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**COMPARISON OF PENNSYLVANIA RESIDENTS' AND REGIONAL
SCIENTISTS' PERCEPTIONS, VALUES, AND ATTITUDES TOWARD
MANAGEMENT OF OLD-GROWTH FORESTS**

A Thesis in

Ecology

by

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ABSTRACT

Identifying public perceptions of public forests and their management is critical to the development of socially acceptable administration approaches as well as to sustaining the values these public forests provide. Recognizing this, ecosystem management has elevated human dimensions to a level of consideration in planning and decision-making equal to that of ecological and economic factors. Visual preference research has revealed much about public preference for forest conditions and those silvicultural treatments that produce them; however, most studies have used western US forest scenes leaving perceptions of eastern forests, particularly those in the rare old-growth condition, relatively unknown.

A sequential mixed-methods approach was utilized to understand how Pennsylvania residents perceive and value old-growth forests as well as to determine the acceptable level of management in the state's public forest old-growth system. Six focus groups informed the development of a self-administered mail survey sent to Commonwealth residents. A comparable Internet survey was administered to scientists to benchmark for comparing public responses.

Over half the residents who responded to the survey were unfamiliar with the term "old-growth forest." Those familiar with the term expressed positive affective beliefs, and demonstrated an awareness of several key old-growth concepts. Generally, however, the public had a less sophisticated understanding of old-growth forests than did scientists. Residents recognized the importance of a diversity of old-growth forest values, and were willing to annually pay \$14.36 and \$20.63 for an increase in the amount of public set-aside forest in Pennsylvania by 10% (55,000 acres) and 50% (275,000 acres), respectively. Residents' willingness-to-pay was best predicted by their self-assessed familiarity with forests, frequency at which they spend time in forests, political views, and income, but was not significantly sensitive to the magnitude of the increase. The public demonstrated more favorable attitudes toward recreation and active management in Pennsylvania's old-growth system than scientists, with the disparity seemingly driven by the former's utilitarian interest in old-growth forests and the latter's desire to adhere to restoration objectives.

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Chapter 1

Introduction

Over the last fifty years, the general public has increasingly gained a greater voice in the management of public forests. Ecosystem management exemplifies the most recent culmination of this trend as it recognizes how people and their needs and values, including perceptions, beliefs, attitudes, and behaviors, affect ecosystems (Carr 1995). As land management agencies, e.g., USDA Forest Service and Pennsylvania Department of Conservation and Natural Resources – Bureau of Forestry (DCNR – BOF), have adopted ecosystem management as their new forestry paradigm, these human dimensions are given as much consideration in forest planning and decision-making as ecological and economic factors (Kearney and Bradley 1998, DCNR – BOF 2003). The assumption that policy can be developed solely on the basis of scientific knowledge is no longer operable. Public forest management decisions fall into the “wicked problem” category requiring value-laden solutions that are increasingly not a result of the traditional analytical science process (Allen and Gould 1986, Miller 1993). By investigating the human dimension of natural resource management, researchers seek to describe, predict, understand, and affect human thought and action toward natural environments, with the intent to incorporate the results into natural resource managers’ decision-making processes (Manfredo et al. 1996).

Forests and the Human Dimension

As a product of the USDA Forest Service's New Perspectives research program, ecosystem management stems directly from the intense controversy over multiple-use management and the conversion of old-growth forests in the Pacific Northwest (Brunson 1993, Swanson and Franklin 1992). It adopts an ecological approach to resource management by striving to sustain ecosystem composition, structure, and function (DCNR – BOF 2003). Prior to the New Perspectives program, a wealth of research explored the connection between the aesthetic merit of "good silviculture" and the public preferences for scenic beauty (Ribe 1989). With the development of ecosystem management, research continued to connect the social and ecological aspects of forest management with the desire to determine the acceptability of this new management approach.

As humans are a highly visual species, empirical research using visual surveys has revealed much about public preferences for forest conditions as well as the silvicultural treatments that produce them. In terms of the individual physical characteristics of forest sites, favorable preferences have been found for large trees; low to moderate stand densities; lush vegetative ground cover; canopy openings, visual, spatial, and species variety; and appearances of health and orderliness; and snags, down wood, dense shrubs, and bare ground reduce site preference (Brush 1976, Arthur 1977, Brush 1979, Vodak et al. 1985, Brown and Daniel 1986, Ribe 1989). Furthermore, mature forests have proved to be preferred over younger forests and natural-looking stands over those with obvious human influence (Ribe 1989). When asked to compare

the scenic quality of stands with various treatments, including an unmanaged control, Brunson and Shelby (1992) found respondents chose unmanaged, old-growth stands as the most attractive, clearcuts as the least attractive, and partially-cut stands fell in between the two. In general, there appears to be a preference for forests that are well-defined, park-like, and well-lit (Brush 1976).

Humans are also an emotional species, judging the environment not only with their heads, but also their hearts. According to Kimmins (2003), the general public constructs a close relationship between large trees and old trees, as well as between large trees and the ecosystem condition collectively referred to as old-growth. Additionally, large trees are visually impressive, thus exerting a strong effect on human emotions and thereby, creating a strong emotional link to old-growth. For instance, members of households within the Great Northern Forest of the northeast expressed positive attitudes and affective beliefs toward late successional forest stages (>100 years old; Enck and Odato 2008). This response was significantly more positive than that expressed for early successional forest stages (<20 years old).

While visual preference research has revealed much about forest management preferences, relatively little is known about the underlying causes of such preferences. Bradley and Kearney (2007) found that stakeholders in the management of Capitol Forest in Washington, a state-owned public forest, stated five general reasons for their preference rating of various silvicultural treatments: amount and quality of vegetation; degree of human intervention; aesthetic issues; technical forestry considerations; and other concerns. The underlying dimension of preference varied with stakeholder group, and Bradley and Kearney (2007) suggest that preference for a scene is not solely based

on its physical attributes, but also on the particular lens through which it is viewed. For instance, they found that foresters acknowledged a rational management action in the presence of slash and stumps, whereas environmentalists interpreted these attributes more negatively as evidence of human intervention. Their conclusions suggest caution that it is not safe for forestry professionals to assume that other stakeholders, including other foresters, will have similar preferences, or even recognize the same physical characteristics of a scene.

Despite its contribution to visual resource management, visual preference research has conceptualized and measured only the visual, perceptual, and affective aspects of the human aesthetic response (Gobster 1996). Some feel that the emphasis on investigating and tailoring to such a scenic aesthetic has perpetuated a preference for forest scenery that is superficial (Nassauer 1992), and created illusions that natural forests are mature, tidy, and unchanging (Gobster 1996). This may have led to the common misconception that old-growth forests are always aesthetically pleasing stands of large trees, with sparse undergrowth and a homogenous, park-like structure (Dunwiddie et al. 1996). In contrast to this scenic aesthetic, some have argued for a cognitive-based ecological aesthetic rooted in Aldo Leopold's land ethic recognizing that form follows function (Gobster 1996). The development of an ecological aesthetic is particularly valid when public perception based on visual evidence counters management objections and the call is made to educate the public (Kearney 2001); however, providing respondents with an ecological justification behind the manipulation of forest scenes viewed in visual surveys has produced mixed and unpredictable results (Brunson and Reiter 1996, Ribe 1999, Kearney 2001, Hill and Daniel 2008).

Old-Growth Forests

Old-growth forests have declined continually since European settlement, and currently exist as rare, isolated remnant stands representing only a small percentage of forested area in the East (Davis 1996). One of the difficulties with discussing old-growth is defining it in a scientifically meaningful, yet operational and policy-relevant manner (Mosseler et al. 2003). Definitions are typically based on reaching thresholds or meeting designated criteria, e.g., age or disturbance (Hunter 1989, Hunter and White 1997); however, thresholds and criteria vary by forest type, site conditions, and disturbance history and a universally acceptable definition is extremely general at best (Hunter 1989, Davis 1996). Although a number of structural, compositional, and process features have been identified as characteristic of old-growth (Davis 1993, White and White 1996, Kneeshaw and Burton 1998, Tyrrell et al. 1998), not all old-growth stands are the same and even within a forest type stands may vary so as not include the same set of distinguishable features. The use of indices as demarcation tools has been suggested and applied (Spies and Franklin 1988, Rusterholz 1999, Whitman and Hagan 2007), but may not be applicable to all forest types (Goebel and Hix 1996).

Ecological Value

With a diminished representation of the old-growth condition throughout the eastern landscape, there is potential for decline of the ecological services provided by old-growth forests. Old-growth forests provide habitat for an array of wildlife (Kimmins and Kimmins 1992, Peterken 1996, McGee 1999). Of the wildlife species in the

northeastern United States, 28 birds, 18 mammals, 23 reptiles and amphibians, and hundreds of invertebrates and fungi use the deadwood, either standing or fallen, common in old-growth forests (Degraaf and Rudis 1986, Hagan and Grove 1999). Specifically, optimal winter fisher (*Martes pennanti*) habitat includes dense mature forest with understories dominated by dense vegetation, fallen logs and other woody debris to provide thermal cover and cavities for den sites (Serfass et al. 1994). Moreover, Haney and Schaadt (1996) found that 20% of Pennsylvania's avifauna species may use old growth during either summer breeding or winter seasons. A few species were entirely restricted to old-growth habitats and several more occurred there much more frequently than in younger habitats. In terms of flora, primary cove hardwood forests in the southern Appalachians have higher vernal herbaceous richness when compared to secondary forests with many species occurring more frequently in the former rather than the latter (Duffy and Meier 1992, Meier et al. 1996). Lichen diversity has also been shown to increase with stand age with a disproportionate number of rare species restricted to very old sites (Selva 1994).

Aside from harboring late-successional biodiversity, old-growth forests play a role in maintaining genetic diversity and the adaptive potential of species by serving as gene banks (Kimmins and Kimmins 1992, Mosseler 2003). Furthermore, the old-growth condition supports other ecological values such as carbon sequestration (Harmon et al. 1990) and aquatic functions. For instance, individual log and large woody debris inputs from old-growth riparian forests contribute to debris dams important for sediment and organic material retention as well as stream habitat complexity, thus indirectly and directly influencing stream invertebrate and fish communities (Keeton et al. 2007).

Finally, old-growth forests hold scientific value as they provide a venue to study natural processes, may serve as a control or ecological benchmark with which to compare managed stands, and present researchers with environmental monitoring sites and indicators of long-term change (Whitney 1987, Kimmins and Kimmins 1992, Peterken 1996, Foster et al. 1996).

Economic Value

In addition to the goods and services directly utilized in sustaining human life (Daily 1997), old-growth forests also provide non-use, or passive-use, value. Non-use value includes the willingness of individuals to pay for the satisfaction of knowing old-growth forests exist, i.e., existence value, and to ensure old-growth forests will exist in the future either for potential personal use, i.e., option value, or for the use of future generations, i.e., bequest value (Weisbrod 1964, Krutilla 1967). Several studies have approximated the non-use value of old-growth forests using stated preference approaches, typically the contingent valuation method. By developing a simulated market scenario, the contingent valuation method elicits individuals' willingness-to-pay for a good using a survey format and is recommended for use in non-market valuation (US Water Resources Council 1983, Mitchell and Carson 1989, US Department of Interior 1994).

To date, contingent valuation surveys have focused on the preservation of old-growth forests as habitat for the spotted owl (*Strix occidentalis*). Rubin et al. (1991) estimated Washington households were willing to pay \$34.84 (\$1987) annually to ensure persistence of the northern spotted owl. At the national level, US households pledged

\$86.32 (\$1990) of yearly support for northern spotted owl conservation policy (Hagen et al. 1992). Shifting the focus of protection from logging to fire, Loomis and Gonzalez-Cabin (1994) exhibited the value to Oregon's general public of fire reduction policy purported to reduce fires in Oregon's old-growth forests. Oregonian households expressed a willingness to pay of \$77.00 (\$1993) in support of the policy. Furthermore, California and New England residents were willing to pay \$94.77 and \$61.17 (\$1995), respectively, for similar fire reduction policies in California and Oregon. Lastly, utilizing a choice-experiment framework, Oregonians indicated an annual household willingness to pay of \$380 (\$1999) to increase the amount of forest dedicated to the development old-growth characteristics by 20% (Garber-Yonts et al. 2004). Regardless of the specific monetary value, it has been clearly demonstrated that old-growth forests represent value beyond the traditional use of forest resources.

Pennsylvania's Old-Growth Forests

Old-growth forest acreage in Pennsylvania has mirrored the trend exhibited across the eastern forest landscape. The Commonwealth holds approximately 27,000 acres of old-growth existing in patches of primarily eastern hemlock, eastern white pine, and northern hardwoods (Smith 1989, Davis 1996). Nearly 75% of Pennsylvania's forestland exhibiting old-growth characteristics persists as public forestland managed by the Pennsylvania DCNR – BOF (Jenkins et al. 2004). Yet, this acreage only represents 0.1% of the state forest system, thus revealing that Pennsylvania's forests are predominantly second-growth where old-growth characteristics are rare or lacking. In fact, the desire to

restore old-growth characteristics makes the major issue concerning old-growth in the east different from that in the west, where the controversy centers to a greater extent on how much of the existing old-growth should be preserved (Lorimer and Frelich 1994).

To ameliorate the successional truncation of the state's forests, the DCNR – BOF proposed development of a 550,000 acre old-growth system dedicated to the restoration and perpetuation of old-growth forest conditions (Jenkins et al. 2004). The old-growth system faces a number of threats and challenges, including: invasive plants, pests, and pathogens; deer over-browsing; a history of selective logging practices, e.g., high-grading and diameter limit cutting; fire suppression; altered successional pathways; and even natural disturbance (Haney 1996, Jenkins et al. 2004, McEwan and Muller 2006). Although passive management would be less costly and likely generate less controversy, active management should be considered an option for restoring old-growth characteristics to Pennsylvania's forests (Jenkins et al. 2004).

Objectives

Contradictions emerge when comparing old-growth forest attributes and the generalized knowledge of scenic preferences (Gobster 1996). For example, while some attributes of old-growth forests are admired (e.g., large, old trees), other characteristic features of old-growth are not viewed favorably (e.g., snags and down coarse woody debris). Also, as there is a preference for unmanaged stands, conflict between public preferences and management objectives seems imminent if active management is applied to restore or accelerate old-growth characteristics in Pennsylvania's predominantly

second-growth old-growth system. As visual preference research has been based primarily in western coniferous forests, there is relatively little known about the public's preference for and knowledge of eastern deciduous forests, particularly its remaining old-growth. Extrapolation of results from western forest studies to eastern forests is ill-advised as the two do not share a similar ecological and social context. As such, the objectives of this research are to determine Pennsylvania residents' perceptions and values of old-growth forests, and to determine their attitudes regarding management of Pennsylvania's old-growth system. Understanding these human dimensions of Pennsylvania's old-growth forests would be valuable to state policy- and decision-makers as they follow an ecosystem management approach to public forest management.

Chapter 2

Methods

In order to investigate the general public's perception of old-growth forests, a mixed-method approach was employed. The approach combined qualitative data collected from focus groups with quantitative data collected from self-administered mail and Internet surveys. Specifically, a sequential mixed-method approach was utilized where the results from the first method, i.e., focus groups, informed the development of subsequent methods, i.e., self-administered surveys (Tashakkori and Teddlie 1998).

Focus Groups

According to Krueger and Casey (2009), focus groups are carefully planned discussions designed to obtain perceptions on an area of interest in a permissive, nonthreatening environment. These discussions allow researchers to understand, rather than assume, the range of ideas about and feelings toward a topic of interest, such as old-growth forests, as well as capture the language used in discussions about that topic. They are exploratory in nature and, as such, are conducive to purposive, or non-probability, sampling techniques. With purposive sampling, some members of the target population have a higher chance of being sampled than others as the researcher makes subjective judgments whether to include or exclude certain individuals (Vaske 2008). Although use of this technique prohibited extrapolation of results to a larger target population, it

provided the freedom necessary to target specific groups of Pennsylvania residents in different parts of the state in an attempt to maximize the range of results.

Six focus groups each running about 75 to 90 minutes were conducted in the summer and fall of 2009 (Table 2-1). Focus group locations were chosen to geographically span the state, achieve a balanced representation of urban and rural residents, and ensure the inclusion of minorities. Community and service group leaders as well as key informants were contacted and asked to distribute a recruitment letter to potential participants (Appendix A). Participants were limited to Pennsylvania residents lacking an extensive knowledge of forestry or forest ecology, and at least 18 years of age. A total of 44 participants were recruited (21 males, 23 females), and met either at a local restaurant, County Cooperative Extension office, or The Pennsylvania State University.

Table 2-1: Location, date, number of participants, and target of focus groups.

Location	Date	# of Participants			Target
		Total	Male	Female	
Harrisburg	8/4/2009	7	6	1	African Americans
Kane	8/6/2009	5	3	2	Young Demographic (18-30)
State College	8/12/2009	10	6	4	Sierra Club Members
Huntingdon	9/17/2009	6	2	4	Extension Board Members
Pittsburgh	11/17/2009	10	2	8	Penn State Master Gardeners
Wilkes-Barre	12/5/2009	6	2	4	Latinos
Total		44	21	23	

After signing an informed consent form, participants were provided a meal and, either during or following the meal, asked a series of open-ended questions regarding forests in general and old-growth forests in particular (Appendix A). The questions were carefully phrased and sequenced to follow a logical order and be easily understood by participants. Each focus group's moderator walked the participants through the

questions, encouraged group discussion, and probed for clarity when necessary. An assistant moderator took notes of the discussions and also probed for clarity when necessary. Each discussion was audiotaped using a digital recorder. Audiotapes were subsequently transcribed and analyzed qualitatively for themes using the Classic Approach (Krueger and Casey 2009).

Self-Administered Surveys

The themes that emerged from the focus group data were incorporated into a predominantly closed-format survey instrument. In an effort to achieve a high response rate, the Tailored Design Method was followed and survey questions were carefully phrased and organized by topic (Dillman 2000). Early drafts of the survey instrument were revised based on input from School of Forest Resources and Department of Agricultural Economics and Rural Sociology faculty members as well as Pennsylvania DCNR – BOF personnel. The survey instrument was pretested with 28 Centre County residents who were asked to complete the survey and provide feedback regarding its format and the clarity of the questions.

Mail Survey

The first set of questions asked respondents about their use of and affective and cognitive beliefs about forests (Appendix B). The following set of questions referenced Pennsylvania's old-growth system; however, survey pretests revealed little familiarity

with the term “old-growth forest.” In this section, “old-growth forest” was replaced with the term “set-aside forest” which was described as “a forest set aside to develop with limited human involvement.” Respondents were asked their opinion regarding what recreational and management activities should be allowed in set-aside forests.

Furthermore, they were asked to indicate their willingness-to-pay for a hypothetical referendum proposing an increase in the amount of public forestland placed in set-asides in Pennsylvania. There were two versions of the referendum: version A proposed a 10% increase to the current amount while version B proposed a 50% increase to the current amount. This led to the third set of questions addressing respondents’ affective and cognitive beliefs about old-growth forests. Finally, the last set of questions was used to collect demographic data about the respondents.

A random sample of 800 Pennsylvania residents’ names, addresses, and phone numbers was obtained from Survey Sampling International to serve as the general public sample. Survey implementation followed a four-contact mailing schedule consisting of an initial survey (5/7/2010), a reminder postcard (5/17/2010), a replacement survey (6/2/2010), and a second replacement survey (6/16/2010; Dillman 2000, Vaske 2008). The initial survey mailing was accompanied by a one-dollar bill as a token of appreciation for completing the survey. Each survey mailing included a personalized, signed cover letter and self-addressed, postage-paid envelope (Appendix B). Outgoing envelopes and postcards were printed with first-class postage.

Mail Survey Non-Response Bias

Non-response bias occurs where survey non-respondents hold systematically different views than respondents (Vaske 2008). After the four survey mailings were completed, a follow-up telephone survey was administered to a random sample of 20 Pennsylvania residents who had not returned the mail survey. The telephone survey consisted of several questions about forests, old-growth forests, and the non-respondent's demographic characteristics, and was taken directly from the mail survey instrument (Appendix B).

Internet Survey

To serve as a benchmark with which to compare results obtained from the mail survey, a second survey was developed using Survey Monkey (Finley 2010). A list of 98 foresters and forest ecologists, hereafter collectively referred to as scientists, was compiled from an Internet search of graduate program faculty and US Forest Service Research and Development personnel. Anyone holding a doctorate in forestry, forest ecology, or other related field, and working within eastern US forests, as defined by the US Forest Service Region 9 boundary, was placed on the list. The scientists were invited to complete a survey comprised of a slightly modified subset of questions taken from the general public mail survey (Appendix C). These questions asked respondents about their affective and cognitive beliefs regarding old-growth forests, and their opinion concerning what recreational and management activities should be allowed in old-growth forests. Implementation followed a three-contact mailing consisting of an initial survey invitation

(5/17/2010) and two follow-up reminders (5/24/2010, 6/2/2010; Appendix C; Dillman et al. 2009).

Analysis

Data from all usable surveys were entered into an IBM SPSS v.17.0.3 data file. Frequency analyses were run to produce frequency and percentage distributions, measures of central tendency, i.e., mean and median where appropriate, and standard deviation for all key variables. Paired-sample t-tests were performed to determine the significance of differences between mail survey variables, i.e., differences between responses within the sample of Pennsylvania residents. Independent-sample t-tests were conducted to determine the significance of differences between mail and Internet survey variables, i.e., differences between the public's and scientists' responses. Differences were considered statistically significant when $p < 0.05$.

