Chapter 4

A Survey of Forest Managers' Attitudes and Perceptions

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4. A Survey of Forest Managers' Attitudes and Perceptions

The National Forest System of the U.S. Forest Service is responsible for the overall management of the national forests. By law, all national forests must develop and implement management plans for all natural resources; they must establish management requirements and describe practices to ensure sustained yields of products and services (NFMA 1976). The plans provide forest-wide standards and guidelines and management prescriptions for each natural resource. By law, all plans are to be revised every 10-15 years. Many national forests are in the process of revising the management plans. In Eastern United States, all of the plans should have a completed revision by 2002. Without reliable information on often overlooked NTFPs such as medicinal plants, these policies will be written without an eye for conservation of this vital resource.

The national forests are managed for multiple objectives. Some objectives, like timber, water, and minerals, are legislated and are found in every national forest management plan (NFMA 1976). Other objectives emerge through the public involvement process that is required in developing national forest management plans. These public issues (e.g., biological diversity, roads and infrastructure, and cultural resources) may vary among national forests. The inclusion of these products in management plans depends greatly on the attitudes of the public and the many groups that influence the decisions of forest managers.

In developing and implementing forest management plans, the managers of our national forests have a daunting task to balance the demands of the public with the requirements of the law. New and emerging issues increase the complexity of the plans and the process tremendously. This research addresses an emerging issue: the management of national forests for non-timber forest products (NTFPs). It examines the attitudes and perceptions of the forest managers toward including NTFPs into these plans.

Non-timber forest products are emerging as an issue of concern within the U.S. Forest Service. Though these products are primarily herbaceous plants or fungi, they may also come from trees. NTFPs are currently organized into four product categories: floral and decorative; foods and edibles; specialty wood, and medicinal and dietary supplements. Evergreen boughs, moss, galax, grapevine, and the leaves, twigs and branches of forest plants may be harvested for floral and decorative products. Wild onions, fungi, as well as the fruits and sap of many plants are harvested and consumed as food. Branches, logs, roots, and trunks are harvested to make specialty wood products. And the roots, leaves, bark, and in some cases the entire plant are harvested for medicinal purposes.

A great deal of research has focused on understanding the attitudes of consumers and stakeholders toward social issues. But no research has tried to improve the understanding of forest managers' attitudes toward non-timber forest management. This research was designed to measure the attitudes and perceptions of forest managers to determine their propensity to include NTFPs in management plans.

The results of this research are particularly relevant to policy makers who are concerned with the management of national forests. It provides valuable insight into how forest managers feel about

a new and emerging issue. Also, it provides insight into why these managers may or may not move to include NTFPs in forest management plans

4.1 Theoretical Framework

Before discussing the application of this research for forest managers of national forests, it is important to establish a theoretical framework on which to base the research. The early work of Martin Fishbein and Iczek Ajzen (1975) provides a good starting point. Their Theory of Reasoned Action (TRA) proposes that peoples' behavior can be predicted by measuring their attitude toward that behavior, and their perception of how influential people feel toward the behavior. The theory has been used to study consumer's intended behavior on many different social issues, including energy conservation, recycling, and environmental issues. This study extends the model to examine forest managers' intended behavior toward an emerging social issue, sustainable management of non-timber forest products. The following sections present the theoretical model; provide examples of how it has been used, and discusses its limitations and how they may affect the current research.

4.1.1 Model Definition

The Theory of Reasoned Action (Fishbein and Ajzen 1975) is based on the fundamental assumption that people are rational and make systematic use of available information. The theory argues that people consider the implications of their actions before they decide to engage or not to engage in a given behavior. The ultimate goal of the Theory of Reasoned Action (TRA) is to predict and understand an individual's behavior (Fishbein and Ajzen 1975).

The theory views a person's intention to perform a behavior as the immediate determinant of the behavior (Fishbein and Ajzen 1975). According to the theory, a person's behavior intention is a direct indicator of actual behavior. All else remaining equal, people usually act in accordance with their intentions (Ajzen and Fishbein 1980).

The Theory of Reasoned Action argues that behavior can be explained by two basic determinants (Figure 4.1). The basis for a person's behavior is determined by his/her attitude toward that behavior, and his/her perception (subjective norm) of how influential people feel they should behave. As illustrated, behavior is directly linked to a person's intended behavior, which in turn is a function of two basic factors.

According to the theory, all other influential factors will only affect behavior intention indirectly through one or both fundamental components: attitude and the subjective norm. People will intend to perform a behavior when they have a positive attitude toward the behavior, and when they perceive that influential people think they should perform the said behavior.

Attitude toward the behavior of interest is considered the personal component of this theory (Ajzen and Fishbein 1980). After a comprehensive review of the literature, Gordon Allport proposed his definition of attitude: individual's positive or negative evaluation of performing a given behavior (Ajzen and Fishbein 1980). It was this definition that became the fundamental basis for the attitude component of the Theory of Reasoned Action. According to Ajzen and

Fishbein (1980 p.17), Allport defines attitude as "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related." Fishbein (1967) elaborated on this, and asserted that attitude is a person's tendency to respond consistently, either favorably or unfavorably, to an object or set of objects. Fishbein and Ajzen (1975) argue that attitude toward performing a particular behavior is based on a set of fundamental beliefs that performing the said behavior will have certain consequences. The evaluation of these consequences is a determinant of a person's attitude toward the behavior of interest.

The second determinant of behavior intention is the person's perception of social pressures to perform or not to perform the behavior (Fishbein and Ajzen 1975). This component is considered the subjective norm or perception variable. It is an indication of the person's perception of how influential others feel toward the behavior. According to Kalafatis et al. (1999), the subjective norm is a measurement of whether a particular influential person thinks the respondent should or should not do the desired behavior. The determinant is subjective because it indicates what the respondent thinks, and it is normative because it measures the respondents, understanding of what other people think should be done (Kalafatis et al. 1999).

In this research, thirteen groups of influential others were identified. These were selected through interviews and discussions with the professionals who were involved in development of the measurement instrument. These groups and individuals represent the major factors that influence forest managers' perceptions. Influential others include government (local, state and federal) and non-government, as well as private industry forces. Non-governmental forces include environmental groups, hunting and recreation organizations, and civic groups. Also, NTFP collectors, the general public, core colleagues and supervisors all influence forest manager's perception.

Neither component of the theory is directly observable, but must be inferred through measurement of responses to specific statements (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980). A common measurement procedure from which it is possible to infer a person's attitude and perception is from responses to specific questions or statements (Aiken 1980). This procedure allows the researcher to locate respondents along a bipolar continuum that refers to their degree of favorableness toward the behavior (Fishbein and Ajzen 1975; Ajzen 1993). Development of a multi-item scale results in a single value that represents a person's attitude toward the behavior, and a separate index for their perception (Ajzen and Fishbein 1980).

The strength and direction of the relationships between the two components and behavior intention may vary with the particular behavior of interest (Ajzen and Fishbein 1980). In general, people will have a more positive attitude toward behaviors when they perceive that influential others think positively about the behavior. With some particular behaviors, attitude may be the dominant influential component, while perception may be a stronger determinant with other behaviors. The relative strength of each component may vary from one behavior to the next (Ajzen and Fishbein 1980).

According to Ajzen and Fishbein (1980) the direction of the relationship between the two components and behavior may not agree. In other words, there are situations where a person may

have a positive attitude toward the behavior and have a negative perception. For example a person might like to wear fur coats, but not do so because others seem to dislike furs. Or, conversely, people may have a negative attitude, but a positive perception toward the behavior. For example, individuals might not like jogging but choose to do so because everyone else does it. Under these circumstances, a person's intentions are determined by the relative strength of the two components on behavior.

The strength of the correlation between attitude and behavior intention depends on several factors: specificity of behavior; time between measurement and behavior; and perceived ability to perform the said behavior (Ajzen and Fishbein 1980; Aiken 1980). How explicitly defined the intended behavior is directly affects the strength of the relationship with attitude. More general behaviors result in weaker correlations. The more clearly defined and articulated the desired behavior is to the respondents, the stronger the relationship with attitude. In general, the relationship between attitude and behavior is strongest when the respondents clearly understand the behavior of interest.

The length of time between the measurement of attitude and the desired behavior also affects the strength of the relationship. Obviously, the shorter the time frame between attitude measurement and desired behavior, the greater the correlation.

Finally, correlation depends on the respondent's perceived ability to perform the desired behavior. The correlation between attitude and behavior intention will be weaker when the respondent does not feel the ability to perform the desired behavior. Stronger correlations are realized when the respondent feels able to perform the behavior of interest. The strength of the relationship depends on the person's ability to perform the behavior. If the person is completely unable to perform the behavior (i.e., it is out of her/his control) the correlation will move toward zero.

4.1.2 Theory Usage

The Theory of Reasoned Action has been used to examine many different issues (Ajzen and Fishbein 1980). It has been used on social issues such as AIDS prevention, predicting safe sex behavior, explaining unethical conduct, as well as explaining cigarette smokers' decisions to stop (Terry et al. 1993; Krebs and Schmidt 1993). The theory also has been used to address a number of environmental issues, including green marketing, the purchasing of organic foods, decisions to recycle, and conserve energy (Huang 1996; Goldenhar and Connell 1993; Awad et al. 1983; Chan 1998; Mainier et al. 1997, Taylor and Todd 1995).

The Theory of Reasoned Action has been the framework for a large number of studies on social issues, including exercise promotion (Godin 1994, Collette et al. 1994), perceived impact of tourism on local environment (Ap 1992), and understanding and predicting recycling behavior (Goldenhar and Connell 1993, Taylor and Todd 1995). The TRA has been the basis of integrated studies focused on conservation (Skaggs et al. 1994), waste management (Chan 1998; Zeiss and Lefrud 1995) as well as recreation (Nord et al. 1998, Bright 1998).

Seligman et al. (1983) used the Theory of Reasoned Action to predict home energy conservation. They argued that the model defines attitude as a disposition to respond consistently (negatively or positively) toward the object of the attitude. They proposed that home energy consumption could be predicted by an individual's intention to conserve energy. According to Seligman et al. (1983), intention to conserve home energy can be predicted by two basic precepts: 1) the individual's attitude toward conserving energy as derived from personal beliefs about the consequences of conservation and 2) the person's perception of how influential others perceive the need to conserve energy. The authors suggest three reasons why past research has had difficulty demonstrating a strong relationship between attitude and behavior: 1) the behavior was not precisely defined, 2) other factors may have a greater effect on behavior and 3) it is difficult to correlate global attitudes with specific behaviors. Even with these difficulties, Seligman et al. (1983) confirmed the proposed relationship between the components of the theory.

The findings of a study published by Awad et al. (1983), which examined customers' attitudes and intentions to conserve energy, also were consistent with the Theory of Reasoned Action. While the authors found attitude to be predictive of energy conservation, perception was not predictive. The authors argue that behavior intention is only predictive of behavior under certain conditions. First, the desired behavior must be well defined and articulated. Second, the time between measuring behavior intention and when the desired behavior will take place must be relatively short. In other words, the predictability of behavior intention decreases as time increases. Finally, the desired behavior must be under the volitional control of the respondent.

Skaggs et al. (1994) used a multinomial logit model to identify participant characteristics that influenced the New Mexico Conservation Reserve Program (CRP). Their analysis revealed perceived constraints and opportunities to improve the CRP. Nord et al. (1998) examined the relationship between forest recreation and a person's attitude toward environmentalism. Earlier, Minton and Rose (1997) investigated the relative effects of environmental concern on three consumer behaviors and six behavioral intentions. Their results suggest that personal norms had primary influence on the behavior, while attitude had primary influence on behavior intention.

Chan (1998) applied the Theory of Reasoned Action to predict behavioral intentions and actual behavior of voluntarily using waste recycling receptacles. His results indicate that attitude was the major factor in predicting behavior intention. Zeiss and Lefrud (1995) used the theoretical framework to examine stakeholders' attitudes toward the locating of waste-treatment facilities. Bright (1997) suggested that obtaining quality information about stakeholders' attitudes toward recreation management issues requires data about the strength of those attitudes. He examined the moderating effects of attitude-certainty and personal relevance on the relationship between attitude-extremity and prediction of support for management strategies, and stakeholder perceptions of arguments for management strategies. Bright found that the predictive value was related to the nature of the beliefs.

Consumer attitudes and preferences toward "green and organic" products also have been studied using the Theory of Reasoned Action (Mainier et al. 1997, Huang 1996). Huang (1996) used a two equation bivariate probit model to analyze consumer preferences and attitudes toward organically grown produce. Looking at the influence of environmental concern on consumer behavior, Mainer et al. (1997) used predictor variables that included awareness about

environmental impacts of products, specific environmental beliefs of consumers, several general environmental attitude scales, demographic, and several pro-environmental behaviors. They found that specific consumer beliefs predicted several "green-buying" behaviors, as well as some general attitudes.

Improving communications and information systems are often the foci of research that uses the Theory of Reasoned Action. Tarrant et al. (1997) studied ways of generating favorable stakeholder attitude toward ecosystem management. Their results showed that in general, respondents had very little knowledge about ecosystem management, and the most favorable attitudes were associated with messages containing strong arguments for management. Bergeran et al. (1995) focused on understanding the various factors that affect the efficiency of executive information systems.

Based on this review, the Theory of Reasoned Action seems appropriate for this research. The attitudes of forest managers are important in developing a better understanding of their intention to manage for NTFPs. Also, their perceptions of how influential people feel toward NTFP management may be an important factor in management for NTFPs.

4.1.3 Theory Limitations

The Theory of Reasoned Action is not without its weaknesses (Simmons and Widman 1990, Hines et al. 1986-87, Weigel 1983, Ajzen and Fishbein 1977, Mainier et al. 1997). Mainier et al. (1997) suggest four possible reasons for low predictive relationships between attitude and behavior. First, we cannot assume that one measure for attitude is good for all behaviors. It is essential that the measure for behavior is clearly and accurately defined. Simmons and Widman (1990) suggest that respondent frustration with how to translate the desired behavior into action may inhibit behavior. Second, the level of specificity in the measures of both attitude and behavior can influence predictability. General behaviors cannot be measured by specific attitudes. Attitude measures can be expected to only predict closely related behaviors.

The third factor that might influence the predictive ability of attitude is the existence of other explanatory variables. Attitude is not the only factor that influences behavior, and the existence of these other variables can directly impact the predictive ability of attitude (Mainier et al. 1997, Hines et al. 1986-87). According to these authors, other factors include knowledge of the subject, social norms, economic constraints, and alternative choices.

Finally, Mainier et al. (1997) suggest that the lack of reliability and validity in earlier studies may have impacted interpretation. Reliability and validity are criteria that determine the quality of the measurement instrument (Mueller 1986). Validity determines if the instrument is measuring what was intended, while reliability deals with consistency and accuracy. Mueller (1986) suggests three reasons for low validity: 1) low reliability of the attitude measurement; 2) actual behavior does not mirror the indicated behavior; and, 3) dissimilarity between attitude and behavior. The use of multiple item scales instead of single measures can help to reduce these problems (Mainier et al. 1997). Cross-validation analysis on a holdout sample is important to demonstrate that the measurement instrument is useful beyond the population from which it was developed.

Another problem that is inherent with the model is the potential for multi-collinearity between independent variables. Collinearity occurs when independent variables are linearly dependent (Goldberger 1991). This phenomenon means that some independent variables are predicted by the other independent variables (Brannick 2000). When this situation occurs, the estimated coefficients are not stable and small fluctuations in the sample can have large impact on the model. Highly significant correlations between independent variables are predictive of this problem. Though multi-collinearity may not affect the predictive ability of the overall model, it does create difficulties in the explanation of the influence variables have on the dependent variable (Chong-ho 2000). Few attitude studies have addressed this problem. For example, Kalafatis et al. (1999) report significant correlations between most independent variables, and yet do not consider the potential ill effects of interaction between the variables. This potential problem can be investigated through factor and correlation analysis.

Another difficulty, inherent in using the Theory of Reasoned Action is the time frame between attitude measurement and the intended behavior. Fishbein and Ajzen (1975) argue that the predictive value of the model is greatest when the time frame between measuring behavior intention and actual behavior is shortest. As the time frame between measuring intention and actual behavior increases, the predictive value decreases.

The time factor could influence the strength of the relationship between attitude and behavior intention in this study because many national forests are not involved in the plan revision process, and the process may take several years. The current research examined the attitudes and perceptions of forest managers toward including non-timber forest products in management plans. Most of these plans were completed by 1985. All are required to be revised by 2002. But, in 1998, the Secretary of Agriculture ordered a moratorium on plan revisions until the new planning regulations were published. Some national forests had started the revision process prior to the moratorium, but most had not initiated the process. Only two national forests had completed the revision process when the survey instrument was administered.

The time frame problem can be reduced by using "should or would," type questions in the measurement instrument (Mueller 1986). These type of statements are adequate for attitude scales. "Since beliefs about, feelings toward, and behavioral tendencies with regard to objects tend to be highly related, the use of 'belief, feeling, would, and should' type statements can be used in attitude scales without distinction" (Mueller 1986, p. 10). These types of statements were incorporated into the survey instrument for this research.

