

Pennsylvania's Private Forests:
2010 Private Forest Landowner Survey Summary

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Executive Summary

In 2006, the Pennsylvania Department of Conservation and Natural Resources' Bureau of Forestry partnered with the Human Dimensions Unit at Penn State University to begin a five-year study of Pennsylvania's private forests and private forest landowners (PFLs).¹ As a result of this effort, changes are being made to the extant research methods used at the state and national level in exploration of private forest issues. Additionally, and beginning with this report, results from this research will provide Pennsylvania stakeholders with important and accurate information about the PFL population, current management of Pennsylvania's private forests, and the future of Penn's Woods.

Results of this study indicate there are 738,000 PFLs in Pennsylvania – a substantially higher number than previously thought and one that raises questions about trends of parcelization and fragmentation across the State. PFLs own their forestland for a diverse set of reasons, the most popular of which include solitude, enjoyment of owning forestland, and enjoying wildlife. Still, many PFLs engage in harvesting activities – mostly for firewood, but commercial harvesting as well. Results indicate one in six (or approximately 16%) PFLs conducted commercial harvests in the past 10 years – these owners control about one third of PA private forests. Lack of oversight by forestry professionals or management planning on such forestlands combined with a preponderance of self-described “select cuts” raises questions about the sustainability of harvests of private forestland.

Other questions remain about the ability of PA PFLs to keep forests as forests. Parcelization, fragmentation, and conversion of forestland have concerned stakeholders across the state for years. Results of this study indicate many PFLs either intend to subdivide their property or leave their forestland to multiple heirs, a process that often results in subdivision/parcelization. Little interest exists among PFLs to purchase or gift conservation easements.

Private forests in Pennsylvania, across the US, and around the globe, provide public benefits: clear air, clean water, wildlife habitat, recreational opportunities, renewable wood products, energy, aesthetic beauty, and venues for solitude and spiritual renewal. Results presented here, along with the dialogue and additional analysis of survey data, will provide stakeholders important information on the owners of these private forestlands and insights toward encouraging stewardship of Pennsylvania's private forests.

¹ The term “private forest landowners” refers to all individual, joint, family, trust, estate, business, association, and

Introduction

Forests dominate Pennsylvania's landscape. Over 16.5 million acres of forests provide clean air, protect watersheds, and host myriad species of wildlife, plants, fungi, and, increasingly, human populations. These forests are the backdrop for many of our communities, our playgrounds for outdoor activities, and a refuge where people find spiritual renewal, refreshment, and solitude.

Of these acres, PFLs control 69.4 percent or about 11.5 million acres. The individual decisions of these private owners collectively influence the future of Pennsylvania's forests and the many public benefits they provide. With funding and support from the Pennsylvania Department of Conservation and Natural Resources (DCNR), Bureau of Forestry (BoF), this study was designed to understand these owners, why they owned their forestland, what their future plans were, and what drove the numerous management decisions across the Commonwealth's private forestland.

One of the main goals of this study was to determine the accuracy of United States Department of Agriculture Forest Service (Forest Service) estimates of the overall PFL population; most recent Forest Service estimates placed the population at 533,000. Our results indicated the population was much higher – 738,000 (with a standard error of $\pm 5.9\%$). In the process of conducting this study, problems associated with Forest Service sampling and analysis methods were uncovered, explained, and addressed with a series of possible solutions. As a result of these efforts, future PFL research in Pennsylvania, and beyond, will be more accurate and precise.

A significantly higher PFL population means parcelization of forestland has been occurring at faster rates than previously believed. To preserve the myriad public benefits provided by private forests, stakeholders across the state must find ways to engage with PFLs and address further parcelization and fragmentation across the forested landscape. Particularly problematic for slowing this trend are PFLs' plans to leave their forestland to multiple heirs. While results indicate few PFLs intend to directly parcelize (5% of PFLs owning 8.3% of private forests), many intend to leave their forestland to more than one child (49.3% of PFLs accounting for 56.9% of private forests). In many instances, forestland owned by or bequeathed to multiple owners is subdivided to equally distribute assets. While the intention of PFLs who leave their forestland to multiple heirs is likely much different than those of PFLs who subdivide and sell off parts of their forestland, the resulting effect on the landscape is the same – smaller parcels of forestland, loss of forestland, reduced forest ecosystem functionality, and loss of access for recreation and timber production.

Pennsylvania's hardwoods are among the most valuable and highest quality in the world. Although most PFLs do not own their land for timber production or other income related objectives, many conduct commercial harvests. Results indicated about 30 percent of current PFLs have conducted a harvest across a self-reported 176,000 acres of private forestland. Unfortunately, many of these harvests are conducted without a forester (only 28.5% of PFLs report hiring a forester) or management plan (4% of PFLs, owning 11.6% of private forests have management plans in place), and most were described by a majority of PFLs (54%) as having "cut a few, select, large trees." In addition, the occurrence of timber

harvests were significantly related to the area of forestland owned: PFLs with larger properties were more likely to harvest than those with smaller holdings. Given PFLs' descriptions of harvests, the lack of oversight from forestry professionals during harvests, and the continued parcelization of forestland, the sustainability and frequency of harvests in the state are both likely in decline.

Pennsylvania forests, private and public, are exploited as sources of energy production via wind, biomass, and natural gas development. Although PFLs indicated relatively little interest in harvesting for biomass (or allowing harvests that did not solely focus on dead/dying trees), there was widespread willingness for wind development, especially when PFLs and/or their communities benefited directly from the energy production. Natural gas development has already been significant on private lands. Over a quarter of PFLs (25%, owning 35% of private forests) reported having entered or were considering entering a legal agreement regarding natural gas. While few PFLs reported problems or impacts of gas development, the vast majority believed landowners in their county were unprepared for the development about to happen. Efforts should be made to ensure any energy development on private land protects forest ecosystem functionality and does not compromise the myriad other benefits provided by forests for PFLs and other Pennsylvanians (e.g., clean air, clean water, wildlife habitat).

PFLs as a group were older (average age 59) and very conservative (52% reported being conservative or moderately conservative, 34% moderate, and only 14% liberal or moderately liberal). They were well educated, many held advanced degrees, and they had higher than average incomes (when compared with aggregate state averages). Many engaged directly with their forestland, even absentee PFLs. Firewood cutting was very common – over half of all PFLs had done so at least once – and there was great concern and care for wildlife, wildlife habitat, and the effects of various activities on wildlife. The latter two issues (i.e., firewood and wildlife) are areas where stakeholders and PFLs might find easy connections and conversations.

Stewardship of Pennsylvania's forests lies in the hands of nearly three quarters of a million PFLs. This summary is a first step toward understanding who these owners are, why they owned their forestland, and what their future plans might be. Findings reported here will help detail the values and attitudes of these PFLs, their desired sources of information, and their receptiveness to a variety of efforts to promote forest stewardship. Continued analysis will focus on regional variation among the PFL population and more detailed modeling of PFL behaviors and decision-making processes.

A short note about methods

This study, originally designed to track private forest changes over time, began in 2006 and involved three waves of surveys to PFLs. In the past, the Forest Service has largely conducted monitoring of statewide forest characteristics and ownership trends. In conjunction with the Forest Inventory and Analysis (FIA) program, designed to monitor forest cover and condition, PFL attitudes, behaviors, and values are annually measured through the National Woodland Owner Survey (NWOS). In turn, these responses are used to estimate the size of the PFL population, the distribution of forestland by property size, and numerous other characteristics of private forest landownership (Butler, Leatherberry, and Williams 2005).

While the NWOS provided statewide statistics on PFLs and private forest management, some Pennsylvania stakeholders, including the BoF, saw a need for increased accuracy/precision of these statistics as well as sub-state, regional analysis of similar trends. The NWOS did not provide enough sampling intensity to meet these needs. As well, no one had questioned whether or not their research methods were sound. At the outset, this study, in order to provide more detailed PFL information, followed NWOS methods for drawing the sample and conducting subsequent analysis, but increased sampling intensity to achieve more precise results. Here, approximately 200 PFLs were sampled in each county, or about 14,000 PFLs statewide, compared to the NWOS sample size of just under 3,000 statewide (Butler 2008). As the first two rounds of surveys were completed, anomalies in the data began to reveal errors in NWOS sampling and estimation methods. While our effort to dramatically increase sample size should have increased precision, the NWOS methods yielded the opposite – the larger our sample, the worse our estimates became. As a result, a series of time intensive investigations began. This exploration of the methods used revealed serious errors with sampling design and estimation equations within the NWOS.

These findings, detailed in Metcalf (2010) and Metcalf et al. (2012) and summarized below, led to immediate changes in our sampling design and estimation procedures. While this meant results from the third and final round of this study would be accurate, it forced us to, in part, abandon the longitudinal study design since population and other estimates from the 2006 and 2008 surveys could not be fully validated nor compared with the data developed in 2010.² This was a frustrating process of trial, error, experimentation, and evolution, but the discoveries uncovered will improve PFL research everywhere and provide confidence in the results provided here and by future analysis.

Errors with Forest Service methods

Analysis of survey data from 2006 and 2008 suggested errors in Forest Service methods of sampling and estimating PFL population parameters. In summary, the first error regarded the estimation equation used to produce all estimates of PFL characteristics including total population size and all variable frequencies and means. As explained in Metcalf et al. (2012), PFLs are selected for the survey sample using random points placed over forestland in the state. As a result, PFLs owning larger properties are more likely to be included in the sample.

To generate unbiased estimates of PFL population characteristics, these unequal inclusion probabilities must be accounted for in the estimation process. The Forest Service's equation and methods for calculating these probabilities and controlling for them are flawed, thus introducing bias into resulting estimates.

The magnitude of this bias was significantly related to sample size – the larger the sample size, the larger the bias. Since this study of Pennsylvania's PFLs used a substantially larger sample size than the NWOS, the bias in our initial results was very large. Because NWOS sample sizes are much smaller, this error did

²² This report contains summary statistics from only the 2010 survey of PFLs. Inferential summary statistics are not possible for data collected in 2006 or 2008, nor is comparative analysis possible among 2006 or 2008 data and 2010 data. However, directional change in variables (although not magnitude) will be possible in future analysis between years 2006, 2008, and 2010 data.

not likely bias their results as dramatically (although this cannot be fully determined due to unavailable historical records prior to 2000). The sampling and estimation procedures for the 2010 portion of this study of PA PFLs were modified after this error was discovered and described; as a result, unbiased, substitute methods were developed.

The second error with Forest Service methods, however, has major implications for NWOS results generated after 2000 – this study of Pennsylvania PFLs was unaffected. In 2000, FIA/NWOS implemented the Enhanced FIA sampling design using a “grid” of hexagons to spatially distribute FIA plots more evenly across the landscape. One FIA/NWOS plot was placed in each hexagon. Using spatially explicit land use/land cover, each point was then categorized as having fallen on forestland or non-forestland. Using property records, owners of all forested points were identified. Only points falling on private forestland were used to select PFLs for inclusion in the NWOS.

Under this protocol, hexagons with low levels of private forest cover were unlikely to contribute a PFL to the sample while hexagons with high levels of private forest cover were very likely to contribute a PFL to the sample. Our analysis across 20 PA counties (ranging from very urban to very rural) indicated a significant relationship between private forest cover within hexagons and characteristics of the PFL population, specifically population size (Metcalf 2010). Hexagons with less forest cover tended to have higher populations of PFLs (many owners with smaller properties) while hexagons with more forest cover tended to have lower populations of PFLs (few owners with larger properties). Thus, the NWOS sampling protocol has been systematically excluding PFLs with small properties from their sample.

Consequently, Forest Service estimates of population size have been significantly biased downward and estimates of PFL population characteristics have been biased toward those PFLs owning larger properties. Since our study of Pennsylvania PFLs did not rely on a grid system to spatially distribute sampling points, this bias did not affect results presented here.

2010 PA PFL Survey Methods

PFLs were identified for the 2010 sample using spatially random points generated over the private forestland of each Pennsylvania County.³ Owners “under” each point were identified using tax assessment and/or GIS ownership records acquired from the appropriate county courthouse. Mailing addresses, drawn from these records, were used in the administration of a questionnaire during the fall of 2010 following a Tailored Design Method (Dillman 2007). Three rounds of surveys were mailed along with a reminder postcard between the first and second mailing. Subsequent mailings were discontinued if/when a survey was returned by the property owner or the owner contacted us and asked to be removed from the study. Penn State Office of Research Protections approved all survey methods and instruments.

Survey results were analyzed from two perspectives: PFLs and private forestland. For example, with respect to posting forestland, results were calculated to estimate both how many PFLs posted their property *and* how many acres of forestland were owned by PFLs who posted their property. PFL statistics were estimated using equations provided in Metcalf et al. (2012). Private forestland statistics

³ Philadelphia County was excluded as it contains less than 0.01% of the private forestland in Pennsylvania.

were estimated using standard statistical estimation methods while including all points (i.e., not excluding instances where more than one point fell on the same property). Survey results were entered into SPSS Data Entry software and analyzed using a combination of PASW 18 and R 2.15.1.

Due to the stratified nature of the sample, standard error calculations for any given estimate must be calculated at the county level and summed across any estimation unit of interest (e.g., region, state) – a time consuming task. Thus, standard error estimates are not included with most results reported here. These estimates will be included in subsequent analyses of specific topics and are available upon request to the authors.

Results

Response rate

Surveys were sent to approximately 100 PFLs in each Pennsylvania County⁴, with the exception of Philadelphia County; a total of 6,862 surveys were mailed. Some surveys were returned because addresses were incorrect (367), PFLs were deceased (46), the owner said they did not own at least one acre of forestland (150), the owner identified as forest industry (5) or public (2), or the owner reported having sold their forestland (14). Surveys returned by PFLs totaled 3,331 – resulting in a final adjusted response rate of 53.1 percent.

PFL population size

Forest Service estimates of the PFL population size have remained relatively constant over the past 30 years. In 1978, the estimate was 492,800 (Birch 1996). By 1994, that number had increased 4.3 percent to 513,900 (Birch 1996). In 2004, the estimate reached 533,000, increasing 3.7 percent over ten years and just over eight percent in 26 years. We believe the combination of errors in the Forest Service equation and the changes in PFL sampling associated with the Enhanced FIA (implemented in 2000) have contributed to a slight overestimation of the PFL population size prior to 2000 and a significant underestimation after 2000. Past results cannot be corrected without access to complete NWOS data sets. Our results indicate there are currently 738,048 PFLs in Pennsylvania, with a standard error of 5.9 percent ($\pm 43,344$ PFLs).

Average forestland holding among these Pennsylvania PFLs was 15.6 acres (± 0.9 acres). It is important to note that forestland holding was not normally distributed, but instead skewed heavily to the right. For example, there were many more PFLs who owned less than 15.6 acres of forestland and relatively few PFLs who owned significantly more (see Figure 1). As with PFLs, private forestland was not normally distributed. The average acre of private forestland in Pennsylvania is found on a property 290 acres in size. Acreage distributions are often reported using uneven acreage categories (Figure 1); however, a histogram with even acreage categories provides a better visualization of the distribution of Pennsylvania's private forestland by property size (Figure 2). PFLs owned an average of 1.86 properties,⁵

⁴ During the 2010 panel

⁵ Properties and parcels are often confused. Our questionnaire asked PFLs how many separate forested properties they owned. Adjoining parcels, owned by the same owner, may be considered a single property.

while the average acre of forestland was owned by a PFL with 3.95 parcels; PFLs owning more acres of forestland were more likely to have multiple properties than PFLs owning fewer acres of forestland.

