3.9 (1.1)
<b>Manager survey</b>	40	5.0	10.0	0.0	42.5	42.5	0.0	4.1ab (1.1)
<b>Chemical control on small areas</b>								
<b>Public survey</b>								
Southwest	415	14.4	12.5	16.2	33.3	14.4	9.2	3.2a (1.3)
West-central	396	12.9	11.4	13.4	38.0	20.7	3.7	3.4ab (1.3)
Northwest	381	11.3	9.1	12.6	41.1	21.9	4.0	3.6b (1.3)
Combined	1 192	13.0	11.1	14.2	37.2	18.8	5.8	3.4 (1.3)
<b>Manager survey</b>	40	21.9	17.1	21.9	24.4	12.2	2.4	2.9a (1.4)

Note: Views on effectiveness were rated on a scale of 1 to 5 where 1 = “very ineffective” and 5 = “very effective.” Any two means for a given management option that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

respondents in the other regions, whereas the respondents in the northwest region viewed prescribed burning of uninfested areas as less effective than respondents in the other regions (Table 14).

The land managers rated most of the management actions listed in the survey as somewhat or very effective in controlling the beetle. However, thinning healthy trees before they are attacked and using chemicals on small areas were rated as effective actions by a minority of land managers (Table 14). Land managers and the public were similar in their views of the effectiveness of most options. Land managers, however, rated prescribed burning of infested areas and thinning healthy trees as significantly less effective than did public respondents.

Respondents’ comments provide some insight into the reasons that MPB controls might be viewed as ineffective. One theme that we identified was related to the MPB being part of nature; as such, only natural controls were viewed as effective.

*“I think it’s a losing battle. We can contain its spread and slow the spread, but not stop it. The original spread was due to climate change, and only climate change will totally end it. I believe the climate will cause more changes to our natural environment in the near future. Maybe it’s time to give up the beetle fight and start spending on post-beetle plan (replacing our forests with trees resistant to beetle attacks).” [Southwest]*

“...the spread of the beetle will be rapid and likely all our attempts at halting its advance will be futile. Until we can get a prolonged cold spell to naturally halt them I think we’re out of luck...”  
[Northwest]

Another theme was that the continuing spread of the beetle was evidence that controls were not effective.

“Regardless of measures taken, the beetle infestation is still spreading, which leads me to believe that not enough is being done to prevent it, or the particular measures are ineffective. I think a lot more needs to be done to prevent and control the beetle.” [West-central]

“From what I’ve seen, my sense is that the attempt at controlling the pine beetle, while commendable, is doomed to failure. The infestation this year is worse than the previous 2, at least at my place.” [Northwest]

The beetle destruction in BC was also cited as evidence of the ineffectiveness of controls.

“I personally think that we really are at the mercy of Mother Nature - if there were viable means of ‘eradicating’ the pine beetle then surely a province like BC would have done so before their forests were decimated.” [West-central]

“I think control (by agencies, etc.) of Mountain Pine Beetle will be largely ineffective except in select ‘high-value’ areas. My impression is that, in BC, control has not been way effective and they have moved on to salvage the remaining economic value and clean up.” [Southwest]

In addition to asking respondents their views on the effectiveness of specific management options, we also asked their views on controlling the MPB infestation in Alberta. Only about 31% of the public respondents thought that it was likely or very likely that current management actions in Alberta will stop the spread of the MPB within the next 5 years (Table 15). There appears to be considerable uncertainty among the public, with about 19% selecting the “not sure” response.

The land managers were not as optimistic about controlling the MPB, with about 69% indicating it was unlikely (37%) or very unlikely (32%) that the MPB would be controlled in the next 5 years. The mean responses show that land managers view short-term control of the MPB as significantly less likely than does the public (Table 15).

Similarly, about 50% of public respondents and 60% of the land managers either somewhat or strongly agreed that natural processes (such

**Table 15. Views on the likelihood that management action will stop the spread of the mountain pine beetle within 5 years (%)**

Sample region	No. of responses	Very unlikely	Unlikely	Likely	Very likely	Not sure	Mean score (SD)
<b>Public survey</b>							
Southwest	468	15.2	38.5	20.3	7.5	18.6	2.8a (1.3)
West-central	418	11.2	35.2	24.6	8.4	20.6	2.9a (1.3)
Northwest	402	14.4	34.8	24.1	8.7	17.9	2.8a (1.3)
Combined	1 288	13.7	36.3	22.9	8.2	19.0	2.8 (1.3)
<b>Manager survey</b>							
	41	31.7	36.6	21.9	7.3	2.4	2.1b (1.0)

Note: Views of likelihood rated on a scale of 1 to 5 where 1 = “very unlikely” and 5 = “very likely.” Any two means that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

as weather) are the only effective means of controlling the MPB (Table 16). More than 60% of residents in all regions agreed that climate change will be a major contributor to MPB outbreaks in the future (Table 17). Similarly, about 61% of land managers agreed that climate change will contribute to future outbreaks.

There was little variation in these views among the public respondents from the three regions (Table 16 and 17). Analysis of the mean ratings indicates that there were no significant differences among respondents in the regions in terms of their views about whether the current management action will stop the spread of MPB in 5 years. Respondents in the southwest

indicated slightly stronger agreement than those in the northwest that natural processes are the only effective means of control and also indicated slightly stronger agreement than the other regions that climate change will be a major contributor to MPB outbreaks.

### Satisfaction with the Management Response

To assess satisfaction with the management response to MPB in the three regions, we asked respondents to both surveys about their satisfaction with the overall response and with the response of specific management agents. A slight majority of public respondents were

**Table 16. Views on whether natural processes are the only effective means of controlling the mountain pine beetle (%)**

Sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Public survey</b>								
Southwest	457	13.6	22.3	7.8	38.9	16.2	1.3	3.2a (1.3)
West-central	412	14.9	26.0	10.8	32.5	14.9	1.0	3.1ab (1.3)
Northwest	397	17.1	27.7	8.9	30.7	13.9	1.7	3.0b (1.4)
Combined	1 266	15.1	25.2	9.1	34.2	15.0	1.3	3.1 (1.3)
<b>Manager survey</b>								
	40	5.0	27.5	7.5	40.0	20.0	0.0	3.4ab (1.2)

Note: Views of effectiveness rated on a scale of 1 to 5 where 1 = “strongly disagree” and 5 = “strongly agree.” Any two means that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

**Table 17. Views on whether climate change will be a major contributor to future mountain pine beetle outbreaks (%)**

Sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Public survey</b>								
Southwest	443	6.0	6.4	11.2	39.9	31.6	4.9	3.9a (1.1)
West-central	399	6.5	11.5	13.7	36.9	27.1	4.3	3.7b (1.2)
Northwest	380	7.0	11.4	13.9	39.3	22.9	5.5	3.6b (1.2)
Combined	1 222	6.5	9.7	12.8	38.8	27.4	4.9	3.7 (1.2)
<b>Manager survey</b>								
	41	9.8	12.2	17.1	19.5	41.5	0.0	3.7ab (1.4)

Note: Views on climate change contribution were rated on a scale of 1 to 5 where 1 = “strongly disagree” and 5 = “strongly agree.” Any two means that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

satisfied with the overall response to MPB in their region (Table 18). About 53% indicated they were somewhat or very satisfied with the response. The most common response (44%) was somewhat satisfied; less than 10% indicated they were very dissatisfied. Land managers

expressed a higher level of satisfaction, with 24% indicating they were very satisfied. A comparison of mean ratings, however, showed no significant differences among the regions or between the regions and land managers on overall satisfaction (Table 18).