The Theory of Reasoned Action has been used in a number of studies similar in nature to the current research. Most of the research has focused on the final stakeholders or consumers. Yet no research has examined the attitudes and perceptions of forest managers. Although managers of public forests must consider the perception of many different stakeholders, their attitude toward management for NTFPs also is important. Their actions to include NTFPs in forest management plans are influenced by their attitudes to this desired behavior. The Theory of Reasoned Action should prove useful in explaining the attitudes and perceptions of the forest managers of Eastern United States toward managing for non-timber forest products.

4.2 Methods

This section deals with the logistics of surveying the population of interest. It identifies the population of interest, how these people were identified and contacted, and the amount of desired coverage of this population. The section defines how the survey instrument was developed, tested, and administered. It summarizes the collection, management and analysis of the primary data used to develop the model of interest. Finally, the section presents the approach used to cross-validate the results.

4.2.1 Population

The population of interest for this research was decision makers (forest managers) within the United States Department of Agriculture, Forest Service (USFS), in the National Forest System (NFS) in eastern United States. The sample frame for the U.S. Forest Service covers thirty-two states (Appendix 4.1). There are 48 national forests in these thirty-two states, but some have been consolidated to reduce the number of planning units. For example, the two national forests in Virginia have been reduced to one planning unit. Fifteen planning units define the Eastern Region, while there are 16 planning units in the Southern.

The geographic area of interest (Eastern United States) is subdivided by the USFS into Region 8 (R8 - Southern Region), Region 9 (R9 - Eastern Region) and National Headquarters (Washington, DC). Region 8 (headquartered in Atlanta, Georgia) covers Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virgin Islands, and Virginia (Appendix 4.2). In this study, coverage of Region 8 was limited to the continental United States. Region 9 (headquartered in Milwaukee, Wisconsin) includes Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin (Appendix 4.3).

The focus of this research was limited to eastern United States for several reasons. First, very little attention has been given to this region concerning NTFPs. Second; in early discussions with forest managers in this region it was perceived that they had not been adequately included in the dialogue concerning management of NTFPs on national forests. Finally, the forests of eastern United States are some of the most biologically productive in the country, and the sources of many unique and valuable non-timber forest products.

The population of interest within the National Forest System (NFS) was vertically stratified to allow for comparison of different management levels. The research focused on four management levels: district, forest, regional, and national. District Rangers deal with daily operational decisions of their portion of the National Forest. They also consider strategic issues, but their primary focus is operational.

At the Forest level, the survey targeted two positions – Forest Planners and Forest Supervisors. The Forest Planner understands and coordinates the planning process and can ensure that critical

issues are addressed. They have direct influence over what is included in the final management plan. The Forest Supervisor makes the final decision on operations throughout the Forest.

At the regional level, the research focused on the Regional Forester, and Unit or Program Leaders representing Forest Products (R8 and R9), Silviculture and Genetic Resource Mgt. (R8 only), Fisheries, Wildlife and Range (R8 and R9), Soil, Water, and Air (R8 and R9), Planning (R8 and R9), Recreation, Wilderness, and Heritage Resources (R8 and R9), Lands, Minerals and Uses (R8 and R9), and Forest Management (R9 only).

At the national level, the research focused on the Deputy Chief of the National Forest System and the Directors of Lands; Minerals and Geology Management; Recreation, Heritage, and Wilderness Resources; Range Management; Ecosystem Coordination Management; Forest Management; Watershed and Air Management; and Wildlife, Fish and Rare Plants.

The total population for this research was 199 NFS personnel (Figure 4.2). The research targeted 112 NFS staff in Region 8, seventy-eight staff in Region 9, and 9 national level staff. In Region 8, the target population was 73 district, 30 forest, and 9 region level managers. In Region 9, the target was 39 district, 32 forest, and 7 region level managers.

4.2.2 Sample Frame

The primary source of information to access the target population was the United States Forest Service Organizational Directory (USDA Forest Service 1997). This was supplemented with the Forest Service's on-line organizational directories (USDA Forest Service 1999).

4.2.3 Census/Sample

This research was designed to complete a census of the National Forest System decision makers in eastern United States. Realizing that a census is difficult to achieve, this research was designed to facilitate statistical analysis based on a large enough sample.

4.2.4 Research Instrument Development

Development and administration of the research instrument was based on generally accepted methods (Figure 4.3). The first step in developing an instrument to measure attitude and perception is to assemble a large pool of favorable and unfavorable statements through semi-structured interviews with people who are similar to the target audience (de Vaus 1986, Henerson et al. 1987, Moser and Kalton 1972, Mueller 1986, Oppenheim 1992). Statements are then modified based on responses from a panel of expert reviewers. Sufficient follow-up is needed to elicit and secure responses. Dillman (1978) recommends sending reminder requests to each person surveyed one week, three weeks, and seven weeks after the initial mailing

The current research departed from these approaches in two ways. It expanded the testing of the instrument on a similar population and it used the Internet as the means to deliver the instrument. The draft survey instrument was administered to a sample that mirrored the population of interest but was not within the geographic area. The draft survey instrument was administered and tested

on Forest Service staff at the district, forest and regional levels in Regions 5 and 6. This sample was selected because they directly parallel the target population and it was felt that they would have comparable responses. Also, this sample would allow for cross-validation of the model estimates.

The second departure was the use of the internet to administer the survey. Except for the initial contact letter, communications with the target population was by way of electronic mail (e-mail). The final survey instrument was setup on the web site of the U.S. Forest Service Southern Research Station (**http://www.srs.us.fs.fed.us/survey**). This provided easy access for the respondents, facilitated return of the surveys, and reduced potential data entry errors.

The survey instrument was developed through a series of semi-structured interviews with more than 50 experts and stakeholders, located in Arkansas, Indiana, Kentucky, Missouri, Ohio, Virginia, and West Virginia. These included specialists in rural development, economic development, herbalists, small business development experts, Forest Service (Research and NFS) staff, and academics. National Forest System staff that participated in development of the survey instrument covered the district and forest management level. A variety of disciplines within the NFS were included: botanists, special forest products coordinators, planners and District Rangers. NFS staff on the Daniel Boone (Kentucky – R8), Hoosier (Indiana - R9), Wayne (Ohio - R9), Monongahela (West Virginia - R9), Ouachita (Arkansas - R8), Ozark (Arkansas - R9), and Mark Twain (Missouri - R9) National Forest participated in the development.

Detailed notes were taken during the interviews. When possible interviews were also taped using a micro cassette recorder. Notes and interviews were summarized and reviewed for potential statements to form the final survey instrument. Statements (positive and negative) were extracted from the comments and suggestions of the diverse group of experts who took part in this development stage.

From the information and knowledge gained through the interviews a pool of statements concerning behavior intention, attitude, perception, and background information was crafted. The original pool consisted of 6 statements concerning behavior intention, 49 attitude statements, 6 perception statements, and 13 background questions. One behavior intention statement was measured as dichotomous, while the other five were Likert-type scale statements. All attitude and perception statements were Likert-type statements. The attitude statements were either positively or negatively worded. Six perception statements, each with 13 categories of "influential" groups were used in the original pool of statements. The 13 background questions dealt with items that would help profile respondents. A faculty member with the Department of Sociology at Virginia Polytechnic Institute and State University reviewed the draft survey instrument prior to testing it on the panel of experts.

The draft survey instrument was administered to a panel of 125 experts who were selected based on their general knowledge of natural resource issues. This panel represented a variety of disciplines, including research, academia, practitioners, US Forest Service, policy makers, social and biological scientists, and forest products industry. Panel members were contacted by way of an e-mail message asking for participation and to verify that electronic communications was working. In the original e-mail message, panelists were provided the web-site address of the

survey instrument. A follow-up e-mail message encouraging participation was sent to all panelists one week after the original message. After one and half weeks, only eleven responses had been received. Additional follow-up, at three weeks, was necessary to get sufficient responses to allow for statistical analysis. A minimum of 30 responses was needed to provide for adequate analysis.

To prepare the final draft survey instruments, the results of the initial test were analyzed for item-scale correlation, and the central tendency and symmetry of the distribution of responses (Mueller 1986). Item-scale correlation analysis was performed to identify statements that may have adversely impacted the overall measurements. Statements with weak (< 0.2) or negative correlations with the scale scores were eliminated from the final survey instrument. Statements also were eliminated if they exhibited kurtosis greater than 1.0. For normally distributed variables, kurtosis should equal zero. To examine internal consistency, reliability analysis using the SPSS procedure (SPSS 2000) was performed on each variable. The coefficient alpha for each component of the survey instrument was 0.826 (Behavior Intention), 0.938 (Attitude), and 0.935 (Perception). According to Malhotra (1996), an alpha value of less than 0.6 is indicative of unsatisfactory internal reliability. The relatively high alpha values suggest that the survey instrument was sufficiently consistent and reliable.

The final draft survey instrument was reduced to 5-behavior intention (1 dichotomous, 4 Likert type scales), 20 Attitude, and 3 Perception statements, and 13 background questions. The Attitude scale consisted of 10 positively and 10 negatively worded statements. Reverse coding of the negative statements was necessary to ensure proper measurements. The statements were randomly placed in the Attitude section of the instrument. Each perception statement had 13 sub-groups of influential people or groups to elicit forest managers' perception of how these groups feel about managing for NTFPs.

The final draft survey instrument was tested by administering it to a population similar to the target for this research. Specifically, the instrument was tested with forest managers from the U.S. Forest Service Regions 5 (R5 – Pacific Southwest) and 6 (R6 – Pacific Northwest). These regions were selected because they have a great deal of activity with non-timber forests products. Because they are similar in nature to the target group in R8 and R9, it was felt that this group would provide similar responses. Also, because they are removed from the target group in R8 and R9, it was felt they would not influence respondents in eastern United States.

National forests were randomly selected from forests in California (CA), Oregon (OR), and Washington (WA). Forty-one NFS personnel were selected from 7 national forests in Region 5: the Cleveland (CA), the Inyo (CA), the Klamath (CA), the Los Padres (CA), the Plumas (CA), and Shasta-Trinity (CA). Thirty-nine NFS personnel were selected from 6 National Forests in Region 6: the Deschutes (OR), the Fremont (OR), the Malheur (OR), the Gifford Pinchot (WA), the Olympic (WA), and the Wenatchee (WA).

The test group consisted of district (District Rangers), forest (Forest Supervisors and Forest Planners), and Region level NFS managers. At the regional level, the test focused on the Regional Foresters and the Ecosystem Conservation Coordinator (R5), Soils Program Coordinator (R5 and R6), Fisheries Program Coordinator (R5), Wildlife Program Manager (R5

and R6), Ecosystem Planning Director (R5 and R6), Natural Resource Management Director (R5), Regional Silviculturist (R5 and R6), Forest Products Coordinator (R6), Water, Fish, and Wildlife Leader (R6), and the Recreation, Lands, Minerals Director (R6).

Initial contact with this group was through an e-mail message requesting their participation and providing a web site where they could access the final draft survey instrument. A second e-mail request was sent to all potential participants one week after the initial message. One week after this second contact, phone calls were initiated to request participation. Due to poor response, all potential participants were sent, via express mail, a formal letter requesting their participation in this research.

Results from this test were analyzed for item-scale correlation, frequency distributions, and scale reliability. Using the same criteria that were used in the first test of the survey instrument, statements that did not correlate well with the scales were eliminated. The final survey instrument had 5 Behavior Intention, 20 Attitude, and 3 Perception statements, and 13 background questions (Appendix 4.4). One Behavior Intention statement was dichotomous, while the other four were seven-point Likert-type scales. All of the statements for Attitude and Perception were measured on a seven-point Likert-type scale.

4.2.5 Data Collection

Primary data collection for this research was accomplished through a written survey that was delivered by way of the internet. Follow-up communications were necessary to realize adequate responses. Subsequent personal interviews were undertaken on representative samples of each management level to get more in-depth perspectives.

The administration of the final survey instrument was initiated through a formal letter to all target participants. This letter was printed on U.S. Forest Service letterhead and co-signed by the Unit Leader of the Forest Service Research Work Unit 4702. It was sent to all participants via certified express mail. Participants were requested to go to the web site location to complete the survey (**http://www.srs.fs.fed.us/survey**).

One week after the initial contact, all potential participants received an e-mail message requesting their contribution. One week later, phone calls were initiated to encourage involvement, and to request follow-up interviews. A final e-mail message was sent to potential participants after the third week. Requests also were made to the Assistant Regional Forester (R9) and Regional Forester (R8) to encourage their staff to participate.

Because the survey was located on the web site of the USDA Forest Service Southern Research Station, each response was directly written to a computer text file. Each subsequent response was automatically appended to this text file. Responses were identifiable by the Internet Protocol (IP) number that is unique to each computer. Using the IP number allowed for identification and removal of duplicate responses. No survey could be submitted unless it was completely filled out. This ensured that virtually every response was useable. This approach reduced the amount of data handling and potential for handling errors. Using the Internet allowed for complete anonymity and increased the efficiency of administration. Unfortunately, it did not allow for

targeted follow-up to those people who had not responded. Because of this, it was not possible to test for non-response bias.

4.2.6 Data Management and Methods of Analysis

After two follow-up requests to participate and allowing sufficient time for people to take part in the survey, the data was electronically transferred from the text file to an Excel spreadsheet file and prepared for subsequent analysis. Examining the IP numbers that identified respondents allowed for elimination of duplicate submissions. Negatively worded statements were reverse coded to provide accurate measurement. Once these modifications were complete, the Excel file was transferred to a SPSS database file. Subsequent analysis was performed using Excel (Microsoft Office 2000) and SPSS (SPSS 2000).

Descriptive statistics and frequency distributions were calculated to provide a depiction of each variable. Descriptive statistics reduce the whole set of measurements to a few summary measures that present a portrait of each variable (Howell 1987; Hays 1994; Kent 1999; Ott 1993). Frequency distributions illustrate the number of responses that fall into specific intervals. They provide valuable information about the distribution of responses. Together, descriptive statistics and frequency distributions offer evidence of the central tendency and symmetry of the variables

An inherent characteristic of the survey instrument design is the potential for independent variables to be highly correlated. In development of a scale variable that relies on more than one statement there is increased potential for correlations between items. Pearson's correlation coefficients were calculated to determine relationships between the independent variables and provided evidence of severe multi-collinearity. If this problem is not eliminated or reduced, estimates of parameters will be inefficient and unstable. Factor analysis was performed to reduce collinearity between the attitude statements. Further correlation analysis was performed between the attitude factor and the perception statements to reduce collinearity between these independent variables.

Factor analysis allows for the reduction and summarization of data (Malhotra 1996). By way of this method it is possible to develop a smaller set of uncorrelated variables from the original correlated set. All of the attitude statements were examined through factor analysis. Principal component analysis was the approach selected because it is recommended when the primary concern is to determine the minimum number of factors that account for the most variance (Malhotra 1996). The number of factors (components) was determined by examining a scree plot, which graphs eigenvalues against the number of factors. The factor loading on each attitude statement was used to calculate the attitude index (ATIFACTO).

Pearson's correlation coefficients were calculated to explore the relationships between the perception statements and ATIFACTO (attitude index). The reason for this analysis was to identify and eliminate variables with high correlations between these independent variables. Again, reducing the collinearity between independent variables is essential to crafting a useful model. Two criteria were used to eliminate perception statements. They were eliminated from the pool if the correlation with ATIFACTO was greater than an absolute value of 0.15. Also, perception statements were eliminated if the two-tailed significance level was 0.09 or greater. In

other words, perception statements were retained if the correlation coefficient was less than or equal to 0.15, and the significance level was greater than or equal to 0.09. The sum of the scores of the remaining statements was used to calculate the perception index (PERI).

Summing the item scores across statements led to creation of the behavior intention index (BII). The BII was simply the sum of the scores of the four behavior intention statements. Variables also were created for the average behavior intention (BIA), the average attitude (ATIAVG), and the average perception (PERAVG).

Analysis of variance (ANOVA) allows us to determine if the differences among sample values are large enough to imply a significant difference between population values (Howell 1987). Separate ANOVA were performed using the behavior intention index (BII), the attitude index (ATIFACTO) and the perception index (PERI) as dependent variables relative to the background variables as the independent variables. Those relationships found to be significant using an overall F-test were subjected to further analysis with Fisher's Least Significant Difference (LSD) post hoc test. Fisher's LSD procedure has been shown to be the most powerful of the common post hoc tests (Howell 1987).

