

social sciences

# Family Forest Ownerships of the United States, 2013: Findings from the USDA Forest Service's National Woodland Owner Survey

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There are an estimated 10.7 million family forest ownerships across the United States who collectively control 36% or 290 million acres of the nation's forestland. The US Department of Agriculture Forest Service National Woodland Owner Survey (NWOS) provides information on the characteristics, attitudes, and behaviors of these ownerships. Between 2011 and 2013, 8,576 randomly selected family forest ownerships with at least 10 acres of forestland participated in the NWOS. Results show: amenity values are the dominant reasons for owning; owners tend to be active on their land, but most are not engaged in traditional forestry programs; and owners are relatively old. Although the general ownership patterns and reasons for owning are the same between the 2002–2006 and current iterations of the NWOS, participation in some management activities changed (some increased and some decreased) and the percentage of female primary decisionmakers increased.

**Keywords:** private forest owners, nonindustrial private forest owners, attitudes, behaviors, demographics, management, trends

The United States is endowed with an estimated 816 million acres of forestland (Butler et al. 2016b) that provide society with myriad benefits, ranging from clean water to recreational opportunities to fiber supply. These lands exist within a social context that helps define what goods and services are produced and who benefits from them. One important component of this social context is the ownership of the resource. It is the owners who ultimately decide, within the context of biophysical, social, political, and financial constraints and

opportunities, whether the land will be forested, whether and how it will be managed, and what, if any, timber harvesting or other resource extraction will be allowed.

The US Department of Agriculture (USDA) Forest Service's Forest Inventory and Analysis (FIA) program is legislatively directed to "make and keep current a comprehensive inventory and analysis of the present and prospective conditions...of the forests and rangelands of the United States" (PL 93-378). As part of this charge, FIA conducts the National Woodland Owner Sur-

vey (NWOS)<sup>1</sup> as a social complement to its plot-based forest inventory program. The objectives of the NWOS are to provide national-, regional-, and state-level information on:

- Who owns the forests?
- Why do they own them?
- What have they done with these lands in the past?
- What do they plan to do with these lands in the future?
- How have these characteristics, attitudes, and behaviors changed over time?

The NWOS covers all private forest ownerships in the United States, but the focus of this article is on family forest ownerships with 10 acres or more of forestland. These ownerships are the focus because of the large amount of land they own, the large number of them, the diversity of their ownership objectives, activities, and management practices, and the fact that they are the target of many forestry programs and policies. Ownerships with less than 10 acres are excluded because these are primarily large backyards

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where traditional forest management approaches are not well suited, and many forestry programs do not apply due to minimum size requirements. There are multiple definitions of forestland and forest ownership categories; the definitions used in this study are provided in Sidebar 1.

The results reported in this article are from the fifth national survey of forest ownerships in the United States, conducted between 2011 and 2013 (the “2013” iteration). Previous national surveys were conducted in 1953 (Josephson and McGuire 1958), 1978 (Birch et al. 1982), 1993 (Birch 1996), and 2002–2006 (the “2006” iteration) (Butler and Leatherberry 2004, Butler 2008). The surveys have progressively increased in thematic detail and geographic resolution (Table 1). Because of differences in sampling methods and questionnaire content, comparisons across survey iterations are limited. The 2006 and 2013 iterations are the first to use the same sampling and estimation methods and the 2013 questionnaire was designed to have many comparable elements to allow for assessments of change.

After a description of the methods used to conduct the 2013 NWOS, the results are presented and discussed. Where possible, the results are compared with those for the 2006 NWOS. Because of space limitations, only a subset of the results can be presented here. Full sets of national, regional, and state summary tables are available in Butler et al. (2016b), and customized tables can be generated from the online NWOS table maker application.<sup>2</sup>

## Methods

### Sampling Design

The NWOS used a stratified, area-based, probability proportional to size sample design (Dickinson and Butler 2013) based on the sample design FIA uses for its biophysical inventory (Bechtold and Patterson 2005). The sample was stratified by state to help ensure reliable state-level estimates. Each state was divided into hexagons, and one sample point was randomly selected per hexagon, resulting in the area-based sampling. The probability proportional to size attribute arises because the greater the acreage of a forest holding, the higher the probability of being selected.

Based on the asymptote for the coefficient of variation for the estimated number

### Sidebar 1. Key definitions.

**Forest\***: “Land with at least 10% percent cover (or equivalent stocking) by live trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. To qualify, the area must be at least 1.0 acre in size and 120.0 ft wide” (Woudenberg et al. 2010).

**Forest holding**: The total area of forestland an ownership has in a state.

**Owner**: An individual who is a part of an ownership.

**Ownership**: A legal entity that, in the case of family forest ownerships, is composed of one or more individuals. The **ownership categories** are defined as follows (Woudenberg et al. 2010, Butler et al. 2016a):

#### • Private

- **Family†**: Individual [and family]
- **Corporate**: Corporate
- **Tribal**: Native American (Indian)
- **Other private**: Nongovernmental conservation and natural resources organization and unincorporated local partnerships, associations, and clubs

#### • Public

- **Federal**: USDA Forest Service, National Park Service, Bureau of Land Management, Fish and Wildlife Service, Departments of Defense and Energy, and other federal agencies
- **State**: State
- **Local**: Local and other nonfederal public agencies

\*This term is synonymous with the combined forest and woodland categories used in the reports supporting the update to the 2010 Renewable Resource Planning Act (RPA) assessment. Consistent with other research (Andrejczyk et al. 2016), this word was conceptualized differently by family forest owners who participated in the NWOS focus groups, and, consequently, the term “wooded land” was used throughout the questionnaire, along with a lay definition provided upfront, to refer to this concept.

†As defined by the USDA Forest Service, the terms “nonindustrial private forest owner” (NIPF) and “family forest ownerships” are *not* synonymous. NIPF is defined as private forest ownerships that do not own a primary wood processing facility (Woudenberg et al. 2010) and includes corporations, nongovernmental conservation organizations, associations and clubs, and Native American tribes, in addition to families and individuals.

of ownerships, the target sample size for each stratum was 250 respondents (Butler et al. 2016a). By taking into account the area of private forestland, historical cooperation rates, and supplemental funding, the hexagon sizes were set accordingly. Within each hexagon, a sample point was randomly lo-

cated, remote sensing and ground truthing were used to determine whether points were forested, and property tax records were used to determine whether the forested points were privately owned, and if so, to identify the name and mailing address of the ownerships.