**Table 18. Overall satisfaction with management response to the mountain pine beetle (%)**

Sample region	No. of responses	Very dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Very satisfied	No opinion	Mean score (SD)
<b>Public survey</b>								
Southwest	433	6.0	15.2	16.0	47.2	8.1	7.5	3.4a (1.1)
West-central	382	5.8	18.6	13.7	45.1	8.9	8.0	3.4a (1.1)
Northwest	360	7.0	19.8	15.0	40.5	7.8	10.0	3.2a (1.1)
Combined	1 175	6.2	17.7	15.0	44.4	8.3	8.4	3.3 (1.1)
<b>Manager survey</b>								
	41	2.4	19.5	12.2	41.5	24.4	0.0	3.6a (1.1)

Note: Satisfaction was rated on a scale of 1 to 5 where 1 = "very dissatisfied" and 5 = "very satisfied." Any two means that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

Public respondents, however, appear to be less satisfied with the responses of individual agents (Table 19) than with the overall response. The provincial government had the highest satisfaction rating, with 46% of public respondents indicating they were somewhat or very satisfied, followed by the forest industry (40%), national parks (38%), municipal governments (35%), and private landowners (16%). In rating their satisfaction with the individual agents, a large percentage of respondents chose the no opinion and neutral responses, suggesting that they do not have a good understanding of what each agent is doing in response to the MPB outbreak.

There was some variation among the regions in terms of satisfaction with agents. The respondents in the southwest region were more satisfied with the national park response than those in the other regions. The respondents in the southwest region were also less satisfied with the forest industry response than those in the northwest region and more satisfied with the municipal government response than those in the west-central region.

Land managers expressed satisfaction with the response of provincial government agencies and the forest industry: 63% and 73% were somewhat or very satisfied with the response of provincial government agencies and the forest industry, respectively. Only 42% and 32% were

somewhat or very satisfied with the response of municipal governments and national parks, respectively. Land managers were significantly more satisfied with the forest industry than public respondents in all three regions (Table 19).

Potential reasons for dissatisfaction with the response to the MPB infestation were revealed in respondents' comments. We identified four themes that might be contributing to dissatisfaction. One theme related to the timeliness of the response.

*"I believe that Alberta was/is too slow to respond to the environmental and economical issues related to the very obvious and relevant, fast-moving pine beetle." [Southwest]*

*"By the time the forestry department even realized that we had a problem and then watched it develop and then tried to come up with some prevention or management with this problem - it was too late as usual." [Northwest]*

*"Too little, too late. The government got caught with their pants down. We witnessed the beetle in BC many years ago, before it came to Alberta. I believe the government ... let it get so out of hand that they cannot control it any longer. The control measures attempted in our community were ineffective and only half heartedly attempted." [Northwest]*

**Table 19. Satisfaction with the management agents' response to the mountain pine beetle (%)**

Agent and sample region	No. of responses	Very dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Very satisfied	No opinion	Mean score (SD)
<b>Provincial government agencies</b>								
<b>Public survey</b>								
Southwest	397	6.5	11.3	18.2	40.9	9.1	14.1	3.4a (1.1)
West-central	354	6.3	15.6	17.5	36.7	10.0	13.9	3.3a (1.1)
Northwest	324	6.5	13.3	22.3	33.5	5.5	19.0	3.2a (1.1)
Combined	1 075	6.4	13.3	19.3	37.2	8.3	15.6	3.3 (1.1)
<b>Manager survey</b>	41	9.8	14.6	12.2	26.8	36.6	0.0	3.7a (1.4)
<b>National parks</b>								
<b>Public survey</b>								
Southwest	379	5.4	9.5	18.6	38.0	10.4	18.1	3.5a (1.1)
West-central	340	9.3	15.9	20.3	30.1	7.6	16.9	3.1b (1.2)
Northwest	268	5.1	11.7	25.7	21.1	4.6	31.8	3.1b (1.0)
Combined	987	6.6	12.3	21.3	30.2	7.7	22.0	3.3 (1.1)
<b>Manager survey</b>	36	22.0	24.4	9.8	19.5	12.2	12.2	2.7b (1.4)
<b>Your municipal government</b>								
<b>Public survey</b>								
Southwest	389	7.1	14.7	23.3	27.2	11.6	16.2	3.3a (1.2)
West-central	331	7.6	16.9	29.1	23.5	3.9	19.1	3.0b (1.0)
Northwest	331	8.3	16.6	19.9	30.5	8.1	16.6	3.2ab (1.2)
Combined	1 051	7.6	16.0	24.1	27.0	8.0	17.2	3.1 (1.1)
<b>Manager survey</b>	36	9.8	17.1	19.5	29.3	12.2	12.2	3.2ab (1.2)
<b>Forest industry</b>								
<b>Public survey</b>								
Southwest	337	10.2	13.8	18.6	23.1	7.1	27.2	3.0a (1.2)
West-central	358	7.8	16.8	15.6	38.5	8.5	12.7	3.3ab (1.1)
Northwest	343	7.6	13.9	19.7	35.8	9.6	13.6	3.3b (1.1)
Combined	1 038	8.6	14.8	18.0	32.1	8.4	18.3	3.2 (1.2)
<b>Manager survey</b>	40	0.0	7.3	17.1	36.6	36.6	2.4	4.1c (0.9)
<b>Private landowners</b>								
<b>Public survey</b>								
Southwest	284	3.9	11.0	35.9	8.4	2.2	38.5	2.9a (0.8)
West-central	298	5.6	13.1	39.4	12.7	1.7	27.5	2.9a (0.9)
Northwest	308	8.6	15.7	29.1	19.5	5.1	22.0	3.0a (1.1)
Combined	890	5.9	13.2	34.9	13.3	2.9	29.8	2.9 (0.9)
<b>Manager survey</b>	32	4.9	12.2	36.6	14.4	9.8	22.0	3.2a (1.1)

Note: Satisfaction was rated on a scale of 1 to 5 where 1 = "very dissatisfied" and 5 = "very satisfied." Any two means for a given agent that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

Another theme related to the level of effort.

*"Some parts of Northern Alberta have been neglected by Provincial Government priorities. Now these neglected areas are heavily infested, and funding is being cut back. The government needs to become more aggressive in Northern Alberta to prevent further outbreak." [Northwest]*

Some commented that funds would be better spent on other issues.

*"Money should be used elsewhere to help fund education and the needy with social programs." [Southwest]*

The lack of response by private landowners was also identified as a concern.