The overall intent of this research was to develop a model to predict behavior intention based on attitude toward the intended behavior and the perception of how influential groups feel toward the intended behavior. This purpose directs the analysis to linear regression models, in which behavior intention is the dependent variable and attitude and perception are independent variables. Linear regression analysis focuses on three key questions: 1) does a statistical relation exist between the independent and dependent variables with some level of predictability; 2) how strong is the predictive relationship and, 3) can a simple linear rule be created to predict the dependent variable with the independent variables (Hays 1994, Hildebrand 1986). Based on this, the following model, which reflects the theoretical model of interest, was evaluated:

$$BII = ATIFACTO + PERI$$

where BII, ATIFACTO, and PERI are indices of behavior intention, attitude, and perception, respectively. The linear regression model assumes the form:

$$BII = B_c + B_1*ATIFACTO + B_2*PERI$$

where B_c is a constant, designating where BII would intercept the y-axis if the independent variables equaled zero. Inclusion of a constant is assumed valid because it is believed that respondents will have some level of intended behavior regardless of the independent variables. B_1 and B_2 are the estimated coefficients for the respective independent variables. They indicate the amount that BII will change when each independent variable changes by one unit, holding the other independent variable constant. The larger the estimated coefficient the more influence the independent variable has on the dependent variable (Garson 2000). The sign of the estimated coefficient is an important indicator of the relationship between the independent and dependent variables. A negative coefficient indicates a reverse correlation between the two variables. A positive coefficient indicates that the independent variable has a positive influence on the dependent variable.

One measure of the strength of the regression model is R-squared, which indicates the percent of the variance in the dependent variable that is explained by the independent variables. The F test is used to determine the significance of the R-squared statistic. The model is acceptable if the F-test is significant at a 0.05 level or greater. To examine and assess multi-collinearity, the tolerance and variance-inflation factor (VIF) is examined. The VIF is simply the reciprocal of tolerance; the larger the VIF, the more severe the multi-collinearity. A tolerance value of unity and a VIF value of one indicate no inflationary impact on the standard error of the estimated parameters (Garson 2000).

The survey instrument also was designed to allow for logistic regression analysis. Logistic regression is appropriate when one or more of the explanatory variables are dichotomous (Allison 1999). The survey instrument was designed to have one dependent variable with a dichotomous measurement. One main function of this type of model is to calculate the probability that respondents will make one of two choices. This research is designed to determine the probability that the respondents intend to include NTFPs in forest management plans. Because the dependent variable takes on the value of 0 or 1, it is inconceivable that the conditional expectation function is linear in the independent variables (Goldberger 1991). While a linear function is unbounded, a qualitative choice model is bounded in the range 0 to 1. Predicting probabilities within the 0 - 1 range can be transformed to a problem of predicting the odds of an event happening within the real number line (Pindyck and Rubinfield 1981). It is reasonable to estimate the logit model by using an estimate of the probability of a given choice for each individual. Hence, maximum likelihood estimation (MLE) is the preferred method to estimate the logit model.

The ML estimators have several desirable statistical properties (Pindyck and Rubinfield, 1981). They are consistent, and asymptotically efficient and normal. The ratios of the estimated coefficient to its estimated standard errors are also normally distributed. To test the significance of the entire model we first evaluate the likelihood function when all parameters are equal to zero (L_o). The same function is then evaluated at its maximum (L_{max}). The ratio ($\lambda = L_o/L_{max}$) of these two values is the likelihood that an event will happen.

In logit models, R^2 is not an acceptable measure of the "goodness of fit." A low R^2 does not necessarily imply lack of a good fit (Maddala 1992). The analog to this test, a pseudo R^2, is the likelihood ratio index (LRI), where LRI = 1 - ln L/ ln L_o. This is intuitively appealing because the index is bounded by 0 and 1. The LRI equals zero if the slope coefficient equals 0 (Greene, 1993). An often-used "goodness of fit" measure is a two-by-two matrix summary of the predictive ability of the model (Greene 1993). The matrix tabulates "hits and misses" of the prediction rule. This score method can make two types of unfavorable errors: often it will incorrectly classify 0s as 1s and conversely 1s as 0s.

4.2.7 Model Cross-Validation

One obstacle in using regression analysis is the ability to cross-validate the model (Malhotra 1996; Howell 1987; Hays 1994). Cross-validating the results on additional samples allows for

evaluation of the stability of the estimated parameters. Cross-validation lets us determine how useful the model is with larger groups of similar nature

To cross-validate the model, the data are typically split into two groups. One group is used to estimate the model, while the other is used to validate the estimates. This study had the unique opportunity to use the entire data set to estimate the model, and to validate it on a sample of similar respondents. In other words, the model was estimated using data from the target population in the eastern United States, and validated using data from a similar population in western United States.

Using coefficients estimated in the linear regression for eastern United State (Region 8 and Region 9), a predicted BII was calculated for the sample from western United States (Region 5 and Region 6). Recall that the survey instrument was administered to U.S. Forest Service managers in Regions 5 and 6, who were in similar positions as respondents in eastern United States. Simple regression with the observed BII (eastern United States) as the dependent variable and predicted BII (western United States) as the independent variable was performed. The model was modified to eliminate the constant term. One hypothesis was tested to determine if the observed BII (eastern U.S.) was equal to the predicted BII (western U.S.):

H_o: $B_{ob} = 1$, where B_{ob} is the estimated parameter for predicted BII (western United States)

If this is shown to be true, then the model equation would be reduced to:

$$BII_{pred\ (eastern\ U.S.)} = BII_{ob\ (western\ U.S.)}$$

Should this occur, observed behavior intention (western United States) would equal the predicted behavior intention (eastern United States).

Cross-validation also was performed using the logistic regression model. With the coefficients estimated in the logistic regression for eastern United States (Region 8 and Region 9), a predicted BI (BI_{pred}) was calculated for the sample from western United States (Region 5 and Region 6) data. From this, values of BI_{obs} were compared to values for BI_{pred}. These comparisons were classified accordingly. The cut-off value, which determines in which category a response is placed, was 0.50. This cut-off value was selected because it is the default used in SPSS analysis. Further, there was no *a priori* knowledge to suggest using some other cut-off value. Calculated values greater than 0.50 were recorded as a one (1). Below this cut-off value, they were counted as a zero (0). In this way a classification table was developed that indicates the percentage of correct predictions to be expected.

4.2.8 Summary

This section has focused on the logistics and operations of the study. It presented and defined the population of interest. The section addressed how the population was identified and contacted, and how much of the population was targeted (census vs. sample). The section details how the survey instrument was developed, tested, and administered. The approach employed in this research deviated in two major ways from the generally accepted methods. The instrument was

administered on a sample of similar respondents that would allow for cross-validation. Also, the survey was administered by way of the Internet, which improved the efficiency and reduced potential data management problems.

4.3 Results and Analysis

4.3.1 Survey response

The distribution of the population, as well as the distribution of the survey participants, in total and for each region was examined and summarized (Table 4.1). In total, 137 completed and fully usable surveys were received from 199 Forest Service managers. Of this total, 64 and 66 participants were from Region 8 and Region 9, respectively. Seven out of nine national level managers participated.

In total, 68.8 percent of the target population participated in this survey. Participation from the national office was the greatest, with more than 75 percent, but of course this segment was the smallest, making it easier to achieve a high response rate. Participation from the districts may be the most impressive, with more than 70 percent of the District Rangers taking part in the survey. Participation from the forest and regional levels was acceptable at 64.5 and 62.5 percent, respectively.

A chi-square test for goodness of fit examines the hypothesis that observed cell probabilities are equal to the expected cell probabilities (Ott 1993). Conversely, the alternative hypothesis is that at least one cell probability differs from the expected value. The chi-square test procedure available with Excel returns the probability that the null hypothesis (no difference between groups) is accepted. It estimates the probability that the observed cells are equal to the expected cell probabilities. The chi-square test does not establish if the observed values are greater or less than the expected, just whether the two values are different.

In general, the sample proportions reflect the population proportions. The overall chi-square value of 0.92 indicated that the sample and population distributions did not differ significantly. This provides valuable insight of the potential for the sample to represent the population. While the district sample proportion was approximately two percentage points above the population proportion, the forest sample proportion was approximately the same amount below the population figure. The region and national sample proportions was less than one percentage point off of the population proportion. None of these deviations from the population figures was significant enough to warrant concern about the ability of the sample to represent the population.

Slightly more variation was found in the regional participation. The overall chi-square value (0.02), comparing regional observed sample response rate to regional expected population response rate, indicated that at least one observation in the regional sample distribution differed significantly from the regional population distribution. The positive deviation in responses from District Rangers in Region 9 may well account for the rejection of the null hypothesis, at a 0.05 significance level. The number of observed responses (39) for District Rangers in Region 9 was 12 greater than the expected value (27). The observed response level from District Rangers in Region 8 was nine fewer than expected, which also could contribute to the rejection of the null

hypothesis. The proportional participation from the districts in Regions 8 and 9 were 7.8 and 2.8 percentage points above the population proportion, respectively. The observed response levels from the Forest level in Region 8 and Region 9 were 4 less than, and 1 more than expected, respectively. Responses from the Forest level deviated less than the Districts: 4.6 and 3.6 percentage points, respectively. Responses from the regional level deviated even less: observed response level from Region 8 equaled expected responses, while observed response level from Region 9 was only one less than expected. Regional responses, for each region, were less than 2 percentage points above the population proportion. None of these differences seem great enough to warrant concern that the sample is not representative of the population. As a matter of fact, the greater observed responses from District Rangers in Region 9 was more than expected.

4.3.2 Statement Variables

Descriptive statistics for the attitude, perception and behavior intention statements provide insight into their distribution. These statements formed the basis for subsequent indices. All statements were measured on a 7-point Likert-type scale, with 1 representing "strongly disagree" and 7 representing "strongly agree." A score of 4 suggests ambivalence toward the statement, while scores below the mid-point suggest negative attitudes, perceptions, or behavior intention.

Though no statement was rated, on average, as extremely positive, or negative toward NTFPs, examination of the attitude statements (Table 4.2) is revealing. In general, the group (all forest managers) was close to the middle point of the attitude scale toward NTFP management (mean = 4.7). Half of the twenty statements received an average response of 4.5 or greater. Seven of the statements received an average response of 5.0 or greater. The negatively worded, and appropriately coded, statement "the management of non-timber forest products is not an issue that the Forest Service should deal with" (mean = 5.9) was almost two points above the middle of the scale. It suggests that the forest managers feel that non-timber forest products are an issue that the Forest Service should address. This was corroborated by another statement: "Non-timber forest products are not an issue of concern in management of national forests" (mean = 5.5). The general attitude of the forest managers surveyed was that personal use collection of NTFPs on national forests was acceptable (mean = 5.7). Forest managers, generally, had a favorable attitude toward the notion that NTFPs are important natural resources on national forests (mean = 5.8). They also felt that the level of risk to the environment from collection of NTFPs was sufficient to require management (mean = 5.3). Forest managers felt that the agency should assign personnel to work on NTFPs (mean = 5.3), and that the agency needs to address NTFPs to realize the goal of ecosystem management (mean = 5.1).

On the other hand, only four attitude statements had an average score of 4.0 or less. The group was just below the middle of the scale about shifting funds to support NTFP management (mean = 3.9), and about making NTFPs a high priority for the agency (mean = 3.9). Interestingly, the statement "I consider myself a champion for inclusion of NTFPs in forest management plan revisions" had a mean score (mean = 3.58) less than the middle point, suggesting that the group did not perceive itself as a champion for NTFP management. The least negative statement, "the Forest Service should actively manage for NTFPs regardless of cost" (mean = 3.0), was one point below the middle of the scale.

The descriptive statistics (Table 4.3) for the statements used to measure perception are revealing. Thirteen groups that influence managers' perceptions are listed below each statement. Survey participants were asked to indicate how they perceived each influential group would react to the statement. The responses do not identify any one group with a strong feeling about NTFP management. The overall group mean of 3.9 suggests that forest managers perceive that influential others do not see NTFPs as a critical forest management issue. The top five groups that seem to influence managers' perceptions about NTFPs are collectors, environmental groups, state agencies, federal agencies, and supervisors. As would be expected, the mean scores for collectors (4.9, 4.8 and 5.4) are greater than other influential groups. Also, not surprisingly, the mean scores (4.6, 4.4, and 4.6) suggest that managers feel that environmental groups have a slightly positive view toward NTFP management.

The descriptive statistics provide insight into the distribution of the behavior intention statements (Table 4.4). These four statements were used to create the behavior intention index. The mean score (4.5) for the target population suggests a slightly positive behavior intention. None of the statements received mean scores that were either strongly positive or strongly negative. The strongest statement suggests that respondents would support the efforts of other Forest Service personnel to include NTFPs in management plans (mean = 5.1). In general, the group was fairly ambivalent about urging "that NTFPs receive the same consideration as other natural resources" (mean = 4.3). The group felt only slightly more positive about initiating discussion with management team members about NTFPs (mean = 4.4), and identifying NTFPs as a critical issue (mean = 4.4).

4.3.3 Background Variables

The frequency distributions for the background variables (Table 4.5) provide insight into the response distribution. These questions were asked to better understand and describe the respondents. Also they are important for identifying relationships with scale variables. Clearly, a major portion (48.9%) of respondents had been in their current positions more than 6 years. Fewer than 10 percent of the respondents had been in their current position less than 1 year. A major portion (48.2%) also was assigned to Region 8 immediately before their current position. Almost 30 percent of the respondents had been assigned to some other region, outside of eastern United States, immediately before their current position.

As expected, the majority of the respondents worked at the district level (58.4 percent). Almost 30 percent of the respondents worked at the forest level. The remaining 12 percent worked either at the regional or national levels. Representation was fairly evenly split between the two regions. Approximately 46.7 percent of the respondents work in region 8, while 48.2 percent of the respondents were from region 9. This was consistent with the responses reported in Table 4.1.

Not all survey participants were involved in forest management plan revisions. For example, those working at the national or regional level may not be directly involved in plan revisions. Almost 30 percent of the respondents involved in the revision of management plans indicated that they are developing alternatives. Approximately 27.7 percent indicated that they had not started the revision process. But, 18.2 percent indicated that the revision was completed.

Approximately 12.7 percent indicated that the scoping process was underway, but the formal planning had not been initiated.

Four background questions sought information on the respondents' expertise and education. A clear majority (70 percent) indicated that their expertise was forest management. Almost 17 percent considered planning as their expertise. Approximately 13 percent indicated an expertise in non-forest management area. Less than 40 percent had obtained education levels greater than a bachelor's degree. More than 70 percent indicated that the major focus of their degree program had been forest management. Finally, almost 30 percent of the respondents indicated that it had been more than 25 years since they had received their last degree. Another 29.9 percent had received their degree from 21-25 years ago. Almost one-quarter received their last degree between 16 and 20 years ago. Less than 17 percent of the respondents had received their degree less than 15 years ago.

The results from the questions concerning personal knowledge and familiarity with collectors are revealing. Almost 70 percent of the respondents indicated that they knew collectors of non-timber forest products. Approximately 62 percent do not use herbal medicines for ailments. The proportion of respondents who have a family history of collectors (47.4%) was about the same as those that had not family history of collectors (52.6%).

4.3.4 Scale Variables

The intention of this research was to model behavior intention as a function of attitude and perception of the target population. To do this it was necessary to define and understand the makeup of these variables. To facilitate development of the model, each group of variables was reduced to an index representing the three model components. The twenty attitude statements were reduced through factor analysis and then summed to create an attitude index (ATIFACTO). The thirty-nine perception statements were reduced through correlations analysis and the values of the remaining statements were summed to form a perception index (PERI). The four behavior intention statements were simply summed to form a behavior intention index (BII).

A scree plot (Figure 4.4) for the factor analysis of the attitude statements is useful in identifying the number of components that explain the variable of interest. Clearly the slope of the line changes drastically at the 2nd component, which suggests that only one component, was a significant factor in measurement of attitude. Component 1 accounted for 47.46 percent of the total variance. The next two components accounted for 7.46 and 6.02 percent of the total variance, respectively. Clearly, component 1 was a dominant factor in the make-up of ATIFACTO.

The component matrix (Table 4.6) from the factor analysis of the attitude statements shows the loading of each of the statements that explain the overall variable. Though the approach extracted three components, all of which were presented, only one was used in creating ATIFACTO. The two minor factors are presented to illustrate the difference between them and 1st component. Clearly, the first component dominated the total variance explained.

The descriptive statistics and correlation coefficients (Table 4.7) for the perception statements that were retained to calculate the perception index (PERI) provide insight to the overall makeup of this index. Ten statements were preserved to formulate PERI. The correlation coefficients and significance level for each statement fulfilled the criteria of less than or equal to 0.15 and greater than or equal to 0.09, respectively. Two influential groups, environmental and civic, were retained in each of the three perception statements. Collectors were represented in two of the three statements. Interestingly, state and federal legislators were retained in the statement that addressed management regardless of cost.

The descriptive statistics for the indices and averages (Table 4.8) are summarized. The behavior intention index (BII) ranged from four to twenty-eight. The mean BII (18.14) was two points greater than the mid-point of 16. The mean for the attitude index (ATIFACTO) was 61.73, which was 6 points above the mid-point of its range (18-92). Also, the mean for the perception index (mean = 38.66) was only 1/10 of a point greater than the mid-point of its range (24-53).

The mean for the average behavior intention (mean BIA = 4.5) suggests that the population was only slightly more than the middle of the scale toward managing for NTFPs. The mean average perception (mean PERAVG = 3.9) indicated that the population perceived that influential groups are only slightly below the middle (4.0), as well. The mean average attitude (mean ATIAVG = 4.7) suggested that managers were slightly above the middle toward managing for NTFPs.

