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Minority Family Forest Owners in the United States

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Abstract

Family forest owners own more forestland in the United States than any other group. There have been no national studies of racial and ethnic minority family forest owners in the United States, in spite of increasing attention to diversity in forestry. Using the US Forest Service's National Woodland Owner Survey data, we sought to better understand minority owners by looking at their characteristics, attitudes, and behaviors. Of the over 4 million family forest ownerships with 10+ ac in the United States, minorities comprise 6.6 percent of the ownerships and own 5.1 percent of the 265 million ac. Although many similarities exist between minority and nonminority owners, such as reasons for owning land and concerns, minority landowners tend to be more regionally located, have smaller forest holdings, are less likely to manage their forests, and are less likely to have participated in assistance programs. Broad insight into the attitudes and behaviors of minority family forest owners can help policymakers, program directors, and outreach coordinators begin to understand the needs of minority landowners, providing this historically underserved group with tools they need to attain their forest management and land-use goals. By increasing minority landowner engagement, we can hopefully slow the loss of land by minority landowners.

Keywords: National Woodland Owner Survey, forestry programs, private forestry, race and ethnicity, underserved landowners, logistic regression

Family forest owners (FFOs) play a large role in shaping the forests across the United States, as their individual engagement with and decisions on their forest land can collectively cause substantial changes throughout the landscape. Together, the 10.7 million FFOs own 36 percent of the country's forestland (290 million ac), and their attitudes toward and behaviors on their land determine how this resource is managed and used (Butler et al. 2016b). There has been much research on general trends of FFOs over time (i.e., Majumdar et al. 2008, Schelhas et al. 2012, Butler et al. 2014, 2016b, 2017, Markowski-Lindsay et al. 2017). A majority of the FFOs in the United States are older (average age 62), white (95 percent), and male (79 percent). We have a general understanding of why they own their forestland (amenity values) and what management activities are common on their lands (i.e., harvesting trees for personal use, reducing invasive plants, and improving wildlife habitat) (Butler et al. 2016b). However, we have a lesser understanding of minority FFOs on the national level, including demographics, attitudes, and behaviors. In this paper, we focus on races and ethnicities that are different from the majority white population of FFOs. Hereafter, we refer to nonwhite and/or Hispanic FFOs as "minority FFOs" and white FFOs as "nonminority FFOs".

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Management and Policy Implications

Family forest owners from racial and ethnic minority groups have many similarities to family forest owners who are not from racial and ethnic minorities. This is particularly true for general attitudes toward the land, including many ownership objectives and concerns. However, family forest owners from racial and ethnic minorities also have some marked differences from other owners. The biggest differences are in terms of participation in technical and financial assistance programs and forest-management practices. This has important implications for those interested in forest management and policy issues. There are many historical and cultural factors that have led to racial and ethnic minority groups being underserved. Although directly addressing these issues is outside the purview of most forestry efforts, these differences may be at least partially mitigated by designing programs and services that appeal more directly to specific minority owners.

Underserved Minority FFOs

Understanding minority groups of FFOs is important, as they have unique societal experiences and may also have unique natural-resource values and needs as a result of historical patterns of discrimination, unequal access to assistance, and culturally influenced relations to land and forests (Schelhas 2002). For example, Native American land ethics and beliefs generally come from spiritual contexts (Jostad et al. 1996). African American forest owners often have strong ties to the land but can be faced with difficulties in forest management because of complicated ownership structures (Schelhas et al. 2017a). We need to understand the diversity of forest uses, values, and management approaches because one-size-fits-all programs will neither meet all people's needs nor ensure forest sustainability (Schelhas et al. 2003). Different programs and policies focused specifically on minority groups of FFOs are likely necessary to reach these traditionally underserved populations.

Minority landowners have long been recognized as an underserved population of FFOs, often with their ownership dynamics leading to land loss for a variety of reasons (Hilliard-Clark and Chesney 1985, Schelhas 2002, Christian et al. 2013, Hitchner et al. 2017). Minority landowners are less aware of policies and programs intended to assist with forest management and planning, and they are less involved in these programs. This, in addition to a multitude of other reasons, i.e., vague boundaries, foreclosures, financial barriers, and illegal takings (Schelhas 2002, Hitchner et al. 2017), can lead to decreases in acreages held by minority FFOs. Most programs and policies have focused on a general FFO—often based on nonminority FFOs. Often, the minority populations are not involved in the programs and policies available to FFOs in general, partially because they are not aware of the programs (Gan and Kolison 1999, Holley et al. 2008, Schelhas et al. 2018). There is also a history of discrimination against minority FFOs, as well as the history of minority FFOs distrusting the government programs available to them (Schelhas 2002, Hitchner et al. 2017). Failure to involve minority FFOs in technical and financial assistance programs and practices is a missed opportunity to provide the resources they need to manage and retain their land. There have been efforts developed that focus on increasing minority FFOs' awareness of technical and financial assistance programs, increasing outreach, and increasing participation (Hughes et al. 2005, Diop and Fraser 2009, Schelhas et al. 2017a, 2018). Studies have suggested that increasing program participation by minority FFOs could potentially decrease the land loss historically experienced by southern, rural African Americans (Christian et al. 2013, Dwivedi et al. 2016, Schelhas et al. 2018). Landowners in other minority groups may face similar issues (Gilbert et al. 2002, Schelhas et al., 2019). Scaling up and adapting effective regional assistance programs requires understanding landowner diversity and perspectives. Having a better understanding of minority FFOs on a national level will provide the basic knowledge needed to design and implement national programs supporting this segment of the population.

Minority Forest and Farm Owners

Comparing minority FFOs to minority farmers provides insights into the challenges minority landowners in general face. Minority farm and forest owners have experienced similar histories of land acquisition and loss (Christian et al. 2013), so it is possible we can expand our understanding of forest owners by examining the details of minority farm ownerships. In 2012, minority farm operators[1] comprised 7.2 percent of all

[1] We used the data on principal farm operators from the United States Department of Agriculture National Agricultural Statistics Service. Although operators are different from owners, principal operators often are at least part owners and were the best agricultural comparison to FFOs (NASS, pers. commun.).

