

Social Sciences

Trends in United States Family Forest Owners' Attitudes, Behaviors, and General Characteristics from 2006 to 2018

Emma M. Sass,^{1,*} Brett J. Butler,² Jesse Caputo,² and Emily S. Huff³

¹Department of Environmental Conservation, University of Massachusetts-Amherst, Amherst, MA 01003, USA (emmasass@umass.edu).

²USDA Forest Service Northern Research Station, Amherst, MA 01003, USA (brett.butler2@usda.gov, jesse.caputo@usda.gov).

³Department of Forestry, Michigan State University, East Lansing, MI 48824, USA (ehuff@msu.edu).

*Corresponding author email: Emma M. Sass: emmasass@umass.edu

Abstract

Family forest owners (FFOs) control a plurality of forestland in the United States, and the decisions these landowners make have a profound impact on the landscape. Most research on FFOs consists of cross-sectional studies, although many of these recognize the importance of capturing long-term trends to understand whether and how FFO attitudes, behaviors, and general characteristics are changing. We use data from the 2006, 2013, and 2018 iterations of the USDA Forest Service, National Woodland Owner Survey (NWOS), with a bootstrapping approach to identify significant changes across these time periods among FFOs with 4+ hectares of forestland. Total FFO hectares decreased and FFO ownerships trended downward over the study period. A decreasing proportion of FFOs owned farms or homes near their forestland, harvested timber, or received advice. Demographic shifts include an increase in age and education level from 2006 to 2018, and an increase in FFOs of color from 2006 to 2013. Overall, we find a trend towards decreased traditional engagement and management and a slight increase in owning land for its amenity values. Understanding temporal trends in FFO characteristics, attitudes, and behaviors will help policymakers and forestry professionals inform and update their outreach, technical support, and financial assistance programs.

Study Implications: Families and individuals hold more forestland than any other ownership group in the United States. We use nationwide survey data from 2006, 2013, and 2018 to determine whether and how these landowners are changing over time. The total forestland held by FFOs decreased between 2006 and 2018, and there has been a decrease in traditional forest management and engagement, such as through timber harvesting and nearby farm ownership. This study provides insights for policies, programs, and outreach and a foundation for future long-term comparisons of this group.

Keywords: longitudinal study, nonindustrial private forest owners, survey, woodland owners

The United States history of land ownership, land use, and land policy has shaped the landscape so that today, families, individuals, trusts, estates, and family partnerships, collectively referred to as family forest owners (FFOs), hold the plurality of forestland in the country. As of 2018, an estimated 9.6 million FFOs hold over a third of the forestland in the United States, more than any other ownership type (Butler et al. 2021). A similar dominance of private ownership is found in many other countries (FAO 2020). The past, present, and future decisions FFOs make—and how their characteristics and habits change over time—has a profound impact on the forested landscape and the myriad benefits forests provide.

A rich literature exists studying diverse aspects of FFO attitudes, behaviors, and other characteristics (Butler et al. 2022). Attitudes refer generally to respondents' beliefs or perceptions about their land or the use of their land, whereas behaviors refer specifically to discrete actions landowners have or have not taken. Most studies on FFOs focus on single time-point cross-sectional descriptions, and many have acknowledged the potential and importance of long-term studies across a broad range of subjects. For example,

studies have called for longer-term and repeated measure or panel FFO research on recreation (Snyder and Butler 2012), timber harvesting (Silver et al. 2015), the structure of parcel ownership (Snyder and Kilgore 2018), intergenerational land transfer (Bell et al. 2019), outreach and engagement outcomes (Lutter et al. 2018), and cross-boundary cooperation (Finley et al. 2006; Fischer, Klooster, and Cirhigiri 2019).