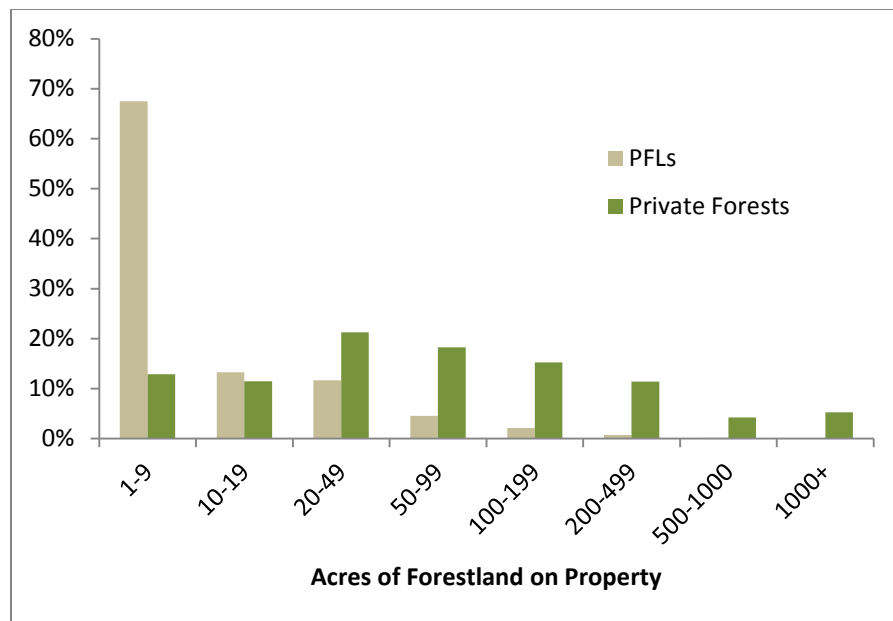


Figure 1: PFLs and private forestland by uneven acreage categories

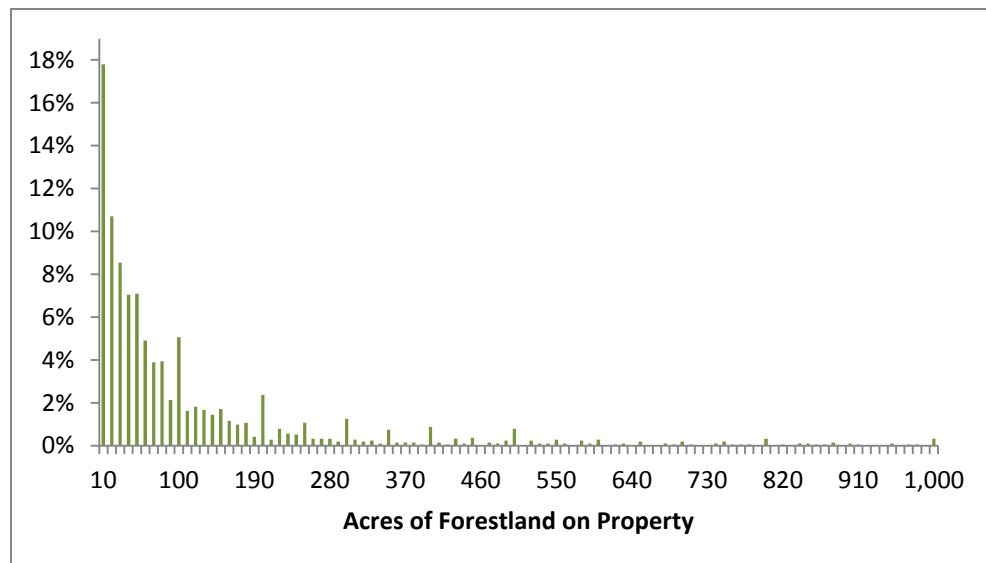


Figure 2: Histogram of private forestland distribution by property size (not including properties >1,000ac)

Absentee ownership

Absentee ownership is a challenging dynamic of forest ownership for communities, neighbors, extension/outreach, and natural resource professionals. Absentee ownership is difficult to define – it can be assessed as a matter of proximity (i.e., distance to forestland from primary residence) or frequency of visitation (i.e., how often an owner or family member visits the forestland). While absentee ownership was common, the majority of Pennsylvania PFLs lived on or within one mile of their

forestland and these owners controlled just over half of Pennsylvania's private forests. Absentee owners, when defined as those living further than 1 mile from their forestland, tended to own larger properties (mean = 21 acres) than those living on or within 1 mile of the forestland (mean = 13.6 acres).

Specifically, about half (50.1%) of all PFLs lived on their forestland and owned 45 percent of private forests (Figure 3). In addition, 62.9% lived on or within 1 mile of their forestland and owned 52.3% of private forests. PFLs living between one and 4.9 miles from their forestland accounted for 7.7% of owners and controlled 9.0% of private forests. PFLs living five to 19 miles away totaled 5.3% and owned 11.4% of private forests. PFLs living 20 to 99 miles away totaled 10.3% and owned 12% of private forests. Those PFLs living over 100 miles from their forestland accounted for 13.7% of the population and owned 15.3% of private forests. In general, these data suggest that the larger a property, the more likely it was to be owned by an absentee owner.

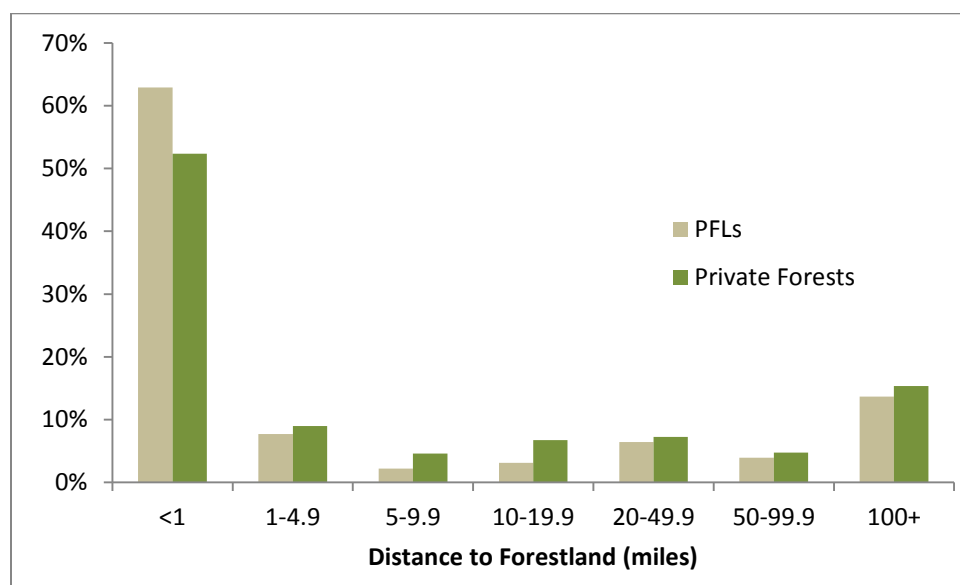


Figure 3: PFLs and private forests by distance to forestland categories (miles)

Despite absenteeism, Pennsylvania PFLs frequently visited their forestland. While most PFLs lived on their forestland, many visited regularly: 14.2% visited at least once per week, 9.8% visited at least monthly, and 18.6% visited several times per year. Regularly visiting PFLs controlled 17.3, 13.1, and 18.2% of private forests, respectively. Very few (2.4%) PFLs visited once per year, 3.4% visited less than once per year, and hardly any (1.4%) reported never visiting their forestland. These owners controlled 2.5, 3.1, and 0.8% of private forests, respectively.

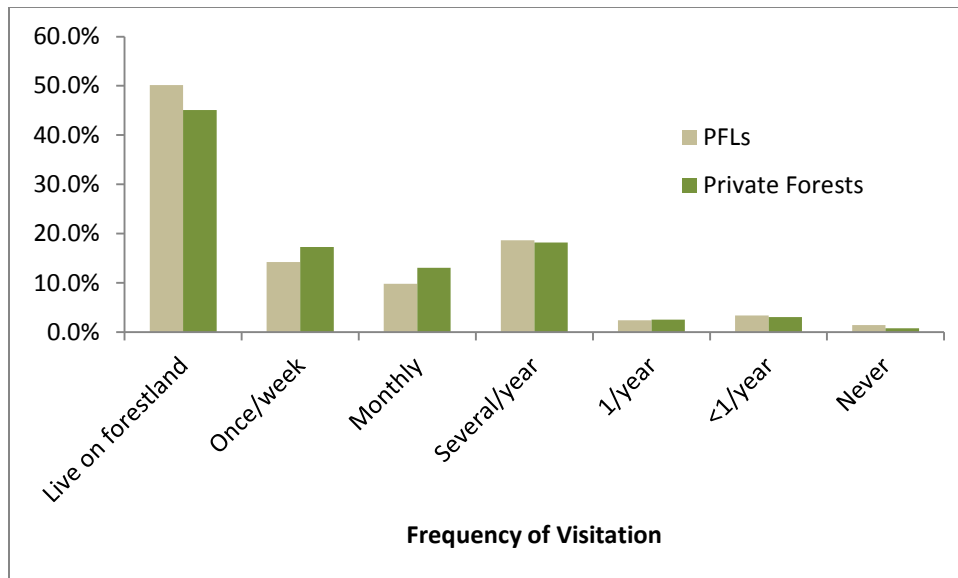


Figure 4: Frequency of forestland visitation among PFLs and private forests

Ownership Objectives

PFLs owned their land for a variety of reasons and often balanced multiple, sometimes conflicting objectives. We asked PFLs to tell us how important several ownership objectives were to them using a 5-point Likert scale where 1 = “very unimportant,” 2 = “unimportant,” 3 = “neither unimportant nor important,” 4 = “important,” and 5 = “very important.” Results indicated Pennsylvania PFLs tended to own for amenity over production or income reasons. Further, while there was some relationship between ownership objectives and acreage, most private forests in the state were owned for similar reasons (Figure 5).

“To enjoy wildlife” received the highest score among PFLs (4.3), closely followed by “solitude” (4.3), “enjoyment of owning forestland” (4.2), and “camping, walking, or recreation” (3.8). “As an estate to pass on to my children” (3.6) follows along with “it came with the property” (3.5), labeled “incidental” in Figure 5. Personal uses of the property, such as “personal uses of wood, such as firewood” (3.2), “hunting opportunities” (3.1), and “Non-timber forest products” (2.7), ranked relatively low. At the bottom of the list were income related objectives such as “land investment” (2.3), “growing trees for sale” (2.2), and “income other than from selling timber” (2.2).

The order of importance among ownership objectives changed only slightly when analyzed from the private forests perspective. Those objectives with substantially more acres of private forests than PFLs included “hunting” (3.6), “growing trees for sale” (2.9), and “income other than from selling timber” (2.5). Still, relatively few acres were owned by PFLs with these objectives as compared to other objectives.

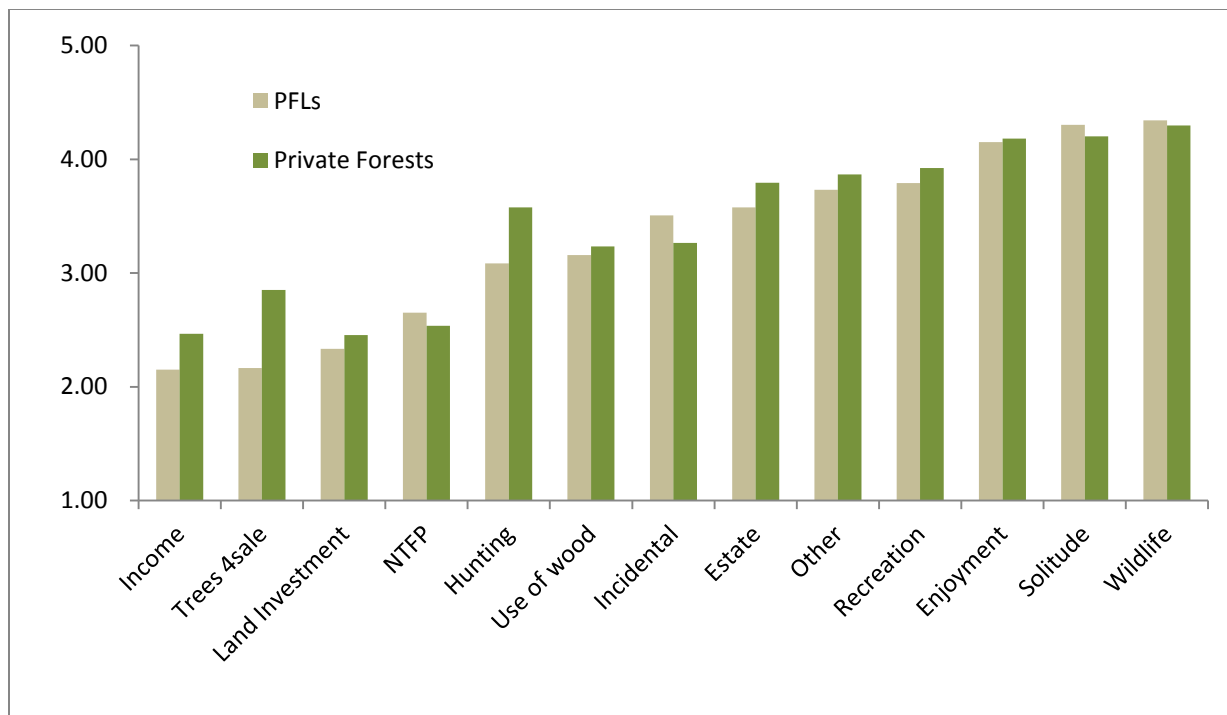


Figure 5: Mean Likert-scale scores for ownership objectives among PFLs and private forests

Table 1: Percent PFLs and percent private forests owned by PFLs by importance scores across ownership objectives

| | Very Unimportant | | Unimportant | | Neither | | Important | | Very Important | |
|---------------------|------------------|-----------------|-------------|-----------------|---------|-----------------|-----------|-----------------|----------------|-----------------|
| | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests |
| Land investment | 42% | 38% | 15% | 16% | 18% | 20% | 17% | 16% | 8% | 10% |
| Hunting | 29% | 17% | 11% | 8% | 13% | 13% | 18% | 24% | 29% | 38% |
| Other recreation | 7% | 7% | 9% | 5% | 16% | 14% | 36% | 37% | 33% | 37% |
| Grow trees for sale | 44% | 25% | 18% | 15% | 19% | 22% | 13% | 23% | 5% | 14% |
| Using wood | 15% | 16% | 13% | 13% | 31% | 23% | 23% | 28% | 17% | 20% |
| Enjoyment of owning | 5% | 5% | 3% | 3% | 10% | 10% | 35% | 33% | 47% | 49% |
| Estate for children | 13% | 11% | 5% | 6% | 25% | 16% | 25% | 29% | 32% | 39% |
| Income (non-timber) | 46% | 33% | 19% | 19% | 16% | 25% | 10% | 13% | 9% | 9% |
| Enjoy wildlife | 3% | 4% | 4% | 2% | 8% | 7% | 27% | 32% | 58% | 54% |
| Solitude | 3% | 5% | 2% | 3% | 12% | 10% | 26% | 28% | 56% | 53% |
| Incidental | 15% | 17% | 5% | 7% | 26% | 32% | 23% | 20% | 31% | 24% |
| NTPF | 27% | 27% | 15% | 19% | 33% | 32% | 15% | 15% | 10% | 6% |
| Other | 23% | 18% | 2% | 2% | 4% | 11% | 19% | 15% | 51% | 54% |

When asked to choose the most important reason for owning forestland, PFLs indicated “solitude” (18.7%) as first and “enjoyment of owning forestland” (17.8%) as second (Figure 6). Clumped for third, fourth, and fifth were “hunting” (12.7%), “it came with the property” (12.0%), and “to enjoy wildlife” (11.5%). “As an estate to pass on to my children” received 6.2%, “camping, walking, or other recreation” 5.9%, and “land investment” 3.9%. At the bottom of the list were personal uses of wood and production related objectives: “income other than from selling timber” (2.3%), “personal uses of wood, such as firewood” (1.9%), “growing trees for sale” (1.4%), and “non-timber forest products” (0.9%).

When analyzed with respect to the acres of private forests owned by PFLs who held these objectives to be most important, there were some interesting differences. “Solitude” dropped from first to third (13.0%) while “hunting” became first (18.6%) and “enjoyment of owning” second (18.3%). “As an estate to pass on to my children” (11.1%) moved from sixth to fourth. Other interesting differences included the reduced importance of “it came with the property” (6.8%) and “to enjoy wildlife” (8.3%), showing incidental ownership and non-hunting enjoyment of wildlife were more popular among PFLs with smaller properties. Further, the increased importance of “land investment” (6.5%) and “growing trees for sale” (2.9%) indicated these values were more important to PFLs with larger properties. Again, however, these income and production objectives remained low on the overall list.

