Woodlot owner survey report

Climate Change Adaptation Project

ABSTRACT

This survey assesses understanding and capacity of woodlot owners to respond to and manage their woodlots in conditions generated by a changing climate.

Louise Comeau

University of New Brunswick

Table of Contents

Tables

Figures

Introduction

The New Brunswick Federation of Woodlot Owners (NBFWO) distributed, through its seven marketing boards, email and face-to-face invitations to complete a Woodlot Owner Climate Change Adaptation Capacity survey from February to May 2019. Respondents could complete the survey in English or French via Survey Monkey or paper. The invitations generated a convenience sample of 216 completed surveys.

The purpose of the survey is to assess understanding and capacity of woodlot owners to respond to and manage their woodlots in conditions generated by a changing climate. The survey is part of a three-year project, funded by Natural Resources Canada, to increase the capacity of New Brunswick woodlots owners to adapt to climate change. The survey establishes a baseline against which project partners can assess changes in understanding, capacity and management actions, over the project's three-year time horizon. Survey results will also guide the New Brunswick Federation of Woodlot Owners and Community Forests International in designing workshops, webinars, silviculture tools content, and approaches to updating management plans.

Demographics

Survey respondents are predominately male (78%; female, 19%). Ninety-three per cent of the completed surveys are in English, seven per cent in French. Woodlot owners who completed the survey distribute well by age, with 16 per cent of respondents aged 18 to 34-years-old; 22 per cent are 35 to 44-years-old; 22 per cent are 45 to 54-years-old; 21 per cent are 55 to 64-years-old, and 17 per cent are over 65-years of age. This age distribution is not representative of woodlot owners in the province, who skew to older age cohorts, according to NBFWO.

Income slightly skews to wealthier respondents, with 25 per cent of household income in 2018 less than $50,000, 32 per cent between $50,000 and $99,000, and 30 per cent more than $100,000. Eleven per cent of respondents preferred not to answer. More than one-third of respondents (36%) work in their community, 15 per cent work outside the community, 19 per cent are retired, two per cent are students, and five per cent preferred not to answer this question.

Climate change

A strong majority of woodlot owners are concerned about climate change. Just over 68 per cent of respondents are very concerned (38%) or concerned (30%); 32 per cent are somewhat concerned (18%), while 10 per cent not too concerned and four per cent are not at all concerned.

An even stronger majority of woodlot owners who completed the survey believe climate change is already affecting New Brunswick forests (75%), with 12 per cent disagreeing, and 13 per cent not sure. When asked whether climate change will affect New Brunswick forests in the future, 82 per cent say yes, while seven per cent say no, and 10 per cent are not sure. Eight-four per cent of survey respondents say they talk to friends and family about climate change, 16 per cent say they do not.

Survey respondents are less certain about climate change effects on forest-dependent jobs, with 39 per cent believing job-related impacts are happening now, 35 per cent not sure, and 25 per cent saying climate change is not currently affecting forest-dependent jobs. There is more confidence that climate change will affect forest-dependent jobs in the future. Almost 64 per cent of respondents say

climate change will affect forest-dependent jobs in the future, while 25 per cent are not sure, and 10 per cent say climate change will not affect forest-dependent jobs in the future.

Just over 34 per cent of respondents commented on why they believe climate change is already affecting New Brunswick forests or forest-dependent jobs. Several woodlot owners took the opportunity to share their skeptical views about climate change and to describe potential opportunities for change and adaptation. Table 1 summarizes some of these perspectives. These comments highlight the need for ongoing education about the scientific consensus about the causes of climate change, but also the need to identify both opportunities and risks associated with a changing climate.

Table 1. Skeptical and opportunity perspectives on climate change

Skeptics	Opportunities/Adapt
The climate is always changing. Cooling and warming trends are natural phenomena that humans contribute very little towards. Historically, one large volcanic eruption has added more carbon dioxide to the atmosphere than all of mankind. Besides, CO2 is a necessary element for plant growth, and at the current 400ppm, there is a need for more CO2 to maintain plant growth	I think it will create more jobs and alter forest management regimes.
The climate has always been changing. We must learn to live with change and stop playing chicken little(the sky is falling)	A climate change could be beneficial for our forests, forcing new approaches, ideas, uses, creating new work forces.
I don't believe "climate change" in itself will effect jobs in my community, but I know that the "Carbon Tax" will have a great effect on forestry dependent jobs. The increased costs will definitely decrease our competitiveness, as well as causing inflation.	Climate is getting warmer and wetter with more snowfall. Urban forest trees such as the elm, ash, butternut and maple are all facing demise. Jobs for tree removal will be increased.
I do not necessarily believe that we are experiencing climate change, I am more convinced it is an evolutionary cycle.	Adaptation will be required moving forward. Reliance on historical ways will no longer be viable, we need to see the changes and adapt.
Climate change is a hoax put in place by the governments of the world. The earth has gone through many many many climate changes through its long history. Ice ages, warm ups, increasingly stronger weather patterns etc.	As climate has always been changing, and will always continue to change the forest will adapt.

Generally, respondent comments identify concerns about the potential risks of a changing climate to forest health, species viability, and species composition due to disturbance events like insect infestations, flooding, forest fires, ice and windstorms. Many noted the combined risk from climate change and current forestry practices emphasizing softwood monoculture plantations, clearcutting, and glyphosate spraying.

"As the climate changes, and becomes warmer, some tree species that traditionally grow here in the Acadian forest will no longer be able to. The species of trees that require our cooler climate will not be able to handle the changes and will no longer grow here. Balsam fir, for instance, is a major species in New Brunswick forests and forestry that will eventually no longer grow in New Brunswick. As well, with a warmer climate more forest pests will be able to survive in New Brunswick, which will put more stress on our forests."

Several respondents wrote about their concern that climate change will affect sugar maple and maple syrup production:

"Climate change will ultimately lead to the disappearance of tree species which we find in N.B. today. No longer will we have Sugar Maple or Balsam Fir, both of which provide economic opportunities for Christmas tree producers and maple syrup product producers. A reduction in Fir also will lead to the availability of softwood for mills which currently process it in our local mills. Unless it is replaced by a species of spruce one would expect a reduction in wood processing jobs to occur."

"Species composition has been shifting on my woodlot. Young sugar maples are being affected by a blight or canker that I haven't seen before. My father regularly comments on the reduction in some species in his lifetime (born 1953). Our maple syrup season has become less predictable, with less reliable snow cover during the season. The period when the ground is sufficiently frozen to permit safe work in the woods has lessened, both in December and in March."