Willingness-to-pay data were also entered into SAS 9.1.3. As willingness-to-pay was not directly observed, the lower and upper bound of each respondent's willingness-to-pay were set as the highest cost level the respondent indicated he/she would definitely support, and the cost level at which the respondent changed from definitely support to possibly support, respectively. Setting the lower and upper bound as the response variable, and descriptive variables (e.g., survey version, familiarity with forests, time spent in forests, familiarity with the term "old-growth forest," and demographic variables) as the explanatory variables, an interval-censored regression was performed

using the PROC LIFEREG statement. Regression coefficients were considered statistically significant when $p < 0.05$.

Chapter 3

Results

Focus Groups

Focus group participants expressed common responses about several perceptions of forests in general. Forests were considered to provide of a number ecosystem services, including: production of oxygen; sequestration of carbon; provision of habitat for wildlife; and recreational opportunities. For example, when asked, “What do forests mean to you?” a Harrisburg participant responded:

How they clean the air, take the CO²s out, replenish the oxygen and whatnot. I think of forestlands that we use for hunting, and state parks and things for camping and whatnot. Everything we talk about now, it’s recreational.

Participants also perceived forests as places to escape from their daily lives. For instance, when asked, “What do forests mean to you?” a Pittsburgh and Wilkes-Barre participant responded, respectively:

You can actually escape in the forest from concrete, noise, electricity, and media.

When I’m older and ready to retire I’m gonna go back to Costa Rica and I’m gonna retire up in the hills, up in the forest. That’s my dream.

All but one focus group, the Wilkes-Barre group, was familiar with the term “old-growth forest,” i.e., they had heard of the term before engaging in the focus group discussion. Participants from the groups familiar with the term “old-growth forest”

identified many characteristics associated with old-growth forests and several responses were repeated both within and across groups. Participants made multiple references to the forest floor describing it as dark, damp, and moss-covered with fallen, dead trees and little undergrowth. For example, a participant from the Kane group recalled a previous visit to an old-growth forest when responding to a question about what old-growth forests look like:

I think of, like, Heart's Content, and it's been a couple years since I've been there, but I can remember there's a lot of fallen, you know, the tree stumps and debris and moss growing everywhere.

Above the forest floor, participants commonly described a high canopy with tall, large-diameter trees. This is perhaps best exemplified with comments made by a State College and Pittsburgh participant during discussion of the appearance of old-growth forests, respectively:

There are big trees and there are parts that give you that cathedral feeling with the open space underneath.

An old-growth forest is when you get those really big trees that a couple of us can't put our arms around.

Old-growth forests were also perceived as places that have either never been disturbed by humans, or if they have been disturbed, typically through logging, have experienced a sufficiently long disturbance-free period. Time since disturbance varied greatly, however, and ranged from 100 to 1,000 years.

Old-growth forests proved to be important for a number of reasons with participants most frequently answering they were important for their historic value, aesthetic appeal, and wildlife habitat. For instance, when responding to a question about the importance of old-growth forests, Kane participants indicated the following:

I think it's important for history sake. It gives you a sense of how long this Earth has been here and how much bigger things are than us.

Seeing a big tree is awesome and it's just amazing and it's beautiful just to look. It takes your breath away.

I would say the habitat. The trees that are lying on the ground are just as important as the ones standing because of the animals that use it for protection...All those animals, all those bugs, and all those big trees.

Participants also expressed that old-growth forests provide the ecological services they recognized for forests in general, e.g., production of oxygen and sequestration of carbon, but clarified that old-growth forests were superior in their ability to provide such services.

Focus group participants commonly supported the recreational uses in old-growth forests that left a minimal footprint. They suggested allowing non-motorized access to old-growth forests, e.g., hiking, cross-country skiing, and canoeing, and restricting motorized access, e.g., ATVs and snowmobiles. For instance, when responding to a question regarding what activities should be allowed in old-growth forests, a Harrisburg and State College participant indicated, respectively:

Hiking would be alright.

There's a sacred aspect to these forests, too, and, you know an ATV trail is really a desecration to that. I mean, it's okay if you have a state forest purchase a reclaimed strip mine, you know, that's fine.

Participants also generally favored management activities that protected old-growth forests from perceived threats; however, not all participants acknowledged the same threats. For example, participants supported the removal of deer and non-native invasive plants from old-growth forests, but were split regarding whether or not to suppress wildfire. Nearly all participants were also against the removal of timber from old-growth forests regardless of the intended purpose. In fact, several individuals were even skeptical of its use for the restoration and/or acceleration of old-growth attributes. For instance, a State College participant expressed:

I think a lot of people in the conservation community would be real cynical of people coming in and saying we're gonna manage this for old growth...Using it as a subterfuge for logging.

Self-Administered Surveys

Response Rates

The overall response rate to the mail survey was calculated as 51.4% (Table 3-1) using the following formula: $\text{Response Rate} = (\text{Usable Returns} + \text{Unusable Returns}) / (\text{Sample Size} - \text{Undeliverables})$. Unusable surveys were those returned blank and undeliverable surveys included those sent to deceased residents and incorrect or out-of-date addresses. Of all returned surveys, 22.2%, 14.2%, 10.3%, and 4.7% were attributable to the initial survey, reminder postcard, first replacement survey, and second replacement survey, respectively.

Table 3-1: Response rate for mail survey sent to Pennsylvania residents.

Mailing	# Returns			Cumulative Response Rate
	Usable	Unusable	Undeliverable	
Initial Survey	168	5	19	22.2%
Reminder Postcard	103	3	14	36.4%
First Replacement Survey	68	6	10	46.7%
Second Replacement Survey	26	9	1	51.4%
Total	365	23	44	51.4%

The overall response rate to the Internet survey was calculated as 69.4%. All responses were usable, none of the scientists selected to opt out of receiving survey invites, and all email addresses were correct. Of the overall 69.4% response rate, 34.7%, 23.5%, and 11.2% was attributable to the initial survey invitation, second follow-up reminder, and third follow-up reminder, respectively.

Respondent Characteristics

This section presents the demographic and forest-user data collected from Pennsylvania residents who responded to the mail survey. Demographic and forest-user characteristics were not collected from the scientists in the Internet survey.

Of all respondents, 63.1% were male and the median age was 57 (Table 3-2). More than 40% had completed college or graduate/professional school. Median household income was \$50,000-\$74,999 with an average household size of 2.62. Caucasian was the predominant race (94.8%) with minor representations of other races. Almost half (47.9%) of the respondents described their political views as conservative or

moderate-conservative compared to only a quarter (25.3%) who considered themselves liberal or moderate-liberal. Four-fifths (80.5%) indicated they belonged to a Christian religious denomination.

Compared to the whole Pennsylvania population, the mail survey captured an older audience with a greater representation of males (Table 3-2). Respondents attained a higher level of education and their households earned larger incomes. They were also racially less diverse than the entire Pennsylvania population.

Table 3-2: Percentage distribution of public respondents' characteristics and comparison with 2000 Pennsylvania Census Population.

	Survey Respondents	Pennsylvania Population¹
Gender	(N=358)	(N=12,281,054)
Male	63.1	48.3
Female	36.9	51.7
Age	(N=347)	(N=12,281,054)
20-24	0.9	8.3
25-34	10.1	17.3
35-44	14.4	21.7
45-54	17.9	18.9
55-59	14.7	6.8
60-64	14.4	5.7
65-74	14.1	10.8
75-84	10.7	7.9
>85	2.9	2.6
Education Level Completed	(N=353)	(N=8,266,284)²
Grade school	1.4	5.5
Some high school	4.2	12.6
High school or GED	35.4	53.6
Technical school beyond HS/Associate's degree	17.8	5.9
College	23.2	14.0
Graduate/professional school	17.8	8.4
Household Income	(N=316)	(N=4,779,186)
< \$15,000	6.3	16.7
\$15,000-\$24,999	9.8	13.8
\$25,000-\$34,999	13.0	13.3
\$35,000-\$49,999	10.1	16.9
\$50,000-\$74,999	27.5	19.5
\$75,000-\$99,999	14.9	9.6
\$100,000-\$149,999	10.4	6.6
> \$150,000	7.9	3.7

Table 3-2 (continued): Percentage distribution of public respondents' characteristics and comparison with 2000 Pennsylvania Census Population.

Race	(N=346)	(N=12,281,054)
Caucasian	94.8	84.1
African American	2.3	10.0
Hispanic	0.6	3.2
Asian	1.4	1.8
Other	0.9	1.0
Household Size		
	(N=353)	
1	18.7	
2	40.2	
3	17.6	
4	15.6	
5	4.2	
6	2.0	
7	0.8	
8	0.3	
9	0.3	
16	0.3	
Political Views		
	(N=340)	
Liberal	12.4	
Moderate liberal	12.9	
Moderate	26.8	
Moderate conservative	25.3	
Conservative	22.6	
Religious Denomination		
	(N=343)	
Christian-Catholic	32.9	
Christian-Protestant	35.6	
Christian-Other	12.0	
Jewish	1.7	
Muslim	0.3	
Spiritual-Not Religious	12.2	
Atheist	1.7	
Other	3.5	
1 = Source: Census 2000 Summary File 1, 3		
2 = Population 25 years and over		

Pennsylvania residents were asked how familiar they were with forests compared to other Pennsylvanians. The response exhibited an approximately normal distribution (skewness = 0.051 +/- 0.129) with over half (53.3%) of the respondents indicating an average familiarity with forests (Figure 3-1).

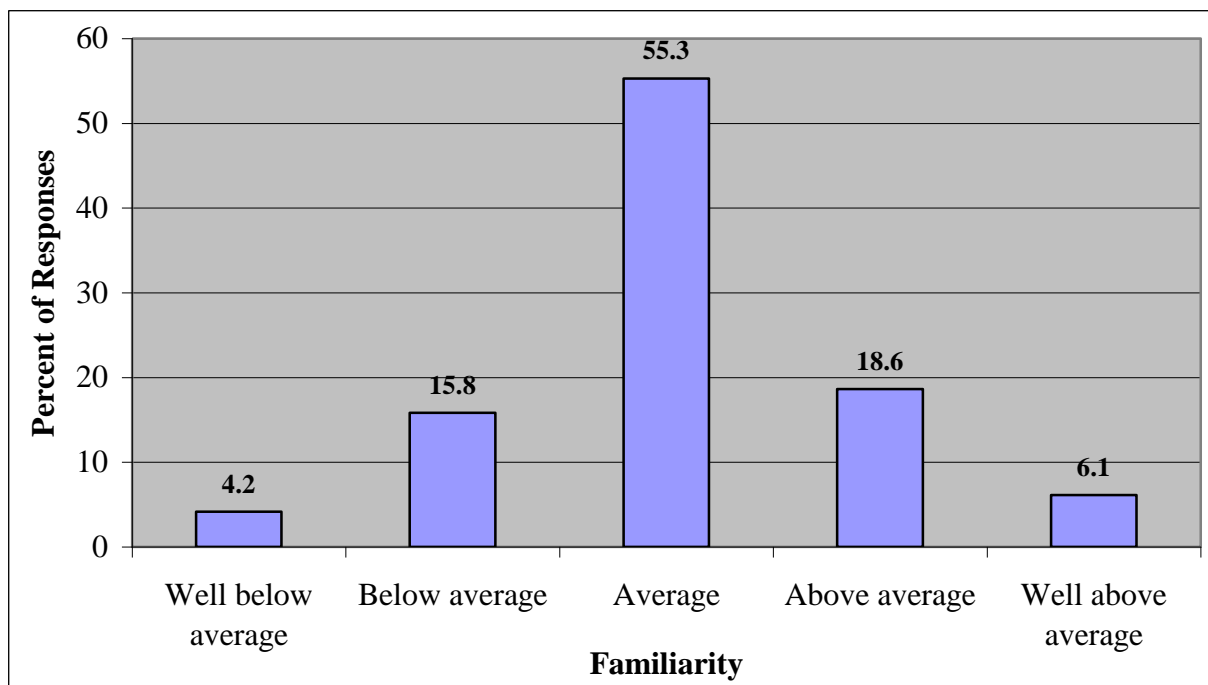


Figure 3-1: Percentage distribution of public respondents' self-assessed familiarity with forests compared to other Pennsylvanians (N = 360).

A majority (51.5%) of respondents spent time in local, state, or national parks during the last 12 months (approximately from May 2009 to May 2010; Figure 3-2). They also spent time in state forests or game lands (30.4%), personal property (23.0%), a friend's property (21.9%), a family member's property (20.3%), national forests (12.1%), and other locations (1.9%). Other locations included private campgrounds and Boy Scout Camps. During the last 12 months, 40.6% of respondents spent the most time in local, state, or national parks, while 24.4%, 12.0%, 11.1%, 8.5%, 3.0%, and 0.3% spent the

most time on their personal property, state forests or game lands, a family member's property, a friend's property, national forests, and other locations (private campgrounds), respectively (Figure 3-3).

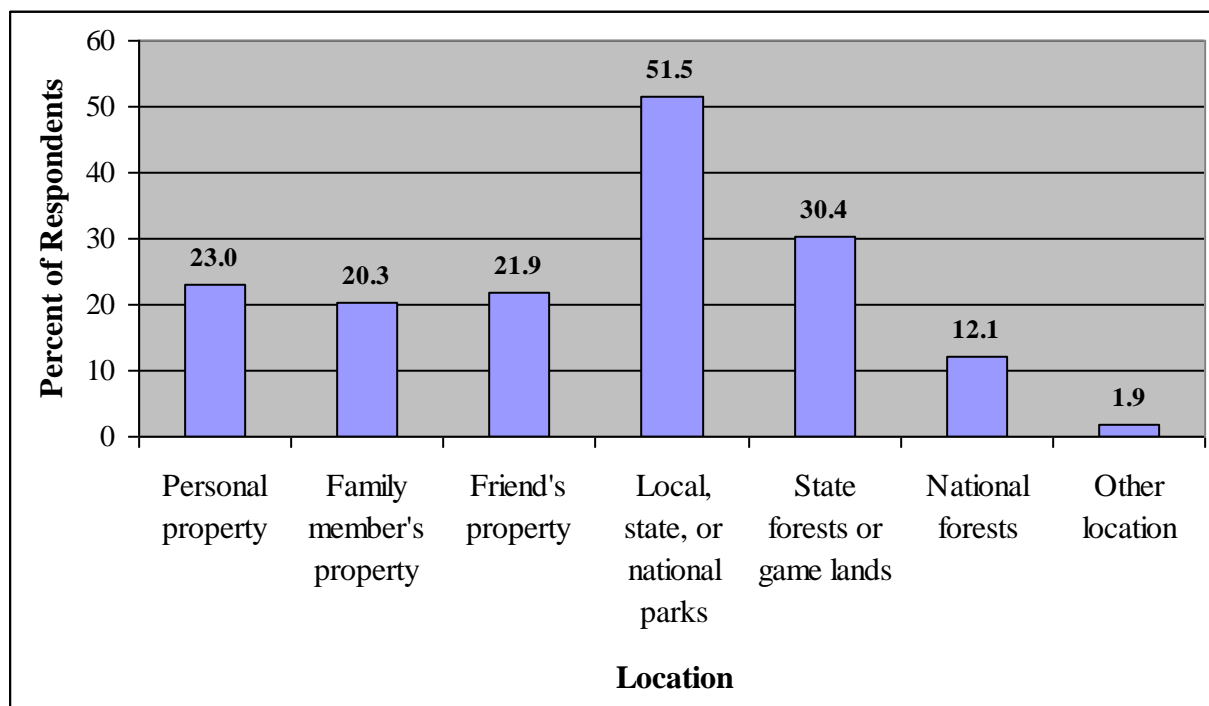


Figure 3-2: Percentage distribution of locations where public respondents spent time in forests during the last 12 months (approximately May 2009 – May 2010; N = 365). Percentages do not add up to 100% as respondents were able to select multiple locations.

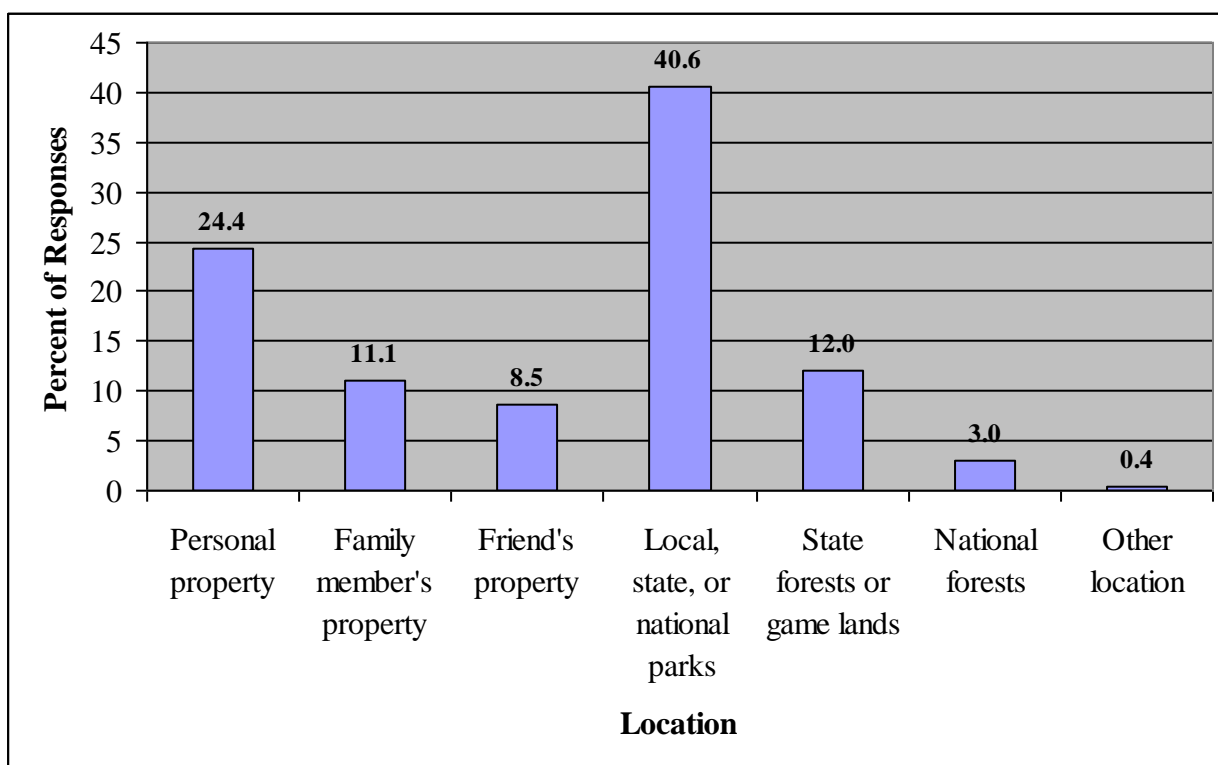


Figure 3-3: Percentage distribution of locations where public respondents spent the most time in forests during the last 12 months (approximately May 2009 – May 2010; N = 234).

Nearly two-thirds of respondents indicated they visited forests either a few times (35.3%) or not at all (29.9%) during the last 12 months (Figure 3-4). Forest-related activities commonly participated in during the last 12 months included walking or hiking, picnicking, and scenic driving (Figure 3-5). Respondents less frequently engaged in wildlife viewing (includes birding), camping, hunting or fishing, ATV driving, horseback riding, working in the forest, and other forest-related activities including mountain biking, foraging, kayaking, snowshoeing, skiing, snowboarding, and firewood cutting/gathering.

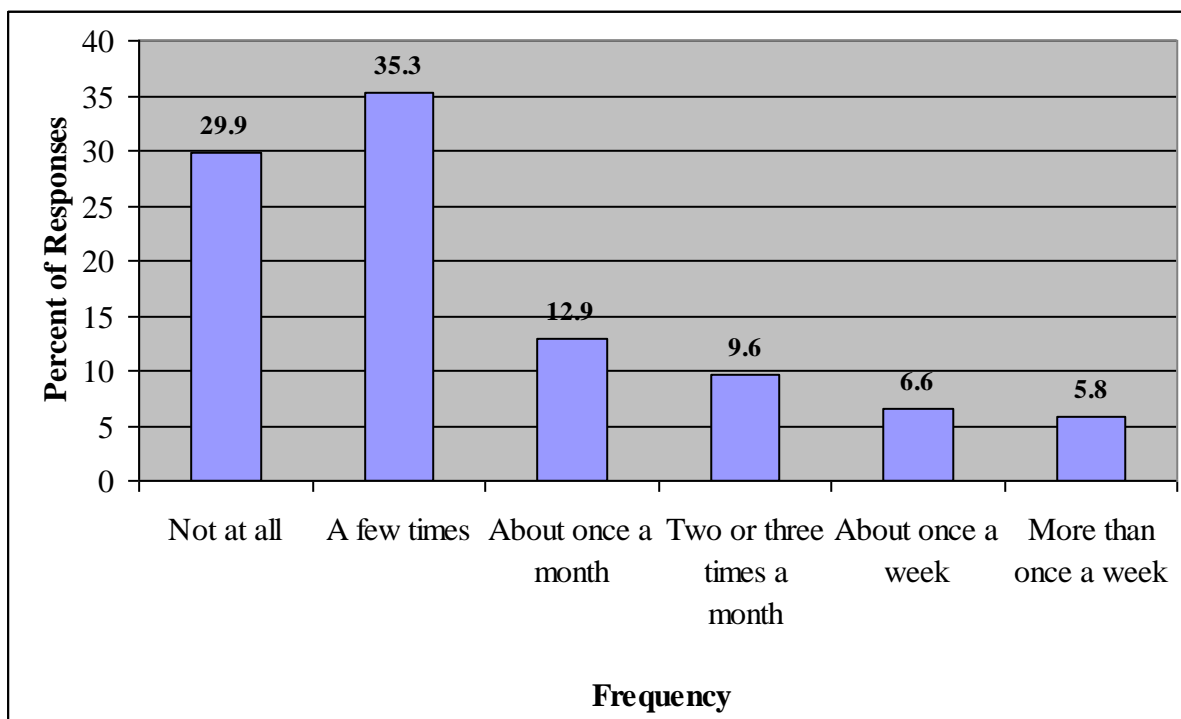


Figure 3-4: Percentage distribution of the frequency at which public respondents spent time in forests during the last 12 months (approximately May 2009 – May 2010; N = 256).