4.3.5 Analysis of Indices

Through analysis of variance (ANOVA), it is possible to develop profiles of the target population that can aid in identifying who was more likely to accept the desired behavior. In this case, the desired behavior was to include NTFPs in national forests management. The characteristics that describe the portion of the population that are more inclined to manage for NTFPs provide valuable information in efforts to change behavior.

The results (Table 4.9) of the ANOVA between groups with respect to the Behavior Intention Index (BII) illustrate important relationships that may influence management. Eight variables were significant at a level of 0.10 or greater. Those variables that had more than one degree of freedom were subjected to post hoc analysis. Post hoc tests were performed on previous assignment, management level, and stage of revision. The other five variables that were found significant (i.e., current region, focus of education, know collectors, use herbs, and family member collected) did not have post hoc tests completed. All three variables that dealt with herbal use and collectors were shown to significantly influenced behavior intention.

Further examination of Table 4.9 reveals that personal characteristics influence managers' behavior intention, as well. A manager whose educational focus was non-forest management (wildlife, botany, fisheries, recreation, and ecology) was more inclined to manage for NTFPs than a manager whose educational focus was forestry (forestry, forest measurements, forest management, timber management). Managers, who knew collectors, used herbal remedies, or who had had a family member collect were more inclined to manage for NTFPs.

Previous and current region of assignment influenced managers' intentions to include NTFPs in forest plans. Post hoc tests were unnecessary on the variable "current region" because it lacked the degrees of freedom needed for this analysis. But post hoc tests were performed on the variable "previous assignment" (Table 4.10). In this table the mean difference between the BII value for the first column (I) and the BII value second column (J) was used to determine if the BII for the two groups was significantly different. Forest managers whose previous assignment was in a region other than Region 8, but not Region 9 had a more positive intention to manage for NTFPs. At the same time, forest managers in region 9 were more favorably inclined to manage for NTFPs than their counterparts in Region 8. But, there was not a significant difference in behavior intention between forest managers whose prior assignment was in Region 9 and whose previous assignment was another Region, but not in Region 8.

Post hoc tests also were performed on the variable "management level" (Table 4.11). Again, the difference between the BII value for the first column (I) and the BII value for the second column (J) was used to determine if the BII for each group differed significantly. This test revealed a significant difference between the BII of district level managers and the BII for Region level managers. District level managers were less inclined to manage for NTFPs than forest managers at the Region level. There were no significant differences between other management levels.

The amount of progress forest managers had made on the forest plan revisions was an important factor on behavior intention. The post hoc, multiple comparison, test on the variable "stage of revision." revealed significant differences among several groups (Table 4.12). Not surprisingly, managers who had completed the revision process were less inclined to manage for NTFPs than managers who were still in the process of developing alternatives. Also, managers who had not started the revision process were more inclined to include NTFPs than those who had completed the process.

The results (Table 4.13) of the analysis of variance between groups relative to the attitude index (ATIFACTO) revealed nine significant variables. Three (previous assignment, stage of revision, and expertise) were subjected to Fisher's Least Significant Distant (LSD) post hoc test. The other six did not have enough degrees of freedom to require post hoc analysis.

As with behavior intention, previous and current assignment were significant factors in managers' attitudes toward NTFPs. Forest managers whose previous assignment was in a region other than Region 8, but not in Region 9 had a more positive attitude toward managing for NTFPs (Table 4.14). But the attitudes of managers whose previous assignment was in Region 9 were not significantly different than those whose prior assignment was another region. Managers in Region 9 had a more positive attitude toward NTFPs than their counterparts in Region 8.

The managers' stage of revision of the forest plan was an important influence on attitude toward managing for NTFPs (Table 4.15). Forest managers who had completed the revision process had a less favorable attitude toward managing for NTFPs than all other categories (scoping underway, developing alternatives, and revision not yet started). But there was no significant difference in attitude toward managing for NTFPs among these other groups. All of the groups had more positive attitudes toward NTFPs than those that had completed the plan revision.

Personal characteristics influenced attitude as well. Managers who defined themselves with an expertise other than forest management had a more positive attitude toward managing for NTFPs (Table 4.16). Referring to Table 4.13; we find other personal characteristics that are significant. Those that had graduate degrees had more positive attitudes toward management than those with undergraduate degrees. Further, managers whose educational focus was not forest management had a more favorable attitude toward non-timber forest products. Finally, managers who knew collectors, who used herbal remedies, or who had family history of collecting NTFPs all had more favorable attitudes toward management of these products.

The results of the analysis of variance for the perception index (PERI) reveals that "stage of revision" was the only variable with a significance level greater than 0.05 (Table 4.17). The results (Table 4.18) of Fisher's LSD post hoc test on the variable "stage of revision" reveals significant differences among respondents who had completed the revision process and those that were developing alternatives and those that had not started the process. Respondents who were developing alternatives had a less positive attitude toward NTFPs than respondents who had completed the process. Also, people who had not started the process had a less positive attitude toward NTFPs than respondents who had already completed the process. Forest managers who had completed the revision process had a more positive attitude than managers who were involved in, or who had not started, the process.

4.3.6 Linear Regression Analysis

To better understand the influence of the two independent scale variables (ATIFACTO and PERI) on the dependent scale variable (BII), two additional analyses were performed. Linear regression was used to analyze behavior intention as a function of attitude and perception. The linear regression model analyzed was:

$$BII = ATIFACTO + PERI$$

BII = Behavior Intention Index
ATIFACTO = Attitude Index
PERI = Perception Index

The default linear regression algorithm modified this model to include a constant term. Inclusion of the constant term was appropriate because without it the value of behavior intention (BII) could go to zero. This would indicate that a respondent had zero behavior intention, a highly unlikely situation. For this reason, unstandardized coefficients are reported. The estimated model reported was:

$$BII = Constant + B_1*ATIFACTO + B_2*PERI$$

BII = Behavior Intention Index
ATIFACTO = Attitude Index
PERI = Perception Index
B_1 = estimated coefficient for ATIFACTO
B_2 = estimated coefficient for PERI

The results of the multiple regression analysis are presented (Table 4.19). The overall model had an R-squared value of 0.62, indicating that 62 percent of the variance in the dependent variable (BII) was explained by the two independent variables. The overall model was significant at better than a 95 percent confidence level (p = 0.00). The collinearity statistics (Tolerance = 0.99; VIF = 1.00) indicates that the two variables were not linearly dependent.

Both ATIFACTO and PERI were significant at the 0.05 level. ATIFACTO was significant at better than a 0.01 level. The positive coefficient for ATIFACTO indicated that attitude has a positive influence on behavior intention. The value of the coefficient (0.30) indicated that all else held constant, the dependent variable would increase by 0.30 units for every one-unit increase in the attitude index. At the same time, PERI had a slight negative influence on BII. All else held constant, the dependent variable would decrease by 0.11 units for each unit increase in the perception index.

Examination of residuals provides insight into the major assumptions of the linear model: 1) the average value of the residuals was zero, 2) variance of the residuals was constant, 3) residuals are normally distributed; and 4) the residuals are independent (Ott 1993, Montgomery and Peck 1992, Malhotra 1996). The frequency distribution of the standardized residuals of the linear regression model suggests a relatively normal distribution (Figure 4.5). The normal probability plot (Figure 4.6) corroborated this finding. A probability plot for a normal distribution should be a straight line. One of the simplest ways to detect non-constant variance is to plot the residuals against the predicted values (Ott 1993, Montgomery and Peck 1992). The scatter graph for constant variance (Figure 4.7) suggests fairly even distribution above and below zero. Finally, the Durbin-Watson (D = 1.84) value, reported in Appendix 4.1, indicated that the fourth assumption of a linear model held. A Durbin-Watson value of 2.0 indicates no correlation in residuals (Ott 1993). A Durbin-Watson value of less than 2.0 suggests a positive correlation, while a value greater than 2.0 indicates negative correlation. The partial regression plots of BII against ATIFACTO (Figure 4.8) and PERI (Figure 4.9), respectively indicate a linear relationship between the dependent and independent variables.

4.3.7 Logistic Regression Analysis

The results of the logistic regression (Table 4.20) analysis indicate that of the two independent variables, only ATIFACTO was significant. The estimated coefficient ($B = 0.13$) for ATIFACTO indicated a slight positive relationship with the dependent variable. The value of the exponent of Beta (Exp(B)) for ATIFACTO indicated that, all else held constant, BII would increase by 0.14 units for each unit increase in ATIFACO. At the same time the value of Exp(B) for PERI indicated that changes in PERI had no effect on BII.

Though a number of logistic R-square measures are used, there is no completely accepted analog to that which is used in linear regression (Garson 2000). A classification table is used to indicate the percentage of correct responses that the model will predict (Table 4.21). The classification rule used in the logistic regression was 0.50. This cut off value is the default used in SPSS, and indicates that values over 0.5 are classified as a one (1), and values below 0.5 are classified as a zero (0). There was no *a priori* knowledge to suggest some other cut-off value was more

acceptable. The classification table indicated that, overall, the model predicted the correct response 75.2 percent of the time.

While the linear regression R-square measures the variation explained by the independent variables, logistic regression R-square measures try to quantify the strength of relationship between the dependent and independent variables. For the model examined, the Nagelkerke R-square value was 0.44. As this R-square measure can range from 0 to 1, a value of 0.44 suggests that the strength of the relationship between the independent and dependent variables was not very strong.

4.3.8 Model Validation

An analysis was performed to determine if this model is useful beyond the population on which it was developed. The coefficients for the linear regression used to validate the linear model were estimated (Table 4.22). Recall that the model was developed with data from eastern United States (Region 8 and Region 9), and was validated with data from western United States (Region 5 and Region 6). In this validation, the standard linear regression model was modified to eliminate the constant. This allowed for direct testing of the relationship between $BII_{obs\ (eastern\ U.S.)}$ and $BII_{pred\ (western\ U.S.)}$. The unstandardized coefficient is 1.02 with a standard deviation of 0.03, which indicates that the coefficient ranged from 0.99 to 1.05. The value for the standardized coefficient, which assumes no constant term, was 0.99. The overall model was significant at 0.00, and had an R-square of 0.983. This indicated that $BII_{pred\ (western\ U.S.)}$ predicted 98.3 percent of the variability in $BII_{obs\ (eastern\ U.S.)}$.

The classification table (Table 4.23) used to validate the logistic regression model indicates the percentage of correct responses that the test model will predict. Recall that the development model, from eastern United States (Region 8 and Region 9) data, predicted correct responses approximately 75.2 percent of the time (Table 4.21). The test model (western United States, Region 5 and Region 6 data) predicted correct responses approximately 79.6 percent of the time.

4.4 Discussion

The population covered by this study was fairly comprehensive and representative of the USFS in the National Forest System of eastern United States. It focused on the major decision makers at each management level within the Forest Service. The research targeted managers who are responsible for "signing off" on operational and policy decisions. These professionals have tremendous influence on the management direction of our national forests. Because of the focus on one institution, the research can be easily duplicated in other regions of the United States within the same institution.

The high participation rate in this research could be due to several factors. The target audience was a fairly homogenous group. They all belonged to one institution, and that institution sanctioned and supported the research at the highest levels. Further, the issue of managing for NTFPs is rapidly emerging -- the Forest Service is struggling to determine how to deal with these "new" products. Also, the higher than expected participation rate could be due to the use of

internet to administer the survey instrument. This approach made responding easy and simple for the target group.

Overall, the profile of the responses by management level represented the population profile, quite well. In other words, the responses proportionally represented the overall population. Though there were some discrepancies between regions, these were not felt to be detrimental to the overall analysis. The observed responses from Region 9 exceeded the expected responses. This indicates that participation was better than expected. On the other hand, actual responses from Region 8 were fewer than expected. This suggests that participation could have been better. But the differences between actual and expected were not sufficient to warrant concern.

Examining the statements that form the basis for each index was revealing. Based on the full compliment of attitude variables, the group as a whole had only a very slightly positive attitude toward managing for non-timber forest products. Interestingly the non-forest management oriented professionals had a significantly more positive attitude toward managing for NTFPs. This group represents a small proportion of the expertise within the agency in this geographic area. The botanists, wildlife management, and recreation staff are motivating much of the discussions and investigations concerning NTFP management. Non-forest management professionals in the agency are driving much of the current interest in this issue. This emphasis from non-forest management professionals may lead to policies and practices that favor preservation and recreational use over economic utilization of the resource. Though this may reduce the collection of NTFPs, in the long run such a strategy could have negative economic impact to local collectors. A more preservation-oriented strategy would provide greater benefits to people who are far removed from the NTFP resources. This result would contradict a basic tenet of the U.S. Forest Service strategy to strengthen local economies.

Past professional and personal experience of the forest managers influenced their attitude toward managing for NTFPs. Forest managers who knew collectors and had used herbal products had a more positive attitude toward management. Also, managers who had more than an undergraduate education that focused on non-forest management had a more positive attitude toward NTFP management. Forest managers whose previous assignment was another region, outside eastern United States, had a more positive attitude toward management for NTFPs. Finally managers in Region 9 had more positive attitudes than their counterparts in Region 8. Forest managers in Region 9 were more inclined to manage for NTFPs than their counterparts in the Southern region. This regional difference could be due to differences in market demand for NTFPs from national forests.

Forest managers' attitudes toward NTFPs were influenced by the stage of the revision process. Those managers who had completed the revision process had significantly lower attitude toward managing for NTFPs than their counterparts who had not started the process or who were in the process of revising the plans. This difference may be due to the fact that managers who had completed the process no longer had to concern themselves with what goes into the plan. Their responses may reflect more accurately the attitude toward management.

Forest managers' perception of how influential others feel toward managing for NTFPs was influenced by the stage of the revision process. As was found with other indices, perception of

managers who had completed the revisions was significantly different than managers who were still involved in the process. But, the direction of the relationship was just the opposite of behavior intention and attitude. With this component, managers who had completed the process perceive that influential others feel that management was more important. This was as expected: managers who had completed the process and no longer have to concern themselves with what is included in the management plans, may respond more accurately. Managers who are involved in the process may want to "down play" their perception of how influential others feel was important.

The overall perception of the forest managers was that people and groups that influence their decisions do not perceive managing for NTFPs as a priority issue. Interestingly, the two groups (collectors and environmental groups) with the highest mean scores may be diametrically opposed in their philosophies on how the Forest Service manages for these products. On the one hand, collectors may prefer greater utilization and access to the resource. Conversely, environmental groups demand less utilization and more preservation. This dichotomy is bound to create social tensions that will exacerbate the management process. The agency has a daunting task to balance the demands of a highly organized and politically savvy, primarily urban population with the everyday needs of an unorganized, often invisible rural population that may be of marginal economic and educational means.

The overall group in general had a slightly positive inclination to promote management for NTFPs. Overall the forest managers would support the efforts of others to promote management for NTFPs. But they were less inclined to initiate efforts to improve NTFP management practices themselves. This presents a dilemma; if everyone follows the lead of others, then improvement of management policies and practices will be slow in coming. To improve the situation will require that forest managers perceive NTFP management as a critical issue that requires addressing in management plans. Then forest managers will be more inclined to urge that NTFPs receive similar consideration as other natural resources.

Behavior intention was influenced by a number of factors. Knowledge and personal experience with the collectors and with the products were major factors that influenced behavior intention. Forest managers who knew collectors (family or otherwise) or who used herbal remedies were more inclined to promote management for NTFPs. At the same time, forest managers in Region 9 are more inclined to promote management than their counterparts in Region 8. This difference may have been due in part to past experience with management plans. Six out of seven forest management plans that addressed NTFPs were from national forests in Region 9. Finally, forest managers whose educational focus was on non-forest management were more inclined to promote management.

Behavior intention also was influenced by past work experience, the management level, and the stage of revision. Perhaps the reason for the regional difference in behavior intention is that other regions have had more active programs and more experience with non-timber forest products. The difference between district and region level managers may have been due to awareness of the wide-spread impact of harvesting NTFPs. district managers were concerned about the day-to-day operations of the forest area for which they are responsible. Regional managers have a wider scope, and may be more aware of other issues. Also, district managers are overwhelmed with

increasing workloads, with decreasing budgets, and may view NTFPs as one more thing they have to deal with. Their intention to take on more responsibility may be directly affected by immediate needs.

The stage of the management plan revision process influenced behavior intention, as well. The behavior intention of forest managers who had completed the process was significantly lower than managers who had yet to start the process, or who were developing alternative management strategies. This difference is expected. Forest managers who have completed the revision process do not have to concern themselves with how to include NTFPs in the management plans. Certainly their intended behavior will differ from managers who are in the process of revising.

Using both linear and logistic regression analysis, the data supported the overall theoretical model. Though attitude and perception explained approximately 62 percent of the variance in behavior intention in the linear model, other extraneous factors accounted for 38 percent of behavior intention. This suggests that other factors are influencing forest managers' decisions to develop NTFP programs.

Both the linear and logistic models have potential in explaining the relationship between attitude, perception and behavior. In the linear model both components were found to contribute significantly to behavior intention. But neither had a very strong correlation with behavior intention. In the logistic regression analysis, only attitude was found to contribute significantly to behavior intention. Perception had virtually no influence on behavior intention. These differences between analytical models suggest that linear regression is more sensitive to the impact of explanatory variables.