When asked about their opinions about specific changes in their communities over the past 20 to 30 years, more than two-thirds (68%) cite wind, causing damage tree blow down or property damage, followed by water-related events (spring-time flooding, 63%; winter flooding, 62%; and freeze/thaw cycles, 62%). Figure 1 also shows woodlot owners believe there has been no change or they are not certain about changes over the past 20 to 30 years in insect outbreaks (where an equal number believe insect outbreaks are increasing and decreasing), in forestry or farming (56%), snowfall (55%) and rainfall 51%).
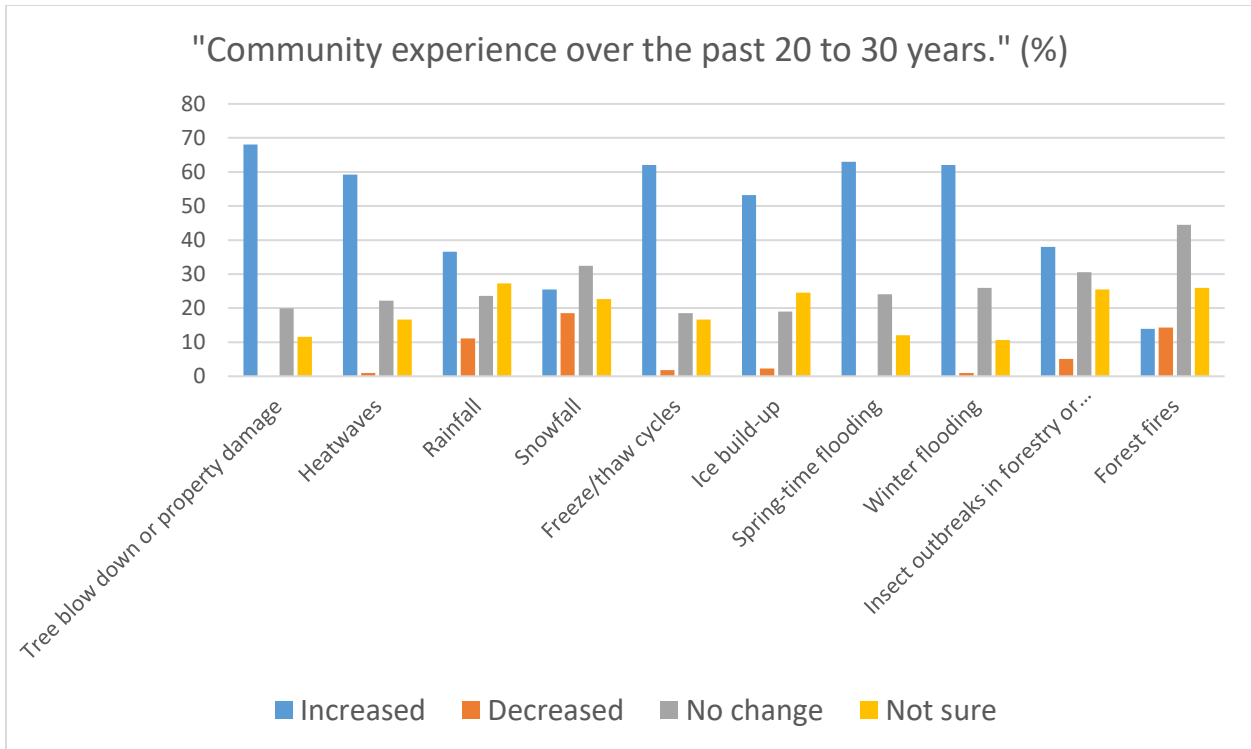
Figure 1. *Wind, causing tree blow-down and property damage most cited change.*

A strong majority of woodlot owners say an extreme weather event (e.g., from an ice storm, flooding, drought) has personally affected them in the last five years (68%), while 28 per cent say they have not been affected by an extreme weather event in that time, and four per cent are not sure. When asked to describe their extreme weather experiences, 38 per cent of respondents answered with stories about spring and winter flooding (51 references), often combined with damage to homes and communities; wind storms (25 references), ice storms (28 references) and often accompanied by power outages (32 references), as well as drought (6 references) or dry (6 references). These quotes provide a flavour of woodlot owner experiences and concerns:

> *"Most of my land has been damaged by several severe winter storms (ice build up), lots of broken tops on trees. Much of the woodland I have has been affected by severe wind storms as well, many, many blow-downs throughout the property."*

> *"Notre maison est située sur le bord d'une rivière. Depuis 2 ans, on doit pomper au printemps pendant 3-4 semaines. Ceci n'était pas le cas avant, sauf exception en 2008) même si on demeure ici depuis 1995."*

> *"Power outages during ice storm, lack of summer rain affected home garden and trees on the property"*

> *"PTS [post-tropical storm] Arthur took down a couple of hundred trees in my woodlot. Flood of 2018 caused my father-in-law's dairy farm to be evacuated and I spent 37 days assisting with milking and feeding of the displaced herd. That flood caused a LOT of damage in the province."*

"Trees blown down. Combination of wind and snow load on trees."