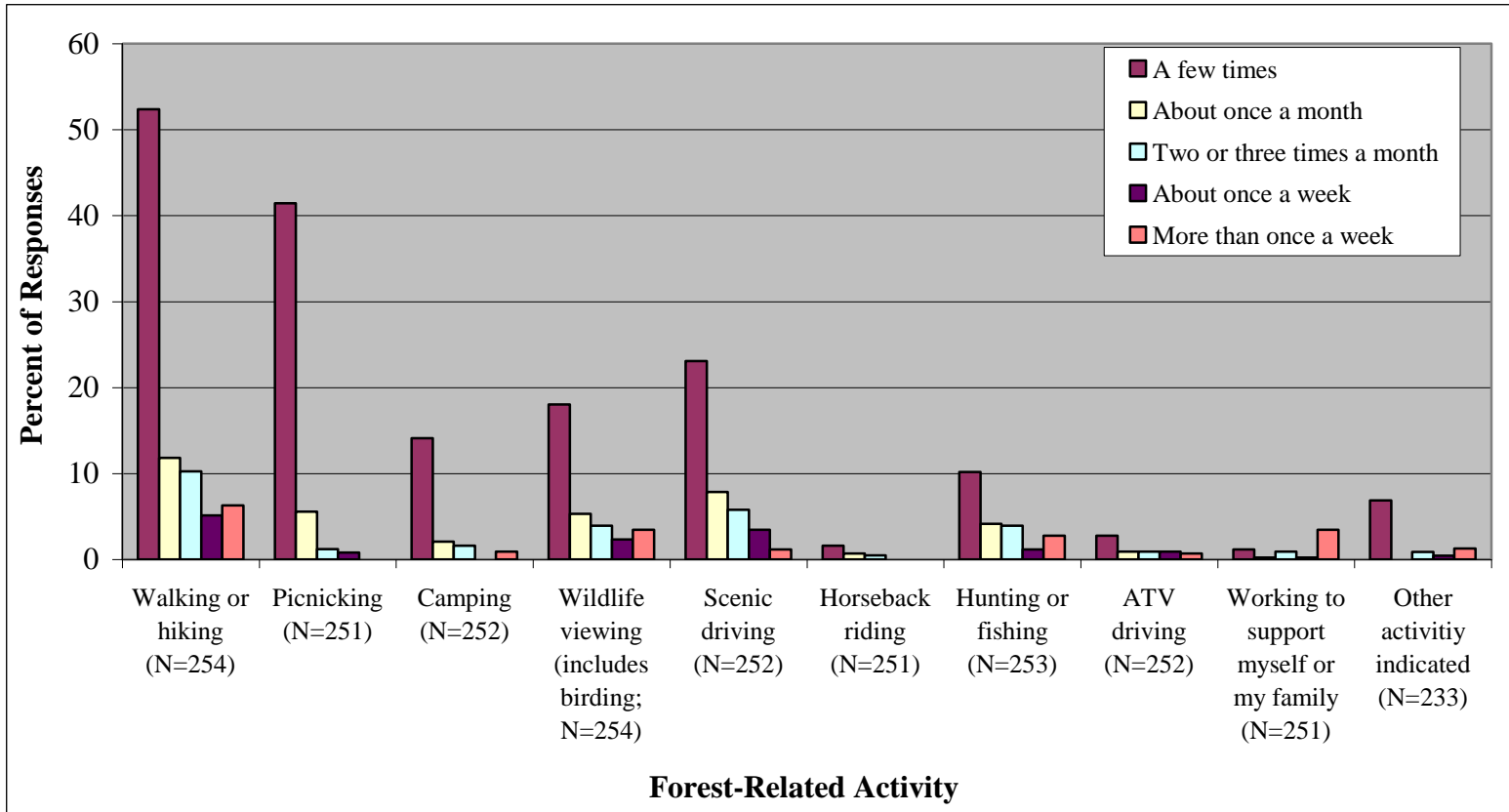


Figure 3-5: Percentage distribution of the frequency at which public respondents participated in forest-related activities during the last 12 months (approximately May 2009 – May 2010).

Perception of Old-Growth Forests

This section presents data collected on the affective and cognitive beliefs about old-growth forests. Data were collected from Pennsylvania residents who responded to the mail survey and scientists who responded to the Internet survey. Over half (55.6%; 203) of the public respondents revealed they were unfamiliar with the term “old-growth forest”, i.e., they had not heard the term prior to receiving the survey mailings, and are not included in the subsequent analyses. Of the respondents who had heard of the term, 52.5% (85) indicated they had not been in an old-growth forest. For those who said they had been in an old-growth forest, a list of where they have visited can be found in Appendix D. It was assumed all scientists were familiar with the term “old-growth forest,” and they were not asked if they had heard the term or if they had ever been in an old-growth forest. As such, where both groups were surveyed, the data are prioritized according to the scientists’ responses as their perspective of old-growth forests holds more credibility than the public’s.

Public respondents tended to describe forests in general as peaceful, natural, and attractive, but not scary, cluttered, and dirty (Table 3-3). They tended to describe old-growth forests the same way except they were perceived to be less attractive, darker, and more mysterious. Scientists and the public regarded old-growth similarly as attractive, exciting, spiritual, dark, and cluttered, but, compared to scientists, the public was significantly more likely to describe old-growth forests as natural, peaceful, mysterious, impenetrable, unsafe, dirty, and scary (Table 3-4).

Table 3-3: Comparison of the mean likeliness of the public (those respondents who had heard of the term “old-growth forest”) to use the given adjectives when describing forests and old-growth forests. Responses given on a Likert scale ranging from 1 (“Very Unlikely”) to 5 (“Very Likely”).

	Forests			Old-Growth Forests		
	N	Mean	SD	Mean	SD	p
Peaceful	153	4.56	0.818	4.47	0.708	0.154
Natural	156	4.55	0.821	4.57	0.788	0.806
Attractive	152	4.34	0.839	4.18	0.957	0.026
Exciting	150	3.77	0.935	3.85	1.035	0.289
Spiritual	151	3.68	1.303	3.81	1.230	0.079
Mysterious	144	3.17	1.212	3.49	1.159	<0.001
Dark	146	2.47	1.128	2.90	1.113	<0.001
Impenetrable	145	2.18	1.147	2.32	1.111	0.143
Unsafe	148	2.00	1.075	2.08	1.175	0.414
Dirty	147	1.88	1.116	1.95	1.169	0.431
Cluttered	145	1.81	1.054	1.96	1.166	0.143
Scary	145	1.73	1.056	1.85	1.063	0.222

Table 3-4: Comparison of the mean likeliness of scientists and the public (those respondents who had heard of the term “old-growth forest”) to use the given adjectives when describing old-growth forests. Responses given on a Likert scale ranging from 1 (“Very Unlikely”) to 5 (“Very Likely”).

	Scientists			Public			p
	N	Mean	SD	N	Mean	SD	
Natural	67	4.30	0.739	159	4.53	0.840	0.047
Attractive	68	4.21	0.659	155	4.15	0.986	0.610
Peaceful	68	4.12	0.923	159	4.43	0.759	0.008
Exciting	66	3.85	0.965	158	3.83	1.036	0.897
Spiritual	65	3.55	1.046	159	3.76	1.260	0.208
Mysterious	67	3.04	1.065	156	3.49	1.167	0.008
Dark	68	2.84	0.924	158	2.91	1.153	0.614
Impenetrable	68	1.85	0.919	156	2.33	1.126	0.001
Cluttered	68	1.75	1.070	157	1.97	1.163	0.187
Unsafe	67	1.40	0.818	159	2.08	1.172	<0.001
Dirty	67	1.21	0.538	157	1.94	1.167	<0.001
Scary	67	1.10	0.394	156	1.90	1.102	<0.001

When asked for their level of agreement with a series of statements about old-growth forests, the public most strongly agreed with, “A forest can still be old-growth, even if it has been logged in the past” (Table 3-5). They also strongly disagreed with, “Old-growth forests are a wasteful use of resources” and “Old-growth forests have never experienced natural disturbance.” Scientists also relatively agreed with, “A forest can still be old-growth, even if it has been logged in the past,” but expressed a significantly greater level of disagreement than the public with the other nine statements.

Table 3-5: Comparison of scientists' and the public's mean level of agreement with specific statements about old-growth forests. Responses given on a Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

	Scientists			Public			p
	N	Mean	SD	N	Mean	SD	
A forest can still be old-growth, even if it has been logged in the past	67	3.48	1.106	157	3.41	0.987	0.671
An old-growth forest is the same as a virgin forest	67	2.22	0.966	158	2.72	1.071	0.001
Old-growth forests are remote	66	2.09	0.836	158	2.78	1.018	<0.001
If a forest has very old trees, it must be old-growth	67	2.07	0.876	156	2.71	0.938	<0.001
An old-growth forest is the same as a wilderness area	67	1.87	0.869	158	2.99	1.016	<0.001
An old-growth forest has never been influenced by humans	67	1.82	0.815	159	2.71	1.127	<0.001
Old-growth forests can't be accessed by people	66	1.62	0.651	158	2.20	0.961	<0.001
There's no change in an old-growth forest	67	1.31	0.763	158	2.24	0.870	<0.001
Old-growth forests are a wasteful use of resources	67	1.28	0.517	159	1.75	0.981	<0.001
Old-growth forests have never experienced natural disturbance	67	1.06	0.239	158	1.99	0.927	<0.001

The percentage distributions for the required minimum age and extent of an old-growth forest were significantly different between the public and scientists (Figure 3-6 and Figure 3-7). The public was more likely to select a younger age, whereas scientists were much more likely to indicate that the age of an old-growth forest may vary. The scientists were more likely to select a smaller minimum extent, while the public was more likely to believe that the extent of an old-growth forest does not matter.

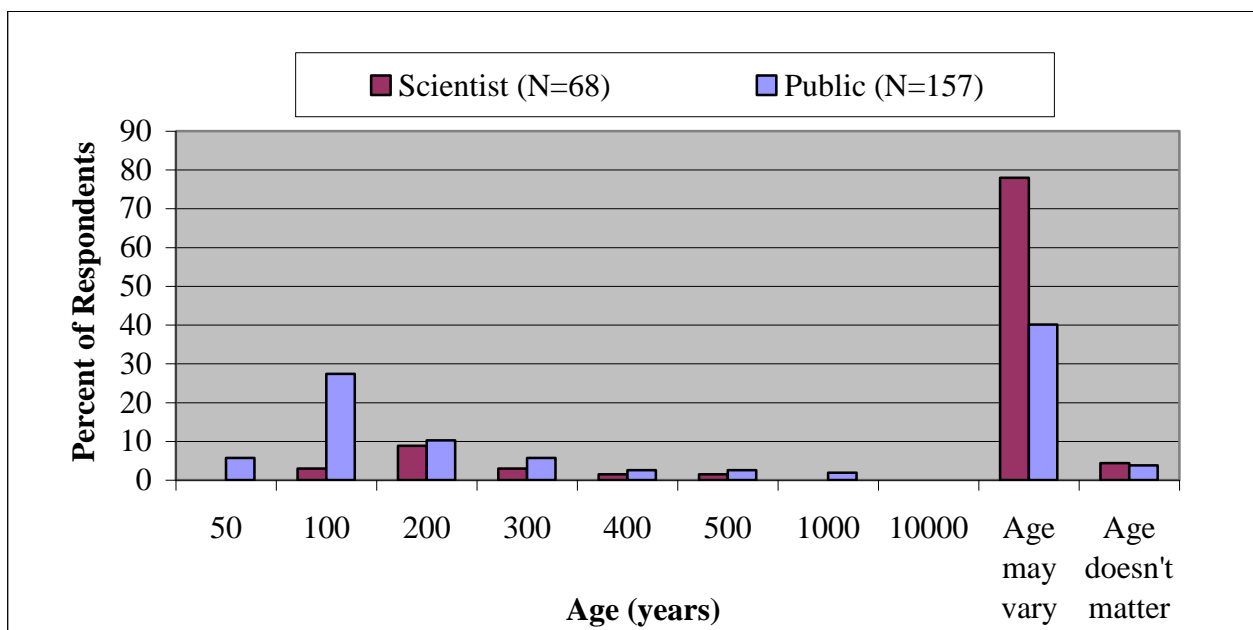


Figure 3-6: Comparison of scientists' and the public's required minimum age (years) for an old-growth forest ($\chi^2 = 33.921$, Cramer's $V = 0.388$, $p < 0.001$).

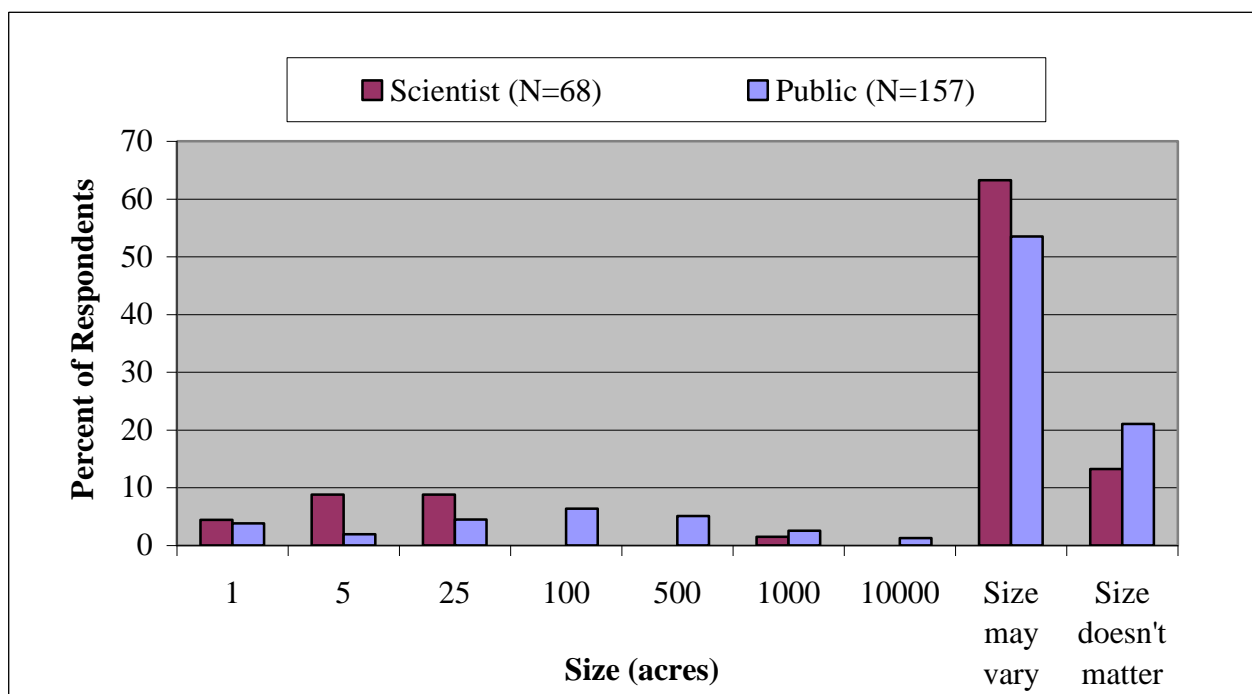


Figure 3-7: Comparison of scientists' and the public's required minimum extent (acres) for an old-growth forest ($\chi^2 = 18.521$, Cramer's $V = 0.287$, $p = 0.018$).

At least three-quarters of scientists indicated nine attributes to be typical of old-growth forests: dead or decaying trees on the ground (98.5%); dead or decaying standing trees (98.5%); many different sizes of dead or decaying standing trees (93.7%); trees of many different diameters (93.7%); gaps in the leaf canopy (93.7%); trees of many different heights (93.5%); very old trees (92.2%); many different sizes of dead or decaying trees on the ground (90.6%); and very large-diameter trees (77.8%; Table 3-6). None of the attributes were selected to be typical of forests that are not old-growth by more than three-quarters of the scientists. Scientists indicated the following to be more typical of old-growth forests than forests that are not old-growth: dead or decaying trees on the ground; dead or decaying standing trees; many different sizes of dead or decaying standing trees; trees of many different diameters; gaps in the leaf canopy; trees of many

different heights; very old trees; many different sizes of dead or decaying trees on the ground; very large-diameter trees; and very tall trees. On the other hand, the only attribute selected by scientists as more typical of forests that are not old-growth than old-growth forests was many non-native invasive plants.

At least three-quarters of the public recognized very old trees (92.2%); very tall trees (88.8%); very large-diameter trees (88.0%); dead or decaying trees on the ground (86.9%); and dead or decaying standing trees (83.6%) to be typical of old-growth forests, while the only attribute indicated to be typical of forests that are not old-growth by at least three-quarters of the public was trees of many different heights (78.5%; Table 3-7). Public respondents indicated the following to be more typical of old-growth forests than forests that are not old-growth: very old trees; very tall trees; very large-diameter trees; dead or decaying trees on the ground; dead or decaying standing trees; dense leaf canopy; many different sizes of dead or decaying standing trees; dark forest floor; and many different sizes of dead or decaying trees on the ground. On the other hand, trees of many different heights; gaps in the leaf canopy; many different species of plants on the ground; dense vegetation on the ground; and many non-native invasive plants were selected by the public as more typical of forests that are not old-growth than old-growth forests.

Compared to scientists, the public was significantly less likely to identify the following as features typical of old-growth forests: dead or decaying trees on the ground; dead or decaying standing trees; many different sizes of dead or decaying standing trees; trees of many different diameters; gaps in the leaf canopy; trees of many different heights; and many different sizes of dead and decaying trees on the ground (Table 3-8).

On the other hand, the public was significantly more likely than scientists to perceive the following as typical of old-growth forests: very large-diameter trees; very tall trees; dark forest floor; and many non-native invasive plants. For every attribute except two, at least 10% of the public did not know if it was typical of old-growth forests whereas there were only four attributes where at least 10% of the scientists indicated “Don’t Know.” Those surveyed were given an opportunity to list attributes they felt are typical of old-growth forests not already listed in Table 3-8. Less than a tenth (9.9%; 16) of public respondents and nearly a third of the scientists (32.4%; 22) listed additional attributes. Their submissions can be found in Appendix D.

Compared to scientists, the public was significantly less likely to identify a dense leaf canopy and dark forest floor as features typical of forests that are not old-growth (Table 3-9). On the other hand, the public was significantly more likely than scientists to perceive the following as typical of forests that are not old-growth: many different species of trees; gaps in the leaf canopy; trees of many different diameters; trees of many different heights; many different sizes of dead or decaying standing trees; and many different sizes of dead or decaying trees on the ground. For every attribute, at least 10% of the public did not know if it was typical of forests that are not old-growth. This was also true of every attribute except two for the scientists.

Table 3-6: Comparison of the percentage distribution of the attributes scientists believe are typical of old-growth forests and forests that are not old-growth.

	Old-Growth		Not Old-Growth	
	Frequency	Percent	Frequency	Percent
Dead or decaying trees on the ground***				
Yes	64	98.5	29	47.5
No	0	0.0	22	36.1
Don't Know	1	1.5	10	16.4
Dead or decaying standing trees***				
Yes	64	98.5	31	50.0
No	0	0.0	21	33.9
Don't Know	1	1.5	10	16.1
Many different sizes of dead or decaying standing trees***				
Yes	59	93.7	13	21.7
No	2	3.2	39	65.0
Don't Know	2	3.2	8	13.3
Trees of many different diameters (widths)***				
Yes	59	93.7	23	39.0
No	2	3.2	25	42.4
Don't Know	2	3.2	11	18.6
Openings (gaps) in the leaf canopy***				
Yes	59	93.7	35	58.3
No	2	3.2	19	31.7
Don't Know	2	3.2	6	10.0
Trees of many different heights***				
Yes	58	93.5	22	37.3
No	3	4.8	25	42.4
Don't Know	1	1.6	12	20.3

Table 3-6 (continued): Comparison of the percentage distribution of the attributes scientists believe are typical of old-growth forests and forests that are not old-growth.

	Old-Growth		Not Old-Growth	
	Frequency	Percent	Frequency	Percent
Very old trees***				
Yes	59	92.2	8	13.1
No	3	4.7	47	77.0
Don't Know	2	3.1	6	9.8
Many different sizes of dead or decaying trees on the ground***				
Yes	58	90.6	11	18.6
No	2	3.1	37	62.7
Don't Know	4	6.3	11	18.6
Very large-diameter (width) trees***				
Yes	49	77.8	17	28.3
No	9	14.3	32	53.3
Don't Know	5	7.9	11	18.3
Very tall trees**				
Yes	44	71.0	26	43.3
No	12	19.4	24	40.0
Don't Know	6	9.7	10	16.7
Dense leaf canopy				
Yes	45	70.3	44	72.1
No	15	23.4	7	11.5
Don't Know	4	6.3	10	16.4
Many different kinds (species) of trees				
Yes	40	63.5	38	62.3
No	17	27.0	18	29.5
Don't Know	6	9.5	5	8.2

Table 3-6 (continued): Comparison of the percentage distribution of the attributes scientists believe are typical of old-growth forests and forests that are not old-growth.