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farmers (Native American 1.7 percent, Asian 0.7 percent, Black or African American 1.6 percent, Hispanic 3.2 percent) (USDA National Agricultural Statistics Service 2014). Native Americans have experienced the largest growth in terms of farm operators and farm size of all the minority groups, whereas African American farmers have experienced the greatest historical decline (from 1920 to 1997), with numbers rising slowly since 2002 (Bediako 2013). Studies examining USDA farm program participation (i.e., CRP, EQIP) have found that whereas there are similarities between minority farm owners and nonminority owners (33 percent versus 29 percent, respectively), minority owners are more likely to be dissatisfied with farm programs, have fewer acres enrolled in programs, be enrolled for shorter periods of time, and have fewer acres of farmland (Gan et al. 2005). The similarities in numbers of minority farm and forest owners, as well as similarities in low program enrollment and dissatisfaction, provide opportunities for professionals to work together to try to understand how to best serve the natural-resource needs of minority landowners more broadly.

Minority FFO Characteristics, Attitudes, and Behaviors

Understanding broadly the demographics, attitudes, and behaviors of minority FFOs can provide insight into ways program managers and policy-makers can better serve the needs of minority FFOs. FFO literature has found differences in how race is related to other landowner demographics, such as age and education. In studies comparing white FFOs to African American FFOs, African American owners were slightly younger than white forest owners (Johnson Gaither et al. 2011, Schelhas et al. 2012, Wyman et al. 2012). However, there were varying results related to education, with African American FFOs having similar educational backgrounds to white FFOs (Schelhas et al. 2012), lower education levels (Gan and Kebede 2005; Johnson Gaither et al. 2011), and more education than white FFOs (Wyman et al. 2012).

Size of forest holdings can often affect what cost-share or property tax programs are available to forest owners, as well as the feasibility of some forest-management practices, such as timber harvests (Gan and Kebede 2005). Although studies have looked at the sizes of holdings in regional, purposively sampled studies focused on minority owners (Gan and Kolison 1999; Gan et al. 2003; Fraser et al. 2005; Holley et al. 2008; Gordon et al. 2013; Hitchner et al. 2017), only Schelhas et al. (2012) compared sizes of holdings of white forest owners to those of African American forest owners and found that African American forest owners had significantly smaller forest holdings than white FFOs (averaging 153 ac versus 475 ac, respectively).

Understanding landowners' reasons for owning land can be important in targeting resources to landowners to best match their ownership objectives. For example, if landowners primarily own land for timber harvesting or investments, professionals can focus on programs and policies designed to provide resources to aid in these objectives. Similarly, if amenity objectives are more important to forest owners, programs focusing on wildlife or recreation can be targeted to landowners. Previous studies have found diverse ownership objectives for minority owners, ranging from timber production and wildlife being most important (Gan and Kolison 1999; Gan et al. 2003), to investment (Schelhas et al. 2012), to personal reasons or amenity values (Holley et al. 2008; Schelhas et al. 2012), depending on the region and landowners asked. Only Schelhas et al. (2012) compared ownership objectives of white forest owners to minority forest owners, finding a higher percentage of African American forest owners citing passing land to future generations as a more important objective than white owners did. Timber harvesting and aesthetic beauty were less important to African American owners than to white owners (Schelhas et al. 2012).

Although many studies found that over half of minority forest owners had participated in some forest-management activities (Gan and Kolison 1999, Gan et al. 2003, Holley et al. 2008, Schelhas et al. 2012, Wyman et al. 2012), only a few studies compared forest-management activities of minority FFOs and white FFOs. Those studies comparing minority and nonminority forest owners found varying results (Johnson Gaither et al. 2011, Schelhas et al. 2012, Wyman et al. 2012). For example, Johnson Gaither et al. (2011) found that timber activities and recreation levels occurred at higher percentages for white forest owners than for African American owners. However, Wyman et al. (2012) found that African American landowners practiced more wildfire-prevention activities on their land than white forest owners. Therefore, based on previous studies, there is not a clear consensus on race/ethnic status and general forest management and use activities. Although these various studies provide valuable insight into attitudes, behaviors, and characteristics of minority FFOs, they are all regional studies of a single race of landowners and therefore cannot be applied more broadly to minority FFOs across the US.

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Program Participation

When FFOs are not engaged with their land, they are more likely to sell their forest land, resulting in forest land loss and land conversion (Butler et al. 2007). Discerning the level of involvement in forestry practices or programs is one way to measure FFO engagement with their land. Studies have shown that when FFOs are actively enrolled in technical and financial assistance programs (i.e., green certification, cost-share programs) or have worked with a forestry professional or received professional advice, they are more likely to be interested in sustainable forest management (Butler et al. 2007). A common theme found in the literature is that African American landowners often have lower participation rates in technical and financial assistance programs (i.e., wildfire mitigation programs, cost-share programs) (Gan et al. 2005, Johnson Gaither et al. 2011). This has been attributed to a lack of program awareness (Schelhas et al. 2012, Wyman et al. 2012, Gordon et al. 2013), distrust of government (Mitchell 2001, Warren et al. 2002, Guffey et al. 2009, Schelhas et al. 2012, Dwivedi et al. 2016), discrimination (Mitchell 2001, Warren et al. 2002, Guffey et al. 2009, Gordon et al. 2013), or inability to pay the cost-share required of some programs (Gan et al. 2005). This may also be explained by the fact that African American owners typically have smaller tracts of land (Gan et al. 2003), limiting their harvesting or timber marketing options (Christian et al. 2013).

Conservation program participation rates are low among all landowners (Gan et al. 2005, Butler et al. 2016c), but minority landowners have been found to have even lower rates of participation, enroll fewer acres, be less likely to be able to afford the cost-share, and be less satisfied with programs (Gan et al. 2005, Johnson Gaither et al. 2011, Gordon et al. 2013). In spite of this, minority landowners (mainly African American landowners in the South) have been shown to be more interested in information about forestry and programs than white FFOs (Schelhas et al. 2012) and have enrolled in them as they become more familiar with them and their requirements (Schelhas et al. 2018).