A handful of studies have used a longitudinal framework to study landowners and found shifts in FFO attitudes over time. In New York State, harvesting attitudes of FFOs decreased between 1983 and 1992 (Rosen 1995). Similarly, in Alabama, between 1994 and 2004, ownership for timber harvesting decreased whereas ownership for recreation and investment increased (Pan, Zhang, and Butler 2007). In the hardwood rangelands of California, ranching decreased, and amenity values increased in importance over 1985, 1992, and 2004; the authors associate these changes with landowners increasingly valuing the diverse ecological and social benefits of their properties (Huntsinger et al. 2010). In a rural Massachusetts county, landowners' attitudes were less favorable towards ecosystem-based management in 2001 than in 1995 (Belin

et al. 2005). Landholding characteristics have also changed over time; Pan et al. (2007) found an increase in the proportion of Alabama FFO holdings in the smallest (under 10 acres) and largest (over 5,000 acres) categories, and Goyke and Dwivedi (2021) concluded that the recent shifts in sizes of forest holdings are an indication of increased inequalities among FFOs. Additionally, several studies that remeasured individuals have found inconsistencies in self-reported values and that intentions about management are not firmly fixed (Egan and Jones 1995; Turner, Finley, and Kingsley 1977). Long-term studies have also been used to understand biophysical forest dynamics in the United States. (e.g., the Forest Inventory and Analysis [FIA] program; Morin and Liknes 2012) and around the world (e.g., northern Europe [Appiah Mensah et al. 2021], African tropical forests [Bennett et al. 2021], and India [Tewari 2016]).

The National Woodland Owner Survey (NWOS) is a survey of private forest landowners in the United States conducted by the USDA Forest Service's FIA program through the Family Forest Research Center, a joint venture between the Forest Service Northern Research Station and the University of Massachusetts-Amherst. The survey asks private landowners with 0.4 or more hectares (1 or more acres) of forestland about their attitudes, intentions, and behaviors relating to their forested land. The three most recent data collection cycles were completed in 2018 (Butler et al. 2021), 2013 (Butler et al. 2016), and 2006 (Butler 2008). Although the survey instruments are not identical across these periods, many questions were the same or similar enough to warrant comparison (Appendix A1). Earlier iterations of the NWOS, conducted in 1994 (Birch 1996), 1978 (Birch, Lewis, and Kaiser 1982), and 1953 (Josephson and McGuire 1958), used sufficiently different instruments and varying data collection procedures that they are excluded from this study. Butler et al. (2016) conducted a preliminary comparison of results between the 2006 and 2013 NWOS iterations and found some interesting differences, including an increase in the number of ownerships, an increase in harvesting activities and management plans, and a decrease in male ownership. However, they acknowledge that their analysis did not account for potential issues with covariance in remeasuring individuals, and the 2013 survey covered a larger geographic area than the 2006 survey. Previous work also compared the names of ownerships of private forest plots that were part of the NWOS sample in 2006, 2013, and 2018 and found that most resampled plots stayed in the same ownership or with some connection to the previous owners across all three iterations (71% between 2006 and 2013, 79% between 2013 and 2018, and 59% between 2006 and 2018; Huff et al. 2019).

The main objective of this study is to understand whether and how US FFOs are changing over time. Specifically, we measure characteristics, attitudes, and behaviors at the population level for FFOs with four or more forested hectares (10 or more acres) in 2006, 2013, and 2018. Population-level change captures both different individuals who may join or exit the population and individuals who remain consistent but may change their opinions and responses. In this article, we focus on addressing the population-level dynamics of FFOs to gain a broader understanding of how their impacts on the forested landscape might be changing or stable over time. This enables reflection on the overall impacts of past engagement and outreach strategies to FFOs and reaction to new or changing needs as their priorities potentially shift. It

also allows us to quantify how larger-scale social and demographic changes in the United States are exemplified in the FFO population, informing our understanding of landholding and equity with implications for mechanisms to support current landowners as well as potentially address the needs of marginalized landowners. This work also serves to contextualize past and future studies of FFOs and provide a foundation for future long-term studies.

