

NON INDUSTRIAL PRIVATE FOREST LANDOWNER COMMUNICATION ANALYSIS
IN NORTH EASTERN MICHIGAN: A SEGMENTATION APPROACH

By

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ABSTRACT

NON-INDUSTRIAL PRIVATE FOREST LANDOWNER COMMUNICATION ANALYSIS IN NORTH EASTERN MICHIGAN: A SEGMENTATION APPROCH

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Providing appropriate and timely forestry information and educational resources to non-industrial private forest (NIPF) landowners is vital for encouraging sound forest management on their lands. Since NIPF landowners are a heterogeneous group of people who value their forests for varying reasons, outreach efforts targeted towards them should take this diversity into account in order to have a greater impact. This study uses a market segmentation approach to separate Michigan's NIPF owners into meaningful clusters or segments based upon their indicated forest ownership reasons. Four landowner segments were identified in the Northeastern Michigan study region. The usage pattern of different communication materials in the past and their stated preferences for types of materials were then analyzed for each landowner cluster. Given that outreach and extension services have limited resources, audience segmentation and tailoring communication methods specific to target audiences could be an effective approach for reaching landowners with forestry outreach materials.

Keywords: nonindustrial private forest landowners, communication strategy, k-means clustering.

Dedicated to Randy and Linda Kuipers

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INTRODUCTION

Individual and family forest landowners form a major forest ownership group in the United States and hold 38% of the country's forest land (Smith et al. 2009). These forestlands cover a wide range of ecosystems and provide a multitude of social, economic, and environmental benefits to the entire nation (Best 2002). In Michigan alone, forested land covers 55% of the total land area (USDA Forest Service, 2010). Of this forest land, 19.4 million acres are capable of producing more than 20 ft³ per acre of industrial wood resources a year and are known as "timberlands" (USDA Forest Service, 2010). Approximately 63.5% of Michigan's timberlands are owned by private individuals, organizations, or corporations (USDA Forest Service, 2010). There are 424,000 nonindustrial private forest (NIPF) landowners in Michigan who collectively own 8.8 million acres of the state's forest resource (Butler, 2006). Numerous economic, social, and environmental goods and services from these forests are provided to the state's forest industry and its citizens. To continue realizing these benefits it is important that NIPF lands be managed sustainably. Timber is one of the most valuable goods desired from these lands, however timber supply models that have been developed in the past have typically ignored landowner psyche regarding their forestland, with the assumption that all forests are available for timber production (Kuuluvainen et al. 1996). However this is far from reality. Because private forest land composes so much of this country's timber land, it is important to study owners' diverse objectives, goals, and intentions for owning their land (Majumdar, 2008). There is value in gaining more information about NIPF landowners, which is one of the most prominent ownership categories of our nation's forest resource, and using this information to design more effective communication programs (Finley, 2006).

Forest managers, foresters, and the forest industry have been searching for effective ways of communicating the importance of sound forest management to private landowners in many states such as Michigan (Butler et al., 2007). It is not always easy, however, to reach NIPF landowners with forestry information as they tend to vary in terms of demographics, psychographics, forest ownership reasons, and ownership characteristics (Mueller 2011, Salmon et al. 2006). Because NIPF owners are such a diverse group, providing beneficial basic information about forest management that relates to them has been difficult (Radhakrishna et al. 2003). From an outreach perspective, the sheer number of landowners also contributes to the dilemma for natural resources agencies and educational organizations when attempting to contact landowners and interest them in attending forestry-based education programs (Magill et al. 2004)

Outreach and education about forest stewardship could play a key role in keeping NIPF lands healthy and vibrant for future generations (English et al. 1997). Likewise, delivering information on forest stewardship to NIPF owners has been the primary objective of state and natural resource agencies (Petersen 2006). However studies have shown that the forestry community usually interacts with landowners who are already involved in active forest management, while neglecting the ones that are less active and less approachable (Butler et al. 2007, Peterson and Potter-Witter 2006). To be more inclusive, forestry resource professionals need to have a better understanding of NIPF owners and their varied management objectives (Butler et al. 2007, Finley and Kittredge 2006). This information is crucial for developing appropriate communication strategies that are efficient and effective at reaching landowners with diverse interests. An approach is needed that not only reaches private forest landowners, but also positively influences their attitudes and behaviors towards stewardship of their lands (Butler

2007). The problem may be that we have treated landowners as a homogeneous group and used a blanket or shotgun approach in terms of forestry information dissemination.

One-on-one communication is likely the best approach of affecting a diverse group of landowners. This is often infeasible due to resource and time constraints. The next best alternative is to group landowners on the basis of some common characteristics which relates to their information seeking behavior and to use a communication strategy that fits their learning preferences. By focusing on their attitudes and behaviors, NIPF owners from a broad general audience with many interests can be grouped into specific audiences with similar interests, common needs and desires for forestry information. If landowners can be segmented based on their common interests, these common interest groups may also share a common interest in how they desire to receive forestry information. Past studies have used a market segmentation approach to group NIPF owners into more homogeneous subgroups (G.C. and Mehmood 2009, Finley and Kittredge 2006, Salmon et al. 2006). “Segmentation according to the benefits desired from a product is a simple way to understand an audience, because direct connections can be made between the motivations of the target audience and their behavior” (Weinstein 1987, Young et al. 1978). “Audience targeting is the process of developing and delivering programs or products designed to meet the needs of specific segments of the population. Businesses succeed by developing and promoting products that certain groups of people want, and to be effective at forestry education and outreach extension educators should do likewise” (North Carolina Cooperative Extension Service 2011). Butler et al. (2007) found that by assessing the effectiveness of targeting specific landowner segments, resources can be distributed more effectively. It is thought that because landowner preferences for ownership are different, so are the ways in which they desire to receive informational materials (Radhakrishna et al. 2003). As

outreach to landowners is a high priority to policy makers and forest management agencies, portions of their budgets are dedicated to such programs each year. It is, therefore, important that the methods used to reach NIPF owners be effective at reaching landowners with varying interests both now and into the future.

Materials ranging from printed publications to field tours have been utilized for reaching landowners with forestry information. Just as landowners' objectives for forest ownership are different, so can be the ways in which they desire to receive informational materials.

Conservation educators in several states agree that no one method of outreach is the most effective at reaching landowners (Petersen 2006). Petersen suggests that, to increase the effectiveness of outreach programs, three factors need to be considered; first the audience, second the objectives for reaching them, and third the needs of the audience.

OBJECTIVE

This study analyzes the audiences that exist among Michigan NIPF landowners.

Ownership preference is, used as the primary means of discovering NIPF landowner audiences within the region. Private forest landowners in Michigan have many different reasons for owning their forest property (Muller 2011). By clustering them into distinct audiences or groups based on their reasons for forest ownership, it may be possible to better understand these diverse landowners.

The second objective of this study is to identify preferred communication materials and methods which can be used to deliver clear and effective forestry messages to Michigan private forest landowners. These materials may be specific to a particular landowner group, or effective for a wide range of landowners. By identifying the forms of communication that have been used, and discovering communication methods that are desired, this study hopes to strengthen existing outreach programs and improve upon the way outreach is conducted now and in the future. Identifying land ownership reasons and segmenting landowners by these reasons for owning forest land can help forest managers and extension specialists gain insight into how to effectively communicate forestry messages. This study takes a step further than most segmentation studies, which have identified the different landowner segments within their regions and drawn broad conclusions about the segments of that population.

This study uses this method and then focuses specifically on discovering outreach materials and communication methods that have been used in the past and which are preferred for use in the future by each segment. Studies by Muller (2011) and Finley and Kittredge (2006) suggest that future studies should focus on discovering ways to better communicate within landowner segments and that the findings of such studies may be valuable for future outreach

efforts by natural resource professionals. These two studies indicated that communication research could be accomplished by either a follow-up study to this work or a new study using segmentation. Segmentation studies are not uncommon; however, few look at communication as their primary focus. Furthermore there has been no segmentation research in the state of Michigan which directly focuses on the subject of communication. The results obtained are expected to provide land managers with insight on how to better communicate with a diverse NIPF landowner audience. Though the results obtained are specific to Michigan, they have a broader application to other similar regions.

LITERATURE REVIEW

Research has been conducted in recent years to identify the various reasons as to why nonindustrial private forest landowners (NIPF) own their land. Until recent years private forest land owners have commonly been assumed to be a homogeneous group. In reality these forest owners are very diverse (Finley, 2006). “Cluster analysis, is a multivariate technique that can organize survey respondents into discreet segments” (Hair et al. 2006) and which has been applied to landowner data in attempts to group or cluster landowner reasons for owning forestland. These analyses found that most private forest landowners value wildlife, recreation, and scenery as the primary reasons for owning forest land. Timber management and forest harvesting tend to rank low as a priority. Often financial reasons for owning forest land are less important than are other forest ownership reasons to NIPF owners (Koontz 2001; Kendra and Hull, 2005).

Several studies have been conducted which help gain insight into and information on how to provide NIPF owners with forestry information that they find useful. A study by Salmon et al. (2006) sought to segment NIPF landowners in Utah according to their desired outcomes for their forest property to gain knowledge of topics which may be of interest to them. Segmentation according to desired outcomes can be useful for improving communication strategies. Knowing the interests and motivations of an audience helps capture interest and is crucial for effective communication. Identification of meaningful landowner segments is the first important step in understanding this diverse NIPF landowner audience. Once landowner segments are identified, the designing of forestry messages which will be accepted and implemented on a wide scale will be more achievable (Salmon et al. 2006). Three groups were identified and titled: amenity focused landowners, multiple use benefit landowners, and passive landowners. The names were

given according to the outcomes which most closely fit the landowner's desires for forest property. The data were gathered by Salmon et al. (2006) using a two-phase study approach which included a mail survey questionnaire and an in-person interview of 25 randomly selected NIPF owners who agreed to attend a personal interview session. The first phase was a sent to NIPF landowners in three select counties in Utah. Survey questions were conducted using the four wave model suggested by Dillman (2000). During the interview session participants were asked about their attitudes towards timber harvesting, sources of forestry information, and relationships with neighboring land owners. The data from the interviews was used to separate the landowners into segments using K-means cluster analysis. All groups reported high percentages of respondents not receiving any forestry information of any kind in the past. The most frequently cited source of forestry information from all three audiences was from friends and relatives. Amenity focused landowners most often desired online materials. Multiple benefit landowners desired personal contact with a forestry professional as the most effective means of communication. Lastly passive landowners were found to be difficult to reach with any informational material offered.

A study in Tennessee, conducted by Davis and Fly (2010), intended to discover what private forest landowners think forest management really is, who and how many believe that they actively manage their forests, and what management related activities are being done on their forest land. Factor analysis paired with principal component analysis was used to narrow 18 management activities to three main management concepts. They were property maintenance, making money, and creating and enhancing forest habitat. Many forest landowners in the study (77%) viewed forest management as something that they already do themselves. If the broader population of NIPF owners is at all similar in this respect, these landowners may be hard to

recruit for forest management. By holding the belief that they currently manage their forest land, these landowners may assume that they do not need forest management information or education because they already do it themselves. In the case that landowners feel this way, outreach and education efforts must incorporate the landowners' "sense of themselves" as managers into their outreach material. Incorporating the reasons they feel are important for management into informational material may improve landowner participation in forestry activities. Another barrier to forest management activities on forest land is derived from a lack of trust towards foresters and the feeling that forest management has no relevance to private forest landowner interests (Kittredge 2004, Bliss and Martin 1989). Gaining trust and incorporating landowner motivations for forest management into outreach and educational materials can enhance the effectiveness of such outreach materials.

Barden et al. (2007) also grouped North Carolina NIPF owners by their preferred informational delivery methods. Five groups were identified through K-means cluster analysis. Of these five identified, three were found to be significantly different from each other. The titles of these groupings were: snail mailers, short mailers, web mailers, fan club, and don't bother me. Names were assigned to the five clusters based upon the preferred media delivery methods within the clusters. Snail mailers preferred traditional mail as their informational delivery method. Short mailers preferred mail and short programs, web mailers preferred mail based information and web information, don't bother me landowners were unlikely to use any communication methods, and fan club forest landowners preferred almost all delivery methods. Landowner demographics such as age, occupation and income played a significant role in placing forest landowners into their respective groups. The significance of the clusters was determined by using Pearson's chi square test. Age class was the main distinguishing factor that

separated the identified groups, suggesting that age contributes considerably to what method of communication will be effective to each landowner group. Other suggestions from the study were to not focus valuable education time and money on non-responsive owners.

Findings from Barden et al. (2007) also support the results from a South Carolina study conducted by Radhakrishna et al. (2003), which did not group landowners but had similar results using descriptive statistics and reporting them as a survey summary. It was found that the five most useful forms of educational delivery were (1) newsletters, (2) publications, (3) field tours, (4) videos, and (5) workshops. Radhakrishna et al. (2003) found a negative correlation between age and high technology delivery systems suggesting that educators should be careful when attempting to reach older landowners with video and internet. Age therefore, can, be a deciding factor in determining what forestry materials will be effectively used by specific audiences. The study ranked the usefulness of communication delivery methods to private landowners, and the results were as follows in decreasing order: newsletters, publications, field tours, video, workshops, evening meetings, short courses, formal classes, and the internet. The study also noted the importance of identifying and examining the usefulness of each delivery method. The study stressed the importance of retaining traditional forms of communication even in an age of changing technology.

A literature review study by Peterson (2006) looked at other studies about private forest landowners in New York, Vermont, New Hampshire, and Maine. This literature review sought to understand how to effectively deliver forest stewardship information and knowledge to private forest landowners in this region. The review found that the use of only one system of communication is not sufficient to reach many types of forest landowners. The results of the study indicated that NIPF landowners in this region prefer printed communication material above

all others with internet and web based information being the second most popular mode of receiving this information.

A study concerning agricultural landowners in Michigan conducted by Howell and Habron (2004) desired to see how effective internet extension materials were at delivering messages concerning improvement in watershed conservation. This study looked at demographic characteristics of these agricultural landowners to see if there were differences within the population. The researcher found that there was a higher preference for using the internet and computer based resources for communication purposes amongst the younger, educated, more affluent landowners, who have home internet access (Howell and Habron 2004).

Research conducted by Magill et al. (2004) studied private forest landowners in West Virginia and a NIPF landowner survey was used to gather data. The study focused on the forestry topics which were of interest to these landowners as well as the methods of communication and financial assistance they desired to receive. Demographic information gained from the survey was analyzed through logistic regression and descriptive statistics to discover landowner topics of interest, assistance needs, and preferred delivery methods. Nine topics of interest were discovered using logistic regression, with forest damage prevention being the most desired topic. The landowners preferred workshops to learn about topics such as property rights and taxes, but other communication methods were not discussed in the study. Respondents were interested most commonly in topics relating to investment in some part of their property or natural values that were present in or on their property. The study outlines the importance of identifying topics which forest landowners desire to gain knowledge about and designing communication methods which can better serve their needs concerning these identified forestry topics.

Joshi and Mehmood (2011) segmented NIPF landowners based upon their ownership objectives and preference for supplying bio energy in Arkansas, Florida, and Virginia. Segmentation through K-means cluster analysis discovered three distinct groups of landowners. The names given to the groups that were found were; bioenergy conservationists, passive landowners, and multiple objective landowners. The aim of the study was to discover how to reach landowner groups with information about biomass energy. The findings suggest that outreach programs should incorporate the specific landownership interests of landowners into their educational, outreach materials.

Another study in Arkansas (G.C. et al. (2009) segmented NIPF landowners based upon their ownership objectives and their place of residence. This goal was to discover if there was information seeking behavior within the segmented groups. The information of interest to the study in particular concerned the red oak borer which was affecting trees in the study region of Arkansas. Four groups of landowners were identified by K-means clustering based on their ownership objectives as well as their residence. The names assigned to the groups were: amenity focused rural landowners, amenity focused urban landowners, passive rural landowners, and passive urban landowners. The study looked, in part, at the use of “personal communication” such as one-on-one experiences with natural resource professionals, versus “mass media” which included forms of media such as news print, television, radio and others. There was found to be no significant difference between the groups identified and the use of mass media. On the other hand, there was a strong association between the groups identified and the use of personal communication. This study found that ownership objectives strongly influence the topic of information that landowners seek out.

Motivations of private landowners and ownership objectives are important characteristics of NIPF landowners. A study by Majumdar (2007) reiterates this important concept. This study grouped NIPF landowners in: Alabama, Georgia, and South Carolina. This is one of the few studies that uses a multiple state approach to segmentation. Using data from the National Woodland Owners survey, questions concerning ownership reasons were used to cluster landowners by K-means cluster analysis. Three clusters were identified within the three state study area: multiple objective, timber, and non-timber landowners. Multiple objective landowners were found to be the largest group of the three landowner clusters. These were also the most active in forest management practices. Findings from this study are similar to other segmentation studies such as Kluender and Walkingstick 2000, Kendra and Hull 2005, Finley et al. 2006, Salmon et al. 2006, G.C et al. 2009, Joshi and Mehmood 2010, Mueller et al. 2011 and others. Majumdar (2007) suggests that because landowners have differing objectives for forest land management, using these identified objectives and segments may help to develop informed policy prescriptions. These policies can be tailored towards specific landowner goals based on their needs and interests. Additionally, the use of such segmented groups has substantial positive implications for designing educational programs and services tailored to specific needs of private forest landowners.

Finley and Kittredge (2006) performed a three phase segmentation of private forest landowners in Massachusetts which used K-means cluster analysis to identify landowner groups based upon their identified ownership reasons and objectives indicated by their survey responses. The first phase of segmentation reduced data by principal component analysis, then K-means clustering was applied, and finally the differences between the clusters was described with the help of discriminate analysis. The study looked at the possibility that these forest values would

influence their attitudes towards government programs using Massachusetts' current use forest property tax program (case 61) as a case study. The study found three distinct groups of landowners based on their segmentation findings: (1) Henry David Thoreau, which was a group that shares the value of contemplative forest benefits; (2) John Muir, which value environmental protection; and (3) Jane Doe, which value a seemingly anonymous, undefined value in their forest. After analysis of the groups the authors suggested that programs such as case 61 can be improved by recognizing the diverse values and beliefs of their landowner constituents. By looking at the various segments of the population government programs and policies can be made more appealing by accommodating the different forest value perspectives of the segments of the population. Finley and Kittredge (2006) also briefly mentioned that outreach programs could benefit by looking at their audience in segments rather than as a collective.

A study by Radtke and Munsell (2010) examined the possibilities that are available through Wikipedia and other online search engines for forestry outreach. By examining web visits or hits on Wikipedia articles related to forestry they could view which forestry topics were most popular to the web based audience and if web outreach was an effective tool for communication. Their results concluded that search engine style web sites like Wikipedia present an opportunity for use in forestry outreach. This mode of disseminating information may be most effective when trying to reach a broad audience.

Research by Butler et al. (2007) looked at the use of social marketing as a way of reaching family forest landowners. The use of multivariate statistical analysis allowed the researchers to categorize the family forest owners according to their attitudes towards forest management as well as their level of engagement in such activities. This project used data from the 2005 National Woodland Owner Survey (NWOS). This study's goal was to discover the

effective tools of communication and outreach to which family forest landowners respond positively. Hierarchical cluster analysis was used to segment the family forest owners who responded to the NWOS survey into four segments: woodland retreat owners, working the land owners, supplemental income owners, and ready to sell owners. Among all landowners newspaper and television programs were shown to be the most effective and promising outreach materials a large audience. Internet outreach methods were discovered to be the least likely effective for reaching family forest owners.

Potter-Witter (2005) studied known populations of forest landowners in Michigan who either belonged to or were enrolled in a landowner organization or landowner assistance program. Landowner demographics, management activities, and assistance programs were analyzed. Variance was found between the groups in regards to their age, education, income, and management activities using logistic regression. Parcel size and distance from property were found to be significantly related to landowner forest management activity. The study concluded that demographic characteristics alone were not sufficient to predict landowners' forest management tendencies and desire for assistance programs.

A 2006 study by Peterson and Potter-Witter followed the study by Potter-Witter (2005). The study took a two phase approach collection of landowner data. The research focused on how to better implement landowner assistance programs in Michigan. Descriptive statistics allowed the researchers to reach several conclusions about reaching NIPF Landowners in Michigan with assistance. Two main findings which are related to this study were, first because NIPF landowners tend to be uninterested in conducting harvests of timber on their forest lands unless the circumstances align with their specific wants desires or needs resource professionals need to find ways to reach these owners at just the right place and time. Also because a majority of

landowners in the study indicated that they are not interested in forest management or did not know who to contact for help, natural resource agencies and extension experts need to find better ways of communicating basic information.

Research by Mueller (2011) segmented private forest landowners in the state of Michigan according to their indicated preferences for owning forest land, as stated by their responses to a 2003 NIPF landowner survey. The research was designed to identify forest landowner groups or segments of the population for the purpose of forming forest policies that will be able to reach a range of landowner group interests in Michigan. A two step cluster analysis was applied to the 2003 landowner data. First principal component analysis was applied followed by K-means cluster analysis to reveal landowner clusters. Mueller (2011) found that Michigan landowners could be grouped into significantly different clusters based upon reasons for ownership. Three clusters were identified and given titles according to their characteristics: timber barons, game wardens, and tenants; corresponding to those who valued timber production activities more than did other landowners, those who valued wildlife management more than the others and those that were content to do no management. The study also looked at demographics, parcel size, management activities, perception of policy tools, and other characteristics, as a way of differentiating landowners. It was discovered that differences between the groups gave credibility to the notion that forest landowners are not a homogeneous group and that policy programs and tools need to be designed according to the characteristics of existing landowner groups. The study also points out the need to determine informational and supportive needs of these identified groups, to aid extension educators and land managers in their attempts to better serve a diverse group of landowners.

The review of past studies has shown that indeed NIPF landowners are a heterogeneous group with a wide variety of forest interests. Many of these studies have successfully segmented landowners according to their ownership objectives and were able to gather valuable information about the forest landowners within their study regions. The overarching message which can be taken from these studies is that NIPF landowners own their land for specific reasons, which may not always line up entirely with what the forester, resource professional, forest industry, or extension specialist may think should be done with the land. It is important that forestry professionals remind themselves that the private owners' wishes are more important than their own because they own the land, and it is their right to do with it as they please. Because this is true forestry professionals need to adapt their outreach, policy decisions, and management systems according to NIPF objectives and goals. By treating landowners as a group made up of individuals with varying objectives for their forests, interest in forestry outreach, policies, programs, and management may be increased.