*"I am dismayed to see that private land owners have not even bothered to destroy their badly infected windbreaks." [Northwest]*

*"Why don't the municipal governments insist land owners destroy infected trees prior to the beetles flying in July? It appears everyone just puts up with it and is willing to loose trees." [Northwest]*

There were also words of encouragement for and appreciation of the MPB response. Respondents in the west-central region wrote:

*"SRD [Alberta Sustainable Resource Development] is doing a great job in controlling the pine beetle in Alberta. Don't give up."*

*"Thank you SRD for their continued efforts to monitor and educate the public. Help keep us green."*

And respondents in the southwest region commented:

*"Ongoing efforts to control the mountain pine beetle are vitally essential. Appreciate all that is being done."*

*"Appreciate all efforts and resources currently in place to manage the pine beetle problem. Thanks!"*

## Trust in Management

To examine trust in management, we first presented general statements of trust in the provincial government and the forest industry.

About 45% of public respondents either somewhat or strongly agreed that the provincial government does a good job of providing information about MPB management activities, and about 48% trusted the provincial government to implement a responsible and effective MPB program (Table 20). About 37%, however, disagreed that the provincial government does a good job of providing information, and 33% did not trust the provincial government to implement a responsible and effective MPB program. Similarly, about 35% agreed that the forest industry is doing a good job of managing the forest to prevent the spread of MPB, and 45% trusted the industry to adjust its practices to minimize the impacts of MPB. About 33% of respondents neither trusted the industry to adjust its practices nor agreed that the industry is doing a good job of managing the forest for MPB.

There were no regional differences on the mean ratings on trust statements related to the provincial government. Respondents in the southwest region, however, gave lower mean ratings on trust statements related to the forest industry than respondents in the other regions (i.e., they were less trusting of the forest industry) (Table 20).

Managers showed a high level of trust in both the provincial government and forest industry. More than 60% either somewhat or strongly agreed that the provincial government does a good job of providing information, that they trust the provincial government to implement a responsible and effective beetle program, that the forest industry is doing a good job of managing the forest to prevent the spread of MPB, and that they trust the industry to adjust its practices to minimize beetle impacts (Table 20). Land managers had significantly higher mean trust ratings than public respondents for both the provincial government and the forest industry.

Some of the public respondents' comments reflected their trust in land managers:

*"It is my opinion that this is a serious threat to our forests and than any and all measures need to be taken to ensure the future of our forests. I have confidence in the professionals to control this issue and hope that they do anything necessary to stop its growth and population here in Alberta." [West-central]*

**Table 20. Trust in the provincial government and forest industry (%)**

Trust statement and sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>The provincial government does a good job of providing information about its mountain pine beetle management activities</b>								
<b>Public survey</b>								
Southwest	457	10.5	25.2	16.5	37.8	7.7	2.4	3.1a (1.2)
West-central	401	9.6	31.3	13.5	34.0	8.2	3.4	3.0a (1.2)
Northwest	377	9.3	25.3	12.8	40.1	7.0	5.5	3.1a (1.2)
Combined	1 235	9.8	27.2	14.4	37.3	7.6	3.7	3.1 (1.2)
<b>Manager survey</b>	41	2.4	19.5	2.4	36.6	39.0	0.0	3.9b (1.2)
<b>I trust the provincial government to implement a responsible and effective mountain pine beetle management program</b>								
<b>Public survey</b>								
Southwest	455	10.9	22.1	15.6	38.1	10.7	2.6	3.2a (1.2)
West-central	406	10.1	23.6	16.4	34.9	12.7	2.4	3.2a (1.2)
Northwest	388	10.8	21.8	16.3	38.0	10.3	3.0	3.2a (1.2)
Combined	1 249	10.6	22.5	16.1	37.0	11.2	2.7	3.2 (1.2)
<b>Manager survey</b>	41	4.9	19.5	12.2	34.2	29.3	0.0	3.6a (1.2)
<b>The forest industry is doing a good job of managing the forest to prevent the spread of the beetle</b>								
<b>Public survey</b>								
Southwest	387	12.2	22.8	24.0	20.0	4.1	17.0	2.8a (1.1)
West-central	391	8.9	19.2	22.8	32.2	10.8	6.0	3.2b (1.2)
Northwest	365	9.0	21.5	21.3	32.5	7.0	8.8	3.1b (1.1)
Combined	1143	10.1	21.2	22.8	27.9	7.2	10.8	3.0 (1.2)
<b>Manager survey</b>	40	2.4	12.2	19.5	41.5	21.9	2.2	3.7c (1.0)
<b>I trust the forest industry to adjust its practices to minimize the impacts from the beetle</b>								
<b>Public survey</b>								
Southwest	437	18.8	23.3	17.3	26.5	7.5	6.6	2.8a (1.3)
West-central	404	11.0	20.4	13.9	35.5	16.1	3.1	3.3b (1.3)
Northwest	382	8.8	20.3	17.0	38.6	11.0	4.3	3.2b (1.2)
Combined	1 223	13.2	21.4	16.1	33.2	11.4	4.8	3.1 (1.3)
<b>Manager survey</b>	40	2.4	19.5	14.6	34.1	26.8	2.4	3.7b (1.2)

Note: Trust statements were rated on a scale of 1 to 5 where 1 = "strongly disagree" and 5 = "strongly agree." Any two means for a given trust statement that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.



*"I don't know much about the pine beetle and I entrust our provincial government to enable resources and expertise to manage elimination of the BEETLE." [West-central]*

Respondents' comments also provide insight into why they did not trust the forest industry. Concerns with the industry included impacts of logging, past forest industry activity, and more extensive logging being rationalized for MPB control. The following quotes are examples of these concerns.

A resident in the northwest region noted:

*"What I disagree with is letting CANFOR and Weyerhaeuser [sic] increase their cuts to get ahead of the beetle. I work in the forest every day, and most of the folks I talk to believe the forest companies are taking advantage of this situation for profit. ... we believe the FMA agreements [forest management agreements] give the Forest companies too much power and the provincial government has no control on them!"*

A similar view was expressed by a resident in the southwest:

*"I believe in general, the forest industry utilizes the mountain pine beetle excuse as justification to harvest a greater amount of healthy trees; all for the mighty dollar."*

Another resident in the northwest region noted the waste and impact on non-timber values associated with logging in the area:

*"The forest industry is taking advantage of the pine beetle to log big patches of timber in our area and they leave the poplar either laying on the ground to rot or they pile them and burn them. They are totally destroying any trails in the area and making it impossible to travel on any logged out area - by walking - or quadding. ... There is no reason to take down the poplar trees. ... It is a total disaster what they are doing in the name of the pine beetle. They are also cutting unaffected trees and leaving a lot of dead (Pine beetle) trees standing which will fall down. You don't see hardly any animals in the area anymore."*

Several respondents in the west-central region cited past logging activities as a reason

for not trusting the industry to manage the MPB:

*"I lived in the Bow Crow Forest west of Sundre, and watched the logging companies rape the forests for years. They took more than they were supposed to, logged right down across creeks, mainly had their own way. They were told they could not go back to some areas for 10 or 20 years. The logging companies are now using the excuse of the pine beetle to go into those areas and take what little they left the first time around, including a huge amount of spruce. The government needs [to] stop listening to the forest industry and put some knowledgeable people in charge. I believe that the forest industry has very little knowledge of the pine beetle."*

There are several dimensions of trust that can influence social acceptance in natural resource management. To examine which dimensions might be relevant to MPB management, we used a series of statements related to openness and fairness, competency and commitment, faith in management, and personal interaction to assess respondents' trust in the provincial government, the agency responsible for the management of MPB in Alberta.