## Management and Policy Implications

The fate of the forest lies primarily in the hands of those who own it. In the United States, family forest ownerships control more forestland than any other ownership group. Understanding the characteristics, attitudes, and behaviors of family forest ownerships is critical for developing and delivering effective programs, policies, and services. Although most family forest ownerships are active on their land, most are not participating in traditional forestry programs. For programs and policies to reach more owners, they need to be designed to better meet the needs and objectives of the owners, most of whom are more interested in amenity than financial values. Approximately 18% of the family forestland is owned by people who indicate they are likely or extremely likely to sell or pass on all or part of their forestland in the next 5 years, a phenomenon that warrants increased consideration in policies and programs. The increased number of female landowners suggests increased emphasis on this group of owners as well.

**Table 1. Summary of national-level forest ownerships surveys in the United States, 1953–2013.**

| Date         | Geographic resolution                          | Topics  | Reference                                       |
|--------------|--|---|---|
| 1953<br>1978 | National and regional<br>National and regional | Ownership type, size of holdings<br>Ownership type, size of holdings,<br>tenure, demographics   | Josephson and McGuire 1958<br>Birch et al. 1982 |
| 1993         | National, regional, and<br>state               | Ownership type, size of holdings,<br>reasons for owning, tenure,<br>land uses (harvesting only),<br>demographics  | Birch 1996                                      |
| 2002–2006    | National, regional, and<br>state               | Ownership type, size of holdings,<br>reasons for owning, tenure,<br>land uses, land management,<br>assistance received/desired,<br>concerns, demographics | Butler and Leatherberry 2004,<br>Butler 2008    |
| 2011–2013    | National, regional, and<br>state               | Ownership type, size of holdings,<br>reasons for owning, tenure,<br>land uses, land management,<br>assistance received/desired,<br>concerns, demographics | This article                                    |

### Survey Instrument

The survey instrument for the 2013 NWOS was based on the 2006 NWOS instrument to maximize trend analyses. Although the goal was to minimize changes, professionals from across the United States were consulted to determine what questions should be dropped, modified, or added based on a question being deemed no longer relevant, being problematic in wording, formatting, or content, or a new/emerging topic being identified. The survey instrument was tested through 10 focus groups, with 8–12 participants per focus group, conducted with family forest owners from across the country (Butler et al. 2016a).

The final survey instrument took owners an estimated 25 minutes to complete and consisted of 37 questions, many with subparts, categorized into sections on ownership characteristics, forest characteristics, reasons for owning, ownership history, forest use, recreation, sources of information, concerns, future intentions, and demographics. Respondents were asked to answer for all of the forestland associated with the ownership in a given state. A copy of the survey instrument is included in the Supplementary Material.<sup>3</sup>

### Implementation

The only contact information consistently available from public-record property ownership information is name and mailing address, so a self-administered, mail-back questionnaire was selected as the primary survey mode. The contact methods followed

those recommended by Dillman et al. (2009). An initial introductory postcard was sent to all potential respondents. Approximately 4 days later, they received the survey along with a cover letter, a postage-paid business reply envelope, and an insert alerting them to an online option for completing the survey. Approximately 8 days later, they received a follow-up postcard thanking respondents and encouraging nonrespondents to respond. For those who had not yet responded, a final mailing, which contained a modified cover letter, another copy of the questionnaire, and a postage-paid business reply envelope, was sent approximately 14 days after the follow-up postcard. To increase response rates and test for nonresponse bias, a subset of the nonrespondents were contacted by telephone and asked a subset of the questions.

The implementation occurred over 3 years—2011, 2012, and 2013. Ownerships were contacted in most states the first year and were contacted in other years in states where target sample sizes were not yet met.

### Cooperation Rate and Nonresponse Bias Assessment

Between 2011 and 2013, 8,576 surveys were received from family forest ownerships with at least 10 acres of forestland from across the United States. The overall cooperation rate for family forest ownerships with 1+ acre<sup>4</sup> was 52%, which varied from 37% in Hawaii to 64% in Michigan. There was a general pattern with cooperation rates higher in the Upper Midwest, Northeast,

and Pacific Northwest and lower in the South and Intermountain West (Butler et al. 2016a).

To test for nonresponse bias, responses between mail and phone respondents were compared using, as appropriate, Kolmogorov-Smirnov, Wilcoxon rank-sum, and  $\chi^2$  tests. No statistically significant differences ( $P \geq 0.05$ ) were detected between the two groups in terms of the size of forest holdings, land tenure, harvesting trees for sale, and cost-share program participation rates. However, mail respondents were found to be more likely to have management plans and have received forest management advice. Based on this analysis, it appears that nonresponse bias is low with the exception of respondents being somewhat more likely to be engaged with the forestry community as evidenced through written forest management plans or having received forest management advice. No adjustments were made to the estimates, but the findings from the nonresponse bias assessment should be considered in interpretation of the results and are further discussed below.

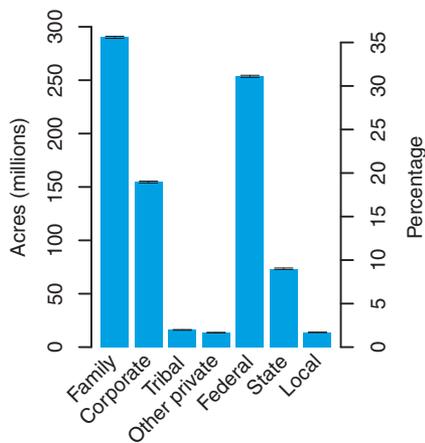
### Estimation

Estimates of population-level attributes were calculated in terms of ownerships and forestland area, along with their associated variances, taking into account the sample design (Dickinson and Butler 2013, Butler et al. 2016a). Because of small sample sizes ( $n \leq 10$ ), Alaska, Nevada, and Wyoming were excluded from the results. For comparisons with the 2006 data, Hawaii, western Oklahoma, and western Texas were also excluded because of inadequate sample sizes in the 2006 implementation.