Windstorms have had the greatest influence on how woodlot owners manage their woodlot 48%, (Figure 2), followed by ice storms (35%). Generally, woodlot owners say they have not changed how they manage their woodlots due to (73% say no), 61% have not changed due to drought (61%), and 67 per cent have not changed management approaches due to erosion events (Table 2, Appendix for numerical summary).
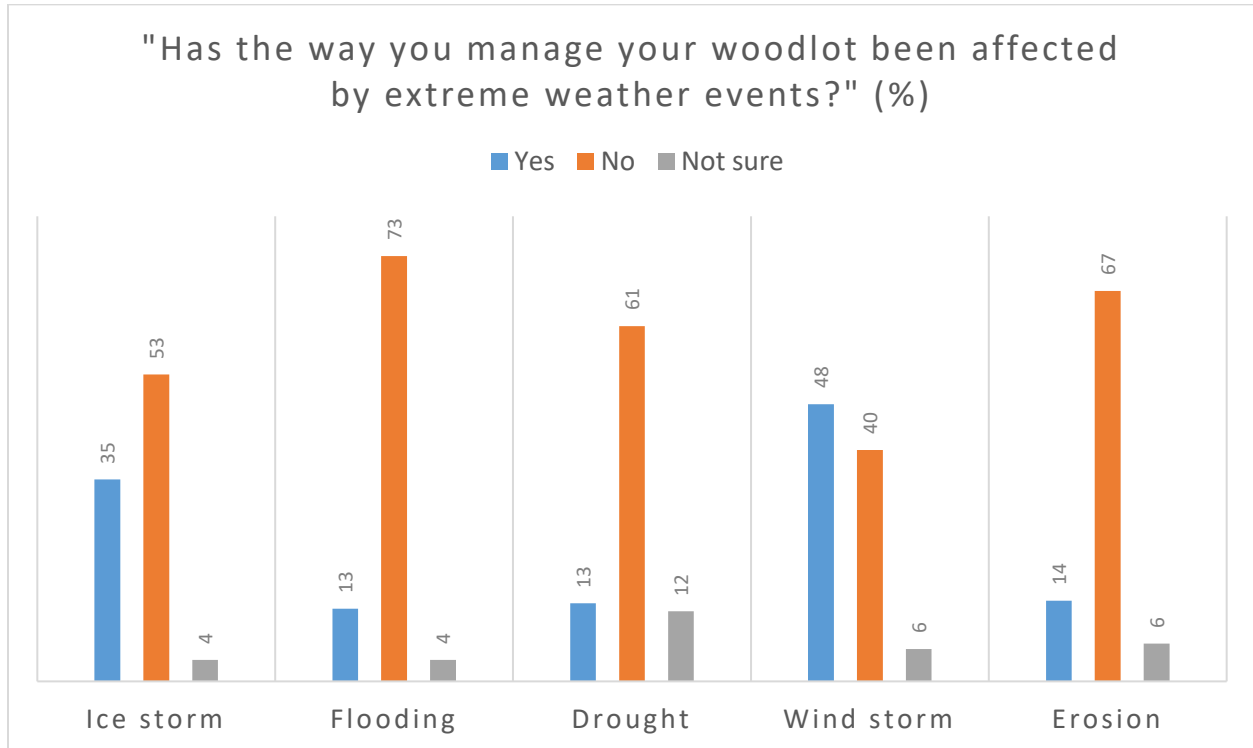
"Has the way you manage your woodlot been affected by extreme weather events?" (%)

■ Yes ■ No ■ Not sure

Figure 2. Windstorms have had the greatest influence on how woodlot owners manage.

When asked to indicate how extreme events have affected management of their woodlots, one respondent notes: "We are encouraging growth and planting of more resilient species." Another respondent says: "The ice storm a few years ago broke off the tops of some of my trees that need cut." Several respondents identify the need for salvage harvesting and harvesting earlier due to blow down and ice damage (9 mentions), including this respondent who says they "Harvested wind damaged trees that otherwise would have left for another decade of growth." Another woodlot owner says: "Now I make sure I cut down any weak or diseased trees for my wood burning as they will fall or break from snow/ice storms." One question NBFWO educators may ask is whether any communication and/or education relating to responding to ice damage could assist with adaptation to climate change.

Two woodlot owners note risks associated with pre-commercial thinning and wind exemplified by this quote:

> *"I am concerned about ice storms after pre-commercial thinning activities and realize this is risk reward from thinning. I am careful not to allow wind lanes to be opened up when cutting trees and conscious of possible wind damage commonly from either a Westerly*

common wind or Northern storm direction. I am doing soil health through cover crops and using that approach to manage erosion and moisture and over all soil health."

The use of cover crops cited by this woodlot owner is a new and unusual practice among woodlot owners. In addition to harvesting changes due to wind and ice storms, one respondent has created "Wider buffers around wood roads and trails to reduce the chance of falling trees/debris on trail and standing deadwood (chico) removal during fall as a pre-emptive measure."

Other woodlot owners (6 respondents), noted washouts caused by flooding is affecting roads used to manage their woodlot requiring new culverts, or that woodlot management is delayed due to flooding. Drought is also affecting woodlot management in at least one location with this woodlot owner noting that: "We were afraid/hesitant to drive or use a chainsaw in the woodlot when it was so dry. I think it was drier in 2017 than 2018. In 2017, there were very limited berries to pick in the woods as well because it was so dry."

Experience to management for climate change

Critical to this climate change adaptation capacity-building project is understanding woodlot-owner readiness to adjust management, operating or silviculture plans. Figure 3 summarizes results for this question. Twenty-one per cent of survey respondents say they consider climate change when preparing or updating their private woodlot management or operating plan/or silviculture plan; 32% say they have not. Sixteen per cent are thinking about it, but are not sure how to proceed, while 10 per cent would do it if there was guidance on how to do it. Another 10 per cent say they would do it if provincial silviculture funding supported it.
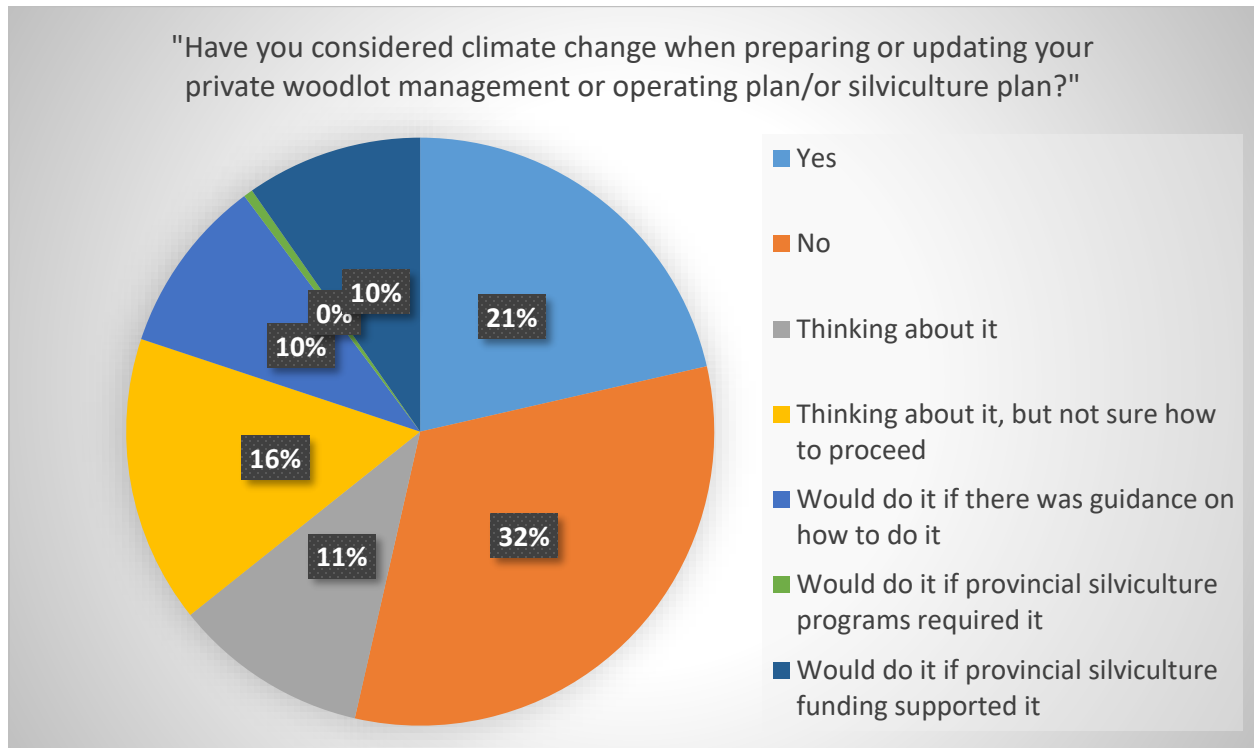

Figure 3. Proportion of woodlot owners considering climate change in woodlot management plans.