	Old-Growth		Not Old-Growth	
	Frequency	Percent	Frequency	Percent
Dark forest floor				
Yes	34	55.7	27	45.8
No	18	29.5	15	25.4
Don't Know	9	14.8	17	28.8
Many different kinds (species) of plants on the ground				
Yes	35	55.6	30	50.0
No	15	23.8	18	30.0
Don't Know	13	20.6	12	20.0
Dense vegetation on the ground				
Yes	22	35.5	24	40.7
No	25	40.3	18	30.5
Don't Know	15	24.2	17	28.8
Many non-native invasive plants***				
Yes	1	1.6	21	36.2
No	46	75.4	14	24.1
Don't Know	14	23.0	23	39.7

* = p<0.05, ** = p<0.01, ***p = <0.001

Table 3-7 Comparison of the percentage distribution of the attributes the public believes are typical of old-growth forests and forests that are not old-growth.

	Old-Growth		Not Old-Growth	
	Frequency	Percent	Frequency	Percent
Very old trees***				
Yes	130	92.2	26	18.2
No	1	0.7	99	69.2
Don't Know	10	7.1	18	12.6
Very tall trees***				
Yes	127	88.8	58	41.4
No	3	2.1	56	40.0
Don't Know	13	9.1	26	18.6
Very large-diameter (width) trees***				
Yes	125	88.0	26	18.4
No	2	1.4	91	64.5
Don't Know	15	10.6	24	17.0
Dead or decaying trees on the ground***				
Yes	126	86.9	83	58.5
No	3	2.1	41	28.9
Don't Know	16	11.0	18	12.7
Dead or decaying standing trees***				
Yes	122	83.6	74	52.1
No	5	3.4	44	31.0
Don't Know	19	13.0	24	16.9
Dense leaf canopy***				
Yes	106	74.1	45	31.9
No	19	13.3	69	48.9
Don't Know	18	12.6	27	19.1

Table 3-7 (continued): Comparison of the percentage distribution of the attributes the public believes are typical of old-growth forests and forests that are not old-growth.

	Old-Growth		Not Old-Growth	
	Frequency	Percent	Frequency	Percent
Many different sizes of dead or decaying standing trees***				
Yes	105	72.4	60	42.3
No	17	11.7	54	38.0
Don't Know	23	15.9	28	19.7
Dark forest floor***				
Yes	102	70.3	20	14.1
No	15	10.3	92	64.8
Don't Know	28	19.3	30	21.1
Many different sizes of dead or decaying trees on the ground***				
Yes	99	70.2	65	46.8
No	17	12.1	48	34.5
Don't Know	25	17.7	26	18.7
Trees of many different diameters (widths)				
Yes	98	68.1	107	74.8
No	23	16.0	19	13.3
Don't Know	23	16.0	17	11.9
Many different kinds (species) of trees				
Yes	84	57.1	100	68.5
No	32	21.8	18	12.3
Don't Know	31	21.1	28	19.2
Trees of many different heights***				
Yes	76	52.4	113	78.5
No	42	29.0	15	10.4
Don't Know	27	18.6	16	11.1

Table 3-7 (continued): Comparison of the percentage distribution of the attributes the public believes are typical of old-growth forests and forests that are not old-growth.

	Old-Growth		Not Old-Growth	
	Frequency	Percent	Frequency	Percent
Openings (gaps) in the leaf canopy**				
Yes	56	40.0	96	66.7
No	47	33.6	17	11.8
Don't Know	37	26.4	31	21.5
Many different kinds (species) of plants on the ground*				
Yes	65	44.5	83	58.9
No	50	34.2	29	20.6
Don't Know	31	21.2	29	20.6
Dense vegetation on the ground*				
Yes	51	34.5	64	45.4
No	70	47.3	46	32.6
Don't Know	27	18.2	31	22.0
Many non-native invasive plants***				
Yes	18	12.4	70	49.3
No	84	57.9	25	17.6
Don't Know	43	29.7	47	33.1

* = p<0.05, ** = p<0.01, *** = p<0.001

Table 3-8: Comparison of the percentage distribution of the attributes scientists and the public believe are typical of old-growth forests.

	Scientists		Public	
	Frequency	Percent	Frequency	Percent
Dead or decaying trees on the ground*				
Yes	64	98.5	126	86.9
No	0	0.0	3	2.1
Don't Know	1	1.5	16	11.0
Dead or decaying standing trees**				
Yes	64	98.5	122	83.6
No	0	0.0	5	3.4
Don't Know	1	1.5	19	13.0
Many different sizes of dead or decaying standing trees**				
Yes	59	93.7	105	72.4
No	2	3.2	17	11.7
Don't Know	2	3.2	23	15.9
Trees of many different diameters (widths)***				
Yes	59	93.7	98	68.1
No	2	3.2	23	16.0
Don't Know	2	3.2	23	16.0
Openings (gaps) in the leaf canopy***				
Yes	59	93.7	56	40.0
No	2	3.2	47	33.6
Don't Know	2	3.2	37	26.4
Trees of many different heights***				
Yes	58	93.5	76	52.4
No	3	4.8	42	29.0
Don't Know	1	1.6	27	18.6

Table 3-8 (continued): Comparison of the percentage distribution of the attributes scientists and the public believe are typical of old-growth forests.

	Scientists		Public	
	Frequency	Percent	Frequency	Percent
Very old trees				
Yes	59	92.2	130	92.2
No	3	4.7	1	0.7
Don't Know	2	3.1	10	7.1
Many different sizes of dead or decaying trees on the ground**				
Yes	58	90.6	99	70.2
No	2	3.1	17	12.1
Don't Know	4	6.3	25	17.7
Very large-diameter (width) trees**				
Yes	49	77.8	125	88.0
No	9	14.3	2	1.4
Don't Know	5	7.9	15	10.6
Very tall trees***				
Yes	44	71.0	127	88.8
No	12	19.4	3	2.1
Don't Know	6	9.7	13	9.1
Dense leaf canopy				
Yes	45	70.3	106	74.1
No	15	23.4	19	13.3
Don't Know	4	6.3	18	12.6
Many different kinds (species) of trees				
Yes	40	63.5	84	57.1
No	17	27.0	32	21.8
Don't Know	6	9.5	31	21.1

Table 3-8 (continued): Comparison of the percentage distribution of the attributes scientists and the public believe are typical of old-growth forests.

	Scientists		Public	
	Frequency	Percent	Frequency	Percent
Dark forest floor**				
Yes	34	55.7	102	70.3
No	18	29.5	15	10.3
Don't Know	9	14.8	28	19.3
Many different kinds (species) of plants on the ground				
Yes	35	55.6	65	44.5
No	15	23.8	50	34.2
Don't Know	13	20.6	31	21.2
Dense vegetation on the ground				
Yes	22	35.5	51	34.5
No	25	40.3	70	47.3
Don't Know	15	24.2	27	18.2
Many non-native invasive plants*				
Yes	1	1.6	18	12.4
No	46	75.4	84	57.9
Don't Know	14	23.0	43	29.7

* = p<0.05, ** = p<0.01, *** = p<0.001

Table 3-9 Comparison of the percentage distribution of the attributes scientists and the public believe are typical of forests that are not old-growth.

	Scientists		Public	
	Frequency	Percent	Frequency	Percent
Dense leaf canopy***				
Yes	44	72.1	45	31.9
No	7	11.5	69	48.9
Don't Know	10	16.4	27	19.1
Many different kinds (species) of trees**				
Yes	38	62.3	100	68.5
No	18	29.5	18	12.3
Don't Know	5	8.2	28	19.2
Openings (gaps) in the leaf canopy**				
Yes	35	58.3	96	66.7
No	19	31.7	17	11.8
Don't Know	6	10.0	31	21.5
Many different kinds (species) of plants on the ground				
Yes	30	50.0	83	58.9
No	18	30.0	29	20.6
Don't Know	12	20.0	29	20.6
Dead or decaying standing trees				
Yes	31	50.0	74	52.1
No	21	33.9	44	31.0
Don't Know	10	16.1	24	16.9
Dead or decaying trees on the ground				
Yes	29	47.5	83	58.5
No	22	36.1	41	28.9
Don't Know	10	16.4	18	12.7

Table 3-9 (continued): Comparison of the percentage distribution of the attributes scientists and the public believe are typical of forests that are not old-growth.

	Scientists		Public	
	Frequency	Percent	Frequency	Percent
Dark forest floor***				
Yes	27	45.8	20	14.1
No	15	25.4	92	64.8
Don't Know	17	28.8	30	21.1
Very tall trees				
Yes	26	43.3	58	41.4
No	24	40.0	56	40.0
Don't Know	10	16.7	26	18.6
Dense vegetation on the ground				
Yes	24	40.7	64	45.4
No	18	30.5	46	32.6
Don't Know	17	28.8	31	22.0
Trees of many different diameters (widths)***				
Yes	23	39.0	107	74.8
No	25	42.4	19	13.3
Don't Know	11	18.6	17	11.9
Trees of many different heights***				
Yes	22	37.3	113	78.5
No	25	42.4	15	10.4
Don't Know	12	20.3	16	11.1
Many non-native invasive plants				
Yes	21	36.2	70	49.3
No	14	24.1	25	17.6
Don't Know	23	39.7	47	33.1

Table 3-9 (continued): Comparison of the percentage distribution of the attributes scientists and the public believe are typical of forests that are not old-growth.

	Scientists		Public	
	Frequency	Percent	Frequency	Percent
Very large-diameter (width) trees				
Yes	17	28.3	26	18.4
No	32	53.3	91	64.5
Don't Know	11	18.3	24	17.0
Many different sizes of dead or decaying standing trees***				
Yes	13	21.7	60	42.3
No	39	65.0	54	38.0
Don't Know	8	13.3	28	19.7
Many different sizes of dead or decaying trees on the ground**				
Yes	11	18.6	65	46.8
No	37	62.7	48	34.5
Don't Know	11	18.6	26	18.7
Very old trees				
Yes	8	13.1	26	18.2
No	47	77.0	99	69.2
Don't Know	6	9.8	18	12.6

* = p<0.05, ** = p<0.01, *** = p<0.001

Value of Old-Growth Forests

This section presents data collected on the importance of forests set aside to develop with limited human involvement, in addition to the willingness-to-pay for and importance of old-growth forests. Only Pennsylvania residents were asked questions regarding the first two topics; however, the willingness-to-pay questions first referred to “Forests set aside to develop with limited human involvement” instead of “old-growth forests.” Then, after respondents who were unfamiliar with the term “old-growth forest” were filtered out, the remaining respondents were asked if their answers would have been the same had “old-growth forest” been used instead. A majority (85.8%; 139) of these respondents indicated their answers would have been the same. For the 14.2% (23) who said their answers would have been different, a list of comments on how their answers would have changed can be found in Appendix D. Both the public and scientists were asked about the importance of old-growth forests using the appropriate term. Where both groups were surveyed, the data are prioritized according to residents’ responses as their perspective on old-growth forest values carries greater importance in the context of the research objectives.

When asked the importance of having areas of forest set aside to develop with limited human involvement, nearly three-quarters of the public respondents indicated it was either very important (26.1%) or important (44.4%) producing a negatively skewed distribution of responses (skewness = -0.747 +/- 0.131; Figure 3-8).

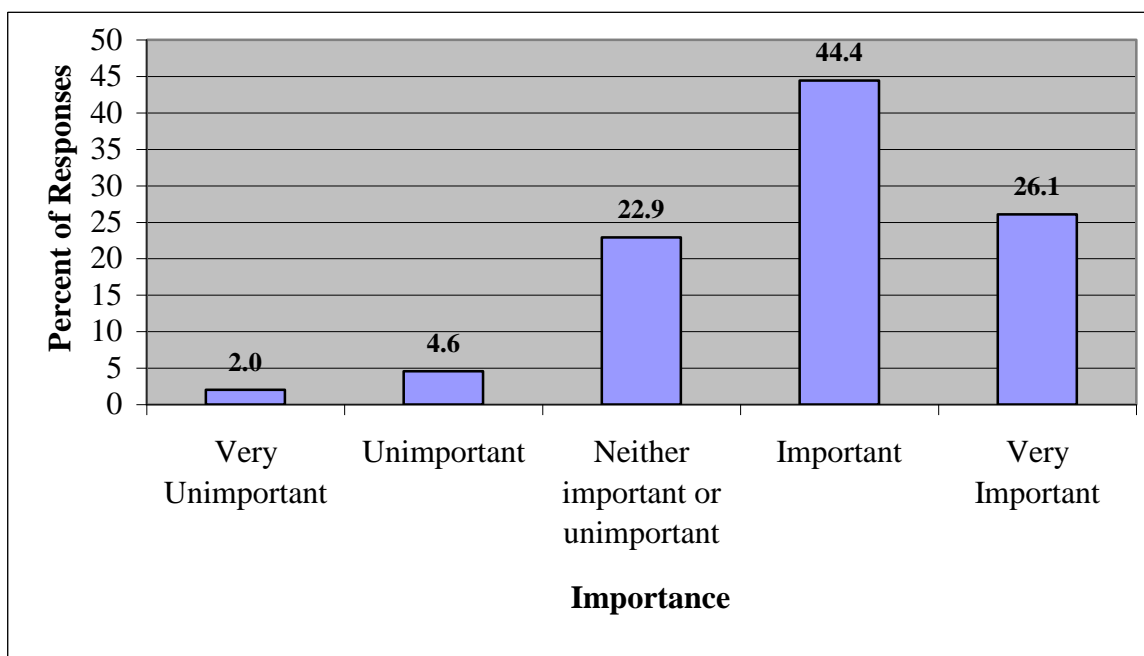


Figure 3-8: Percentage distribution of the importance public respondents placed on having areas of forest set aside to develop with limited human involvement (N = 349).

Public respondents were asked to indicate their intended level of support for a hypothetical referendum proposing an increase in the amount of public forestland placed in set-asides in Pennsylvania. There were two versions of the referendum: version A proposed a 10% increase to the current amount while version B proposed a 50% increase to the current amount. A majority of respondents indicated they would either definitely or possibly support the referendum given an annual cost to their household of \$20 or less (Table 3-10). Until the referendum's cost to households reached \$100/year, the percentage of respondents expressing possible support for the measure was relatively consistent, but with each successive increase in cost there was a larger increase in the loss of definite supporters.

Even at the lowest cost to households 15.5% of respondents revealed they would definitely oppose the referendum (Table 3-10). In fact, regardless of cost level, a baseline of 9.2% and 11.5% always selected “Definitely Support” and “Definitely Oppose,” respectively. When asked a series of statements about Pennsylvania’s set-aside forests, those respondents who indicated they would “Definitely Support” the referendum at any cost level most strongly agreed that, “The amount of set-aside forest should be increased by more than the proposed amount” (Table 3-11). Respondents who indicated they would “Definitely Oppose” the referendum at any cost level agreed that, “I want more forestland to be set aside, but my household can’t afford to pay anything at this time,” “There doesn’t need to be more set-aside forestland than there is now,” and “I want more forestland to be set aside, but Pennsylvania residents shouldn’t have to pay for it.” Compared to the “Always Definitely Oppose” respondents, “Always Definitely Support” respondents were significantly more likely to agree that, “The amount of set-aside forest should be increased by more than the proposed amount.” On the other hand, “Always Definitely Oppose” respondents were significantly more likely than “Always Definitely Support” respondents to agree that, “I want more forestland to be set aside, but my household can’t afford to pay anything at this time,” “I want more forestland to be set aside, but Pennsylvania residents shouldn’t have to pay for it,” “I want more forestland to be set aside, but someone else should pay for it, not me,” “There doesn’t need to be more set-aside forestland than there is now,” “There should be less set-aside forestland than there is now,” and “Set-aside forests are not necessary.”

Table 3-10: Percentage distribution of the public's support for a hypothetical referendum proposing an increase in the amount of public forestland placed in set-asides in Pennsylvania given various annual costs to households.

Annual Cost	Level of Support	Survey Version	
		A	B
\$1 (N = 329)	Definitely oppose	10.3	5.2
	Possibly oppose	1.2	0.9
	Possibly support	8.5	8.8
	Definitely support	33.7	31.3
\$5 (N = 333)	Definitely oppose	11.6	7.0
	Possibly oppose	3.0	2.7
	Possibly support	10.0	7.9
	Definitely support	30.1	28.9
\$10 (N = 332)	Definitely oppose	12.8	8.5
	Possibly oppose	4.9	4.0
	Possibly support	11.6	9.4
	Definitely support	25.5	24.3
\$20 (N = 330)	Definitely oppose	16.1	10.9
	Possibly oppose	9.4	7.0
	Possibly support	9.7	10.9
	Definitely support	18.8	17.3
\$50 (N = 331)	Definitely oppose	21.9	18.5
	Possibly oppose	13.1	10.0
	Possibly support	11.2	7.0
	Definitely support	7.9	10.9
\$100 (N = 332)	Definitely oppose	30.1	23.7
	Possibly oppose	12.8	10.6
	Possibly support	6.4	4.9
	Definitely support	4.9	7.6

Table 3-11: Comparison of the public’s mean level of agreement with statements about set-aside forests in Pennsylvania. Respondents are categorized as either “Always Definitely Support” (respondent’s level of support is “Definitely Support” regardless of cost level) or “Always Definitely Oppose” (respondent’s level of support is “Definitely Oppose” regardless of annual cost level). Responses given on a Likert scale ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”).

	Always Definitely Support			Always Definitely Oppose			p
	N	Mean	SD	N	Mean	SD	
The amount of set-aside forestland should be increased by more than the proposed amount	32	3.84	1.139	38	2.53	1.156	<0.001
I want more forestland to be set aside, but I would rather volunteer to work on DCNR-BOF projects in the system than pay money	32	2.47	1.218	36	2.47	1.028	0.990
I want more forestland to be set aside, but my household can't afford to pay anything at this time	32	2.41	1.292	37	3.35	1.438	0.006
I want more forestland to be set aside, but I would rather write letters or start a petition than pay money	32	2.31	1.256	36	2.83	1.159	0.080
I want more forestland to be set aside, but Pennsylvania residents shouldn't have to pay for it	32	2.03	1.257	39	3.31	1.454	<0.001
I want more forestland to be set aside, but someone else should pay for it, not me	32	1.88	1.129	36	2.67	1.394	0.013
There doesn't need to be more set-aside forestland than there is now	32	1.66	1.096	36	3.33	0.986	<0.001
There should be less set-aside forestland than there is now	32	1.53	0.983	39	2.85	1.204	<0.001
Set-aside forests are not necessary	32	1.38	0.833	39	2.72	1.213	<0.001

A respondent's self-assessed familiarity with forests (Familiar), frequency at which they spent time in forests (Howoften), political views (Political), and income (Income) were significant predictors of their annual willingness-to-pay for an increase in the amount of public forestland placed in set-asides in Pennsylvania (Table 3-12). With a unit increase in a respondent's familiarity with forests, time spent in forests, and income, their willingness-to-pay for more set-asides would be expected to increase by \$7.70, \$4.25, and \$0.20, respectively. By contrast, with a unit increase in a respondent's political views, i.e., a shift from liberal to conservative, their willingness-to-pay for more set-asides would be expected to decrease by \$6.42.

The Version variable was not significant indicating no significant difference in respondents' intended level of support between versions A and B irrespective of cost level (Table 3-12). However, survey versions were not distributed randomly across the sample of Pennsylvania residents resulting in significant correlation between the Version variable and Howoften, Gender, Education, White, and Income variables, as well as a significant difference between the Education, Political, White, and Income variables of respondents across survey versions.

Table 3-12: Interval-censored regression equation for annual willingness-to-pay for an increase in the amount of public forestland placed in set-asides in Pennsylvania.

Variable	Description	Mean	Coefficient	SE	p
Constant			-10.050	13.136	0.444
Version	Version A (10% increase to current amount of Pennsylvania public forestland in set-asides) = 0 Version B (50% increase to current amount of Pennsylvania public forestland in set-asides) = 1		6.270	5.743	0.275
Familiar	Respondent's self-assessed familiarity with forests; Response given on a Likert scale ranging from 1 ("Well Below Average") to 5 ("Well Above")	3.052	7.695	3.789	0.042
Howoften	How often respondent spends time in forests; Response given on a scale ranging from 1 ("Not At All") to 6 ("More Than Once A Week")	2.461	4.253	2.187	0.049
Political	Respondent's political views; Response given on a Likert scale ranging from 1 ("Liberal") to 5 ("Conservative")	3.356	-6.422	2.221	0.004
Income	Household income of respondent (X \$1000)	61.492	0.195	0.058	0.001

The median annual willingness-to-pay for an increase in the amount of public forestland placed in set-asides in Pennsylvania was \$14.36 and \$20.63 for the average respondent with survey version A and B, respectively (Table 3-13). Applying these estimates to the full sample of respondents, a referendum proposing an additional 10% (55,000 acres) of public set-asides would be expected to annually generate \$5,241, and one proposing an additional 50% (275,000 acres) would be expected to annually generate \$7,530. As respondents' household income was inflated compared to that of all Pennsylvania households (Table 3-2), the Pennsylvania median household income (Census 2008) was used in place of respondents' average household income when willingness-to-pay estimates were expanded up to the full population of Pennsylvania households. Also, to provide a more conservative estimate of the total willingness-to-pay for all Pennsylvania households, non-respondents to the survey were assumed to have a zero willingness-to-pay for more set-asides. As such, the 10% increase in set-aside forests would be expected to annually generate between \$30.1 and \$58.5 million, and the 50% increase would be expected to annually generate between \$45.5 and \$88.5 million.