Heirs' Property

Heirs' property, land held in common by family members after an ancestor dies without a will, is private property, where each owner has partial rights and responsibilities for the entire, undivided property (Baab 2011, Hitchner et al. 2017). Heirs' property is common among African American landowners in the South (Johnson Gaither 2016). Although less studied for other groups, heirs' property has also been found to be significant among privately held allotments among Native Americans, in Hispanic communities along the US–Mexico border, and among whites in rural Appalachia (Deaton 2012, Johnson Gaither 2016, 2017). Although there are no recent, large-scale regional studies, the amount of land in heirs' property at specific locations or subregions has been found to range from 2 to 40 percent (Johnson Gaither 2016). The underlying issue of heirs' property may influence our understanding of FFOs. Heirs' property limits the ability of its owners to engage in many forestry activities, including conservation program participation and timber sales (Hitchner et al. 2017). It may influence family forest owners' attitudes and behaviors. The prevalence of heirs' property among rural, African American populations is linked to both low productivity of land and land loss (Gilbert et al. 2002, Dyer and Bailey 2008, Hitchner et al. 2017).

Shared ownership in the form of heirs' property often makes it difficult to productively use land and results in under investment (Deaton 2012, Johnson Gaither and Zarnoch 2017). Often one or several landowners manage heirs' property belonging to many more family members, and they may be reluctant to invest in land that is shared with others, particularly for long-term land uses like forestry (Hitchner et al. 2017). Shared ownership also makes land-use decisionmaking difficult and participation in forestry assistance programs unlikely (Hitchner et al. 2017, Schelhas et al. 2017a). The lack of participation in forestry should not suggest that land is unimportant to minority owners. Often heirs' properties have been in families for generations, are highly valued, and are the centers of family stories and memories, as well as being the sites of tangible family heritage, such as cemeteries and home places (Deaton 2007, Schelhas et al. 2017b). Heirs' property may also be a way for disadvantaged groups to keep land intact and in the family without going through formal legal processes (Johnson Gaither 2016), which may make heirs' property owners less likely to participate in government programs. Yet, even when land has been in heirs' property for generations, it is still legally precarious, results in under investment, and may lead to low engagement in activities such as forestry (Deaton 2012, Johnson Gaither 2016, Hitchner et al. 2017). We know heirs' property ownership may be a significant factor for minority FFOs and may influence survey response rates, but we do not know either the magnitude of the

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problem or the details of its effects (Johnson Gaither 2016. Johnson Gaither and Zarnoch 2017). A survey of rural landowners in the Southern United States in 1979 determined that 73 percent of rural owners were nonheir owners, whereas 27 percent were heir property owners (Emergency Land Fund 1980). Although these data do not reflect recent estimates or forest owners specifically, they do give us an idea of the magnitude of the heirs' property issue. Heirs' property, because of its association with precariousness, is difficult to capture in survey research. Yet evidence suggests it is more common among minority landowners, associated with land loss, and important to discussions of minority FFOs.

Gaps in Knowledge

Research on minority FFOs has been limited, and there are many gaps. This research often focuses on a single race, such as African Americans (Gan and Kolison 1999, Gan and Kebede 2005, Johnson Gaither et al. 2011, Schelhas et al. 2012, 2017b) or Native Americans (Holley et al. 2008), is often limited to a particular geographic location (Fraser et al. 2005, Schelhas et al. 2012), and often produces descriptive studies that do not compare the minority landowners' attitudes and behaviors to those of nonminority landowners (Gan and Kolison 1999, Gan and Kebede 2005, Johnson Gaither et al. 2011). Although we can glean valuable information from these studies, we lack a broad and general understanding of minority FFO land engagement, in the form of program participation and, more generally, objectives, concerns, uses, and intentions for their land. Additionally, the ability to compare minority and nonminority FFOs is beneficial when trying to discern how the programs, policies, and outreach are falling short in regard to engaging minority FFOs. There are no studies in the United States that we know of that examine minority FFOs on a national scale. Gaining a general understanding of how minority FFOs are similar and different from nonminority FFOs across the country would give us a basis by which to then delve deeper into regional or more focused studies.

Because FFOs make decisions about over a third of the country's forest land, it is important to understand the status of their engagement with the land and how their decisions and forest use might impact landscape changes. Although understanding FFO engagement in general is important, it is especially important for us to understand the barriers to minority land conservation and land management to ensure that minority FFOs have the tools they need to manage their forest and land loss does not occur at an accelerated pace.

Objectives

Here we endeavor to gain a better understanding of the attitudes and behaviors of minority landowners and identify similarities and differences between minority and nonminority FFOs on a national level by using data from the US Forest Service, National Woodland Owner Survey (NWOS). More specifically, our objectives were (1) to examine bivariate relations between race and key NWOS variables describing land-use-characteristics, forest management behaviors, forest use, objectives for owning land, concerns, conservation attitudes, and intentions for the future of FFOs' forestlands; (2) to create a descriptive multivariate model of FFOs with minority/nonminority as the dependent variable; and (3) to determine whether race is a significant predictor of program participation of FFOs (race as an independent variable), as the literature points to program participation as an important difference between minority and nonminority FFOs. The use of the NWOS, which relies on a national, random sampling approach, allows expansion upon the results of the previous studies that rely primarily on nonrandom sampling and are regional or local in scope.

Methods

The NWOS focuses on understanding private forest owners' attitudes, behaviors, and characteristics across the United States. The survey is administered by the USDA Forest Service's Forest Inventory and Analysis program and is implemented in conjunction with the Family Forest Research Center based at the University of Massachusetts Amherst. The data used in the analyses presented here were derived from the 2011–13 iteration of the survey (Butler et al. 2016a). Here we focused on FFOs, or forests owned by families, individuals, trusts, estates, and family partnerships, with 10+ ac of forestland. A total of 8,581 family forest owners with 10+ ac responded to the 2013 NWOS mail survey with an overall cooperation rate of 51.6 percent. To test for nonresponse bias, telephone followup interviews were conducted with 12 percent of the mail survey nonrespondents. No clear nonresponse biases were found, so no adjustments were made to the estimates (Butler et al. 2016b). For detailed information on the NWOS sampling, implementation, and estimation procedures, please refer to Butler et al. (2016a)

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and Dickinson and Butler (2013). Please note that surveys where race and ethnicity were not answered (item nonresponses) are dropped when calculating percentages in the estimations (Butler et al. 2016b).