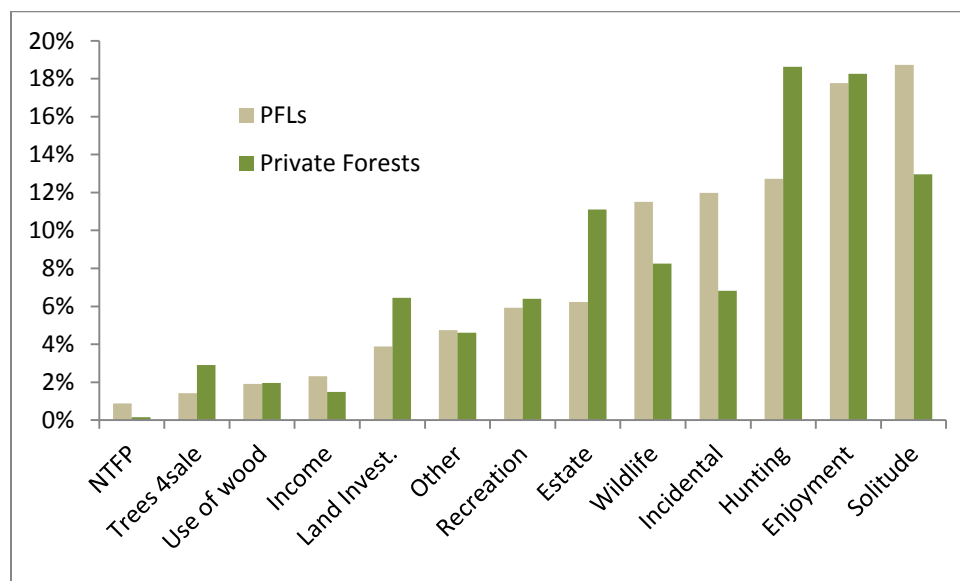


Figure 6: Most important ownership objectives among PFLs and private forests

General activities

We asked PFLs which activities they had done on their forestland and how likely they were to do each activity in the future, the former as a yes/no question, the latter with a 5-point Likert scale where 1 = “very unlikely,” 2 = “unlikely,” 3 = “neither unlikely nor likely,” 4 = “likely,” and 5 = “very likely.”

Responses to these questions very closely reflected one another with PFLs likely to do those activities they had done in the past, at least collectively. Figure 7 shows several activities and the percentage of PFLs and the percentage of private forests owned by PFLs who had done each. The most common activities included “recreate, besides hunting,” “improve wildlife habitat,” and “hunting.” Interestingly, while few PFLs and few private forest acres were owned by those who owned for timber/income related objectives, “cut trees for sale” was a fairly common activity among PFLs and on private forests. The least common activities included “erect a deer fence,” “clear trees for wind development,” and “lease to a club or organization.” Figure 8 shows future plans for these activities; future plans closely mirrored past behavior.

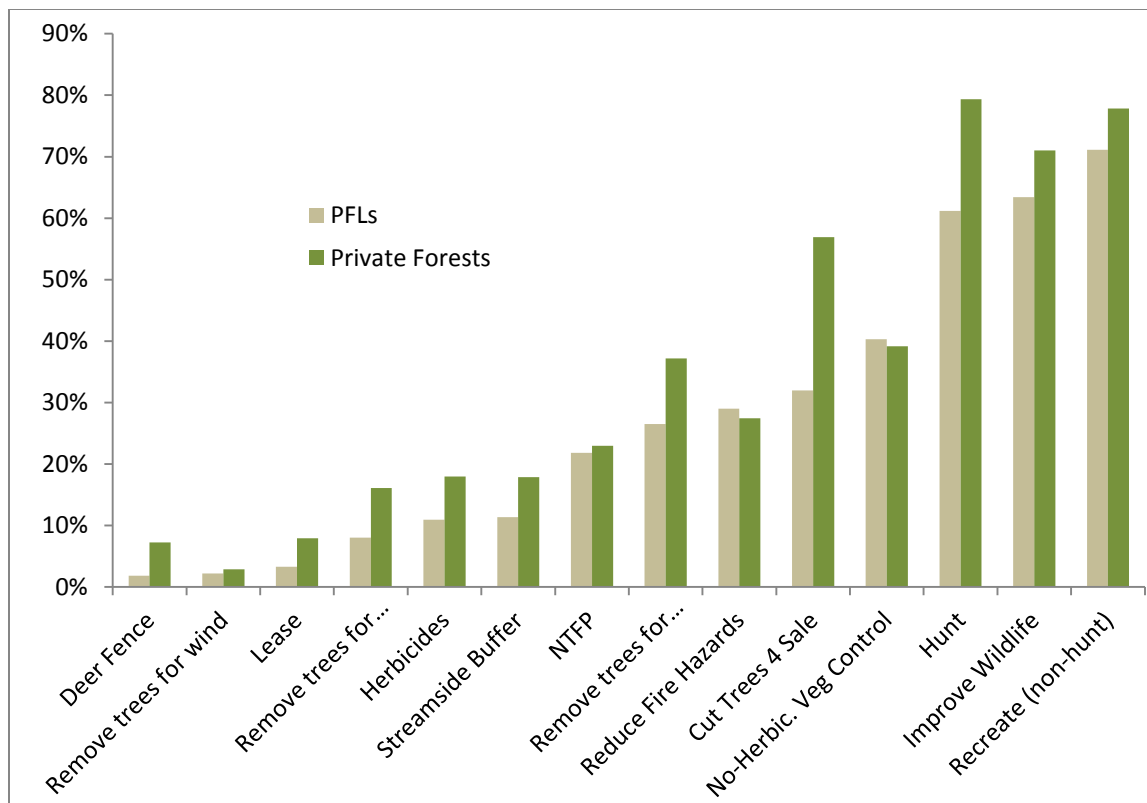


Figure 7: Activities and the percentage of PFLs and percentage of private forests owned by PFLs who have done each

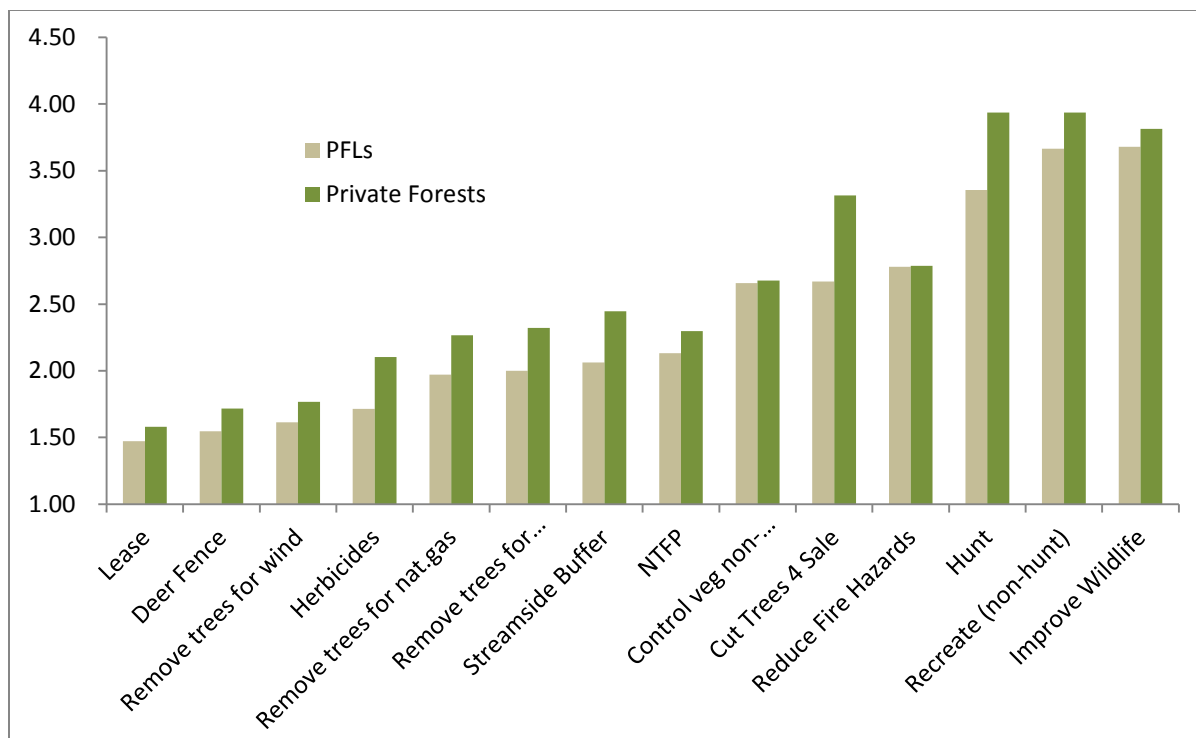


Figure 8: Mean Likert-scale scores for future plans of PFLs and private forests

Forestland attributes

Several questions asked PFLs to describe their forestland, the ownership structure, how and from whom it was acquired, and several other attributes. Results indicated 48.1% of PFLs had their primary residence on their forestland (Figure 9). These PFLs controlled 41.5% of private forests. Only 14.7% percent of PFLs indicate a farm on their forestland, yet these PFLs own 25.1% of private forests. This number was likely inflated as it was based on personal definitions and not the technical definition of “farm.”⁶ PFLs with camps on their forestland totaled 9.4% and owned 18.5% of private forests. PFLs with second homes on their forestland totaled 8.2% and owned 13.1% of private forests. Those PFLs who indicated they owned no home, farm, camp, or second home totaled 33.6% and owned 25.2% of private forests.

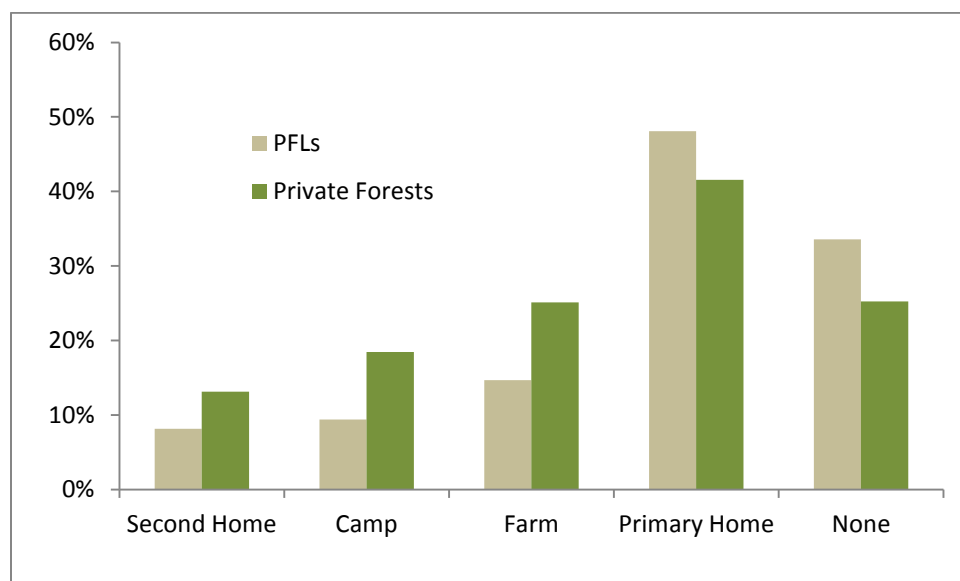


Figure 9: Percent of PFLs and the percent of private forests owned by PFLs who had a second home, camp, farm, and/or primary home and none of the above on their forestland – totals do not sum to 100% as PFLs may fall in more than one category

The plurality (44.9%) of PFLs owned their forestland jointly with a spouse and accounted for 43% of private forests (Figure 10). However, individual ownership was also common (35.8%) and accounted for 28.5% of private forests. Other types of ownership were much less common: family partnerships accounted for 6.6% of PFLs and 11.2% of private forests. No other ownership type surpassed 5% of PFLs, yet, in total, they accounted for 12.6% of PFLs and 17.3% of private forests.⁷

⁶ There are 63,163 farms in Pennsylvania accounting for 7,809,244 acres (total) and 1,717,791 acres of “woodland” (USDA Census of Agriculture 2009).

⁷ TIMOs and forestry-related corporations were excluded from this and all other analysis.

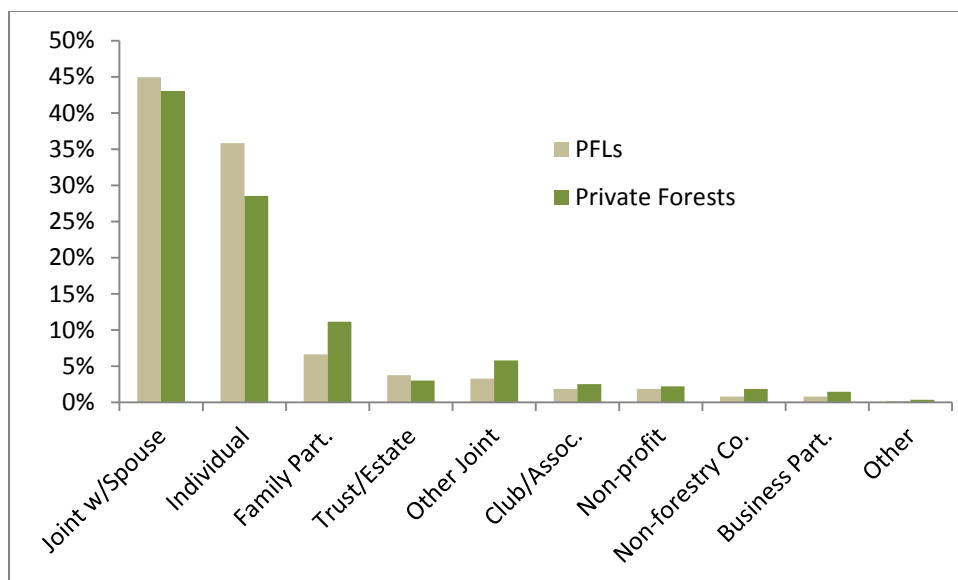


Figure 10: Percent of PFLs and private forests owned by PFLs by ownership type

The term “Family Forest Owner” has recently entered the lexicon. According to the NWOS, 94.4% of Pennsylvania PFLs were family forest owners and they owned 77.4% of private forests. We were curious about how many PFLs considered themselves family forest owners; we found that 54.7% said yes (they considered themselves family forest owners), while 45.3% said no. Those who considered themselves family forest owners owned larger properties, on average, collectively accounting for 68.8% of private forests.

Private forests owned by families was first acquired an average of 60 years ago, while those private forests acquired by the current owner occurred, on average, 19.5 years ago. The majority (72.8%) of PFLs purchased their forestland and the majority of private forests (76.3%) was purchased (Figure 11). However, a large percentage of PFLs (26.2%) inherited their forestland, accounting for 24.6% of all private forests. Another 9.6% of PFLs were gifted their forestland, accounting for 9.8% of private forests.⁸

⁸ These numbers do not total 100% as some PFLs acquired their forestland via multiple methods

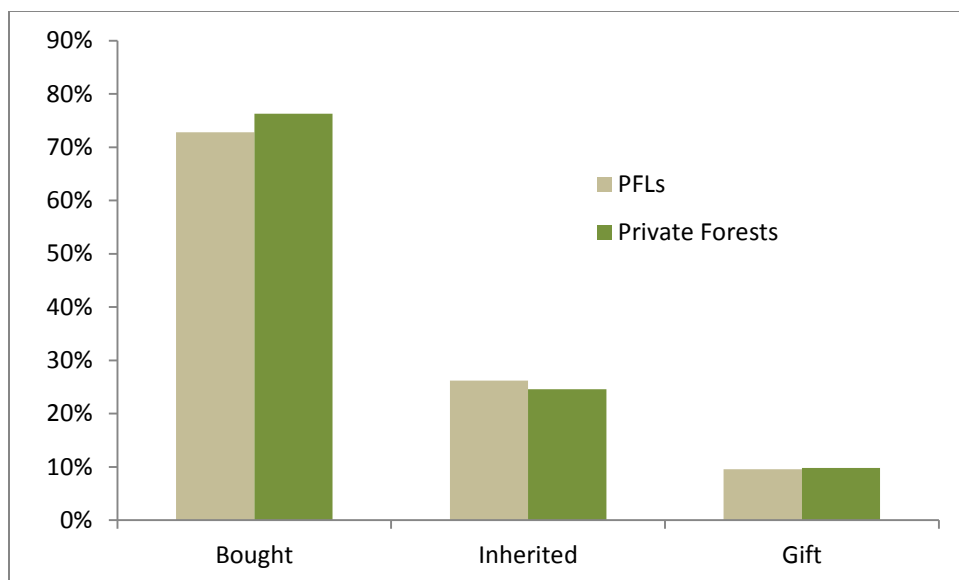


Figure 11: Acquisition of forestland among PFLs and private forests - columns do not sum to 100% as some PFLs acquired their forestland via multiple methods

The plurality of PFLs (48.4%) acquired their forestland from an unrelated individual, accounting for 43.1% of private forests (Figure 12). Still, many PFLs (41.7%) acquired their forestland from their parents, spouse, or another family member, accounting for a majority of private forests (53.1%). Other sources included developers (4.7% of PFLs, 3.9% of private forests), corporations (4.5% of PFLs, 5.5% of private forests), government (0.7% of PFLs, 1.2% of private forests), and other (3.8% of PFLs, 4.7% of private forests).