MATERIALS AND METHODS

Study Area

The Northern Lower Peninsula and the Eastern Upper Peninsula (Northeastern Michigan) encompasses the forestlands within 150 miles of a proposed cellulosic ethanol facility located in Kinross Michigan which will be owned jointly by Mascoma Corporation and Frontier Renewable Resources. Frontier Renewable Resources and the Michigan Economic Development Commission are partners in funding the Feedstock Supply Chain Center of Energy Excellence, which provided the funding for this research. The focus of the study was to discover regional availability of wood, feasibility of creating a wood utilizing plant, attitudes of loggers, landowners, foresters and other key stakeholders in procuring wood fiber to the plant, and to contribute information for policy decisions within the state of Michigan. The key research institutions were Michigan State University and Michigan Technological University.

Survey Design

Data for this study were collected through a mail survey of 1600 randomly selected NIPF owners owning at least 20 acres of forest area in the study region. Landowners having less than 20 acres were not included in the survey since they are less likely to be engaged in forest management activities (Kennedy 2001, Conway et al. 2003, Joshi and Mehmood 2011). Since there is no existing list of NIPF landowners available for Michigan, the list of landowners was acquired by first looking at plat maps of 29 counties which lie within the 150 mile radius of the proposed cellulosic ethanol facility in Kinross Michigan. Selection of landowners was accomplished by first randomly selecting townships within the counties and then randomly selecting sections within the townships. To determine if these sections were forested Michigan land cover data acquired from the NOAA website (2006) along with county and section shape

files from the Michigan Geographic Data Library website were used. This data was then loaded into ArcGIS 9.3 where forested area percentages were calculated within the sections. The sections were examined for forest land cover and those with at least 50% of the land area covered by forests were retained in the sample. For the selected sections, the mailing address of all property title holders owning at least 20 acres was acquired by contacting each county equalization office which then sent the list of names and addresses. Many charged a fee for this information.

The mail survey was conducted in the winter of 2010 following a standard survey design as recommended by Dillman (2000). Pre-survey postcards were sent, followed two weeks later by the questionnaire which included a cover letter and business reply envelope (Appendix B). Two weeks after sending the first questionnaire, reminder postcards were sent to those landowners who had yet to respond. Two weeks after the reminder postcard was sent, a second questionnaire was sent to the landowners who had failed to respond.

The questionnaire included sections that asked for landowner demographic characteristics, forest management activities, and their use of as well as perceptions regarding various forestry outreach materials. After taking into account the seven undeliverable addresses, 628 total responses were received, giving an overall response rate of 39% which is consistent with other NIPF surveys (G.C. et al. 2009, Magill et al. 2004, and Mueller 2011). To check for non-response bias, landowner variables from early and late respondents were tested with t-tests and Mann-Whitney U tests as suggested by Armstrong and Overton (1977). No significant differences between early and late respondents were observed, thus ruling out the concern for non-response bias in the data.

Segmentation

To understand landowner motivations for forestland ownership, landowners were asked to rate each of 11 reasons for owning forest property (Table 1). For each option, the landowner could indicate his/her value of each option using a five-point Likert scale, with one indicating that the reason was very important to five, not important.

High simple correlations were found among the ownership reasons. Principal component analysis (PCA) was therefore applied to create combinations of landownership variables, to simplify the data based on their correlation. PCA is an important statistical tool used to reduce the number of variables based upon their correlation while still accounting for most of the variance in the original dataset (Majumdar et al. 2008). In this study PCA reduced 11 ownership reasons into three composite variables or principal components (PC's) using varimax rotation. A correlation value of .5 was selected to exclude small coefficients, because the important values in the PCA output matrix are those that are highly correlated with each other rather than those that are less correlated. The rotated matrix sorted the correlated values greater than .5 and placed each of the ownership reasons into one of three principal components based upon the associated correlations (Table 1).

Table 1. Factor loadings representing correlations between NIPF owners forest ownership reasons, three group solution.

Ownership reasons	PC1	PC2	PC3
To enjoy beauty or scenery	.772		
Protect nature	.758		
For land investment		.547	
Home, vacation, farm, ranch	.669		
For privacy	.747		
Bequest			
Non timber forest products		.664	
For firewood or biofuel		.784	
For production of timber		.794	
For hunting and fishing			.859
Other recreation			.663

Principal component one included the four reasons for owning forest property ‘to enjoy beauty or scenery’, ‘to protect nature and biologic diversity’, ‘as part of my home, vacation home, farm, or ranch’ and ‘for privacy’.

Principal component two included the four reasons for owning forest property ‘for land investment’, ‘for cultivation or collection of non-timber forest products’, ‘for production of firewood or biofuel, and ‘for production of sawlogs, pulpwood, or other timber products’.

Principal component three includes the two reasons for owning forest property ‘for hunting or fishing’ and ‘for recreation other than hunting or fishing.

The variable ‘passing land on to my children or other relatives’ was not included in any of the PCs and was retained as a unique variable, as it was in studies by Mueller 2011 and Finley and Kittredge 2006. Studies by Kennedy (2001) and Conway et al. (2003) suggest that NIPF owners value passing land on to heirs, which affects their management decisions. In order to include this variable for conducting K-means cluster analysis, PCA was run again with four PCs selected (Table 2). This allowed the variable ‘passing land on to my children or other relatives’ to be reported with a factor score rather than being reported in a Likert scale keeping the unit scale to be consistent across all PCs . Because of this a reliability analysis was conducted by computing Cronbach’s alpha for each PC. Cronbach’s alpha for PC1 and PC2 were .73 and .68 respectively, suggesting adequate internal consistency for these factors (Hair et al. 1998). However for PC3, Cronbach’s alpha value was .44. Due to this low value, caution was taken when interpreting results representing PC3.

Table 2. Factor loadings representing correlations between NIPF owners forest ownership reasons, four group solution

Ownership reasons	PC1	PC2	PC3	PC4
To enjoy beauty or scenery	.785			
Protect nature	.738			
For land investment		.529		
Home, vacation, farm, ranch	.692			
For privacy	.751			
Bequest				.925
Non timber forest products		.660		
For firewood or biofuel		.798		
For production of timber		.803		
For hunting and fishing			.892	
Other recreation			.617	

Once the PCA was completed, K-means clustering was conducted using the factor scores obtained through principal component analysis to create landowner segments based upon their forestland ownership reasons. K-means is a commonly used clustering algorithm found in market segmentation studies (MacQueen 1967, Chiu et al. 2001,) which minimizes within group differences and maximizes between group differences (Hair et al. 2006). In K-means clustering a researcher must specify the number of clusters desired; K represents the number of clusters selected by the researcher. Once these clusters are selected the search algorithm identifies the K points in the data that are not close to each other. Once these initial points are identified K-means assigns each respondent to the cluster that it is closest to. After each respondent is added to a

cluster a new cluster center is formed. These new cluster centers are formed by calculating the mean of all the points in the cluster. This process is repeated for the entire data set until the clusters become stable (Statistical Discovery Software Statistics and Graphics Guide 1995).

SPSS 18[©] was used to perform the K-means analysis with two, three, and four cluster solutions. Cluster memberships were then extracted from SPSS, exported into Microsoft Excel and respondents were placed into their associated clusters for each of the three cluster options. The four cluster solution was selected as the best fit to the data after comparing the K-means results from all three cluster arrangements. The review of past literature (Butler et al. 2007, G.C et al. 2009) and knowledge of NIPF landowner behavior also influenced the decision to select the four cluster solution.

Based upon the cluster analysis results, the data were then divided into the appropriate four clusters and exploratory as well as inferential statistics were conducted to examine the differences among groups. Tests were conducted to identify differences with respect to landowner demographics, forest management activities, forest characteristics, ownership reasons, usage of communication methods, and preference for communication methods among the groups. Analysis of Variance (ANOVA) followed by Tukey's Test and Kruskal Wallis test as well as Mann-Whitney U tests were used to compare landowner segments based upon forest characteristics, preference for communication, ownership reasons, and demographic variables. Pearson's Chi-square test was used to test forest management activities, communication usage, as well as the sex of landowners. An alpha level of 5% was used for all statistical tests.

OVERALL SURVEY RESULTS

Respondent Demographics

NIPF owners from Northeastern Michigan responding to the 2010 mail survey had a mean age of 61 years. Seventy-six percent of respondents had completed at least some college and 23% had a high school diploma as their highest level of education. Many of the respondents (40%) indicated that they were employed full time, or were retired (49%) with 5% earning an annual gross income at or below \$19,000 dollars, 66% earning between \$20,000 and \$100,000, and 28% earning at or above \$100,000. The median annual family income for all respondents fell in the category of \$60,000 to \$75,000, which is greater than the median household income for the state of Michigan, which is \$45,354 (USDA 2010). The majority (85%) of the respondents were male. Demographics obtained from the study were consistent with two recent Michigan NIPF studies by Potter Witter and Peterson (2006), and Mueller (2011).

Ownership

Of the total responses 26% of the forestland ownership was in the Eastern Upper Peninsula (EUP), 15% was in the Western Upper Peninsula (WUP), 52% was in the Northern Lower Peninsula (NLP), and 7% of the owners had forestland parcels which are located in a combination of the three regions. Among all the respondents 58% said that they own only one parcel of forestland, 21% own two parcels, 17% own three to five parcels, 1% own six to ten parcels, and 3% own more than ten parcels of forestland. The mean number of acres owned was 163.9 with a standard deviation of 373.5 acres. The range of acreage owned spans from 20 acres to 5,000 acres. When asked how they acquired their forest property, 83% reported that they purchased their land, 20% inherited their property, 2% received the property as a gift, 7% said that they both purchased and inherited their forestland, and 1% indicated that they obtained their

forestland in some other way not indicated on the survey. A majority of the landowners surveyed (78%) indicated that they acquired their forestland more than 10 years prior to the survey and 22% said that they acquired their land within the last 10 years. An overwhelming number (98%) of forest landowners indicated that they fell into the ownership category known as individual family forest, and 8% said that their ownership was a partnership or some other joint ownership.

When asked what was the single most important reason for owning forestland, 32% said hunting, 23% indicated recreation and enjoyment, and 15% said for privacy and peace. In the study region 34% of forest landowners had their forest property as the site of their permanent residence. Those who did not reside on their forest property lived a median distance of 140 miles away.

Past activity and future intentions

Determining forest landowners' past, present and future operations, plans, and trends is important in helping natural resource professionals understand NIPF owners so that they can better serve these forest landowners. This survey asked several questions about their past history and future plans as they related to forest management and harvesting. Respondents were asked if the previous owner had conducted a harvest within the past 10 years. Of the total respondents 59% said that there had not been a harvest, 28% said that there had been a previous harvest, and 13% said that they did not know if one had taken place.

The survey asked forest landowners to indicate if they *actively manage* their forestland to gain insight on the current state of these lands. Active management includes practices such as planting trees, thinning/pruning, harvesting, pest management, utilization of fire and controlled

burns. Fifty-six percent said that they do actively manage their forestland and 44% said that they do not. The most frequently indicated future forest plans for landowners in this region are to (1) continue managing for timber, wildlife, or other natural resource benefits (67%), (2) to bequest to heirs 49%, (3) to sell at a later date (20%), and (4) to develop as a home site for themselves or family (15%) (Table 3).

Table 3. Future forest plans indicated by NIPF landowners in Northeastern Michigan

Plans	Percentage
Continue managing for timber, wildlife, or other natural resource benefits	67 %
Bequest to heirs	49 %
Sell at a later date	20 %
Develop as a home-site for myself or family	15 %
Other (please specify)	9 %
Convert to agricultural uses or biomass production	6 %
Subdivide to sell home lots	2 %

The questionnaire was designed to specifically examine the kinds of forestry related actions that have been conducted, are being practiced, and are planned to take place in the future, as well as the motivations behind such actions. In the past 10 years, 46% of the forest landowners said that they had harvested or sold timber from their land in Michigan. Of those who harvested in the past 10 years 52% said that they had used a management plan before harvesting on their property. The remaining 48% who did not use the management plan indicated that the top two reasons for not doing so were that they were not interested (41%) and that they did not know who to contact for help (24%). Because a number of landowners indicated that they did not know whom to contact for help, it is not surprising that only 50% of forest landowners who had harvested in the past 10 years had talked to a forestry or natural resource professional. The top two reasons for not consulting a forestry or resource professional

were because they were not interested and that they did not know who to contact for help. There were two primary motivations for those who have harvested timber in the past, that the timber was mature and to maintain forest health. The next most important reasons for harvesting were for cash income and wildlife habitat management (Table 4).

Table 4. Motivations for harvesting timber in the past by NIPF Landowners in Northeastern Michigan

Reason for Harvesting	Median value
For maintenance of forest health	1(very important)
The timber was mature	1(very important)
For cash income	2(Somewhat important)
For wildlife habitat management	2(Somewhat important)
Time to harvest according to the management plan	3(Neutral)
For land conversion	4(Somewhat unimportant)

More than one-third of the landowners (36%) indicated that they plan to sell timber from their forest in the next ten years, 29% said that they would not, and 35% were unsure of the future plans they have for their timber. Of the landowners who said that they had harvested in the past only 34% intend to conduct a timber harvest in the future showing a change from past harvest to future harvest intentions. Those who had not harvested timber or other wood ranked the top reasons for not doing so. These included lack of interest (28%) among landowners and the concern that the income obtained from harvesting may not be worth the effort (30%).

Ownership reasons

Respondents were given 11 reasons for forest ownership that they could rank from one to five, one being very important and five being not important. The main reasons for ownership in rank order were: (1) to enjoy beauty or scenery, (2) for hunting or fishing, (3) for privacy, (4) to protect nature and biologic diversity, (5) as part of their home, vacation home, farm, or ranch, (6)

for recreation other than hunting or fishing, (7) to pass land on to their children or other heirs, and (8) for land investment (Figure 1). The least important reasons to own forestland for these NIPF landowners were timber production or consumptive uses. These were (1) for cultivation or collection of non-timber forest products, (2) for production of sawlogs, pulpwood, or other timber products, and (3) for production of firewood and bio-fuel (Figure 1). Forty-four percent of the respondents viewed cultivation or collection of non-timber forest products as being an unimportant reason for owning forest land, this being the least important reason of all those listed land ownership reasons, and also received the fewest number of important votes (20%) of all forest landownership reasons.

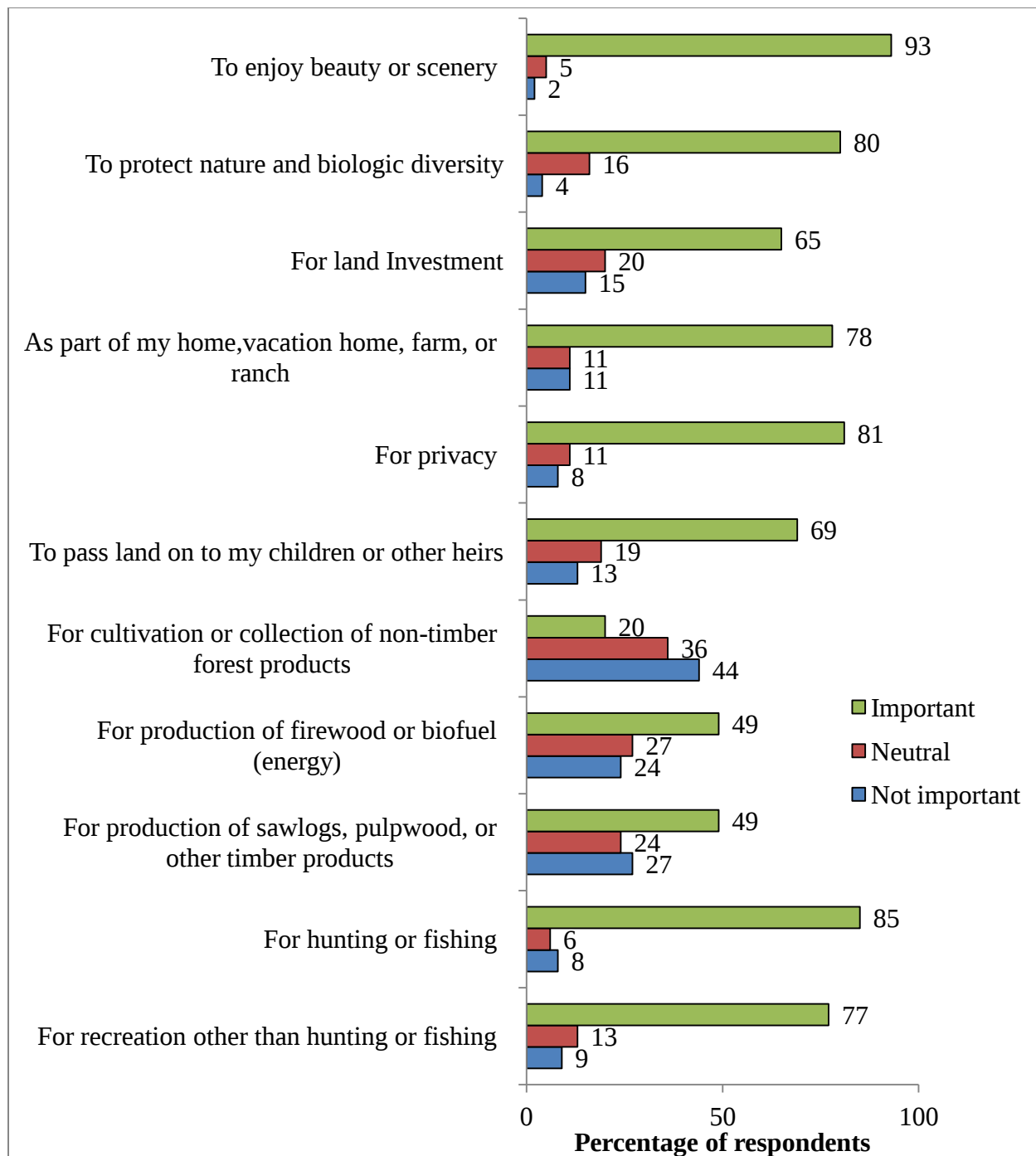


Figure 1. Rating of land ownership reasons for NIPF owners in Northeastern Michigan (For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this thesis.)

Past communication use

For the Northeastern region the past most commonly used forms of communication of the 11 specified in the survey, in decreasing order, were: (1) publications such as a book or a newsletter, (2) a newspaper or magazine article, (3) field tours, (4) internet/web information, and (5) television programs. The least commonly used forms of communication used by landowners were videotapes for home viewing and computer CD-ROMS (Figure 2). Of those who had not used one or more of the specified communication methods gave reasons why they had not used 51% percent said they were not interested, 30% did not know where to get the information and 15% said that the information was not easily accessible for them (Figure 3). A high percentage of the respondents have not used forestry informational materials in the past, percentages ranged from 60% non-use for printed materials and 87% non-use for take home computer CD-ROM disks.

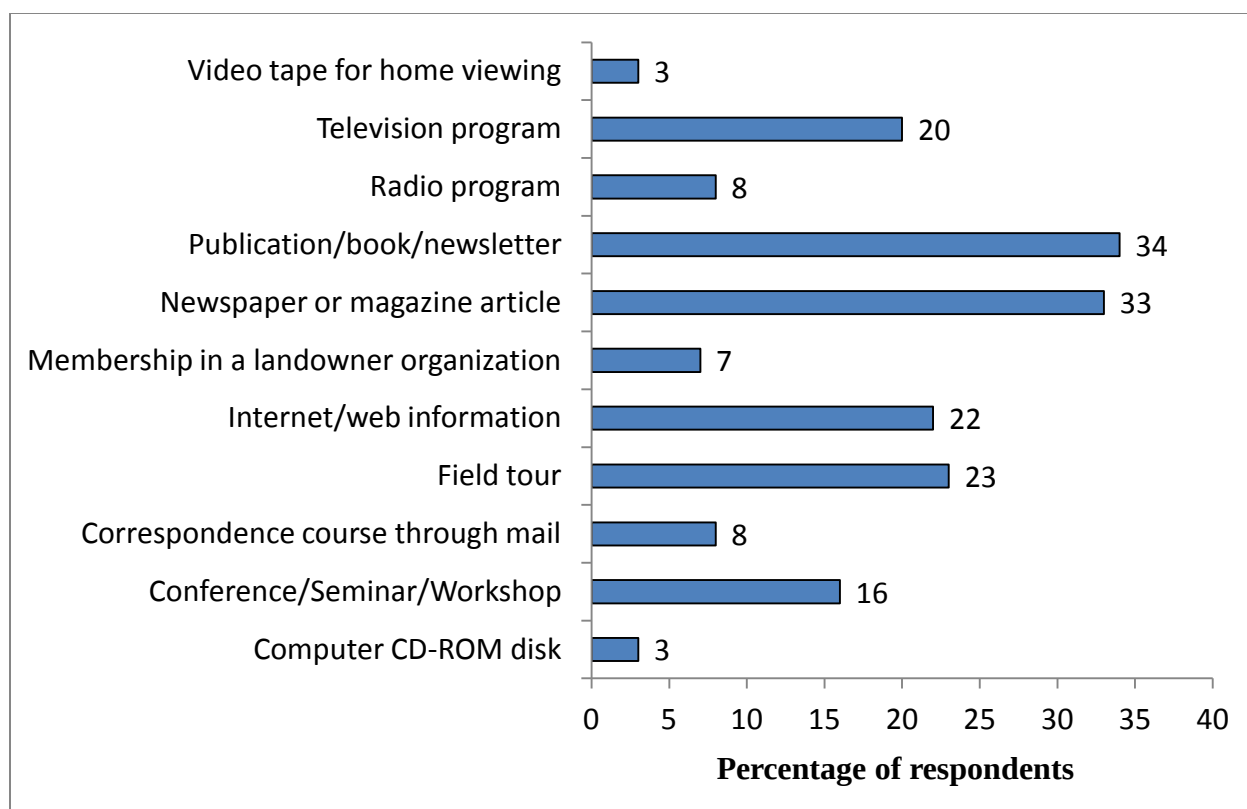


Figure 2. Forestry communication methods used in the past by NIPF owners in Northeastern Michigan

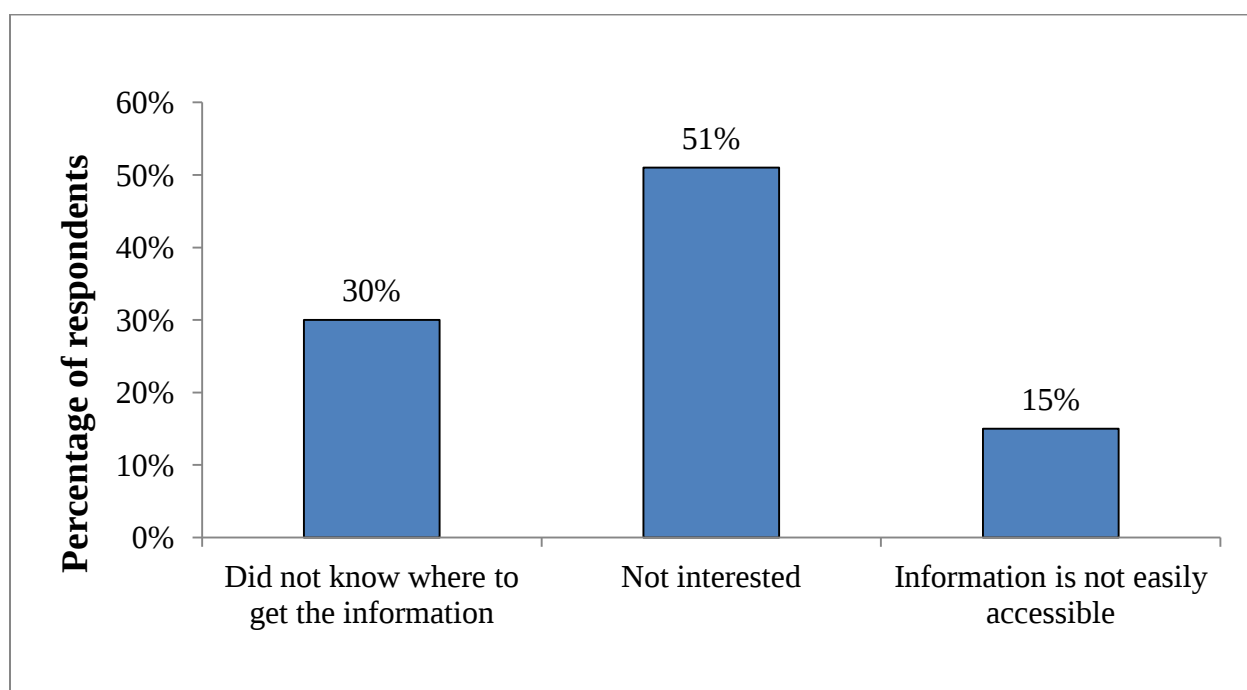


Figure 3. Reasons NIPF owners in Northeastern Michigan have not used forestry communication methods

Communication preference

Respondents indicated that they preferred some forestry communication methods to others. The most preferred means of receiving forestry informational material was by the internet, newspaper or magazine articles, publications such as books or newsletters, and field tours (Figures 4, 5 & Table 5). Seven of the eleven media mentioned were found to be neutral with the median value equal to three as their preference and desirability rank (Figure 4). Four of the 11 were found to be “somewhat useful” with a median value of two. There were no median values which rated a specific communication tool to be “very useful” and also none which rated them to be “not so useful” or “not at all useful”(Figure 4). This is similar to the findings of Radhakrishna et al. (2003) who found that the top four most useful communication/education delivery methods identified by forest landowners were; (1) newsletters, (2) Publications, (3) field tours, and (4) videos.