These results are encouraging, suggesting almost 40 per cent of respondents are open to incorporating climate change into woodlot management efforts, with the kind of support being developed as part of this NRCan funded project. It is also likely that the 21 per cent who say they already incorporate climate change into their woodlot management, will also find the resources and support helpful to their efforts. This suggests an engagement audience of over 60 per cent of woodlot owners.

When asked what they would do to manage for climate change, 64 per cent say that it is important or very important to manage to diversify age class and 62 per cent say the same about increasing selective logging (Figure 4). Four in 10 believe it is important or very important increase riparian buffers, increase canopy cover, and manage for fire resistance. With respect to riparian buffers, it is also the case that some woodlot owners express frustration over riparian protection rules. It will be important to ensure that project-related content highlight the value of complying through investing time, effort and resources into protecting riparian zones.

Two in 10 think these actions are slightly or moderately important (22%, 24% and 26%, respectively). Woodlot owners split over the value of planting more trees, with 31 per cent saying this is not at all important or slightly unimportant and 46 per cent saying planting trees is very important or important. Respondent rates for this question ranged from 199 to 201, lower than for all other survey questions (Table 3, Appendix for numerical results). These results highlight the need for follow up through focus groups and/or interviews to investigate how woodlot owners interpret the idea of planting more trees as a response to climate change.
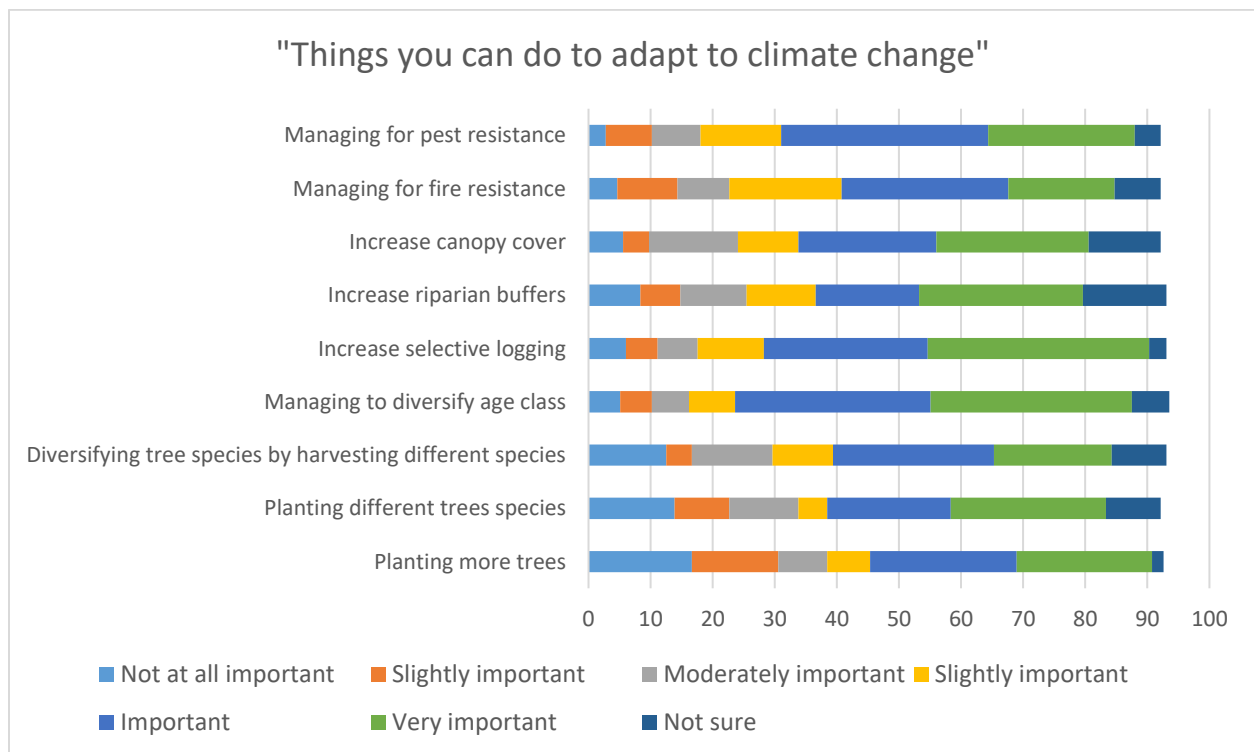

Figure 4. *Woodlot owner options for managing for climate change.*

Were, for example, woodlot owners thinking about planting new forests or clearcutting and planting as a treatment method when they answered this question. If they were thinking of their own woodlot, planting more trees in the same area is expensive and woodlot owners may perceive little economic benefit. It is also important that project education and training content cover each of these adaptation options to explain why they are important, and how and when they might be deployed.

Critical to increasing capacity of woodlot owners to adapt to climate change is reaching them. Sixty-six per cent of respondents have never attended a community meeting focused on climate change impacts to forests or opportunities like carbon offsets; 26 per cent say they have done this occasionally, while three per cent have attended meetings often. Five per cent are not sure. Face-to-face meetings may not always be the most effective way of engaging woodlot owners, but it may also be the case that woodlot owners have few opportunities to attend these kind of events.

Climate change knowledge

Eight-six per cent of woodlot owners who answered the survey know that methane is a greenhouse gas. Sixty-eight per cent understand that the processes leading to global warming involve carbon-based gases trapping heat at the Earth's surface. Twenty-two per cent incorrectly identify the process as letting more of the sun's heat into the Earth's atmosphere through a thinner ozone layer, and six per cent are not sure. Three respondents identify chemical reactions using up the air's oxygen and pesticides changing the chemical makeup of the air.