To examine the different races of FFOs, we used the NWOS answers about race and ethnicity from the primary landowner. In the case where the FFO indicated more than one race, we considered that ownership a minority (1.4 percent of minority respondents indicated they were more than one race/ethnicity). Overall, these questions had a relatively high item nonresponse rate (7.8 percent and 9.6 percent for ethnicity and race, respectively) (Butler et al. 2016a), dropping our overall sample size to 6,533 (76 percent of the respondents). The minority groups were represented by a low number of respondents in the dataset: American Indian or Alaska Native (n = 143, 2.1 percent, excluding FFOs who did not respond to the race and ethnicity questions); Asian (n = 23, 0.3 percent); Black or African American (n = 71, 1.0 percent); Native Hawaiian or Other Pacific Islander (n = 6, 0.1 percent); Hispanic (n = 63; 0.9 percent); and White (nonhispanic) (n = 6,321, 96.6 percent). Because the sample sizes were small for the different minority FFO groups, we combined them to compare them to white (only) landowners (minority n = 291; 4.5 percent and nonminority n = 6,242; 95.5 percent) for the quantitative analyses. In addition, we carried out a qualitative analysis of the individual groups of minority FFOs in order to get a sense of the homogeneity among these respondents.

We used bivariate analyses using chi-squared tests for an initial, broad exploration of similarities and differences between minority and nonminority FFOs. Bivariate statistics are used to determine the relation (strength and direction) between two variables, and we believe these results will help direct areas of future research. We also used a descriptive logistic regression model, where minority status was the dependent variable, to see what variables were significant in describing the two groups. In addition, we used a logistic regression looking at program participation to see if race was a significant predictor variable. The observations were weighted in the bivariate and logistic regression analyses to account for the probability proportional to the size sample design of the NWOS (Butler et al. 2016a).

Variables

Variables of interest were selected based on existing literature (Gan and Kolison 1999, Mitchell 2001, Warren et al. 2002, Gan et al. 2003, Fraser et al. 2005, Gan and Kebede 2005, Holley et al. 2008, Johnson Gaither et al. 2011, Schelhas et al. 2012, Wyman et al. 2012, Gordon et al. 2013, Dwivedi et al. 2016, Hitchner et al. 2017, Schelhas et al. 2018). We examined landowner demographics, land characteristics, objectives for owning land, land-management characteristics, information and advice received, concerns, and the respondents' ideas about the future of their land. Because our sample sizes were small to begin with, we did not include variables with high item nonresponse rates (where item nonresponse numbers >250) (Table 1; a full list of variable descriptions is provided in Table S1). In some analyses (logistic regressions—see below), we created some composite variables in order to get a more generalized sense of each variable's effect and to reduce the number of distinct variables. For example, we created a variable called "programs" that describes if a landowner is involved in one or more of the distinct programs listed on our survey (tax program, green certification, easement, or cost-share program).

Bivariate Statistics

Because little is known about minority FFOs on a national level, we began our analyses looking at the bivariate statistics to get a better descriptive picture of who the minority landowners are, compared to nonminority landowners. We examined relations between minority FFOs and the dependent, categorical variables using chi-squared tests for independence in R (R Development Core Team 2016). To examine relations between race/ethnicity and continuous variables (size of forest holdings and age), we used point-polyserial correlations using the "polycor" package in R (Fox 2010). Because we performed a large number of bivariate tests, we corrected for false-positive significance using the Benjamini–Hochberg procedure with an acceptable error rate of 10 percent, denoted as Benjamini–Hochberg-adjusted P values (Thissen et al. 2002).

Logistic Regressions

We analyzed the minority FFO data with logistic regressions in two ways: with race as the dependent variable to predict what variables might describe minority FFOs as well as to see if race is a significant predictor of FFO involvement with programs. The logistic regressions were performed using the "survey" package in R (Lumley 2017) so that survey weights could be incorporated. The first model used minority status as the dependent variable. This first model is a descriptive model intended to determine what variables are important in differentiating between minority and nonminority

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Table 1. Description of select variables used in the bivariate statistics and logistic regression models. Full variable definitions in Supplemental Table 1.

Category	Variable	Description and code
General Characteristic	Region	North, South, and West
General Characteristic	Ownership type	Which category best describes ownership. 1 = individual; 2 = joint, such as husband and wife; 3 = Family partnership; 4 = Trust or estate.
General Characteristic	Size of forest holdings	Natural log of total forest acres of each landowner's property.
Landowner Objective	Objective: Amenity	How important are amenity objectives as a reason for owning woodland. Five-point Likert scale, where 1 = Not important to 5 = Very important.
Landowner Objective	Objective: Financial	How important are financial objectives as a reason for owning woodland. Five-point Likert scale, where 1 = Not important to 5 = Very important.
Forest Management and Use	Forester manages land	A land manager or forester makes the management decisions on their wooded land. 1 = yes; 0 = no.
Forest Management and Use	Has a management plan	Landowner has a management plan. 1 = yes; 0 = no.
Forest Management and Use	Has cut trees for sale in the past 5 years	Landowner has harvested timber from their wooded land in the past five years. 1 = yes; 0 = no.
Forest Management and Use	Has managed for wildlife habitat in the past 5 years	Landowner has managed for wildlife habitat in the past 5 years. 1 = yes; 0 = no.
Forest Management and Use	Has managed for invasive species in the past 5 years	Landowner has managed for invasive species in the past 5 years. 1 = yes; 0 = no.
Forest Management and Use	Has done no management in the past 5 years	Landowner has done no management in the past 5 years. 1 = yes; 0 = no.
Forest Management and Use	Posts land to restrict access	Landowner has posted land to restrict access and/or use by the general public. 1 = yes; 0 = no.
Programs	Has used a cost-share program in the past 5 years	Landowner has used a cost-share program. 1 = yes; 0 = no or don't know.
Programs	Enrolled in a tax program	Landowner's wooded land is enrolled in a tax program. 1 = yes; 0 = no or don't know
Programs	Has a conservation easement	Landowner has sold or voluntarily given away development rights on their wooded land. 1 = yes; 0 = no or don't know.
Programs	Has participated in programs (cert, tax, ease, cost)	Landowner has participated in any one of the following programs: green certification, enrollment in a tax program, conservation easement, cost-share. 1 = yes; 0 = no.
Information and Advice	Has received advice in the past 5 years	Landowner has received advice/information about their wooded land in the past 5 years. 1 = yes; 0 = no.
Intentions	Likelihood of transferring land in the next 5 years	Landowner is likely to sell or give away any of their wooded land in the next 5 years. Five-point Likert scale with 1 = Extremely unlikely and 5 = Extremely likely.
Intentions	Wants woods to stay wooded	Landowner's level of agreement with the statement "I want my wooded land to stay wooded." Five-point Likert scale where 1 = Strongly disagree and 5 = Strongly agree.
Intentions	Would sell land if offered reasonable price	Landowner's level of agreement with the statement "I would sell my land if offered a reasonable price." Five-point Likert scale where 1 = Strongly disagree and 5 = Strongly agree.