Less than 50% of public respondents either somewhat or strongly agreed with statements related to openness and fairness (Table 21): that information is biased and one-sided (25%), that all relevant points of view are considered (34%), that there is openness to new ideas and alternative points of view (38%), and that the government is too influenced by the forest industry (37%). There was a high percentage of no opinion and neutral responses among the public, with nearly 50% of residents choosing these responses to some of the openness and fairness statements. This suggests that the public is unfamiliar with information provided by the provincial government or with public involvement in MPB decision-making.

The highest agreement was for statements about the competency and commitment of the provincial government. About 50% of the public either somewhat or strongly agreed that the provincial government has the necessary expertise to manage the MPB, and 67% either somewhat or strongly agreed that the provincial government is committed to reducing the impacts of the MPB.

**Table 21. Dimensions of trust related to mountain pine beetle management (%)**

Trust statement and sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Openness and fairness</b>								
<b>Provincial government information about the mountain pine beetle tends to be biased and one-sided</b>								
<b>Public survey</b>								
Southwest	387	6.9	20.7	30.6	19.2	6.0	16.6	3.0a (1.0)
West-central	356	7.3	17.7	35.8	20.1	5.3	13.8	3.0a (1.0)
Northwest	344	6.5	20.9	34.4	19.1	5.5	13.6	3.0a (1.0)
Combined	1 087	6.9	19.8	33.5	19.5	5.7	14.8	3.0 (1.0)
<b>Manager survey</b>	40	25.0	42.5	17.5	7.5	7.5	0.0	2.3b (1.2)
<b>In managing the mountain pine beetle, the provincial government considers all relevant points of view</b>								
<b>Public survey</b>								
Southwest	383	6.0	20.0	24.1	28.0	4.3	17.5	3.1a (1.0)
West-central	368	4.8	22.5	24.5	32.2	5.1	10.9	3.1ab (1.0)
Northwest	342	4.5	21.7	27.5	27.0	5.5	13.9	3.1a (1.0)
Combined	1 093	5.2	21.4	25.3	29.0	5.0	14.2	3.1 (1.0)
<b>Manager survey</b>	40	7.5	12.5	12.5	45.0	17.5	5.0	3.6b (1.2)
<b>The provincial government is open to new ideas and alternative points of view on beetle management</b>								
<b>Public survey</b>								
Southwest	360	4.9	12.5	27.3	25.8	6.9	22.8	3.2a (1.0)
West-central	346	3.9	11.5	26.1	32.7	10.2	15.6	3.4ab (1.0)
Northwest	335	4.5	11.3	28.9	30.4	9.1	15.8	3.3ab (1.0)
Combined	1 041	4.5	11.8	27.4	29.4	8.6	18.3	3.3 (1.0)
<b>Manager survey</b>	40	5.0	10.0	12.5	52.5	20.0	0.0	3.7b (1.1)
<b>The provincial government is too influenced by the forest industry regarding mountain pine beetle management</b>								
<b>Public survey</b>								
Southwest	392	4.7	15.0	23.4	26.8	14.2	15.9	3.4a (1.1)
West-central	377	9.9	18.9	26.2	25.4	10.9	8.7	3.1b (1.2)
Northwest	343	7.6	19.4	26.5	23.9	9.1	13.6	3.1b (1.1)
Combined	1 112	7.3	17.6	25.2	25.5	11.5	12.9	3.2 (1.2)
<b>Manager survey</b>	40	30.0	37.5	12.5	12.5	7.5	0.0	2.3c (1.2)

**Table 21. Continued**

Trust statement and sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Competency and commitment</b>								
<b>The provincial government has the necessary expertise to manage the beetle effectively</b>								
<b>Public survey</b>								
Southwest	432	9.4	23.1	13.3	39.2	7.5	7.5	3.1a (1.2)
West-central	386	5.1	24.2	14.7	38.4	10.9	6.8	3.3a (1.1)
Northwest	381	6.3	23.3	14.8	40.9	10.3	4.5	3.3a (1.1)
Combined	1 119	7.0	23.5	14.2	39.5	9.5	6.3	3.2 (1.2)
<b>Manager survey</b>	40	2.5	17.5	10.0	30.0	40.0	0.0	3.9b (1.2)
<b>The provincial government is committed to reducing the impacts of mountain pine beetle on Alberta</b>								
<b>Public survey</b>								
Southwest	427	3.0	7.5	12.6	45.3	22.9	8.8	3.9a (1.0)
West-central	383	1.5	10.2	12.6	45.0	23.5	7.3	3.9a (1.0)
Northwest	377	3.8	10.3	15.8	45.6	19.1	5.5	3.7a (1.0)
Combined	1 187	2.7	9.2	13.6	45.3	21.9	7.3	3.8 (1.0)
<b>Manager survey</b>	40	5.0	5.0	7.5	47.5	35.0	0.0	4.0a (1.0)
<b>Faith in management</b>								
<b>Mountain pine beetle control is in the best interest of Albertans</b>								
<b>Public survey</b>								
Southwest	459	4.1	5.2	7.7	31.8	49.9	1.3	4.2a (1.1)
West-central	408	1.2	4.3	5.8	26.2	60.6	1.9	4.4b (0.9)
Northwest	383	2.0	5.8	5.0	26.1	57.3	3.8	4.4ab (1.0)
Combined	1 250	2.5	5.1	6.3	28.2	55.7	2.3	4.3 (1.0)
<b>Manager survey</b>	40	5.0	5.0	2.5	20.0	67.5	0.0	4.4ab (1.1)
<b>There is no other option but to accept the provincial government's plans for mountain pine beetle</b>								
<b>Public survey</b>								
Southwest	422	14.2	26.6	20.2	23.6	6.0	9.4	2.8a (1.2)
West-central	385	13.6	31.3	19.9	21.4	7.3	6.6	2.8a (1.2)
Northwest	360	10.9	32.3	19.6	20.6	8.1	8.4	2.8ab (1.2)
Combined	1 167	13.0	29.9	19.9	22.0	7.1	8.2	2.8 (1.2)
<b>Manager survey</b>	39	10.0	22.5	12.5	32.5	20.0	2.5	3.3b (1.3)