Methods

For the NWOS in the 2006 cycle, 15,440 respondents completed surveys between 2002 and 2006, with a 51% cooperation rate (Butler 2008). In the 2013 cycle, 10,092 landowners responded between 2011 and 2013, with a 52% cooperation rate (Butler et al. 2016). The 2018 cycle had 9,518 respondents between 2017 and 2018, with a 40% cooperation rate (Butler et al. 2021). In 2006, interior Alaska, western Texas, western Oklahoma, Nevada, and Hawaii were excluded from the survey because of a lack of sampling frames in these areas (Butler 2008); in 2013, Nevada, Wyoming, and Alaska were excluded, and in 2018, interior Alaska was excluded due to small sample sizes. Although the NWOS surveys all private forest ownerships, the analyses presented here focused on FFOs with 4 or more hectares of forestland, except in estimating total FFO ownerships and acreages. The 4 ha cutoff was chosen to align with previous NWOS reporting (e.g., Butler et al. 2021) and because these smallest ownerships are generally less active on their land and may be interested in different topics than larger landowners (Snyder, Butler, and Markowski-Lindsay 2019). All survey implementation methods were approved by the UMass Internal Review Board (IRB approval 684) and the US Office of Management Budget (OMB No. 0596-0078).

The data for all three cycles were (re)processed using the identical procedures; this caused some differences with the originally published results but allowed for maximum consistency for comparisons. The large and systematic sample of the NWOS allows for estimates of the population of FFOs (Butler and Caputo 2021; Butler et al. 2021). The area-based sample design of the NWOS means that inclusion probabilities are proportional to size of holdings, that is, ownerships with larger holdings were more likely to be selected. To calculate population-level estimates, respondents were weighted based on the area they own within a state (Butler and Caputo 2021). For full explanations of the population estimation methods, see Butler and Caputo (2021) and Butler et al. (2021). Because this analysis uses population-level estimates, all respondents are included, not just those who were repeated between cycles.

Data Processing

Although the survey instruments varied slightly between cycles, twenty-seven questions were the same or had only slight wording changes but measured the same attributes (Appendix A1); the total forest area and number of ownerships were also compared. All categorical variables were collapsed to binary to facilitate comparison and interpretation across years. For some questions, different answer options were available in different years, so some answer choices were combined to make responses comparable (i.e., combining "I Don't Know" or "Not Applicable" with "No"). Tenure was calculated by subtracting the year they reported acquiring the property from the year the survey was implemented. The likelihood that

respondents will sell or transfer some or all of their forestland was asked on a 5-point Likert scale, and responses were condensed with “Extremely likely” and “Likely” combined and “Undecided,” “Unlikely,” and “Extremely unlikely” combined. Reasons for owning wooded land were condensed to binary questions to highlight those for whom the reason is more important, with “Very important” and “Important” combined and “Moderately important,” “A little important,” “Not at all important,” and “Not applicable” combined (Butler et al. 2021). Age was asked as a categorical question in 2006 and a continuous variable in 2013 and 2018, so we binned age into two categories, 65 and older and 64 and younger. Due to the low proportion of landowners identifying as Asian, Black, Pacific Islander, or Indian, respondents in these categories were combined. Ethnicity (identification as Hispanic or Latino) was kept as a separate variable. Education was asked as a binned category in all years and was condensed for this analysis to “Some college or less,” and “Associate degree or higher.” Six questions (multiple parcels, reasons for owning forestland, tenure, future plans, timber harvesting in the past 5 years, and gender) were not asked in comparable ways in 2006 so these questions were compared only between 2013 and 2018.

Analyses

Population estimates were compared pairwise among the three cycles (2006 to 2013, 2006 to 2018, and 2013 to 2018). Only states and substates present in all 3 years were included, so Alaska, Hawaii, Nevada, western Oklahoma, western Texas, and Wyoming were excluded. Ownerships that held 4 or more hectares (10 or more acres) of wooded land were included for variable comparisons, and all ownerships (i.e., FFOs who held 0.4 hectares or 1 acre or more) were included for the estimates of total ownerships and hectares.