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owners. These results differ from the bivariate analyses because the model incorporates multivariate relations. We then ran a predictive model to determine whether minority status is an important predictor when examining if an FFO is involved in any forest management programs. If the landowner is enrolled in at least one program (tax program, cost-share, or green certification), they are coded as a "1," whereas if the FFO is not enrolled in any program, they are coded as a "0." To examine multicollinearity, we used a variance inflation factor with a threshold of 2.5 and found that the variance inflation factors for our variables for both models were 1.4 or less, suggesting no multicollinearity (Allison 1999). We used the Tjur statistic as a measure for goodness of fit (Tjur 2009). The Tjur statistic is a pseudo-R^2 (with values ranging from 0 to 1) that is the difference between the mean predicted probabilities of an event occurring in the logistic regression.

Results

Minority Groups

Although we cannot present a quantitative look at differences and similarities between the minority groups defined by the NWOS (American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and Hispanic) because of low sample sizes, we can qualitatively describe trends that we see from the dataset. In general, we do see some differences when looking at FFO demographics, such as age, gender, and education level attained among minority groups, whereas the reasons for ownership were similar. Forest use differed slightly among minority groups, with Native American and Hispanic FFOs more likely than the other minority groups to have engaged in some forest management or had some forest use on their land in the past 5 years; however, forest use overall was lower for minority FFOs than for nonminority FFOs. Program participation was very low among all minority groups, except for Hispanic FFOs who tended to be more similar to nonminority FFOs for certain programs (i.e., tax programs and cost-share programs). All minority groups were less likely to have received advice in the past 5 years than nonminority FFOs; however, the minority groups tended to be more likely to think stronger timber markets, and some information or advice would be "very helpful" or "helpful" in the future. Although we see some differences among minority groups, we see enough similarities to feel comfortable combining them for the following quantitative analyses. In the future, we hope to have high enough sample sizes to take a closer look at the differences among the individual groups.

Minority Characteristics, Attitudes, and Behaviors

General Characteristics

Of the over 4 million family forest ownerships with 10+ ac in the United States, minorities comprise 6.6 percent of the ownerships, owning 5.1 percent, or 265 million ac of family forestland. The average size of forest holdings for minority landowners is 50.7 ac, whereas the average size of forest holdings is 66.0 ac for nonminority landowners (as defined by this paper). In order to understand the basic characteristics of minority FFOs and their land, we looked at descriptive variables such as location or region where the land was located, size of holdings, ownership structure, and if the FFO owned land that was farmed or ranched within a mile of their wooded land. Regional location was found to be significantly different between minority and nonminority FFOs based on bivariate statistics as well as the logistic regression where race is the dependent variable. A higher percentage of minority FFOs live in the southern and western parts of the US than in the north (Figure 1, 2). An FFO from the south is 3.81 times more likely to be a minority than an FFO not from the south (Table 2). FFOs in the west were similarly about 2.25 times more likely to be a minority than an FFO not from the west (Table 2). After dropping records with missing data for one or more independent variables, the sample size for the model where race is the dependent variable is 5,771 (minority sample size = 249; nonminority sample size 5,522). The Tjur statistic for this model was 0.02. We recognize this is a poorly fitted model, likely because of the unbalanced sample size, with very low numbers of minority owners. Even though this model has a poor fit, we include it as a conceptual model, as the significant variables are aligned with and support our bivariate results as well as what has been found in other studies. Interpretations of this model should be done cautiously, and we suggest using the results as a launching point for further studies.

Size of forest holdings is also a significant descriptor of race and ethnicity (Table 2). For each acre increase in size of forest holding, the likelihood of an FFO being a minority owner is 0.73 times that of an FFO being a nonminority owner. Therefore, minority FFOs were more likely to have a smaller size of forest holdings than nonminority owners. Nonminority FFOs were more likely than minority FFOs to have a joint ownership, such as husband or wife (Figure 2). Minority FFOs are less likely to own land that is farmed or ranched (Figure 2).

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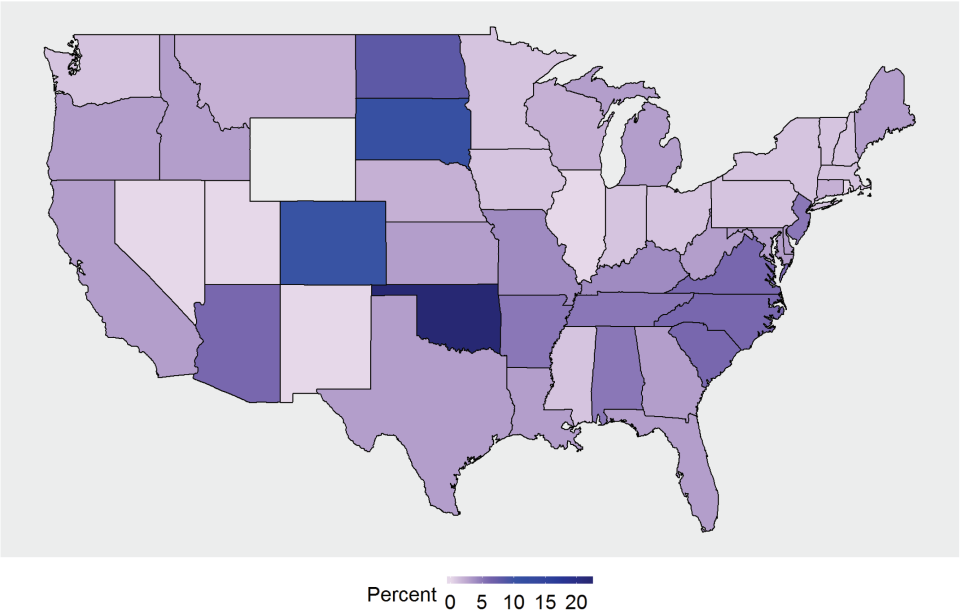