Table 3-13: Annual willingness-to-pay for an increase in the amount of public forestland placed in set-asides in Pennsylvania.

			All PA Households Total Annual WTP Adjusted for Income^{1, 2}	
Increase	Annual WTP / Household	Respondent Total Annual WTP	Lower Bound	Upper Bound
10%	\$14.36	\$5,241	\$30,082,641	\$58,526,539
50%	\$20.63	\$7,530	\$45,478,853	\$88,480,258

1 = Source: Census 2000 Summary File 1

2 = Source: Census 2008, Small Area Income & Poverty Estimates for States and Counties

When asked about their agreement with reasons why old-growth forests are important, the public respondents mostly strongly agreed that, “Old-growth forests provide a sense of history for an area,” “Old-growth forests provide beautiful, large trees,” “Old-growth forests are important whether or not they provide benefits to people,” “Old-growth forests are useful for youth and adult education,” and “Old-growth forests are useful for scientific research” (Table 3-14). Compared to scientists, the public did not agree as strongly with, “Old-growth forests are useful for scientific research” and “Old-growth forests are important whether or not they provide benefits to people.” On the other hand, the public was significantly more likely than scientists to perceive old-growth forest to be important because they, “Provide humans with the cleanest water,” “Have more wildlife than younger forests,” “Produce the largest and most valuable timber,” “Provide humans with more oxygen than young forests,” and “Take more carbon out of the atmosphere than young forests.”

Table 3-14: Comparison of the public’s and scientists’ mean level of agreement with reasons why old-growth forests are important. Responses given on a Likert scale ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”).

Old-growth forests...	Public			Scientists			p
	N	Mean	SD	N	Mean	SD	
...provide a sense of history for an area	161	4.43	0.659	67	4.45	0.585	0.836
...provide beautiful, large trees	161	4.38	0.774	66	4.30	0.744	0.498
...are important whether or not they provide benefits to people	160	4.28	0.770	67	4.55	0.634	0.012
...are useful for youth and adult education	160	4.20	0.708	67	4.28	0.545	0.388
...are useful for scientific research	159	4.19	0.843	67	4.82	0.386	<0.001
...provide humans with the cleanest water	160	3.91	0.974	67	3.39	0.999	<0.001
...provide humans with more oxygen than young forests	160	3.63	1.007	67	2.55	0.822	<0.001
...take more carbon out of the atmosphere than young forests	160	3.62	0.957	67	2.43	1.018	<0.001
...have more wildlife than younger forests	160	3.50	1.034	67	2.72	0.982	<0.001
...produce the largest and most valuable timber	159	3.17	1.259	67	2.69	1.047	0.006

Acceptable Management of Old-Growth Forests

This section presents data collected on the importance of recreational activities and agreement with management actions in old-growth forests as well as the perception of forests having old-growth features created through applied management. Both the public and scientists were asked questions concerning the first two topics; however, for the public, questions first referred to “Forests set aside to develop with limited human involvement” instead of “old-growth forests.” Then, after respondents who were unfamiliar with the term “old-growth forest” were filtered out, the remaining respondents were asked if their answers would have been the same had “old-growth forest” been used instead. A majority (85.8%; 139) of these respondents indicated their answers would have been the same. For the 14.2% (23) who said their answers would have been different, a list of comments on how their answers would have changed can be found in Appendix D. Only Pennsylvania residents were asked about their perception of forests having old-growth features created through applied management. Where both groups were surveyed, the data are prioritized according to residents’ responses as their attitudes regarding acceptable management of old-growth forests carry greater importance in the context of the research objectives.

Both the public and scientists stressed the importance of non-motorized access to set-asides forests and old-growth forests, respectively (Table 3-15). Motorized access was of the least importance to both the public and scientists, and proved to be the only use on the unimportant end of the scale for the former. Compared to scientists, the public

placed a greater level importance on six recreational uses: camping; developed interpretive centers with parking lots and bathrooms; horseback riding; mountain biking; fires for personal use; and motorized access. Nearly all these trends hold when considering only the public respondents who equate set-aside forests with old-growth forests (Table 3-16). An exception includes the decline in the importance of fires for personal use and its shift to the unimportant end of the scale. Also, the level of importance assigned to hunting and fishing by the public increases and becomes significantly greater than that indicated by scientists.

Table 3-15: Comparison of the mean importance to the public (all respondents) and scientists of allowing specific uses of set-aside forests and old-growth forests, respectively. Responses given on a Likert scale ranging from 1 (“Very Unimportant”) to 5 (“Very Important”).

	Public			Scientists			p
	N	Mean	SD	N	Mean	SD	
Non-motorized access (for example: walking, hiking, canoeing)	349	4.12	0.904	66	4.20	0.728	0.501
Hunting and fishing	348	3.68	1.249	66	3.36	1.076	0.054
Camping	350	3.60	1.180	65	2.85	1.121	<0.001
Interpretive signs and displays	344	3.49	1.153	66	3.67	0.771	0.125
Developed interpretive centers with parking lots and bathrooms	350	3.34	1.303	66	2.77	0.925	<0.001
Horseback riding	350	3.28	1.139	66	2.42	0.978	<0.001
Mountain biking	347	3.19	1.225	66	2.24	1.039	<0.001
Fires for personal use	345	3.01	1.289	66	2.44	1.025	0.001
Motorized access (for example: ATVs, snowmobiles, 4-wheel driving)	349	2.32	1.329	66	1.48	0.749	<0.001

Table 3-16: Comparison of the mean importance to the public (only those respondents who indicated their responses wouldn't change if "old-growth forests" had been used instead of "forests set aside to develop with limited human involvement") and scientists of allowing specific uses of set-aside forests and old-growth forests, respectively. Responses given on a Likert scale ranging from 1 ("Very Unimportant") to 5 ("Very Important").

	Public ¹			Scientists			p
	N	Mean	SD	N	Mean	SD	
Non-motorized access (for example: walking, hiking, canoeing)	132	4.12	0.925	66	4.20	0.728	0.562
Hunting and fishing	134	3.75	1.243	66	3.36	1.076	0.034
Camping	135	3.46	1.214	65	2.85	1.121	0.001
Interpretive signs and displays	129	3.43	1.171	66	3.67	0.771	0.088
Horseback riding	134	3.20	1.194	66	2.42	0.978	<0.001
Developed interpretive centers with parking lots and bathrooms	134	3.10	1.311	66	2.77	0.925	0.040
Mountain biking	133	3.03	1.273	66	2.24	1.039	<0.001
Fires for personal use	132	2.90	1.283	66	2.44	1.025	0.007
Motorized access (for example: ATVs, snowmobiles, 4-wheel driving)	134	2.16	1.305	66	1.48	0.749	<0.001

1 = Only those respondents who indicated their responses wouldn't change if "old-growth forests" had been used instead of "forests set aside to develop with limited human involvement".

Public respondents were most likely to support the reintroduction of native plants; maintenance of existing trails and roads; and fire suppression in set-aside forests (Table 3-17). They were also unlikely to support herbicide spraying for non-native invasive plants; construction of new roads; timber removal for commercial purposes; and oil and gas activities in set-aside forests. “Don’t Know” was most frequently selected for timber removal for commercial purposes (10.2% of respondents); reintroduction of native plants (9.5%); and fire suppression (7.8%). Compared to scientists, the public was significantly less likely to support the mechanical removal of non-native invasive plants; prescribed fires; construction of deer fences to control excessive deer browsing; and herbicide spraying for non-native invasive plants in set-aside forests. On the other hand, the public was significantly more likely than scientists to support the maintenance of existing trails and roads; construction of new trails and roads; adding plants expected to do better under predicted climate change; fire suppression; timber removal of dead and dying trees; timber removal for commercial purposes; and oil and gas activities in set-aside forests. Scientists were not given the option to select, “Don’t Know.”

A majority of these trends hold when considering only the public respondents who equate set-aside forests with old-growth forests (Table 3-18). An exception includes an increase in the level of support for herbicide spraying for non-native invasive plants and its shift to the likely end of the scale. Also, the public’s level of support for maintenance of existing trails and construction of new trails decreased slightly and is no longer significantly greater than scientists. Lastly, “Don’t Know” was most frequently

selected for timber removal for commercial purposes (10.1% of respondents); oil and gas activities (7.5%); and reintroduction of native plants (6.0%).

Table 3-17: Comparison of the mean likeliness of the public (all respondents) and scientists to support specific management activities in set-aside forests and old-growth forests, respectively. Responses given on a Likert scale ranging from 1 (“Very Unlikely”) to 5 (“Very Likely”).

	Public			Scientists			p
	N	Mean ¹	SD	N	Mean ¹	SD	
Reintroduction of native plants	337	4.14	0.883	66	3.91	0.818	0.053
Maintenance of existing trails	344	4.13	0.889	66	3.92	0.640	0.027
Maintenance of existing roads	344	4.03	0.912	65	3.08	0.907	<0.001
Fire control (suppression)	337	3.96	0.904	66	2.61	1.080	<0.001
Timber removal of dead and dying trees	343	3.69	1.177	66	1.94	1.094	<0.001
Adding plants expected to do better under predicted climate change	324	3.53	1.165	66	2.77	1.020	<0.001
Mechanical removal of non-native invasive plants	321	3.48	1.113	66	3.98	0.813	<0.001
Prescribed (intentionally set, controlled) fires	309	3.34	1.118	66	3.64	0.955	0.046
Construction of new trails	341	3.32	1.256	65	3.05	0.874	0.035
Construction of deer fences to control excessive deer browse	323	3.18	1.290	66	3.53	1.026	0.017
Timber cutting without removal for restoration of specific forest attributes	313	3.12	1.279	66	3.11	1.242	0.944
Pesticide spraying for insect control	334	3.04	1.302	66	2.77	1.093	0.112
Herbicide spraying for non-native invasive plants	319	2.75	1.266	66	3.41	1.109	<0.001
Construction of new roads	333	2.71	1.287	66	1.85	0.881	<0.001
Timber removal for commercial purposes	332	2.16	1.305	66	1.82	0.959	0.016
Oil and gas activities	327	2.12	1.255	65	1.45	0.751	<0.001

1 = Excluding "Don't Know" responses

Table 3-18: Comparison of the mean likeliness of the public (only those respondents who indicated their responses wouldn't change if "old-growth forests" had been used instead of "forests set aside to develop with limited human involvement") and scientists to support specific management activities in set-aside forests and old-growth forests, respectively. Responses given on a Likert scale ranging from 1 ("Very Unlikely") to 5 ("Very Likely").

	Public ²			Scientists			p
	N	Mean ¹	SD	N	Mean ¹	SD	
Reintroduction of native plants	131	4.11	0.914	66	3.91	0.818	0.139
Maintenance of existing trails	132	3.98	1.000	66	3.92	0.640	0.652
Fire control (suppression)	129	3.90	0.951	66	2.61	1.080	<0.001
Maintenance of existing roads	130	3.87	0.999	65	3.08	0.907	<0.001
Timber removal of dead and dying trees	132	3.55	1.304	66	1.94	1.094	<0.001
Mechanical removal of non-native invasive plants	124	3.50	1.186	66	3.98	0.813	0.001
Prescribed (intentionally set, controlled) fires	116	3.34	1.150	66	3.64	0.955	0.068
Adding plants expected to do better under predicted climate change	125	3.30	1.233	66	2.77	1.020	0.003
Construction of new trails	130	3.20	1.272	65	3.05	0.874	0.324
Timber cutting without removal for restoration of specific forest attributes	125	3.14	1.287	66	3.11	1.242	0.845
Pesticide spraying for insect control	130	3.08	1.267	66	2.77	1.093	0.098
Construction of deer fences to control excessive deer browse	124	3.03	1.275	66	3.53	1.026	0.007
Herbicide spraying for non-native invasive plants	124	3.01	1.259	66	3.41	1.109	0.031
Construction of new roads	125	2.42	1.193	66	1.85	0.881	<0.001
Timber removal for commercial purposes	127	2.32	1.391	66	1.82	0.959	0.004
Oil and gas activities	123	2.16	1.270	65	1.45	0.751	<0.001

1 = Excluding "Don't Know" responses

2 = Only those respondents who indicated their responses wouldn't change if "old-growth forests" had been used instead of "forests set aside to develop with limited human involvement".

When asked about their agreement with statements about forests having old-growth features created through applied management, the public mostly strongly agreed that, “To be considered old-growth, a forest with created old-growth features must ecologically function like old-growth forests that developed naturally” (Table 3-19). Respondents also most strongly disagreed with, “I could recognize the difference between created old-growth features and those that developed naturally.” Over a tenth of respondents selected “Don’t Know” for, “I could recognize the difference between created old-growth features and those that developed naturally” (21.9% of respondents), and “To be considered old-growth, a forest with created old-growth features must ecologically function like old-growth forests that developed naturally” (13.1%).

Table 3-19: Public’s mean level of agreement with statements about forests having old-growth features created through applied management. Responses given on a Likert scale ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”).

	N	Mean¹	SD
To be considered old-growth, forests with created old-growth features must ecologically function like old-growth forests that developed naturally	152	3.72	0.990
To be considered old-growth, forests with created old-growth features must have the appearance of old-growth forests that developed naturally	153	3.51	1.084
A forest with created old-growth features would not be as appealing to me as an old-growth forest whose features developed naturally	154	3.25	1.057
Forests with created old-growth features can't be considered old-growth because their features have been created by humans and did not develop naturally	152	2.94	0.972
I could recognize the difference between created old-growth features and those that developed naturally	151	2.83	0.963

1 = Excluding "Don't Know" responses

Mail Survey Non-Response Bias

This section presents data collected from a random sample of 20 Pennsylvania residents who did not respond to the mail survey. Data was not collected from scientists who did not respond to the Internet survey.

Of the sample of non-respondents, 70.0% were male and the median age was 59. Exactly 45% completed college or graduate/professional school, and all were Caucasian. Almost half (45.0%) described their political views as conservative or moderate-conservation compared to only a quarter (25.0%) who considered themselves liberal or moderate-liberal. Over half (55.0%) of the non-respondents sampled indicated an average familiarity with forests, and the response exhibited an approximately normal distribution (skewness = -0.315 +/- 0.512). Three-fourths indicated they either spent time in forests a few times (45.0%) or not at all (30.0%) during the last 12 months (approximately July 2009 – July 2010).

Having forests set aside to develop with limited human involvement was considered very important and important to 25% and 45% of non-respondents, respectively, and the distribution of responses was approximately normal (skewness = -0.363 +/- 0.512). Two-fifths (40%) were familiar with the term “old-growth forest,” and 37.5% of those familiar with the term said they been in an old-growth forest before. Further, non-respondents were most likely to described old-growth forests as peaceful and attractive, while least likely to describe them as scary (Table 3-20).

None of the responses collected from the non-responding residents were significantly different from those collected from responding residents, therefore giving no indication of non-response bias.

Table 3-20: Mean likeliness of non-respondents to use the given adjectives when describing old-growth forests. Responses given on a Likert scale ranging from 1 (“Very Unlikely”) to 5 (“Very Likely”).

	N	Mean	SD
Peaceful	8	4.63	0.518
Attractive	8	4.38	0.518
Dark	8	3.25	1.282
Scary	8	1.75	0.886

Chapter 4

Discussion

Perception of Old-Growth Forests

The first objective of this research was to define the public's perception of old-growth forests. Foremost, over half of the Pennsylvania residents who responded to the survey were unfamiliar with the term "old-growth forest," i.e., they had not heard the term prior to receiving the survey mailings. These respondents were directed to bypass all questions referring to the term and are not considered in the discussion of the public's perception of old-growth forests.

Overall, respondents held positive affective beliefs about old-growth forests, thus corroborating Enck and Odató's (2008) demonstration of positive affective beliefs toward late-successional forests. They were not only likely to describe old-growth forests as peaceful, natural, and attractive, but also unlikely to refer to old-growth forests as dirty, cluttered, or scary. These attitudes mirrored those conveyed for forests except forests were viewed as slightly more attractive. Also when compared to forests, old-growth forests were perceived as relatively darker and more mysterious; however, neither adjective, i.e., dark and mysterious, was likely to be used by public respondents when describing old-growth forests. Furthermore, although the public was relatively more likely than scientists to use several negatively connoted adjectives (e.g., impenetrable, unsafe, dirty, and scary), they did so while remaining on the unlikely end of the scale.

The public expressed strong disagreement with the statements, “There’s no change in an old-growth forest” and “Old-growth forests have never experience natural disturbance.” These findings contradict earlier suggestions that the public is under the impression that forests persist in a static state (Gobster 1996, Kimmins 2003). In addition to the existence of natural disturbance, the relative agreement with, “A forest can still be old-growth, even if it has been logged in the past,” and disagreement with, “An old-growth forest has never been influenced by humans” and “An old-growth forest is the same as a virgin forest” suggest the public also recognizes the potential for human disturbance in old-growth forests. However, of the statements concerning cognitive beliefs about old-growth forests, the public’s level of agreement matched that of the scientists only once, implying the former’s knowledge of old-growth forests is less refined than the latter’s.

The public was bimodal in their selection of an age a forest must be in order to be considered old-growth. About as many respondents said the age of an old-growth forest may vary as did those who chose 200 years or younger as the minimum age. On the other hand, a majority of the scientists recognized that the age of an old-growth forest may vary and were twice as likely to select that response as compared to the public. Regarding the minimum extent of an old-growth forest, a majority of public respondents indicated the size of an old-growth forest may vary or the size of an old-growth forest doesn’t matter with more than twice as many respondents selecting the former over the latter. The scientists were more likely than the public to select a minimum extent of 25 acres or less, but still predominantly indicated the size of an old-growth forest may vary.

Public respondents disagreed with the statement, “If a forest has very old trees, it must be old-growth,” indicating they do not perceive the presence of very old trees to be the sufficient condition for demarcating old-growth forests. In fact, a majority of the public recognized five attributes to be typical of old-growth forests: very old trees; very tall trees; very large-diameter trees; dead or decaying trees on the ground; and dead or decaying standing trees. Although the public was not as unanimous in their selection of the last two attributes as the scientists, they did exhibit an awareness of the presence of coarse woody debris and snags in old-growth forests; however, they also gravitated more strongly toward choosing individual tree characteristics than scientists and were not as likely to be certain about less obvious attributes (e.g., canopy gaps) or those that require previous knowledge and training to identify (e.g., under- and over-story species richness). Considering more than half of respondents indicated they had never been in an old-growth forest, the disagreement between the public’s and scientists’ responses are likely due to the former’s lack of experience in addition to the latter having a better developed definition.

Compared to their responses regarding old-growth attributes and to the public’s responses for attributes typical of forests that are not old-growth, the scientists were generally more uncertain of the attributes typical of forests that are not old-growth. This is a reasonable observation, as an array of stand types fall into the “not old-growth” category and an attribute may be typical of one, but not the other. Moreover, old-growth forest attributes are often context-dependent while varying by forest type, site conditions, and disturbance history (Davis 1996). In either case it may be challenging to characterize

an attribute given only a dichotomous choice. In fact, many of the scientists expressed concern with the format of the question and indicated they would have responded “It Depends” rather than “Don’t Know” had the option been given.

Value of Old-Growth Forests

Pennsylvania residents familiar with the term “old-growth forest” expressed agreement with many of the statements regarding why old-growth forests are important. With each statement falling under one of four forest value categories (Bengston and Xu 1995), residents demonstrated they consider a variety of old-growth values important. Strong importance was placed on moral/spiritual (“Old-growth forests provide a sense of history for an area” and “Old-growth forests are important whether or not they provide benefits to people”), aesthetic (“Old-growth forests provide beautiful, large trees”) and economic values (“Old-growth forests are useful for youth and adult education” and “Old-growth forests are useful for scientific research”), while life-support values (“Old-growth forests take more carbon out of the atmosphere than young forests” and “Old-growth forests provide humans with more oxygen than young forests”) were of relatively less importance. Previous research has also demonstrated the importance placed on a diversity of values for both forests in general and old-growth forests in particular, although the exact ranking has varied (Manning et al. 1999, Owen et al. 2009).

A majority of the disparity between scientists and the public resulted from the former’s stronger disagreement with several of the statements addressing life-support values (e.g., “Old-growth forests take more carbon out of the atmosphere than young

forests,” “Old-growth forests provide humans with more oxygen than young forests,” and “Old-growth forests have more wildlife than younger forests”). Perhaps scientists truly do place a lower importance on these life-support values relative to other value categories and to the public. On the other hand, it is more likely they are expressing their disagreement with how the statements proposed the direction of the differential between old-growth forests and younger forests as old-growth forests are characterized by very low net primary productivity and actually sequester carbon and produce oxygen at a much lower rate than younger forests.

Given an annual cost to their household of \$20 or less, a majority of residents indicated they would either definitely or possibly support a referendum proposing to increase the amount of public forestland placed in set-asides in Pennsylvania. Residents who always opposed the referendum regardless of cost level suggested they did so for several reasons, including their household’s inability to afford additional taxes or fees, their opinion that the current amount of set-aside forestland was sufficient, or their belief that Pennsylvania residents should not have to pay for the increase. On the other hand, it appeared that residents who always supported the referendum would have supported an even larger increase regardless of which was initially proposed, i.e., 10% or 50% of the current amount. Generally, however, residents were not more likely to pledge a higher level of support for a referendum proposing a larger increase, thus supporting other evidence indicating willingness-to-pay’s insensitivity to forest size (Lindhjem 2007). Yet, it was inconclusive whether the magnitude of the increase to set-aside forests in

Pennsylvania was truly independent of willingness-to-pay, or if experimental design error confounded its effect.