Estimates were bootstrapped 1,000 times to determine variances, following the methods outlined in Butler and Caputo (2021; Efron and Tibshirani 1986). The difference between estimates for each year pair was calculated for each bootstrap (i.e., 1,000 times), and the 95% confidence interval of the difference was determined based on the replicates. However, to account for multiple comparisons, instead of determining the 95% confidence interval as the range between the 25th and 975th values, we used the 1st and 1,000th value. If the 95% confidence interval of the difference did not include zero, the difference between the year estimates was considered significant. The proportion of the population in each category was compared for binary questions, and the population mean was compared for continuous variables. All analyses were run in the R statistical environment (R Core Team 2021) using the tidyverse package (Wickham et al. 2019). The 0.4+ ha sample size for 2006 was 14,081, for 2013 was 8,251, and for 2018 was 9,524; for 4+ ha, the sample size for 2006 was 12,917, for 2013 was 7,057, and for 2018 was 7,908.

Results

Total FFO wooded acreage in the United States significantly decreased from 2006 to 2018, from 100 million to 94 million hectares; total FFO ownerships also trended downward, from 10.1 million to 8.9 million ownerships (Table 1). Average parcel size for FFOs with at least 4 ha did not significantly vary across the study period (Table 2). FFOs in 2018 were more likely to hold multiple forested parcels than in 2013

Table 1. Population estimates for FFOs with 0.4+ ha in the United States (excluding AK, HI, western TX, western OK, NV, and WY) for total ownerships and hectares across 2006, 2013, and 2018. Significant differences (95% confidence interval of the difference does not overlap zero) are determined from the confidence interval of the bootstrap replicates and are indicated by superscript letters.

Variable	Value 2006 (SE)	Value 2013 (SE)	Value 2018 (SE)
Total FFO ownerships (million)	10.2 (0.3)	9.2 (0.3)	8.9 (0.3)
Total FFO hectares (million)	100.4 (0.9) ^a	98.4 (0.9) ^{ab}	94.2 (0.7) ^b

(Table 2). FFOs were less likely to have a home, more likely to have a secondary home, and less likely to have a farm on or near their forested land in 2018 than 2006 (Table 2). The proportion of FFOs who have a management plan was highest in 2013 (13.9%) and lowest in 2006 (7.3%) (Table 3). More FFOs received advice about their wooded land in 2006 than the two subsequent cycles; harvesting timber in the last 5 years decreased from 2013 to 2018 (Table 3). Most reasons for owning wooded land that were considered important or very important were consistent between 2013 and 2018, although nonhunting recreation was important for more FFOs and passing land to heirs was important to fewer FFOs in 2018 than in 2013 (Table 4). Examples of nonhunting recreation include hiking, birding, camping, skiing, or using off-road vehicles, although these examples were not provided on the survey. FFO average level of education increased over time, with the proportion of primary decision makers with at least an Associate degree increasing from 42.0% in 2006 to 51.6% in 2018 (Table 2). The percent of ownerships whose primary decision-maker identified as female did not change between 2013 and 2018 (Table 2). Between 2006 and 2013, an increasing percent of FFOs identified as Black, Asian, Pacific Islander, or Indian, and between 2006 and 2018, an increasing percent of FFOs identified as Hispanic or Latino (Table 2).

Discussion

The decline in number of FFO hectares and the decreasing trend in ownerships are concerning in terms of sustainability of family forests, as has been discussed by Butler et al. (2022), who found acreage decreases in every region and an average annual national net decrease of 1 million hectares of family forest each year. This is in contrast to previously increasing estimates—FFO ownerships were estimated at 9.3 million in 1993 (Birch 1996) and 10.3 million in 2003 (Butler and Leatherberry, 2004). Although the majority (an estimated 64%) of the recent loss of family forest land was to nonforest use, the rest transitioned to nonfamily ownerships but remained forested (Butler et al. 2022). Other studies have found forestland held by families having a net transition to corporate holdings, although some of this land transfer may be a nominal change in the structure of the ownership (e.g., a family creating a limited liability company [LLC] to hold their land), as opposed to a real change in the ownership and management (Sass et al. 2021). However, transitions like this may still have meaningful differences for the decisions made about land that could affect broader ecosystem services.

Table 2. Population estimates for FFOs with 4+ ha in the United States (excluding AK, HI, western TX, western OK, NV, and WY) for comparable holdings and demographic variables across 2006, 2013, and 2018. Significant differences (95% confidence interval of the difference does not overlap zero) are determined from the confidence interval of the bootstrap replicates and are indicated by superscript letters.