Table 5. Highest ranked communication methods found useful by NIPF owners in Northeastern Michigan

	Communication Methods	Usefulness
Rank		Percentage of all respondents
1	Publication/book/newsletter	64%
2	Field tour	61%
3	Newspaper or magazine article	59%
4	Internet/web information	56%

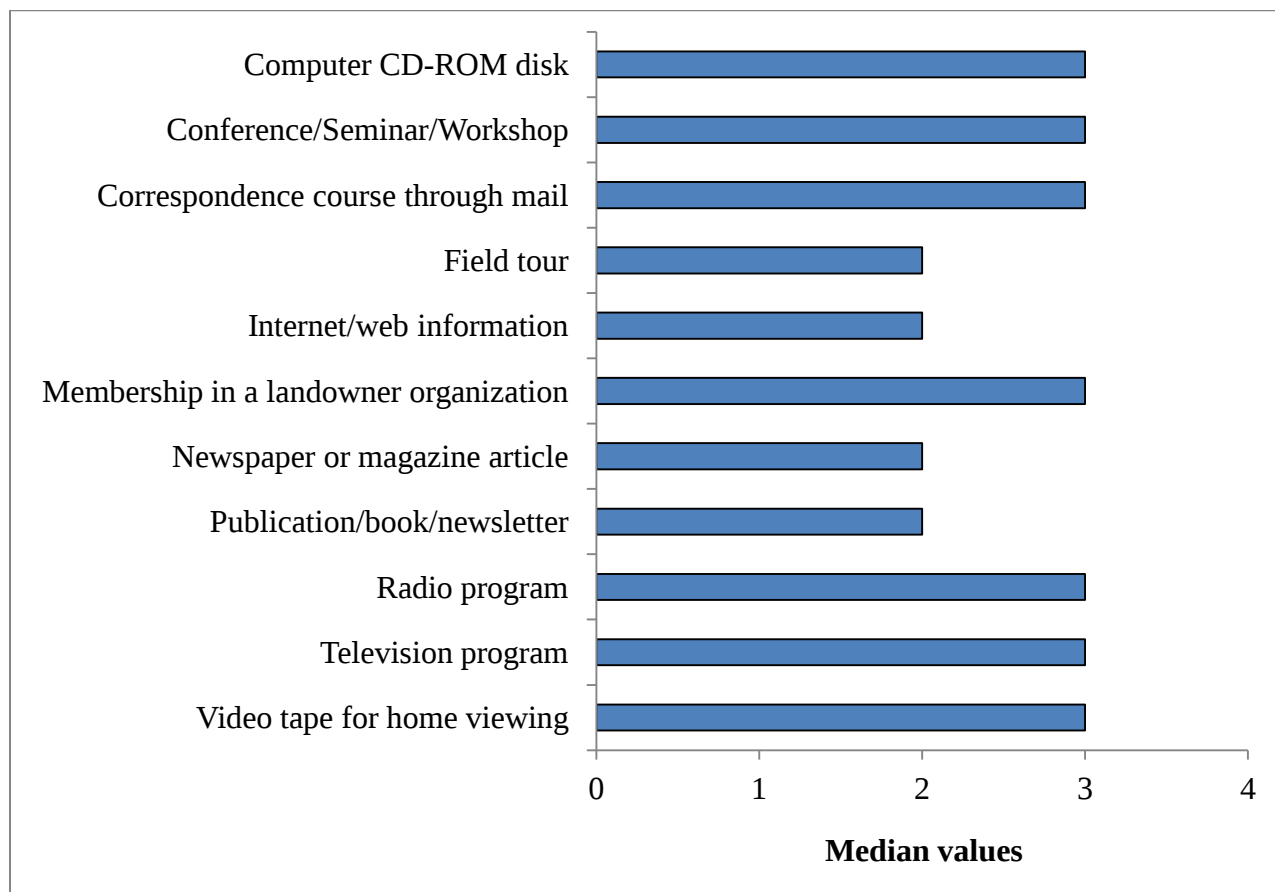


Figure 4. Ratings of usefulness of communication methods by NIPF owners in Northeastern Michigan

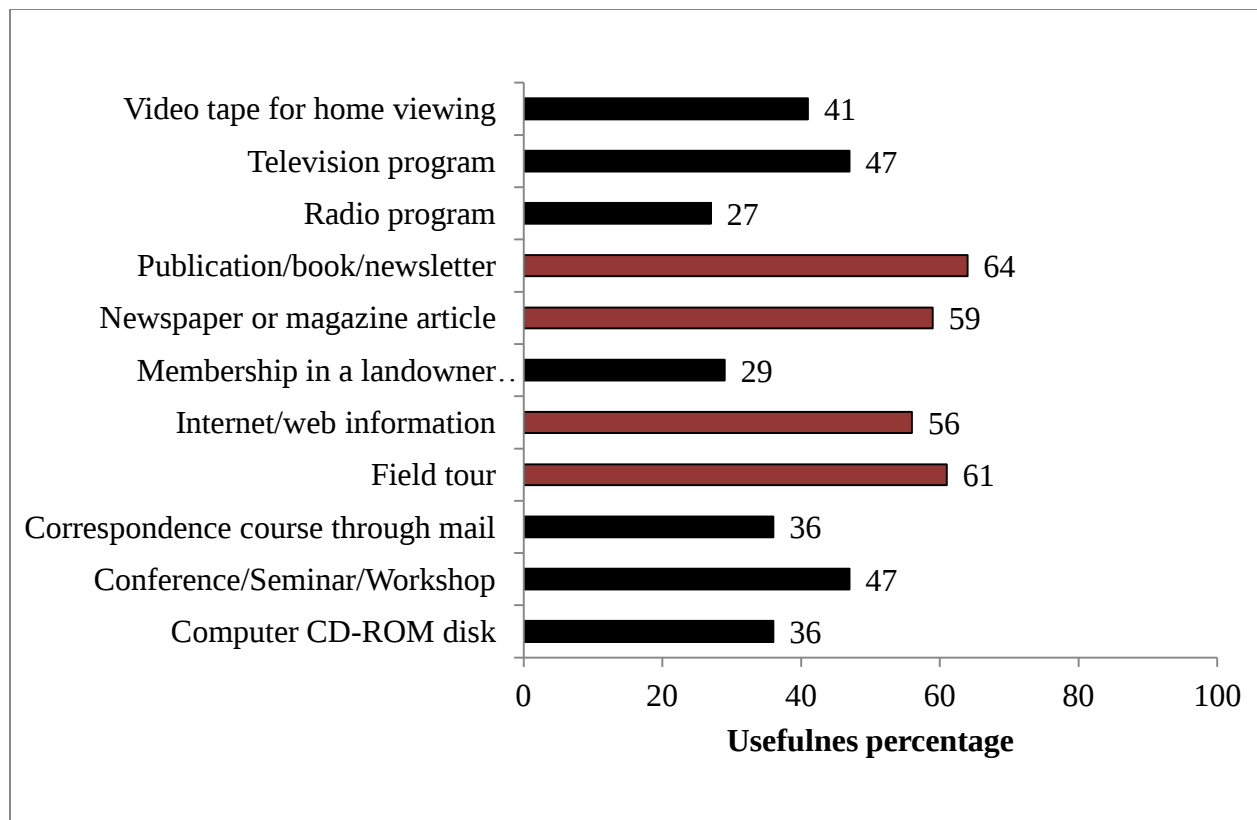


Figure 5. Percentage of NIPF owners in Northeastern Michigan finding individual forestry communication methods useful to them

The least useful methods of communicating forestry information to private forest landowners were radio programs (27%) and memberships in landowner organizations (29%) (Figure 5).

RESULTS FROM SEGMENTATION

Cluster analysis revealed four distinct groups of landowners according to their ownership reasons. Cluster one, Consumptive use forest owners, contained 90 landowners, cluster two Recreationists, contained 151, cluster three, Naturalists, contained 70, and cluster four, Multiple objective forest owners, contained 193 landowners. They were given titles based upon their indicated objectives for owning forest property.

Consumptive use forest owners (N=90)

Ownership reasons

Consumptive use forest landowners value hunting and fishing as the most important reason for owning their forestland. They value hunting and fishing, however, significantly less than do Recreationists and Multiple objective landowners (Table 6). Other important ownership reasons by members of this group include to enjoy beauty and scenery, for land investment, for production of timber, and to bequeath forestland on to their heirs (Table 6). This group values land investment and bequeathing forestland significantly more than do Recreationists and value producing sawlogs, pulpwood, or other timber products significantly more than do Recreationists and Naturalists (Table 6). Consumptive use landowners value beauty or scenery, to protect nature or biologic diversity, forestland as a part of their home, vacation home, farm or ranch, and forest land for the purpose of privacy significantly less than do all other clusters (Table 5). Consumptive use landowners seem to invest their time into hunting and fishing on their property as well as valuing the monetary and legacy values of their forest property.

Table 6. Median response for owning forest land by clustered groups of NIPF owners in Northeastern Michigan

Ownership reasons	Consumptive	Recreationists	Naturalists	Multiple
To enjoy beauty or scenery	Somewhat Important ^b	Very Important ^a	Very Important ^a	Very Important ^a
Protect nature	Neutral ^c	Very Important ^b	Very Important ^a	Very Important ^a
For land investment	Somewhat Important ^a	Neutral ^b	Somewhat Important ^a	Somewhat Important ^c
Home, vacation, farm, ranch	Neutral ^c	Very Important ^a	Very Important ^a	Very Important ^b
For privacy	Neutral ^c	Very Important ^a	Very Important ^a	Very Important ^b
Bequest	Somewhat Important ^a	Neutral ^b	Neutral ^{ab}	Very Important ^c
Non timber forest products	Somewhat Unimportant ^a	Not Important ^b	Somewhat Unimportant ^a	Neutral ^c
For firewood or biofuel	Neutral ^a	Neutral ^b	Neutral ^{ab}	Somewhat Important ^c
For production of timber	Somewhat Important ^a	Somewhat Unimportant ^b	Neutral ^c	Somewhat Important ^d
For hunting and fishing	Very Important ^b	Very Important ^a	Somewhat Unimportant ^c	Very Important ^a
Other recreation	Neutral ^b	Very Important ^a	Neutral ^b	Very Important ^a

Like superscripts denote no significant difference with an alpha level of .05

Demographics

The average Consumptive use landowner is 63 years of age and male, (88% of them are male). Forty-three percent of respondents had earned a bachelor's degree or had some higher education, 56% had earned a high school diploma or completed some college, and 1% had

completed some school. The median education level for the landowners in this group was some college which was significantly less than the level of education completed by Naturalist landowners (Table 7). The median annual family income for this group ranged from \$60,000 to \$74,000 (Table 7), which is higher than the median annual income for the state of Michigan (\$45,354) (USDA 2010). Many of these landowners are either retired (49%) or are employed full time (44%) with the remainder being employed part time (5%) or a full time home maker (1%). Only 13% resided on their forest property (Table 8). The median distance of travel for those not residing on their property was 30 miles, showing that these landowners do not live very far from their property.

Table 7. Demographic characteristics

Variable	Consumptive	Recreationists	Naturalists	Multiple
Mean age (years)	63 ^a	60 ^{ab}	63 ^a	58 ^b
Sex (Male%, Female %)	88, 12 ^a	88, 12 ^a	69, 31 ^b	89, 11 ^a
Education (median)	Some college ^a	Bachelor's degree ^{ab}	Bachelor's degree ^b	Some college ^a
Employment (mode)	Retired ^a	Retired ^a	Retired ^a	Employed full time ^a
Income (median)	60,000 - 74,999 ^a	75,000 - 99,999 ^a	60,000 - 74,999 ^a	60,000 - 74,999 ^a

Like superscripts denote no significant difference with an alpha level of .05

Table 8. Forest management and ownership characteristics

Variable	Consumptive	Recreationists	Naturalists	Multiple
Mean forest area (acres)	202 ^a	110 ^b	88 ^b	147 ^a
Past harvest (%)	55 ^a	32 ^b	41 ^b	53 ^a
Intend to harvest in the future (%)	61 ^{ac}	47 ^{ab}	39 ^b	68 ^c
Actively manage (%)	51 ^a	46 ^a	40 ^a	71 ^b
Resident owner (%)	13 ^a	25 ^b	46 ^c	42 ^c

Like superscripts denote no significant difference with an alpha level of .05

Management activities

The Consumptive use landowner group reported owning an average of 202 acres of forestland, which is the largest average holdings of all groups and is significantly higher compared to that owned by Recreationists and Naturalists (Table 8). The average duration of forestland ownership for this group was 25 years. When asked if a previous owner had cut timber in the time period of ten years prior to owning the land, 22% said yes, 69% said no, and 9% indicated that they did not know. Approximately 55% of the Consumptive use forest landowners had conducted timber harvests of their own in the past, which is a significantly higher percentage than that of Recreationists and Naturalists. Forty percent were willing to

harvest timber in the future (Table 8). Of those who had harvested timber in the past ten years 52% had a written management plan and 44% spoke with a resource professional other than a logger or log buyer before harvesting the timber. Forty percent said that they plan to sell timber or other wood products from their property in the next ten years. This is the second highest stated intention to harvest among all the clusters. Thirty-four percent were unsure if they would harvest in the future and 26% indicated that they would not harvest. There is a notable decrease (15%) from past harvest to future plans of harvest among landowners in this group. When asked if they actively manage (plant trees, thin/prune trees, harvest trees, control against insects/pests, wildfire etc.) their forests, 51% said that they do so.

Recreationist forest owners (N=151)

Ownership Reasons

The most important motivations for forestland ownership among the Recreationists were recreation activities other than hunting or fishing, hunting and fishing, privacy, forestland as a part of their home, to protect nature and biologic diversity, and to enjoy beauty or scenery (Table 6). These landowners said that they value forests for land investment and for cultivation or collection of non-timber forest products significantly less than do all other landowner clusters (Table 6). They placed value on nature and experiences derived from being in nature such as hunting or fishing and other recreational activities. They seemingly place little value on the consumptive or monetary incentives that the forest has to offer.

Demographics

Landowners in this group average 60 years of age, with a majority (88%) being male, much like Consumptive users and Naturalists. Thirty-three percent had received a bachelor's degree, 27% had completed some college, 22% had completed an advanced college degree, 17% had

finished high school, and 1% attended some school. The median level of education completed for this group was a bachelor's degree. The median range for annual family income was \$75,000-\$99,999 which is the highest among all clusters (Table 7), and considerably higher than the median annual family income for the state of Michigan. The majority of these landowners said that they are either retired (46.6%) or employed full time (46.6%), with the remainder being employed part time (6.1%), employed seasonally (3.4%), unemployed seeking work (3.4%), or a full time home maker (1.4%).

Management activities

This recreation oriented group of landowners owned an average of 110 acres of forestland and 25% of them utilized a portion of this land as their permanent residence (Table 8). This group had a significantly greater number of resident landowners than did Consumptive use owners. Nonresident landowners lived a median distance of 150 miles from their forest property. The average length of ownership for these landowners was 22 years. When asked if timber had been cut by a previous owner prior to owning the land, 24% said yes, 63% said no, and 13% didn't know if it had been previously cut or not. Approximately 32% of Recreationist landowners had conducted timber harvests in the past, the lowest amount of past harvest participation of all the landowner groups. Of those who had harvested timber in the past ten years 46% had a written management plan and 50% talked to a resource professional other than a logger or log buyer before harvesting. Twenty-eight percent said that they plan to harvest timber in the future, 41% were unsure of their future harvest plans, and 32% indicated that they would not harvest at all. This shows a 4% difference from those who said they had harvested in the past and those who plan on harvesting in the future, possibly showing a slight negative attitude or hesitation towards timber harvesting within the same group of recreationist

landowners. Forty-six percent of Recreationist landowners said that they actively manage their forests (Table 8).

Naturalist forest owners (N= 70)

Ownership reasons

Forest landowners belonging to this group indicated that the values of enjoying beauty and scenery, protecting nature and biologic diversity, forest as a part of their home, and privacy are very important to them (Table 6). Land investment was also somewhat important to this group. However, hunting and fishing was valued significantly less than it was by landowners in all other clusters (Table 6). Naturalist landowners seem to place importance on the existence values of their forest. They indicated a neutral value for recreation, and a somewhat unimportant rating for hunting, which may imply that they enjoy observing nature rather than engaging in hobbies or practices that actively influence forest resources. They may in fact value land investment for the specific reason of protecting nature and maintaining a natural untouched community within their forest. Looking at the overall ownership responses, landowners in this group showed some naturalist, environmentalist or preservationist tendencies in the values they place on forestland ownership.

Demographics

Naturalist landowners were 63 years of age on average, with a majority (69%) being male, much like all other clusters. However this group had a significantly higher percentage of female respondents (31%) than did all other groups (Table 7). When asked to indicate the highest level of education they had attained, 29% had received a bachelor's degree, 20% had completed

some college, 31% had completed an advanced college degree, and 20% had finished high school. The median education level for Naturalists was a bachelor's degree, which is significantly higher than that for Consumptive use forest landowners and Multiple objective landowners (Table 7). The median annual family income was \$60,000-\$74,000 which is not significantly different from Consumptive use forest owners and Multiple objective forest owners, and higher than the median annual family income for the state of Michigan. A majority of landowners in this group were either retired (50.7%) or employed full time (38.8%). The remainder were employed part time (6%), unemployed seeking work (1.5%), or were a full time home maker (3%).

Management activities

The Naturalist focused forest landowners owned on average 88 acres of forestland, the smallest acreage among all groups (Table 8). Landowners in this group whose forest property is also the site of their permanent residence totaled 46%, which is the highest percentage of all landowner clusters and is significantly more than Consumptive use owners and Recreationists (Table 8). Those who are nonresident landowners live a median distance of 225 miles away from their forest property. These landowners on average had owned their forests for 28 years. When asked if timber had been cut 10 years prior to their ownership, 29% said yes, 57% said no, and 14% said that they did not know. Approximately 41% of them had conducted timber harvests of their own in the past with 28% indicating that they would harvest in the future. Forty-three percent of those who had participated in a harvest in the past ten years said that they had followed a management plan during their harvest and 43% had contacted a forestry resource professional prior to harvesting. This group along with Recreationist landowners are the least likely to harvest timber from their land in the next ten years. Like the Recreationists, only 28%

said that they plan on harvesting timber from their property in the future. This demonstrates a 13% decrease among those landowners who had harvested. In regards to their future plans of harvest 29% said that they were uncertain about the future harvest plans in their wood lot, and 43% said that they will not be conducting a harvest in the next ten years. When asked if they *actively manage* their forest land, this group was found to have the lowest percentage of landowners involved in active forest management compared to all other groups. Only 40% of the Naturalists indicated that these actions were taking place on their forest property (Table 8).

Multiple objective forest owners (N=193)

Ownership reasons

These landowners responded to questions regarding forestland ownership objectives with a wider variety of important values than did all other landowners, all of which were rated considerably higher than by those in other landowner clusters. For land investment, as part of home, for privacy, to bequeath forest land, for cultivation or collection of non-timber forest products, for production of firewood or biofuel, and for production of sawlogs, pulpwood or other timber products were significantly more important forest ownership reasons for Multiple objective landowners compared to all other clusters (Table 6). These forest landowners rated beauty and scenery significantly higher than did Consumptive users, protecting nature and biologic diversity significantly higher than Consumptive use forest landowners and Recreationists, hunting and fishing and other recreation activities significantly higher than Consumptive users and Naturalists. Since there were an abundance of ownership objectives which these landowners value highly it seems logical to name them Multiple objective forest landowners.

Demographics

Multiple objective landowners were the youngest of all landowner clusters. They were 58 years of age on average and a majority (89%) of them were male. They were significantly younger than Consumptive users and Naturalists (Table 7). Twenty percent received a bachelor's degree, 30% had completed some college, 22% had completed an advanced college degree, 27% had completed high school, and 2% some school. The median education level for this group was some college which is similar to Consumptive users, but lower than Recreationists and significantly lower than Naturalist forest owners (Table 7). The median range of annual family income was \$60,000-\$74,000 and is the same as that of Consumptive users and Naturalists, yet still higher than the median annual family income for the state of Michigan (Table 7). The majority of these landowners were either retired (42%) or were employed full time (47%), the remainder being employed part time (6%), unemployed seeking work (4%), or a full time home maker (0.5%).