A respondent's willingness-to-pay for set-aside forests was best predicted by their self-assessed familiarity with forests, frequency at which they spent time in forests, political views, and income, and the public's median willingness-to-pay was \$14.36 and \$20.63 for an increase in the amount of public set-aside forest in Pennsylvania by 10% (55,000 acres) and 50% (275,000 acres), respectively. Although the survey elicited a robust response and the sample list was obtained from a reputable source, the sample of residents who responded to the survey was not representative of the Pennsylvania population. Specifically, the respondents earned a higher household income and as the income variable proved significant in predicting willingness-to-pay, an adjustment was made for this observation in the calculation of all Pennsylvania households' total willingness-to-pay for more set-asides. In addition to this correction, the derivation of total willingness-to-pay was conservative on two accounts. First, in defining a respondent's lower bound on willingness-to-pay, the highest cost level the respondent indicated he/she would definitely support was used rather than the highest cost he/she would possibly support. Furthermore, in setting the lower bound on Pennsylvania household's total willingness-to-pay, it was assumed that non-respondents to the survey had a willingness-to-pay of zero. Even so, a referendum proposing a 10% increase in the amount of set-aside forests in Pennsylvania would be expected to generate between \$30.1 and \$58.5 million, and a 50% increase would be expected to generate between \$45.5 and \$88.5 million.

Interestingly, even the smaller of the two increases would be expected to annually generate between \$30.1 and \$58.5 million for the maintenance and administration of Pennsylvania's old-growth system with the lower bound comparable to the typical annual revenue generated from timber sales on the rest of the state forest system (DCNR – BOF 2007). It is unclear whether asking the same question in reference to Pennsylvania's old-growth system would produce the same levels of support given that more than half the residents who responded were unfamiliar with the term. Nonetheless, it is unlikely support would decline, especially since more than four out of five residents who were familiar with the term perceived it as equivalent to "forests set-aside to develop with limited human involvement," and considering set-aside forests proved to be important to a majority of the public.

Acceptable Management of Pennsylvania's Old-Growth System

Of those survey respondents familiar with the term "old-growth forest," a majority said their answers regarding the recreational use of and management in "Forests set aside to develop with limited human involvement" would have been the same had the term "old-growth forest" been used instead. This suggests these residents perceive old-growth forests as places of limited human involvement, and in setting the boundaries of "limited human involvement" for Pennsylvania's old-growth system, the public demonstrated a much broader definition than scientists. Much more than scientists, they exhibited a utilitarian interest in old-growth forests that was reflected in their approval of

recreational uses and management activities. For example, the public appeared to view Pennsylvania's old-growth system as a place for recreation. Of the recreational uses considered for approval in the old-growth system, not only did they feel it was important to allow four more in the system than scientists, but they also assigned higher importance to the relatively more intensive recreational uses, such as horseback riding and mountain biking.

The public also held a more favorable view toward intervention in Pennsylvania's old-growth system. Public respondents placed 13 of the 16 management activities considered for approval in the system on the likely-to-support end of the scale while scientists were only likely to support nine. Moreover, the public was not very unlikely to support any of the management activities compared to scientists who indicated they were very unlikely to support three. With several of the management actions, the public's level of support for and diversion from scientists' opinions seemed driven by the former's utilitarian interest in old-growth forests and the latter's desire to adhere to restoration goals. Certainly, the maintenance of existing roads and timber removal of dead and dying trees would move more toward the improvement of access for and enhance the experience of recreationists rather than the development of old-growth conditions.

Compared to the scientists, the public was generally less accepting of several management actions likely to benefit Pennsylvania's old-growth system such as prescribed fires; construction of deer fences; and chemical as well as mechanical removal of non-native invasive plants. Combining this observation with the fact that residents placed higher importance on the relatively more intensive recreational uses than

scientists, the public's definition of acceptable management in old-growth forests appears counterintuitive to the justification behind creation of Pennsylvania's old-growth system, i.e., the restoration and perpetuation of old-growth forest conditions (Jenkins et al. 2004). However, it may be that the public's level of support for these management activities is more reflective of whether or not they perceive the target of the action to be a risk to old-growth forests. For instance, for nearly three-quarters of a century, the Smokey Bear campaign has embedded the importance of fire prevention in the mind's of the American public, and has only recently attempted to modify the message to reflect current scientific knowledge. On the other hand, compared to fire, non-native invasive plants is a nascent topic and less likely to be at the top of residents' concerns when thinking about natural resource issues. Furthermore, it is unknown whether actual observation of a given management activity would translate into the same perception it did through the survey.

Chapter 5

Conclusion

Considering the DCNR – BOF follows an ecosystem management paradigm, it is important for its personnel to understand the public's perception and value of as well as its definition of acceptable management for the state's old-growth system. This study revealed that Pennsylvania residents held a lower level of ecological literacy with respect to old-growth forests than expected as over half of those who responded to the survey were unfamiliar with the term. While an ecologically literate individual will not always act to promote the health of ecosystems (Jordan et al. 2009), completely lacking any familiarity with the term "old-growth forest" serves as a barrier to further discussion about acceptable management. On the other hand, those familiar with the term expressed positive affective beliefs and did not validate common assumptions about public misconceptions regarding old-growth forests, e.g., that they are static systems with delineation dictated solely by the presence of very old trees. As anticipated, the public had a less sophisticated understanding of old-growth forests than scientists, and this was strongly evidenced in their selection of old-growth attributes. A diversity of old-growth forest values was recognized, and a majority of residents expressed willingness-to-pay for set-aside forests up to an annual household cost of \$20. In fact, median willingness-to-pay for a 10% and 50% increase in the amount of public forestland placed in set-asides in Pennsylvania was \$14.36 and \$20.63, respectively. Although this study suggested that a majority of those familiar with old-growth forests perceived them as forests set aside to

develop with limited human involvement, residents were much less restrictive than scientists when it came to the tolerance of recreation and active management in Pennsylvania's old-growth system.

Potential for future research exists both in terms of deeper analysis of the existing survey data as well as additional data collection. Quantitatively, it would be interesting to cross-tabulate attitudes and perceptions with respondent characteristics to understand how and why responses vary. Linking responses to respondents' zip codes in order to view data spatially in a geographic information system would provide a powerful visual representation of the survey data as well as a multitude of possibilities for further analysis. Examination of the qualitative data (e.g., old-growth forests respondents have visited) would likely give reason to question respondents' self-assessed familiarity with old-growth forests. Additional data collection could focus on better clarifying how responses would have been different if old-growth forests had been used instead of "Forests set aside to develop with limited human involvement." Also, it would be beneficial to understand how respondents familiar with the term "old-growth forest" were exposed to the topic. Whether an individual's ecological literacy is a function of their direct behavior (e.g., forest recreation), result of a more indirect contact (e.g., exposure to natural resources issues through public media), or combination of both, it would be helpful to know what personal experiences and communicative tools involved in those experiences have been most successful in developing the public's insight.

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Appendix A

Focus Group Materials

Recruitment Script for Community/Service Group Leaders and Key Informants

Hello, my name is Collin Shephard and I am a graduate student at Penn State University's School of Forest Resources. I am conducting a study for research regarding people's perception of old-growth forests.

Do you have time to discuss this now or would there be a better time to call?

If yes, continue.

If yes, but not right now: "When would be a more convenient time for us to talk?" Get the following information and thank them.

Date _____ Time _____
Phone Number _____

If no, thank them for their time and terminate the call.

I am seeking volunteers to participate in a focus group about people's perception and value of old-growth forests. As leader in _____ (community or service group/town), I would like to request that you distribute a recruitment letter for my study. Is this something you would consider?

If yes, thank them and ask where it would be convenient to receive the recruitment letter (obtain email or mailing address).

If no, thank them for their time and terminate the call.

Do you have any questions or concerns?

If yes, address the questions or concerns.

If no, continue.

If any questions or concerns should arise, please do not hesitate to call me at (814) 865 – 4183. Thank you for your time.

Recruitment Letter

[DATE]

Hello,

I am a graduate student at Penn State University's School of Forest Resources and am conducting a study regarding people's perception and value of old-growth forests. I am holding old-growth forest focus groups throughout Pennsylvania, and am seeking volunteers to participate in a focus group with other residents of [LOCATION].

The focus group will be held at [LOCATION] and will meet for no longer than 2 ½ hours. This includes time for a provided dinner and discussion with the actual length primarily driven by the participants.

This research study is being conducted by Penn State University in cooperation with the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry (DCNR BOF). The opinions expressed at the focus group will be used to develop a mail survey about the perceptions and values of old-growth forests that will be sent to a larger sample of Pennsylvania's residents. Your focus group and the survey are critical in helping the BOF understand how Pennsylvanians perceive old-growth forests and what they expect from the old-growth forests the BOF manages.

If you are interested in volunteering for this old-growth forest focus group, or if you have any questions or concerns, I can be reached via the email address and phone number below. I look forward to hearing from you and thank you in advance for your help.

Sincerely,

Collin Shephard

cms541@psu.edu
(814) 865-4183

Informed Consent Form

Title of Project: Public perception and value of old-growth forests

Co-Principal Investigators: Dr Marc E McDill, Associate Professor of Forest Management
 310 Forest Resources Building
 University Park, PA 16802
 phone: (814) 865-1602
mmcdill@psu.edu

Dr Kim C Steiner, Professor of Forest Biology
 301 Forest Resources Building
 University Park, PA 16802
 phone: (814) 865-9351
kcs@psu.edu

Other Investigator(s): Collin Shephard

1. **Purpose of the Study:** The objectives of this study are to understand the how the general public of Pennsylvania perceives and values old-growth forests. We are contacting members of the general public in five Pennsylvania communities and asking them to participate in old-growth forest focus groups. Your input will be used to develop a mail survey about the perceptions and values of old-growth forests that will be sent to a larger sample of Pennsylvania's residents.

This research study is being conducted in cooperation with the Pennsylvania Department of Conservation and Natural Resources Department of Forestry (DCNR BOF). The findings from your focus group and the survey are critical in helping the BOF understand what Pennsylvania's residents expect from the old-growth forests they manage.

2. **Procedures to be followed:** You will be asked a series of questions about old-growth forests. During this time we would like to take handwritten notes and make an audio recording of the discussion.

3. **Duration/Time:** The discussion will take about 90 - 120 minutes.

4. **Statement of Confidentiality:** Your participation in this research is confidential. During the focus group, we will not ask for any information that would identify individual responses. Although we will record the discussion, we will not put your name on the audio recording or in our handwritten notes. Therefore, we do not believe that you can be identified. If you speak about the contents of the focus group outside the group, it is expected that you will not tell others what individual participants said.

The audio recording will be stored and secured at 436 Forest Resources Building, University Park in password protected files. The handwritten notes and transcripts of the audio recordings will be stored and secured at 310 Forest Resources Building, University Park. Only the coordinators of the research project will have access to the audio recordings, notes, and transcripts. In the event of a publication or presentation resulting from the research, no personally identifiable information will be shared. When the project is finished, all audio recordings and transcripts will be retained for three years and then destroyed in 2013 to protect your confidentiality.

5. **Right to Ask Questions:** Please contact Collin Shephard at (814) 865 - 4183 with questions or concerns about this study.

6. **Compensation for Participation:** You will be provided a meal at the designated focus group location. No additional compensation will be provided for travel to or time spent in the focus group.

7. **Voluntary Participation:** Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.

You must be 18 years of age or older to consent to take part in this research study. You will be provided a copy of this form for your records.

You will now be asked two questions regarding consent to participate in this research study:

I **give** permission to be **AUDIO** taped.

I **do not give** permission to be **AUDIO** taped.

I **do give** permission for portions of this interview to be directly quoted in publications/presentations.

I **do not give** permission for portions of this interview to be directly quoted in publications/presentations.

Participant Signature

Date

Person Obtaining Consent

Date

Instrument

- 1) What do forests mean to you?
 - a. What connection do you have to Pennsylvania's forests?
 - b. Do you spend time in Pennsylvania's forests? If so, where, how often, and what do you do?

- 2) Is there a difference between forests that are of different ages?
 - a. For example, between very young forests and mature forests? What about mature forests and very old forests?
 - b. How do you know how old a forest is?

- 3) What do you think of when you hear the term old-growth forest?
 - a. What do you envision an old-growth forest to look like?
 - i. Can you describe the scene? What do the trees look like? What wildlife lives there?
 - ii. Where is your old-growth forest?
 - iii. How old is your old-growth forest?
 - b. How big (EXTENT) does an old-growth forest need to be?
 - c. Why do you think old-growth forests look the way you envision them?
 - d. Do you think humans have had an influence on the way the old-growth forest looks?

- 4) Have you ever been in an old-growth forest? If so, where and what did you do there?
 - a. How did you know you were in an old-growth forest?

- 5) Are old-growth forests important? If so, why?
 - a. Can old-growth forests be used for things that other younger forests don't provide? If so, what?
 - b. Do old-growth forests provide the environment with things that younger forests can't? If so, what?

- 6) The PA DCNR's Bureau of Forestry manages 2.1 million acres of public forestland, and earned about 220 million dollars in revenues from gas leases and timber harvests last year. Of this, about 28 million dollars was from timber sales. In the past, the Bureau of Forestry has annually generated nearly 40 million dollars from timber. Of those 2.1 million acres, 550,000 comprise an old-growth system dedicated to the restoration and perpetuation of old-growth forest conditions.
 - a. What activities (undertaken by PA residents, by BOF) should be allowed in this old-growth system? What activities (undertaken by PA residents, by BOF) should not be allowed in the old-growth system?
 - b. How much of the 2.1 million acres should be maintained as old growth?
 - c. How should the BOF maintain part of its forests as old growth?
 - i. Is active management acceptable in the old-growth system? What activities? Under what conditions? To what extent?

- 7) What personal actions would you be willing to take to ensure the maintenance of old-growth forests in Pennsylvania (e.g., make a donation, volunteer your time, accept a reduction of income, pay higher state taxes, pay higher fees for other state services)?

Appendix B

Mail Survey Materials

Initial Cover Letter

May 7, 2010

Recipient
Recipient's address
Recipient's address

Dear Recipient,

I am asking for your help in an important study of Pennsylvania residents by The Pennsylvania State University. This research is part of an effort to learn how you connect to and think about forests, and is in cooperation with the Pennsylvania Department of Conservation and Natural Resources – Bureau of Forestry (DCNR – BOF). Specifically, I am interested in understanding your use of and beliefs about forests in general and old-growth forests in particular.

You are one of a small number of Pennsylvania residents chosen at random and invited to participate in this important study by completing the enclosed questionnaire. Results from the questionnaire will help the DCNR – BOF better understand how Pennsylvanians view old-growth forests and what they expect from the old-growth forests the state manages. A full understanding of all perspectives depends on having all opinions represented. You must be 18 years old or older to complete the questionnaire. Even if you do not visit or use forests, your participation is important.

Your participation is voluntary and should take no longer than 25 minutes. You may stop at any time and can choose not to answer any questions. The questionnaire has an identification number for mailing purposes only. When you return your completed questionnaire, the identification number is checked off the list. Your name will never be connected to your answers, so your responses are confidential.

Enclosed is a small token of appreciation for completing the questionnaire. When you complete the questionnaire, please place it in the enclosed addressed and postage-paid envelope, and mail it back as soon as possible. Completion and return of this questionnaire implies consent to participate in this study. Please keep this letter for your records. If you have any questions regarding this questionnaire or the study, please feel free to contact me at (814) 865-4183 or cms541@psu.edu.

Thank you very much for completing and returning the enclosed questionnaire. Your input is very important!

Sincerely,

Collin Shephard
Graduate Research Assistant

Reminder Postcard

Last week, I sent you a questionnaire about your use of and beliefs about forests in general and old-growth forests in particular. You are one of a very small number of Pennsylvania residents chosen at random and invited to participate in this important study.

If you have already completed the questionnaire and mailed it back to me, please accept my sincere thanks. If not, please do so today. Your response is important because the Pennsylvania Department of Conservation and Natural Resources – Bureau of Forestry values the opinions of the Commonwealth's residents, like yourself, in the management of public forestland.

If you did not receive the questionnaire or it was misplaced, please ask for another copy by contacting me at (814) 865-4183 or cms541@psu.edu.

Thank you for your cooperation!

Sincerely,

Collin Shephard
Graduate Research Assistant
The Pennsylvania State University
School of Forest Resources
University Park, PA 16802

Replacement Cover Letter

June 2, 2010

Recipient
Recipient's address
Recipient's address

Dear Recipient,

About three weeks ago, I sent you a questionnaire about your use of and beliefs about forests in general and old-growth forests in particular. As of today, I have not received your completed questionnaire. If you have completed the questionnaire in the last few days and mailed it back to me, please accept my sincere thanks.

I am writing again because every questionnaire is important. You are one of a very small number of Pennsylvania residents chosen through a random sampling process. For results to represent opinions of Pennsylvania residents, it is important that every questionnaire be completed and mailed back to me. Without your help, conclusions I draw from questionnaires already received from other Pennsylvania residents *may be wrong*.

Even if you do not visit or use forests, your opinions are still important and must be considered. Results from this questionnaire will help the Pennsylvania Department of Conservation and Natural Resources – Bureau of Forestry (DCNR – BOF) better understand how Pennsylvanians view old-growth forests and what they expect from the old-growth forests the state manages.

I want to assure you that completion of this survey is voluntary. The questionnaire has an identification number so that I can check it off the list when it is returned. Responses are confidential as your name will never be connected to your answers. Protecting confidentiality of your answers is important to me and Penn State University.

We have enclosed another copy of the questionnaire in case you did not receive the first copy or it was misplaced. Please place your completed questionnaire in the enclosed addressed and postage-paid envelope, and mail it back to me as soon as possible. If you have any questions, please feel free to contact me at (814) 865-4183 or cms541@psu.edu.

Thank you very much for completing and returning the enclosed questionnaire. Your input is *very* important!

Sincerely,

Collin Shephard
Graduate Research Assistant

Second Replacement Cover Letter

June 16, 2010

Recipient
Recipient's address
Recipient's address

Dear Recipient,

During the last month, I have sent you several mailings about an important study I am conducting for my graduate work. I am interested in learning about your use of and beliefs about forests in general and old-growth forests in particular. As of today, I have not received your questionnaire. If you have completed the questionnaire in the last few days and mailed it back to me, please accept my sincere thanks.

The questionnaire has only been sent to a small number of Pennsylvania residents; therefore, *every questionnaire is important*. Your response will be very useful as it will help the Pennsylvania Department of Conservation and Natural Resources – Bureau of Forestry (DCNR – BOF) better understand how Pennsylvanians view old-growth forests and what they expect from the old-growth forests the state manages.

Even if you do not visit or use forests, your opinions are still important and must be considered. I want to assure you that your response to this study is voluntary. Responses are confidential as your name will never be connected to your answers. Protecting confidentiality of your answers is important to me and Penn State University.

I have enclosed another copy of the questionnaire. Please place your completed questionnaire in the enclosed addressed and postage-paid envelope, and mail it back to me as soon as possible. If you have any questions, please feel free to contact me at (814) 865-4183 or cms541@psu.edu.

Thank you very much for completing and returning the enclosed questionnaire. Your input is *very* important!

Sincerely,

Collin Shephard
Graduate Research Assistant

Survey Instrument

A Survey of Forest Beliefs: What Do Pennsylvanians Think About Forests?

Please read each question and indicate your answer in the space provided. Your responses will be most useful if you read each question and follow directions carefully. Some questions may be more challenging than others, but please answer what you are able. All information you provide will be treated confidentially and will never be linked with your name.

The first set of questions focuses on your use of and beliefs about forests. Based on your personal opinions, please enter or circle the answer(s) that best describes your response.

Q1. How familiar do you feel you are with forests compared to other Pennsylvanians?

- A.** Well above average
- B.** Above average
- C.** Average
- D.** Below average
- E.** Well below average

Q2a. During the last 12 months, have you spent time in forests at any of the following places? (*PLEASE CIRCLE ALL THAT APPLY*)

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> A. My personal property B. A family member's property C. A friend's property D. Local, state, or national parks E. State forests or game lands F. National forests | <ul style="list-style-type: none"> G. I did not spend any time in forests during the last 12 months → <i>skip to Question 5 on page 2</i> H. Other:
_____ |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Q2b. Of the locations you selected in Question 2, please *WRITE* the letter corresponding to the location where you spent the most time during the last 12 months.

Q3. During the last 12 months, how often did you spend time in forests?

- A.** Not at all
- B.** A few times
- C.** About once a month
- D.** Two or three times a month
- E.** About once a week
- F.** More than once a week

Q4. Please tell us, on average, how often you participated in each of the following forest-related activities during the past 12 months.

Please **CIRCLE** a number for each activity.