Having an empirical model that is valid across larger samples is critical to the usefulness of the research. This research was fortunate to have a sample on which to validate the model that was outside the geographic focus, but of similar representation. The respondent profile of the validation sample was similar to that of the test sample. The estimated model was found to be valid using linear as well as logistic regression.

4.5 Conclusions

Though management for non-timber forest products is not considered a major public issue, it is rapidly becoming a matter of concern to the U.S. Forest Service. The Forest Service is leading the way to improving national forest management for non-timber forest products. The agency is steadily recognizing that biotic materials, which are harvested for non-timber products, are a natural resource that requires management. Awareness about these products is increasing among forests managers at all levels within the Forest Service. The agency is quickly becoming aware that these plants and fungi require management at a level similar to other natural resources.

No previous research has examined the attitudes and perceptions of forest managers toward management for NTFPs. Yet understanding their attitudes and perceptions can help develop our understanding of what is needed to better manage the NTFP resources. The attitudes and perceptions of the forest managers directly influences how the agency manages for these

products. The attitudes and perceptions of the agency are reflected in the policies, procedures, protocols, and practices concerning NTFPs.

The Theory of Reasoned Action (TRA) is an effective model to examine the relationship between attitude, perception and intended behavior. Though the strength of the relationship between the components and behavior intention was not great, they were both significant contributors to explain behavior intention. The research clearly demonstrated that attitude and perception were direct determinants of behavior intention, in the linear model. But the unexplained variation suggested that other factors were influencing behavior. It may be that the amount of variation that was not explained by attitude and perception was generated by a lack of support for the issue. An expansion of this model to examine this may be warranted.

Attitude and perception may not be the only determinants of behavior intention. Other factors, such as knowledge and experience, may help to explain behavior intention of forest managers. According to the Theory of Reasoned Action, these are subsumed by attitude. But, perhaps these factors may help to explain the type of person who is more inclined to promote management. The factors are useful in differentiating the behavior intention of different groups. Extending the Theory of Reasoned Action to include these factors may improve the explanatory ability of this model. To explore this would require additional research.

These findings could have significant implications to improving management of NTFPs. The more educated managers and those who actively use these products were more likely to support management activities. The influence of working in another region was significant to forest managers' attitudes toward managing for these products. Forest managers in Region 9 seemed more inclined to support active management for NTFPs.

But the implications extend beyond the Forest Service. The personal and professional experiences that reflect a positive attitude toward managing national forest for NTFPs might be extended to other segments of the society. The profile that these experiences generate suggests that supporters of sustainable management for NTFPs are people who know collectors, and use herbal products. Further, people who are educated in a field other than traditional forest management also may be more inclined to support sustainable forest management. In addition, people who have lived in other regions of the United States are more inclined to support sustainable forest management. To substantiate this extension of the results will require similar research on a different population. An extension of the Theory of Reasoned Action could be developed and used to understand the attitudes and perceptions of a broader spectrum of the public concerning NTFPs.

The perception of the forest managers in eastern United States, in general, was that people who influence their decision making process do not feel that NTFP management is an issue. The two groups (collectors and environmental groups) that are perceived to have the greatest concern for NTFP management may be diametrically opposed to how national forests are managed regarding these products. One group is politically savvy, well organized and funded, while the other is unorganized, under-represented, and unsophisticated, if not invisible. This presents an opportunity to identify stakeholders and to develop a community to help guide the management of NTFP resources.

This research was designed to help managers better understand how the Forest Service in eastern United States feels toward managing for non-timber forest products. It is hoped that forest decision makers will have a better appreciation for this type of research. It has the potential to improve our understanding of how other segments of the U.S. population feel about forestry issues. The approach and methodology could be incorporated into the Forest Service research agenda to better understand the attitudes and perceptions of different segments of the public on other forestry issues. It could prove invaluable to developing our knowledge of the underlying elements that contribute to the public's attitude toward forest management.

This research provides valuable insight for policy makers to better understand some of the constraints and opportunities that forest managers confront in dealing with NTFPs. Eliminating the factors (e.g., lack of knowledge, funding, expertise, and direction) that constrain these highly trained and skilled professionals to manage for NTFPs is necessary to achieve sustainable forest management. At the same time, capturing the opportunities that could improve the efficiency and effectiveness of these professions is essential to improve management for NTFPS.

To improve the management of public forests for non-timber products will require an investment far greater than the current levels. Decision makers concerned with management of public forests must accept that NTFPs are economically, ecologically, socially, and culturally valuable resources. Then policies and practices need to be developed that consider and address these factors. Investments are needed to support all of the additional requirements of managing for NTFPs. New investments are needed to support the new demands on labor and capital. Without sufficient investment, sustainable management of non-timber forest products will be an elusive goal.

4.6 References

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4.6 Tables

Table 4.1 The size and proportion of the population of interest and the sample that participated in the survey.

Management Level	Population		Response						
			Total		Region 8		Region 9		Rate[1]
	#	%[2]	#	% of Total	#	%	#	%	%
District	112	56.28	80	58.39	41	64.06	39	59.09	71.43
Forest	62	31.16	40	29.20	17	26.56	23	34.85	64.52
Region	16	8.04	10	7.30	6	9.38	4	6.06	62.50
National	9	4.52	7	5.11	N/A[3]	N/A	N/A	N/A	77.78
Total	199	100.00	137	100.00	64	100.00	66	100.00	68.84

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[1] Response rate for each management level and for the overall total is calculated by dividing the total number of responses by the total size of the segment (i.e., subsample).
[2] A population proportion for each management level is calculated by dividing the sample segment size by the total sample size (e.g., 112/199 = .5628).
[3] N/A indicates figures that are not applicable.

Table 4.2 Descriptive statistics for attitude statements from survey Regions 8 and 9.[4]

Attitude Statement	Mean	Std. Dev.
1. Non-timber forest products deserve the same attention that other natural resources (i.e.; range, wildlife, minerals, recreation, and timber) receive in management plans.	4.2	1.81
2. Personal use collection of NTFPs from national forests is an acceptable use of the forest resources.	5.7	1.42
3. The F.S. should actively manage for NTFPs regardless of cost.	3.0	1.69
4. The Forest Service does not need to manage for NTFPs to realize its goal of ecosystem management.	5.1	1.76
5. The market value of NTFPs is not large enough to justify managing for these resources.	4.6	1.58
6. Non-timber forest products should be included in forest plan revisions at the same level of analysis as other natural resources.	4.1	1.85
7. NTFPs are not important enough to shift funds from other budgets to support management efforts for these resources.	4.2	1.49
8. The Forest Service should not assign personnel to work on NTFPs.	5.3	1.43
9. A shift of funds from other budget allocations to support management of NTFPs would be good.	3.9	1.47
10. Managing the national forests for NTFPs would improve biodiversity conservation.	4.3	1.55
11. In general, NTFPs are not important resources on national forests.	5.5	1.43
12. The Forest Service should be managing the national forests for commercial collection of NTFPs.	4.2	1.59
13. The management of non-timber forest products is not an issue that the Forest Service should deal with.	5.9	1.40
14. The level of risk to the environment from collection of NTFPs is not sufficient to require managing for these products.	5.3	1.38
15. Non-timber forest products (NTFPs) are not an issue of concern in management of national forests.	5.5	1.44
16. NTFPs should be a high priority for the Forest Service.	3.8	1.56
17. I consider myself a champion for the inclusion of NTFPs in forest management plan revisions.	3.6	1.56
18. NTFPs are just as important as other natural resources that are found on national forests.	4.5	1.53
19. Management of forests for NTFPs should not be a strategic goal of the Forest Service.	4.4	1.66
20. The F.S. has enough problems to deal with without addressing NTFPs.	4.6	1.77
Mean Scale Score	4.7	1.57

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[4] Survey of U.S. Forest Service District, Forest, Region, and National level managers; valid n = 137; scale 1-7 where 1 = strongly disagree, 7 = strongly agree; a mean score of 4.0 is considered ambivalent.

Table 4.3 Descriptive statistics for perception statements from the survey[5] of Regions 8 and 9, by influential groups.[6]

Perception Statements	Mean[7]	Std. Dev.
1. The Forest Service should actively manage for NTFPs, regardless of cost.		
Collectors	4.9	2.04
General Public	3.6	1.27
Environmental Groups	4.6	2.28
Civic Groups	3.7	1.16
Recreation and Hunt Groups	3.6	1.46
Forest Products Industry	3.1	1.70
State Legislators	3.6	1.27
State Agencies	3.9	1.28
Federal Legislators	3.6	1.31
Federal Agencies	3.9	1.39
Local Agencies	3.6	1.32
Core Colleagues	3.5	1.47
Supervisor	3.9	1.51
2. Managing the national forests for NTFPs would improve the health of the forests.	**Mean**	**Std. Dev.**
Collectors	4.8	1.51
General Public	3.8	1.09
Environmental Groups	4.4	2.17
Civic Groups	3.9	1.00
Recreation and Hunt Groups	3.8	1.22
Forest Products Industry	3.5	1.54
State Legislators	3.7	1.05
State Agencies	4.0	1.19
Federal Legislators	3.7	1.04
Federal Agencies	4.1	1.27
Local Agencies	3.8	1.19
Core Colleagues	4.0	1.40
Supervisor	4.1	1.43

[5] Survey of U.S. Forest Service, District, Forest, Region, and National level managers.
[6] Groups identified are influential to forest manager's decision process; they were identified through in-depth interviews during development of the measurement instrument.
[7] Valid n = 137; scale 1-7, where 1 = strongly disagree, 7 = strongly agree.

Table 4.3. (continued)

Perception Statements	Mean[8]	Std. Dev.
3. Management of the national forests for non-timber forest products should be a priority of the Forest Service.		
Collectors	5.4	1.82
General Public	3.7	1.26
Environmental Groups	4.6	2.14
Civic Groups	3.8	1.07
Recreation and Hunt Groups	3.6	1.35
Forest Products Industry	3.1	1.65
State Legislators	3.6	1.25
State Agencies	3.8	1.21
Federal Legislators	3.7	1.19
Federal Agencies	4.0	1.19
Local Agencies	3.7	1.32
Core Colleagues	3.6	1.40
Supervisor	4.0	1.36
Mean Scale Scores	3.9	1.40

(Back to text)

[8] Valid n = 137; scale 1-7, where 1 = strongly disagree, 7 = strongly agree.
[9] Valid n = 137; scale 1-7, where 1 = strongly disagree, 7 = strongly agree.

Table 4.4 Descriptive statistics for behavior intention statements from the survey.[10]

Behavior Intention Statements	Mean[11]	Std. Dev.
1. If I was requested to review and comment on a forest management plan revision, I would urge that non-timber forest products receive the same consideration as other natural resources	4.3	1.69
2. I would support the effort of other Forest Service personnel to include NTFPs in the revision of forest management plans.	5.1	1.58
3. I would not initiate discussion with management team members to consider NTFPs in future forest management plan revisions at the same level of analysis as other natural resources.	4.4	1.83
4. I would not identify non-timber forest products as a critical issue that needs addressing in forest management plan revisions.	4.4	1.87
Mean Scale Scores	4.5	1.74

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[10] Survey of U.S. Forest Service, District, Forest, Region, and National level managers.
[11] valid n = 137; scale 1-7, where 1 = strongly disagree, 7 = strongly agree.

Table 4.5 Frequency distributions for background variables from the survey.[12]

Background question and response categories	#	%
1. How many years have you been in your current position?		
Less than 1 year	13	9.5
1-3 years	33	24.1
4-6 years	24	17.5
More than 6 years	67	48.9
2. Immediately before your current position, in which region were you assigned?		
Region 8	66	48.2
Region 9	31	22.6
Other Region	40	29.2
3. How many years have you worked for the US Forest Service?		
Less than 15 years	22	16.1
16-20 years	26	19.0
21-25 years	38	27.7
More than 25 years	51	37.2
4. At what level within the Forest Service do you work?		
District	80	58.4
Forest	40	29.2
Region	10	7.3
National	7	5.1
5. In which region do you work?		
Region 8	64	46.7
Region 9	66	48.2
National	7	5.1

Note: Valid n = 137

[12] Survey of U.S. Forest Service, District, Forest, Region, and National level managers.

Table 4.5. (continued).

Background question and responses categories	#	%
6. At what stage in the revision process is the national forest on which you work? [13]		
Revision complete	25	18.2
Scoping underway	16	11.7
Developing alternatives	41	29.9
Revision not started	38	27.7
7. Which one area best describes your field of expertise?		
Forest Management	96	70.1
Non-Forest Management	18	13.1
Planning	23	16.8
8. What is the highest level of education that you have obtained?		
Under graduate (Bachelors degree or less)	84	61.3
Graduate (Master's degree or greater)	53	38.7
9. What was the major focus in your degree program?		
Forest Management	100	73.0
Non-Forest Management	37	27.0
10. How many years has it been since you received your last degree?		
Less than 15 years	23	16.8
16-20 years	32	23.4
21-25 years	41	29.9
More than 25 years	41	29.9
11. Do you personally know anyone that collects NTFPs from national forests?		
Don't know collectors	42	30.7
Know collectors	95	69.3
12. Do you use herbal remedies for ailments?		
Don't use herbal remedies	85	62.0
Use herbal remedies	52	38.0
13. In your lifetime, did any of your family members collect NTFPs from public or private forests?		
No family member collected	72	52.6
Family member collected	65	47.4

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[13] Percent totals do not sum to 100 because the response category "do not work on National Forest" was excluded from the comparisons.

Table 4.6 Component matrix for factor analysis[14] of attitude statements for the survey of Regions 8 and 9.

	Component		
	1	2	3
NTFPs deserve same attention as other resources	.728	-.260	.217
Personal use collection is acceptable	.250	.598	.593
Actively manage regardless of cost	.600	-.223	.391
Need to include for ecosystem management	.727	2.9E-02	-.286
Market value is enough to warrant management	.690	.114	1.0E-02
Should include in plan revisions at same level	.799	-.342	7.5E-02
NTFPS are important enough to shift funds	.800	5.1E-02	-8.E-02
FS should assign personnel to work on NTFPs	.804	.252	5.6E-03
Shift funds to support management for NTFPs	.754	4.7E-02	3.3E-02
Management would improve biodiversity conservati	.681	-.315	1.5E-02
NTFPs are an important resource on national forests	.693	.316	-.153
FS should manage for commercial collection	.381	.148	.497
Management for NTFPs is an issue to deal with	.738	.423	-.172
Level of risk to the environment is sufficient	.599	-1.E-02	-.387
NTFPs are an issue of concern in management	.736	.322	-.208
NTFPs should be a high priority for the FS	.684	-.173	4.7E-02
Consider myself a champion for NTFPs	.716	-.260	.179
NTFPs are just as important as other resources	.708	-.455	3.1E-03
Mgt. for NTFPs should be a strategic goal	.713	8.1E-02	2.1E-02
The FS should deal with NTFP management	.717	4.7E-02	-.170

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[14] Extraction method was principal component analysis.

Table 4.7 Descriptive statistics and correlation coefficients for remaining perception variables.

Perception Statements	Mean	Std. Dev.	Cor. Co.[15]	Sig.[16]
1. The Forest Service should actively manage for NTFPs, regardless of cost.				
Environmental Groups	4.6	2.28	.05	.54
Civic Groups	3.7	1.16	.12	.17
State Legislators	3.9	1.28	.14	.09
Federal Legislators	3.6	1.31	.09	.30
2. Managing the national forests for NTFPs would improve the health of the forests.				
Collectors	4.8	1.51	-.12	.15
Environmental Groups	4.4	2.17	.09	.31
Civic Groups	3.9	1.00	.04	.63
3. Management of the national forests for non-timber forest products should be a priority of the Forest Service.				
Collectors	5.4	1.82	-.05	.60
Environmental Groups	4.6	2.14	.03	.73
Civic Groups	3.8	1.07	.15	.09

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[15] Correlation coefficients with attitude factor
[16] Two-tailed significance level

Table 4.8 Descriptive Statistics[17] for index variables describing an eastern United States perspective on NTFP management.

	N	Mean	Std. Deviation	Variance
Behavior Intention Index (BII)	137	18.14	5.66	32.00
Average Behavior Intention (BIA)	137	4.53	1.41	2.00
Attitude Index (ATIFACTO)	137	61.73	14.97	224.07
Average Attitude (ATIAVG)	137	3.09	.75	.56
Perception Index (PERI)	137	38.66	6.85	46.89
Average Perception (PERAVG)	137	4.30	.76	.58
Valid N (listwise)	137			

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[17] Range for BII is 4-28, with a mid-point of 15.5; range for ATIFACTO is 18-92, with mid-point of 55; range for PERI is 24-53, with mid-point of 38.5; average scores are based on a scale of 1-7, with 1 = strongly disagree and 7 = strongly agree.

Table 4.9 Analysis of variance for behavior intention index (BII) against listed independent variables.