Management activities

Multiple Objective landowners reported owning an average of 147 acres of forestland, which is significantly larger than ownerships by Recreationists and Naturalists (Table 8). Forty-two percent of these landowners said that their forestland is the site of their permanent residence; this is a significantly higher percentage than that of Consumptive use owners and Recreationists (Table 8). Non-resident landowners lived a median distance of 155 miles from their forest property. Multiple objective landowners had owned their property for an average of 26 years. Thirty-one percent said that the previous landowner prior to their ownership had harvested timber on the property, 58% said that it had not been harvested by the previous owner and 12% indicated that they were unsure. When asked about their own past harvest, approximately 53%

said that they had conducted a timber harvest in the past ten years and 46% indicated their willingness to do so in the future. This is a significantly higher percentage of past harvests than for recreationists and naturalists (Table 8). During these past harvests 56% of Multiple objective landowners used a management plan and 55% talked with a forestry or resource professional prior to their harvest. When asked if they will harvest in the next 10 years, 46% indicated that they would, 33% were uncertain, and 21% indicated that they will not harvest. The data shows that a greater proportion of Multiple objective landowners are willing to harvest in the future (46%) than were landowners in all other groups. Despite the higher percentage of planned future harvests, there is a 7% decrease from landowners who has harvested in the past harvest and those who planned to harvest in the future. Multiple objective landowners are significantly more active and engaged in forest management than are all other landowner groups, as 71% said that they actively manage their forest land (Table 8).

Reasons for not using communication methods

All clusters showed a similar pattern in response to why they have not used forestry information sources in the past (Figure 6). They all indicated a high percentage of non-use for either non-interest or not knowing where to obtain the information. The least common reason was that the information was not easily accessible to them. Consumptive users, Recreationists and Naturalists had the most similar responses. Consumptive use landowners, Recreationists and Naturalists indicated that lack of interest was the main reason that they had not used communication methods in the past (Figure 6). Multiple objective landowners also indicated that lack of interest was a large reason for not utilizing forestry informational sources (48%), however this is almost equal to its second highest reason of not knowing where to find forestry information (47%). The second most common response for non-use among Consumptive users,

Recreationists, and Naturalists was; “did not know where to get the information” with responses being quite similar, ranging from 28% to 30%. Multiple objective landowners also placed this as the second highest reason, yet there is not a distinct percentage gap between not knowing where to get information and lack of interest as seen with the other three clusters. All clusters indicated similarly that the third reason for not using forestry communication materials was that the information had not been easy for them to access (figure 6).

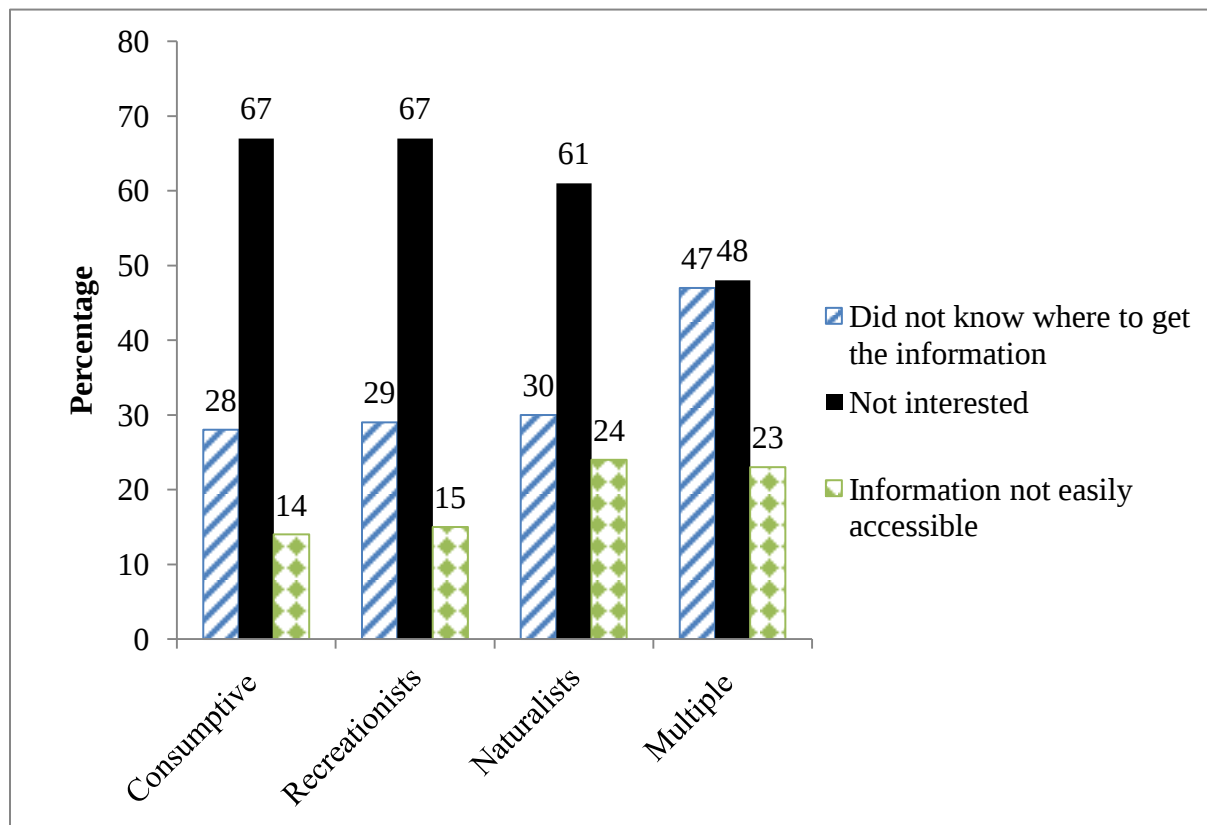


Figure 6. Reasons for not using communication methods for all forest landowner clusters

Communication uses and usefulness for each cluster

To understand landowners’ use of different forestry outreach materials and to identify the perceived effectiveness of these outreach efforts 11 sources of information were listed in the

survey. Landowners indicated the communication methods that they had used in the past (Table 10), reasons for non-use, and their perception of how useful these methods are to them (Table 9).

Approximately 41% of all respondents indicated that they had not used any forestry informational materials in the past. This is similar to the findings of Salmon et al. (2006), which suggest that high percentages of NIPF owners have not received forestry information of any kind in the past. Those who had not used one or more of the specified communication methods gave reasons for not using them. Fifty-one percent were not interested, 30% did not know where to get the information and 15% said that the information was not easily accessible (Figure 3). The most commonly used forms of communication were publications such as a book or a newsletter (34%), a newspaper or magazine article (33%), field tours (23%), and internet/web information (22%). The same methods of forestry outreach were identified as useful by NIPF owners for use in the future.

Consumptive use forest landowners have used forestry informational methods less frequently than all other clusters. A high percentage of these landowners have not used any of the eleven forms of communication methods provided in the survey. Fifty-eight percent reported not using any form of forestry information in the past. The methods used most frequently include publications (24%), newspaper or magazine articles (21%), and field tours (18%). Computer CD-ROM (3%), and radio programs (4%) have been used the least by landowners in this group and none of them have used video tapes (Figure 7& Table 10).

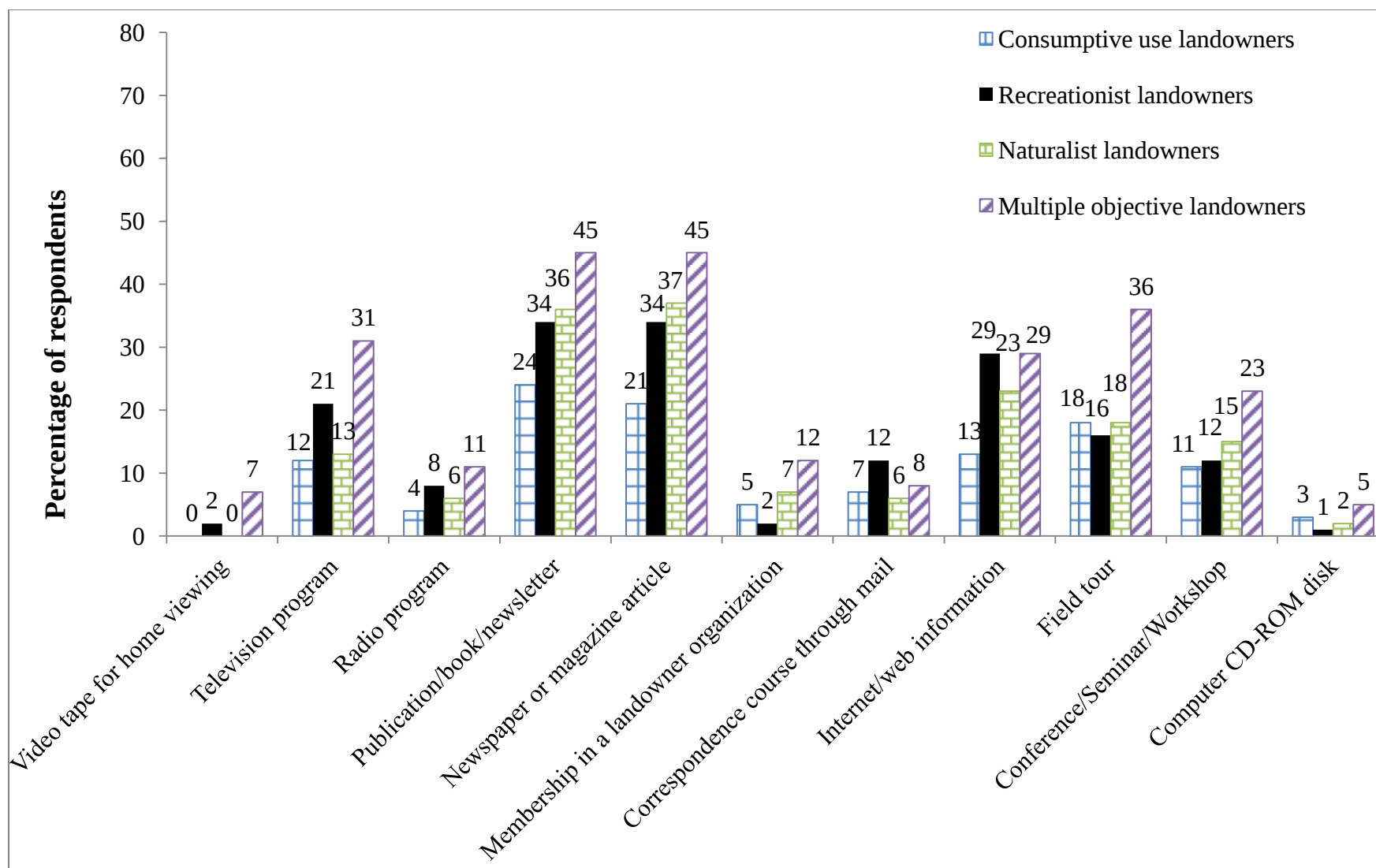


Figure 7. Percentage of NIPF land owners in each cluster who have used communication methods in the past

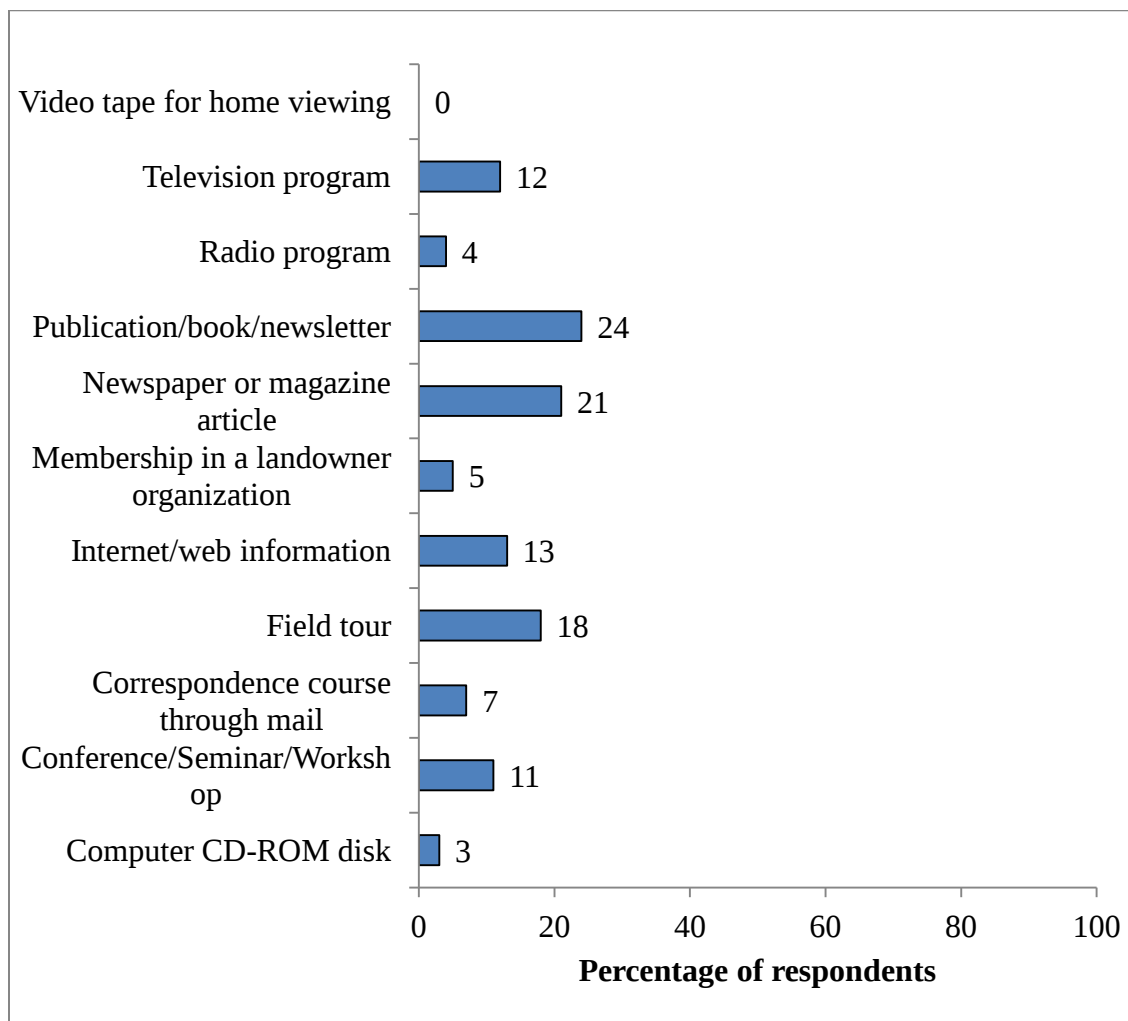


Figure 8. Communication methods used in the past by Consumptive use forest landowners

These landowners show similarities in the communication methods that they had used in the past and those that they prefer for use in the future (Figures 7 & 8). Only one method was stated to be somewhat useful; a publication, book or newsletter (59%) was reported as the most preferred means of communication to Consumptive use forest landowners overall (Figure 9). All other methods were rated as neutral in usefulness by this cluster of landowners (Figure 10). Consumptive use forest landowners found Internet and web information significantly less useful

for them than did all other clusters (Figure 7 & Table 9). However the least useful of all forms of communication were found to be radio programs (14%) and memberships to landowner organizations (25%) (Figure 7).

Table 9. Median response for usefulness of communication methods by clustered groups of NIPF owners in Northeastern Michigan

	Consumptive	Recreationists	Naturalists	Multiple
Conference	Neutral ^b	Neutral ^b	Somewhat Useful ^{ab}	Somewhat Useful ^a
Field tour	Neutral ^b	Somewhat Useful ^b	Somewhat Useful ^b	Very Useful ^a
Mail	Neutral ^a	Neutral ^a	Neutral ^a	Neutral ^a
Publication	Neutral ^b	Somewhat Useful ^b	Somewhat Useful ^b	Somewhat Useful ^a
Newspaper	Neutral ^b	Somewhat Useful ^b	Somewhat Useful ^{ab}	Somewhat Useful ^a
Videotape	Neutral ^b	Neutral ^b	Neutral ^{ab}	Neutral ^a
Television	Neutral ^b	Neutral ^b	Neutral ^b	Somewhat Useful ^a
Radio	Neutral ^b	Neutral ^b	Neutral ^{ab}	Neutral ^a
Internet	Neutral ^b	Somewhat Useful ^a	Somewhat Useful ^a	Somewhat Useful ^a
CD-ROM	Neutral ^b	Neutral ^b	Neutral ^{ab}	Neutral ^a
Membership	Neutral ^b	Neutral ^b	Neutral ^{ab}	Neutral ^a

Like superscripts denote no significant difference using a chi square test with an alpha level of .05

Table 10. Percentage of past communication usage by cluster with significant differences

	Consumptive	Recreationists	Naturalists	Multiple
Conference	11% ^b	12% ^b	15% ^{ab}	23% ^a
Field tour	18% ^b	16% ^b	18% ^b	36% ^a
Mail	7% ^a	12% ^a	6% ^a	8% ^a
Publication	24% ^b	34% ^b	36% ^{ab}	45% ^a
Newspaper	21% ^b	34% ^{bc}	37% ^{ac}	45% ^a
Videotape	0% ^b	2% ^b	0% ^b	7% ^a
Television	12% ^b	21% ^{ab}	13% ^b	31% ^a
Radio	4% ^a	8% ^a	6% ^a	11% ^a
Internet	13% ^b	29% ^a	23% ^{ab}	29% ^a
CD-ROM	3% ^a	1% ^a	2% ^a	5% ^a
Membership	5% ^{ab}	2% ^b	7% ^{ab}	12% ^a

Like superscripts denote no significant difference using a chi square test with an alpha level of .05

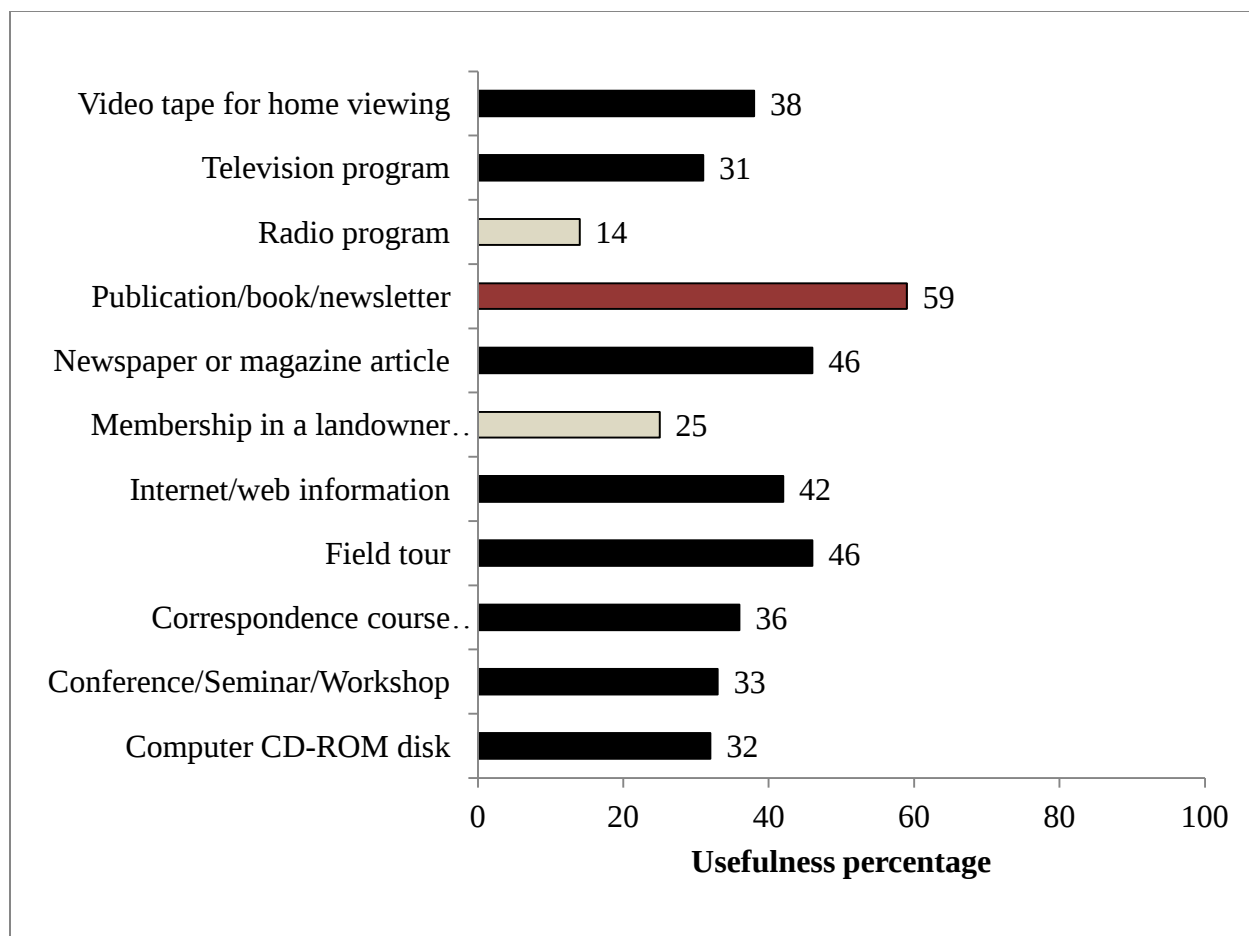


Figure 9. Usefulness of forestry communication methods for Consumptive use forest landowners (Very useful and somewhat useful responses combined)

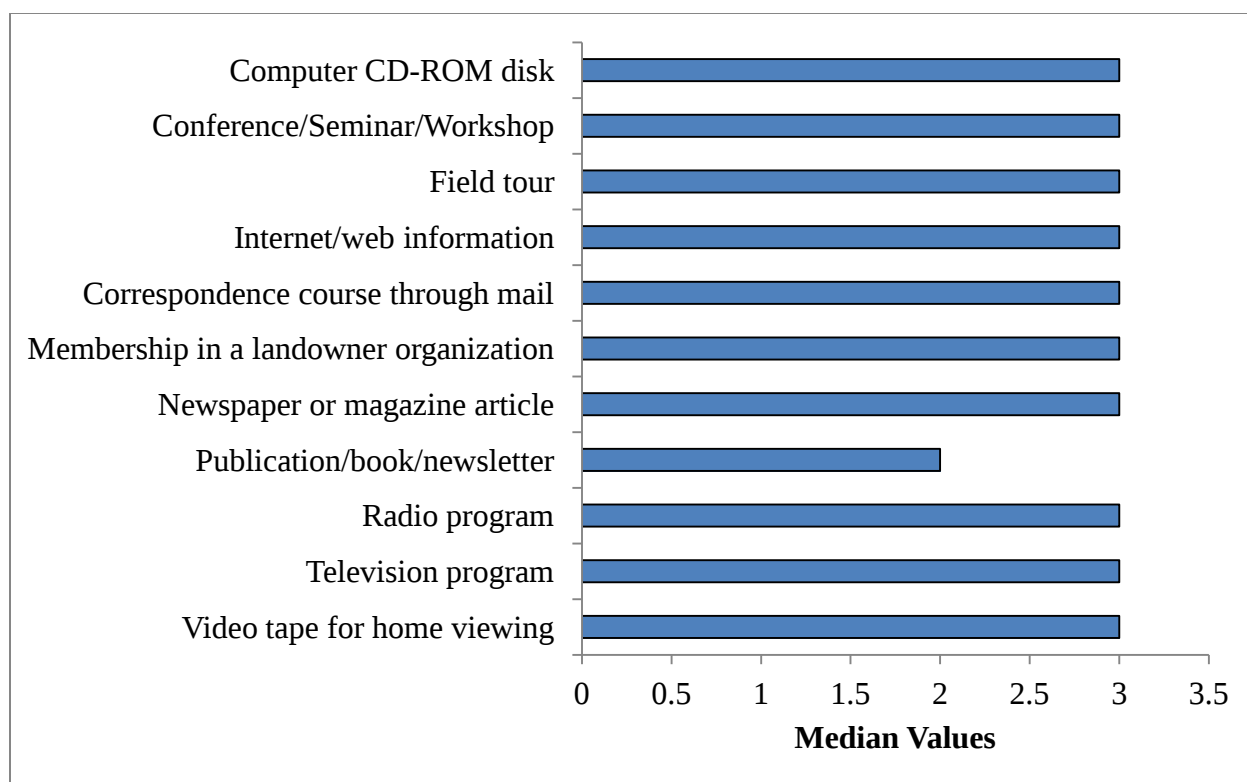


Figure 10. Usefulness of communication methods by Consumptive use forest landowners (Median response: 1 denotes very useful, 2 somewhat useful, 3 neutral, 4 not so useful and 5 not at all useful)

Approximately 55% of Recreationist forest owners had used at least one form of the 11 proposed communication sources. Five main methods of communication were used more than others: publications such as books or newsletters (34%), newspapers or magazine articles (34%), internet/web information (29%), television programs (21%), and field tours (16%). The least commonly used forms of forestry information by Recreationists were computer CD-ROM disks (1%), video tape for home viewing (2%), and memberships in landowner's organizations (2%) (Figures 7 & 11).