Variable	Value 2006 (SE)	Value 2013 (SE)	Value 2018 (SE)
Forested hectares owned (mean)	59.2 (<0.1)	61.3 (0.9)	62.0 (<0.1)
Own multiple parcels (percent)	Excluded*	24.3 (0.9) ^b	29.1 (1.0) ^a
Own a home near forestland (percent)	66.5 (0.8) ^a	64.1 (1.1) ^{ab}	62.3 (1.1) ^b
Own a secondary residence near forestland (percent)	13.7 (0.6) ^b	15.3 (0.7) ^{ab}	16.0 (0.7) ^a
Own a farm near forestland (percent)	37.3 (0.9) ^a	30.4 (0.9) ^b	30.2 (0.9) ^b
Gender (percent female)	Excluded	21.4 (1.0)	23.8 (0.9)
Ethnicity (percent Hispanic/Latino)	0.5 (0.1) ^b	1.0 (0.3) ^{ab}	1.5 (0.3) ^a
Race—identify as white (percent)	98.1 (0.3) ^a	96.5 (0.4) ^b	97.2 (0.4) ^{ab}
Race—identify as Black, Asian, Pacific Islander, or Indian (percent)	3.3 (0.3) ^b	4.9 (0.5) ^a	4.6 (0.5) ^{ab}
Education—Associate degree or more (percent)	42.0 (0.9) ^b	47.7 (1.1) ^a	51.6 (1.1) ^a
Tenure of forestland ownership (mean)	Excluded	24.3 (<0.1)	24.4 (<0.1)
Age (percent 65+)	41.4 (0.9) ^c	44.9 (1.1) ^b	52.3 (1.1) ^a

*Variables that did not have an equivalent question in a given year were excluded.

Table 3. Population estimates for FFOs with 4+ ha in the United States (excluding AK, HI, western TX, western OK, and NV) for comparable behavioral variables across 2006, 2013, and 2018. Significant differences (95% confidence interval of the difference does not overlap zero) are determined from the confidence interval of the bootstrap replicates and are indicated by superscript letters.

Variable (percent)	Value 2006 (SE)	Value 2013 (SE)	Value 2018 (SE)
Have received advice in the past 5 years	22.9 (0.7) ^a	19.7 (0.9) ^b	17.6 (0.7) ^b
Have a management plan	7.3 (0.3) ^c	13.9 (0.6) ^a	10.9 (0.5) ^b
Harvested timber in the past 5 years	Excluded*	51.3 (1.2) ^a	44.7 (1.0) ^b
Used a cost-share program in the past 5 years	4.0 (0.3)	4.1 (0.3)	3.7 (0.3)
Have certified forestland	1.8 (0.2)	1.4 (0.2)	2.0 (0.2)
Plan to transfer their forestland in the next 5 years	Excluded	14.9 (0.7)	15.4 (0.8)

*Variables that did not have an equivalent question in a given year were excluded.

Table 4. Population estimates for FFOs with 4+ ha in the United States (excluding AK, HI, western TX, western OK, and NV) for reasons for owning across 2013 and 2018. Significant differences (95% confidence interval of the difference does not overlap zero) are determined from the confidence interval of the bootstrap replicates and are indicated by superscript letters.

Variable (percent)	Value 2013 (SE)	Value 2018 (SE)
Enjoying beauty	80.0 (0.8)	81.1 (0.9)
Protecting wildlife	75.6 (0.9)	76.6 (1.0)
Protecting water	65.0 (1.1)	65.1 (1.1)
Protecting nature	70.5 (1.0)	71.1 (1.0)
Land investment	49.5 (1.1)	50.8 (1.1)
Privacy	68.2 (1.0)	71.4 (1.0)
To raise my family	47.1 (1.2)	46.9 (1.2)
Passing land to children or heirs	66.8 (1.1) ^a	61.8 (1.1) ^b
Timber harvesting	24.7 (0.9)	22.4 (0.8)
Hunting	44.7 (1.1)	45.6 (1.1)
Other recreation	44.3 (1.1) ^a	48.5 (1.1) ^b
Nontimber forest products	8.1 (0.6)	8.3 (0.6)
Firewood as a reason for owning	24.1 (1.0)	21.6 (0.9)