A strong majority (64%) also correctly answer that it is false that greenhouse gases intercept incoming solar radiation from the sun and re-emit it back towards space (greenhouse gases are transparent to solar radiation but trap infrared radiation, or the heat re-radiated from Earth). Almost 15 per cent of respondents know that global average temperature has increased 0.8 degrees Celsius. Answers, however, cluster around 1 degree Celsius (18% say 1.1 degree Celsius) and 24 per cent say 1.5 degree Celsius (the amount Canada and NB have warmed over this period). Twenty-four per cent say they are unsure.

When asked what happens to precipitation as global temperature rises, 46 per cent correctly say average precipitation increases, while 25 per cent say it decreases (this can be true in some locations, but globally average precipitation is increasing).

Awareness of forest health issues in New Brunswick

Almost half of the woodlot owners answering this survey say they are very aware of current conversations about herbicide use in forestry; 45 per cent say the same about tree species and forest composition changes due to forest management, and 40 per cent are very aware of degradation of forest habitat (Figure 5).
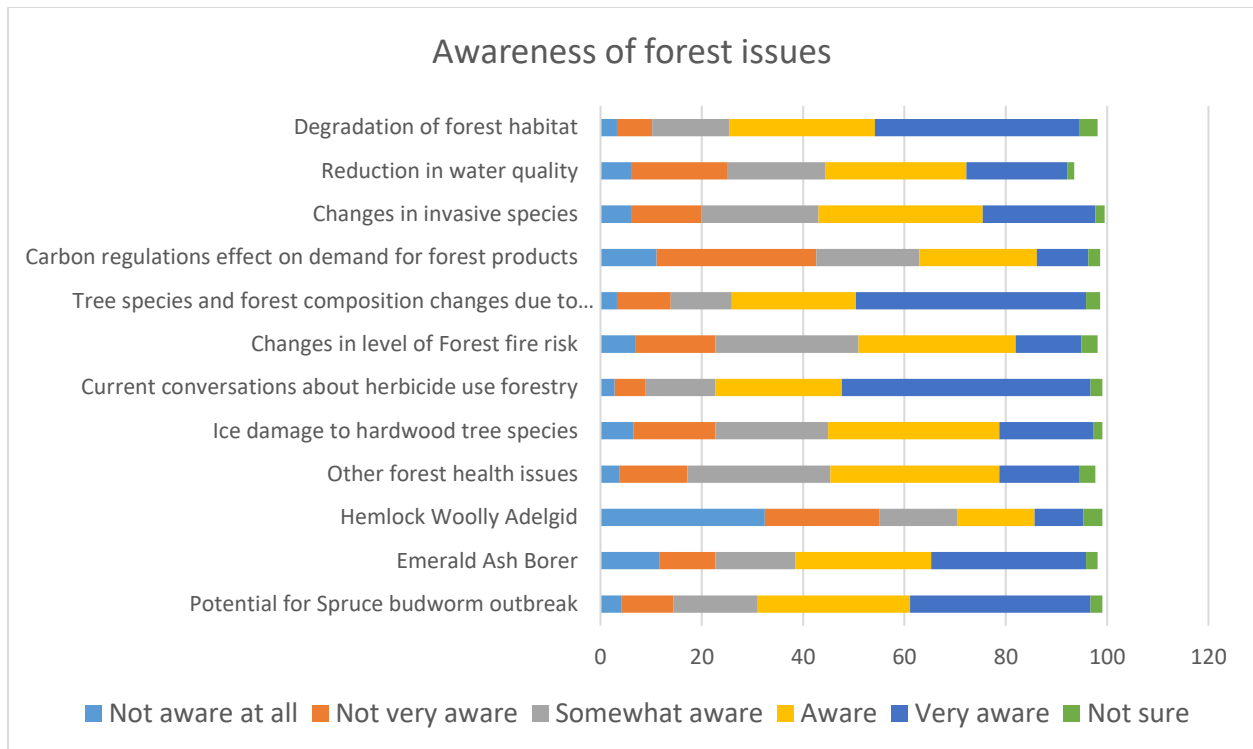
Figure 5. *Awareness of NB forest issue.*

Woodlot owners are least aware of Hemlock Woolly Adelgid, a new issue in New Brunswick, and currently present only in southern regions of the province (32% not at all aware, 23% not very aware). With respect to carbon-induced changes to demand for forest products, 11% are not at all aware, 31% not very aware. Fifty-six per cent of woodlot owners are somewhat aware or aware of ice damage to hardwood tree species. Fifty-nine per cent say the same about changes in or level of forest fire risks; and 55 per cent are somewhat aware or aware of changes over time in the number or reach of invasive tree species (Table 4, Appendix for numerical results). These results also suggest opportunities for targeting information and outreach to educate and inform woodlot owners of the risks associated with climate change and pest outbreaks, as well as opportunities through carbon protection.

Knowledge of NB forests and their management

Woodlot owners are confident that the Acadian forest is a forest ecosystem made up of a mix of softwood and hardwood trees, with 93 per cent of survey respondents saying this is true and only four per cent not sure. Respondents are equally well versed in harvesting rules, with 91 per cent correctly answering that by law, a buffer strip of trees must be left along rivers, streams, and wetlands during timber harvesting. Four per cent answer this is false, while three per cent are unsure. Woodlot owners are well aware that clearcutting is the most common harvesting method in New Brunswick, with 81 per cent indicating this is true, eight per cent indicating it is false, and nine per cent not sure. Seventy-six per cent correctly answered that it is true that forest companies are required to follow guidelines when harvesting timber on Crown lands, 11 per cent say this is false, and 10 per cent are not sure. While woodlot owners rightly acknowledge what forest companies are required to do, a follow on question should have asked if woodlot owners belief that forest companies actually follow the rules.

On this follow-on question, anecdotal evidence suggests the response would suggest forest companies, while required, do not always follow the rules or are penalized when they do not.