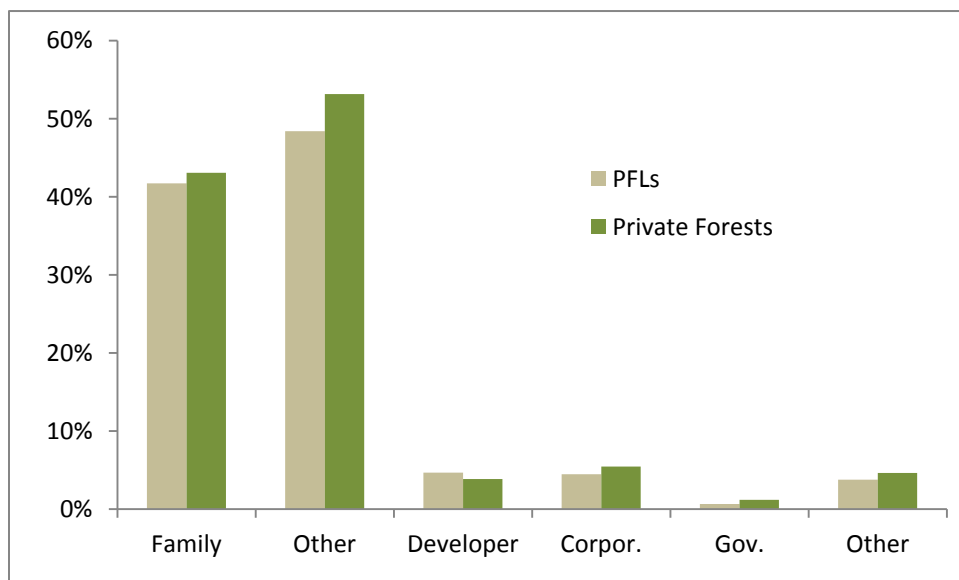


Figure 12: Source of acquisition among PFLs and private forests – columns do not sum to 100% as some PFLs acquired their forestland from multiple sources

Surface and subsurface property ownerships are sometime divided in Pennsylvania with one owner controlling the surface and another owner controlling subsurface or mineral rights. Pennsylvania PFLs owned most of the natural gas rights beneath their forestland (68.2%) and most of the coal rights (59.8%) as well (Figure 13). PFLs maintaining mineral rights tended to own larger properties – PFLs with natural gas rights owned 72.2% of private forests and PFLs with coal rights own 65.4% of private forests. Still, substantial numbers of PFLs, across many private forest acres, did not own mineral rights.



Figure 13: Percent of PFLs and private forests owned by PFLs who own natural gas and/or coal rights under their property

Sociodemographics

While the plurality of PFLs and private forests were owned jointly between spouses (44.9% and 43.0%, respectively), the majority of PFLs were male (66.9%). Still, fully a third (33.1%) was female. Despite these “hard” numbers, there was likely much influence from both genders on management decisions and future plans. Males tended to own larger properties and thus controlled 80.9% of private forests with females owning 19.1%.

Average age of PFLs was 59. Age was unrelated to acreage – the average acre of private forest was owned by a PFL 61 years old. As expected with an older population, many PFLs (32.5%) were retired (Figure 14). Retired PFLs owned 37.2% of private forests. Still, most PFLs were employed full-time (53.8%) and owned the majority of private forests (52.7%). A few PFLs were employed part time (8.1%) – they owned 6.5% of private forests. Still fewer were students (0.5%), homemakers (3.6%), and not employed⁹ (1.5%) – they owned 0.1, 1.8, and 1.7% of private forests, respectively.

⁹ Non-employed includes unemployed and looking, unemployed and not looking, and those laid off

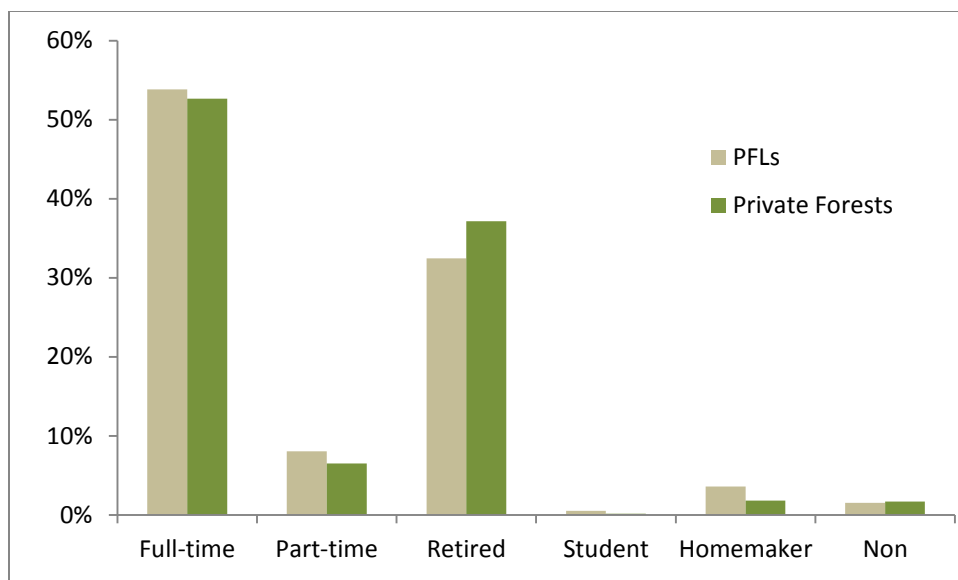


Figure 14: Percent of PFLs and private forests owned by PFLs by employment status

PFLs were fairly well educated (Figure 15). While the plurality had only a high school diploma or GED (26.5%) or less (4.7%), many had an advanced degree (23.7%), a bachelor degree (19.9%), or a technical or associates degree (14.7%). In addition, a few (10.8%) had some college experience, but no degree. Those with a high school diploma or GED owned 28.5% of private forests, while those with less owned 5.3%. PFLs with some college, but no diploma, owned 12.2% of private forests, while those with technical or associate degrees owned 11.9%, those with a bachelor degree owned 21%, and those with advanced degree(s) owned 21.1% of private forests.

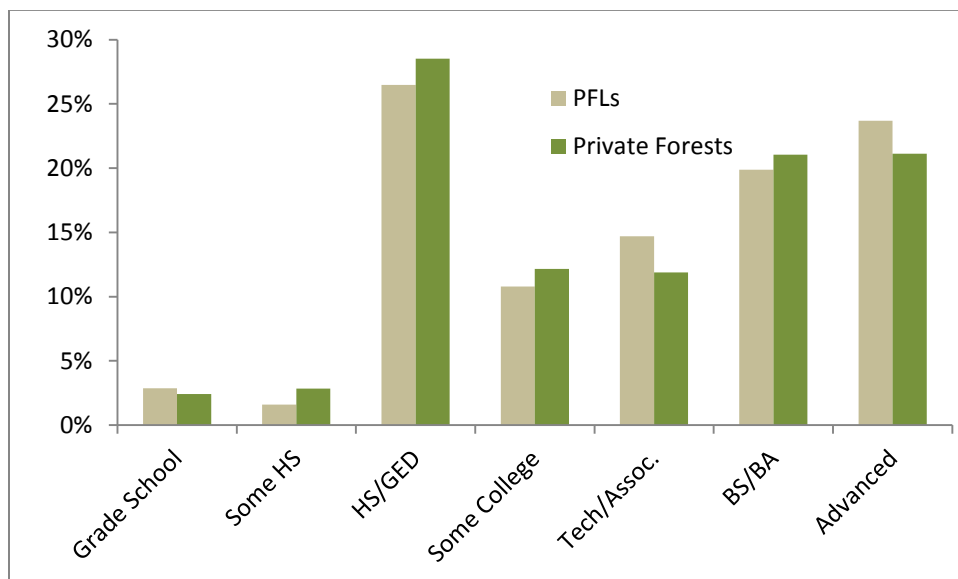


Figure 15: Percent of PFLs and private forests owned by PFLs by education level

The vast majority of PFLs (77.5%) are currently married; they owned 81.2% of private forests. Relatively few were divorced (9.9%), widowed (8.9%), or not married (3.7%). These PFLs owned 7.4, 7.2, and 4.2% of private forests, respectively.

While the plurality of PFLs (34.4%) considered themselves moderate, many considered themselves moderately conservative (27.7%) or conservative (24.5%). Very few PFLs considered themselves moderately liberal (10%) and fewer still considered themselves liberal (3.4%). Acreage of forestland owned tended to parallel political orientation – a full third of private forests were owned by conservative PFLs (33.0%) and another 29.4% were owned by moderately conservative PFLs. Moderate PFLs owned 26.6% of private forests, while moderately liberal PFLs owned 7.8% and liberal PFLs owned 3.3%.

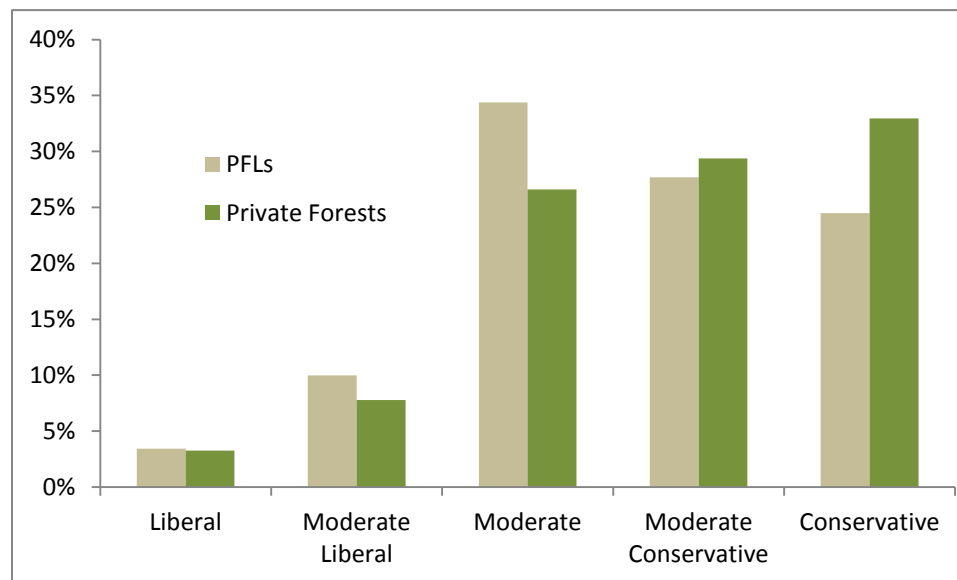


Figure 16: Percent PFLs and private forests owned by PFLs by political orientation

PFLs lived an average of 32 years in their present community.¹⁰ Acreage was related to years in present community – the average acre of private forestland was owned by a PFL who had lived in their present community 41.5 years.

PFLs derived income from a variety of sources (Figure 17). Most PFLs (64.2%) received wage income – these PFLs owned 57.6 % of private forests. Social Security provided income for 36.5% of PFLs – they owned 40.0% of private forests. Pensions supported 27.0% of PFLs who owned 30.2% of private forests. Over a third of PFLs (35.6%) derived income from interest and/or investments – they owned almost half of private forests (45.7%). Nearly a quarter of PFLs (22.6%) earned income from a business – they owned nearly a third of private forests (32.3%). Rentals provided income for 14.8% of PFLs who owned 24.5% of private forests. PFLs deriving income from other sources, including supplemental security income, disability benefits, unemployment, food stamps, public assistance/welfare, and others, totaled 13.6% and owned 10.6% of private forests.

¹⁰ Includes both absentee and resident PFLs

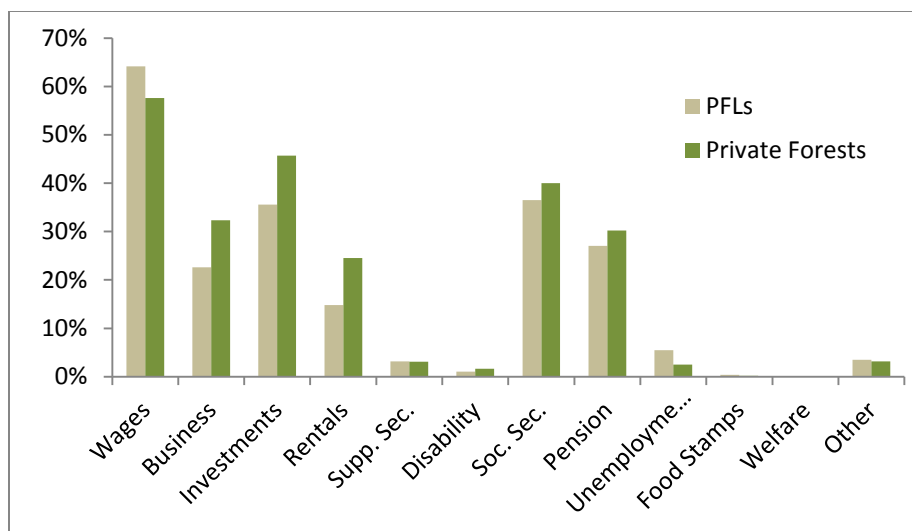


Figure 17: Percent PFLs and private forests owned by PFLs by income sources – columns do not total 100% as some PFLs derive income from multiple sources

Household income among PFLs was, on average, fairly high (Figure 18). Few PFLs (2.2%) earned less than \$15,000/year – they owned 2.8% of private forests. Those who earned \$15,000 to \$24,999 per year (8.6%) controlled 5.7% of private forests and those who earned \$25,000 to \$34,999 per year (7.5%) held 8.3% of the private forest, respectively. A few more earn \$35,000 to \$49,999 per year (13.9%) and \$50,000 to \$74,999 per year – they owned 12.9 and 19.6% of private forests, respectively; however, just shy of half (49.9%) of PFLs earned \$75,000 or more and owned just over half (50.6%) of private forests. Those PFLs earning \$75,000 to \$99,999 totaled 16.0% and owned 14.8% percent of private forests and PFLs earning \$100,000 to \$149,999 totaled 18.5% and owned 16.4% of private forests. The top earning PFLs, those who earned \$150,000 or more, totaled 15.4% and owned 19.4% of private forests.

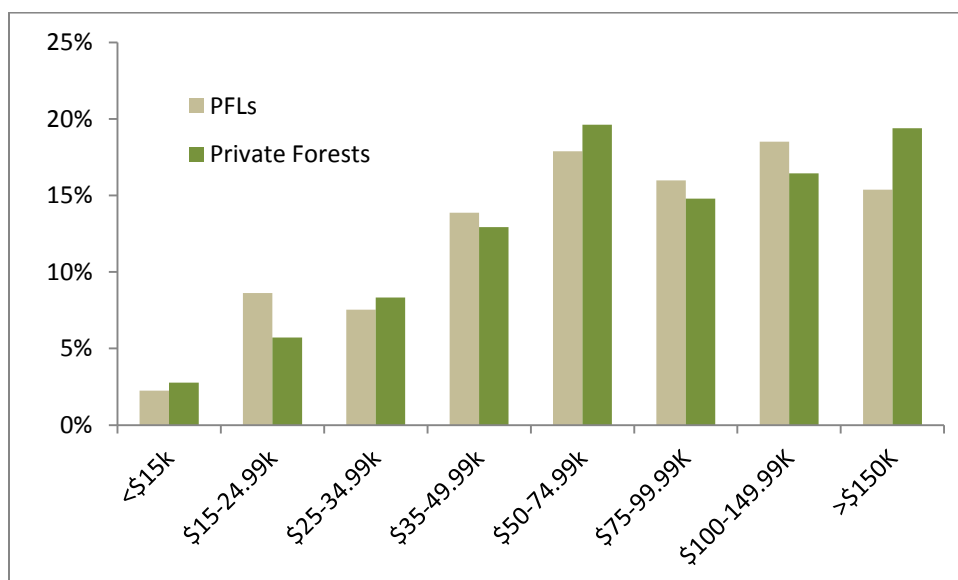


Figure 18: Percent PFLs and private forests owned by PFLs by income categories

Harvesting

Anecdotal evidence has suggested PFLs often conduct a harvest prior to sale of a property to extract timber value before divesting of the land. We asked PFLs if trees were cut from their forestland before they obtained it (within about 5 years of their acquisition). Over a quarter of PFLs (27.7%) responded affirmatively, representing over a third (35.4%) of private forests. This is not to say that 35% of private forests were harvested. First, these acquisitions took place over a long time span – from recent to long-ago purchases. Second, while PFLs may have indicated their forestland was harvested prior to acquisition, that does not necessarily mean every acre was harvested.

