

Social Sciences

United States Family Forest Owners' Awareness of and Participation in Carbon Sequestration Programs: Initial Findings from the USDA Forest Service National Woodland Owner Survey

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Abstract

Family forest owners (FFOs) hold a plurality of forestland in the United States, and programs and markets exist that compensate landowners for sequestering and storing increased carbon through extended rotations, improved forest management, and increased forest cover. We used USDA Forest Service National Woodland Owner Survey (NWOS) data from 2018 to estimate the number of ownerships and their associated acreage that are enrolled, that are familiar but not enrolled, and that are unfamiliar with these programs, as well as differences in attributes among these groups. As of 2018, less than 0.1% (SE < 0.1%) of FFOs are enrolled in carbon sequestration programs, and collectively they hold an estimated 400,000 ha (SE = 100,000). FFOs who are enrolled have larger holdings, are more likely to participate in other programs, and are more concerned about climate change, among other characteristics. Most FFO holdings are too small to be viable in traditional carbon programs, although new and evolving programs might enable smaller landholdings to be feasible to enroll. Knowing the characteristics of ownerships that are enrolled or aware of programs will allow for more informed design and implementation; future monitoring will be important to identify trends as these programs become more widespread.

Study Implications: Family forest owners (FFOs) hold a plurality of US forestland, making them part of a critical opportunity to help mitigate climate change through carbon sequestration and storage. A variety of programs and markets exist that compensate landowners, including FFOs, for increasing carbon storage and sequestration on their lands. Understanding characteristics of landowners who are participating in or aware of carbon programs and markets can help inform program outreach and implementation, furthering climate change mitigation goals.

Keywords: Carbon storage, carbon sequestration, climate change mitigation, landowner, non-industrial private forest landowners

Carbon sequestration through extended rotations, improved forest management, and increased forest cover is a critical opportunity to help mitigate climate change. In the United States, an estimated 9.6 million families, individuals, trusts, estates, and family partnerships (hereafter family forest owners or FFOs) hold more than a third of forested land (110 million ha, excluding interior Alaska, [Butler et al. 2021](#)), which account for 39% (5.5 billion metric tonnes) of aboveground tree forest carbon storage in the United States ([USDA Forest Service, Forest Inventory and Analysis \(USFS FIA\) 2021](#)). This study aims to provide a reflection on the current participation of FFOs in carbon programs across the United States, as well as on those who are familiar with programs but not enrolled. Specifically, the questions are (1) how many FFOs participate in carbon programs, and how many are familiar with such programs but are not participating, and (2) what are the characteristics of participating landowners, and how do they

differ from landowners who are familiar with the programs and markets (but not participating) and those who are not familiar.