Parcelization and fragmentation may be more likely to occur when land is transferred and can decrease landscape connectivity and constrain management options; other studies have found a slow but potentially substantial change in these dynamics over time, as 7.6% of FFO lands in the South reduced in size by 40 ha or more between 2001 and 2011 in conjunction with a net loss of FFO lands in the region (Caputo et al. 2020). Interestingly, the percentage of FFOs who hold multiple parcels increased between 2013 and 2018, which may reflect acquisition of divided parcels, consolidation of wealth, or other dynamics and will be important to monitor over time, as it potentially increases the impact of a smaller number of FFOs. We find more FFOs had farms within a mile of their forested land in 2006 than in either 2013 or 2018, which aligns with the long-term trend of farm consolidation and fewer smaller farms (MacDonald 2020). FFO ownership in the context of land use and ownership dynamics will be important to continue to monitor going forward.

Many of the variables studied changed over at least some part of the study period. For some, there is a consistent direction and difference between each time period, like the increasing percentage of FFOs over 65 years old; in this case, the repeated measurements illustrate a consistent trend. For some traits, like having a home or secondary residence near the wooded land, there is a significant difference over the entire study period (i.e., 2006 to 2018), but the trend did not

register as significant in either of the two subperiods. It is important to note that some variables are inconsistent in their direction over time, such as in having a management plan. Many variables remained consistent over time, and the changes in FFOs notably seem less rapid than changes in some other forest ownership types, such as the rapid divestment of vertically integrated forest products companies to other structures (Zhang, Butler, and Nagubadi 2012).

FFO priorities and uses of their land shifted over the study period, although some changes were subtle, and some factors—including most of the reasons for owning wooded land—remained the same. FFOs historically account for the majority of roundwood harvested in the United States (Adams, Haynes, and Daigneault 2006) and may be an increasingly important source (Silver et al. 2015), so their decreasing likelihood of harvesting timber from 2013 to 2018 is of concern. Future work to investigate the reasons for this decline in harvesting will be important to support wood supply. Attitudes towards timber harvesting have also been found to become more negative in other studies at shorter time and smaller geographic scales (Pan, Zhang, and Butler 2007; Rosen 1995). A smaller proportion of FFOs received advice about their wooded land in the past 5 years over the study period; however, the reason for the decline is not clear and could include changes in outreach program capacity and resources or changes in landowner interest and trust in seeking out information and warrants further study. Other studies have also pointed to the importance of building trust in relationships between landowners, professionals, and peer networks (Huff et al. 2015). Amenity values, such as biodiversity, privacy, and recreation, are high across the study period, and nonhunting recreation increased from 2013 to 2018, highlighting the importance of outreach and support for landowners that focus and build on amenity value priorities. Other studies have found an increase in amenity goals for private landowners (Huntsinger et al. 2010) as well as on public lands, with influence on forest management decisions, such as a shift to a multiple-use framework rather than a primary focus on timber (D'Amato et al. 2017). These findings lead to the question of whether family-owned forest land in the United States may be undergoing “ecological decoupling,” a hypothetical phenomenon in developed postindustrial societies in which reduced emphasis is placed on ecosystems as sources of extractive, consumable resources (e.g., timber, food, fuel) and a correspondingly greater emphasis is placed on passive amenity and conservation values (Asafu-Adjaye et al. 2015). The possibility that FFOs may be transitioning from an emphasis on active, extractive uses to an emphasis on passive uses and values could have substantial impacts in terms of biodiversity, wildlife habitat, nutrient cycling, carbon dynamics, management for wildfire, and other local, in situ ecosystem considerations and warrants further consideration. It would also be interesting to disentangle the potential drivers of shifts in resource extraction: whether it is being driven by an unwillingness to harvest, reduced demand for these resources, lack of current market opportunities as the result of prior demand fluctuations (e.g., mill closures), or whether demand is being satisfied by timber from other ownership types (e.g., corporate ownerships) or by resources imported from forests in other parts of the world (Berlik, Kittredge, and Foster 2002).