To determine statistical differences between the 2006 and 2013 iterations, Z-tests were conducted (Dorofeev and Grant 2006). The two samples were not completely independent, but because of the complex sample design, it was not feasible to include estimates of covariance in the tests. The tests should be interpreted cautiously, but given that covariance is typically positive for sample units measured at two points in time, the test results are probably conservative.

Not all of the respondents answered all of the questions on the questionnaire, resulting in item-nonresponse. The published tabular results (Butler et al. 2016b) list item-

<sup>3</sup> Supplementary data are available with this article at <http://dx.doi.org/10.5849/jof.15-099>.



**Figure 1. Distribution of forestland by ownership category, United States 2013. Error bars in this and other figures represent  $\pm 1$  SE.**

nonresponse separately, but these responses are dropped when percentages are reported to make the statistics easier to interpret.

## Results

### Forest Ownership Patterns

Of the estimated 816 million acres of forestland across the United States, 58% are held by 11.5 million private ownerships. Of this private acreage, 290 million acres are owned by family forest ownerships who account for 10.7 million of the private forest ownerships. Family forest ownerships control 36% of the forestland in the United States (Figure 1). This is more than any other ownership group; federal ownerships are the next most common group at 31%.

The acreage and dominance of family forest ownership vary substantially across the United States (Figure 2). Texas has the greatest acreage of family forestland (42 million acres) and Rhode Island has the smallest (164,000 acres). In terms of percentage of a state's forestland, Kansas has the highest (89%) and Nevada has the lowest (2%). National and regional summary statistics for family forest ownerships are included in Sidebar 2.

There is a large range in the size of family forest holdings from tens to many thousands of acres (Figure 3); a holding is defined here as all of the forestland an ownership has in a state, regardless of the number of individual parcels. In looking just at family forest ownerships with 10+ acres of forestland, the focus of this article, there are an estimated 4.0 million ownerships in the United States with an average of 67.2 acres of forest per ownership (Figure 4) and a collective

acreage of 269 million acres of forestland. There are an additional 6.6 million family forest ownerships with 1–9 acres of forestland, but they own only about 7% of the family forestland and are excluded from the analysis for the reasons stated above.

### Family Forest Ownership Demographics

A family forest ownership is a legal entity that is composed of one or more individuals. Among the estimated 4.0 million family forest ownerships with 10+ acres of forestland, there are an estimated 9.7 million owners. An estimated 31% of the ownerships are composed of a single owner, 58% have two owners, and 11% have three or more owners.

On average, family forest owners, at least the primary decisionmakers, are older, more likely to be male, less racially diverse, and more educated than the general US population, as reported by the 2010 US Census (US Census Bureau 2012). The average age of the owner who is the primary decisionmaker for a family forest ownership is 62 years. Forty-three percent of the ownerships, with 48% of the land, have primary decisionmakers who are at least 65 years of age (Figure 5) compared with the general US population of which 13% of the people are 65 or older. The primary decisionmakers are predominantly male (79%), white (95%), and non-Hispanic (99%) compared with 49% male, 72% white, and 84% non-Hispanic for the general US population. The family forest ownership primary decisionmakers tend to have attained a high level of formal education; 48% have a college degree, compared with 39% for the general US population. The annual income of family forest ownerships is similar to those of the average US household; 25% of the family forest ownerships report an annual household income of at least \$100,000 compared with 23% for households across the United States.

The 2013 NWOS collected demographic information for up to two owners per ownership. Although there are only relatively small differences between most demographic characteristics for the person listed as the primary decisionmaker and the other owner for whom demographic information was provided, this is not true for gender. Eighty-three percent of the second owners are *female*.

### Family Forest Ownership Objectives

The reasons why family forest ownerships own their land are diverse, and most report multiple reasons (Figure 6). Amenity-

related objectives are most likely to be rated as important or very important. The most commonly cited reasons for owning are the beauty, wildlife habitat, and nature protection the forestlands provide. Another common objective is family legacy, being able to pass land on to heirs.

Financial objectives, such as land investment and timber production, while rated as important or very important by some ownerships, are rated much lower overall compared with amenity-oriented objectives (Figure 6). In terms of area, the financial values increase in relative importance, but these objectives and timber production in particular are still rated lower than most of the amenity values. The low relative importance of financial objectives is supported by the fact that 83% of the family forest ownerships report receiving no annual income from their forestland.