**Table 21. Concluded**

Trust statement and sample region	No. of responses	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion	Mean score (SD)
<b>Personal interaction</b>								
<b>I have the opportunity to learn about the reasons for mountain pine beetle management decisions</b>								
<b>Public survey</b>								
Southwest	416	4.5	15.3	18.8	32.5	18.5	10.3	3.5a (1.1)
West-central	378	4.1	13.8	17.7	39.6	16.5	8.3	3.6a (1.1)
Northwest	349	4.3	12.5	22.1	35.9	14.0	11.2	3.5a (1.1)
Combined	1 143	4.3	14.0	19.5	35.9	16.5	9.9	3.5 (1.1)
<b>Manager survey</b>	40	2.5	5.0	12.5	30.0	50.0	0.0	4.2b (1.0)
<b>I understand why specific management actions have been taken</b>								
<b>Public survey</b>								
Southwest	426	3.0	8.4	14.3	46.7	19.7	8.0	3.8a (1.0)
West-central	380	2.7	6.3	18.0	45.5	20.0	7.5	3.8a (1.0)
Northwest	351	1.8	7.3	18.8	40.5	19.9	11.8	3.8ab (1.0)
Combined	1 157	2.5	7.4	16.9	44.3	19.8	9.0	3.8 (1.0)
<b>Manager survey</b>	40	0.0	7.5	12.5	32.5	47.5	0.0	4.2b (0.9)
<b>My past experience with forest management issues was positive</b>								
<b>Public survey</b>								
Southwest	365	6.9	14.4	22.8	26.7	7.8	21.3	3.2a (1.1)
West-central	343	4.9	20.0	23.6	25.1	10.0	16.6	3.2a (1.1)
Northwest	316	4.0	14.6	22.4	30.5	8.1	20.4	3.3a (1.0)
Combined	1 024	5.4	16.3	23.0	27.4	8.6	19.5	3.2 (1.1)
<b>Manager survey</b>	37	2.5	7.5	7.5	45.0	30.0	7.5	4.0b (1.0)
<b>I feel the response to the mountain pine beetle reflects my values and opinions</b>								
<b>Public survey</b>								
Southwest	407	7.6	14.9	25.5	31.1	8.9	12.1	3.2a (1.1)
West-central	377	5.6	14.6	30.6	29.9	10.9	8.5	3.3a (1.1)
Northwest	339	5.6	13.5	30.1	28.3	8.9	13.5	3.2a (1.0)
Combined	1 123	6.3	14.4	28.6	29.8	9.6	11.4	3.2 (1.1)
<b>Manager survey</b>	39	5.0	15.0	7.5	52.5	17.5	2.5	3.6a (1.1)

Note: Trust statements were rated on a scale of 1 to 5 where 1 = "strongly disagree" and 5 = "strongly agree." Any two means for a given trust statement that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

There was also agreement that MPB control is in the best interest of Albertans (84% either somewhat or strongly agreed). A majority of public respondents also agreed that they have opportunities to learn about the reasons for management actions and they understand why specific actions have been taken. However, a minority (39%) felt that the response to MPB reflects their values and opinions.

Public respondents from the three regions differed on only one statement. Those in the southwest region indicated significantly higher agreement than those in other regions that the provincial government is too influenced by the forest industry (Table 21).

Land managers exhibited a high level of trust in the provincial government. Most land managers rated the provincial government as open and fair. Only 15% and 20% strongly or somewhat agreed that information is biased and one-sided and that the government is too influenced by the forest industry, respectively (Table 21). In contrast, most land managers strongly or somewhat agreed that all relevant points of view are considered (63%) and that there is openness to new ideas and alternative points of view (73%). Land managers also expressed a high level of agreement with statements about competency and commitment: 70% either somewhat or strongly agreed that the government has the expertise to manage the MPB effectively, and 83% either somewhat or strongly agreed that it is committed to reducing the MPB's impacts. About 70% of land managers either somewhat or strongly agreed that the response to the MPB reflected their values.

A comparison of the mean ratings shows that land managers were significantly more trusting of the provincial government than were the public respondents (Table 21). For example, land managers consistently viewed the provincial government as more open and fair and had more confidence in government expertise. The land managers indicated they have had more positive experiences with government, and they agreed more strongly with statements that the response to the MPB reflects their values and that they have had the opportunity to learn the reasons for management decisions.

## Information on the Mountain Pine Beetle

We asked a series of questions about information sources to determine which sources the public uses and trusts. First, we provided a list of possible sources and asked respondents to indicate the sources they used. Next, we asked them to indicate the sources they trusted the most and the least to provide accurate and reliable information on the MPB.

The most popular sources of information on the MPB for the public were media (87%), the provincial government (54%), the federal government (37%), and the forest industry (34%). More respondents in the southwest region than in the other regions used the federal government (50%), non-government environmental organizations (33%), and universities (17%) as sources of information, whereas fewer used the forest industry (20%) (Table 22).

Although the media was the most popular information source, it was chosen as the most trusted source by only 11% of public respondents, and it was the least trusted source for 27% of respondents. The provincial government had the largest percentage of respondents who indicated it was their most trusted source (27%). About 13% chose the federal government and an equal percentage chose the forest industry as their most trusted source. About 25% chose the forest industry and 18% chose non-government environmental organizations as the least trusted source for MPB information.

The public respondents in the southwest region seemed to differ from those in the other regions on sources they trusted to provide reliable information. A larger percentage of respondents in the southwest chose the federal government, universities, and non-government environmental organizations as the most trusted sources, and 37% chose the forest industry as the least trusted source.

An analysis of public respondents' comments suggests that respondents may distrust the media because they perceive that the media sensationalizes the issue and reports on it inaccurately.

**Table 22. Sources of information on the mountain pine beetle (%) for respondents to the public survey**

Source and sample region	Use as source	Most trusted source	Least trusted source
<b>The media (newspapers, radio, television)</b>			
Southwest	88.9	8.2	26.3
West-central	87.8	8.9	28.4
Northwest	89.2	15.5	24.9
Combined	86.6	10.6	26.6
<b>The provincial government (forestry and parks departments)</b>			
Southwest	51.9	22.5	7.2
West-central	54.3	31.0	11.3
Northwest	55.8	26.6	11.0
Combined	53.9	26.5	9.7
<b>Your municipal government</b>			
Southwest	35.0	4.1	6.0
West-central	12.4	0.8	9.4
Northwest	32.7	6.3	10.7
Combined	26.9	3.7	8.5
<b>The federal government (Parks Canada, Canadian Forest Service)</b>			
Southwest	49.8	18.2	5.2
West-central	31.3	9.4	7.2
Northwest	28.4	9.0	6.5
Combined	37.1	12.6	6.2
<b>Forest industry</b>			
Southwest	20.3	4.1	37.0
West-central	45.2	17.3	18.2
Northwest	37.2	18.8	17.5
Combined	33.6	12.8	25.1
<b>Non-government environmental organizations</b>			
Southwest	32.9	13.9	12.7
West-central	23.7	8.6	18.8
Northwest	18.6	6.6	22.6
Combined	25.5	10.0	17.6

**Table 22. Concluded**

Source and sample region	Use as source	Most trusted source	Least trusted source
<b>Think-tanks such as the Pembina or Fraser Institutes</b>			
Southwest	16.7	7.9	4.7
West-central	14.6	9.2	4.4
Northwest	8.5	5.1	5.8
Combined	13.5	7.5	4.9
<b>Universities</b>			
Southwest	16.7	14.9	0.7
West-central	10.3	9.2	1.4
Northwest	11.1	8.7	0.6
Combined	12.8	11.1	0.9
<b>Other (please specify):</b>			
Southwest	15.0	6.2	0.0
West-central	15.8	5.7	0.6
Northwest	13.3	3.3	0.3
Combined	14.7	5.2	0.3
<b>I do not use any of these</b>			
Southwest	1.5	0.0	0.2
West-central	2.6	0.0	0.3
Northwest	2.8	0.3	0.0
Combined	2.3	0.1	0.2

A respondent in the southwest region wrote:

*"Unfortunately, I don't access the government agencies for updates on MPB actions and control measures. All info is through the media, and frankly it's biased and sensational at best."*

And a resident in the northwest region noted:

*"Media reports in the past have been very misleading. Federal Scientists quoting high mortality rates when locally we are well aware this is not true."*

Land managers were provided with a list of possible information sources and asked to indicate the top three they rely on in making MPB management decisions. Scientific information was the most popular source, followed by the MPB experience in BC (Table 23). Industry stakeholders and municipal governments were sources for few of the land managers. Public opinion was used the least.