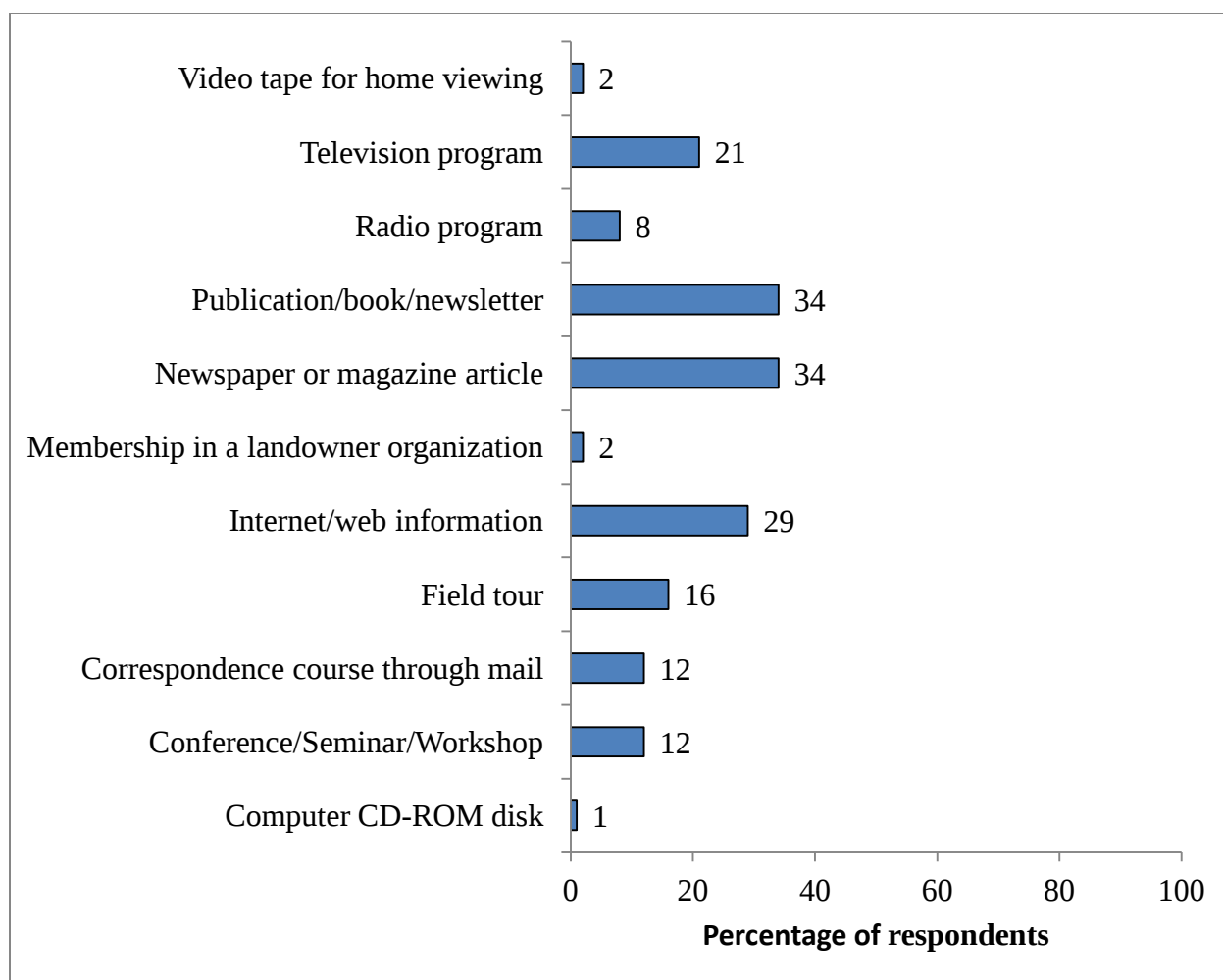


Figure 11. Communication methods used by Recreationist forest landowners

Recreationist landowners have indicated that Internet web information, newspaper and magazine articles, publications, and field tours were somewhat useful forms of forestry communication materials to them (Figure 12). These four were similar to the most common communication uses in the past except that television programs were in the top five most used communication methods in the past, but were considered as neutral in their usefulness as a forestry information source (Figures 11&12) (Table 9). It is important to note that the use of conference/ seminar /workshops, field tours, publications/books/ or newsletters, newspapers or magazine articles, video tape for home viewing, radio programs, computer CD-ROM disks, and

memberships to landowner groups were all significantly less useful to recreationists than Multiple objective landowners (Table 9).

The usefulness of Internet information sources to Recreationists was significantly higher than that for Consumptive landowners (Table 9). All other forms were considered neutral in their usefulness to this group (Figure 12 & Table 9).

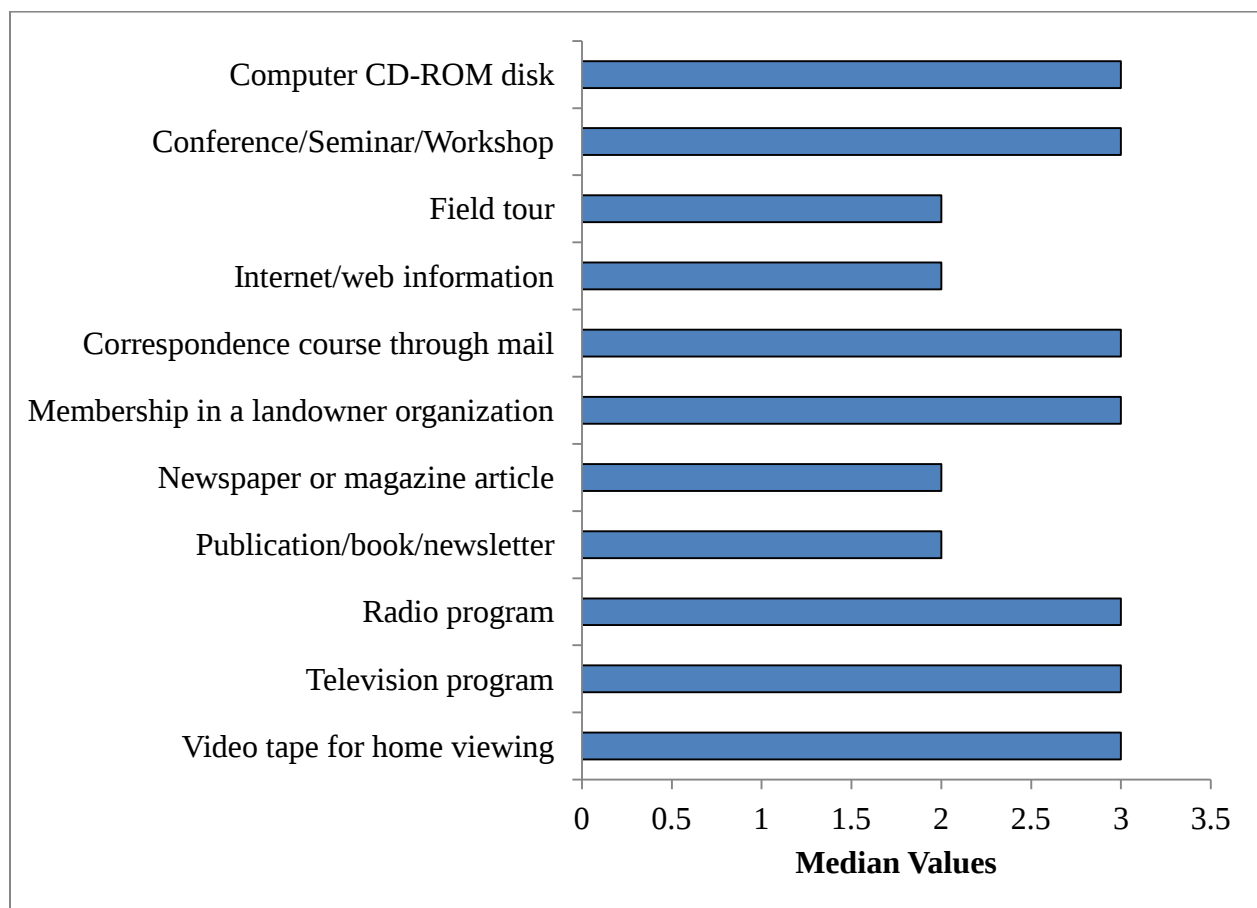


Figure 12. Usefulness of communication methods by Recreationist landowners (Median response: 1 denotes very useful, 2 somewhat useful, 3 neutral, 4 not so useful and 5 not at all useful)

Publications, books and newsletters (59%), field tours (57%), internet web information (57%), and newspaper/magazine articles (55%) were rated as the most useful forms of forestry communication methods to these landowners (Figure 13 & 14), with the most useful being publications/books/or newsletters. Radio programs (23%) were found to be the least useful form of communication to Recreationist forest landowners.

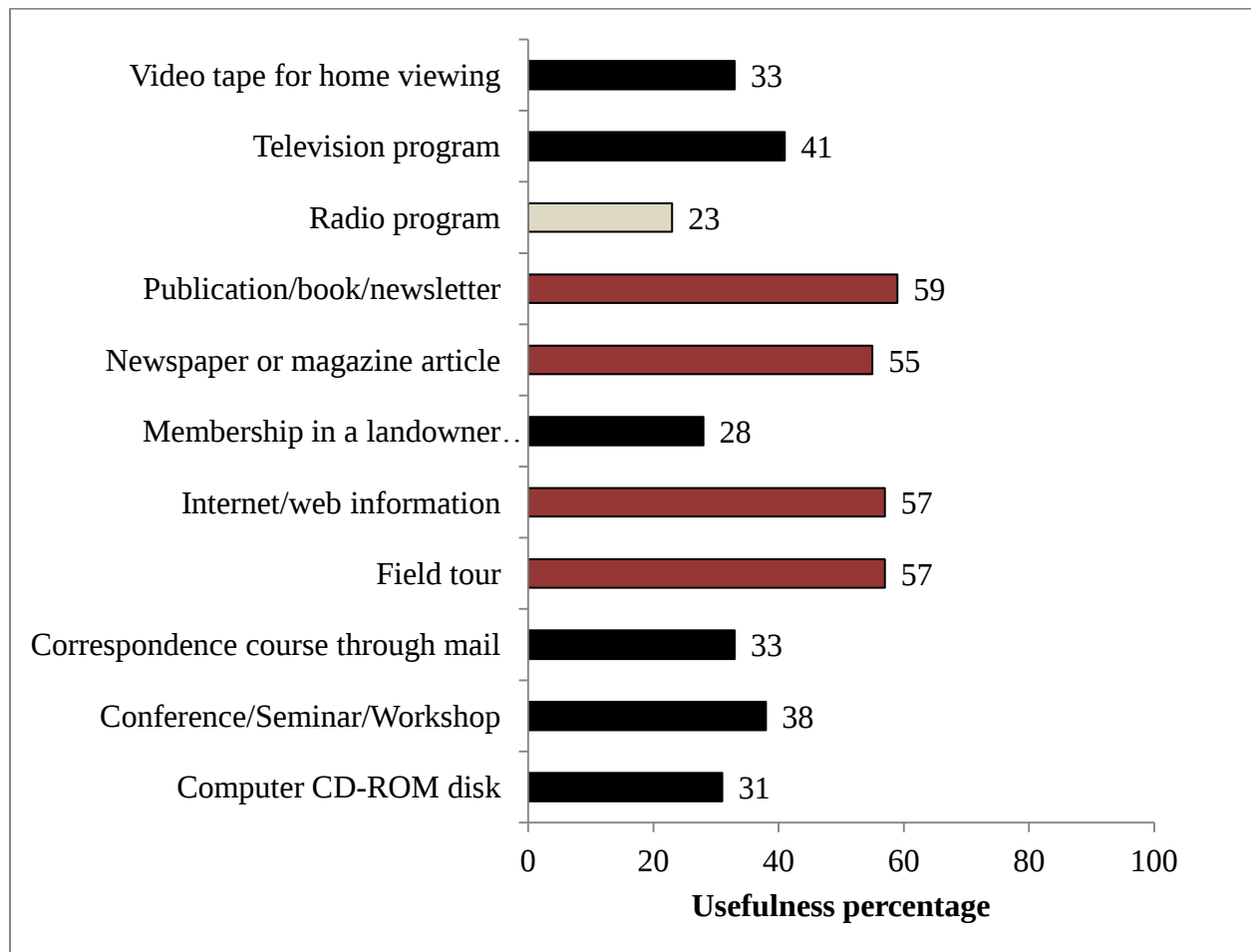


Figure 13. Usefulness of forestry communication methods for Recreationist forest landowners (Very useful and somewhat useful responses combined)

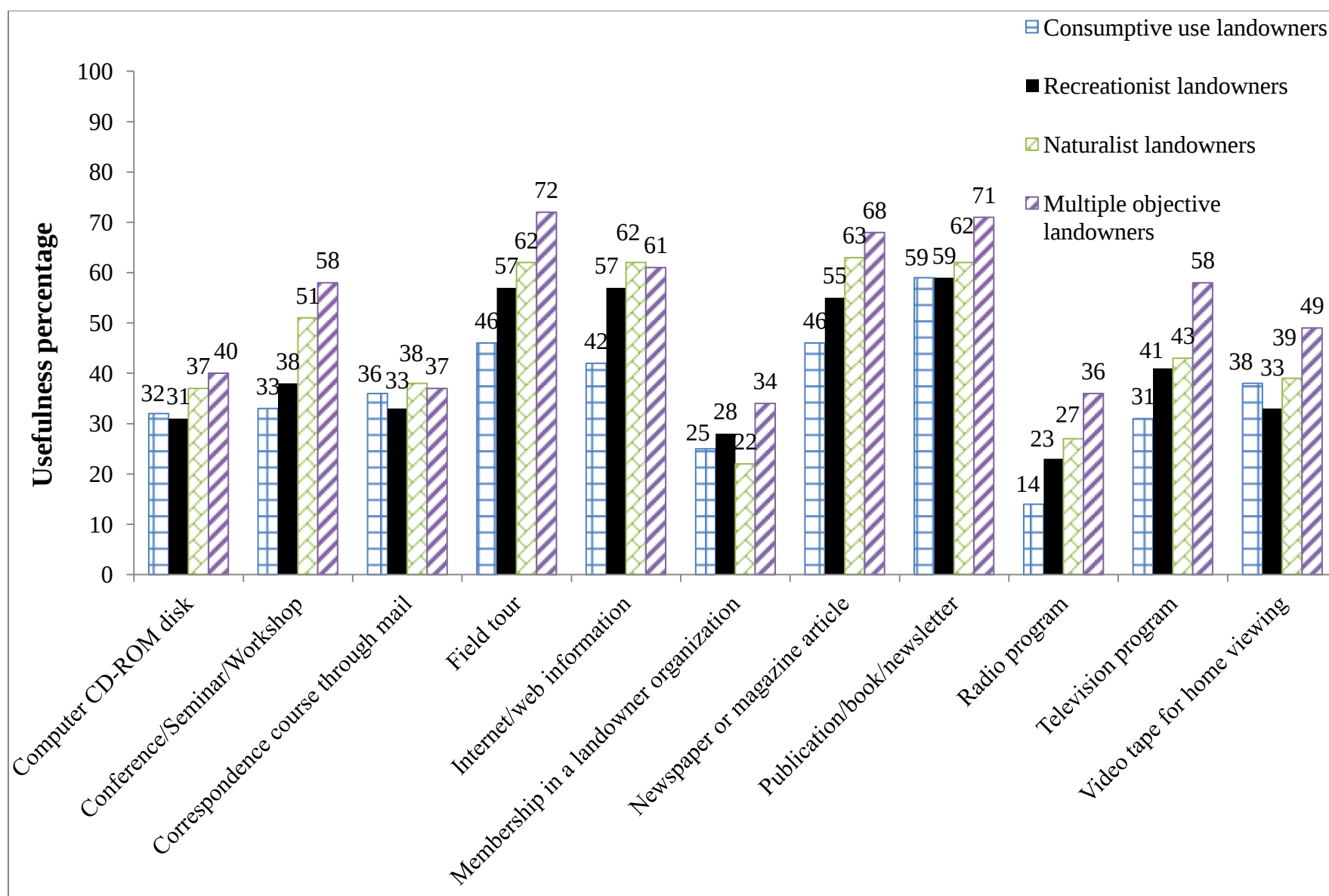


Figure 14. Percentage of NIPF owners in each cluster finding individual forestry communication methods useful to them

Almost half of Naturalist forest owners had not used any form of forestry information in the past. For those who had used information, the most common forms of communication means included newspapers or magazine articles (37%), publications (36%), web information (23%) hands on field tours (18%), and conferences, seminars and workshops (15%) (Figure 15). Computer CD –ROM’s were used the least by these landowners and video tapes for home use were not used by any of them. Naturalist landowners have used newspapers and magazine articles significantly more than have Consumptive use landowners (Figures 7 & 15) (Table 9).

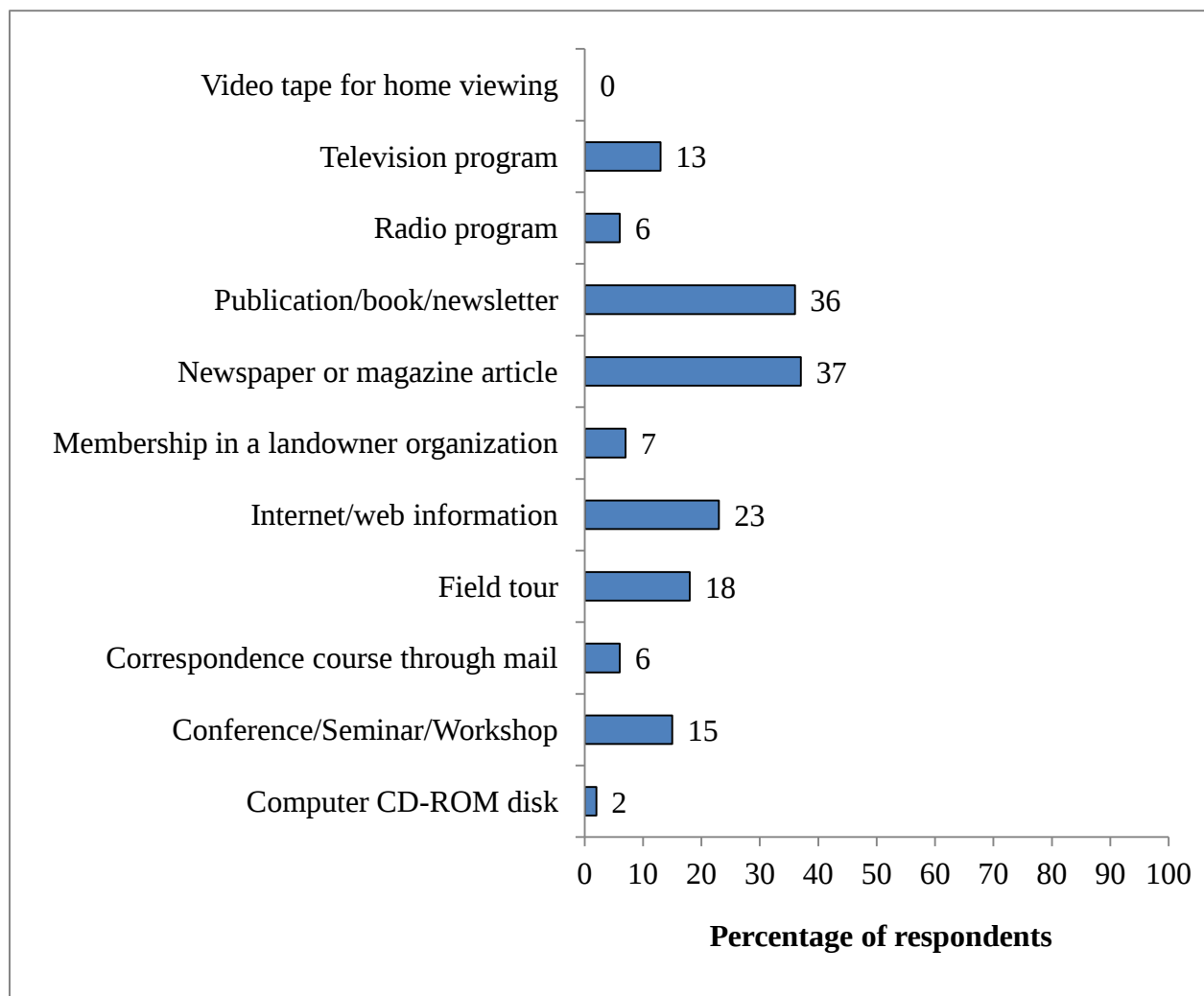


Figure 15. Communication methods used by Naturalist forest landowners

Like the Recreationists, Naturalist landowners had used five main forms of communication in the past, however, unlike the recreationists their preferences for communication were consistent with past use. The methods that were viewed as most useful by Naturalists were newspapers and magazine articles (63%), field tours (62%), publications, books or newsletters (62%), internet/web information (62%), and conference/seminars/ and workshops (51%) (Figure 14, 16 & 17). Unlike Consumptive users and Recreationists, these landowners found conferences, seminars and workshops to be one of the more useful forms at conveying forestry information. The least useful form of communication to this group was a membership in a landowner organization (22%). They also preferred internet sources significantly more than did Consumptive users (Table 9).