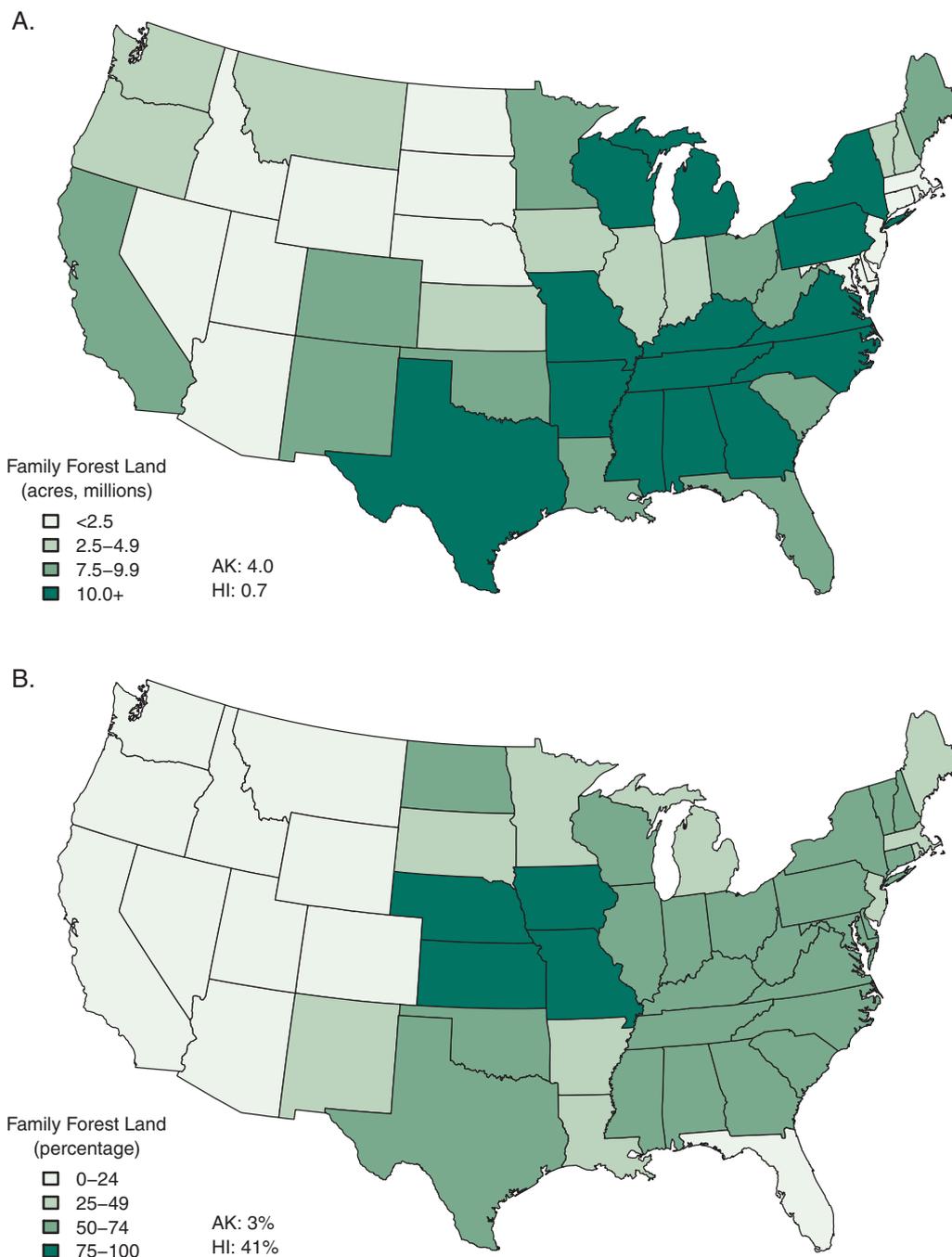
### Past Activities on Family Forest Land

For more than 70% of the family forest ownerships across the United States, one or more of the activities listed in Figure 7 have occurred on their land in the preceding 5 years. The most common activity is harvesting for personal use, mostly firewood. Given that the activities listed are just for the previous 5 years, it is not surprising that longer time frame activities, such as commercial timber harvesting, are much less common. When asked if they have commercially harvested trees anytime during their ownership tenure, the percentage increases from 18 to 29%.

Although activities are occurring on the lands of many family forest ownerships, most are not involved in traditional forest management activities and programs (Figure 8). Of the traditional forestry activities and programs queried, having received forest management advice in the previous 5 years is the most common, accounting for 20% of the family forest ownerships, who own 37% of the family forestland.

### Future Activities on Family Forest Land

Similar to past activities, more than 70% of the family forest ownerships across the United States are likely or very likely to have one or more of the 11 listed activities occur on their land in the next 5 years (Figure 9). However, in contrast to the past activities, the order is slightly different, and the percentages for most activities are higher. The largest shift is the increased percentage of ownerships planning to improve wildlife habitat.



**Figure 2. Acreage of family forestland (A) and percentage of forestland that is family owned (B), 2013.**

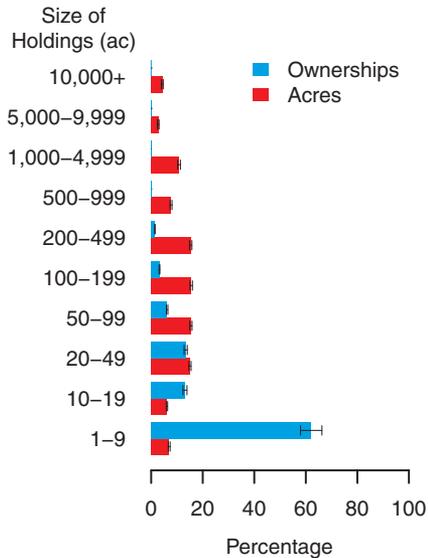
### Changes in Forest Ownership Patterns and Family Forest Ownership Characteristics

Besides a reported increase in the area of forestland in western Texas, the area of forestland stayed relatively constant between 2006 and 2013 and so too has the distribution across broad forest ownership categories. The increase in forestland in western Texas is due to inventory-based estimates being made available for the first time during the intervening years. The total area of family forestland (1+ acres) increased from 264

million acres in 2006 to 290 million acres in 2013, again mainly due to western Texas, and the number of family forest ownerships went from 10.4 to 10.7 million over this same time period; the area and number of family forest ownerships with 10+ acres show similar patterns. The average size of forest holdings shows very little change at the national level and the difference is not statistically significant ( $P = 0.20$ ).

Looking just at the owner who is the primary decisionmaker, as that is all that is available from the 2006 NWOS, and just for

those states for which data were collected in both iterations, there are some substantial differences in terms of some, but not all, demographic characteristics. The biggest difference is in terms of gender, with the percentage of male owners going down from 89 to 78% ( $P = 0.001$ ). Education levels and income levels, which are often related to education, both increased; the percentage of owners with a college degree went from 41 to 47% ( $P = 0.003$ ) and those with annual incomes of at least \$100,000 went from 17 to 24% ( $P < 0.001$ ). Age increased slightly



**Figure 3. Percentage of family forestland and ownerships by size of forest holdings, United States 2013.**

from 41% of the owners being 65 or older in 2006 to 44% in 2013, but the difference is not statistically significant ( $P = 0.18$ ). Neither race nor ethnicity changed appreciably ( $P = 0.95$  and  $0.95$ , respectively).