PFLs willingness to harvest trees is high (Figure 19). Nearly half of PFLs were willing (35.8%) or very willing (12.9%) to cut trees on their forestland. These PFLs owned well over half of private forests – willing PFLs owned 42.6%, very willing PFLs owned 19.8%. Those neither unwilling nor willing represented 22% of the PFL population and own 19% of private forests; however, over a quarter of PFLs were unwilling (16.0%) or very unwilling (13.3%) to cut trees. These owners controlled 9.5 and 9.0% of private forests, respectively. While these numbers are promising for harvesting statewide, county-based analysis indicated wide regional variation in attitudes among PFLs and biophysical constraints, both of which combine to limit access to private forests for wood products (Metcalf et al. 2011).

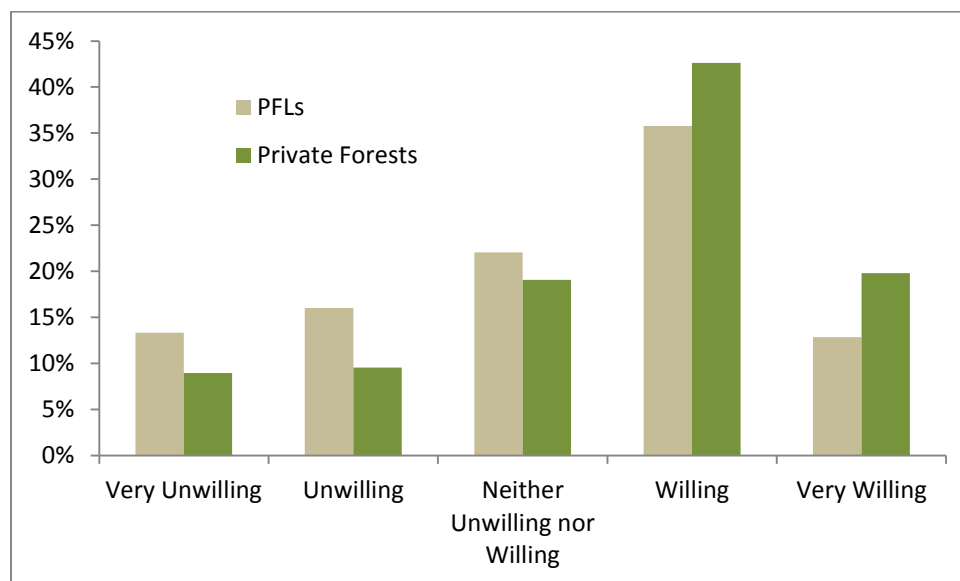


Figure 19: Percent of PFLs and private forests owned by PFLs by willingness to cut trees on their forestland

Cutting trees for firewood was popular among Pennsylvania PFLs. Over half (55.5%) of PFLs had cut firewood and they owned nearly two thirds (65.9%) of private forests. The vast majority of those PFLs who cut firewood (97.5%) cut solely for personal use. Only 1.3% of owners cut firewood for both sale and for personal use and 1.2% cut firewood solely for sale. Most PFLs (53.1%) who cut firewood did so each year. The remaining cut firewood either every two to four years (20.6%), once every 5 years (13.8%), or only once since acquiring their forestland (12.4%). Those who cut firewood for personal use, cut an average of 3.5 cords per year. Those PFLs who cut firewood for both sale and for personal use cut

an average of 21 cords total, 7 for personal use and 14 for sale. Those PFLs who cut firewood solely for sale cut an average of 6.8 cords.

Commercial harvests were conducted by 30.8% of PFLs. These PFLs owned 51.7% of private forests. This does not mean half of all private forests had been harvested by current owners as harvests were rarely conducted across entire properties. PFLs who harvested commercially had done so on an average of 49.1% of their forestland. When limited to harvests in the past 10 years, only 15.9% of PFLs had conducted commercial harvests. These recently harvesting PFLs owned 32.6% of private forests, yet reported only harvesting an average of 47.0% of their forestland. Our survey results indicated 15.3% of private forests, some 1,762,796 acres, had been commercially harvested in the past 10 years, suggesting about 176,000 acres per year were harvested.

Prior to cutting trees, PFLs received advice from a variety of sources (Figure 20). Foresters and loggers provided the vast majority of input (44.6% and 44.9%, respectively); however, those PFLs who received advice from foresters tended to own larger tracts of forestland and collectively controlled over half of the private forests owned by harvesting PFLs (53.6%). Those PFLs receiving advice from loggers owned 39.5% of private forests owned by harvesting PFLs. One-fifth (20.0%) of harvesting PFLs received no advice prior to cutting. These PFLs held 18.7% of private forests owned by harvesting PFLs. Other sources of advice sought by harvesting PFLs included other PFLs (10.3%), friends (10.0% of PFLs), family (9.5%), and neighbors (8.7%). PFLs receiving advice from these sources owned 10.3, 9.7, 12.8, and 5.8% of private forests owned by harvesting PFLs, respectively. Institutional advice reached relatively few harvesting PFLs [BoF (7.0%), Penn State Extension (3.3%), and other government (0.4%)]. PFLs receiving advice from these sources owned 9.7, 4.6, and 1.4% of private forests owned by harvesting PFLs, respectively. Other sources of info were used by 3.3% of PFLs – they owned 5.1% of private forests owned by harvesting PFLs.

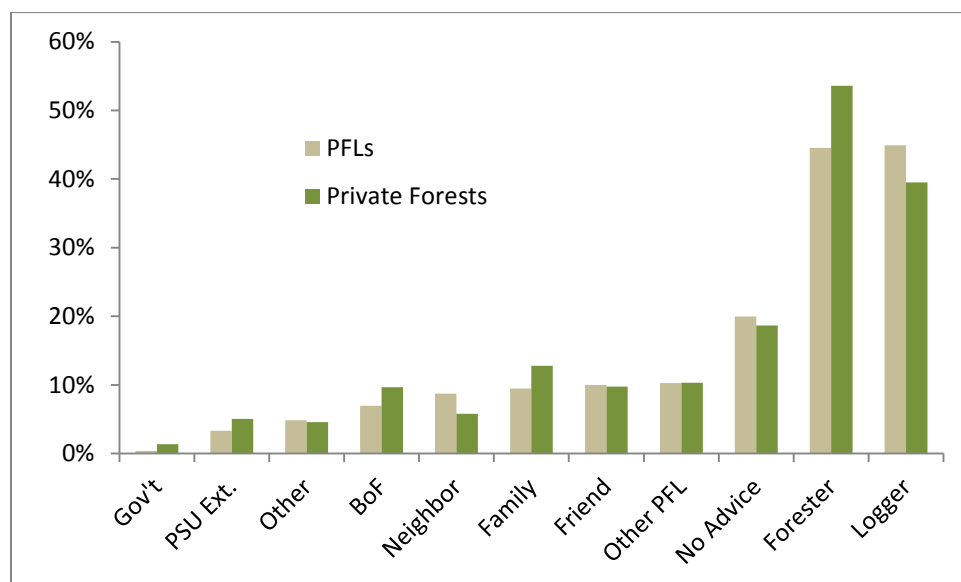


Figure 20: Percent PFLs and percent of forestland owned by harvesting PFLs who received advice, prior to cutting, by source

PFLs managed their harvests in a variety of ways (Figure 21). Almost half of harvesting PFLs (47.1%) sold timber directly to a logger; these PFLs owned 37.1% of private forests owned by harvesting PFLs. Only 28.5% of harvesting PFLs hired a forester; these PFLs owned 34.5% of private forests owned by harvesting PFLs. About a quarter of harvesting PFLs (26.1%) sold the timber directly to a timber company; these PFLs owned 22.8% of private forests controlled by harvesting PFLs. Some harvesting PFLs (16.6%) managed the harvests themselves; these PFLs owned 19.0% of private forests owned by harvesting PFLs.

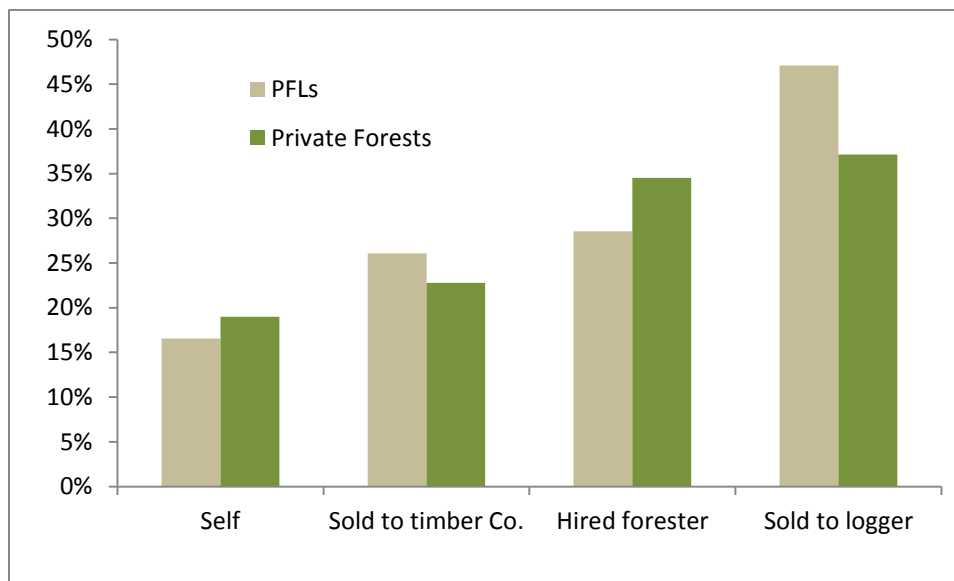


Figure 21: Percent harvesting PFLs and private forests owned by harvesting PFLs by harvest management type

When asked to describe the harvests on their forestland, 3.1% of harvesting PFLs chose “clearcut;” these PFLs owned 5.6% of private forests owned by harvesting PFLs (Figure 22). Very few harvesting PFLs (0.6%) chose “cut small trees, but left large trees;” they owned 2.0% of private forests owned by harvesting PFLs. A few more harvesting PFLs (13.7%) chose “cut trees of all sizes, but left a lot of trees;” these PFLs owned 22.9% of private forests owned by harvesting PFLs. Over a quarter of harvesting PFLs (28.2%) chose “cut most of the large trees;” these PFLs owned 27.5% of private forests owned by harvesting PFLs. The majority of harvesting PFLs (54.2%) chose “only cut a few select, large trees;” these PFLs owned 42.0% of private forests owned by harvesting PFLs.

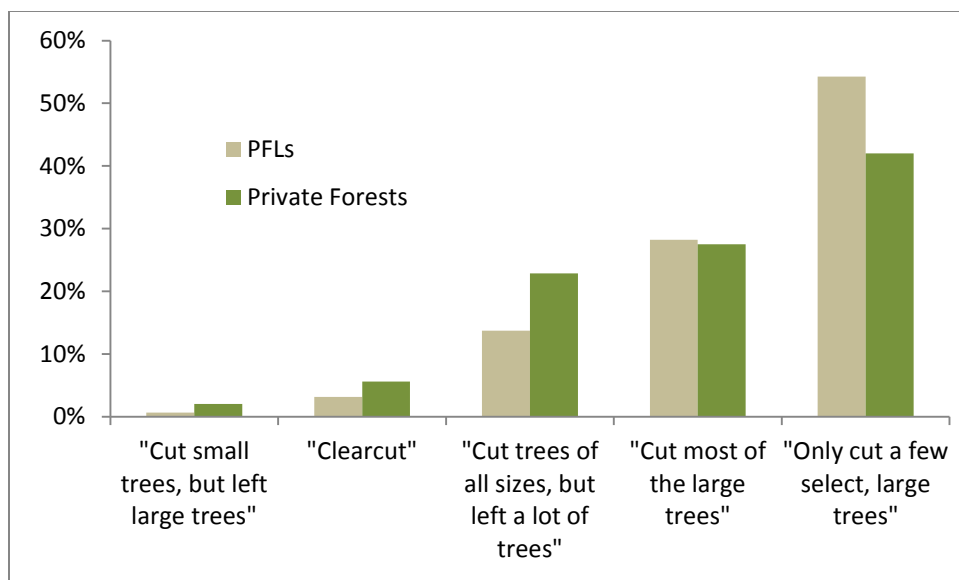


Figure 22: Percent harvesting PFLs and private forests owned by harvesting PFLs by harvest description

Regardless the description of harvest methods, most harvesting PFLs (45.7%) said they were “happy” with the outcome of their harvest(s); these PFLs owned 45.8% of private forests owned by harvesting PFLs. Another 19.9% of harvesting PFLs said they were “very happy” with the outcome of their harvest(s) and they accounted for 26.5% of the private forests owned by harvesting PFLs. Nearly a quarter of PFLs (23.0%) said they were “neither unhappy nor happy” with the outcome of their harvest(s); these PFLs owned 17.5% of private forests owned by harvesting PFLs. Few of those PFLs who harvested (7.3%) said they were “unhappy” with the outcome of their harvest(s); these PFLs owned only 5.3% of private forests owned by harvesting PFLs. Even fewer harvesting PFLs (4.1%) said they were “very unhappy” with the outcome of their harvest(s); these PFLs owned 4.9% of private forests owned by harvesting PFLs.

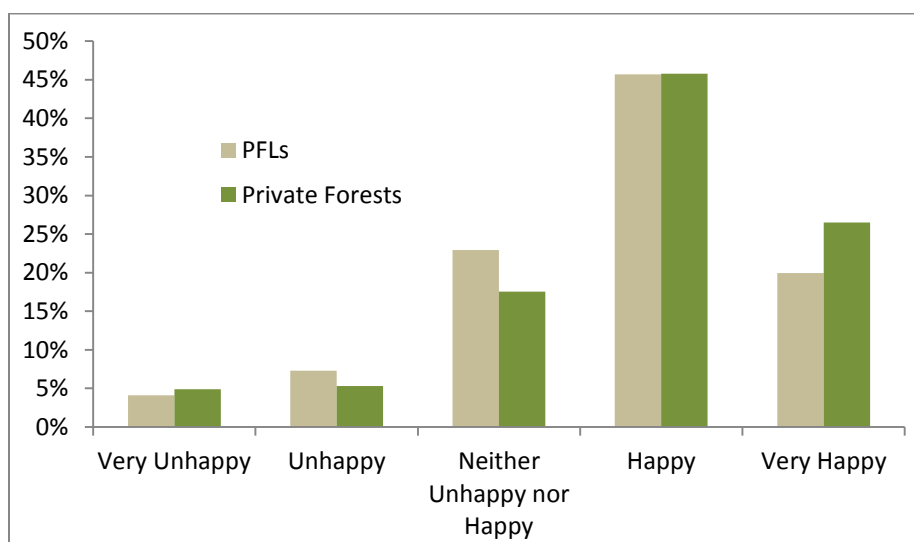


Figure 23: Percent harvesting PFLs and private forests owned by harvesting PFLs by satisfaction with harvests

Plans to harvest trees in the future vary among PFLs. We asked PFLs to report the likelihood, on a 5-point Likert scale, of conducting a variety of types of harvests: sawlogs for sale or personal use, firewood for sale or personal use, veneer for sale, pulpwood for sale, or posts for personal use (Table 2). Across most of these categories, a majority of PFLs chose “very unlikely;” however, PFLs likely or very likely to harvest tended to hold larger acreages and therefore controlled substantial portions of Pennsylvania’s private forests (Table 2). While the majority of PFLs (66.2%) were unlikely or very unlikely to harvest sawlogs for sale, those PFLs likely or very likely to do so owned 43.2% of private forests. Similarly, although 69.1% of PFLs were unlikely or very unlikely to harvest veneer logs for sale, PFLs likely or very likely to do so owned 36.4% of private forests. Harvesting both pulpwood and firewood for sale were unlikely or very unlikely among significant majorities of PFLs (78.7 and 77.4%, respectively) and even those PFLs likely and very likely to do so owned relatively small proportions of private forest (19.2 and 14.1%, respectively). Continuing the trend, most PFLs (64.3%) were unlikely or very unlikely to harvest sawlogs for personal use; PFLs likely or very likely to do so owned 18.3% of private forests. Posts for personal use were unlikely or very unlikely to be cut by 63.1% of PFLs; PFLs likely or very likely to cut posts for personal use owned only 16.9% of private forest. The only harvesting likely or very likely to be done by a majority of PFLs (52.0%) was cutting firewood for personal use, these PFLs owned 62.9% of private forests. Figure 24 shows mean Likert scores for each type of harvest.