Independent Variable	Between Groups				
	Sum of Squares	df	Mean Square	F	Sig.[18]
Years in Current Position	10.76	3	3.59	.11	.95
Previous Assignment	258.48	2	129.24	4.23	.02
Years of Service	31.40	3	10.47	.32	.81
Management Level	223.76	3	74.59	2.40	.07
Current Region	105.24	1	105.24	3.30	.07
Stage of revision	212.16	3	70.72	2.16	.10
Expertise	88.56	2	44.28	1.39	.25
Level of education	54.08	1	54.08	1.81	.18
Focus of education	266.69	1	266.69	8.81	.00
Years since degree	11.00	3	3.67	.11	.95
Know collector	92.22	1	92.22	2.92	.09
Use herbs	159.74	1	159.73	5.14	.03
Family member collected	131.35	1	131.35	4.20	.04

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[18] Variables with significance of 0.10 or greater, and with greater than 1 degree of freedome are subjected to post hoc tests. This type of test is for multiple comparisons, used in situations where an item is being compared to more than one other item.

Table 4.10 Fisher's Least Significant Difference post hoc test on the variable "previous assignment" with behavior intention (BII) as the dependent variable.

Previous Assignment (I)	Previous Assignment (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Region 8	Region 9	-1.65	1.20	.17	-4.03	.73
	Other Region	-3.19*	1.11	.00	-5.38	-1.00
Region 9	Region 8	1.65	1.20	.17	-.73	4.03
	Other Region	-1.54	1.32	.25	-4.16	1.07
Other Region	Region 8	3.19*	1.11	.00	1.00	5.38
	Region 9	1.54	1.32	.25	-1.07	4.16

*. The mean difference is significant at the .05 level.

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Table 4.11 Fisher's Least Significant Difference post hoc test on the variable "management level" with the dependent variable behavior intention (BII).

Management Level (I)	Management Level (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
District	Forest	-1.88	1.08	.08	-4.01	.26
	Region	-3.85*	1.87	.04	-7.55	-.15
	National	-3.14	2.20	.16	-7.48	1.21
Forest	District	1.88	1.08	.08	-.26	4.01
	Region	-1.98	1.97	.32	-5.87	1.92
	National	-1.26	2.28	.58	-5.78	3.25
Region	District	3.85*	1.87	.04	.15	7.55
	Forest	1.98	1.97	.32	-1.92	5.87
	National	.71	2.75	.80	-4.72	6.15
National	District	3.14	2.20	.16	-1.21	7.48
	Forest	1.26	2.28	.58	-3.25	5.78
	Region	-.71	2.75	.80	-6.15	4.72

*. The mean difference is significant at the .05 level.

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Table 4.12 Fisher's Least Significant Difference post hoc test on the variable "stage of revision" with the dependent variable behavior intention (BII).

Stage of Revision I	Stage of Revision J	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Revision complete	Scoping underway	-2.82	1.83	.126	-6.45	.81
	Developing alternatives	-3.00*	1.45	.041	-5.88	-.13
	Not started	-3.58*	1.47	.017	-6.49	-.66
Scoping underway	Revision complete	2.82	1.83	.126	-.81	6.45
	Developing alternatives	-.18	1.69	.915	-3.52	3.16
	Not started	-.75	1.70	.659	-4.13	2.62
Developing alternatives	Revision complete	3.00*	1.45	.041	.13	5.88
	Scoping underway	.18	1.69	.915	-3.16	3.52
	Not started	-.57	1.29	.658	-3.12	1.98
Not started	Revision complete	3.58*	1.47	.017	.66	6.49
	Scoping underway	.75	1.70	.659	-2.62	4.13
	Developing alternatives	.57	1.29	.658	-1.98	3.12

*. The mean difference is significant at the .05 level.

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Table 4.13 Analysis of variance for the dependent variable – Attitude Index -- against listed independent variables.

Independent Variable	Between Groups				
	Sum of Squares	df	Mean Square	F	Sig.[19]
Years in Current Position	480.80	3	160.27	.71	.55
Previous Assignment	1878.64	2	939.32	4.40	.01
Years of Service	266.97	3	88.99	.39	.76
Management Level	753.06	3	251.02	1.12	.34
Current Region	1267.77	1	1267.77	5.75	.02
Stage of revision	2653.74	3	884.58	3.94	.01
Expertise	2476.67	2	1238.34	5.93	.00
Level of education	803.80	1	803.80	4.10	.05
Focus of education	2307.92	1	2307.92	11.06	.00
Years since degree	627.66	3	209.22	.93	.43
Know collector	1401.16	1	1401.16	6.51	.01
Use herbs	1184.96	1	1184.96	5.46	.02
Family member collected	845.77	1	845.77	3.85	.05

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[19] Variables with significance better than 0.05 are subjected to post hoc tests. These tests are performed only on variables with greater than 1 degree of freedom because this type of test is for multiple comparisons, used in situations where an item is being compared to more than one other item.

Table 4.14 Fisher's Least Significant Difference post hoc test on the variable "previous assignment" with attitude (ATIFACTO) as the dependent variable.

Previous Assignment (I)	Previous Assignment (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Region 8	Region 9	-5.19	3.18	.11	-11.48	1.10
	Other Region	-8.46 *	2.93	.00	-14.25	-2.67
Region 9	Region 8	5.19	3.18	.11	-1.10	11.48
	Other Region	-3.27	3.50	.35	-10.19	3.64
Other Region	Region 8	8.46 *	2.93	.00	2.67	14.25
	Region 9	3.27	3.50	.35	-3.64	10.19

*. The mean difference is significant at the .05 level.

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Table 4.15 Fisher's Least Significant Difference post hoc test on the variable "stage of revision" with attitude (ATIFACTO) as the dependent variable.

Stage of Revision (I)	Stage of Revision (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Revision	Scoping Underway	-12.51 *	4.80	.01	-22.02	-3.00
	Developing Alternatives	-10.73 *	3.80	.01	-18.26	-3.20
	Not Started	-11.86 *	3.86	.00	-19.50	-4.21
Scoping Underway	Revision	12.51 *	4.80	.01	3.00	22.02
	Developing Alternatives	1.78	4.42	.69	-6.97	10.53
	Not Started	.65	4.47	.88	-8.19	9.50
Developing Alternatives	Revision	10.73 *	3.80	.01	3.20	18.26
	Scoping Underway	-1.78	4.42	.69	-10.53	6.97
	Not Started	-1.13	3.38	.74	-7.81	5.56
Not Started	Revision	11.86 *	3.86	.00	4.21	19.50
	Scoping Underway	-.65	4.47	.88	-9.50	8.19
	Developing Alternatives	1.13	3.38	.74	-5.56	7.81

*. The mean difference is significant at the .05 level.

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Table 4.16 Fisher's Least Significant Difference post hoc test on the variable "expertise" with attitude (ATIFACTO) as the dependent variable.

Expertise (I)	Expertise (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Forestry	Non-Forestry	-12.67 *	3.71	.00	-20.01	-5.33
	Planning	-3.51	3.36	.30	-10.15	3.13
Non-Forestry	Forestry	12.67 *	3.71	.00	5.33	20.01
	Planning	9.16 *	4.55	.05	.16	18.15
Planning	Forestry	3.51	3.36	.30	-3.13	10.15
	Non-Forestry	-9.16 *	4.55	.05	-18.15	-.16

*. The mean difference is significant at the .05 level.

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Table 4.17 Analysis of variance for the dependent variable – Perception Index – against listed independent variables.

Independent Variables	Between Groups				
	Sum of Squares	df	Mean Square	F	Sig.[20]
Years in Current Position	125.75	3	41.92	.89	.45
Previous Assignment	119.88	2	59.94	1.28	.28
Years of Service	88.96	3	29.65	.627	.60
Management Level	344.13	3	114.71	2.53	.06
Current Region	2.76	1	2.76	.06	.81
Stage of Revision	500.71	3	166.90	3.69	.01
Expertise	27.12	2	13.56	.29	.75
Level of Education	3.60E-03	1	3.60E-03	.00	.99
Focus of Education	17.43	1	17.43	.37	.54
Years since Degree	293.48	3	97.83	2.14	.10
Know Collector	59.40	1	59.40	1.27	.26
Use Herbs	8.10	1	8.10	.17	.68
Family Member Collected	12.06	1	12.06	.27	.61

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[20] Variables with significance better than 0.05 and with more than 1 degree of freedom are subjected to post hoc test. This type of test is for multiple comparisons, used in situations where an item is being compared to more than one other item.

Table 4.18 Fisher's Least Significant Difference post hoc test on the variable "stage of revision" with perception (PERI) as the dependent variable.

Stage of Revision (I)	Stage of Revision (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Revision Complete	Scoping Underway	4.01	2.15	.06	-.25	8.27
	Developing Alternatives	4.18*	1.71	.02	.80	7.55
	Not Started	5.67*	1.73	.00	2.25	9.10
Scoping Underway	Revision Complete	-4.01	2.15	.06	-8.27	.25
	Developing Alternatives	.16	1.98	.93	-3.76	4.09
	Not Started	1.66	2.00	.41	-2.31	5.63
Developing Alternatives	Revision Complete	-4.18*	1.71	.02	-7.55	-.80
	Scoping Underway	-.16	1.98	.93	-4.09	3.76
	Not Started	1.50	1.51	.32	-1.50	4.50
Not Started	Revision Complete	-5.67*	1.73	.00	-9.10	-2.25
	Scoping Underway	-1.66	2.00	.41	-5.63	2.31
	Developing Alternatives	-1.50	1.51	.32	-4.50	1.50

*. The mean difference is significant at the .05 level.

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Table 4.19 Coefficients for the linear regression model for Region 8 and Region 9, with Behavior Intention Index (BII) as the dependent variable.

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tol.	VIF
(Constant)	4	2.05		1.9	.06		
Attitude Index (ATIFACTO)	.30	.02	.79	15	.00	.99	1.01
Perception Index (PERI)	-.1	.04	-.13	-2	.02	.99	1.01

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Table 4.20 Coefficients for the logistic regression model for Region 8 and Region 9, with behavior intention (BII) as the dependent variable.

	B	S.E.	Wald	df	Sig.	Exp(B)
ATIFACTO	.13	.02	28.02	1	.00	1.14
PERI	.00	.03	.02	1	.90	1.00
Constant	-7.79	1.83	18.14	1	.00	.00

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Table 4.21 Classification table for the Region 8 and Region 9 logistic regression model.

		Predicted		
		Management Y/N		Percentage
Observed		0	1	Correct
Management Y/N	0	46	20	69.7
	1	14	57	80.3
Overall Percentage				75.2

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Table 4.22 Coefficients for validation of linear regression model with Region 5 and Region 6 data with the constant removed from the model.

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tol.	VIF
BIPRED	1.02	.03	.99	40.45	.00	1.00	1.00

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Table 4.23 Classification table for validation of the logistic regression model for Region 8 and Region 9 using Region 5 and Region 6 data.

Observed		Predicted		
		Management Y/N		
		0	1	Percentage Correct
Management Y/N	0	10	3	76.9%
	1	3	14	82.4%
Overall Percentage				79.6%

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4.7 Figures

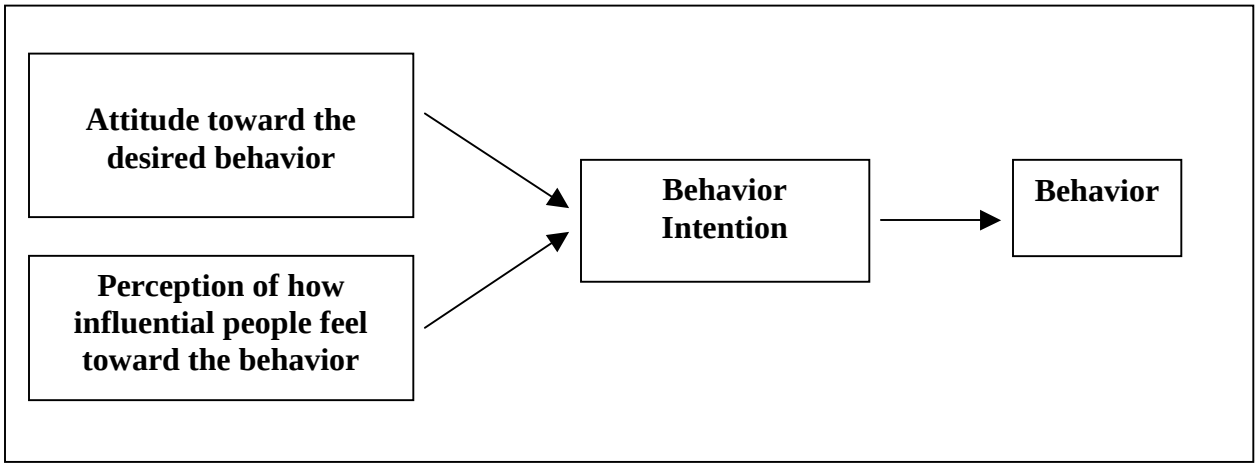

Figure 4.1 The determinants of behavior[21] as proposed by the Theory of Reasoned Action.[22]

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[21] Note: Arrows indicate direction of influence
[22] Source: Fishbein and Ajzen, 1975

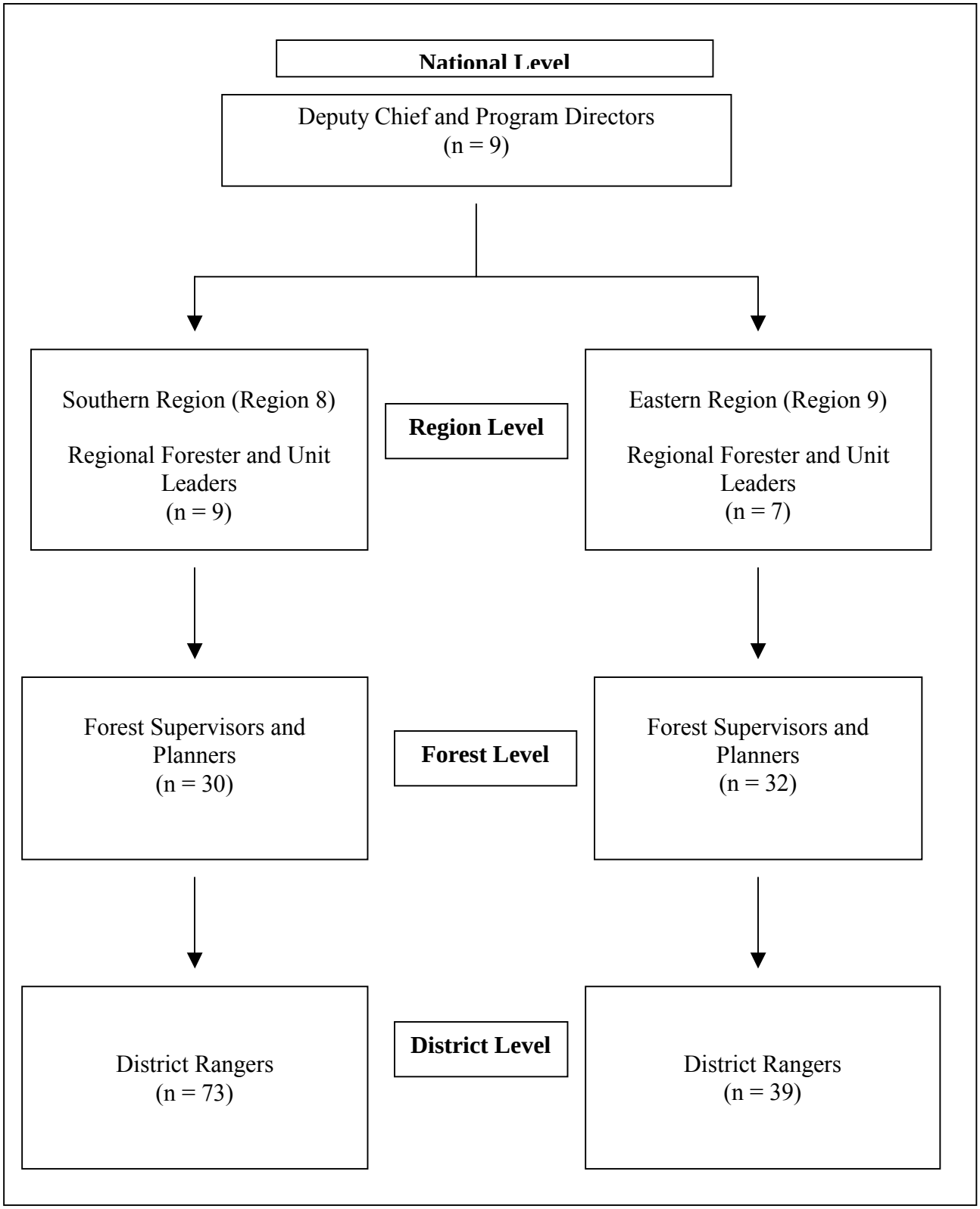

Figure 4.2 The population of interest within the U.S. Forest Service, National Forest System (N = 199).