Almost half of survey respondents (49%) know the statement that over 30 per cent of New Brunswick crown lands are permanently protected by legislation from any timber harvesting is false, 17 per cent say this is true, and 32 per cent are unsure (Figure 6).
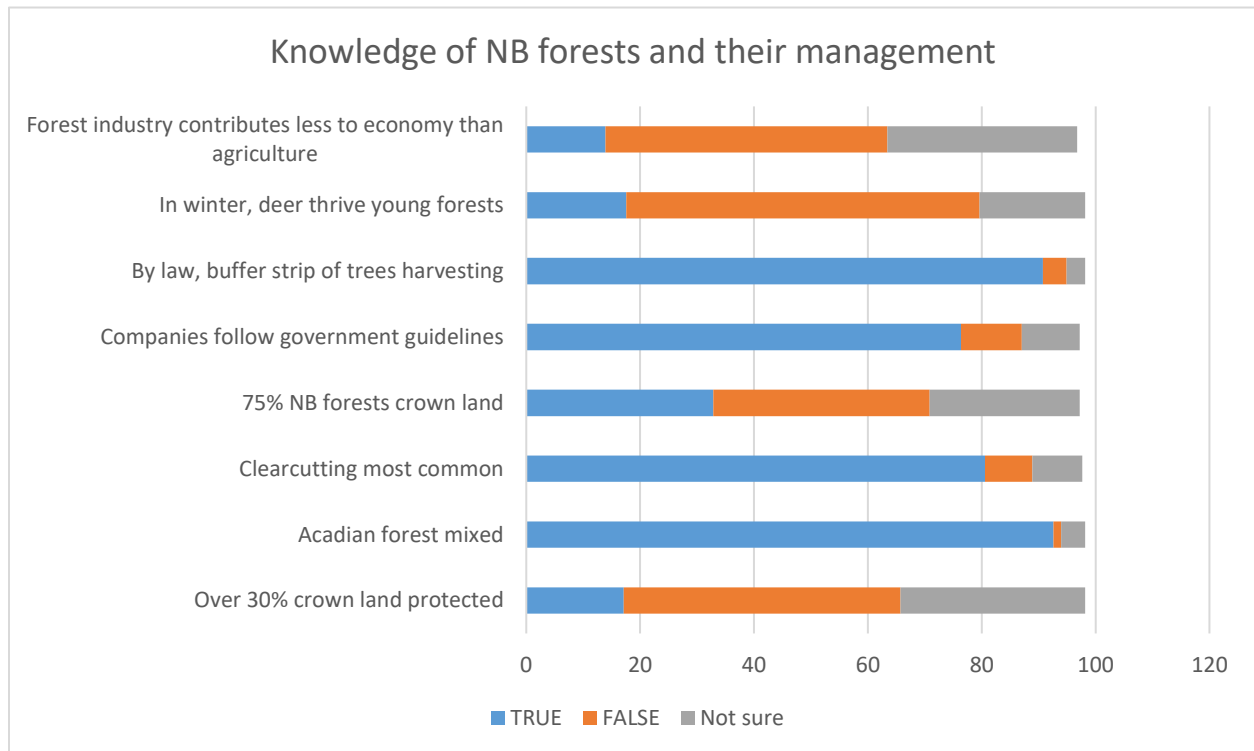

Figure 6. *Familiarity with NB forests and their management.*

Woodlot owners are uncertain about whether in New Brunswick, 75 per cent of forests are on Crown land, with 38 per cent correctly saying this is false, 33 per cent saying incorrectly that this is true, and 26 per cent are not sure. Sixty-two per cent of woodlot owners correctly answered that it is false that in winter, deer thrive in very young planted forests, while 18 per cent say this is true, and 19 per cent are not sure. Fifty per cent correctly indicated that it is false that the forest industry contributes less to the New Brunswick economy than the agriculture industry, 14 per cent say this is true, and 33 per cent are not sure (Table 5, Appendix for numerical results).

Community engagement and employment

Fifty-six per cent of respondents have lived in their present community all (22%) or most of their life (34%). Twenty-one per cent have done so for 10 or more years, 29 per cent have done so for five to 10 years, and seven per cent have done so for between three to five (3%), or one to three years (4%).

Forty-per cent of survey respondents work in the woods (harvesting, tree planting, trucking, planning), while 44 per cent say that no one in their household obtains income from any forest-related activities. Seventeen per cent make at least some of their living from sugaring, Christmas tree production, fir

tipping, or wreath making, 10 per cent in trapping and just over 9 per cent work in a mill that produces wood products. Of the almost 7 per cent who indicated other, activities included guiding, outdoor recreation, non-timber forest products, and non-profit forest activities.

Forty-one per cent of woodlot owners answering the survey do not belong to any organizations. Twenty per cent belong to an ATV, 4X4 or snowmobile club or to an environmental or conservation organization. Fifteen per cent belong to a hunting organization, 11 per cent to a non-timber organization (e.g., maple syrup or other products/crafts, agriculture) and 12 per cent belong to a recreational club (i.e., cross-country skiing, biking, hiking).

Values, beliefs, and interaction with the land

Several survey questions measured forest values, as well as activities that respondents engage in their own or provincial forests. New Brunswick woodlot owners answering the survey feel strongly (98%) that it is important to maintain the forests for future generations (80% strongly agree, 18% agree). Ninety-five per cent believe that forests let us feel close to nature (63% strongly agree, 32% agree), that forests give us a sense of peace and well-being (73% strongly agree, 22% agree) and that it is important that forests exist in my province (77% strongly agree, 18% agree). Eighty-four per cent believe that forests rejuvenate the human spirit (43% strongly agree, 41% agree).

In addition to the widely held values, factor analysis shows that woodlot owner's values differ on two dimensions (Tables 6 and 7, Appendix for factor analysis and numerical results). One dimension centres on values relating to human interests (anthropocentric, utility where forests meet mainly or only human needs, are useful to humans and can be improved by humans). The mean for this anthropocentric-utility orientation is 2.53 out of a potential score of five, indicating the sample is not heavily oriented in this direction. Consistent with social science research, men are more strongly oriented to anthropocentric-utility values, with a mean of 2.63, compared to 2.16 for women (significant at p = .000). There is no significant differences in values orientation by age or income.

There is interesting variation among the items in this factor, with almost half of the respondents strongly agreeing or agreeing that forests should be managed to meet as many human needs as possible (47%), but not exclusively. More than 80 per cent strongly disagree or disagree we should manage forests only for human needs. Seventy-two per cent also strongly disagree or disagree that forests should exist mainly to serve human needs, and 81 per cent strongly disagree or disagree that forests that not used for the benefit of humans are a waste of our natural resources. Thirty-eight per cent strongly agree (7%) or agree (31%) that the primary function of forests should be for products and services that are useful to humans, while 19 per cent strongly disagree and 42 per cent disagree. Woodlot owners' views are mixed on whether forests not threatened by human actions, should be used to add to the quality of human life (e.g., for recreation and other non-economic uses). On this question, 16 per cent strongly disagree, 46 per cent disagree, and 52 per cent agree, 26 per cent strongly agree.