Table 2: Percent PFLs and private forests owned by PFLs by likelihood to conduct different types of harvests

| | Very Unlikely | | Unlikely | | Neither Unlikely nor Likely | | Likely | | Very Likely | |
|-------------------------------|----------------------|-----------------|-----------------|-----------------|------------------------------------|-----------------|---------------|-----------------|--------------------|-----------------|
| | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests |
| Cut sawlogs for sale | 56% | 32% | 11% | 11% | 14% | 14% | 13% | 23% | 7% | 20% |
| Cut veneer logs for sale | 57% | 35% | 12% | 14% | 14% | 15% | 12% | 19% | 5% | 17% |
| Cut pulpwood for sale | 62% | 44% | 16% | 18% | 12% | 18% | 7% | 11% | 2% | 8% |
| Cut firewood for sale | 63% | 50% | 15% | 21% | 15% | 16% | 5% | 7% | 2% | 7% |
| Cut firewood for personal use | 26% | 18% | 8% | 8% | 14% | 10% | 24% | 22% | 28% | 41% |
| Cut sawlogs for personal use | 48% | 42% | 16% | 19% | 19% | 20% | 9% | 10% | 8% | 8% |
| Cut posts for personal use | 48% | 45% | 15% | 19% | 18% | 19% | 13% | 10% | 6% | 7% |

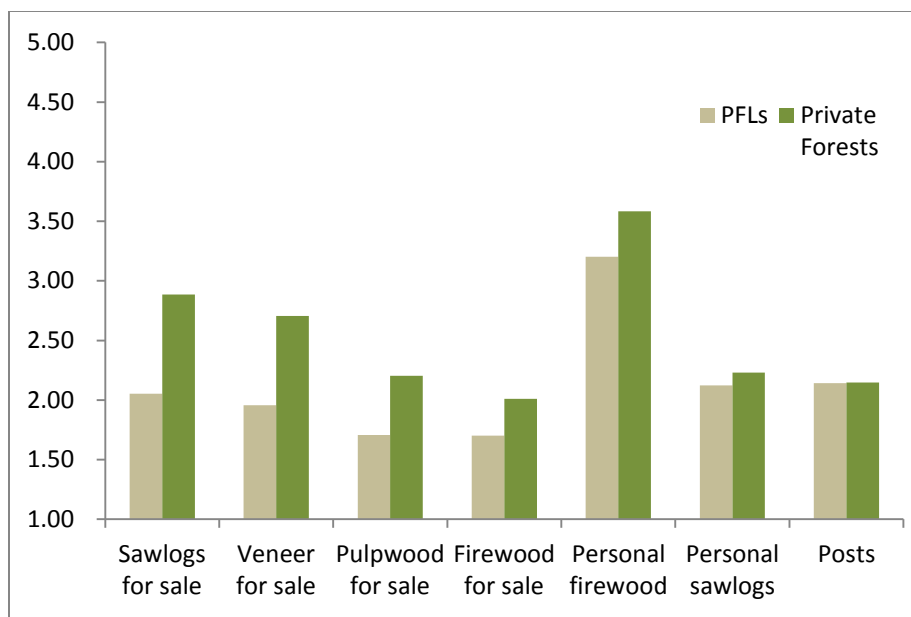


Figure 24: Mean Likert scores for PFLs and private forests owned by PFLs for likelihood to conduct different harvest types

Energy

Harvesting for biomass

Although biomass harvesting is a difficult activity to describe and explore via survey research, we asked PFLs how willing or unwilling they would be to cut trees for “renewable energy purposes” (Figure 25). Almost half of PFLs were “unwilling” (16.6%) or “very unwilling” (30.1%). Almost a third of PFLs (29.3%) were “neither unwilling nor willing.” Only about a quarter of PFLs were “willing” (19.1%) or “very willing” (4.9%). Acres of forestland owned was only slightly related to this question, with 35.5% of private forests owned by PFLs “unwilling” and “very unwilling,” 33.7% of private forests owned by PFLs “neither unwilling nor willing,” and 30.4% of private forests owned by PFL “willing” or “very willing.”

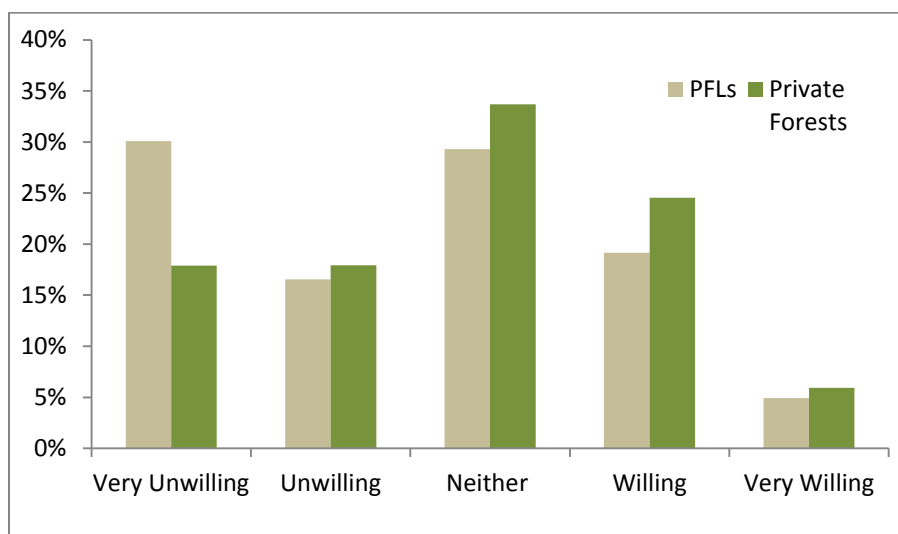


Figure 25: Percent PFLs and private forests owned by PFLs by willingness to harvest trees for renewable energy purposes

When asked what type of harvests PFLs would allow, knowing the trees would be used for renewable energy purposes, there was a strong preference for cutting dead (55.3% PFLs, 59.3% private forests), dying (51.0% PFLs, and 57.8% private forests), and low-quality trees (41.9% PFLs, 52.7% private forests). Still, a third of PFLs (33.2%) said they would not cut trees; these PFLs own 24.6% of private forests. There was relatively low interest in cutting healthy, quality trees for renewable energy purposes, regardless of size and/or intensity of harvest. Some PFLs (19.9%), owning 18.2% of private forests, would accept cutting a few, select, large trees. A few PFLs (13.6%), owning 16.9% of private forests, would accept cutting trees of all sizes, but leaving many trees. Fewer PFLs (9.8%), owning 8.3% of private forests, would accept cutting most of the large trees. Importantly for biomass harvests, very few PFLs (1.9%) would accept cutting small trees, but leaving large trees; these PFLs owned 3.3% of private forests. Similarly, very few PFLs (1.2%) would accept clearcuts; these PFLs owned 1.9% of private forests.

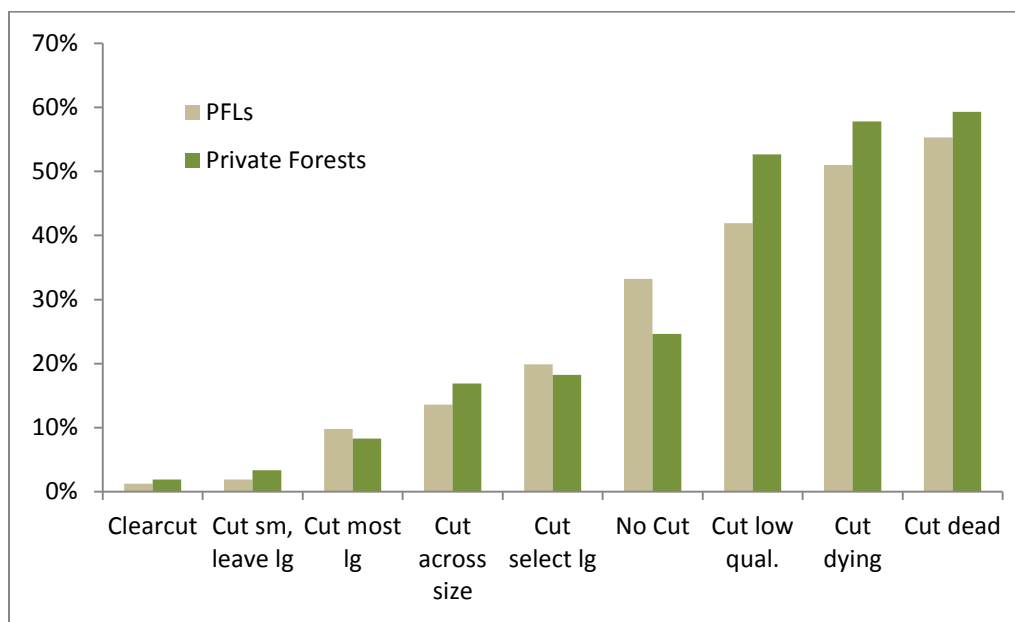


Figure 26: Percent PFLs and private forests owned by PFLs by acceptable renewable energy (biomass) harvests

We asked PFLs how important several factors would be when considering harvesting trees for renewable energy purposes using a 5-point Likert scale where 1 = very unimportant and 5 = very important (Figure 27). Most important among PFLs was to “improve wildlife habitat” – mean score 3.8 for PFLs, 3.1 for private forests. Nearing the same importance among PFLs was to “harvest dead trees” (mean 3.7 for PFLs, 3.1 for private forests), and “aid forest regeneration” (mean 3.7 for PFLs, 3.0 for private forests). To “clean up forest” received a mean score of 3.3 (2.7 for private forests). To “support local renewable energy” and “reduce fossil fuel use” both received mean scores of 2.9 (2.83 and 3.18 for private forests, respectively). To “remove low value trees” and “generate income” received the lowest scores among PFLs (2.9 and 2.8, respectively) and for private forests (both 2.5).

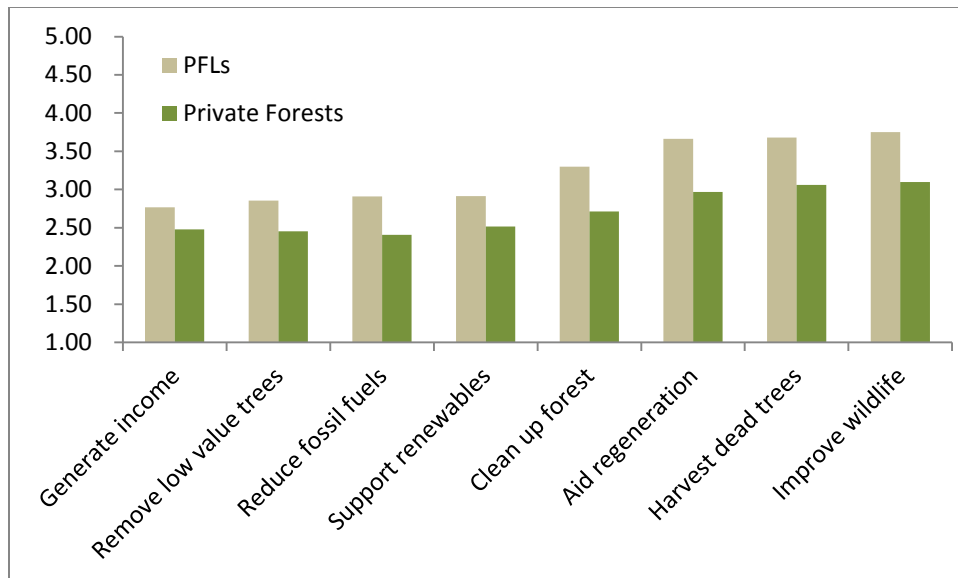


Figure 27: Mean importance scores for PFLs and private forests owned by PFLs by factors affecting decisions to harvest trees for renewable energy (biomass)

Wind turbines

There was fairly widespread willingness among PFLs and across private forests to pursue wind energy development. We asked willingness of PFLs to install wind turbines for a variety of purposes using a 5-point Likert scale where 1 = very unwilling and 5 = very willing. Results indicated that when wind turbines directly benefit PFLs, their willingness is high (Figure 28). As PFLs benefit less directly from wind turbines, support wanes. Many PFLs (42.6%) were willing or very willing to install wind turbines for personal energy supply; these PFLs owned 42.4% of private forests (Table 3). Mean score among all PFLs for personal energy turbines was 3.0 (2.7 for private forests). About a third of PFLs (33.6%) were willing or very willing to install wind turbines to sell energy to a power company; these PFLs owned 36.2% of private forests. Mean scores among all PFLs for turbines that generate income was 2.8 (2.4 for private forests). Over a quarter of PFLs (29.4%) would lease land for wind turbines if they were locally owned and for local use; these PFLs owned 31.3% of private forests. Mean score for leasing land for locally owned/used turbines was 2.6 (2.3 for private forests). Almost a quarter of PFLs (23.7%) were willing or very willing to lease land for wind turbines owned by a public utility; these PFLs owned 28.2% of private forests. Mean score for leasing land for public utility turbines was 2.4 (2.2 for private forests). Only about one-fifth of PFLs (20.8%) were willing or very willing to lease land for privately owned turbines; these PFLs owned 23.8% of private forests. Mean score for leasing land for private turbines was 2.3 (2.1 for private forests).