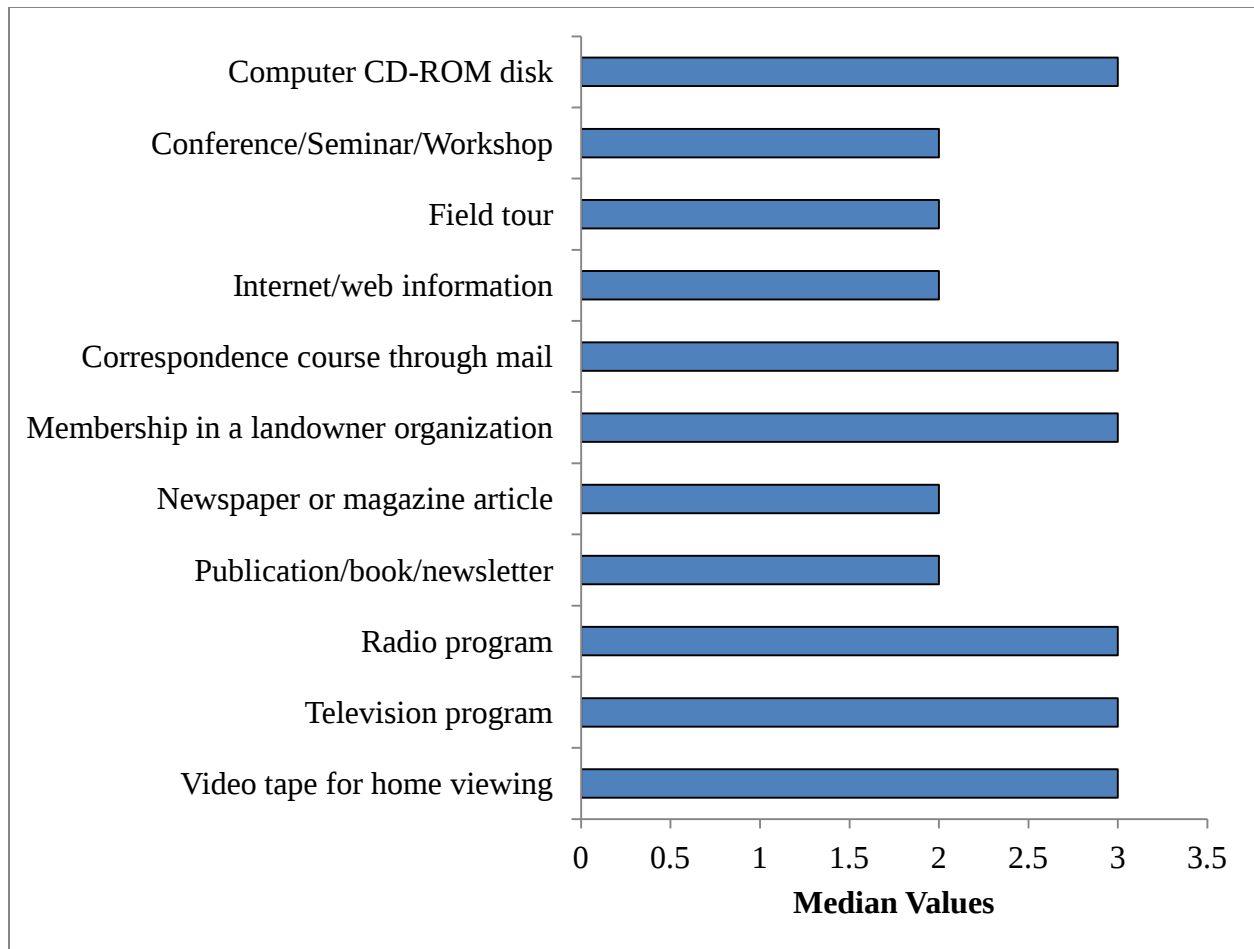


Figure 16. Usefulness of communication methods by Naturalist forest landowners (Median response: 1 denotes very useful, 2 somewhat useful, 3 neutral, 4 not so useful and 5 not at all useful)

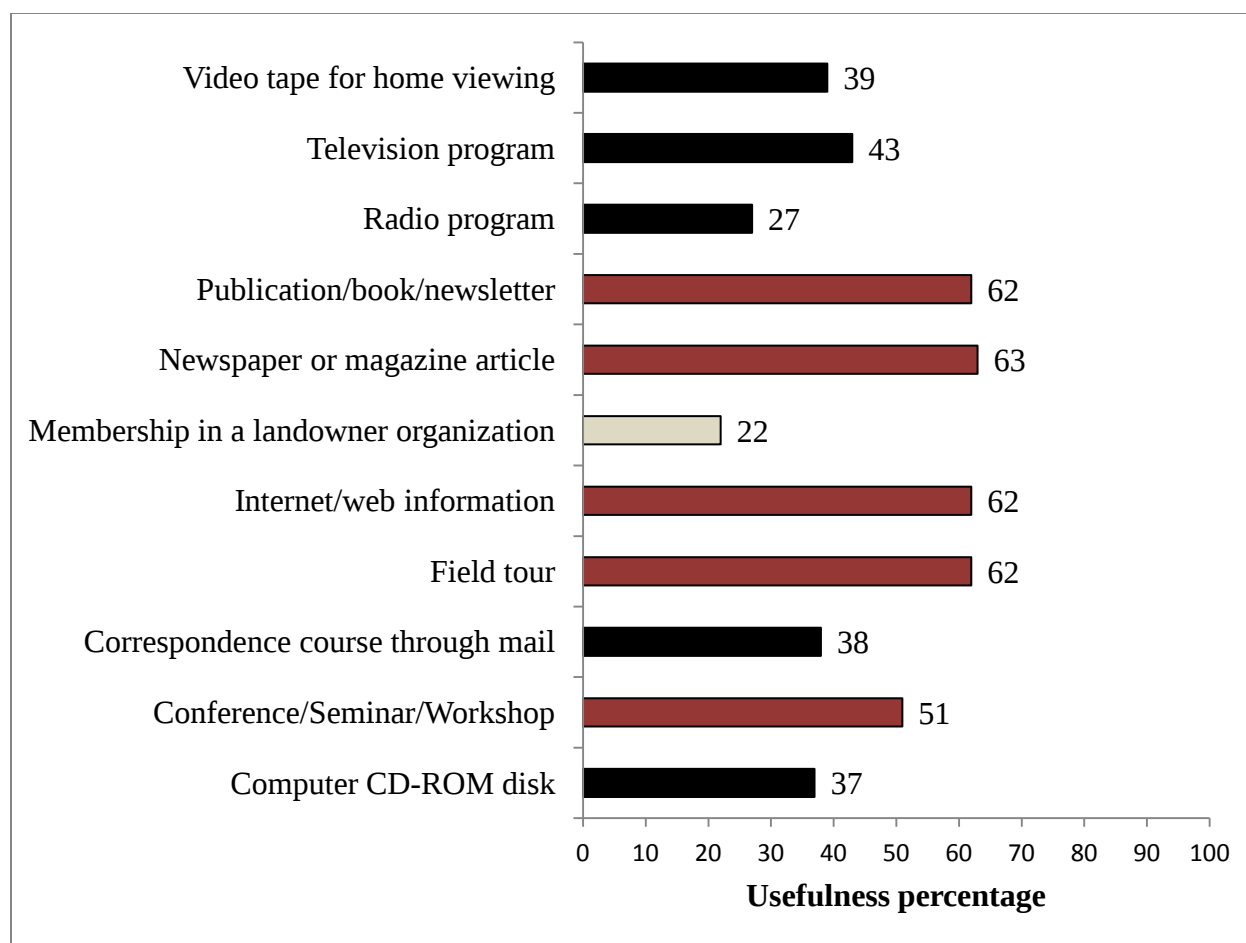


Figure 17. Usefulness of forestry communication methods for Naturalist forest landowners (Very useful and somewhat useful responses combined)

Approximately 70% of Multiple objective forest owners had used some form of communication method in the past, making them the most active information users of all the clusters. The most commonly used forms of communication were magazine articles and newspapers (45%), and publications, books and newsletters (45%). Both of these print media categories were used by Multiple objective landowners significantly more than by Consumptive owners and Recreationists (Figure 7). Field tours (36%) were the next most commonly used form of communication which had significantly more past use by Multiple objective landowners than it did for all other clusters (Table 10). Television as a source of information was used by

31% of these landowners, which is significantly more use than by Consumptive owners and Naturalists (Table 9). Internet/web sources have been utilized by 29% of Multiple objective landowners followed by conference, seminar, or workshop (23%). Conference, seminars, or workshops were used significantly more by these landowners than by Consumptive users and Recreationists. Though it was not used as often as other media, television was used significantly more Multiple objective landowners than by all other clusters (Figure 7).

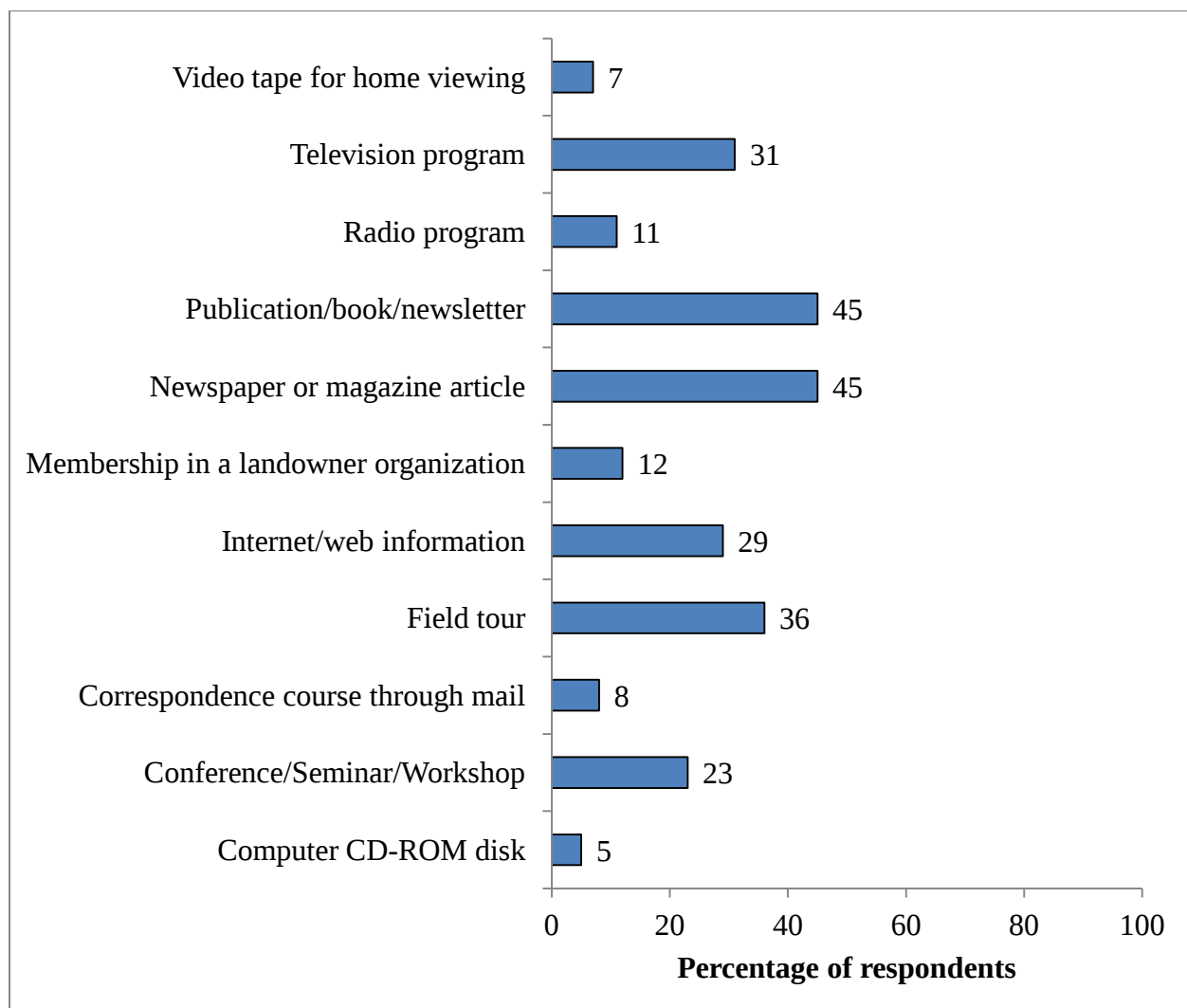


Figure 18. Communication methods used by Multiple objective forest landowners

The materials that have been described as useful by Multiple objective landowners are the same six methods that they had recognized as being used in the past (Figure 14). The most useful form of forestry informational material was the use of a field tour, which received a median value of one indicating very useful (Figure 19), the highest rating for an informational source in the study. The use of a field tour was significantly more preferred by Multiple objective forest landowners than by any other clusters (Table 9). Multiple objective forest landowners, as indicated by their median response values for all forms of communication along with their past use have been the most receptive and engaged in seeking forestry informational sources. After grouping the responses of “very useful” and “somewhat useful” into a category of useful, over 50% of Multiple objective landowners found six of the 11 communication methods to be useful (Figures 19 & 20). All methods described in the survey were found useful by at least 34% of Multiple objective landowners (Figure 20). The least useful communication method reported by this group was a membership in a landowner organization, which was still found to be useful by 34% of the Multiple objective landowners (Figures 14 & 20).

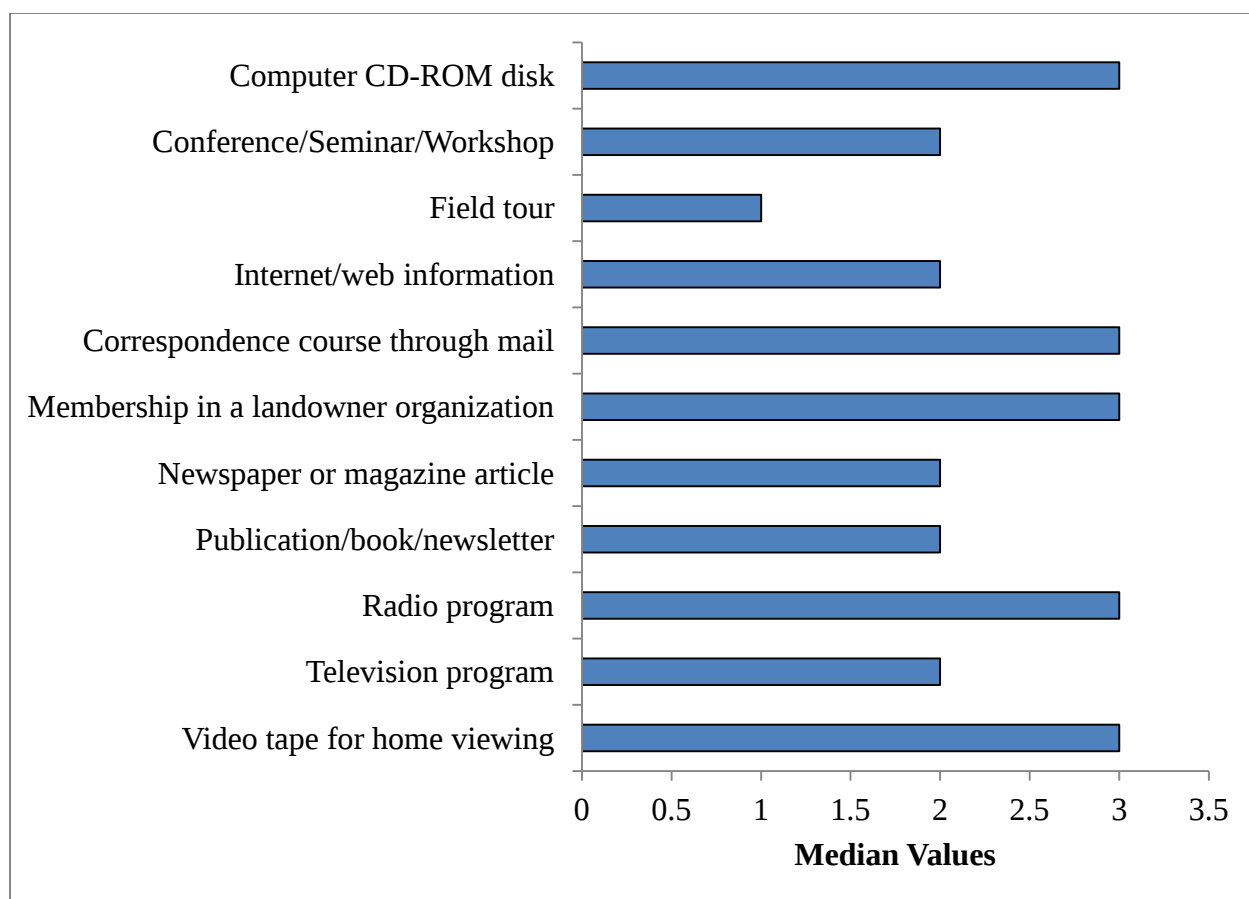


Figure 19. Usefulness of communication methods by Multiple objective forest landowners (Median response: 1 denotes very useful, 2 somewhat useful, 3 neutral, 4 not so useful and 5 not at all useful)

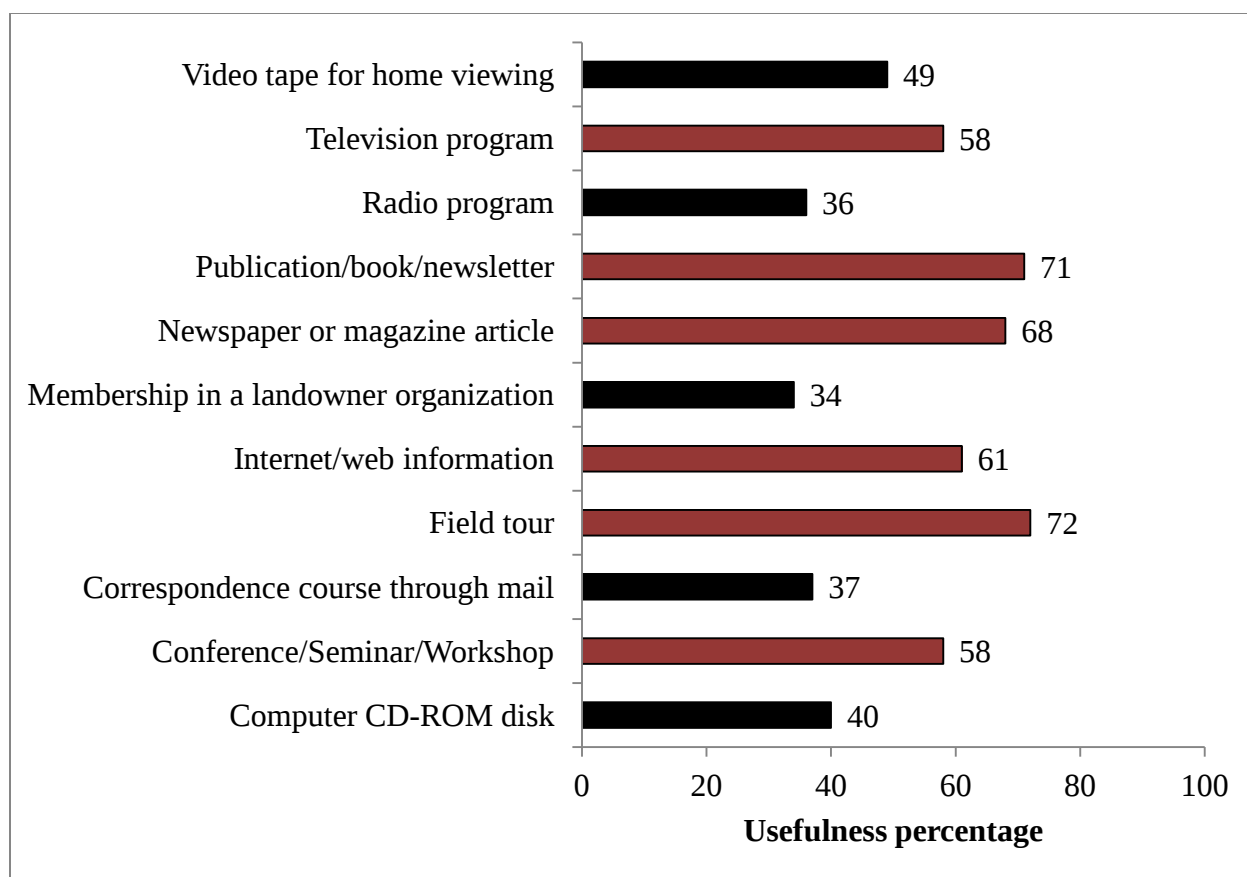


Figure 20. Usefulness of forestry communication methods for Multiple objective forest landowners (Very useful and somewhat useful responses combined)

Summary of communication past use and preference findings

The most commonly used information sources for landowner clusters were publications such as books, newspapers or magazine articles, followed by internet sources, and field tours (Figure 5). The least used forms of communication for all groups were computer CD-ROM disks, video tapes for home viewing, radio programs, and memberships to landowner organizations. There were no significant differences found between any of the groups regarding the past use of mail, radio programs, or CD-ROM's (Table 10), all of which were relatively unutilized by Michigan private forest landowners. The methods highly favored for future use by forest landowners for use were (1) publication/book/newsletter, (2) field tours, (3) newspaper or

magazine articles, and (4) Internet/web information which confirms studies conducted by Radhakrishna et al. (2003) and Howell and Habron (2004).