**Table 23. Land managers' top three sources of information about the mountain pine beetle (%)**

Source of information	Ranking of information		
	First	Second	Third
Consensus of my Alberta colleagues	20.9	9.3	39.5
My personal experience	11.6	11.6	11.6
The mountain pine beetle experience in BC	25.6	34.9	23.3
Scientific information	44.2	32.6	11.6
Industry stakeholders	2.3	9.3	7.0
Municipal governments	0.0	2.3	2.3
Public opinion	0.0	0.0	4.7

## Experience and Familiarity with the Mountain Pine Beetle

To assess the extent to which residents have experience with the MPB we asked about a range of experiences, from indirect experience (media coverage) to direct, personal experience (having beetles on their property) (Table 24). Nearly all public respondents (>90%) had been exposed to media coverage of the MPB, and many reported having seen forests affected by MPB. A majority reported having seen small patches of trees (78%) or large areas of forest (70%) affected by the MPB or having driven through areas in BC affected by the MPB (79%). Very few reported that the MPB had attacked trees on their property. Reports of infestation on personal property were highest in the northwest region, where nearly 20% of respondents reported MPB on their property. West-central residents seemed to have had less experience with the MPB than residents in the other regions. Fewer west-central residents reported seeing small patches or large areas affected by the MPB or having the MPB on their property.

We assessed the public's familiarity with MPB and its management using both a self-rated level of awareness of management and an assessment of MPB knowledge. Respondents rated their level of awareness of MPB management in their region by indicating if they were not aware of it, had little or moderate knowledge of it, or were well informed. To assess how well informed the public is about basic information on the MPB in Alberta, we presented a series of true-or-false statements based on information that had appeared in

Alberta newspapers or was readily available on the Internet. We created a knowledge score for each respondent by summing the number of correct responses.

Most respondents (52%) rated themselves as having moderate knowledge of MPB management in their region (Table 25). About 41% rated themselves as having little knowledge. Very few respondents said they were not aware or well informed.

From responses to the true-or-false statements, it appears that the public is not very well informed about basic MPB facts. The only statement that nearly all respondents (91%) answered correctly was that mild winters have contributed to the MPB outbreak (Table 26). A majority also knew that MPB is not spread by birds (74%) and that it is a naturally occurring insect in parts of western Alberta (53%). A minority knew that the MPB infests mainly old pine trees (41%), that fire suppression has contributed to the outbreak (46%), that a single beetle cannot kill a young pine (41%), that the beetle was not imported from Europe (26%), and that the beetle is not found across Canada (38%). Although 53% knew the beetle is naturally occurring in some parts of western Alberta, about 65% indicated they were "not sure" whether the beetle had been imported from Europe.

There was considerable variation among the regions in respondents' familiarity with the MPB. Respondents from the southwest region appeared to be the best informed. For example, fewer respondents in the northwest knew that the beetle is naturally occurring



**Table 24. Personal experience with the mountain pine beetle (%) among respondents to the public survey**

Experience	Sample region	Yes
Heard about the mountain pine beetle in the media (newspapers, radio, TV)	Southwest	92.1
	West-central	90.5
	Northwest	93.3
	Combined	91.7
Seen small patches of trees affected by the beetle	Southwest	83.8
	West-central	68.3
	Northwest	82.4
	Combined	78.3
Seen large areas of forests (such as entire hillsides) affected by the beetle	Southwest	77.5
	West-central	63.3
	Northwest	68.6
	Combined	70.1
The beetle has attacked trees on my property	Southwest	11.5
	West-central	5.5
	Northwest	19.3
	Combined	12.0
Driven through or visited areas in BC affected by the beetle	Southwest	85.3
	West-central	79.0
	Northwest	73.0
	Combined	79.4

**Table 25. Self-rated knowledge of the mountain pine beetle management (%) among respondents to the public survey**

Sample region	Level of awareness			
	Not aware of it	Little knowledge	Moderate knowledge	Well informed
Southwest	0.9	39.0	54.9	5.2
West-central	1.7	40.6	50.9	6.8
Northwest	3.3	42.2	49.3	5.3
Combined	1.9	40.5	51.8	5.8

**Table 26. Distribution (%) of responses to true-or-false statements in the public survey**

Statement and sample region	Mostly true	Mostly false	Not sure
<b>The mountain pine beetle is a naturally occurring insect in parts of western Alberta</b>			
Southwest	62.2	26.3	11.5
West-central	51.2	30.1	18.7
Northwest	44.1	35.3	20.6
Combined	53.0	30.4	16.7

**Table 26. Concluded**

Statement and sample region	Mostly true	Mostly false	Not sure
<b>A single mountain pine beetle can kill a young tree</b>			
Southwest	26.6	44.1	29.3
West-central	28.9	40.8	30.3
Northwest	31.0	38.8	30.2
Combined	28.7	41.4	29.9
<b>The mountain pine beetle is spread mainly by birds carrying it from one tree to another</b>			
Southwest	3.7	79.1	17.2
West-central	2.7	69.8	27.5
Northwest	6.6	73.0	20.5
Combined	4.3	74.2	21.6
<b>The mountain pine beetle infests mostly old pine trees</b>			
Southwest	43.5	40.9	15.7
West-central	41.3	43.0	15.8
Northwest	37.9	46.5	15.6
Combined	41.0	43.3	15.7
<b>Mild winters have contributed to the current mountain pine beetle outbreak</b>			
Southwest	93.9	1.7	4.3
West-central	91.5	2.9	5.6
Northwest	88.3	3.7	8.0
Combined	91.4	2.8	5.9
<b>The mountain pine beetle was imported to Canada from Europe</b>			
Southwest	7.0	31.5	61.5
West-central	8.6	24.8	66.6
Northwest	13.0	20.3	66.8
Combined	9.4	25.8	64.8
<b>The suppression or prevention of forest fires has contributed to the current mountain pine beetle outbreak</b>			
Southwest	52.5	20.8	26.7
West-central	47.2	24.2	28.6
Northwest	38.7	27.7	33.7
Combined	46.4	24.1	29.5
<b>The mountain pine beetle is found in forests across Canada, from Newfoundland to Vancouver Island</b>			
Southwest	23.0	39.6	37.4
West-central	23.8	39.1	37.1
Northwest	24.1	36.4	39.5
Combined	23.6	38.4	38.0

(44%) than respondents the southwest (62%), that the beetle was not imported from Europe (20% northwest, 32% southwest), and that fire suppression is a contributing factor in the outbreak (39% northwest, 53% southwest). Respondents in the southwest also had a significantly higher mean knowledge score (4.5 out of a possible 8) than respondents from the west-central (4.1) and northwest (3.8) regions (Table 27).

**Table 27. Mean knowledge scores (and standard deviation) in the public survey**

Sample region	Mean score (SD)
Southwest	4.5a (1.9)
West-central	4.1b (2.0)
Northwest	3.8b (1.9)
Combined	4.1 (1.9)

Note: Any two means that do not share a letter are significantly different at  $p < 0.05$  according to the Tukey-Kramer test. SD = standard deviation.