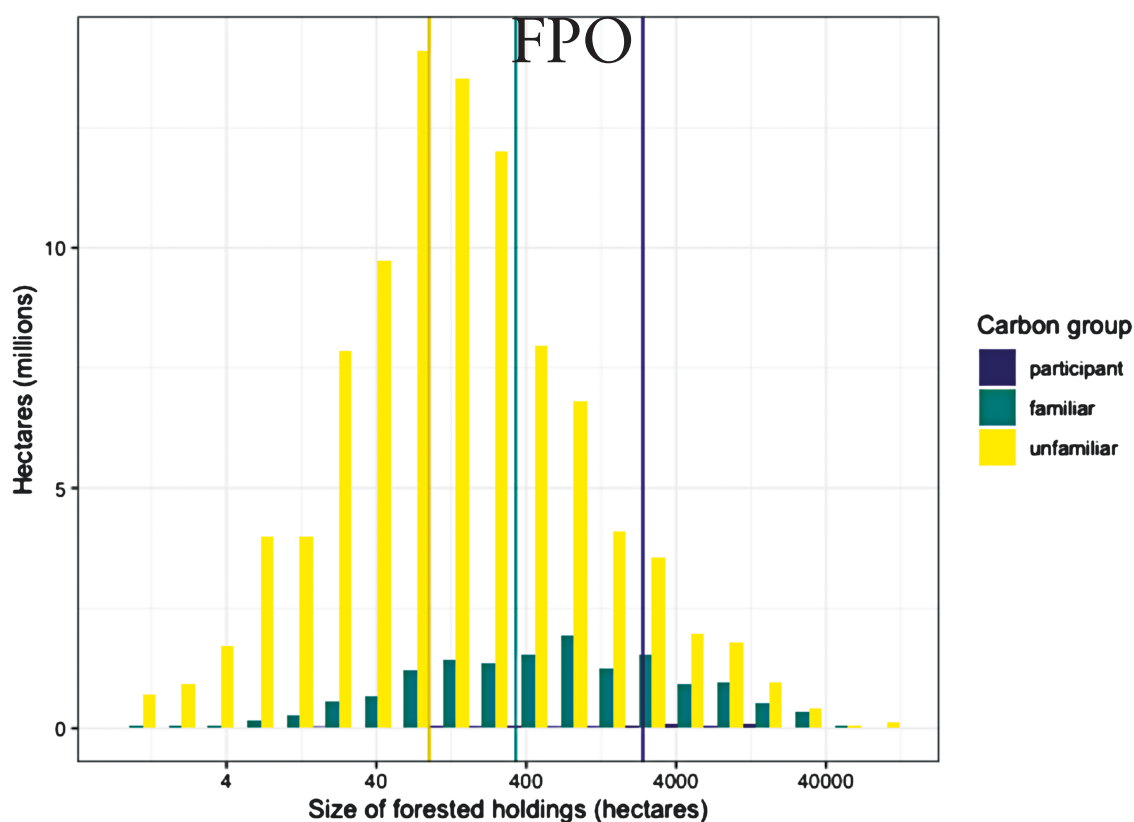
Programs and markets, including regulatory programs, voluntary markets, and over-the-counter markets (hereafter programs), exist that compensate landowners, including FFOs, for increasing carbon sequestration and storage on their land. The largest regulated program available to private landowners in the United States is the California Cap-and-Trade program through the California Air Resources Board, although enrollment can involve high costs, complexity, and risk, especially for FFOs with smaller holdings ([Kerchner and Keeton 2015](#), [Wise et al. 2019](#)). Voluntary program registries include American Carbon Registry (ACR, established in 1996), Climate Action Reserve (established in 2001), and Verra (established in 2007) ([American Carbon Registry 2022](#), [Climate Action Reserve 2022](#), [Verra 2022](#)).

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Table 1. Population estimates for family forest owners (FFOs) with 0.4 + hectares and their familiarity and participation in carbon programs.

	Totals (thousands)		Percentages	
	Ownerships (SE)	Hectares (SE)	Ownership (SE)	Hectares (SE)
Participating	3 (3)	400 (100)	<1 (<1)	<1 (<1)
Familiar	625 (148)	14,900 (500)	6.5 (<1)	13.5 (<1)
Unfamiliar	9,000 (400)	94,700 (800)	93.5 (<1)	86.1 (<1)

**Figure 1.** Population estimates of family forest owner hectares by size of holdings and whether the ownership is a participant, familiar, or unfamiliar with carbon programs. Vertical lines represent the median size of holdings for each group. Note the log scale on the x axis.

land, are more likely to have an easement, and are more likely to have participated in a cost-share program in the last 5 years (Table 2). They are also more likely to be concerned about climate change affecting their forestland; to receive more of their income from their forestland; and to report that protecting nature and biological diversity, having privacy, and passing land on to their children or heirs are important reasons why they own their forestland (Table 2). Among participating landowners, 56% ($\pm 10\%$) report having a management plan and 26% ($\pm 9\%$) have an easement on their wooded land (Table 2).

Discussion

The low participation and familiarity with carbon programs highlights the potential of the large amount of FFO forestland and the importance of landowner engagement. Other programs investigated in the NWOS have higher levels of participation from this population, including tax programs (17%, SE < 1%), cost-share programs (4%, SE < 1%), and conservation easements (3%, SE < 1%) (Butler et al. 2021). Although size of holdings is an important factor for

enrollment in carbon programs, the threshold for determining project feasibility also depends on many other variables, including the requirements of the carbon program (Kerchner and Keeton 2015, Khanal et al. 2016, Kelly et al. 2017). Other barriers include the low price of carbon, the high cost of entry into markets and program requirements (e.g., developing a management plan, certification, or carbon inventories), and whether participation is consistent with other management goals (Charnley et al. 2010). Carbon programs that are simple, flexible, and low-cost for landowners to participate in while still providing permanence and additionality will be crucial to engaging smaller forest owners. In addition to their substantial forest holdings, US FFOs own more than 280 million ha of non-forested land—more than twice the amount of forested land owned by this group. Not all of this land can—or should—be forested, but planting forests on even a portion of this land (especially reforesting land where forests existed historically, including almost all of the eastern United States) could represent a substantial contribution to carbon sequestration and storage (Nave et al. 2019).

Although not causal, the differences between participating, familiar, and unfamiliar landowners offer some potential

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