We found characteristics relating to intergenerational land transfer to be largely stable; there has been a relatively

constant slow churn of forest ownership turnover that is continuing. Reporting “passing wooded land onto heirs” as an important reason for owning decreased between 2013 and 2018, although it is still important for over 60% of FFOs. There was no change in the length of tenure or plans to sell or give away land in the next 5 years. However, intentions and objectives are not necessarily predictors of FFO actions (Floress et al. 2019), so it may be informative to use a panel or cohort study to compare specific FFO stated plans with their decisions in the next five or 10 years. Even with relatively stable FFO characteristics related to land transfer, there are reasons for concern that forestland may be parcelized, fragmented, or converted to other land uses. Comparing NWOS plots between cycles based on matching names, Huff et al. (2019) found that 42% of privately owned plots had different owners between 2006 and 2013 (not including plots that had some of the same owners), and 31% changed hands between 2013 and 2018. Markowski-Lindsay et al. (2017) found a third of landowners in the New England areas they studied did not have any formal tools in place to transfer their land. More FFOs are over 65 years old in each subsequent time period; early work on the application of statistical life tables to the NWOS has suggested that, as of the 2018 cycle, FFOs in the United States had an estimated mean life expectancy of 21 years, with >10% of the population not expected to live an additional 5 years after survey completion (Caputo, unpublished data). Most owners report that they intend to pass their land to their children or other family (77% of ownerships in 2018), but most owners themselves bought their land rather than inheriting it (88% of owners in 2018; Butler et al. 2021). As land is transferred when the owner passes, there is the risk of the forest undergoing conversion or parcellation, especially when there are not formal tools in place to protect or maintain the forested parcel.

The self-reported primary decision-makers predominantly identify as white and male, although these metrics have shifted slightly over time. Previous studies have found differences between how male and female FFOs manage their forestland (Butler et al. 2018). We were unable to compare the gender of ownerships in 2006 to subsequent study periods because respondents were able to indicate the gender for more than one owner, whereas in later years, they were restricted to one option for the primary decision-maker. There is also potential undercounting of female FFOs because the “primary decision-maker” is asked to complete the survey, which may bias the results towards responses by men where cultural assumptions and power dynamics lead to overidentification of men as primary decision-makers in ownerships in which men and women own land together, even in cases where decision-making is in fact equitable (Carter 2019). There is also potential nonresponse bias in the survey due to the increased potential risk to Black and Indigenous people and people of color sharing information about their land based on the history of land dispossession from the government and other entities (Copeland 2013; Horst and Marion 2019; Indian Forest Management Assessment Team 2013). Other dynamics potentially influencing nonresponse bias also have racial and wealth discrepancies, such as heirs' property, in which inherited land is held by two or more tenants in common, usually because it was inherited without a will; for such ownerships, decisions must be made by all heirs (which can be in the hundreds or thousands), and land is particularly at risk of dispossession. Heirs' property is more common among

certain groups, including Black and Indigenous landowners in the South and poor rural landowners in Appalachia (Johnson Gaither 2016). Ownerships that hold land as heirs' property could find the survey logistically difficult to fill out as well as risky for the landowner's property rights and tenure.

Ownerships are not changing in a vacuum, and many landscape dynamics will continue to influence how FFOs own and manage their lands. Climatic and biotic factors, such as climate change, insect outbreaks, wildfires, and changing precipitation and disturbance regimes, as well as economic and social factors, such as changing forest markets, increasing interface of urban and rural areas, and globalization, will all affect forest owners and how they relate to their forestland (D'Amato et al. 2017). Longitudinal studies on forests, including national efforts like the FIA program as well as state-level or localized efforts, provide important information and context on these trends (e.g., Oswalt et al. 2019) as well as the foundation for predictive models for future forest dynamics (e.g., Duveneck and Thompson 2019).