Based on the limited comparisons available, the ownership objectives are very similar between 2006 and 2013 with amenity values remaining at the top of the list (Table 2). Because of a change from a 7-point to a 5-point Likert scale, only the relative rankings of the objectives can be compared. The comparisons are also limited to the subset of the objectives asked in both iterations.

There are five past activities that are comparable between the 2006 and 2013 NWOS. Harvesting for sale or personal use, road or trail work, and wildlife habitat improvement increased significantly in terms of percentages of ownerships and area ( $P < 0.001$  for all). Fire hazard reduction and collection of nontimber forest products did not significantly change in terms of ownership ( $P = 0.16$  and  $0.96$ , respectively) or area ( $P = 0.47$  and  $0.23$ , respectively).

The percentage of ownerships with forest management plans increased from 7 to 13% ( $P < 0.001$ ) between 2006 and 2013, but advice received decreased from 23 to 20% ( $P = 0.006$ ). In terms of area, management plans increased from 18 to 26% ( $P < 0.001$ ), and advice decreased from 39 to 36% ( $P = 0.001$ ). Cost-share, easements, and certification did not significantly change in terms of ownerships ( $P = 0.23, 0.76$ , and  $0.11$ , respectively) or area ( $P = 0.87, 0.28$ , and  $0.05$ , respectively). No comparisons can

## Sidebar 2. General statistics for family forest ownerships of the United States, 2013.

| Statistic                    | Region* | Size of holdings |        | Total |
|------------------------------|---------|------------------|--------|-------|
|                              |         | 1-9 ac           | 10+ ac |       |
| Total area (ac, millions)    | North   | 9.4              | 84.1   | 93.5  |
|                              | South   | 7.5              | 146.1  | 153.7 |
|                              | West    | 4.6              | 38.4   | 43.0  |
|                              | US      | 21.6             | 268.6  | 290.2 |
| No. of ownerships (millions) | North   | 3.0              | 1.8    | 4.8   |
|                              | South   | 2.7              | 1.8    | 4.5   |
|                              | West    | 0.9              | 0.5    | 1.4   |
|                              | US      | 6.6              | 4.0    | 10.6  |
| Average size (ac/ownership)  | North   | 3.1              | 46.7   | 19.5  |
|                              | South   | 2.8              | 81.2   | 34.2  |
|                              | West    | 5.1              | 76.8   | 30.7  |
|                              | US      | 3.3              | 67.2   | 27.4  |
| No. of owners (millions)     | North   | 5.3              | 3.5    | 8.8   |
|                              | South   | 4.6              | 5.3    | 9.9   |
|                              | West    | 1.3              | 0.9    | 2.2   |
|                              | US      | 11.2             | 9.7    | 20.9  |
| Average tenure (yr)          | North   | 22.8             | 24.3   | 23.3  |
|                              | South   | 20.9             | 23.4   | 21.9  |
|                              | West    | 25.5             | 22.9   | 24.1  |
|                              | US      | 22.1             | 23.8   | 22.8  |

Data may not add to totals due to rounding.

\* *North:* Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin; *South:* Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia; *West:* Arizona, California, Colorado, Hawaii, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oregon, South Dakota, Utah, and Washington. *Note:* Alaska, Nevada, and Wyoming were excluded due to small sample sizes ( $n < 10$ ).

be made for participation in preferential property tax programs as this was not asked in the 2006 NWOS.

## Discussion

Between 2006 and 2013, the estimated area of all family forestland (i.e., including ownerships with 1+ acres) in the United States increased by 26 million acres, but the change is largely attributable to increased acreage in western Texas because it was recently inventoried for the first time. In a comparison of only states where data are available for 2006 and 2013, which drops Alaska, Hawaii, Nevada, western Oklahoma, and western Texas, the total private forestland area increased by 1.8 million acres. Over this same time period and geography, there was a net loss of 5.1 million acres of family forestland. The exact reason for this loss is not known and deserves further research, but likely reasons include conversion of forestland to other uses, such as agriculture and development, parcellation, and fragmentation that reduce the size of holdings to less than the one acre threshold used in the Forest Service definition, and transitions of ownerships to limited liability partnerships and other legal entities. Ideally,

these limited liability partnerships and similar ownerships who still largely resemble and function as typical family forest ownerships would be classified by FIA as family forest ownerships, but there is limited information available to the FIA field crews that classify the ownerships.

Understanding the characteristics, attitudes, and behaviors of family forest ownerships has important implications for programs, policies, and services. The 2013 NWOS found that nearly 50 million acres of family forestland are owned by people who are likely or very likely to sell or give away some or all of it in just the next 5 years. There are multiple programs that have been designed to help with the intergenerational transfer of forestland, but there is more work needed to refine and deploy these tools (Cattanzaro et al. 2014).

The percentage of female primary decisionmakers increased from 11 to 22% between 2006 and 2013. It is not explicitly known whether ownerships consist of spouses: some are siblings, some are parents and offspring, and some are completely unrelated, but based on much anecdotal evidence, many family forests are owned by