Figure 1. Map displaying percent of respondents who are minority FFOs with 10+ ac in each state. No data exist for Wyoming, Alaska, or Hawaii.

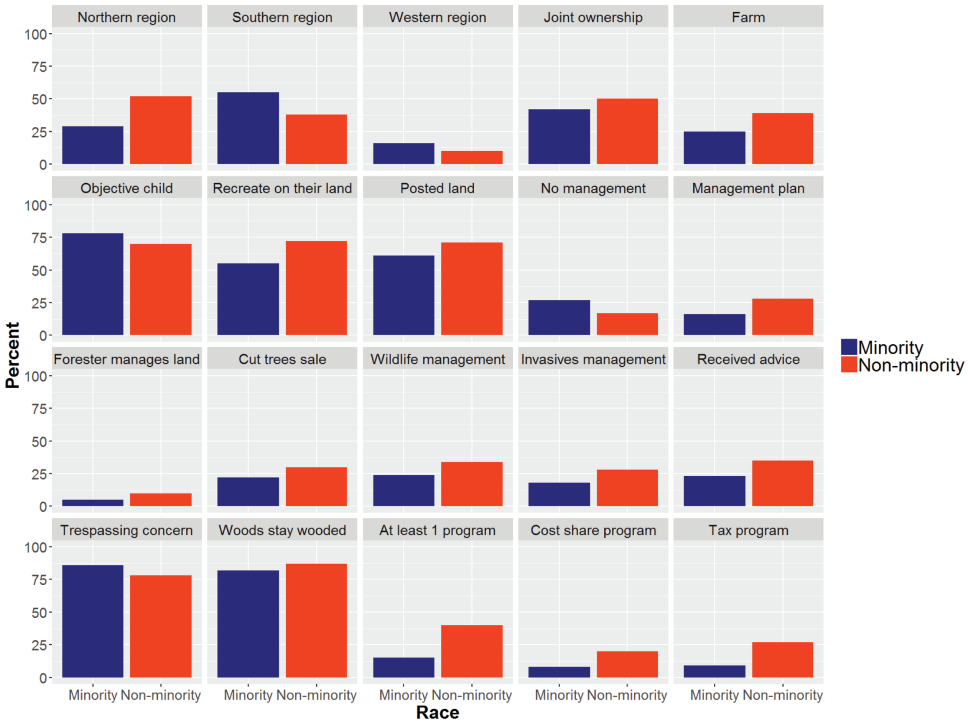

Figure 2. Comparison of general characteristics, attitudes, and behaviors between minority and nonminority owners. Bars represent the percentage of minority and nonminority owners for each variable. All variables significant based on chi-squared tests and the Benjamini–Hochberg correction procedure, with *P* values listed in table S2.

Reasons for Owning Land

Understanding an FFO's reasons for owning land is important for understanding their general motivations. Although there is no significant difference between minority and nonminority FFOs in most of their reasons for owning land, minority FFOs were more likely to cite "To pass land on to my children or other heirs" as an important or very important reason for owning their forest (Figure 2; a full list of bivariate statistics is provided in Table S2).

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Table 2. Logistic regression with minority status as the dependent variable (minority = 1 and nonminority = 0). Standard errors in parentheses. Because this model has a low Tjur statistic (0.02), we present this as a conceptual model and advise caution when drawing strong inferences.

Variable	Estimate	SE	*P* value	Odds ratio
(Intercept)	–3.61	1.02	0.00	0.03
Size of forest holdings	–0.31	0.14	0.03	0.73
Age	0.01	0.01	0.22	1.01
Region (South)	1.34	0.28	0.00	3.81
Region (West)	0.81	0.43	0.06	2.25
Amenity objective	–0.40	0.47	0.39	0.67
Financial objective	0.14	0.27	0.61	1.15
Inherited land	0.24	0.32	0.45	1.27
Posted land	0.10	0.29	0.75	1.10
Cut timber for sale past 5 years	0.44	0.31	0.16	1.55
Cut timber for personal use past 5 years	0.08	0.30	0.79	1.08
No management past 5 years	0.46	0.39	0.23	1.59
Prefers written advice/info	0.13	0.27	0.63	1.14
Prefers personal advice/info	–0.12	0.26	0.66	0.89
Advice past 5 years	0.34	0.31	0.27	1.41
Programs	–1.08	0.36	0.00	0.34

Forest Use and Management

How an FFO uses and manages their land provides insight into the behaviors (as opposed to attitudes) they have on their wooded land. Minority land owners were less likely to have recreated on their land in the past 5 years than nonminority FFOs (Figure 2). Minority FFOs were also less likely than nonminority FFOs to post their land to restrict access and/or use by the general public (Figure 2).

In general, minority FFOs were less likely to have participated in forest-management activities, including having a management plan, having a forester manage their land, cut trees for sale in the past 5 years, invasive species management in the past 5 years, and wildlife management in the past 5 years than nonminority FFOs (Figure 2). They are also less likely to have received advice about their forests in the past 5 years (Figure 2). Both groups, however, prefer to get their information and advice by the same method—in a written manner.

Concerns and Intentions

Although minority and nonminority FFOs largely have the same concerns with their wooded land, minority FFOs are more likely to state they are "very concerned" or "concerned" with trespassing on their land. Landowner intentions to sell their land, as well as their intentions to keep their wooded land wooded, both have implications for conservation. Although there is no significant difference between minority and nonminority FFOs in regard to their agreement with the statement "I would sell my land if offered a reasonable price," minority FFOs are less likely than nonminority FFOs to say they agreed or strongly agreed with the statement "I want my wooded land to stay wooded" (Figure 2).