ACTIVITY	Not at all	A few times	About once a month	Two or three times a month	About once a week	More than once a week
A. Walking or hiking.....	1	2	3	4	5	6
B. Picnicking.....	1	2	3	4	5	6
C. Camping.....	1	2	3	4	5	6
D. Wildlife viewing (includes birding).....	1	2	3	4	5	6
E. Scenic driving.....	1	2	3	4	5	6
F. Horseback riding.....	1	2	3	4	5	6
G. Hunting or fishing.....	1	2	3	4	5	6
H. ATV driving.....	1	2	3	4	5	6
I. Working to support myself or family.....	1	2	3	4	5	6
J. Other: _____	1	2	3	4	5	6

Q5. People may describe forests in many different ways. Please indicate how likely or unlikely you would be to use each of the following words to describe forests. Use the following scale:

- 5 = Very Likely (VL)
- 4 = Likely (L)
- 3 = Neither Likely or Unlikely (N)
- 2 = Unlikely (U)
- 1 = Very Unlikely (VU)

Please **CIRCLE** a number for each word.

WORD	LIKELY TO USE				
	VU	U	N	L	VL
A. Scary.....	1	2	3	4	5
B. Peaceful.....	1	2	3	4	5
C. Spiritual.....	1	2	3	4	5
D. Dark.....	1	2	3	4	5
E. Exciting.....	1	2	3	4	5
F. Mysterious.....	1	2	3	4	5
G. Dirty.....	1	2	3	4	5
H. Unsafe.....	1	2	3	4	5
I. Cluttered.....	1	2	3	4	5
J. Impenetrable.....	1	2	3	4	5
K. Attractive.....	1	2	3	4	5
L. Natural.....	1	2	3	4	5

Q6. Based on your beliefs about forests, please indicate to what extent you agree or disagree with each of the following statements. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* statement.

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
A. Forests are important because they provide people with clean oxygen and water.....	1	2	3	4	5
B. There is little value in having forests that aren't harvested for their timber.....	1	2	3	4	5
C. Some forestland should be set aside and protected.....	1	2	3	4	5
D. Forests are important because they provide habitat for wildlife.....	1	2	3	4	5
E. The most important benefits derived from forests are not financial.....	1	2	3	4	5
F. Forests are important because they provide people with recreational opportunities.....	1	2	3	4	5
G. Forests are a cultural resource that help identify an area.....	1	2	3	4	5
H. Forests are important because they bring people together.....	1	2	3	4	5
I. Forests that don't provide jobs or income for a community are worthless.....	1	2	3	4	5
J. Forests are important whether or not they provide benefits to people.....	1	2	3	4	5

Q7. Some people want to have areas of forest that are set aside to develop with limited human involvement. Please indicate how important this is to you.

- A. Very Important
- B. Important
- C. Neither Important or Unimportant
- D. Unimportant
- E. Very Unimportant

The next paragraph relates to Questions 8 and 9. Please read the paragraph first. Then, answer the questions by circling the choice that best describes your response.

The Pennsylvania Department of Conservation and Natural Resources-Bureau of Forestry (DCNR-BOF) manages 2.1 million acres (3,280 square miles) of Pennsylvania’s public forestland. Of the 2.1 million acres the DCNR-BOF manages, 550,000 acres (860 square miles; about the average size of a county in Pennsylvania) have been set aside to develop with limited human involvement. The 550,000 acres includes existing Natural Areas (15%) and Wild Areas (27%), as well as Limited Resource Zones (58%). The Limited Resource Zones include buffers along roads and streams, and steep slopes. The DCNR-BOF would like to know your opinion about what should and should not be allowed in these set-aside forests.

Q8. Please indicate how important it is to you that each of following are allowed in the set-aside forests. Use the following scale:

- 5 = Very Important (VI)
- 4 = Important (I)
- 3 = Neither Important or Unimportant (N)
- 2 = Unimportant (U)
- 1 = Very Unimportant (VU)

Please **CIRCLE** a number for each item.

ITEM	IMPORTANCE				
	VU	U	N	I	VI
A. Interpretive signs and displays.....	1	2	3	4	5
B. Non-motorized access (for example: walking, hiking, canoeing).....	1	2	3	4	5
C. Horseback riding.....	1	2	3	4	5
D. Mountain biking.....	1	2	3	4	5
E. Camping.....	1	2	3	4	5
F. Fires for personal use.....	1	2	3	4	5
G. Hunting and fishing.....	1	2	3	4	5
H. Developed interpretive centers with parking lots and bathrooms.....	1	2	3	4	5
I. Motorized access (for example: ATVs, snowmobiles, 4-wheel driving).....	1	2	3	4	5

Q9. The DCNR-BOF could pursue management activities in these set-aside forests. Please indicate how likely or unlikely you would be to support each of the following possible management actions in the set-aside forests. Use the following scale:

- 5 = Very Likely (VL)
- 4 = Likely (L)
- 3 = Neither Likely or Unlikely (N)
- 2 = Unlikely (U)
- 1 = Very Unlikely (VU)
- 0 = Don't Know (DK)

Please **CIRCLE** a number for each management action.

MANAGEMENT ACTION	LIKELY TO SUPPORT					
	DK	VU	U	N	L	VL
A. Timber removal for commercial purposes.....	0	1	2	3	4	5
B. Timber removal of dead and dying trees.....	0	1	2	3	4	5
C. Timber cutting without removal for restoration of specific forest attributes.....	0	1	2	3	4	5
D. Maintenance of existing trails.....	0	1	2	3	4	5
E. Maintenance of existing roads.....	0	1	2	3	4	5
F. Construction of new trails.....	0	1	2	3	4	5
G. Construction of new roads.....	0	1	2	3	4	5
H. Construction of deer fences to control excessive deer browse.....	0	1	2	3	4	5
I. Reintroduction of native plants.....	0	1	2	3	4	5
J. Adding plants expected to do better under predicted climate change.....	0	1	2	3	4	5
K. Mechanical removal of non-native invasive plants.....	0	1	2	3	4	5
L. Herbicide spraying for non-native invasive plants.....	0	1	2	3	4	5
M. Pesticide spraying for insect control.....	0	1	2	3	4	5
N. Fire control (suppression).....	0	1	2	3	4	5
O. Prescribed (intentionally set, controlled) fires.....	0	1	2	3	4	5
P. Oil and gas activities.....	0	1	2	3	4	5

The next paragraph relates to Questions 10 and 11. Please read the paragraph first. Then, answer the questions by circling the choice that best describes your response.

In the future, it may be possible for the DCNR-BOF to set aside more public forestland to develop with limited human involvement. However, there would be several costs associated with this action. Currently, oil and natural gas activities are prohibited on these lands and timber harvesting is highly restricted. Therefore, little to no revenue is generated from these set-aside forests, but the DCNR-BOF still incurs costs associated with its administration and management. Also, there are costs associated the possible management actions listed in Question 9. To increase the amount of public forestland set aside to develop with limited human involvement, it would likely be necessary for the DCNR-BOF to receive additional funding from Pennsylvania’s residents through taxes and fees.

Q10. Suppose Pennsylvania’s residents were asked to vote on a referendum to determine whether or not to increase the amount of public forestland set aside to develop with limited human involvement by 55,000 acres (10% more than there is now), and suppose the cost of this increase would be paid by households like yours. For each of the five possible costs listed below, please indicate whether you would oppose or support the referendum. Use the following scale:

- 4 = Definitely Support (DS)
- 3 = Probably Support (PS)
- 2 = Probably Oppose (PO)
- 1 = Definitely Oppose (DO)

Please **CIRCLE** a number for each amount.

COST TO YOUR HOUSEHOLD (per year)	SUPPORT?			
	DO	PO	PS	DS
A. \$1.....	1	2	3	4
B. \$5.....	1	2	3	4
C. \$10.....	1	2	3	4
D. \$20.....	1	2	3	4
E. \$50.....	1	2	3	4
F. \$100.....	1	2	3	4

Q11. Please indicate to what extent you agree or disagree with each of the following statements about the set-aside forests in Pennsylvania. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* statement.

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
A. Set-aside forests are not necessary	1	2	3	4	5
B. There should be less set-aside forestland than there is now	1	2	3	4	5
C. There doesn't need to be more set-aside forestland than there is now	1	2	3	4	5
D. The amount of set-aside forestland should be increased by more than 55,000 acres (10% of the current amount)	1	2	3	4	5
E. I want more forestland to be set aside, but I would rather write letters or start a petition than pay money	1	2	3	4	5
F. I want more forestland to be set aside, but I would rather volunteer to work on DCNR-BOF projects in the system than pay money	1	2	3	4	5
G. I want more forestland to be set aside, but my household can't afford to pay anything at this time	1	2	3	4	5
H. I want more forestland to be set aside, but someone else should pay for it, not me	1	2	3	4	5
I. I want more forestland to be set aside, but Pennsylvania residents shouldn't have to pay for it	1	2	3	4	5

Q12. Have you ever heard the term 'old-growth forest'?

- A. Yes
- B. No → skip to Question 23 on page 12

Q13. If Questions 8 – 11 had asked about 'old-growth forests' instead of 'forests set aside to develop with limited human involvement,' would you have answered differently? If **YES**, then please use the space below to describe how your answers would have been different.

Q14. People describe old-growth forests in many different ways. Please indicate how likely or unlikely you would be to use each of the following words to describe old-growth forests. Use the following scale:

- 5 = Very Likely (VL)
- 4 = Likely (L)
- 3 = Neither Likely or Unlikely (N)
- 2 = Unlikely (U)
- 1 = Very Unlikely (VU)

Please **CIRCLE** a number for *each* word.

WORD	LIKELY TO USE				
	VU	U	N	L	VL
A. Scary.....	1	2	3	4	5
B. Peaceful.....	1	2	3	4	5
C. Spiritual.....	1	2	3	4	5
D. Dark.....	1	2	3	4	5
E. Exciting.....	1	2	3	4	5
F. Mysterious.....	1	2	3	4	5
G. Dirty.....	1	2	3	4	5
H. Unsafe.....	1	2	3	4	5
I. Cluttered.....	1	2	3	4	5
J. Impenetrable.....	1	2	3	4	5
K. Attractive.....	1	2	3	4	5
L. Natural.....	1	2	3	4	5

Q15. There are many reasons why people believe old-growth forests are important. Please indicate to what extent you agree or disagree with each of the following reasons why old-growth forests are important. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* statement.

OLD-GROWTH FORESTS...	AGREEMENT				
	SD	D	N	A	SA
A. ...provide humans with the cleanest water.....	1	2	3	4	5
B. ...are useful for youth and adult education.....	1	2	3	4	5
C. ...provide humans with more oxygen than young forests.....	1	2	3	4	5
D. ...produce the largest and most valuable timber.....	1	2	3	4	5
E. ...provide beautiful, large trees.....	1	2	3	4	5
F. ...take more carbon out of the atmosphere than young forests.....	1	2	3	4	5
G. ...provide a sense of history for an area.....	1	2	3	4	5
H. ...have more wildlife than younger forests.....	1	2	3	4	5
I. ...are important whether or not they provide benefits to people.....	1	2	3	4	5
J. ...are useful for scientific research.....	1	2	3	4	5

Q16. Based on your beliefs about old-growth forests, please indicate whether you agree or disagree with each of the following statements. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* statement.

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
A. A forest can still be old-growth, even if it has been logged in the past.....	1	2	3	4	5
B. An old-growth forest has never been influenced by humans.....	1	2	3	4	5
C. There's no change in an old-growth forest.....	1	2	3	4	5
D. An old-growth forest is the same as a virgin forest.....	1	2	3	4	5
E. An old-growth forest is the same as a wilderness area.....	1	2	3	4	5
F. Old-growth forests are remote.....	1	2	3	4	5
G. Old-growth forests can't be accessed by people.....	1	2	3	4	5
H. Old-growth forests are a wasteful use of resources.....	1	2	3	4	5
I. If a forest has very old trees, it must be old-growth.....	1	2	3	4	5
J. Old-growth forests have never experienced natural disturbance.....	1	2	3	4	5

For Questions 17 and 18, please circle the choice that you believe best completes the sentence.

Q17. In your opinion, a forest has to be at least ____ years old to be considered old growth. (*PLEASE CIRCLE ONLY ONE*)

- A.** 50
- B.** 100
- C.** 200
- D.** 300
- E.** 400
- F.** 500
- G.** 1,000
- H.** 10,000
- I.** The age of an old-growth forest may vary
- J.** The age of an old-growth forest doesn't matter

Q18. In your opinion, a forest has to be at least ____ acres to be considered old growth. (*PLEASE CIRCLE ONLY ONE*)

- A.** 1
- B.** 5
- C.** 25
- D.** 100
- E.** 500
- F.** 1,000
- G.** 10,000
- H.** The size of an old-growth forest may vary
- I.** The size of an old-growth forest doesn't matter

Q19. The Pennsylvania Department of Conservation and Natural Resources-Bureau of Forestry (DCNR-BOF) manages 2.1 million acres of Pennsylvania’s public forestland of which 550,000 have been placed in an old-growth system dedicated to the restoration and perpetuation of old-growth forest conditions. Some of the forests in this old-growth system have not yet developed old-growth features. Some people believe that managers can create old-growth features in the old-growth system faster than they would naturally develop. Please indicate whether you agree or disagree with each of the following statements about forests that have old-growth features created through applied management. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)
- 0 = Don’t Know (DK)

Please CIRCLE a number for each statement.

STATEMENT	AGREEMENT					
	DK	SD	D	N	A	SA
A. To be considered old-growth, forests with created old-growth features must have the appearance of old-growth forests that developed naturally	0	1	2	3	4	5
B. To be considered old-growth, forests with created old-growth features must ecologically function like old-growth forests that developed naturally	0	1	2	3	4	5
C. Forests with created old-growth features can't be considered old-growth because their features have been created by humans and did not develop naturally	0	1	2	3	4	5
D. A forest with created old-growth features would not be as appealing to me as an old-growth forest whose features developed naturally	0	1	2	3	4	5
E. I could recognize the difference between created old-growth features and those that developed naturally	0	1	2	3	4	5

Q20. As far as you know, have you ever been in an old-growth forest? If **YES**, then please use the space below to tell us the name and/or location (for example: state, county, or town) of up to 5 old-growth forests you have visited.

Q21. Different people have different ideas about what features distinguish old-growth forests from forests that are not old-growth. In **Part I**, indicate whether you believe each of the following features are typically found in old-growth forests. In **Part II**, indicate whether you believe each of the following features are typically found in forests that are NOT old-growth. Use the following scale:

- 1 = Yes, the feature is typically found
- 2 = No, the feature is not typically found
- 3 = I don't know if the feature is or is not typically found

Please **CIRCLE** a number for *each* feature for *Part I* and *Part II*.

PART I: OLD-GROWTH			FEATURE	PART II: NOT OLD-GROWTH		
TYPICALLY FOUND?				TYPICALLY FOUND?		
YES	NO	DON'T KNOW		YES	NO	DON'T KNOW
1	2	3	Many different kinds (species) of trees	1	2	3
1	2	3	Dense leaf canopy	1	2	3
1	2	3	Openings (gaps) in the leaf canopy	1	2	3
1	2	3	Very tall trees	1	2	3
1	2	3	Very large-diameter (width) trees	1	2	3
1	2	3	Very old trees	1	2	3
1	2	3	Trees of many different heights	1	2	3
1	2	3	Trees of many different diameters (widths)	1	2	3
1	2	3	Dead or decaying standing trees	1	2	3
1	2	3	Many different sizes of dead or decaying standing trees	1	2	3
1	2	3	Dead or decaying trees on the ground	1	2	3
1	2	3	Many different sizes of dead or decaying trees on the ground	1	2	3
1	2	3	Dense vegetation on the ground	1	2	3
1	2	3	Many different kinds (species) of plants on the ground	1	2	3
1	2	3	Dark forest floor	1	2	3
1	2	3	Many non-native invasive plants	1	2	3

Q22. If there are any features you believe are typically found in old-growth forests that were not listed in Question 21, please *WRITE* them below.

In this final set of questions, we'd like to ask about yourself and your family. As with all the information you've provided, your answers to these questions will remain confidential and never be linked to your name.

Q23. What is your gender?

A. Male

B. Female

Q24. What year were you born?

19 _____

Q25. What was the highest grade of school you completed? (PLEASE CIRCLE ONE)

A. None

B. Grade school

C. Some high school

D. Completed high school or GED

E. Technical school beyond high school/Associates Degree

F. Completed college

G. Graduate/professional school

Q26. Currently, how many people, including yourself, live in your household?

Q27. How do you describe yourself politically? (PLEASE CIRCLE ONE)

A. Liberal

B. Moderate liberal

C. Moderate

D. Moderate conservative

E. Conservative

Q28. How do you describe your race? (PLEASE CIRCLE ONE)

A. Caucasian

B. African American

C. Hispanic

D. Asian

E. Other:

Q29. What is your religious denomination (PLEASE CIRCLE ONE)?

A. Christian – Catholic

B. Christian – Protestant

C. Christian – Other

D. Jewish

E. Muslim

F. Spiritual – Not Religious

G. Atheist

H. Other:

Q30. What was the total income of your household (before taxes) last year? (PLEASE CIRCLE ONE)

A. Less than \$15,000

B. \$15,000 to \$24,999

C. \$25,000 to \$34,999

D. \$35,000 to \$49,999

E. \$50,000 to \$74,999

F. \$75,000 to \$99,999

G. \$100,000 to \$149,999

H. \$150,000 or more

Non-Response Telephone Survey Instrument

- Q1.** How familiar do you feel you are with forests compared to other Pennsylvanians?
- A. Well above average
 - B. Above average
 - C. Average
 - D. Below average
 - E. Well below average
- Q2.** During the last 12 months, how often did you spend time in forests?
- A. Not at all
 - B. A few times
 - C. About once a month
 - D. Two or three times a month
 - E. About once a week
 - F. More than once a week
- Q3.** Some people want to have areas of forest that are set aside to develop with limited human involvement. Please indicate how important this is to you.
- A. Very Important
 - B. Important
 - C. Neither Important or Unimportant
 - D. Unimportant
 - E. Very Unimportant
- Q4.** Have you ever heard the term 'old-growth forest'?
- A. Yes
 - B. No

If the answer to Q4 was 'Yes,' continue to Q5. If not, skip to Q11

- Q5.** How likely are you to use the word 'scary' to describe an old-growth forest?
- A. Very Likely
 - B. Likely
 - C. Neither Likely or Unlikely
 - D. Unlikely
 - E. Very Unlikely

Q6. How likely are you to use the word 'peaceful' to describe an old-growth forest?

- A. Very Likely
- B. Likely
- C. Neither Likely or Unlikely
- D. Unlikely
- E. Very Unlikely

Q7. How likely are you to use the word 'dark' to describe an old-growth forest?

- A. Very Likely
- B. Likely
- C. Neither Likely or Unlikely
- D. Unlikely
- E. Very Unlikely

Q8. How likely are you to use the word 'attractive' to describe an old-growth forest?

- A. Very Likely
- B. Likely
- C. Neither Likely or Unlikely
- D. Unlikely
- E. Very Unlikely

Q9. Have you ever been in an old-growth forest? If yes, where?

Q10. What year were you born?

19 _____

Q11. What was the highest grade of school you completed?

- | | |
|---------------------------------|----------------------------------------------------------|
| A. None | E. Technical school beyond high school/Associates Degree |
| B. Grade school | F. Completed college |
| C. Some high school | G. Graduate/professional school |
| D. Completed high school or GED | |

Q12. How do you describe yourself politically?

- | | |
|---------------------|--------------------------|
| A. Liberal | D. Moderate conservative |
| B. Moderate liberal | E. Conservative |
| C. Moderate | |

Q13. How do you describe your race?

- | | |
|---------------------|-----------|
| A. Caucasian | D. Asian |
| B. African American | E. Other: |
| C. Hispanic | |

Appendix C

Internet Survey Materials

Initial Invitation Email

Dear Dr. [LastName],

I am asking for your help in a study of beliefs about old-growth forests. I am a Master's candidate in Ecology at The Pennsylvania State University, and this study is part of my thesis research regarding the general public's perception of old-growth forests. The link below is to a survey that is being sent to foresters and forest ecologists that work throughout the eastern United States. The results from this survey will serve as a benchmark with which to compare the results obtained from a similar mail survey of Pennsylvania residents.

Participation in this survey is voluntary and will take no more than 15 – 20 minutes. Your answers are confidential and will be reported only in the aggregate. If you are willing to participate in this study, please click on the link below. This link is uniquely tied to this survey and your email address to ensure that I do not receive duplicate responses. Please do not forward this message.

*** SURVEY LINK***

If you have any questions about the survey or my research, please contact me at (814) 865-4183 or cms541@psu.edu. Please keep this email for future reference.

Thank you for your participation!

Best regards,
Collin Shephard
School of Forest Resources
The Pennsylvania State University
436 Forest Resources Building
University Park, PA 16802

SURVEY MONKEY OPT-OUT LINK

First Reminder Email

Dear Dr. [LastName],

Last week, I sent you an email asking for your help in a study investigating how the general public perceives old-growth forests. In the email, I requested you complete a survey that will be used as a benchmark with which to compare results obtained from a similar mail survey of Pennsylvania residents.

I realize this is a busy time of year as the field season is beginning to ramp up. However, I have contacted a very small number of foresters and forest ecologists like you in hopes of obtaining an informed opinion about old-growth forests.

As I mentioned before, answers are confidential and will be reported only in the aggregate. If you are willing to participate in this study by completing the survey, please click on the link below. The link is uniquely tied to the survey and your email address to ensure that I do not receive duplicate responses. Please do not forward this message.

SURVEY LINK

If you have any questions about the survey or my research, please contact me at (814) 865-4183 or cms541@psu.edu. Please keep this email for future reference.

Thank you for your participation!