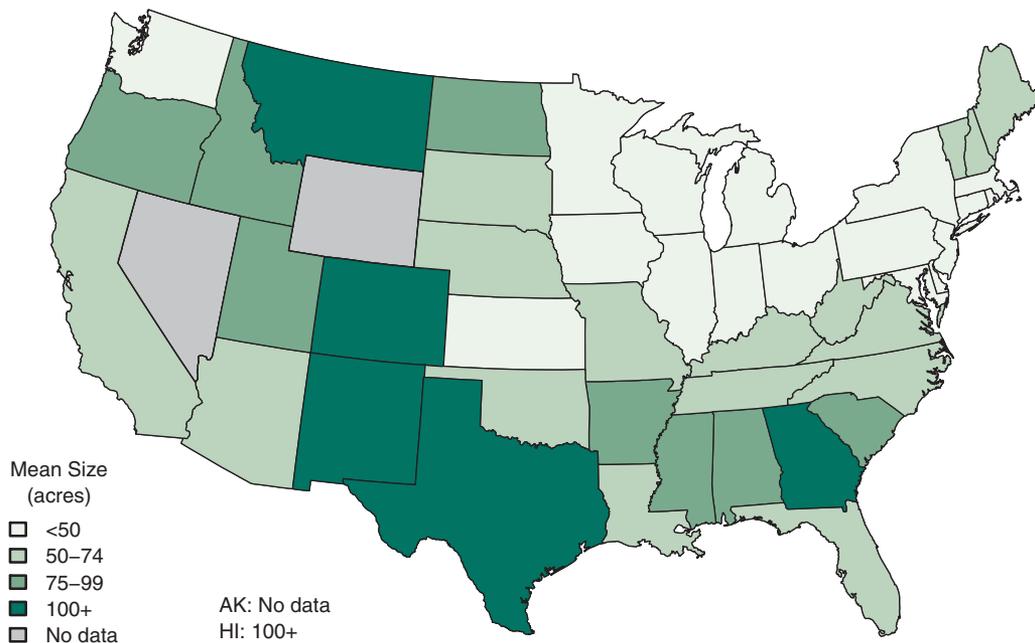


Figure 4. Average size of family forest holdings (10+ acres), 2013.

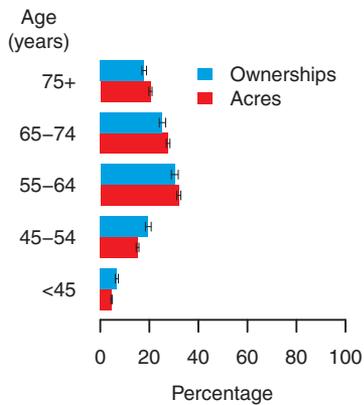


Figure 5. Percentage of family forestland and ownerships (10+ ac) by age of the primary decisionmaker, United States 2013.

spouses. For those ownerships that are indeed owned by a man and woman who are a couple and given the fact that women tend to outlive men, the number of female primary decisionmakers is likely to continue to increase, as indicated by the large percentage of female owners listed second in the 2013 NWOS. This is particularly important because these women will ultimately be making the most important decisions about the future of the land, such as whether the land will be sold, bequeathed, or subdivided. Further research is required to determine how these decisions are being made, e.g., were they discussed with the spouse before his passing, but circumstances change and it will ultimately be the final owner who makes the final decisions regardless of who was the primary decisionmaker for most of the time

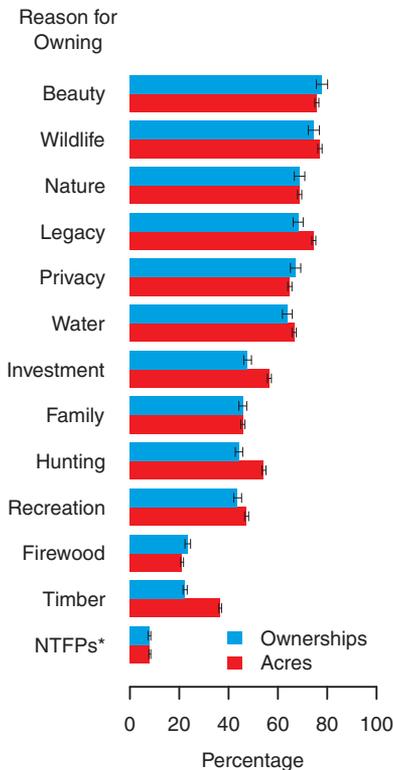


Figure 6. Percentage of family forestland and ownerships (10+ ac) by reasons for owning (includes ownerships that rated an objective as "important" or "very important" on a 5-point Likert scale), United States 2013. \*NTFPs = nontimber forest products.

they owned the land. Fortunately, there are an increasing number of programs designed specifically for female family forest owners,

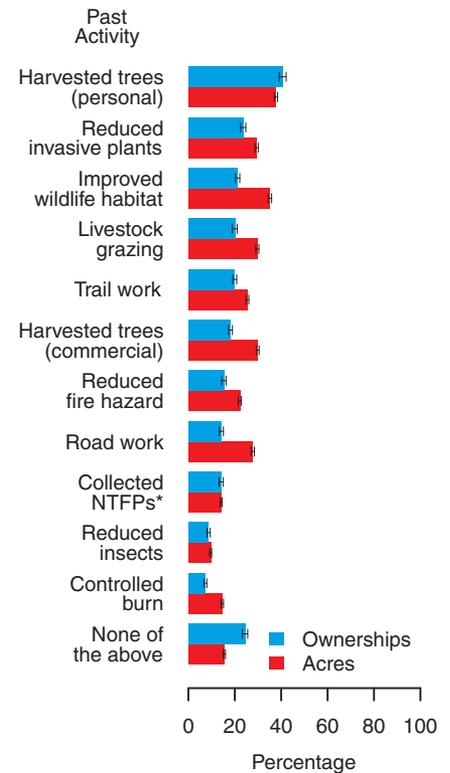
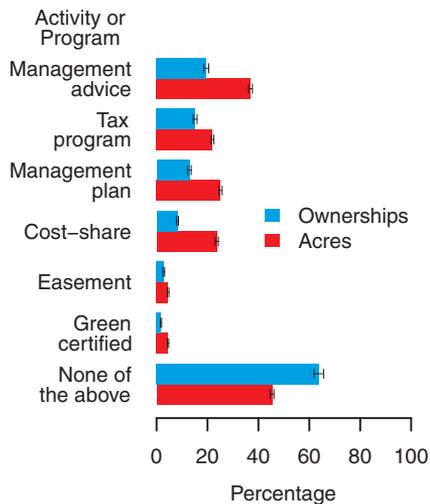
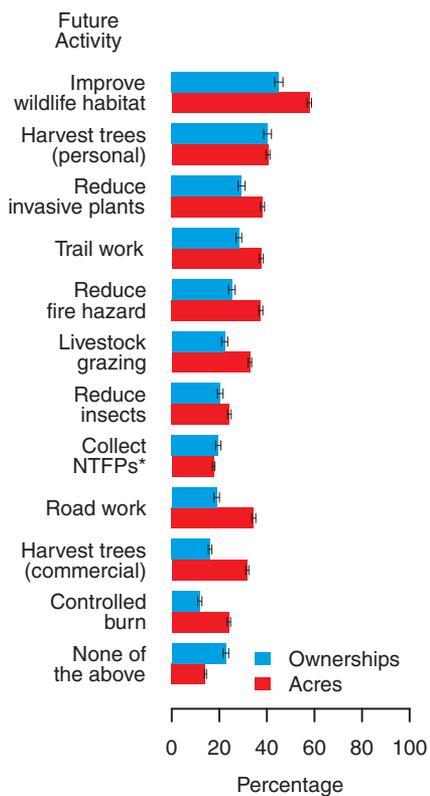