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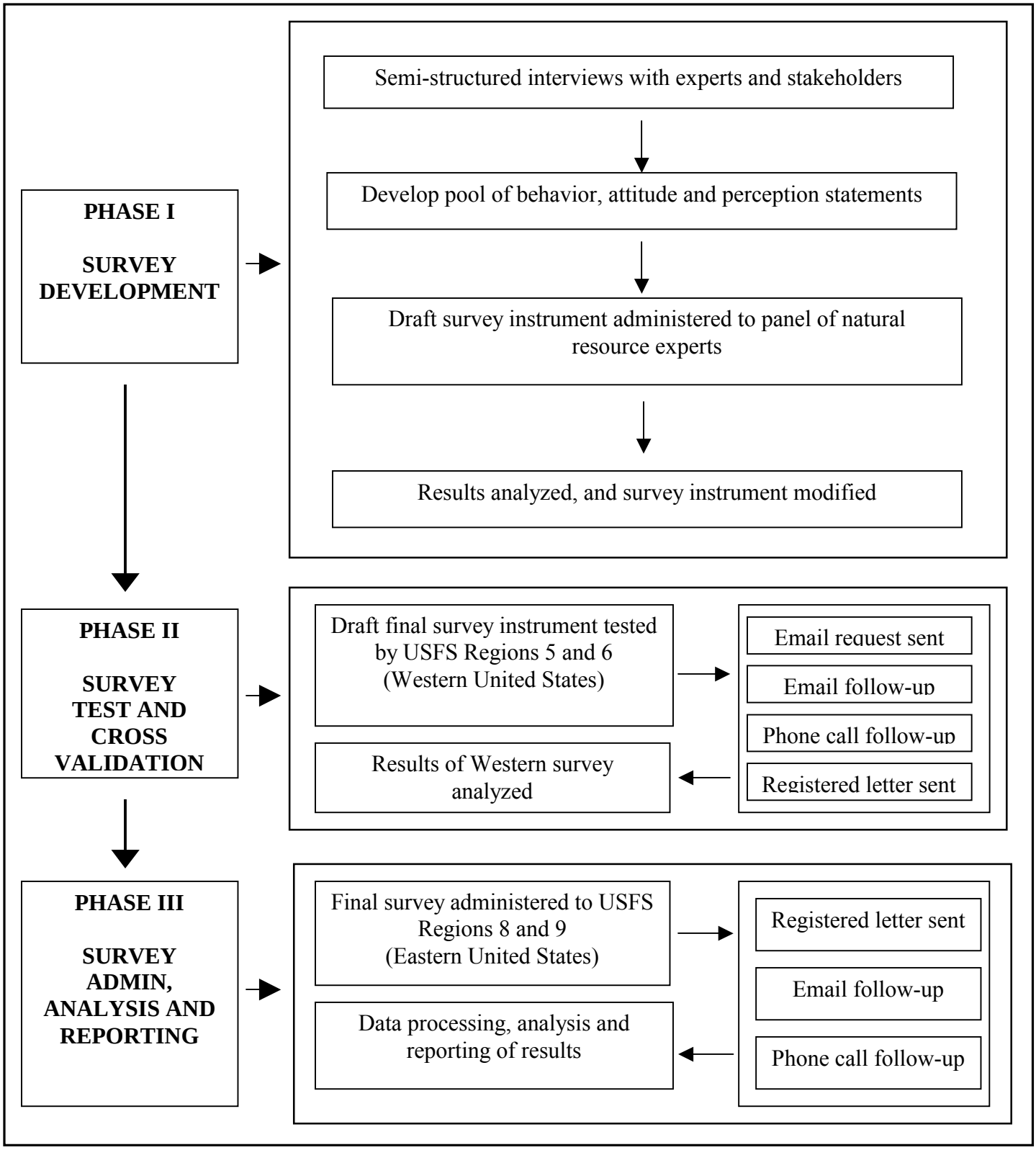

Figure 4.3 Study flow chart illustrating the approach used to survey forest managers.

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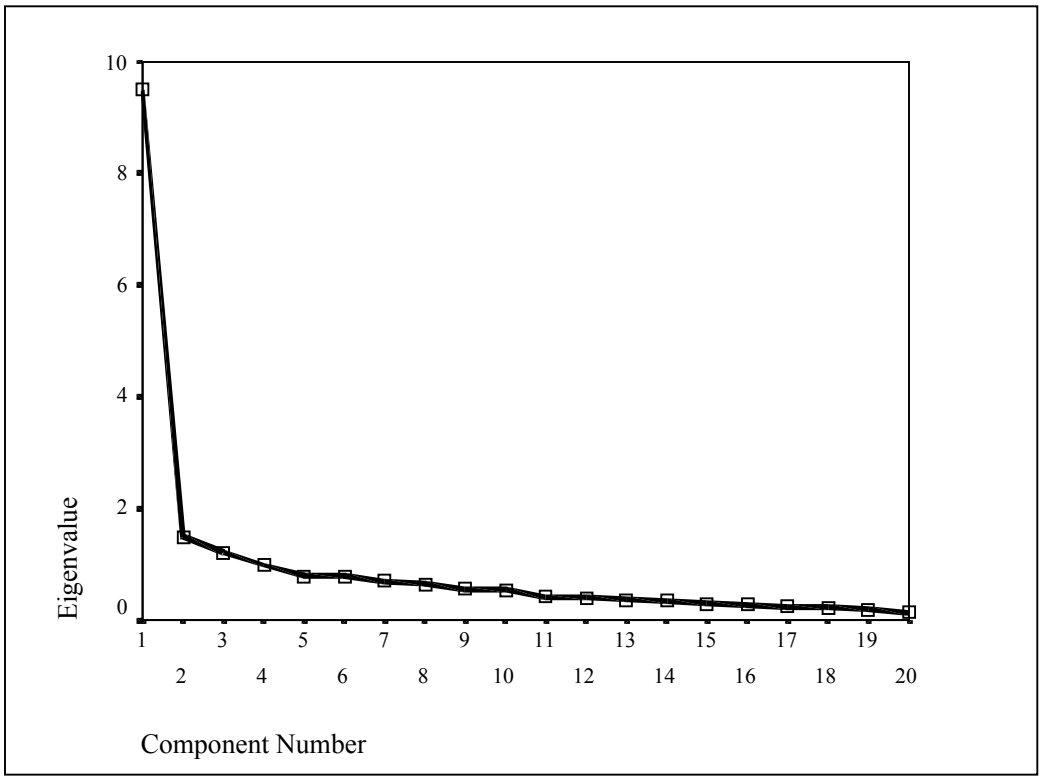

Figure 4.4 This scree plot for the factor analysis of the attitude statements suggests that only one factor explains the variable ATIFACTO.[23]

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[23] Source: Malhotra 1996

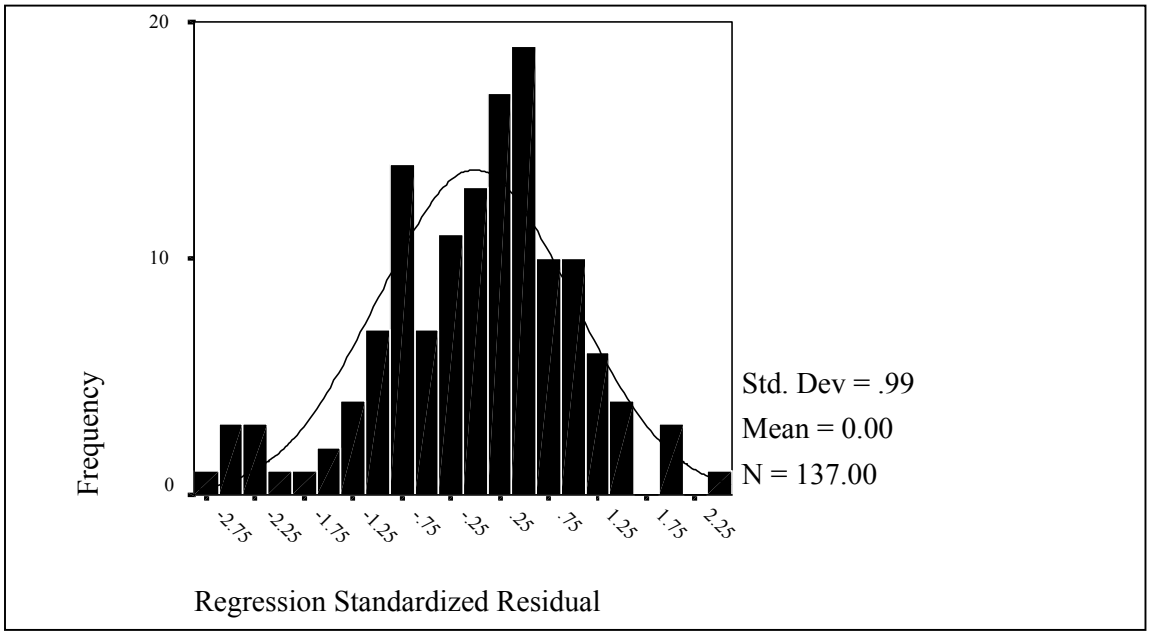

Figure 4.5 Frequency distribution of standardized residuals of linear regression model suggests a normal distribution. [24]

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[24] Source: Ott 1993

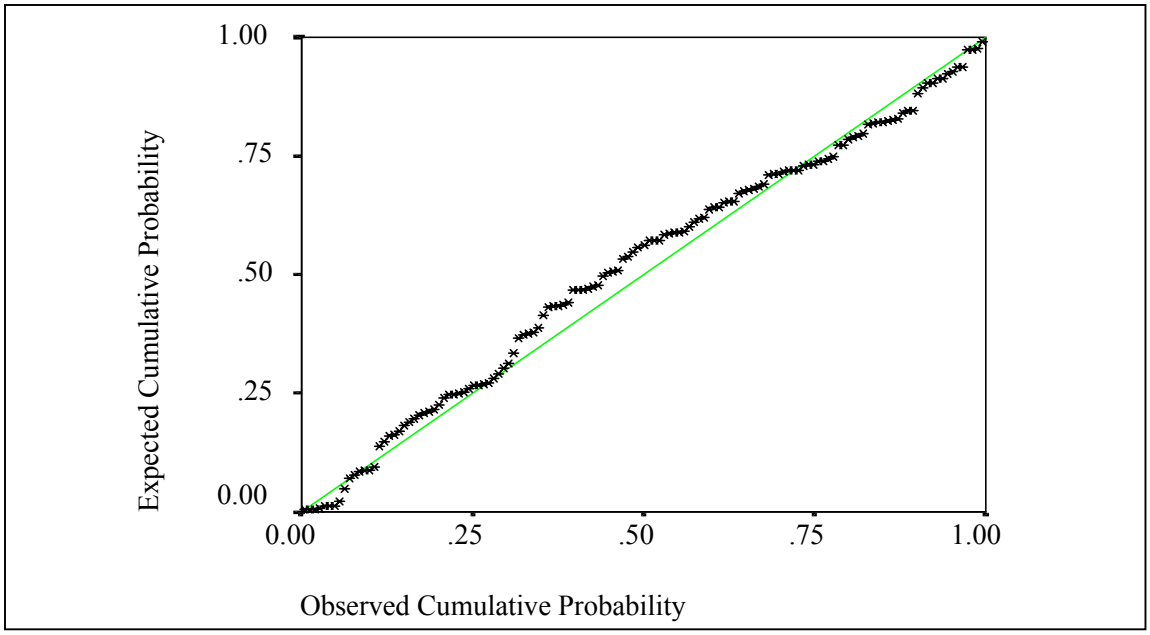

Figure 4.6 Normal probability plot of the residuals should be a straight line for normally distributed residuals.[25]

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[25] Source: Ott 1993, p. 698; Montgomery and Peck 1992

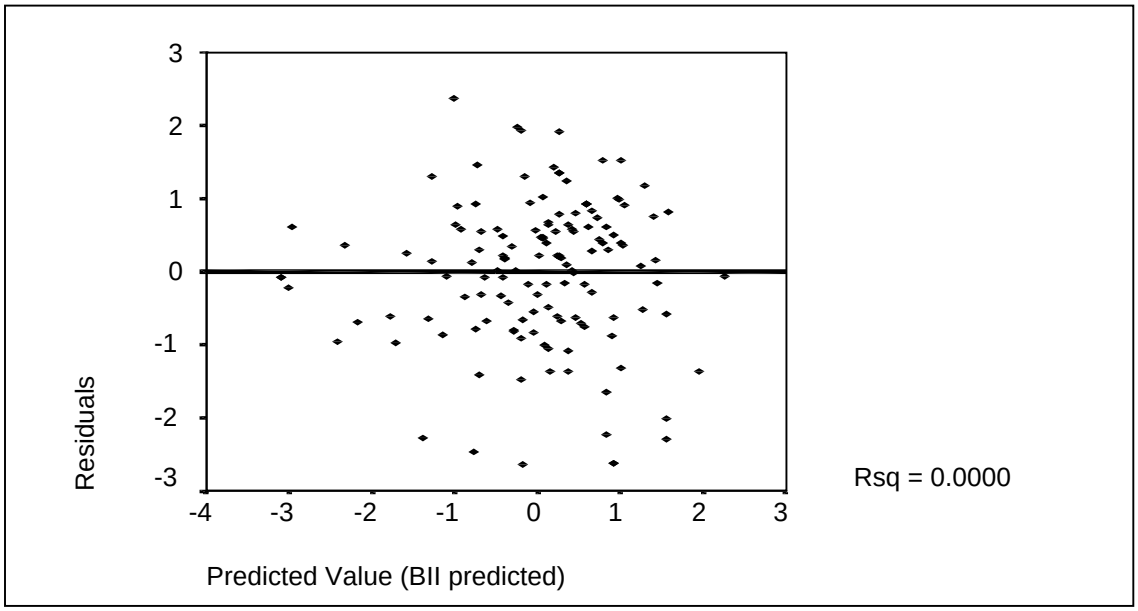

Figure 4.7 Plotting the residuals against the predicted values is a simple and recommended way to test the assumption of constant variance.[26]

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[26] Source: Ott, 1993

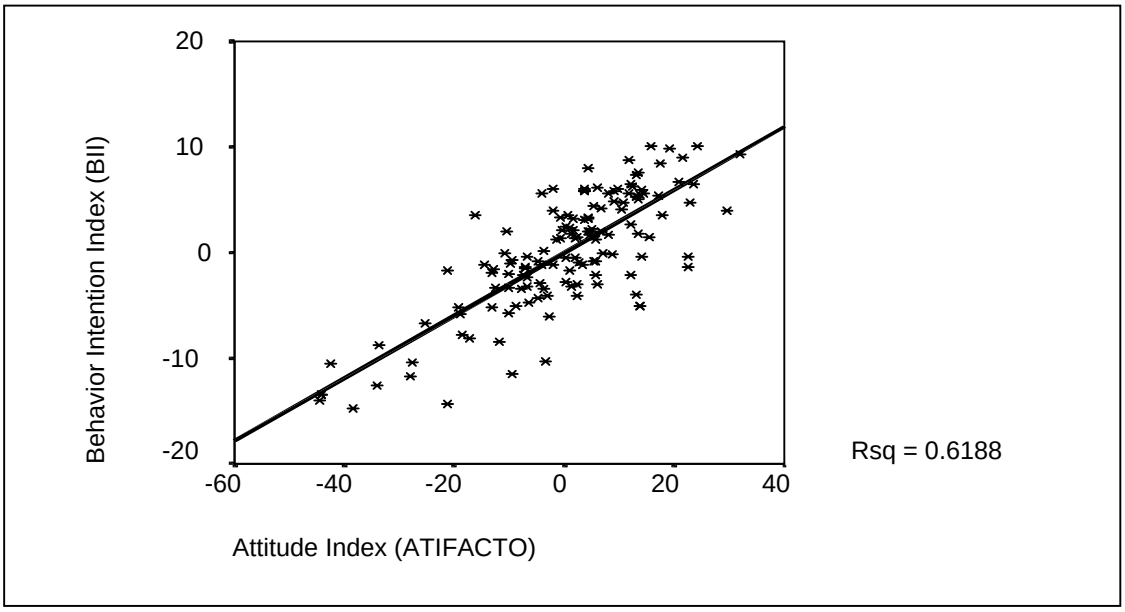

Figure 4.8 A partial regression plot of the dependent variable against the independent variable suggests a linear relationship.