Best regards,
Collin Shephard
School of Forest Resources
The Pennsylvania State University
436 Forest Resources Building
University Park, PA 16802

SURVEY MONKEY OPT-OUT LINK

Second Reminder Email

Dear Dr. [LastName],

Over the past few weeks, I've requested you complete a survey about old-growth forests. Please consider taking the time to complete the survey as it is very important to my thesis research. Results from the survey will be used as a benchmark with which to compare results obtained from a similar mail survey of Pennsylvania residents.

I want to assure you that your answers are confidential and will be reported only in the aggregate. If you are willing to complete the survey, please click on the link below. The link is uniquely tied to the survey and your email address to ensure that I do not receive duplicate responses. Please do not forward this message.

SURVEY LINK

If you have any questions about the survey or my research, please contact me at (814) 865-4183 or cms541@psu.edu. Please keep this email for future reference.

Thank you for your participation and best of luck with your field seasons!

Best regards,
Collin Shephard
School of Forest Resources
The Pennsylvania State University
436 Forest Resources Building
University Park, PA 16802

SURVEY MONKEY OPT-OUT LINK

Survey Instrument

A Survey of Old-Growth Forest Beliefs: What Do Foresters and Forest Ecologists Think About Old-Growth Forests?

Please read each question and indicate your answer in the space provided. Your responses will be most useful if you read each question and follow directions carefully. All information you provide will be treated confidentially and will never be linked with your name.

- Q1.** People describe old-growth forests in many different ways. Please indicate how likely or unlikely you would be to use each of the following words to describe old-growth forests. Use the following scale:

- 5 = Very Likely (VL)
4 = Likely (L)
3 = Neither Likely or Unlikely (N)
2 = Unlikely (U)
1 = Very Unlikely (VU)

Please CIRCLE a number for each word.

WORD	<u>LIKELY TO USE</u>				
	VU	U	N	L	VL
A. Scary.....	1	2	3	4	5
B. Peaceful.....	1	2	3	4	5
C. Spiritual.....	1	2	3	4	5
D. Dark.....	1	2	3	4	5
E. Exciting.....	1	2	3	4	5
F. Mysterious.....	1	2	3	4	5
G. Dirty.....	1	2	3	4	5
H. Unsafe.....	1	2	3	4	5
I. Cluttered.....	1	2	3	4	5
J. Impenetrable.....	1	2	3	4	5
K. Attractive.....	1	2	3	4	5
L. Natural.....	1	2	3	4	5

Q2. There are many reasons why people believe old-growth forests are important. Please indicate to what extent you agree or disagree with each of the following reasons why old-growth forests are important. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* statement.

OLD-GROWTH FORESTS...	AGREEMENT				
	SD	D	N	A	SA
A. ...provide humans with the cleanest water.....	1	2	3	4	5
B. ...are useful for youth and adult education.....	1	2	3	4	5
C. ...provide humans with more oxygen than young forests.....	1	2	3	4	5
D. ...produce the largest and most valuable timber.....	1	2	3	4	5
E. ...provide beautiful, large trees	1	2	3	4	5
F. ...take more carbon out of the atmosphere than young forests.....	1	2	3	4	5
G. ...provide a sense of history for an area.....	1	2	3	4	5
H. ...have more wildlife than younger forests.....	1	2	3	4	5
I. ...are important whether or not they provide benefits to people.....	1	2	3	4	5
J. ...are useful for scientific research.....	1	2	3	4	5

Q3. Please indicate whether you agree or disagree with each of the following statements. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* statement.

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
A. A forest can still be old-growth, even if it has been logged in the past.....	1	2	3	4	5
B. An old-growth forest has never been influenced by humans.....	1	2	3	4	5
C. There's no change in an old-growth forest.....	1	2	3	4	5
D. An old-growth forest is the same as a virgin forest.....	1	2	3	4	5
E. An old-growth forest is the same as a wilderness area.....	1	2	3	4	5
F. Old-growth forests are remote.....	1	2	3	4	5
G. Old-growth forests can't be accessed by people.....	1	2	3	4	5
H. Old-growth forests are a wasteful use of resources.....	1	2	3	4	5
I. If a forest has very old trees, it must be old-growth.....	1	2	3	4	5
J. Old-growth forests have never experienced natural disturbance.....	1	2	3	4	5

For Questions 4 and 5, please circle the choice that you believe best completes the sentence.

Q4. In your opinion, a forest has to be at least ____ years old to be considered old growth. (*PLEASE CIRCLE ONLY ONE*)

- A.** 50
- B.** 100
- C.** 200
- D.** 300
- E.** 400
- F.** 500

- G.** 1,000
- H.** 10,000
- I.** The age of an old-growth forest may vary
- J.** The age of an old-growth forest doesn't matter

Q5. In your opinion, a forest has to be at least ____ acres to be considered old growth. (*PLEASE CIRCLE ONLY ONE*)

- A.** 1
- B.** 5
- C.** 25
- D.** 100
- E.** 500
- F.** 1,000

- G.** 10,000
- H.** The size of an old-growth forest may vary
- I.** The size of an old-growth forest doesn't matter

Q6. Different people have different ideas about what features distinguish old-growth forests from forests that are not old-growth. In **Part I**, indicate whether you believe each of the following features are typically found in old-growth forests. In **Part II**, indicate whether you believe each of the following features are typically found in forests that are NOT old-growth. Use the following scale:

- 1 = Yes, the feature is typically found
- 2 = No, the feature is not typically found
- 3 = I don't know if the feature is or is not typically found

Please **CIRCLE** a number for *each* feature for *Part I and Part II*.

PART I: OLD-GROWTH			FEATURE	PART II: NOT OLD-GROWTH		
TYPICALLY FOUND?				TYPICALLY FOUND?		
YES	NO	DON'T KNOW		YES	NO	DON'T KNOW
1	2	3	Many different kinds (species) of trees	1	2	3
1	2	3	Dense leaf canopy	1	2	3
1	2	3	Openings (gaps) in the leaf canopy	1	2	3
1	2	3	Very tall trees	1	2	3
1	2	3	Very large-diameter (width) trees	1	2	3
1	2	3	Very old trees	1	2	3
1	2	3	Trees of many different heights	1	2	3
1	2	3	Trees of many different diameters (widths)	1	2	3
1	2	3	Dead or decaying standing trees	1	2	3
1	2	3	Many different sizes of dead or decaying standing trees	1	2	3
1	2	3	Dead or decaying trees on the ground	1	2	3
1	2	3	Many different sizes of dead or decaying trees on the ground	1	2	3
1	2	3	Dense vegetation on the ground	1	2	3
1	2	3	Many different kinds (species) of plants on the ground	1	2	3
1	2	3	Dark forest floor	1	2	3
1	2	3	Many non-native invasive plants	1	2	3

Q7. If there are any features you believe are typically found in old-growth forests that were not listed in Question 6, please **WRITE** them below.

Q8. We'd like to know what you believe is acceptable in old-growth forests. Please indicate to what extent you agree or disagree with allowing each of the following in old-growth forests. Use the following scale:

- 5 = Strongly Agree (SA)
- 4 = Agree (A)
- 3 = Neither Agree or Disagree (N)
- 2 = Disagree (D)
- 1 = Strongly Disagree (SD)

Please **CIRCLE** a number for *each* item.

ITEM	AGREEMENT				
	SD	D	N	A	SA
A. Interpretive signs and displays.....	1	2	3	4	5
B. Non-motorized access (for example: walking, hiking, canoeing).....	1	2	3	4	5
C. Horseback riding.....	1	2	3	4	5
D. Mountain biking.....	1	2	3	4	5
E. Camping.....	1	2	3	4	5
F. Fires for personal use.....	1	2	3	4	5
G. Hunting and fishing.....	1	2	3	4	5
H. Developed interpretive centers with parking lots and bathrooms.....	1	2	3	4	5
I. Motorized access (for example: ATVs, snowmobiles, 4-wheel driving).....	1	2	3	4	5

Q9. Please indicate how likely or unlikely you would be to support each of the following possible management actions in old-growth forests. Use the following scale:

- 5 = Very Likely (VL)
- 4 = Likely (L)
- 3 = Neither Likely or Unlikely (N)
- 2 = Unlikely (U)
- 1 = Very Unlikely (VU)

Please **CIRCLE** a number for *each* management action.

MANAGEMENT ACTION	LIKELY TO SUPPORT				
	VU	U	N	L	VL
A. Timber removal for commercial purposes.....	1	2	3	4	5
B. Timber removal of dead and dying trees.....	1	2	3	4	5
C. Timber cutting without removal for restoration of specific forest attributes.....	1	2	3	4	5
D. Maintenance of existing trails.....	1	2	3	4	5
E. Maintenance of existing roads.....	1	2	3	4	5
F. Construction of new trails.....	1	2	3	4	5
G. Construction of new roads.....	1	2	3	4	5
H. Construction of deer fences to control excessive deer browse.....	1	2	3	4	5
I. Reintroduction of native plants.....	1	2	3	4	5
J. Adding plants expected to do better under predicted climate change.....	1	2	3	4	5
K. Mechanical removal of non-native invasive plants.....	1	2	3	4	5
L. Herbicide spraying for non-native invasive plants.....	1	2	3	4	5
M. Pesticide spraying for insect control.....	1	2	3	4	5
N. Fire control (suppression).....	1	2	3	4	5
O. Prescribed (intentionally set, controlled) fires.....	1	2	3	4	5
P. Oil and gas activities.....	1	2	3	4	5

Appendix D

Qualitative Survey Results

Old-Growth Forests the Public has Visited

1323	Black Forest – Germany BWCA – Northern MN Cascades – OR Mt Baker – OR Gokarna Forest – Nepal	PA - Jacobsburg State Park PA – Hickory Run in the Poconos PA – My own backyard PA – Stonybrook State Park, Tioga County
1038	Redwoods Arcadia Shenandoah	1349 California Redwoods, Sequoia Nat'l Park OR – Costal Forests and Cascade Mountains
1071	I think it was called Red Rock state park near Benton, PA	0377 CA – Redwoods PA – Several counties
1052	Poconos, PA Upstate, NY, Adirondacks Mt. of W.Va. Blue Ridge Parkway, NC, Boone	1036 Yes, can't remember name of state park. It was in Central PA.
1337	Delaware State Forest (NE PA) Promised Land State Park (Poconos) Valley Forge State Park (SE PA) Ridley Creek State Park (SE PA) Pine National Forest (Colorado) San Juan Nat'l Forest (Colorado) Prescott Nat'l Forest (Arizona)	0032 Cooks Forest Johnstown Alleg. Nat. Forest
0292	Cook Forest State Park Bear Meadows Natural Area Pine Creek Gorge	0465 Cooks Forest
0286	Hemlock area, Perry County, west of Blain	1421 Vancouver Island, Canada. We were in the McMillan Cathedral Forest.
0332	Micheaux	1455 Calif. Oregon Washington State NJ
0135	White Mountain Area near Mont Alto Campus	1299 Muir Woods
0156	Allegheny Nat. Forest Warren, PA Black Forest Colorado Yellowstone Park	1512 Hickory Run State Park
0148	State game land 42, PA, Westmoreland, Ligonier Twp	1143 Tyler State Park, Newtown PA Ricketts Glenn, Bloomsburg PA Lock Haven, PA
1115	Ricketts Glen State Park	0211 Cooks Forest
1044	PA - Michau State Park (sp?) near Gettysburgh	0241 Paradise Furnace, Huntingdon Co., Pa. (Known as Trough Creek State Park) Potter Co., Pa. Kerlske State Park in Ky.
		0348 Seven Mountains Area of Centre County

- 0223** Hearts Content
- 0209** Cooks forest
- 1100** I have visited many sites on E. Mountains, where I reside, on quads near Montage, (SNO Mtn), Scranton, PA, 18505. Not only have I experienced old growth forests but I also was near the Nesbitt Dam and the #5 Dam. I have some old growth forest in my back yard.
- 1051** Potter/Tioga Counties
- 0389** Wisconsin – Pine forest – Set aside during lumber boom late 19th cent.
California – Redwood forest – Preserved
Montana– Douglas fir forest – Preserved
- 1049** Yes – can't recall – Yellowstone National Park??
- 1315** World's End State Park
- 0226** Tionesta, PA
- 0312** Yosemite
Redwoods
Olympic Peninsula
Hemlock Natural Area
- 0202** Yes – Rochester mills
- 0375** Redwood Forest California
- 0214** Cooks Forest
- 0391** Joyce Kilmer, NC (I think)
Pisgah National Forest, NC
- 0393** The Pa Grand Canyon Area
- 0385** Stone Creek Valley, Huntington County, PA – Alan Seeger, Wipple DAM
Pine Grove, PA – Mt. Gretna Area
Fort Jackson Area Columbia, SC
Blue Ridge Mtn's – VA
Warren and McKean County, PA –
Allegheny National Forest
Moraine St. Park, PA
Tioga County, PA – Grand Canyon of PA
Ricketts Glen St. Park
- 0346** Pokomoke State Forest, Pocomoke, MD
Swallow Falls State Park, MD
- 0395** Spartinsburg
WMSP Water Authority
Alleghaney State Park
- 0205** Cook forest
- 0185** Alleganey
Cook
McConnells
- 1152** Redwoods Tall Tree Grove. California
Sequoia National Forest, California
Napoli Coast Kauia (sp?) Hawaii
Zion National Park, UT
Yosemite National Park, California
Denalli National Forest, Alaska
- 1180** PA, Elk Co.
- 0057** Sanfrancisco – Muir WOODS
PA – Pocono Region
- 0373** Upstate NY near Cooperstown.
- 0132** Cook's Forest near Clarion, PA
- 0024** Cook's And Allegheny both in PA
- 1321** Redwood Forest - Northern CA
Glacier N.P - Montana
Banff – Canada
- 1073** Jim Thorpe, PA Glen Onoko
- 1196** Cooks forest, pa
Yesememie, Calf
Big Sur, Cal.
Smoky Mts – Tenn.
Pa. Clinton Co.
- 1008**
- 0207** Heart's Content, Penn.
- 1385** Nolde Forest South of Reading PA
- 0289** Little Grand Canyon
Hawk Mountain
Bushkill
- 0276** Ricketts Glen State Park
Allen Seeger Picnic Area
- 0133** Washington Co PA
Greene Co PA
- 1393** Nolde Forest, Berks County, PA
- 1625** Pine Creek Gorge PA
Tall Timbers Natural Area PA
Hearts Content PA
Swallow Falls State Park Md.
Caledon Natural Area VA
Monongahela National Forest WV
- 0502** Cook Forest

- 0368** Sullivan County Hillsgrove, Forksville Estella Area
Fern Canyon CA
Several in Oregon
The Rainforest El Yunque PR.
- 1465** The Silver Lake Wilderness Area in New York State's Adirondack Park
Hamilton County near Benson
West Elk Wilderness, CO near Gunnison
- 0623** Virgin Hemlocks up state - off Route 75 above Fort Loudon
- 0514** PA Cook Forest
Hermit Springs near Sheffield PA.
- 0554** I have encountered several old growth forests while hiking In Erie, Chautauqua, Warren, Crawford, and other counties
- 1563** Longwood Gardens
Redwood Forrest
- 1624** California
- 1214** Yes, but forget names/location.
- 1763** Redwood Park CA
Tyler Aboreatum PA
- 0936** Lackawanna County PA
Delaware Water Gap PA
Pothole State Park Lynon(sp?)
- 0781** Penna GameLands, Leeper, Forest Co.
GameLands at the end of Alis Rd, Leeper, along Bull Run intersecting w/ Big Coon Cr Wally Run
- 0661** Penna-Clinton County
Arizona-Tuscan
New York – Bradford County
Canada – Montrall?
- 1482** Ralph Stover Park, Bucks Co., PA
Lake Plaid area, N.Y.
- 0941** Muir Woods – Near San Francisco, California

Additional Attributes Typical of Old-Growth Forests – Public

- 0160** Vines you could surf on
- 0135** Animal trails, other signs of wildlife
- 0348** Mature vegetation beneath canopy
- 1100** I have seen families of baby raccoons, rats, baby chipmunks living in a hollowed out log on standing old stump. So, an old-growth forest is home to many animals. The downed, hollowed out trees make great shelters.
- 1205** The different sound, or lack of it!
- 0393** Thick dense Hemlock with little ground cover
- 0057** Higher diversity of animals and insects
- 0132** More animal/bird species
- 0024** Artifacts/treasures of history
- 1321** Animal activity
- 0276** Little wildlife
- 1194** Many different kinds of animals living with highly organized conglomerates i.e., wolves, bears, snakes, hawks, eagles, beavers
- 1465** Silver Like Wilderness has quite a few blow downs (large trees) – seems to encourage dense beech and birch saplings
- 0514** What species, what kind
- 0554** The soil always seems a lot richer in old forest. When woods in areas have been logged heavily erosion takes its toll.
- 0264** Old-growth forests have far more moss growing on the ground covering the forest floor.

Additional Attributes Typical of Old-Growth Forests – Scientists

- 1** Abundance and variety of types of non-vascular plants, fungi, lichens, invertebrates
- 2** More variability in tree sizes, ages, and spatial pattern than younger forests.
- 4** High frequency and diversity of dispersal-limited plant species
Gap-phase spatial dynamics
Well-developed soil structure
Distant from human-generated forest edges"
- 5** Peoples initials in old trees
- 8** I find the best indicator of old growth is crown size.
- 10** My basic criteria for old growth (structural definition) is a forest with large old trees (in the northeast may be oaks, beech, hemlock, sugar maple or mixtures of these). It has standing and fallen dead trees, a gap dynamic with denser understory in gaps. Old growth forests should be several acres in size in order to preserve the qualities of old growth. I think about 5 acres at a minimum.
- 12** Large accumulations of coarse woody debris, particularly larger piece sizes.
- 13** Diversity of wood-decay fungi and wood-inhabiting beetles, complex forest canopy structure
- 14** Low level of prior anthropogenic disturbance.
A large volume of dead and down wood.
Uneven-aged forest structure"
- 15** Mound and pit micro-topography
- 16** Pit-and-mound topography is often a characteristic of old-growth.
- 18** Epiphytes, thick litter layer, well developed soil horizons with high organic matter content, high soil biodiversity
- 20** Tolerant dominants
- 21** A wide range in the representation of trees of different cohorts indicating continuity of recruitment.
- 23** Broader range of sizes of canopy openings; more pit and mound topography; more developed forest floor
- 24** Locally, it has been shown that the diameter range for woody debris on the forest floor extends to much larger sizes in old-growth remnants.
- 25** Mounds and pits from previous generations of windthrown uprooted trees. Oldest trees very seldom have large branches low down.

- 26 More complex food webs
More specialist (as opposed to generalist) species
- 27 Pit and mound topography reflecting uprooting of large trees over centuries, greater abundance or frequency of endemic species (plants and animals)
- 29 Unusual growth forms of trees, gnarled canopies, tertiary bark characteristics, large pit and mound complexes
- 30 Moss, lichen, epiphytic plants
- 32 Greater proportion of larger size classes of dead wood in older versus younger

**Comments on how Answers Would Have Changed had “Old-Growth Forests”
Replaced “Forests Set Aside to Develop with Limited Human Involvement”**

- 0160** I'd have answered even further in favor of the forests.
- 1011** Yes – need more unmanaged old growth forest in PA.
- 0148** Limited timber cutting
No roads other than what we have
No drilling at all
Take care of what we have
- 0383** I would try and answer differently. Old growth forests should remain untouched.
- 1115** Old growth forest should have the most limited human intervention and access.
- 0465** To my knowledge an old growth forest is different from ‘forests set aside to develop w/ limited involvement’, i.e., Cook’s Forest. An old growth forest is the result of the ‘forests set aside to develop w/ limited human involvement’ after about 400 years.
- 1051** Yes – I don’t believe old growth should be disturbed in any way. All old growth should be preserved for non-invasive activities only.
- 1315** Yes, because old growth forests have a history. They have not been impacted as severely as other “forested” forests. Also, native species are much more likely to be flourishing in an old growth forest.
- 0380** I’d say “old growth forests” should have very limited human involvement, if any. There may be trees and other vegetation or animal life that should not be disturbed and at risk of being lost.
- 0312** Yes – Old growth should be preserved forever.
- 0385** Yes, I would have answered slightly different. “Old growth” forests are to be protected and treasured as a state (and) national monument. However, old growth forests earn that designation in one way: left alone by man for many generations with the exception of very RARE selective cutting to promote healthy, old growth timber and in keeping with the best practices of “responsible” forestry preservation management!
- 1014** No fires
No hunting or fishing
- 1151** Yes. Old growth forests should be protected at all costs. It is not easy to replace and it is something that should be cherished!
- 0132** Yes, I would have answered “very unlikely” for new construction of trails/roads and “very unlikely” for construction of deer fences. Basically I would disagree with any management action in disturbing anything with regard to “old growth forests” – should be left as is!

- 0024** If we really want to save forests and animals from extinction leave them alone. Letting the general public access to it will not be beneficial. Let's continue to preserve them.
- 1003** We need some areas left untouched to be able to determine how our forests are holding up under man and mother nature's demands.
- 1046** Yes – would likely have thought setting aside these areas was more important if they contained old growth timber. And the associated costs less burdensome.
- 1188** Never touched forests.
- 1079** “Old growth” forests should not be touched except to preserve in a very limited way. I would hope hiking would occur, but I would rather have them preserved in their natural state then trashed, damaged, or burned by humans.
- 0131** Depending on how many “old growth forests” exist. Some answers would be different – Leave it alone.
- 0255** May be more likely to pay w/ tax money for old growth forest.
- 1624** Yes – There should be no disturbance to old growth forests.
- 1214** Yes, let the forests develop as they are, except for possibly eliminating plants and trees not natural to the area.