Figure 7. Percentage of family forestland (land refers to the area owned, not necessarily the area involved in the given activity) and ownerships (10+ ac) by forest-related activities in the previous 5 years, United States 2013. \*NTFPs = nontimber forest products.

but there is limited research on the programs (Redmore and Tynon 2011) and of the limited research looking specifically at female



**Figure 8. Percentage of family forestland and ownerships (10+ ac) by management activities and program participation, United States 2013.**



**Figure 9. Percentage of family forestland (land refers to the area owned, not necessarily the area involved in the given activity) and ownerships (10+ ac) by intentions for forest-related activities in the next 5 years (includes ownerships that rated an activity as “likely” or “extremely likely” on a 5-point Likert scale), United States 2013. NTFPs, nontimber forest products.**

family forest owners, most is from Nordic countries (Lidestav and Berg Lejon 2013, Karppinen and Berghäll 2015).

In addition to understanding demographics, it is important to be aware of forest owners’ attitudes toward their land to understand their actions and how to communicate with them effectively (Butler et al. 2007, Davis et al. 2010, Andrejczyk et al. 2016). Among family forest ownerships, the reasons for owning forestland continue to be dominated by amenity-oriented objectives. Participation rates in traditional forestry programs remain low, although the rates are up or down depending on the specific type of program. The lack of participation in traditional forestry programs should not be interpreted as landowners not being engaged with their land; it may be more a function of the forests “running in the background” (Kittredge 2004, p. 16) and the programs not meeting the needs or interests of the owners. As Davis and Fly (2010) and Andrejczyk et al. (2016) explain, level of engagement depends in part on how engagement is defined. Engagement is low in terms of traditional forestry programs (Figure 8) but is substantially higher in terms of activities occurring on their land (Figure 7). Neither of these metrics from the NWOS completely captures these complex concepts, but they are indicative of broad trends. Additional research is warranted on what engagement means to family forest owners and how the forest conservation community can use this knowledge.

There are some interesting and important correlations across many of the NWOS variables. Doing one activity or participating in one program increases the probability that an ownership does other activities or participates in other programs. For example, harvesting trees for personal use is statistically correlated ( $P < 0.05$ ) with all of the other activities asked about except controlled burning. Although not surprising, these correlations have important implications in that they suggest a cohort of more active owners and the possibility that once one action is taken, others may follow. Further research is needed to confirm the existence of this cohort and the potential implications, but it could lead to new pathways by which to engage landowners.

Another important relationship is between size of forest holdings and other attributes (Figure 10). The size of a holding can limit what an owner can do with his or her land; e.g., annual commercial timber harvests become increasingly difficult as the size of a holding decreases. Having land investment as an important or very important

ownership objective, having commercially harvested timber, participating in cost-share programs, and having a greater annual income all showed positive relationships with size of forest holdings. There are some ownership attributes that show little relationship with size of holdings, such as the importance of nature protection as a reason for owning. In addition, there are also some potential nonlinear relationships, such as the importance of timber production as a reason for owning, this increases until about 1,000 acres and then decreases, but the sample sizes for the larger size categories are small and the trends should be interpreted cautiously. Size of forest holdings is a common predictor variable in many models of landowner behavior (Silver et al. 2015) and is a strong predictor of numerous attributes collected by the NWOS. The opportunities and limitations imposed by the size of forest holdings should be considered when communicating with landowners and designing services, programs, and policies for them.

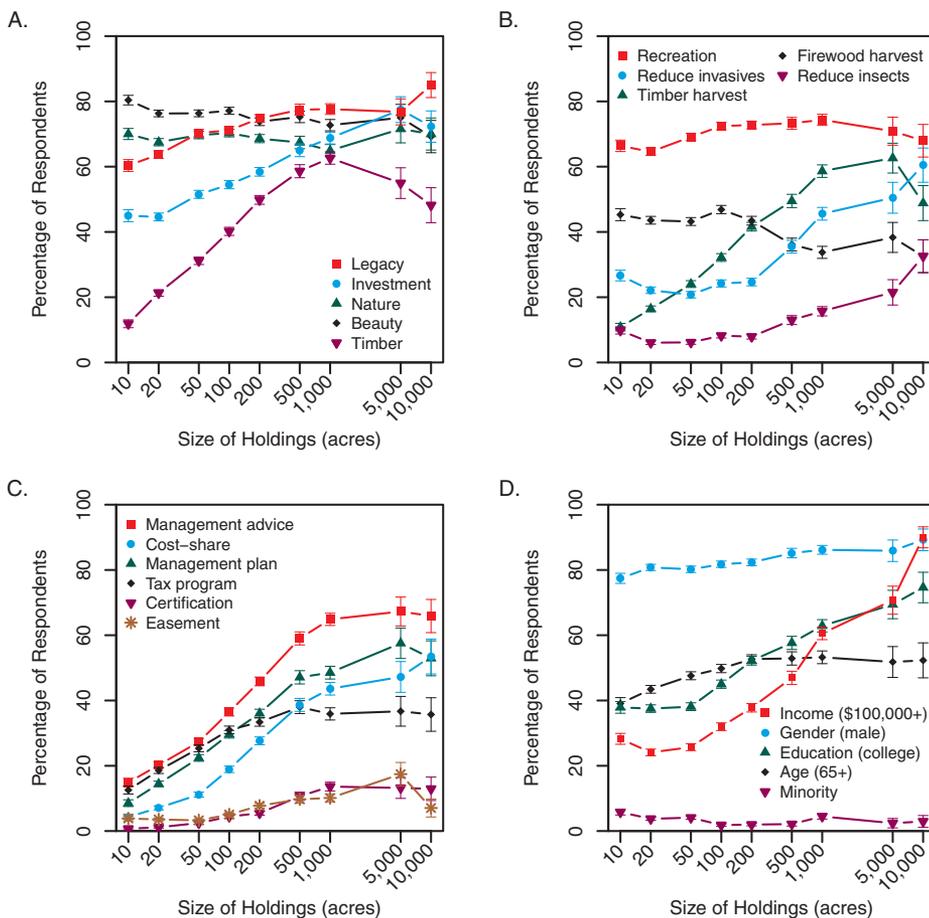
Although care was taken to conduct the NWOS in as rigorous and thorough a manner as possible, there are multiple shortcomings. The cooperation rate is high (52%) for a mail survey, but the percentage of respondents contacted who did not respond is still substantial. The nonresponse bias assessment did not show significant issues, and the results should be generally representative of family forest ownerships across the United States. However, one potential bias is that those most interested in forest management appear to be more inclined to participate in the NWOS, and the relatively low rates of participation in traditional forestry programs may actually be even lower than estimated. Another potential bias is that minority landowners and landowners with lower education levels are underrepresented because of proportionally lower response rates from these groups, but additional research is needed to verify whether this is actually happening and, if so, what the implications are. Previous research has shown that these two groups have many attributes in common with the broader family forest ownership population, but there are also some unique attributes, such as land inheritance patterns and ability to participate in assistance programs (Gan et al. 2003, Townsend and Leahy 2013).