DISCUSSION/CONCLUSIONS

Market segmentation allows resource professionals to better understand NIPF landowners in their region and discover the strengths and weaknesses of their current outreach efforts (Kittredge 2004). The results obtained from this study show that NIPF owners in Michigan are diverse in terms of their forest ownership reasons. These diverse reasons, however, can be grouped into more homogeneous groups using statistical tools. Four distinct landowner groups were identified in the study area and their use and preference for communication methods were analyzed. These four audiences will each require a specific communication strategy based upon their landownership objectives and preference for forestry communication methods.

Since landowners have varying objectives for their land use, a communication strategy which specifically addresses these diverse interests and objectives may be more effective in reaching them with forestry information than the current “one size fits all” approach. The results from this research suggest that 41% percent of northeast Michigan landowners are not interested in any method of forestry outreach material. It may be that current methods do not address the topics that are relevant to specific landowner groups or that the methods themselves are not accommodating landowners’ learning styles. To spark interest in forestry messages, it is important to design information that is focused and relevant to landowner objectives and interests. There are also various means of providing forestry information to NIPF landowners, some of which may be more effective than others. The effectiveness of outreach programs may be increased by eliminating or refining the communication methods that are less useful and promoting those that are more preferred.

Since Consumptive use landowners value tangible benefits (hunting, fishing, land investment, production of timber etc.) from their forests, outreach materials targeted at them

should address how forestry can enhance use values. These landowners tend to prefer print media such as publications, books or newsletters for acquiring information. It should be noted that Consumptive use landowners are active in forest management yet are the least receptive to forestry outreach efforts. These landowners may believe that they already conduct forest management on their lands and do not need further information. This belief or attitude makes it difficult for natural resource professionals to reach these landowners with forestry outreach materials (Davis and Fly 2010).

Recreationist landowners value recreation and amenity benefits from their forest. Forestry education and outreach programs should emphasize how these benefits can be enhanced through forest management. Since they are less interested in gaining financial returns from their property, messages focused specifically on timber production may not interest them. Instead messages informing Recreationists of the positive effects of forest stewardship which directly contribute to the health of their forest, as well as preserve visual and recreational values may be effective in grabbing their attention. Communication methods that may provide effective outreach to this group are print media, field tours and the Internet.

Naturalist landowners value amenity benefits gained from their forest property. They value the existence of their forests, enjoy privacy, and desire to preserve biodiversity. However they do not actively interact (hunt, fish, recreate) with their forest property as do all other clusters and are the least interested in consumptive forest values of all groups. Messages that focus on maintaining forest health, aesthetics, sustainability, and ecology may be of interest to these landowners. Information about how to be involved in programs such as conservation easements and other similar programs that aid in sustaining these values may promote their participation in forest management. Similar to Recreationists these landowners prefer print media, field tours,

and the Internet for receiving forestry information. Additionally they prefer more hands-on learning such as conferences, seminars and workshops.

Multiple objective landowners place value on receiving many benefits from their forests. They are the most active forest managers and are also the most receptive to forestry outreach efforts. Many forestry outreach messages appear to resonate with this group; hence reaching them will likely be less difficult. This is supported by the findings of Bardon et al. (2007), that communication methods used to attract less responsive groups was also effective at reaching more responsive landowners which they called 'Fan Club' landowners. All communication channels described in the survey have been used and were rated as useful to Multiple objective owners and a majority of the materials have been utilized significantly more than all other clusters. Since these landowners actively manage their forests more regularly than do those in other clusters, it is not surprising that they have a more positive attitude towards forestry related activities and materials.

Landowner groupings in this study tend to differ in the number of communication methods they have used in the past and the ways in which they prefer to receive forestry information in the future. In general, however, a common pattern of communication use and preferences was observed among the respondents. Publications/books/newsletters, field tours, newspapers or magazine articles, and internet/web information were found to be more commonly used and preferred by the respondents. Since only a few communication methods were identified as useful to all, it is advisable to use these in a mixed audience.

Accounting for the similarities and differences between the landowner groups that have been found, it is advisable to adapt current communication methods and create new

communication strategies that are suitable for audiences that exist within a region. Because demographics, psychographics, ownership objectives, management objectives, management participation, and other variables can differ from region to region, extension agents, natural resource professionals, and educators can gain valuable information about the audiences within their region. A market segmentation approach similar to this study can allow resource professionals to identify landowner groups such as the ones identified in this study, by clustering them according to their ownership objectives and then using communication specific questions to discover the communication preference and learning style within each identified group. By looking at the communication preferences and learning style of each group, resource professionals may be more effective at communicating forestry messages to landowner audiences within their geographic regions. Gaining this group specific information may be valuable for natural resource communicators, as knowledge of what motivates an audience can improve the short and long term effectiveness of a message and increase knowledge.

CONSIDERATIONS

Preference for communication methods within each landowner group was studied extensively in this study and suggestions for future action were made. However these data show that a high percentage of landowners within the forest landowner groups have indicated that they had not used communication methods because they were not interested (Figure 3 & 6). This poses important questions to resource professionals such as, what are the underlying reasons for non-interest and how to create and cultivate more interest? Identifying land ownership objectives of landowner groups by segmentation such as has been done in this study may help to create and adapt current materials as one way of dealing with this problem. Also by conducting a follow up survey or focus group with the same landowners in this study may be helpful. The questions should ask respondents to identify reasons why they are not interested. The answers to such in depth questioning may help researchers obtain new information about this subject of non-interest and gain new insights that may help natural resource professionals create new informational resources which include topics of interest to target specific audiences with. Gaining this knowledge may help increase interest and knowledge of forestry among NIPF forest owners in Michigan and in other regions.

Other reasons why NIPF landowners in the survey indicated why they had not used forestry communication sources was because they did not know where they could obtain the information (30%), or that communication materials or sources of information were not easily accessible (15%) (Figures 3 & 6). Because publications, field tours, newspaper or magazine articles, and Internet/web information sources were found to be the most useful forms of communication to all landowners, improving the accessibility of these information sources may lead to more use. Making the locations where this information can be acquired more publicized

and visible to information seekers would be helpful. Also by providing information sources for distribution to non-forestry outlets such as wildlife associations, sports shops, hunting expos, rotary clubs community centers, and other nontraditional forestry outlets may allow forestry messages to gain traction within a larger audience and increase accessibility to this valuable information.

Today the Internet plays an important role in how people obtain information and other services. Recent surveys have indicated that 79% of American adults go online (Lenhart 2010) and that much of the population uses the Internet to obtain information and research products (Radtke and Munsell 2010). With the Internet as a communication tool the forestry profession could reach a broader audience. Using the Internet to deliver forestry outreach through well established websites could increase awareness of forestry to audiences which had been viewed as hard to reach (Radtke and Munsell 2010).

Print media communication including publications, books, newsletters, newspapers or magazine articles could be improved by publishing and distributing this information in nontraditional forestry audience outlets such as recreation, hunting and other outdoor focused magazines. Also making electronic copies available on line for home use and printing may be a way to make this information more accessible to information seekers.

Mass media such as publications, books, newsletters, newspapers, magazine articles, and the internet are often good for building awareness but personal contact can be more effective in aiding change (Tyson et al. 1998). Personal communication such as field tours, field days, and other personal one on one contact may be inconvenient, but their value can often outweigh the inconvenience (Kuhns 1998). Greater attendance to events such as field tours or field days by

Michigan landowners may be achieved, by promoting these events via mass media outlets. By advertising these events through mass media there may be greater attendance, which may lead to a heightened awareness and interest in forestry related messages.

According to Salmon et al. (2006) in Utah many NIPF landowners in their study were members of livestock associations. Several foresters in the state reported successfully using these associations to reach out to forest landowners. It may be the case that forestry professionals should focus on reaching out to such existing associations, groups, or clubs that may not be directly associated with forestry. If forestry messages can be presented as part of the discussion in these settings where interest may not be centered on forestry, new interest in forestry can be cultivated. For example, presentations to such non-forestry associations may spark interest in forestry and forest management simply because it is a relatively lesser known topic. Whereas when speaking to or giving a tour to a forestry association, there will likely be less impact because much of the audience is already participating in forestry management practices. It may be wise to attempt to reach those outside of the “choir” with forestry outreach methods that are at the disposal of natural resource professionals.

Internet, mass media, and personal communication were all specified as the most useful methods of communication by the landowners in this study. By improving these information outlets and using them together as an integrated tool for communication rather than as separate tools of communication it may increase the ability to reach landowners. This integration may help solve some of the problems natural resource professionals face such as accessibility and lack of interest.

Each landowner cluster has indicated a considerable amount of uncertainty of whether or not they will harvest in the future. This not only includes those who have harvested, but also those who had no past experience with harvesting. Consumptive users which indicated that they were uncertain of their future harvest plans totaled 34% ,41% for Recreationists, 29% for Naturalists, and 33% of Multiple objective owners were unsure if they will harvest. Because each group shows a lower expectancy to harvest in the future and a high level of uncertainty, it may be advisable for the forest products industry to provide information explaining the positive aspects of harvesting will be necessary to foster changes in attitudes towards harvesting trees. This information should have focused messages that are specific to each landowner group and their ownership objectives and interests. Explaining how harvesting timber can benefit their personal landownership objectives, generate income, as well as maintaining the health of their forest may change attitudes, increase knowledge and create interest in harvesting timber on their own forest land. As forestry research continues into the future, an emphasis on discovering the reasons for landowner reluctance and uncertainty towards harvest will be important to the forest products industry. Research which obtains information through surveys, focus groups, or phone interviews may allow foresters to uncover the underlying reasons for hesitance and uncertainty towards timber harvests. Questions that allow respondents to express their true feelings, fears, and concerns about timber harvesting may allow resource professionals to focus on these specific concerns. By understanding these concerns they can focus their efforts towards putting some of these fears and concerns to rest. Gaining insight into the thought process and rational behind landowner decision making as it relates to forestry decisions and timber harvesting may aid resource professionals as they seek to create an effective communication strategy, foster an increase in harvest activity, and promote positive change in attitudes towards forestry.

A new tool for confronting concerns, promoting positive attitudes, and fostering increased harvest activity of NIPF landowners may be web video. Short concise factual forestry messages presented on the Internet at outlets such as Youtube or other web media outlets may be a way to addressing the concerns NIPF owners may have. Two videos have been created and another is being produced currently in conjunction with this project. The videos are titled “Forestry From Fear to Facts: A Landowners Perspective” and “Forestry: Investing in, and Profiting From Sustainable Forestry” (Appendix A). These short web videos may give forestry and resource professionals another tool by which to address NIPF landowner concerns and reach them with factual information. A follow up study to these and other web videos will be important and worthwhile to observe their effectiveness.

Cluster analysis can provide natural resource professionals with valuable information as seen in this study, yet it may not address all of the needs of extension professionals. Segmentation is but one step in the process of digging deeper into identifying the audiences that are present within a population. From CA we do know who our audiences are, what interests them and how they prefer to receive information, but locating them, bringing them together, confronting uncertainty towards harvest and disinterest towards forestry related topics, as well as reaching them as a group will be the next step to truly having effective outreach.

APPENDICES

The 2010 Forest Landowner Survey: Bioenergy from Forest-based Biomass

Dear Forest Landowner,

I have enclosed a survey designed to investigate Michigan forest landowners' willingness to enter into the production and supply of biomass for wood-based bioenergy. The survey is being conducted as a part of research by Michigan State University's Department of Forestry. You were randomly selected to receive the survey because you own at least 20 acres of forested land in Michigan.

We would very much appreciate your completed and returned survey within the next two weeks. For your convenience, a business reply envelope is enclosed along with the survey packet. The survey takes approximately 20-25 minutes to complete. The information being sought is valuable to us and will help explore the feasibility of establishing a bioenergy generation plant utilizing woody biomass in Michigan.

Records of the study will be kept completely confidential. No information about your forest will be provided to any other organization or person. Only researchers involved in analyzing the data will have access to the surveys and only summary statistics will be reported to the organization. Your privacy will be protected to the maximum extent of the law. Your name

will never be associated with any responses. The surveys are numbered so that we may remove your name from the mailing list when your survey is returned as to avoid burdening you with unnecessary reminders and to protect your privacy.

Filling out the questionnaire is completely voluntary and by returning it you are giving us your consent to use the information in our research .Your decision of whether or not to participate in the survey will not affect your current or future relations with Michigan State University. You may choose not to answer particular questions on the survey.

We understand that it will take some of your valuable time to complete this survey. If you would like a copy of the study when it is completed, please indicate so at the end of the survey. We will be happy to provide you with copies of writings based on this study. Thank you in advance for your cooperation and contribution to the study. We greatly appreciate your help by completing this survey. If you have any questions about the survey, please feel free to contact me at 517-353-9447 or karen@msu.edu. If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, fax: 517-432-4503, or email: irb@msu.edu or regular mail at 207 Olds Hall, MSU, East Lansing, MI 48824.

Sincerely,



Karen Potter-Witter

Professor, Michigan State University

The 2010 Forest Landowner Survey

Section A: We would like to start by asking you a few questions about the forest land that you own in Michigan.

1. Do you currently own any forest land in Michigan?

☐ Yes

☐ No

2. If “yes”, please tell us the location of your forest land.

County

State

3. How many unconnected parcels or tracts of forestland do you own? (Please Check (✓) one box)

☐ 1 parcel

☐ 2 parcels

☐ 3-5 parcels

☐ 6-10 parcels

☐ More than 10 parcel

☐ 0 parcels

4. How many total (forested and non-forested) acres of land do you own in Michigan?

acres

5. Of the total acres of land you own, approximately how many **acres** are in each of these uses?

Active cropland or pasture land

Permanently or temporarily inactive cropland or pasture, shrub land, meadow

Tree plantation

Developed (homestead, buildings, roads, quarry, etc.)

Water or wetland

Natural forest (at least 10% covered by trees or other forest vegetation)

All other uses

6. How did you acquire your forest land? Please check one that best applies:

☐ Purchase

☐ Gift

☐ Inheritance

☐ Other (please specify)

7. In what year did you first acquire your forest land?

8. Was the timber cut by the previous owner within 10 years before you acquired the land?

☐ Yes

☐ No

☐ Don't know

9. Is your forest land also the site of your permanent residence?

☐ Yes (skip to question 11)

☐ No

10. If you answered “no” to Question 9, how many road miles do you live from the nearest forested land you own?

miles

11. How important to you is each of the following reasons for owning forested land? Please check one in each row.

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Not Important
To enjoy beauty or scenery	☐	☐	☐	☐	☐
To protect nature and biologic diversity	☐	☐	☐	☐	☐
For land investment	☐	☐	☐	☐	☐
As part of my home, vacation home, farm, or ranch	☐	☐	☐	☐	☐
For privacy	☐	☐	☐	☐	☐
To pass land on to my children or other heirs	☐	☐	☐	☐	☐
For cultivation or collection of non-timber forest products	☐	☐	☐	☐	☐
For production of firewood or biofuel (energy)	☐	☐	☐	☐	☐
For production of sawlogs, pulpwood, or other timber products	☐	☐	☐	☐	☐
For hunting or fishing	☐	☐	☐	☐	☐
For recreation other than hunting or fishing	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐

12. What is your single **most** important reason for owning the forested land?

13. Approximately how many acres of your forest are in the following species type?

Maple/beech/birch group acres

Aspen/birch group acres

Oak/hickory group acres

Spruce/fir group acres

Elm/ash/cottonwood group acres

White/red/jack pine group acres

Mixed acres

Don't know acres

14. How would you describe the size of the trees on your property? Please choose one option.
If you have multiple parcels, please answer for the **largest forested parcel** that you own.

☐ Three quarters or more are large trees (more than 12 inches in diameter at 4 feet in height)

☐ Three quarters or more are medium trees (between 5 and 12 inches in diameter at 4 feet in height)

☐ Three quarters or more are small trees (less than 5 inches in diameter)

☐ Don't know

15. How would you describe the terrain of your property?

☐ Relatively flat

☐ Relatively hilly

☐ Steep

16. How many miles of dirt/paved roads would you estimate to be on your property?

miles

Section B: In this section, we would like to know about your forest management activities

17. Do you actively manage your forest land (e.g. plant trees, thin/prune trees, harvest trees, control against insects/pests, wildfire etc)?

☐ Yes

☐ No

18. Within the past 10 years, have you converted or switched any portion of your property to other uses?

☐ Yes

☐ No (skip to question 19)

If yes, please tell us how many acres you switched

Acres of forest changed from forest to other uses such as

agriculture/open land, commercial development etc.

acres

Acres of open land changed from other uses to forest

acres

19. What are the future management plans for your forest land? (Check all that apply)

- ☐ Develop as a home-site for myself or family
- ☐ Bequest to heirs
- ☐ Subdivide to sell home lots
- ☐ Sell at a later date
- ☐ Convert to agricultural uses or biomass production
- ☐ Continue managing for timber, wildlife, or other natural resource benefits
- ☐ Other (please specify)

20. In the past 10 years, have you harvested and sold timber or other wood from the land you own in Michigan?

☐ Yes

☐ No (Skip to question 22)

21. If yes, when was your most recent harvest?

In the

of

(Season)

(Year)

22. In the next 10 years, do you plan to sell timber or other wood from your land?

☐ Yes

☐ No

☐ Unsure

23. If you harvested timber or other wood, did you have a written management plan before harvesting?

☐ Yes

☐ No

If no, please check why not? (Check all that apply)

☐ Didn't have the time

☐ Didn't have the money

☐ Didn't know who to contact for help.

☐ Not interested

☐ Other (describe)

24. If you have harvested timber or other wood in the past, rate the importance of these reasons to your decision to harvest. Please check one in each row.

	Very Important	Somewhat Important	Neutral	Somewhat Unimportant	Not Important
For cash income	☐	☐	☐	☐	☐
For wildlife habitat management	☐	☐	☐	☐	☐
For maintenance of forest health	☐	☐	☐	☐	☐
The timber was mature	☐	☐	☐	☐	☐
For land conversion	☐	☐	☐	☐	☐
Time to harvest according to the management plan	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

25. Did you talk to a forestry or natural resource professional other than the logger or timber buyer before harvesting?

☐ Yes

☐ No → Why not?

(Check all that apply)

☐ Didn't have the time

☐ Didn't have the money

☐ Didn't know who to contact for help

☐ They haven't been helpful in the past

☐ Not interested

☐ Other (describe)

26. If you have NOT harvested timber or other wood, rank the top 3 items (with 1 being the most important) why you did NOT harvest.

- Do not have the time
- Do not have the money
- Harvesting is not feasible because of small forest acreage
- The land is not accessible for timber harvest
- Income from harvesting might not be worth the effort
- My management plan recommends waiting to harvest
- Do not know how to effectively conduct a timber harvest
- Do not know who to contact for help in conducting a timber harvest
- Not legally able to carry out a timber harvest on my forested land
- Not interested
- Other (please specify)

27. There are many ways that information on forests and forestry can be shared with landowners. Which have you used in the past?

Have used

Have not used

☐
☐

Conference/seminar/workshop

☐
☐

Field tour

☐
☐

Correspondence course through mail

☐
☐

Publication/book/newsletter

☐
☐

Newspaper or magazine article

☐
☐

Video tape for home viewing

☐
☐

Television program

Radio program

Internet/web information

Computer CD-ROM disk

Membership in a landowner organization

28. If you have not used one or more of the information sources given in question 27 above, please tell us why you did not use it? (Check all that apply)

- ☐ Did not know where to get the information
- ☐ Not interested
- ☐ Information is not easily accessible
- ☐ Other (please specify)

29. In your opinion how useful is each of these methods for conveying information related to forestry to landowners like you (Please check one option in each row).

	Very Useful	Somewhat Useful	Neutral	Not so Useful	Not at all Useful
Conference/seminar/workshop	☐				
Field tour	☐				
Correspondence course through mail	☐				
Publication/book/newsletter					
Newspaper or magazine article					
Video tape for home viewing					
Television program					
Radio program					
Internet/web information					
Computer CD-ROM disk					
Membership in a landowner organization					

Section C: In this section, we would like to know about your thoughts on using wood biomass for the production of alternative forms of energy. Wood biomass means any kind of wood including wood residues, tree tops, and limbs as well as wastes. It can be used as a feedstock for the production of energy such as electricity, heating power, and biofuels like ethanol, among others.

30. Did you know that wood can be used to produce alternative liquid fuels such as ethanol?

☐ Yes

☐ No

31. Please indicate your level of agreement/disagreement with the following statement: The production of alternative fuels (such as ethanol) from wood can create economic opportunities for landowners like you in Michigan.

☐ Strongly agree ☐ Agree ☐ Not Sure ☐ Disagree ☐ Strongly Disagree

32. If a market existed for woody biomass, would you be willing to produce and sell timber from your forest for converting it to alternative energy?

☐ Yes (go to question 33) ☐ No (skip to question 34) ☐ Not sure

33. If you said “yes” to question 32 above, how important would the following factors be in your decision to produce and harvest timber for conversion to alternative energy? Choose one option in each row.

	Importance				
	High				Low
	5	4	3	2	1
	←				
Price of the timber	☐	☐	☐	☐	☐
Steady market condition (long term contract)	☐	☐	☐	☐	☐
Low investment cost	☐	☐	☐	☐	☐
Satisfaction obtained by contributing for larger cause such as energy security, climate change etc.	☐	☐	☐	☐	☐
A sense of contributing to the local economy	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐

34. If you said “no” to question 32 above, please indicate the importance of following factors in your decision for not producing and harvesting timber from your forest for conversion to alternative energy.