Program Participation

Program participation was significantly different between minority and nonminority FFOs. Minority FFOs are also less likely to be enrolled in a cost-share program or tax program than nonminority FFOs (Figure 2).

The odds of being enrolled in at least one program are 0.34 times as likely for a minority than a nonminority FFO (Table 2). Finally, minority landowners were less likely to be enrolled in any programs than nonminority FFOs (Table 3). Other variables significant in predicting program enrollment for minority owners, and likely driving forces behind participation, include FFO receiving advice in the past 5 years, posting land to restrict access and/or use by the general public, having financial objectives for owning land, and size of forest holdings (Table 3). The Tjur statistic for the model was 0.22. Although this is still a relatively low measure of the goodness of fit, we believe it is a sufficient model given the unbalanced sample size and low numbers of minority owners. After dropping records with missing data for one or more independent variables in the logistic regression where program participation is the dependent variable, the sample size for the model where race is an independent variable is 5,755.

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Table 3. Logistic regression of family forest owners' enrollment in one or more programs (cost-share, tax, easement, or green certification programs). If the FFO was enrolled in at least one program, this variable was coded as a 1, and if the FFO was enrolled in no programs, the variable was coded as a 0.

Variable	Estimate	SE	*P* value	Odds ratio
Intercept	–3.54	0.44	0.00	0.03
Race (minority)	–1.04	0.37	0.01	0.35
Size of forest holdings	0.34	0.06	0.00	1.41
Age	0.00	0.00	0.49	1.00
Region (South)	0.15	0.12	0.22	1.16
Region (West)	–0.30	0.23	0.18	0.74
Ownership type (Joint)	0.04	0.13	0.77	1.04
Ownership type (Family partnership)	0.03	0.21	0.87	1.04
Ownership type (Trust or estate)	–0.09	0.22	0.70	0.92
Amenity objective	0.03	0.21	0.89	1.03
Financial objective	0.47	0.12	0.00	1.60
Home	0.19	0.12	0.12	1.21
Inherited land	0.03	0.13	0.84	1.03
Farm	0.08	0.12	0.50	1.09
Posted land	0.25	0.12	0.04	1.28
Cut for sale past 5 years	0.17	0.15	0.23	1.19
No management past 5 years	–0.14	0.15	0.35	0.87
Advice past 5 years	1.30	0.13	0.00	3.65

Discussion

The NWOS estimates that 5.1 percent of the family forestland in the United States is owned by minority owners. This translates into 10.5 million ac and 209,000 owners. Compared to the general population in the United States, which is 36 percent minority (US Census Bureau 2018), a disproportionately small amount of family forestland is owned by minorities. These differences are likely due to multiple factors already identified as differences between minority and nonminority landowners in previous studies, including the economic disadvantages of smaller holdings and discrimination in access to technical and financial assistance. These factors can lead to FFOs selling or losing their land (Wood and Gilbert 2000). Although the extent and exact racial and ethnic breakdown of heirs' property are largely unknown, they are thought to be more prevalent among poorer and minority land owners (Johnson Gaither 2016), and heirs' property is more easily lost both because it tends to produce lower economic returns and because it is subject to partition sales. Often these factors combine for minority forest owners, leading to cycles of underinvestment and low returns (Schelhas 2018) that make land loss more probable.

Geographic location of minority FFO land may also contribute to less accessibility of information and resources, potentially contributing to land loss. Minorities are much more likely to be in the south or west than in the northern United States. Studies have examined the spatial unevenness of race and ethnicity in the United States, in both urban and rural areas, and the unevenness is complex and can be attributed to a multitude of circumstances. Spatial unevenness can be a result of political and economic unevenness, variations in quantities and quality of resources in rural areas, and segregation and concentration of poverty (Fraser et al. 2005, Squires and Kubrin 2005, Thiede et al. 2018). The implications of spatial unevenness for minority landowners include isolation from other landowners with knowledge of timber markets, forestry assistance, and overall engagement in forestry. There are also potential implications of spatial unevenness for researchers in terms of undersampling minority FFOs when conducting surveys. In terms of FFOs responding to the NWOS, we also see spatial unevenness in regard to race and ethnicity, although we only examined this on a very broad, regional level. Examining spatial distributions of minority FFOs in more depth could provide additional insights into barriers they face in terms of forest management, conservation, or estate planning.

Taking a closer look at the specific similarities and differences between minority and nonminority owners, in terms of characteristics, attitudes, and behaviors, can provide insight into ways in which professionals work toward stemming the loss of land among minority

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FFOs. In terms of similarities, many of the reasons for owning land are similar for minority and nonminority owners. For example, both groups rate amenities, such as aesthetics, highly. The age distribution, skewed toward older owners, is also similar between the groups. The ownership patterns are similar, with the dominant acquisition method being purchasing land as opposed to inheriting or being gifted land. However, we cannot discern from the NWOS differences within these dynamics, such as number of people inheriting or being gifted land. Therefore, whereas we know something about the general ownership patterns between groups, there are likely distinctions not addressed by our survey that parse out differences such as the presence or absence of heirs' properties. Both groups also prefer to get their information and advice in a written manner. When developing programs and policies specifically geared toward minority FFOs, noting these similarities between minority and nonminority FFOs is important. Professionals can use the parts of programs and policies that have worked for the general FFO population in matters where minority and nonminority owners are similar, such as programs geared toward an older age class of FFOs and method delivering information and advice.