Whereas this study includes all FFO respondents to understand changes in the population, Huff et al. (2019) describe the power of using repeated measurements of the same respondents to connect intentions to actions and to track cohort effects over time (Butler, Butler, and Markowski-Lindsay 2017; Diggle et al. 2013). By using population-level estimates we are able to get at changes in the population but not disentangle if it is the owners who are changing their attitudes (e.g., Egan and Jones 1995; Turner, Finley, and Kingsley 1977) or if different owners are now part of the population. Tracking a cohort over time would be especially insightful for dynamics that are explicitly or implicitly age related, such as intergenerational transfer or harvesting, respectively (Huff et al. 2019). A cohort study would also help to clarify the connection between stated intentions and behavior. Silver et al. (2015) also describe the importance of ground truthing or observing landowner behavior directly rather than relying solely on landowner attitudes or intentions. The FIA methodology of biophysical plots aligns with the NWOS sample, and although there are many challenges and caveats for connecting the datasets, future work could use the biophysical data to ground truth the intentions that FFOs report in the survey.

The results presented here have direct implications for policies, programs, and efforts aimed at FFOs in the United States. Most FFOs have relatively small holdings, are amenity-driven, and have not been participating in traditional activities (e.g., management plans), dynamics that have been relatively stable over time. If the goal is to engage more FFOs, the findings suggest a need for programs and policies that better suit their needs, as has been suggested by others (e.g., VanBrakle 2015). For example, forest management activities could be recast more in terms of wildlife habitat improvement and general land stewardship rather than forest/timber management (e.g., many states' bird-focused forestry programs), although timber will remain an important output for many of these lands. If the goal is to maintain FFO lands to support the current public benefits they provide, consistently low traditional engagement indicates that different and creative mechanisms might be beneficial, such as programming to support landowners' attachment to place and to focus on landowner concerns (Leahy and Lyons 2021). Additional work to examine trends at more local (e.g., state) levels could further help refine these implications as could implications

of emerging markets, such as carbon sequestration (Sass, Caputo, and Butler 2022).

Although this article focuses on the United States, there are potential international implications of these findings and comparative lessons from other countries. For example, the importance of roundwood supply from nonindustrial private forest lands has led to long-term studies in several countries to quantify characteristics associated with harvesting, including in Finland (Kuuluvainen and Tahvonen 1999; Kuuluvainen et al. 2014), Norway (Bolkesjø and Solberg 2003; Bolkesjø, Solberg, and Wangen 2007), Sweden (Hultkrantz and Aronsson 1989), Germany (Selter et al. 2009), and Austria (Koch, Schwarzbauer, and Stern 2013). Several European countries have developed forest accountancy data networks, which are a framework for systematically collecting detailed socioeconomic data on a sample of forest ownerships. These data on forest income and output at the level of the individual ownership are a powerful way to understand forest ownerships, and although most networks initially focused on timber production, they have shifted to include more holistic aspects of multiuse forestry (Toscani and Sekot 2018). Analogous efforts in the United States could be used to support forestry organizations, policy makers, financial bodies, researchers, and extension, although such networks may require ongoing efforts on the part of participants, specialized data collection staff, or payments to landowners (Toscani and Sekot 2018).

Conclusion

In general, we find small and slow changes in characteristics in the FFO population from 2006 to 2018, with trends towards less active management and extraction and increases in amenity or passive engagement. These shifts may also reflect changes in who is considered an FFO, such as excluding family ownerships that incorporate into an LLC and are considered corporate owners. Moving forward, trends should be monitored to look for changes that are too subtle to notice at present but may be noticeable at a longer time scale and for the consistency of ongoing changes. Future work could also investigate trends at the subnational scale, as many of the dynamics reported here have regional and local influences and implications. This study highlights the importance of long-term studies and in keeping instruments used for repeated measures as consistent as possible over time. Although specific surveys will be necessary to gauge the impact of specific programs, policies, and interventions, this work provides an overview and framework to understand the broad characteristics and decisions of FFOs.

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Conflict of Interest

None declared.

Supplementary Materials

Supplementary data are available at *Forest Science* online.

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