	Importance				
	High		Low		
	5	4	3	2	1
Do not have the time					
Do not have the money					
Harvesting is not feasible because of small forest acreage					
The land is not accessible for timber harvest					
Income from harvesting might not be worth the effort					
Unsure about the market potential					
I am concerned about the ecological impacts of producing and harvesting timber for energy					
Do not know how to effectively conduct a timber harvest					
Do not know who to contact for help in conducting a timber harvest					
Not legally able to carry out a timber harvest on my forested land					
Not interested					
Do not know how to grow biomass					
Others (Please specify)					

35. Suppose that you have been approached by a logging contractor to sell timber from your forest for bioenergy production. These materials are likely to be young trees, species not in high demand, deformed or diseased trees, salvaged tree, tops, limbs etc. However, in the presence of a wood-based energy industry, woody materials that are now being used for other purposes (such as pulpwood) may also be sold as biomass for bioenergy. In the following table each row represents a hypothetical price for this material. For each of these hypothetical price levels, please indicate your preference of whether or not you will sell timber by checking a box. For your information, the current statewide average hardwood pulpwood stumpage price is approximately \$ 24 per cord. A cord is the amount of wood in a neat stack 4 feet wide by 4 feet high by 8 feet long, which is about 128 cubic feet. **(Check one box for each row)**

Price levels for	Definitely will not sell	Probably will not sell	Not sure	Probably will sell	Definitely will sell
Biomass					
\$ 12/cord	☐				
\$ 18/cord	☐				
\$ 24/cord					
\$ 30/cord					
\$ 36/cord					
\$ 42/cord					
\$ 48/cord					

36. If you would never harvest biomass from your forest irrespective of the price offered, then check here. ☐

37. If you checked not sure option for any price level in question no. 35 above, then please tell us why

- ☐ I am not sure if the price is appropriate
- ☐ I do not know enough about my property to answer
- ☐ I am not the decision-maker for the property
- ☐ I did not understand the question
- ☐ Other (Please specify)

38. For the lowest amount that you checked probably yes or definitely yes in question no. 35 above, please indicate how much forest in your property would you be willing to harvest?

- ☐ 25% ☐ 50% ☐ 75% ☐ All ☐ Other

39. For the highest price that you checked probably yes or definitely yes in question no. 35 above, please indicate how much forest in your property would you consider harvesting?

- ☐ 25% ☐ 50% ☐ 75% ☐ All ☐ Other

40. What do you think will be the appropriate price that will lead you to harvest timber for conversion to alternative energy?

- ☐ Approximately the same price as that of pulpwood
- ☐ Approximately the same price as that of sawtimber
- ☐ Approximately \$ per cord of wood.
- ☐ Other (please specify)

41. Fast growing trees such as hybrid willow, poplar, or cottonwoods can often be planted solely for the purpose of being harvested for energy. This type of plantation is referred to as an energy plantation. Will you be willing to establish an energy plantation if you have active or inactive cropland or pasture land, for supplying feedstock for producing bioenergy if a market existed for it in the future?

☐ Yes ☐ No ☐ Do not have sufficient land for plantation

If yes, approximately how many acres will you be able to use for this purpose?

acres

42. Will you be willing to lease your land for energy plantation in the future?

☐ Yes ☐ No ☐ Unsure

If yes, at what price will you be willing to lease your land for energy plantation?

\$ per acre

43. Since the supply of wood usable for bioenergy production can also be used for making other conventional forest products such as pulpwood, do you have any specific preference on how the wood from your property is used?

☐ Yes ☐ No

If “yes”, which industry would you prefer to supply your forest products to?

☐ Pulpwood over Bioenergy
☐ Bioenergy over Pulpwood
☐ No specific preference

Section D: In this last section, we would like to ask you some questions about yourself to help us compare your answers with other landowners. We stress that all of your answers are strictly confidential.

44. What is your age? years

45. What is your highest level of education?

- ☐ Some school ☐ High school diploma ☐ Some college
- ☐ Bachelor's degree or equivalent ☐ Advanced college degree

46. In which of these ownership categories does your forested land fit?

- ☐ Individual or family ☐ Partnership or other joint ownership
- ☐ Association ☐ Corporation without publicly traded stock
- ☐ Tribal land ☐ Other (Please specify)

47. Are you... ☐ Male ☐ Female

48. Which of the following categories best describes your employment status during 2010?

- ☐ Employed full time ☐ Employed part time ☐ Unemployed, seeking work

49. What is your annual family income before taxes for 2010? Please check one.

☐ \$19,000 or less

☐ \$75,000 – 99,999

☐ \$20,000 – 39,999

☐ \$100,000 – 149,999

Thank you for taking time to fill out our questionnaire. Your cooperation is greatly appreciated. Would you like to be sent a copy of the results of this survey?

☐ Yes

☐ No.

Please feel free to write any comments you have in the space below.



Figure 21 Survey Questionnaire

Dear forest landowner,

We sent you a **survey** from the Department of Forestry at Michigan State University a few weeks ago. The survey included questions related to your activities on your forestland. If you returned the survey, we thank you! If you have not done so yet, we want to encourage you to return the survey.

Sincerely,

A handwritten signature in black ink that reads "Karen Potter-Witter". The signature is written in a cursive, flowing style.

Karen Potter-Witter, Professor

Figure 22. Reminder postcard

Appendix B. Summary Tables for 2010 NIPF Survey (Listed numerically in accordance with the order of the survey in Appendix A.)

Total survey sent out: 1,600
 Undeliverable addresses: 7
 Effective sample size: 1593
 Total responses received: 628
 Response rate: 39.4%

1. Do you currently own any forest land in Michigan?

Total responses: 613
 Yes: 580
 No: 14
 Blank: 19

2. If “yes”, please tell us the location of your forest land.

Total responses: 565
 EUP: 145 (26%)
 WUP: 86 (15%)
 NLP: 292 (52%)
 Combined: 42 (7%)

3. How many unconnected parcels or tracts of forestland do you own?

Total responses: 527

	1 Parcel	2 Parcels	3-5 Parcels	6-10 Parcels	More than 10 Parcels	Total Responses
Total count	306	112	89	4	16	527
Percent of total responses	58%	21%	17%	1%	3%	

4. How many total acres of land do you own in Michigan?

Total responses: 575

Mean: 163.9 acres

Range: 20 acres to 5,000 acres

Median: 75.0

Standard Deviation: 373.5

5. Of the total acres of land you own, approximately how many acres are in each of these uses?

Total responses: 554

	Active cropland or pasture land	Permanently or temporarily inactive cropland or pasture, shrub land, meadow	Tree plantation	Developed (homestead, buildings, roads, quarry, etc.)	Water or wetland	Natural forest (at least 10% covered by trees or other forest vegetation)	All other uses
Mean	47.1	21.1	36.0	7.5	35.5	130.3	46.6
Median	15.0	10.0	10.0	3.0	10.0	51.0	6.0
Standard deviation	93.9	24.4	155.0	16.7	124.9	310.2	110.6

6. How did you acquire your forest land?

Total responses: 574

	Purchase	Gift	Inheritance	Other
Count	475	10	115	6
Percentage	83%	2%	20%	1%
	7% ticked both purchase and inheritance			

7. In what year did you first acquire your forest land?

Total Responses: 556

Last 10 years: 121 (22%)

More than 10 years ago: 435 (78%)

8. Was the timber cut by the previous owner within 10 years before you acquired the land?

Total Responses: 572

Yes: 161 (28%)

No: 338 (59%)

Don't know: 74 (13%)

9. Is your forest land also the site of your permanent residence?

Total Responses: 576

Yes: 194 (34%)

No: 382 (66%)

10. If you answered "no" to question 9, how many road miles do you live from the nearest forested land you own?

Total Responses: 374

Mean: 227.6 miles

Median: 140.0 miles

Range: 0.1 to 4000 miles

Standard Deviation: 435.2 miles

11. How important to you is each of the following reasons for owning forested land? (Very Important =1, Somewhat Important =2, Neutral = 3, Somewhat Unimportant = 4, Not Important = 5)

Total responses: 577

Reason for Ownership	Total Responses	Median value
To enjoy beauty or scenery	565	1 (Very Important)
To protect nature and biologic diversity	550	1 (Very Important)
For land investment	550	2 (Somewhat Important)
As part of my home, vacation home, farm or ranch	552	1 (Very Important)
For privacy	557	1 (Very Important)
To pass land on to my children or other heirs	560	2 (Somewhat Important)
For cultivation or collection of NTFPs	538	3 (Neutral)
For production of firewood or biofuel (energy)	545	3 (Neutral)
For production of sawlogs, pulpwood, or other timber products	547	3 (Neutral)
For hunting or fishing	567	1 (Very Important)
For recreation other than hunting or fishing	546	2 (Somewhat Important)
Other	37	1 (Very Important)

12. What is your single most important reason for owning the forested land?

Total Responses: 523

Reason	Count	Percentage
Hunting	167	32%
Recreation and enjoyment	118	23%
For privacy/peace	79	15%
Investment	43	8%
Homestead	43	8%
For enjoying beauty/scenery	44	8%
Vacationing	39	7%
To protect nature	35	7%
Timber production/ for income	24	5%
To observe wildlife	18	3%
Bequest to children or other heirs	16	3%
Family property	18	3%
Firewood	13	2%
Fishing	13	2%

13. Approximately how many acres of your forest are in the following species type?

Total responses: 556

Species Type	Mean	Median	Standard Deviation
Maple/beech/birch group	69.3	28.0	194.1
Aspen/birch group	51.0	20.0	94.7
Oak/hickory group	56.5	20.0	155.2
Spruce/fir group	38.0	16.0	90.6
Elm/ash/cottonwood group	15.0	10.0	28.9
White/red/jack pine group	37.0	20.0	101.1
Mixed	89.6	40.0	168.3

14. How would you describe the size of trees on your property?

Total Responses: 557

Tree Size	Count	Percentage
Three quarters or more are large trees	164	29.4%
Three quarters or more are medium trees	316	56.7%
Three quarters or more are small trees	40	7.2%
Don't know	37	6.6%

15. How would you describe the terrain of your property?

Total Responses: 557

Terrain	Count	Percentage
Relatively flat	256	46.0%
Relatively hilly	284	51.0%
Steep	17	3.1%

16. How many miles of dirt/paved roads would you estimate to be on your property?

Total Responses: 545

Mean: 1.7 miles

Median: 0.5 miles

Range: 0 to 38.0 miles

Standard Deviation: 3.7

17. Do you actively manage your forest land (e.g. plant trees, thin/prune trees, harvest trees, control against insects/pests, wildfire etc)?

Total responses: 567

Yes: 315 (56%)

No: 252 (44%)

18. Within the past 10 years, have you converted or switched any portion of your property to other uses?

Total responses: 568

Yes: 55 (10%)

No: 513 (90%)

	Total count	Mean	Median	Range	St. Dev.
Acres converted from forest to other uses	48	14.4	5.0	1 to 161	26.8
Acres converted from other uses to forest	9	61.8	15.0	2 to 400	128.3

19. What are the future management plans for your forest land?

Total responses: 553

Plans	Total count	Percentage
Develop as a home-site for myself or family	84	15.2%
Bequest to heirs	270	48.8%
Subdivide to sell home lots	11	2.0%
Sell at a later date	110	19.9%
Convert to agricultural uses or biomass production	35	6.3%
Continue managing for timber, wildlife, or other natural resource benefits	371	67.1%
Other (please specify)	51	9.2%

20. In the past 10 years, have you harvested and sold timber or other wood from the land you own in Michigan?

Total responses: 566

Yes: 261 (46%)

No: 305 (54%)

21. If yes when was your most recent harvest?

22. In the next 10 years, do you plan to sell timber or other wood from your land?

Total responses: 569

Yes: 205 (36%)

No: 165 (29%)

Unsure: 199 (35%)

23. If you harvested timber or other wood, did you have a written management plan before harvesting?

Total responses: 383

Yes: 170 (44%)

No: 213 (56%)

Reason for not having the management plan

	Total responses	Percentage
Didn't have the time	6	3%
Didn't have the money	13	7%
Didn't know who to contact for help	46	24%
Not interested	80	41%
Other	68	35%

24. If you have harvested timber or other wood in the past, rate the importance of these reasons to your decision to harvest.

Total responses: 364

Reason for Harvesting	Total Count	Median value
For cash income	333	2 (Somewhat important)
For wildlife habitat management	324	2 (Somewhat important)
For maintenance of forest health	328	1(very important)
The timber was mature	317	1(very important)
For land conversion	264	4 (Somewhat unimportant)
Time to harvest according to the management plan	275	3 (Neutral)
Other	29	2 (Somewhat important)

25. Did you talk to a forestry or natural resource professional other than the logger or timber buyer before harvesting?

Total responses: 366

Yes: 172 (47%)

No: 194 (53%)

Reason for not consulting a forestry or natural resource professional

	Total responses	Percentage
Didn't have the time	9	5%
Didn't have the money	13	7%
Didn't know who to contact for help	56	30%
They haven't been helpful in the past	14	8%
Not interested	72	39%
Other	50	27%

26. If you have not harvested timber or other wood, rank the top 3 items (with 1 being the most important) why you did not harvest.

Total responses: 285

Reason	Most Important Reason	(%)	2 nd Important Reason	(%)	3rd Important Reason	(%)
Do not have the time	22	6	9	8	15	15
Do not have the money	9	2	1	1	2	2
Harvesting is not feasible because of small forest acreage	27	7	8	7	8	8
The land is not accessible for timber harvest	8	2	3	3	3	3
Income from harvesting might not be worth the effort	62	16	34	30	18	18
My management plan recommends waiting to harvest	40	10	4	4	7	7
Do not know how to effectively conduct a timber harvest	33	9	22	19	8	8
Do not know who to contact for help in conducting a timber harvest	22	6	19	17	15	15
Not legally able to carry out a timber harvest on my forested land	4	1		0		0
Not interested	108	28	10	9	11	11
Other	49	13	4	4	12	12

27. There are many ways that information on forests and forestry can be shared with landowners. Which have you used in the past?

Total responses: 502

Mode of information	Percentage that have used it	Percentage that have not used it
Conference/Seminar/Workshop	16	78
Field tour	23	70
Correspondence course through mail	8	82
Publication/book/newsletter	34	60
Newspaper or magazine article	33	60
Video tape for home viewing	3	86
Television program	20	71
Radio program	8	82
Internet/web information	22	71
Computer CD-ROM disk	3	87
Membership in a landowner organization	7	83

28. If you have not used one or more of the information sources given in question 27 above, please tell us why you did not use it?

Total responses: 413

Reason	Total Count	Percentage
Did not know where to get the information	122	30%
Not interested	212	51%
Information is not easily accessible	63	15%
Other	74	18%

29. In your opinion, how useful is each of these methods for conveying information related to forestry to landowners like you?

Total responses: 495

Mode of information	Total Count	Median value
Conference/Seminar/Workshop	452	3(Neutral)
Field tour	459	2(Somewhat useful)
Correspondence course through mail	432	3(Neutral)
Publication/book/newsletter	456	2(Somewhat useful)
Newspaper or magazine article	453	2(Somewhat useful)
Video tape for home viewing	435	3(Neutral)
Television program	440	3(Neutral)
Radio program	436	3(Neutral)
Internet/web information	436	2(Somewhat useful)
Computer CD-ROM disk	427	3(Neutral)
Membership in a landowner organization	429	3(Neutral)

30. Did you know that wood can be used to produce alternative liquid fuels such as ethanol?

Total responses: 556

Yes: 433 (81%)

No: 123 (23%)

31. Please indicate your level of agreement/disagreement with the following statement: The production of alternative fuels (such as ethanol) from wood can create economic opportunities for landowners like you in Michigan.

Total responses: 556

	Strongly agree	Agree	Not Sure	Disagree	Strongly disagree
Total count	108	225	177	33	13
Percentage	19%	40%	32%	6%	2%

32. If a market existed for woody biomass, would you be willing to produce and sell timber from your forest for converting it to alternative energy?

Total responses: 557

Yes: 235 (42%)

No: 133 (24%)

Not sure: 189 (34%)

33. If you said “yes” to question 32 above, how important would the following factors be in your decision to produce and harvest timber for conversion to alternative energy? (5=high importance, 1= low importance)

Total responses: 284

Reason	Total Count	Median value
Price of the timber	283	5
Steady market condition (long term contract)	272	4
Low investment cost	276	5
Satisfaction obtained by contributing for larger cause such as energy security, climate change etc.	271	3
A sense of contributing to the local economy	275	4
Other	33	5

34. If you said “no” to question 32 above, please indicate the importance of following factors in your decision for not producing and harvesting timber from your forest for conversion to alternative energy? (5=high importance, 1= low importance)

Total responses: 202

Reason	Total Count	Median value
Do not have the time	127	2
Do not have the money	124	2
Harvesting is not feasible because of small forest acreage	136	3
The land is not accessible for timber harvest	125	1
Income from harvesting might not be worth the effort	147	4
Unsure about the market potential	138	3
I am concerned about the ecological impacts of producing and harvesting timber for energy	147	4
Do not know how to effectively conduct a timber harvest	126	3
Do not know who to contact for help in conducting a timber harvest	127	2
Not legally able to carry out a timber harvest on my forested land	118	1
Not interested	155	4
Do not know how to grow biomass	125	2
Others	18	5

35. Willingness/unwillingness to supply biomass at various price levels

Total responses: 529

Price level	Total Count	Median value
\$ 12/cord	499	1(Definitely will not sell)
\$ 18/cord	499	1(Definitely will not sell)
\$ 24/cord	504	3(Not sure)
\$ 30/cord	508	3(Not sure)
\$ 36/cord	507	3(Not sure)
\$ 42/cord	503	3(Not sure)
\$ 48/cord	513	4(Probably will sell)

Price level	Unwilling Count (Percentage)	Neutral Count (Percentage)	Willing Count (Percentage)
\$ 12/cord	362 (73%)	123 (25%)	14 (3%)
\$ 18/cord	349 (70%)	131 (26%)	19 (4%)
\$ 24/cord	237 (47%)	173 (34%)	94 (19%)
\$ 30/cord	178 (35%)	180 (35%)	150 (30%)
\$ 36/cord	136 (27%)	163 (32%)	208 (41%)
\$ 42/cord	114 (23%)	141 (28%)	248 (49%)
\$ 48/cord	98 (19%)	147 (29%)	268 (52%)

36. I will not harvest biomass from my forest irrespective of the price offered.

Total count: 89

Percentage of total responses: 15%

37. If you checked not sure option for any price level in question 35, then please tell us why?

Total responses: 338

Reason	Total count	Percentage
I am not sure if the price is appropriate	209	62%
I do not know enough about my property to answer	82	24%
I am not the decision maker for the property	4	1%
I did not understand the question	2	1%
Other	91	27%

38. For the lowest amount that you checked probably yes or definitely yes in question 35, please indicate how much forest in your property would you be willing to harvest?

Total responses: 354

Amount willing to harvest	Total count	Percentage of the respondents
25%	141	40%
50%	98	28%
75%	24	7%
All	31	9%
Other	62	18%

39. For the highest price that you checked probably yes or definitely yes in question 35, please indicate how much forest in your property would you consider harvesting?

Total responses: 345

Amount willing to harvest	Total count	Percentage of the respondents
25%	100	28%
50%	112	32%
75%	51	14%
All	44	12%
Other	50	14%

40. What do you think will be the appropriate price that will lead you to harvest timber for conversion to alternative energy?

Total responses: 400

	Total count	Percentage of the respondents	Mean	Range	Median
Approximately the same price as that of pulpwood	97	24%			
Approximately the same price as that of sawtimber	104	26%			
Approximately.... \$/cord	80	20%	\$42/cord	\$12/cord to \$100/cord	\$40/cord
Other	128	32%			

41. Fast growing trees such as hybrid willow, poplar, or cottonwoods can often be planted solely for the purpose of being harvested for energy. This type of plantation is referred to as an energy plantation. Will you be willing to establish an energy plantation if you have active or inactive cropland or pasture land, for supplying feedstock for producing bioenergy if a market existed for it in the future?

Total responses: 498

Yes: 163 (33%)

No: 158 (32%)

Do not have sufficient land for plantation: 177 (36%)

If yes, approximately how many acres will you be able to use for this purpose?

Mean: 43 acres

Range: 2 to 400 acres

Median: 30 acres

42. Will you be willing to lease your land for energy plantation in the future?

Total responses: 547

Yes: 45 (8%)

No: 300 (55%)

Unsure: 202 (37%)

If yes, at what price will you be willing to lease your land for energy plantation?

Mean: \$352/acre

Range: \$10/acre to \$2500 per acre

Median: \$100/acre

43. Since the supply of wood usable for bioenergy production can also be used for making other conventional forest products such as pulpwood, do you have any specific preference on how the wood from your property is used?

Total responses: 491

Yes: 78 (16%)

No: 413 (86%)

If “yes”, which industry would you prefer to supply your forest products to?

Pulpwood over Bioenergy: 34 (49%)

Bioenergy over Pulpwood: 36 (51%)

44. What is your age?

Total Responses: 556

Mean: 61 years

Range: 29 years to 95 years

Median: 60 years

45. What is your highest level of education?

Total responses: 563

Education level	Total count	Percentage
Some school	8	1%
High school diploma	131	23%
Some college	162	29%
Bachelor's degree or equivalent	136	24%
Advanced college degree	132	23%

46. In which of these ownership categories does your forested land fit?

Total responses: 572

	Total count	Percentage
Individual or family	520	91%
Partnership or other joint ownership	43	8%
Association		
Corporation without publicly traded stock		
Tribal land	1	
Other	8	1%

47. Sex of the respondent

Total responses: 557

Male: 473 (85%)

Female: 84 (15%)

48. Which of the following categories best describes your employment status during 2010?

Total responses: 564

Employment status	Total count	Percentage
Employed full time	224	40%
Employed part time	33	6%
Unemployed, seeking work	14	2%
Full time homemaker	8	1%
Employed seasonally	6	1%
Retired	279	49%

49. What is your annual family income before taxes for 2010?

Total responses: 447

Annual Income Range	Total count	Percentage
\$ 19,000 or less	23	5%
\$ 20,000 - 39,999	95	21%
\$ 40,000 - 59,999	87	19%
\$ 60,000 - 74,999	51	11%
\$ 75,000 - 99, 999	69	15%
\$ 100,000 - 149,999	70	16%
\$ 150,000 - 199,999	20	4%
\$ 200,000 or more	32	7%

50. Would you like to be sent a copy of this survey?

Total responses: 559

Yes: 432 (77%)

No: 127 (23%)

Appendix C. Study area



List of Counties in the study area

Alcona	Cheboygan	Iosco	Marquette	Otsego
Alger	Chippewa	Kalkaska	Menominee	Presque Isle
Alpena	Crawford	Leelanau	Missaukee	Roscommon
Antrim	Delta	Luce	Montmorency	Schoolcraft
Benzie	Emmet	Mackinac	Ogemaw	Wexford
Charlevoix	Grand Traverse	Manistee	Oscoda	

Figure 23. Study area

Appendix D. Related web videos

Forestry web videos created in conjunction with this project



http://www.youtube.com/watch?v=XlC95YBxt7M&list=LLcM6RlHZF6H9hhQXkQXD3Kw&index=3&feature=plpp_video

Figure 24. Image of web video with link “Forestry From Fear to Facts, a Landowners Perspective”



http://www.youtube.com/watch?v=kiust33r858&list=LLcM6RIHZF6H9hhQXkQXD3Kw&index=4&feature=plpp_video

Figure 25. Image of web video “Forestry: Investing in and Profiting From, Sustainable Forestry”

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