With the latest iteration, the NWOS is now a true longitudinal survey, and methods appropriate for analyzing such panel-based surveys should be explored. These analyses

**Table 2. Relative rankings of family forest ownership (10+ ac) objectives from the 2006 and 2013 iterations of the NWOS in terms of ownerships and area, United States.**

| Ownership basis |               | Area basis    |               |
|-----------------|---------------|---------------|---------------|
| 2006            | 2013          | 2006          | 2013          |
| 1. Beauty       | 1. Beauty     | 1. Beauty     | 1. Beauty     |
| 2. Privacy      | 2. Nature     | 2. Legacy     | 2. Legacy     |
| 3. Nature       | 3. Legacy     | 3. Nature     | 3. Nature     |
| 4. Legacy       | 4. Privacy    | 4. Privacy    | 4. Privacy    |
| 5. Investment   | 5. Investment | 5. Investment | 5. Investment |
| 6. Hunting      | 6. Hunting    | 6. Hunting    | 6. Hunting    |
| 7. Recreation   | 7. Recreation | 7. Recreation | 7. Recreation |
| 8. Timber       | 8. Firewood   | 8. Timber     | 8. Timber     |
| 9. Firewood     | 9. Timber     | 9. Firewood   | 9. Firewood   |
| 10. NTFPs       | 10. NTFPs     | 10. NTFPs     | 10. NTFPs     |

For the 2006 data, ranking is based on respondents who rated an objective as 1, 2, or 3 on a 7-point Likert scale where 1 was defined as “very important” and 7 was defined as “not important.” For the 2013 data, ranking is based on respondents who rated an objective as “important” or “very important” on a 5-point Likert scale. Only ownership objectives that were assessed in both iterations are included in this list. NTFPs = nontimber forest products.



**Figure 10. Relationship between size of family forest holdings (10+ acres) and percentage of NWOS respondents who rated selected ownership objectives as important or very important (A); have had selected activities occur on their land (B), have participated in selected management activities/programs (C), and have selected demographic characteristics (D), United States 2013. The x-axis is on a log scale, and the listed sizes represent the minimum values of the bins used to group the respondents.**

will need to be confined to those elements of the survey that were asked in comparable or, ideally, identical manners in both iterations,

an important constraint that needs to be acknowledged. Future iterations of the NWOS will continue to expand the longi-

tudinal time series and make these analyses stronger. In addition, future iterations of the NWOS are planned to expand into urban areas, have a corporate-specific version, allow for state-level intensification and customization, and introduce new modules that will explore specific topics more in-depth, such as landowners’ attitudes and actions related to climate change, wildfire, and invasive species.

## Conclusions

The results from the 2013 NWOS show:

- Family forest ownerships continue to dominate much of the forested landscape of the United States.
- Many family forest owners are relatively advanced in age and are likely to pass their land onto the next generation in the not too distant future, and female landowners are likely to play a particularly important role in these decisions.
- Amenity-related objectives, such as beauty, wildlife, and nature, are the most common reasons to own family forestland.
- Most family forest ownerships are doing something active with their land, but most are not engaged in traditional forestry activities.
- Size of forest holdings is correlated with many key family forest ownership attributes.

These results have important implications for the design and implementation of forestry policies, programs, and services and for a general understanding of those who own America’s forests. Most owners are willing to be active stewards of their land, but most owners are not participating in programs be they traditional landowner assistance programs (Kilgore et al. 2015) or more recently available programs such as those promoting carbon sequestration (Miller et al. 2012). Program effectiveness will likely increase with more explicit incorporation of amenity-oriented ownership objectives, increased emphasis on intergenerational transfer of land, and a focus on traditionally overlooked owners, such as females. The NWOS is able to provide a broad overview of family forest ownership characteristics, attitudes, and behaviors, but additional research is needed to investigate topics in further detail, and ideally an evidence-based practices approach will be used to develop and refine the programs, policies, and services.

## Endnotes

1. For more information, see [www.fia.fs.fed.us/nwos](http://www.fia.fs.fed.us/nwos).
2. For the online NWOS Table Maker, see [apps.fs.fed.us/fia/nwos/tablemaker.jsp](http://apps.fs.fed.us/fia/nwos/tablemaker.jsp).
3. The survey instrument can also be accessed at [www.fia.fs.fed.us/nwos](http://www.fia.fs.fed.us/nwos).
4. Separate estimates for family forest owners with 10+ acres are not possible because acreage is not known for nonrespondents.

## Supplemental Podcast

This article includes a podcast interview. Visit the online version of this article to listen to the podcast.

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