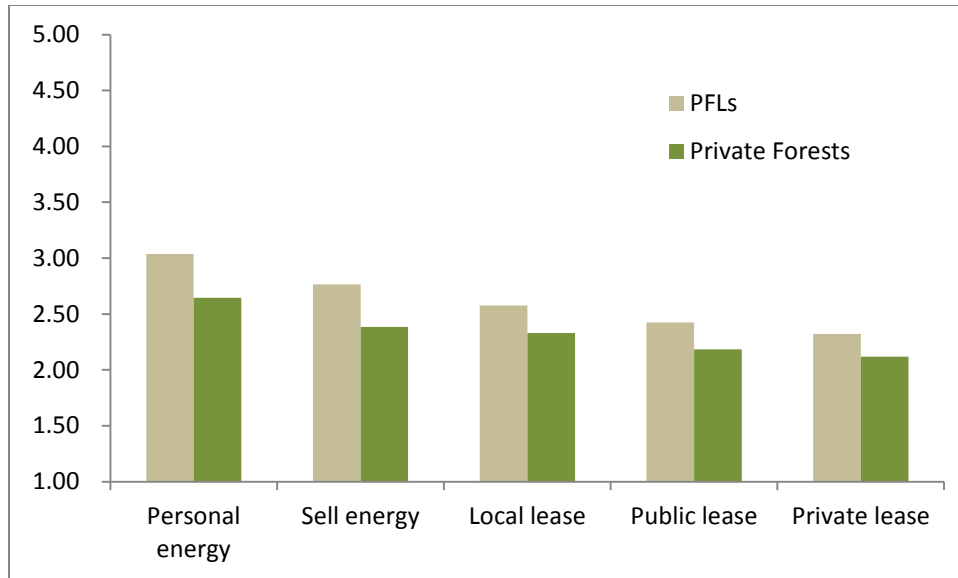


Figure 28: Mean willingness scores for PFLs and private forests owned by PFLs by types of wind turbine installation/lease

Table 3: Percent PFLs and private forests owned by PFLs by willingness to install/lease different types of wind turbines

| | Very Unwilling | | Unwilling | | Neither Unwilling nor Willing | | Willing | | Very Willing | |
|-----------------|----------------|-----------------|-----------|-----------------|-------------------------------|-----------------|---------|-----------------|--------------|-----------------|
| | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests |
| Personal energy | 23% | 24% | 11% | 10% | 23% | 24% | 24% | 25% | 19% | 17% |
| Sell energy | 26% | 28% | 17% | 12% | 23% | 24% | 21% | 22% | 12% | 14% |
| Local lease | 32% | 31% | 17% | 13% | 21% | 25% | 19% | 20% | 10% | 11% |
| Public lease | 35% | 33% | 20% | 14% | 22% | 25% | 16% | 18% | 8% | 11% |
| Private lease | 38% | 35% | 22% | 16% | 20% | 25% | 13% | 16% | 8% | 8% |

When considering whether or not to install wind turbines, PFLs weighed several factors (Figure 29). While there was little separation among factors, the most important factor was impacts on wildlife, including birds and bats (mean 3.9 for PFLs, 3.1 for private forests). Second most important were effects on overall forest health 3.9 for PFLs, 3.1 for private forests). Air pollution, noise, aesthetics, recreation, income and local renewable energy all scored around 3.5 among PFLs (3.7, 3.6, 3.5, 3.5, 3.5, and 3.5 respectively) and around 2.8 among private forests (2.9, 2.8, 2.8, 2.8, 2.8, and 2.6, respectively).

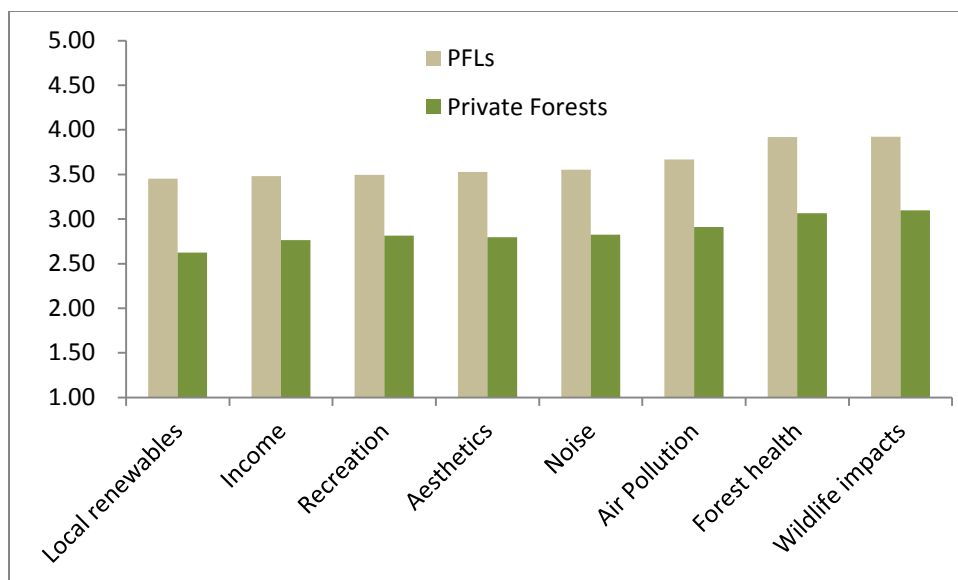


Figure 29: Mean importance scores among PFLs and private forests owned by PFLs by concerns regarding wind turbine development

Natural gas development

Natural gas exploration has the potential to affect PFLs and their forests, even if their forestland is not leased or drilled. Very few PFLs (2.9%) reported having experienced impacts to water quality on their forestland due to natural gas drilling; these PFLs owned 1.7% of private forests.¹¹ Similarly, only 1.4% of PFLs reported having experienced impact to water quantity on their forestland due to natural gas drilling; these PFLs owned 1.2% of private forests. Regardless of impacts, very few PFLs believed landowners were prepared for the natural gas exploration in their county (Figure 30). Well over half of PFLs believed landowners were either unprepared (38.1%) or extremely unprepared (23.0%); these PFLs owned 40.1 and 20.8% of private forests, respectively. Only 9.2% of PFLs, owning 13.0% of private forests, believe landowners were prepared or extremely prepared.

¹¹ All questions (including natural gas questions) were analyzed across all Pennsylvania counties, not just those with active natural gas exploration.

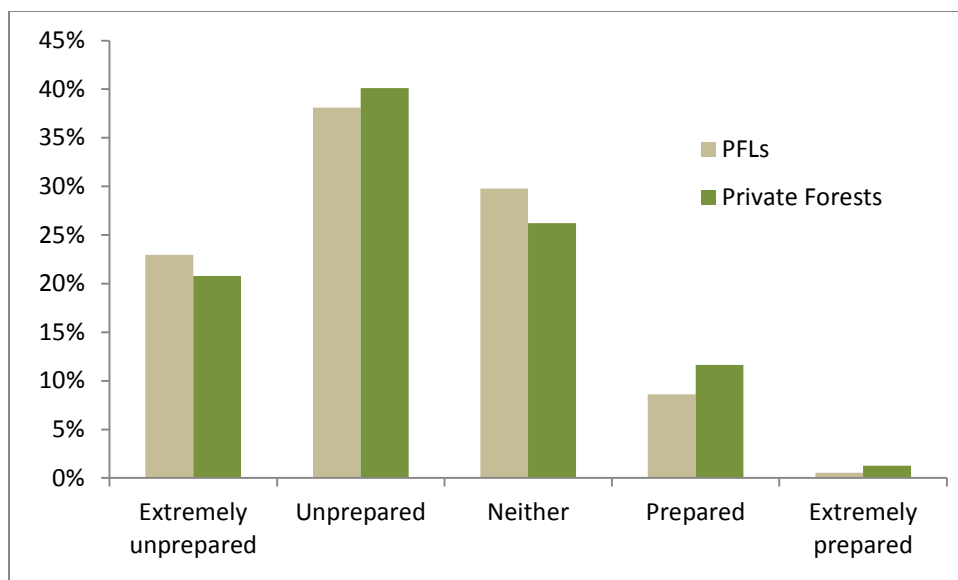


Figure 30: Percent PFLs and private forests owned by PFLs by perceived preparedness among PFLs for natural gas development in their county

Most PFLs (42.9%) neither opposed nor favored the use of rivers and streams in their county to provide water for the natural gas exploration; these PFLs owned 42.7% of private forests. Despite this strong indecision, more PFLs (43.1%) opposed or strongly opposed using local rivers and streams to supply water for natural gas exploration than supported or strongly supported that use (14.0%). Those in opposition or strong opposition owned 37.2% of private forests, while those in support or strong support owned 20.0% of private forests.

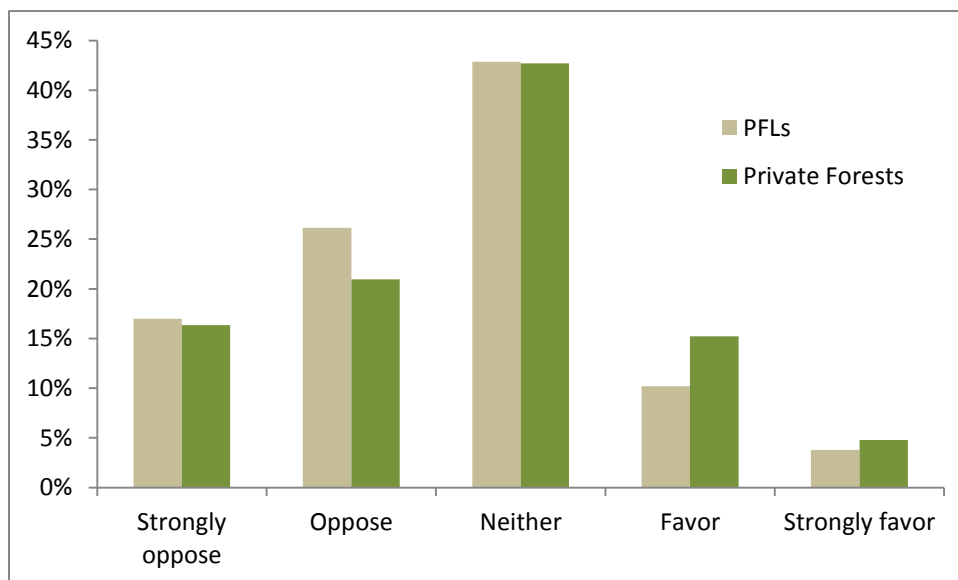


Figure 31: Percent PFLs and private forests owned by PFLs by opposition/support for use of rivers and streams to provide water for natural gas exploration

PFLs believed Marcellus Shale gas development would have both positive and negative impacts on their forestland and their communities (Figure 32). We asked PFLs if they agreed or disagreed with several statements about Marcellus Shale gas development using a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree. PFLs' mean score for "presence of gas well heads does *not* affect recreation" was 2.8 (2.1 for private forests), showing slight disagreement. PFLs' mean score for "natural gas drilling negatively impacts forestland" was 3.3 (2.5 for private forests), showing agreement among PFLs with smaller properties, disagreement among PFLs with larger properties. This disparity between PFL scores and private forest scores continued for each of the remaining statements. PFLs' mean score for "natural gas drilling will enhance Pennsylvania's economy" was 3.7 (2.9 for private forests), an interesting position for PFLs with larger properties. PFLs' mean score for "natural gas drilling is harmful to wildlife" was 3.2 (2.4 for private forests). PFLs' mean score for "benefits of gas development are greater than the costs" was 3.1 (2.4 for private forests). PFLs' mean score for "enjoyment of your forestland is lessened by gas wells" was 3.4 (2.6 for private forests).

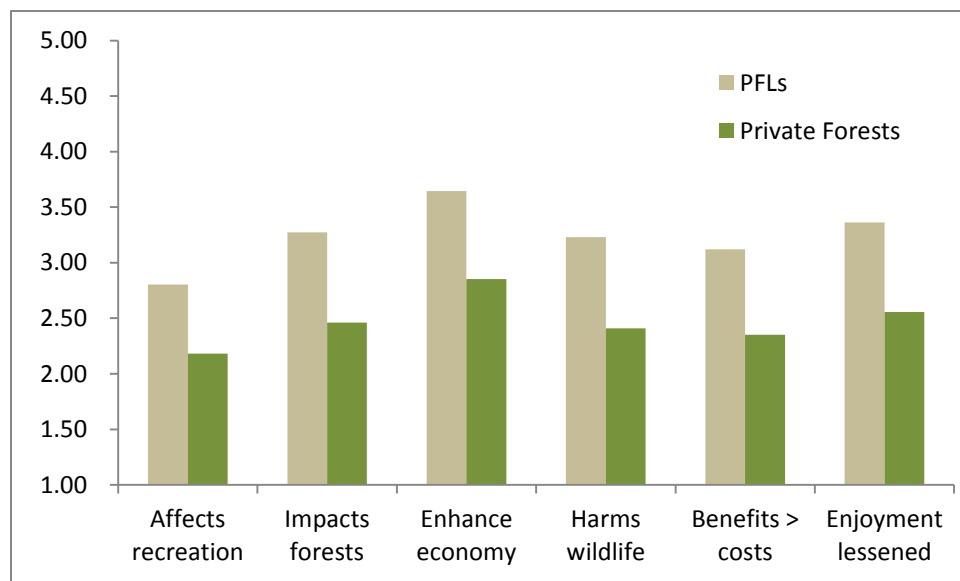


Figure 32: Mean agreement scores among PFLs and private forests owned by PFLs regarding impacts of Marcellus Shale development

Survey results indicated over one quarter of PFLs (25.3%) have entered or are considering entering a legal agreement regarding natural gas; these PFLs owned over one third (35.2%) of private forests. The average legal agreement was first entered six years prior to the survey date (2003, for the 2010 survey panel). Before entering an agreement, PFLs received advice from a variety of sources (Figure 33). While the plurality (39.2%) of PFLs in natural gas agreements received advice from a lawyer, this number seems troublingly low – 60% of natural gas agreements were signed without the landowner consulting a lawyer. Of the private forests owned by PFLs who have entered natural gas agreements, 44.3% was owned by those who consulted a lawyer. Almost as many PFLs (38.5%) received advice from another PFL; these PFLs owned 34.7% of private forests owned by PFLs in natural gas agreements. A quarter of PFLs in natural gas agreements (24.1%) received advice from a natural gas company; these PFLs owned 27.3% of private forests owned by PFLs in natural gas agreements. Almost a fifth of PFLs in natural gas

agreements (18.9%) received no advice; they owned over a quarter (27.8%) of private forests owned by PFLs in natural gas agreements. Some PFLs in natural gas agreements (17.1%) received advice from a financial advisor; these PFLs owned 10.0% of private forests owned by PFLs in natural gas agreements. Few PFLs in natural gas agreements (7.8%) received advice from a forestry professional; these PFLs owned 8.1% of private forests owned by PFLs in natural gas agreements. Some PFLs in natural gas agreements (17.6%), owning 14.4% of private forests owned by PFLs in natural gas agreements, received advice from “other” sources.

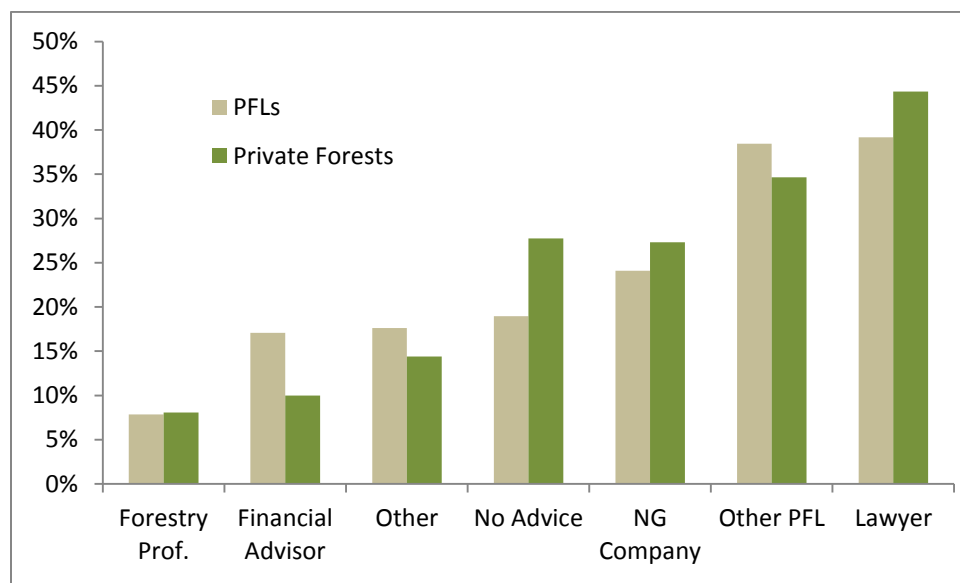


Figure 33: Percent PFLs and private forests owned by PFLs in natural gas agreements by sources of advice

PFLs in natural gas agreements reported an average of 0.77 well pads installed on their properties and expected an average of 0.98. Average area of impact among PFLs in natural gas agreements was 7.0 acres (including roads, pads, pipelines, etc.). Most PFLs (54.5%) were neither unhappy nor happy with the gas development on their forestland; these PFLs owned 56.0% of private forests owned by PFLs in natural gas agreements. Despite this overwhelming uncertainty, more PFLs were happy (25.6%) or very happy (6.9%) with the gas development on their forestland; these PFLs owned 35.4% of private forests owned by PFLs in natural gas agreements. Few PFLs were unhappy (4.4%) or very happy (8.6%) with the natural gas development on their forestland; these PFLs owned 8.6% of private forests owned by PFLs in natural gas agreements.

Similarly, the vast majority of PFLs (85.1%) in natural gas agreements said that gas development has not changed their future plans to cut trees. However, more PFLs said they are less likely (2.1%) or a lot less likely (10.0%) to cut than said they are more likely (2.0%) or a lot more likely (0.7%) to cut now that gas development is occurring on their forestland.