The second values dimension centres on nature's intrinsic value (sacred, right to exist, respect, left to grow, provide peace and well-being). Woodlot survey respondents tend toward values centred on intrinsic value of nature, with a mean of 3.84 (on a scale from 1 to 5). Women are more strongly oriented toward this value orientation, with a mean of 4.18, compared to men with a mean of 3.76 (significant at p = .000). There are no significant differences in values orientation by age or income.

Values activate and deactivate, or prioritize differently, depending on factors like stage of life and security concerns, and on what values are emphasized or de-emphasized. The tendency by woodlots owners who answered this survey toward biocentric values respondents suggest that economics is one, and perhaps, not always the primary motivation in woodlot management decisions. Education, information and outreach that engage woodlot owners through their existing, but perhaps less nurtured, biocentric values, could help engage in ways to considering woodlot management through an ecosystem lens.

Beliefs

Virtually all woodlot owners strongly believe in forest-related goals to protect water quality (84%, very important, 15%, somewhat important) and provide wildlife and plant habitat (81%, very important, 18%, somewhat important), while 70 per cent say it is very important to maintain diversity and characteristics of New Brunswick's forests (26%, somewhat important). Over half feel it is very important to use forests for recreation and relaxation (57% and 39% say somewhat important), to protect forests from pests and diseases (55%, 29% say somewhat important), and to access forests for meat, firewood, berries, traditional medicines, and other non-timber products (52%, very important, 38%, somewhat important, Table 8, Appendix for numerical results).

While these results suggest an openness to managing for multiple forest values, willingness to alter practices to maintain or enhance these forest values within the economic model driving woodlot management for many woodlot owners is not necessarily as high. We will add a question regarding willingness to future exist and tracking surveys.

Forty-two per cent believe it is very important (11%) or somewhat important (31%) to ensure that wood supply for the forest industry remains at current levels. Forty-five per cent say it is very important to conserve forests to absorb carbon, which happens as plants and trees grow, while 37 per cent say it is somewhat important. This result further reinforces the need for follow-up focus groups and/or interviews to explore the thinking driving these results. Do these results stem from low wood prices or because woodlot owners are selling wood through other mechanisms.

Overall, values and beliefs results suggest important avenues for communicating climate-change impact risks and adaptation opportunities. Values and beliefs motivate and guide action, but within practical realities of day-to-day economics and management needs. Survey results suggest opportunities for communication climate-change risks and opportunities, within an action-guiding framework.

Land interactions

We asked woodlot owners to indicate the types of forests in New Brunswick they spend time in during a typical year. Responses show strong levels of interaction with provincial forests

- 88 per cent visit their own forested lands;
- 67 per cent visit other crown lands;
- 62 per cent spend time during the year in provincial parks or protected areas;
- 47 per cent spend time in land owned by forest companies;
- 42 per cent spend time in forests within city limits;
- 37 per cent visit Kouchibouguac or Fundy National Parks; and

- 31 per cent visit forests but are not sure who owns them.

Those respondents who indicated "other" say they spend time on ATV and skidoo trails, on the UNB woodlot, land trusts, and on land owned by friends, family and other woodlot owners.

New Brunswick woodlot owners also enjoy outdoor recreational activities, with,

- 88 per cent walking and hiking in provincial forests during a typical year;
- 69 per cent visiting a camp or a cottage;
- 63 per cent canoeing/kayaking/boating;
- 64 per cent skiing or snowshoeing;
- 58 per cent fishing (58%), camping (59%);
- 57% hunting and trapping (57%);
- 49 per cent four-wheeling/ATV'ing;
- 49 per cent picnicking;
- 37 per cent bird watching;
- 31 per cent in biking; and
- 28 per cent snowmobiling.

Other activities noted by woodlot owners, include cutting wood, foraging, horseback riding, nature photography, observing and educating, painting, studying plants, insects, and animals, and lying down in the plants and eating blueberries.

When asked which forest products woodlot owners use in a household during a typical year (bought, are given or harvest), they say they use:

- Firewood (87%);
- Food products (78%, e.g., mushrooms, berries, or fiddleheads);
- Maple products (75%, e.g., syrup, candy);
- Christmas trees, fir tips or pine boughs (69%);
- Fish (64%);
- Saw logs or other wood products (63%);
- Catch/eat small game (e.g., rabbits, partridge, 51%);
- Big game (e.g., moose, deer, bear, 52%);
- Collect material for handicraft products (44%);
- Collect medicinal items (e.g., Chaga, ground hemlock, 38%); and
- Furbearers (mink, beaver, 11%).

Woodlot owners also say they collect birch bark for fire starter, seedlings and use tissue and toilet paper from forest products. Woodlots clearly are multi-purpose assets for the owners answering this survey. These results may not be representative of all woodlot owners, but do suggest that management options that allow for climate change adaptation and maintaining multiple uses will be of interest to woodlot owners similar to those who answered this survey.

A third of woodlot owners (33%) answering the survey own 100 to less than 250 acres (40 to 101 hectares), while 25 per cent own between 50 to less than 100 acres (20 to 40 hectares). Twelve per

cent own between 10 and less than 50 acres (4 to 20 hectares), while 22 per cent own 250 to more than 500 acres (101 to 202 hectares).

Forty-four per cent are familiar with land conservation easements (35% say no, and 21% are not sure). When asked if they would be interested in protecting their land with a conservation easement if allowed to harvest wood yet protect the woodlot for future generations, 38 per cent said yes, 15 per cent say no, and 43 per cent are not sure.

Conclusion

The purpose of the survey is to assess understanding and capacity of woodlot owners to respond to and manage their woodlots in conditions generated by a changing climate. The 219 survey respondents (a convenience sample) have helped establish a baseline against which project partners can assess changes in understanding, capacity and management actions, over the project's three-year time horizon. While results are not generalizable to all woodlot owners in New Brunswick, the results do suggest opportunities for project partners as they deliver this three-year project, funded by Natural Resources Canada, to increase the capacity of New Brunswick woodlots owners to adapt to climate change.

Overall, values and beliefs results suggest important avenues for communicating climate-change impact risks and adaptation opportunities. Values and beliefs motivate and guide action, but within practical realities of day-to-day economics and management needs. Survey results suggest opportunities for communication climate-change risks and opportunities, within an action-guiding framework.

Woodlot owners answering this survey are concerned about the effects of changing weather conditions on their woodlots, especially due to ice and wind damage, see their woodlots as multi-purpose assets and are open to learning more about how to adapt to climate change, including options for changing silviculture approaches if support is available. Providing timely information to fill knowledge gaps, tied to current concerns and priorities of woodlot owners will enhance uptake of climate change adaptation training and woodlot management planning and implementation.