In their comments, many respondents acknowledged that they did not know much about MPB other than what they had seen in BC and locally. On the basis of these comments, we identified two themes pertaining to the type of information that people would like to receive. The following quotes provide examples of these themes.

The first theme was requests for information on how to identify and control MPB on respondents' property.

*"We have been made aware through media, municipality, etc of when they came, the level of infestation and partly why (winds, mild winter etc) ... but very little on what we and others can do in [our] backyard [for] all our affected trees."* [Northwest]

*"I have Pine Trees on my property. I feel there has not been any good information about how to protect our trees if it is possible."* [Northwest]

*"I think more information regarding the pine beetle, specifically how to determine if trees are infested should have been distributed to all property owners."* [Southwest]

*"I have not yet seen evidence of mountain pine beetle in my trees - but I am uncertain as to what to look for. ... I would be interested in knowing if I can do anything about the pine beetle on my property if it is affected."* [Southwest]

The second theme pertained to requests for updates on the Alberta situation. Many respondents felt uninformed about the MPB in the province.

*"Maybe more local information in [the] paper on what's happening, where prevention is at. How prevention methods used have worked or not."* [Southwest]

*"More education is needed to familiarize people with the causes, outcome and control methods of Mountain Pine Beetle infestations. I have not seen any promotional or educational campaigns by the province or forestry industry."* [Southwest]

*"I don't really know which measures or to what degree the government or Parks or forestry or whoever are actually taking to control the beetle infestation and spread. More literature and news needs to be accessible to keep the public better informed."* [West-central]

*"I also believe that there should be far more literature about the beetle and the proposed action plans, available to the public. Generally I hear very little about the beetle."* [Northwest]

## Land Managers' Views of Science, Media Coverage, and the Public's Opinions

Land managers were asked additional questions to examine their views of MPB science, of the media's role in communicating MPB information to the public, and of the public's opinions about MPB.

Land managers had a very favourable view of MPB science (Table 28). They use and trust science in MPB management decision-making. Nearly all land managers agreed that they used science in management decisions (92%), that science is useful in management decision-making (96%), and that they keep up to date

on MPB science (90%). A majority disagreed with statements that the science is too complex (67%) and there is too much uncertainty in MPB science (65%) and agreed that the science is timely (61%). Land managers were supportive of investing money in science. Most disagreed (77%) with a statement that both government and industry should invest less money in MPB science. About 79% of land managers trusted the science produced by government agencies; a smaller majority (76%) trusted the science produced by universities.

Few land managers agreed that the media does a good job of representing MPB science to the public (20%) and that the media can be trusted to portray the MPB in a responsible manner (14%). Clearly, land managers do not have a favourable view of the media's reporting of MPB information to the public.

Although few land managers (14%) thought that public opinion on MPB is informed by scientific information, a majority (63%) thought that local values and opinions should be included in MPB management.

**Table 28. Land managers' views on mountain pine beetle (MPB) science, media coverage, and the public's opinions (%)**

Statement	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	No opinion
I keep myself up to date on MPB science	0.0	2.0	8.2	32.7	57.1	0.0
MPB science is timely in management decision-making	0.0	16.3	20.4	28.6	32.7	2.0
MPB science is useful in management decision-making	0.0	0.0	4.1	36.7	59.2	0.0
I utilize MPB science in management decisions	0.0	0.0	6.1	30.6	61.2	2.0
There is too much complexity within MPB science to use it effectively in management decisions	18.4	49.0	10.2	16.3	6.1	0.0
There is too much uncertainty within MPB science to use it effectively in management decisions	20.4	44.9	14.3	16.3	4.1	0.0
I trust the MPB science that is produced by government agencies	2.1	6.3	12.5	35.4	43.8	0.0
I trust the MPB science that is produced by universities	0.0	4.1	20.4	30.6	44.9	0.0
Governments need to invest less money in the science of MPB	22.9	54.2	14.6	8.3	0.0	0.0
Industry needs to invest less money in the science of MPB	22.9	54.2	14.6	6.3	2.1	0.0
The media does a good job at representing MPB science to the public	18.4	38.8	22.5	18.4	2.0	0.0
The media can be trusted to portray the MPB in a responsible manner	22.5	38.8	24.5	14.3	0.0	0.0
The public's opinions on MPB are informed by good scientific information	22.5	36.7	26.5	10.2	4.1	0.0
Local public values and opinions ought to be included in MPB management	5.0	12.5	20.0	47.5	15.0	0.0

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## DISCUSSION

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Public acceptance is essential for effective natural resource management decision-making. Adverse public judgments can result in postponement, modification, or even cancellation of any management strategy, regardless of its economic feasibility or the rigor of the underlying science (Shindler et al. 2002). Thus, it is important that MPB management strategies be based on an understanding of public perceptions and that they include efforts to address public concerns. This study provides insights into public perceptions of the MPB and its management in areas of Alberta most affected by the MPB. The findings have implications for addressing public concerns in the management response.

First, this study showed that the MPB is an important issue for residents in forested regions of western Alberta and there is strong public support for intervention to stop the spread of the MPB. Some respondents to the public survey, however, viewed the beetle as a natural phenomenon and controls as futile or viewed past forest management practices such as clear-cut logging and fire suppression as factors contributing to the current infestation.

Regarding specific control options, harvesting activities (salvage logging, harvesting infested areas, and adjusting harvest plans) received the strongest support. Prescribed burning of uninfested areas was the least acceptable option for the management of both crown lands used by the forest industry and protected areas. Respondents' comments suggest that lack of support for prescribed burning is grounded in concerns about the health effects from smoke, the risk of a prescribed burn escaping its planned boundaries, and the burning of valuable timber.

Although the public survey results indicate that there is strong public support for managing the MPB, most respondents believe that natural processes are the only effective means of controlling it and that climate change will be a major contributor to future outbreaks. In other words, the study suggests that the public wants management agencies to try to stop the spread of the MPB and supports most of the control options being used but is at the same

time sceptical about the effectiveness of these interventions. This scepticism could result from the view that MPB outbreaks are closely linked to climate (i.e., cold winters).

Second, our indicators of trust showed the public views the provincial government as being competent and committed to managing MPB. The respondents to the public survey also agreed that MPB management is in the best interest of Albertans. Although most respondents felt that they had opportunities to learn about MPB management and understood why actions were taken, fewer respondents viewed the government as open and fair. The public displayed a high degree of uncertainty (as evidenced by a high number of no opinion and neutral responses) regarding the openness and fairness of the provincial government in its management of the MPB, suggesting that they might be unfamiliar with how stakeholders are involved or how decisions are made. Those who expressed an opinion on these issues were divided on whether or not the government considers all points of view and is open to new ideas and whether or not the information provided by the government is biased. In spite of these assessments, however, the provincial government was the most trusted source of information for many respondents.

The public's lack of awareness of basic MPB information and of MPB management in their region and their trust in provincial government information suggests there is an opportunity for government to communicate directly with residents. Some examples of direct communication between management agencies and the public could include hosting community events such as workshops on MPB identification and management on private property and conducting tours of treated areas. Demonstrating how non-timber considerations (especially scenic quality and wildlife habitat) are incorporated into management strategies, discussing benefits of management options, and acknowledging uncertainties are other potential means to improve communications and continue building trust. The inclusion of forest health officers, scientists, wildlife biologists, and other experts in public events provides the public with

an opportunity to hear the latest information and have their questions answered by those most knowledgeable.