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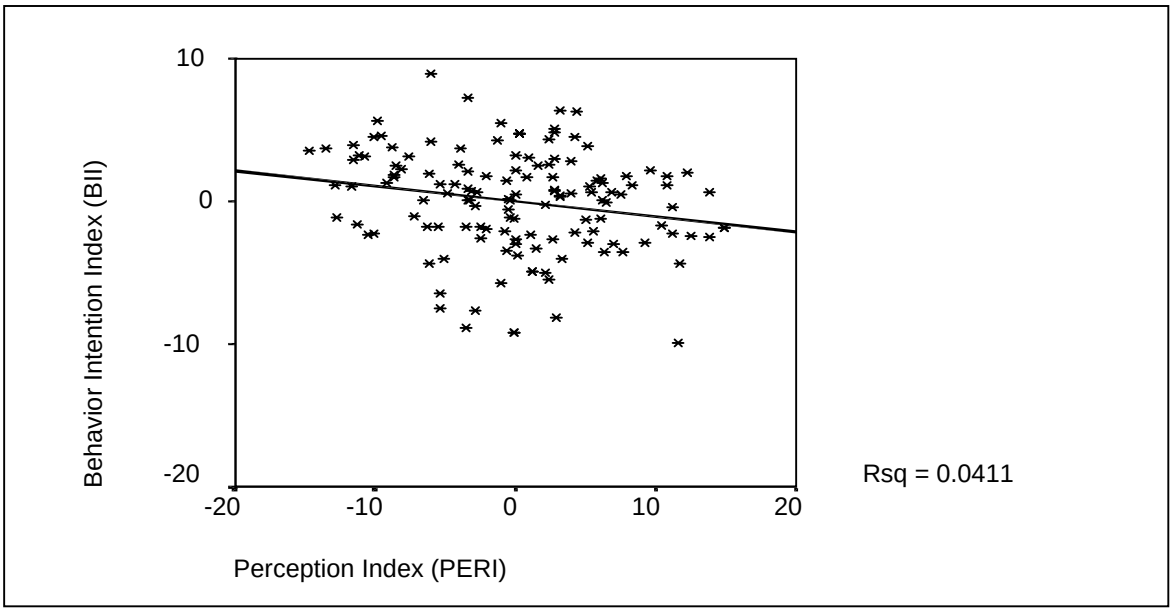

Figure 4.9 Partial regression plot of dependent variable against the independent variable suggests a linear relationship.

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4.8 Appendices

Appendix 4.1 Overall sample frame for USDA, Forest Service, National Forest System, Region 8 (Southern Region) and Region 9 (Eastern Region).

REGION 8 (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virgin Islands, and Virginia)

Headquarters: 1720 Peachtree Road, Atlanta, GA 30367
Contact: Mr. Paul Arndt
Phone: 404-347-4985

National Forests:

Alabama (4)	Arkansas (2)	Florida (3)
Georgia (2)	Kentucky (1)	Louisiana (2)
Mississippi (6)	North Carolina (4)	South Carolina (2)
Tennessee (1)	Texas (6)	Virginia (2)

REGION 9 (Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin)

Headquarters: 310 W. Wisconsin Avenue, Rm 500, Milwaukee, WI 53203
Contact: Sam Emmons, Regional Planner
Phone: 414-297-3088

National Forests:

Illinois (1)	Indiana (1)	Michigan (3)
Minnesota (2)	Missouri (1)	New Hampshire (1)
Pennsylvania (1)	Vermont (2)	West Virginia (1)
Wisconsin (2)		

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Appendix 4.2 Detailed sample frame for U.S. Forest Service, Region 8 (Southern Region).

State	National Forest	Initial Contact[27]/Title	Phone #
Alabama	William Bankead	Rick Morgan, Planning Team Leader	334-241-8166
	Conecuh		
	Talladega		
	Tuskegee		
Arkansas	Ouachita	John Cleeves, Mgt. Planning	501-321-5251
	Ozark-St. Francis	Dave Purser	501-964-9363
Florida	Apalachicola	Larry Kolk, Planning Staff Officer	850-942-9363
	Ocata		
	Osceola	Richard Shelfer, Forest Planner	
Georgia	Chattahoochee	Marcus Beard, Planning Team Leader	770-536-0541
	Oconee	John Petrick, Fores Planner	
Kentucky	Daniel Boone	Kevin Lawrence, Planning Staff Officer	606-945-3100
Louisianna	Kisatchie	Carl Brevelle, Forest Planning	318-473-7160
		Cindy Dancak, Planning Staff Officer	
Mississippi	Bienville	Jeff Long, Planning Team Leader	601-965-4391
	Delta		
	DeSoto		
	Holly Springs		
	Homochitto		
	Tombigbee		
North Carolina	Croatan	Larry Hayden, Director Planning	828-257-4200
	Nantahala		
	Pisgah		
	Uwharrie		
South Carolina	Francis Marion	Tony White, Planning Team Leader	803-561-4000
	Sumter		
Tennessee	Cherokee	Keith Sandifer	423-476-9700
		Red Anderson	
Texas	Caddo-LBJ	George Whike, Planning Team Leader	409-639-8501
	Angelina		
	Davy Crockett	Bill Bartush, Original Leader	
	Sabine		
	Sam Houston		
Virginia	George	Nancy Ross, Planning Team Leader	540-265-5100
	Jefferson		

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[27] Initial contacts are not identified for each national forest because U.S. Forest Service personnel may be responsible for more than one forest. For example, Nancy Ross is responsible for the George Washington and Jefferson National Forest.

Appendix 4.3 Detailed sample frame for U.S. Forest Service, Region 9 (Eastern Region).

State	National Forest	Initial Contact[28]/Title	Phone #
Illinois	Shawnee	Steve Huber, NEPA Coordinator	618-658-2111
Indiana	Hoosier	Regis Terney, Planning Team Leader	812-275-5987
Michigan	Hiawatha	Don Howlett, Forest Planner	906-786-4062
	Huron-Manistee	Jim DiMaio, Planning Team Leader	616-775-2421
	Ottawa	Robert Brenner, Planning Team Leader	906-932-1330
Minneosta	Chippewa	Duane Lula, Forest Planner	218-626-4383
	Superior		
Missouri	Mark Twain	Laura Watts, Acting Forest Planner	573-364-4621
		Rich Hall, Forest Planner	
Ohio	Wayne	Ted King, Forest Planner	740-592-6644
Pennsylvania	Alleghany	Gary Kell, Forest Planner	814-723-5150
Vermont	Green Mountains	Mary Krueger	802-747-6700
	Finger Lakes		
West Virginia	Monongahela	Gary Williams, Forest Planner	304-636-1800
Wisconsin	Chequamegon	Mike Miller, Planning Team Leader	715-762-2461
	Nicolet		

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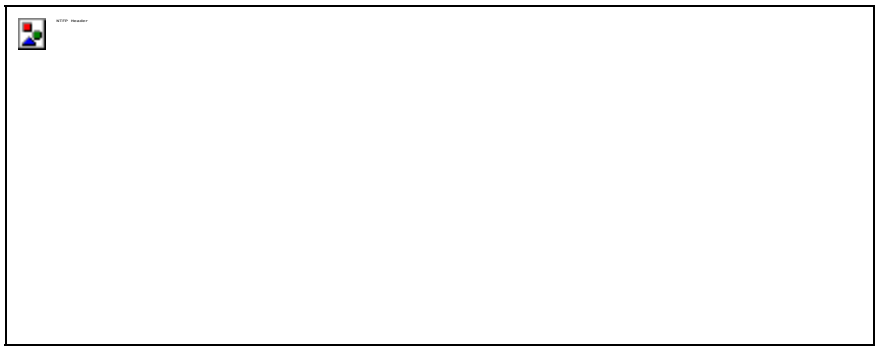
[28] Initial contacts are not identified for all national forests because U.S. Forest Service personnel may be responsible for more than one forest.

Appendix 4.4 The survey instrument used to estimate attitude, perception and behavior intention of the forest managers of eastern United States.



Background

This study is supported by two USDA-FS research work units (4702 - Integrated Life Cycle of Wood: Tree Quality, Processing, and Recycling and, 4106 - Managing Upland Forest Ecosystems in the Mid-South) of the USFS Southern Research Station. The USDA National Needs Fellowship program also provides support. The support and endorsement of these institutions is indicative of their concern about this issue.

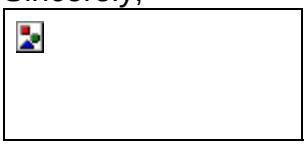
I am trying to better understand how Forest Service personnel at different levels of the agency feel toward managing forests for non-timber products (NTFPs). I am interested in getting your opinions on managing national forests for these products. The main focus of this research is your attitude toward the issue, and your thoughts on how other people feel toward this issue. I believe that understanding these factors is critical to developing sound forest management policy.

The issue that this research addresses is: the management of national forests for non-timber forest products. "National forests are established and administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes" (Multiple Use-Sustained Yield Act (MUSYA) of 1960; 16 USC 528). Further, the National Forest Management Act (NFMA) of 1976 amended the Forest and Rangeland Renewable Resources Planning Act of 1974 to provide additional statutory direction on preparation and revision of forest management plans for the National Forest System. The NFMA provides that such plans "include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness. The forest management plans "determine management systems, harvesting levels, and procedures in light of all of the uses" set forth in the MUSYA. The plans guide natural resource management, establish management requirements and describe practices, and management levels. They provide forest-wide standards and guidelines for each natural resource. The plans also establish prescriptions for each management objective for specific management areas within each forest.

You may be more familiar with the term **"special forest products,"** as used by the Forest Service. For this research, the term **"non-timber forest products" (NTFPs)** is used to describe resources generated from the forest that are not timber-based, and have market value. The products may be wood-based, but they do not require harvesting, and secondary processing of the timber. NTFPs come from plants, parts of plants, fungi, and other organisms that are harvested from within and on the edges of natural or manipulated forests. The research is focused on four product categories: Floral and Decorative; Foods and Edibles; Specialty Wood, and Medicinal and Dietary Supplements. Moss, grapevine, and the leaves, twigs and branches of forest plants may be harvested for floral products. Fungi, as well as the fruits and sap of many plants are harvested and consumed as food. Branches, logs, roots, and trunks are harvested to make specialty wood products. And the roots, leaves, bark, and in some cases the entire plant are harvested for medicinal purposes.

I truly appreciate your input on this effort to better understand the issues that affect how non-timber forest products will be managed. Thank you for participating in this research.

Sincerely,



Jim Chamberlain

P.S. I will provide you the results and findings if you click the circle at the end of the survey and provide your e-mail address.

Instructions

The questions ask for your opinions and perceptions on managing for non-timber forest products. Please click on the circle that most closely represents your agreement or disagreement with the issue expressed in each question. Accurate and candid responses are essential! When you are finished, click the submit button. **You must complete all questions; the survey can not be submitted without all questions completed.**

---

1. If I were a member of a USFS forest management plan revision team, I would advocate that non-timber forest products be included at the same level of analysis as other natural resources (i.e.; timber, wildlife, recreation, range, and minerals). (P)

Yes ○ No ○

2. If I was requested to review and comment on a forest management plan revision, I

would urge that non-timber forest products receive the same consideration as other natural resources. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

3. I would support the effort of other Forest Service personnel to include NTFPs in the revision of forest management plans. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

4. I would not initiate discussion with management team members to consider NTFPs in future forest management plan revisions at the same level of analysis as other natural resources. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

5. I would not identify non-timber forest products as a critical issue that needs addressing in forest management plan revisions. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

Instructions

In this section, I am interested in your opinions on the issues raised in each question. Please click on the circle that most closely aligns with your level of agreement or disagreement with each statement.

---

6. The Forest Service should allow commercial collection of non-timber products from the national forests. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

7. The collection and sales of NTFPs provide significantly to the local economy. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

8. In general, the current levels of collection (personal and commercial) of non-timber products from the national forests have a negative impact on forest health. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

9. The Forest Service is not established to manage national forests for NTFPs. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

10. The market value of NTFPs is not large enough to justify managing for these resources. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

11. Non-timber forest products should be included in forest plan revisions at the same level of analysis as other natural resources. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

12. NTFPs are not important enough to shift funds from other budgets to support management efforts for these resources. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

13. The Forest Service should not assign personnel to work on NTFPs. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

14. A shift of funds from other budget allocations to support management of NTFPs would be good. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

15. Managing the national forests for NTFPs would improve biodiversity conservation. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

16. In general, NTFPs are not important resources on the national forests. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○
Strongly Disagree Strongly Agree

17. The Forest Service should be managing the national forests for commercial collection of NTFPs. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

18. Overall market demand has not been sufficient at the District level to justify managing for NTFPs. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

19. The level of risk to the environment from collection of NTFPs is not sufficient to require managing for these products. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

20. Non-timber forest products (NTFPs) are not an issue of concern in management of national forests. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

21. NTFPs should be a high priority for the Forest Service. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

22. I consider myself a champion for the inclusion of NTFPs in forest management plan revisions. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

23. NTFPs are just as important as other natural resources that are found on national forests. (P)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

24. Management of forests for NTFPs should not be a strategic goal of the Forest Service. (N)

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○

Strongly Disagree Strongly Agree

25. I really don't want to be bothered with having to manage for one more objective, like

non-timber forest products. (N)

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

Instructions

In this section, I am looking for your perception of how influential people or groups feel toward the issue of managing national forests for NTFPs. Please click on the circle that most closely aligns with your perception of how each client group generally thinks about the issue.

Remember, your answers to the following questions should reflect how you think each person/group would react to the statement.

---

26. The person or group listed below would demand action to improve management of forests for non-timber forest products. (P)

	Strongly Disagree						Strongly Agree
Collectors	1	2	3	4	5	6	7
General public	1	2	3	4	5	6	7
Environmental groups	1	2	3	4	5	6	7
Civic groups[1]	1	2	3	4	5	6	7
Recreation and Hunting Groups	1	2	3	4	5	6	7
Forest products industry	1	2	3	4	5	6	7
State legislators	1	2	3	4	5	6	7
State agencies	1	2	3	4	5	6	7
Federal legislators	1	2	3	4	5	6	7
Federal agencies	1	2	3	4	5	6	7
Local agencies and legislators	1	2	3	4	5	6	7

My core colleagues[2]	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
My immediate supervisor	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○

[1] e.g.; League of Women Voters, Garden Club, Rotary, Lions Club
[2] People with whom I have daily contact

27. Non-timber forest products deserve the same attention that other natural resources (ie.; range, wildlife, minerals, recreation, and timber) receive in forest management plans. (P)

	Strongly Disagree						Strongly Agree
Collectors	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
General public	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Environmental groups	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Civic groups	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Recreation and Hunting Groups	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Forest products industry	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
State legislators	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
State agencies	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Federal legislators	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Federal agencies	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
Local agencies and legislators	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
My core colleagues	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○
My immediate supervisor	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○

28. Management of the national forests for non-timber forest products should be a priority of the Forest Service. (P)

	Strongly Disagree						Strongly Agree
Collectors	1	2	3	4	5	6	7
General public	1	2	3	4	5	6	7
Environmental groups	1	2	3	4	5	6	7
Civic groups	1	2	3	4	5	6	7
Recreation and Hunting Groups	1	2	3	4	5	6	7
Forest products industry	1	2	3	4	5	6	7
State legislators	1	2	3	4	5	6	7
State agencies	1	2	3	4	5	6	7
Federal legislators	1	2	3	4	5	6	7
Federal agencies	1	2	3	4	5	6	7
Local agencies and legislators	1	2	3	4	5	6	7
My core colleagues	1	2	3	4	5	6	7
My immediate supervisor	1	2	3	4	5	6	7

Background Information

29. How many years have you been in your current position?

< 1 1-3 4-6 > 6

30. Immediately before your current position, in which USFS region were you assigned?

1 2 3 4 5 Other FS branch

6 7 8 9 10 Did not work for USFS

31. How many years have you worked for the US Forest Service?

1 ○ 1-5 ○ 6-10 ○ 11-15 ○ 16-20 ○ 21-25 ○ >25 ○

32. At what level within the Forest Service do you work?

District ○ Forest ○ Region ○ National ○

33. In which region do you work?

Region 8 ○ Region 9 ○ National ○

34. At what stage in the revision process is the national forest on which you work?

- ○ Don't work on nat. forest
- ○ Developing alternatives
- ○ Revision complete
- ○ Revision not started
- ○ Scoping underway

35. Which **one** area best describes your field of expertise?

- ○ Forestry
- ○ Forest Measurements
- ○ Wildlife Management
- ○ Forest Management
- ○ Industrial Forest Operations
- ○ Recreation Management
- ○ Economics
- ○ Botany
- ○ Planning
- ○ Ecology
- ○ Forest Products
- ○ Timber Management
- ○ Endangered Species Management
- ○ Fisheries Management
- ○ Wood Science

36. What is the highest level of education that you have obtained?

- ○ High School or equivalent
- ○ Two year technical training

- Bachelors degree
- Masters degree
- Doctoral degree

37. What was the major focus in your degree program?

- Forestry
- Forest Management
- Forest Measurements
- Industrial Forest Operations
- Wildlife Management
- Recreation Management
- Botany
- Timber Management
- Planning
- Ecology
- Fisheries Management
- Forest Products
- Wood Science
- Economics
- Other Forestry Related
- Non-Forestry Related

38. How many years has it been since you received your last degree?

1 1-5 6-10 11-15 16-20 21-25 >25

39. Do you personally know anyone that collects NTFPs from national forests?

Yes No

40. Do you use herbal remedies for ailments?

Yes No

41. In your lifetime, did any of your family members collect NTFPs from public or private forests?

Yes No

Please put me on the e-mail list to receive the results and findings of this research.

Yes ○ No ○

If you answered YES to the preceeding question, please enter your e-mail address in the box below:

Please take a moment to add any comments concerning this survey and this issue.

Submit Reset

Last Modified: 09/07/99

Send questions or comments to Jim Chamberlain at jachambe@vt.edu or FAX: (540) 231-8868

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