It is also key for program and policy development to understand the differences between minority and nonminority FFOs. We can use this information to tailor programs and outreach specifically to minority FFOs in hopes to overcome the history of land loss, discrimination, and lack of forest management. One of the largest differences between minority and nonminority owners is program participation. Minority owners are one-third (0.34) as likely to have participated in any forest management program. This is the first time this value has been available for the nation, but it is in general agreement with previous local and regional studies (Schelhas et al. 2012, Christian et al. 2013, Dwivedi et al. 2016). Lower participation rates may be attributed to past discrimination leading to trust issues with the government (Schelhas 2002, Christian et al. 2013, Gordon et al. 2013). They may also be due to lower awareness of the programs (Gan et al. 2003). If programs are tailored to nonminority FFOs, outreach and communication to minority FFOs might be lacking, leading to lower awareness and lower participation. Another potential reason for lower program participation rates could be the cost-share requirement of many programs. If minority FFOs have lower incomes, it may be harder for them to contribute to the cost-share match, making them ineligible for the programs (Christian et al. 2013, Gordon et al. 2013). Minorities also have been historically less likely to receive information or advice (Daniel 2013). This may be due to similar reasons to the lower program participation rates, such as discrimination, distrust, and lower awareness.

Another major difference is in terms of forest management. Minority landowners are less likely than nonminority FFOs to carry out forest-management activities (i.e., have a management plan, have a forester manage their land, have cut trees for sale in the past 5 years). A lesser degree of forest management among minority FFOs could be for a multitude of reasons, as seen in other studies (Gan et al. 2003, Schelhas et al. 2012). If many of these properties are heirs' properties, organizing forest management among all the heirs could be a barrier (Hitchner et al. 2017, Schelhas et al. 2018). In addition, minority FFOs typically have smaller forest holdings, and research has shown that smaller tracts of land often have less forest management (Gan et al. 2003). Finally, we see that minority FFOs are less likely to receive advice about their land, and this lesser degree of advice may lead to less forest management overall (Kilgore et al. 2015).

A higher percentage of minority landowners than nonminority FFOs view passing land on to their heirs as important or very important. This is in line with the findings of Schelhas et al. (2012), who reported that African American family forest owners were more likely than white owners to indicate that passing land on to heirs was a primary objective. This is linked to family history and the cultural value of land, including ancestors who obtained land despite great hardship while being excluded from many elements of society (Zabawa et al. 1990, Savoy 2015, Schelhas 2017b). Although passing land on to heirs might be an important objective for minority FFOs, the complex reality of retaining their land might make it difficult to follow through on this objective.

Land loss because of heirs' properties is a serious issue with some minority FFOs, especially African American landowners. Land is lost for a variety of reasons, including partition sales, foreclosures, outmigration, and discrimination (Hitchner et al. 2017). Providing support and outreach to segments of landowners who have complicated ownership dynamics, but who also have a heightened desire to pass land on to heirs, is important in decreasing land loss. Landowner engagement and resolution of heirs' property issues can work synergistically to increase forest management (Schelhas et al. 2018). Additionally, including

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information regarding ways in which minority FFOs can successfully pass land on to their heirs into outreach, programs, and policies might motivate more minority FFOs to participate in assistance programs. This is a broad overlook into the minority FFO, so the story is also on the broad side. These findings can contribute information to professionals when designing programs, policies, and outreach to minority FFOs, in order to ensure they have the resources and information they need to make decisions about their land and prevent unintended land loss.

Although examining minority landowners using the NWOS data is an important first step in understanding traditionally underserved FFOs on a national level, this study has some limitations that warrant future research. Our sample size of minority FFOs is low. The low minority FFO sample sizes of the current iterations of the NWOS make it impossible to examine specific races or ethnicities separately. It is unclear if this small sample size is due to low cooperation rates of minority FFOs, if landownership is low among minority FFOs, or both. Another potential issue is nonresponse bias. If minority nonrespondents are substantially different from minority respondents, our understanding of minority FFOs may be biased. Demographic questions were not asked during the nonresponse bias assessment phone calls during this NWOS cycle, so we cannot assess minority nonresponse bias assessment in this study. Heirs' property owners may be less likely to respond because of uncertainty and precariousness of ownership, and there is some evidence that minorities in general may be less likely to respond to surveys (Krysan et al. 1994). Future studies with an added component of outreach with groups working with minority FFOs could foster trust and encourage participation in the survey, and allow a better understanding of low numbers of respondents.

Summary

Gaining a better understanding of key differences between minority and nonminority FFOs is important in informing policies, programs, education, and outreach. It is equally important to understand what factors minority and nonminority FFOs might have in common. Minority and nonminority FFOs both own their lands for similar reasons and share many of the same concerns. Both groups prefer to obtain information and advice from written materials, tend to acquire their land in the same manner, have similar ownership types, and have similar age, gender, and education breakdowns. The differences primarily lie in minority FFOs' geographic locations, size of forest holdings, and participation in programs. Minority FFOs are also less likely to have received advice in the past 5 years and more likely not to have carried out any forest management over the same period.

Insecure land ownership and low economic returns from these lands have significant consequences for minority communities (Gilbert et al. 2002). Ownership issues such as heirs' property, combined with lower participation in programs and forestry activities, exacerbate these consequences. It is important for research findings to uncover how minority FFOs differ from nonminority FFOs, as well as to address aspects of forest ownership and management that are more pronounced or unique among minority FFOs. Because many of the landowner characteristics, ownership reasons, concerns, and other attitudes are similar between minority and nonminority FFOs, but the program participation and forest management behavior differ, it is possible that the factors driving landowner action differ between minority and nonminority FFOs. Program and policy development and outreach should focus on the barriers to action as opposed to program and policy content. Recognition of lower program participation and lower forest-management activity of minority FFOs by professionals at the federal, state, and local level will hopefully encourage tailored outreach to minority FFOs to overcome the barriers they face and provide the resources they need to participate in programs and increase engagement with their forest. Overcoming the barriers that prevent forest management and program participation among minority FFOs is important in land retention, sustainable forest management, and ultimately forest conservation.

This is, to our knowledge, the first national study of minority FFOs. Having a basic understanding of the similarities and differences between minority and nonminority FFOs in the United States is an important first step to better engage this traditionally underserved population of FFOs. Having this national broad baseline of information gives us a reference in which to compare studies with a more specific focus on a region or race/ethnicity. In the future, we need further, more nuanced studies of individual minority forest owners around the country, as well as an understanding of the generalized importance of minority status, which across groups has often been associated with discrimination and marginalization, of forest ownership and management.

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Supplementary Materials

Supplementary data are available at *Journal of Forestry* online.

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