Respondents' comments also provided an indication of the types of information that people wanted. Some residents, particularly in the northwest region, requested help in identifying MPB-infested trees on their property and in controlling MPB on their own land. There was also a desire for more information on the MPB situation, MPB control measures, and the progress of MPB control.

Third, there were some notable differences in responses to the public survey among the study regions. Respondents in the northwest region — the region most dependent on the forest sector and the region where the beetle arrived from BC more recently — viewed the beetle's impacts on forests and communities more negatively than respondents in the other regions. They also rated loss of the forest as an economic resource of greater concern, whereas respondents in the other regions were more concerned about the loss of scenic quality. The respondents in the southwest region (the region that was the least dependent on the forest sector and the only region with historical MPB outbreaks) differed from the respondents in the other regions in several respects. For example, residents in the southwest had greater knowledge of the MPB, were less accepting of harvesting activities to control the beetle, and viewed harvesting activities as being less effective in controlling the MPB than respondents in the other regions. More respondents in the southwest thought it unlikely that current controls will stop the spread of MPB, viewed natural processes as the only effective means of controlling the MPB, and believed that climate change will be a major contributor to future MPB outbreaks. Respondents in the southwest also had a more negative view of the forest industry. More respondents from this region disagreed that the industry is doing a good job of managing forests to prevent the spread of MPB and that the industry can be trusted to adjust its practices to minimize impacts from the MPB. The lack of trust in the forest industry was also evident in the number of respondents who indicated that the forest industry was their least trusted source of MPB information. Written comments provided some insights into the source of distrust of the forest industry. Several respondents indicated

dissatisfaction with past logging activity in the southwest region, suggesting that distrust of the forest industry is not specific to MPB management.

The regional differences shown in this study suggest that local concerns and context can influence public perceptions and judgments. Tailoring responses to local concerns and contexts benefits public education and management. For example, the primary concern for the respondents in the southwest region was scenic quality; these respondents were not as supportive of logging activities to control MPB. In contrast, the primary concern of the respondents in the northwest region was economic impacts; they supported management strategies that entail support for the forest industry (i.e., logging activities). Responses tailored to address regional concerns (such as management strategies that explicitly address scenic quality in the southwest region and economic impacts in the northwest region) are likely to be more acceptable in the long term than a uniform response applied across the province.

The context for forest insect disturbance is constantly changing. As the MPB infestation moves through its cycle its biophysical and socioeconomic impacts will change. Like the infestation itself, public perceptions and willingness to accept particular control measures are likely to be dynamic, changing as the infestation goes through its cycle (Flint 2006). Therefore, as the MPB infestation continues in Alberta, land managers may have to contend not only with MPB dynamics but also with changing public perceptions of the MPB and its management. It may be necessary to monitor and incorporate public concerns into management strategies and effectively communicate these strategies to ensure continued public acceptance. In addition, if the MPB continues to expand its range into Canada's boreal forest, understanding the public response in these new social contexts should be an essential component in formulating a management response.

Fourth, although land managers and residents expressed similar views in several respects, there were some notable differences that could have implications for public education and MPB management. Land managers were less

concerned about non-timber impacts (scenery, wildlife, and recreation) of the MPB on forests; their concerns were primarily economic impacts and fire risk. Although economic impacts were also a concern of residents, residents were concerned about a broader array of impacts, including scenic quality and changes to wildlife habitat. Land managers were more supportive than residents of harvesting activities to control the MPB on crown lands but were less supportive than residents of harvesting activities in parks and protected areas. Although a minority of the public thought that the MPB will be controlled within five years, they were more optimistic about control than land managers, suggesting the public might have higher expectations of management outcomes than the land managers. The land managers who participated in this study, who are provincial government and forest industry employees, expressed a higher level of satisfaction with the overall response than the public and were more satisfied with provincial government and forest industry responses. The land managers also expressed higher levels of trust in the provincial government and forest industry. It is important for land managers to be aware of how their judgments of MPB differ from those of the public. Our survey findings suggest that land managers are focused on traditional forest management concerns (economic impacts and fire risk). Although the public may

agree with the traditional forest management outcomes, the public has additional concerns that, if not given adequate attention, could serve as a source of dissatisfaction with the response to MPB.

Finally, the need to formulate a rapid response to the MPB and the considerable time involved in negotiating a management strategy with local stakeholders (Flint et al. 2009) present challenges for fostering public engagement and building trust between management agencies and the public (MacKenzie and Larson 2010). Unlike conventional forest management plans, plans to respond to insect disturbances may need to be developed quickly and can leave little time to develop trust relationships, seek consensus, or incorporate local concerns into the management response. The public appears to share the government's sense of urgency for a response to the MPB, and this is probably having an important influence on the current acceptance of management strategies. As the sense of urgency diminishes and the MPB persists and spreads further east, however, openness and trust relationships will help foster continued public support for MPB management plans. Therefore, sustained communications and engagement with those affected and the engagement of new publics that are in the path of potential MPB spread will be important actions in the management of MPB.

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## APPENDIX

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### Options for Managing the Mountain Pine Beetle

There are a number of options that can be used to prevent or slow the beetle's spread. Some, but not all, of these are being used on provincial crown land. We would like to know if these are acceptable to you and whether you believe they will be effective in controlling the beetle in northwest Alberta.

#### Here is some information to assist you in answering the next question.

**Prescribed burning** is the deliberate burning of forested areas under controlled conditions that allow the fire to be confined to a predetermined area. Fire can be effective in killing the beetles and in preventing their spread by reducing suitable habitat for the beetle.

**Pheromones** are chemicals produced by the beetles to communicate with each other. One type of pheromone is used by forest managers to attract the beetles to an area. This concentrates the beetles in small areas in preparation for application of other control measures. Another type of pheromone acts as a repellent, keeping the beetles away from an area. Pheromones are used to treat small areas.

**Thinning the forest** is the harvesting of healthy trees before they are attacked by the beetle. It involves removing only selected trees

from an area to reduce the susceptibility of the remaining trees to attack. This increases tree vigor and decreases suitable habitat for the beetle.

**Cut and burn** involves cutting infested trees and burning them on site or moving the trees to a central place and burning them in a large pile. This is effective when there are only a few affected trees.

**Harvesting** involves cutting and removing infested trees from an area and milling and processing the trees to kill the beetles. This is effective when there are large blocks of affected trees and in areas where timber companies are operating.

**Adjusting harvest plans** involves logging healthy but susceptible areas before they are attacked. Forestry companies change their harvest plans to log areas that are most vulnerable to the beetle and reduce beetle habitat.

**Chemical control** is the application of the insecticide carbaryl (Sevin). It is used primarily on high-value trees in campgrounds or other landscaped sites and in seed orchard plantations.

**Salvage logging** is not used to control the beetle. Rather, it involves harvesting forests killed by the beetle before the trees lose their economic value. Removing the dead trees also reduces the threat of forest fires and speeds up the regeneration of a new forest.