Recreational access and cooperation

Nearly half of all PFLs (46.9%) reported posting their forestland; these PFLs owned 60.2% of private forests. PFLs had an average of 4 neighbors, 2.5 of whom they knew on a first name basis. The plurality

of PFLs (42.8%) reported interacting with their neighbors “sometimes;” these PFLs owned 47.2% of private forests. Some PFLs (14.6%) said they interacted with their neighbors “often” and a few (5.5%) said they interacted “very often;” these PFLs owned 16.0 and 3.4% of private forests, respectively. More PFLs, however, said they interacted with their neighbors “rarely” (26.2%) or “never” (10.9%); these PFLs owned 27.0 and 6.4% of private forests, respectively. Over a third of PFLs (38.9%) said they have interacted with their neighbors regarding their forestland; these PFLs owned 44.7% of private forests.¹²

Although there wasn’t strong enthusiasm for cooperation among PFLs and their neighbors, the activities PFLs were most likely to cooperate with included: providing access across forestland, allowing neighbors to hunt, improving wildlife habitat across properties, and allowing neighbors to recreate (Figure 34). The activities PFLs were least likely to cooperate with neighbors included: allowing neighbors to cut firewood, coordinating trail building across properties, sharing large equipment, or spraying for insects.

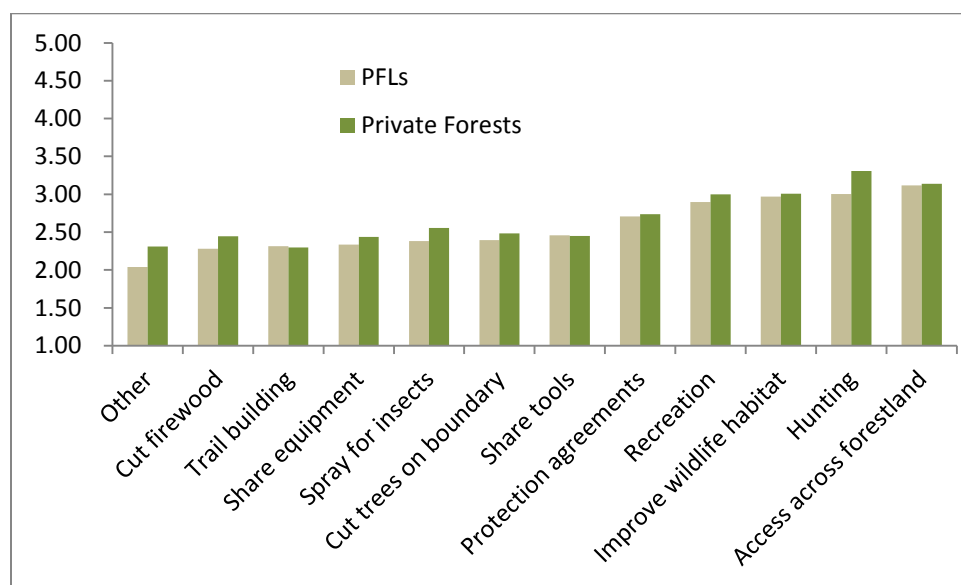


Figure 34: Mean likelihood score for PFLs and private forests owned by PFLs for cooperative activities

Future plans

In planning for the future, relatively few PFLs had taken concrete steps to ensure their legacy (Figure 35). The most common planning activity among PFLs was creating a last will and testament – 40.2% of PFLs had one and they owned 48.6% of private forests. Still, nearly two-thirds of PFLs had not created a last will and testament and many had done nothing. Only 12% had met with a lawyer (23.2% of private forests), 8.9% had created an estate plan (14.9% private forests), 5.0% had met with a tax advisor (12.0% private forests), 5.3% had met with an estate planning professional (10.6% private forests), and 3.7 had considered development of a conservation easement (8.9% of private forests).

¹² Future analysis of open-ended responses will detail the forestland related interactions.

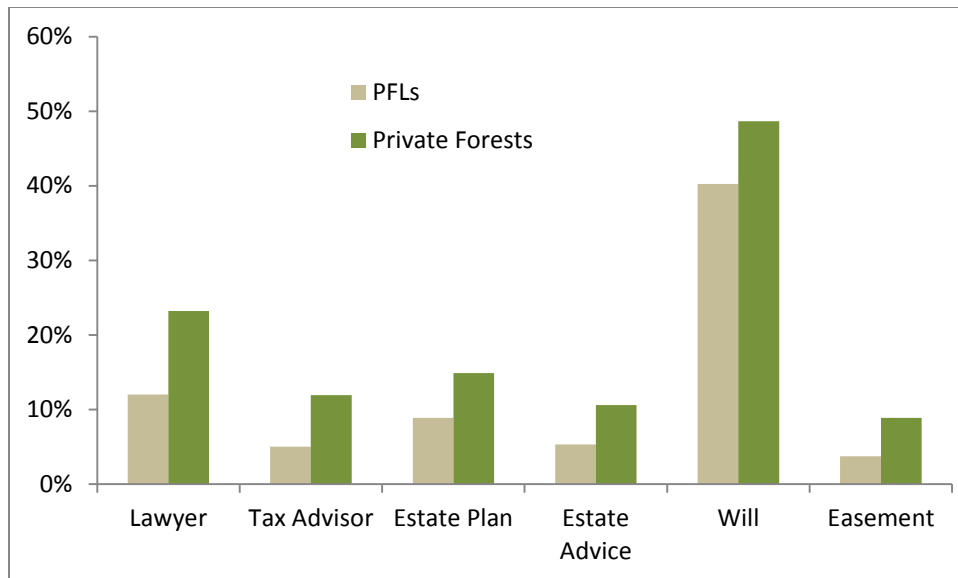


Figure 35: Percent PFLs and private forests owned by PFLs who have taken the following planning actions

While few PFLs reported plans to subdivide or subdivide and sell, many PFLs did plan to leave their forestland to more than one child, sell as is, or lease mineral rights (Figure 36). Mean likelihood scores among PFLs were 3.1 for leave to more than one child (3.1 for private forests), 2.5 for sell as is (2.3 for private forests), 2.4 for lease mineral rights (2.6 for private forests). PFLs likely or very likely to do these activities totaled 24.1% (19.7% for private forests) for sell as is, 25.4% (36.3% for private forests) for lease mineral rights, and 49.3% (56.9% for private forests) for leave to more than one child. Mean likelihood scores among PFLs were 2.1 for establishing a trust, 1.8 for establishing a family corporation, and 1.7 for selling a conservation easement. PFLs likely or very likely to do these activities totaled 13.6% (20% for private forests) for establishing a trust, 6.9% (12% for private forests) for establishing a family corporation, and 4.0% (6.7% for private forests) for selling a conservation easement. Mean likelihood scores among PFLs were 1.5 for subdivide and sell (1.6 for private forests), 1.5 for subdivide (1.7 for private forests), and 1.6 for gifting conservation easement (1.6 for private forests). PFLs likely or very likely to do these activities totaled 3.1% (6.5% for private forests) for subdivide and sell, 5.0% (8.3% for private forests) for subdivide, and 2.1% (5% for private forests) for gift a conservation easement.

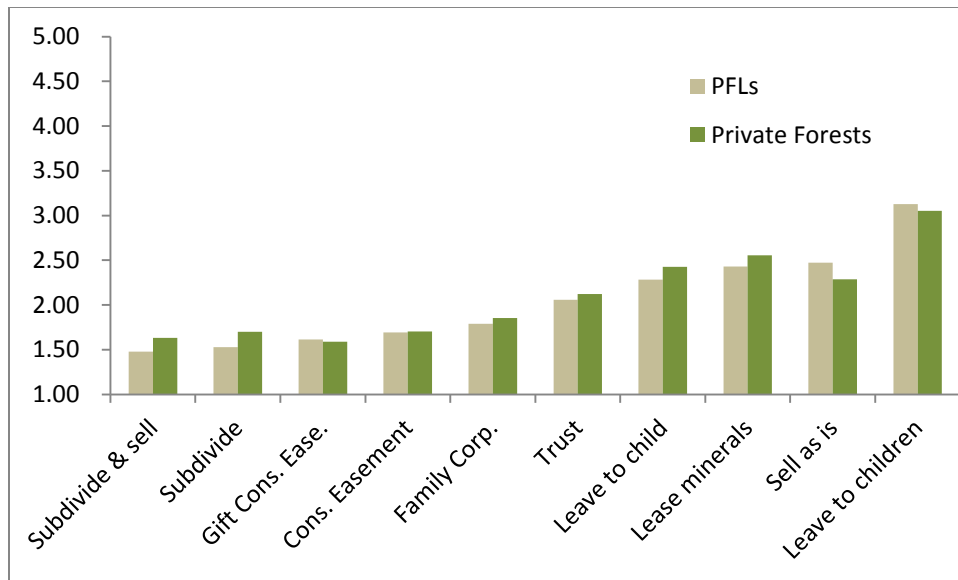


Figure 36: Mean likelihood scores for PFLs and private forests owned by PFLs by future activities

Attitudes and values

We asked PFLs several questions about their values and attitudes regarding several issues. First, we asked PFLs to choose between three diagrams expressing the connection between themselves and nature. In the diagrams (Figure 37), one circle represented the PFL and the other circle represented nature, including animate objects (e.g., plants, animals) and inanimate objects (e.g., streams, the atmosphere, landscapes). The first diagram showed the two circles barely touching. The second diagram showed the two circles overlapping some. The third diagram showed the two circles nearly completely overlapping. The majority of PFLs (55.5%) identified with the diagram showing almost complete overlap; these PFLs owned 60.3% of private forests. Many other PFLs (39.3%) identified with the diagram showing some overlap; these PFLs owned 34.6% of private forests. Only a few PFLs (5.1%) identified with the diagram showing no overlap; these PFLs owned 5.0% of private forests.



Figure 37: Diagrams representing various levels of overlap between PFLs and nature

We asked PFLs to agree or disagree with several value/attitude statements about forests and human interactions with forests using a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree. Value statements included:

1. "Neighboring landowners should work together to manage their forests"
2. "Humans shouldn't interfere with nature"
3. "Healthy forests are important to me"
4. "Forests have a right to exist for their own sake regardless of human concerns or use"

5. "The primary use of forests should be for products useful to humans"
6. "Humans should have more love, respect, and admiration for forests"
7. "You don't have to worry about the forest because it will take care of itself"
8. "People who own forestland have the right to use that forestland as they see fit"
9. "There is not much we can do to protect the forest"

The distribution of PFL values/attitudes and their mean agreement scores are shown in Table 4.

Table 4: Distribution of PFLs and private forests owned by PFLs by agreement with value statements & mean agreement scores

| | Strongly Disagree | | Disagree | | Neither | | Agree | | Strongly Agree | | Mean | |
|---|-------------------|-----------------|----------|-----------------|---------|-----------------|-------|-----------------|----------------|-----------------|------|-----------------|
| | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests | PFLs | Private Forests |
| 1 | 1% | 3% | 2% | 4% | 37% | 37% | 40% | 39% | 21% | 17% | 3.8 | 2.8 |
| 2 | 10% | 12% | 22% | 26% | 38% | 37% | 21% | 19% | 10% | 7% | 3.0 | 2.2 |
| 3 | 0% | 0% | 0% | 0% | 7% | 4% | 46% | 46% | 46% | 50% | 4.4 | 3.4 |
| 4 | 4% | 6% | 7% | 9% | 26% | 26% | 34% | 36% | 29% | 24% | 3.8 | 2.9 |
| 5 | 15% | 14% | 33% | 31% | 32% | 33% | 14% | 16% | 6% | 5% | 2.6 | 1.9 |
| 6 | 0% | 1% | 1% | 1% | 18% | 15% | 34% | 43% | 46% | 40% | 4.3 | 3.3 |
| 7 | 18% | 19% | 36% | 42% | 34% | 27% | 8% | 9% | 4% | 3% | 2.5 | 1.8 |
| 8 | 5% | 5% | 16% | 13% | 24% | 26% | 34% | 34% | 21% | 22% | 3.5 | 2.7 |
| 9 | 38% | 36% | 40% | 46% | 18% | 11% | 4% | 4% | 1% | 2% | 1.9 | 1.5 |

These results show a strong commitment to healthy forests and the intrinsic value of forests among Pennsylvania PFLs. They believe forests need to be actively managed and that much can be done to protect forests. To this end, a somewhat surprising number of PFLs see the need for cooperation among landowners and a tempering of absolute private property rights.

We asked PFLs to tell us the importance of several issues using a 10-point scale where 1 = very unimportant and 10 = very important. The issues and mean importance scores are shown in Table 5.

Table 5: Mean importance score among PFLs and private forest owned by PFLs for several issues

| | Mean Score | |
|----------------------------------|------------|-----------------|
| | PFLs | Private Forests |
| College Tuition | 4.2 | 4.2 |
| Timber production | 5.5 | 6.2 |
| Wind power generation | 5.6 | 5.2 |
| Gas energy development | 5.9 | 6.0 |
| Protecting hunting opportunities | 6.6 | 7.3 |
| Renewable wood resources | 7.1 | 7.3 |
| Green space | 7.7 | 7.7 |
| Retirement security | 7.8 | 7.6 |
| Family finances | 7.8 | 7.7 |
| Health care costs | 7.8 | 7.3 |
| Protecting recreation | 7.9 | 7.7 |
| Forest health | 8.5 | 8.6 |
| Protecting ground water | 9.0 | 9.1 |
| Access to clean drinking water | 9.5 | 9.5 |

While results indicate strong interest in economic values (except for college tuition, which likely reflects owner age structure), there is an even stronger interest in some forest related values. Among these, some relate to ecological and social values (e.g., protecting ground water and access to clean drinking water), which suggest an understanding of the linkage between forests and water issues. There was also strong concern for forest health. As expected, recreation and hunting showed strong standings, which relate back to PFLs' ownership objectives.

Conclusion

This report represents one piece of a continued dialogue among Pennsylvania stakeholders regarding the stewardship of private forests. Sustaining the myriad benefits provided by private forests will require partnerships among these stakeholders and the owners of those forests. A critical first step towards creating/establishing such partnerships is a clear understanding of who PFLs are and what their objectives, needs, preferences, and plans for the future might be. While much is “known” anecdotally or by individual stakeholders about PFLs, these results are a statistically rigorous description of PFLs and provide an essential baseline reference of private forest management from which changes may be measured.

Somewhat accidentally, but with clear necessity, this study focused on understanding, detailing, and correcting PFL research methodology. As a result of the investment in this work by the PA DCNR BoF and Penn State, PFL research conducted at national and state levels will be more accurate, less biased, and better serve to inform stakeholders everywhere about this important population. While at times frustrating and time-consuming, our research led to substantial contributions important for continued dialogue about sustainable private forest management.

Finally, these summary results are only an intimate first step to better understanding PFLs. Continued dialogue will be necessary to fully utilize the data collected through the course of this study. Additional analysis should be conducted, in consultation with key stakeholders, to provide clearer answers to pertinent questions and allow more sophisticated analysis of PFL decision making processes and their implications. Through continued conversations and partnership, this study will continue to help shape outreach and extension efforts to promote stewardship of Pennsylvania’s private forests.

Literature cited

- Birch, T.W. 1996. *Private forest-land owners of the United States, 1994*. Resour. Bull. NE-134. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment State. 183p.
- Butler, B.J. 2008. *Family forest owners of the United States, 2006: a technical document supporting the Forest Service 2010 RPA assessment*. Gen. Tech. Rep. NRS-27. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 72p.
- Butler, B.J., E.C. Leatherberry, and M.S. Williams. 2005. *Design, implementation, and analysis methods for the national woodland owner survey*. Gen. Tech. Rep. NE-336. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 43p.
- Dillman, D.A. 2007. *Mail and internet surveys: The tailored design method*. Wiley and Sons, Inc.: New York, NY. 523p.
- Metcalf, A.L. 2010. *Human dimensions of private forest landownership: Sampling, estimation, decision making processes, and implications*. Ph.D. dissertation. The Pennsylvania State University: University Park, PA. 264p.
- Metcalf, A.L., J.C. Finley, A.E. Luloff, D.Shumway, R.C. Stedman. 2012. Private forest landowners: Estimating population parameters. *Journal of Forestry (In press)*.