Appendix

Table 2. "In your opinion, has your community over the past 20 to 30 years experienced…"

	Increased %	Decreased %	No change %	Not sure %
Tree blow down or property damage (*n* = 215)	**68**		20	12
Heatwaves (*n* = 214)	59	1	22	17
Rainfall (*n* = 213)	37	11	24	27
Snowfall (*n* = 214)	25	19	32	23
Freeze/thaw cycles (*n* = 214)	**62**	2	19	17
Ice build-up (*n* = 214)	53	2	19	25
Spring-time flooding (*n* = 214)	**63**		24	12
Winter flooding (*n* = 214)	**62**	1	26	11
Insect outbreaks in forestry or farming (*n* = 215)	38	5	31	25
Forest fires (*n* = 214)	14	14	44	26

Table 3. Importance of climate change adaptation options

	Not at all important %	Slightly important %	Moderately important %	Slightly important %	Important %	Very important %	Not sure %
Planting more trees (n = 200)	17	14	8	7	24	22	2
Planting different trees species (n = 199)	14	9	11	5	20	25	9
Diversifying tree species by harvesting different species (n = 201)	13	4	13	10	26	19	9
Managing to diversify age class (n = 202)	5	5	6	7	**31**	**32**	6
Increase selective logging (n = 201)	6	5	6	11	**26**	**36**	3
Increase riparian buffers (n = 201)	8	6	11	11	17	26	13
Increase canopy cover (n = 199)	6	4	14	10	22	25	12
Managing for fire resistance (n = 199)	5	10	8	18	27	17	7
Managing for pest resistance (n = 199)	3	7	8	13	33	24	4

Table 4. Knowledge of NB forestry issues

	True %	False %	Not sure %
Over 30% crown land protected (*n* = 212)	17	49	32
Acadian forest mixed (*n* = 212)	93	1	4
Clearcutting most common (*n* = 211)	81	8	9
75% NB forests crown land (*n* = 210)	33	38	26
Companies follow government guidelines (*n* = 210)	76	11	10
By law, buffer strip of trees harvesting (*n* = 212)	91	4	3
In winter, deer thrive young forests (*n* = 212)	18	62	19
Forest industry contributes less to economy than agriculture (*n* = 209)	14	50	33

Table 5. Awareness of New Brunswick forest issues

	Not aware at all %	Not very aware %	Somewhat aware %	Aware %	Very aware %	Not sure %
Potential for Spruce budworm outbreak (*n* = 214)	4	10	17	30	36	2
Emerald Ash Borer (*n* = 212)	**12**	11	16	27	31	2
Hemlock Woolly Adelgid (*n* = 214)	**32**	**23**	15	15	10	4
Other forest health issues (*n* = 211)	4	13	28	33	16	3
Ice damage to hardwood tree species (*n* = 214)	6	16	22	34	19	2
Current conversations about herbicide use forestry (*n* = 214)	3	6	14	25	**49**	2
Changes in level of Forest fire risk (*n* = 212)	7	16	28	31	13	3
Tree species and forest composition changes due to forestry (*n* = 213)	3	11	12	25	**45**	3
Carbon regulations effect on demand for forest products (*n* = 213)	**11**	**31**	20	23	10	2
Changes in invasive species (*n* = 215)	6	14	23	32	22	2
Reduction in water quality (*n* = 212)	6	19	19	28	20	1
Degradation of forest habitat (*n* = 202)	3	7	15	29	**40**	4

Table 6. Forest values factor analysis

Forest Values Factor Structure Matrix

	Factor 1	Factor 2
Forests should exist mainly to serve human needs	0.823	-0.400
Forests should be managed for human needs only	0.771	-0.388
The primary function of forests should be for products and services that are useful to humans	0.682	-0.470
Forests that are not used for the benefit of humans are a waste of our natural resources	0.679	-0.429
Forests should be managed to meet as many human needs as possible	0.487	-0.338
Forests are sacred places	-0.390	0.714
Forests should have the right to exist for their own sake	-0.479	0.672
Humans should have more respect and admiration for the forests	-0.333	0.609
Wildlife, plants, and humans should have equal rights to live and develop	-0.337	0.601
Forests should be left to grow, develop and succumb to natural forces without being managed by humans	-0.346	0.491
Forests give us a sense of peace and well-being	-0.197	0.391
Forests can be improved through management by humans	0.332	-0.335

Extraction Method: Maximum Likelihood.
Rotation Method: Oblimin with Kaiser Normalization.

Table 7. Forest Values

	Strongly disagree %	Disagree %	Neither %	Agree %	Strongly agree %
Important forests exist (n = 214)	2		2	18	77
Forests managed many human needs (n = 214)	10	24	18	33	13
Forests managed human needs only (n = 213)	51	31	9	5	2
Forests right to exist own sake (n = 211)	3	6	15	33	41
Forests give sense of peace, well-being (n = 213)	1		3	22	73
Forests should exist for human needs (n = 213)	30	42	15	7	5
Forests are sacred places (n = 212)	5	7	24	35	27
Maintain forests for future generations (n = 215)	1		0	18	80
Forests left to grow, develop (n = 216)	16	46	23	12	4
Forests not for human use a waste (n = 216)	50	31	9	8	1
Humans more respect and admiration forests (n = 213)	1	1	6	33	58
Forests let us feel close to nature (n = 211)		0	2	32	63
If not threatened, humans should use (n = 212)	2	2	16	52	26

Forests rejuvenate human spirit (n = 211)		2	12	41	43
Forests can be improved by human management (n = 215)	2	5	15	50	29
Wildlife, plants, and humans equal rights (n = 215)	4	11	19	37	30
Primary function of forests products and services humans (n = 215)	19	42	20	14	3

Table 8. Beliefs about forest-related goals

	Not at all important %	Somewhat unimportant %	Neither %	Somewhat important %	Very important %
To create economic wealth and jobs (*n* = 214)	4	8	10	51	26
Maintain diversity (*n* = 214)	0	0	2	26	70
Ensure wood supply for industry remains at current levels (*n* = 215)	14	19	25	31	11
Use for recreation and relaxation (*n* = 216)	0	1	2	39	57
Provide wildlife and plant habitat (*n* = 215)			1	18	81
Access for meat, firewood, berries, traditional medicines (*n* = 214)	0	2	7	38	52
Protect water quality (*n* = 215)			0	15	84
Protect forests from insect pests and diseases (*n* = 215)	1	4	11	29	55
Conserve forests to absorb carbon (*n* = 213)	3	3	12	37	45
Protect forests for future generations (*n* = 214)	2	2	5	28	61