

Farmers and Woods: A Look at Woodlands and Woodland-Owner Intentions in the Heartland

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ABSTRACT

This paper reports the results of a pilot study that explores the relationship between farm woodland owners' stated intentions for owning woodland, and their use of the land, with the structure and composition of the woodland. Two databases maintained by the USDA Forest Service, Forest Inventory and Analysis (FIA) program were used in the analysis-- the FIA forest resources inventory and National Woodland Owner Survey (NWOS). From the forest resources inventory database we were able to estimate measures of volume and diversity of the forest resources. We matched the resource data to the owner's stated intentions, actions and goals as expressed in the NWOS mail-back questionnaire. The analysis revealed a number of relationships among woodland owners. For instance, owners interested in income potential generally had higher volumes on their woodlands. Those who valued aesthetics or enjoyment of their wooded land had fairly well-stocked stands and larger volumes per tree. Farmers who harvested sawtimber and veneer from their woodlands had higher volumes per hectare, whereas those who harvested firewood had a lower volume per hectare. We found the highest number of species on land owned for timber production and wildlife purposes. The Shannon index for species was highest on biodiversity, investment, legacy, timber and wildlife properties, whereas the index for diameter and height was highest on aesthetics, timber, wildlife, and biodiversity farms. As changes in the agriculture sector and population shifts alter the rural landscape, FIA data can provide insight into emerging resource trends in the Midwest and can be used to identify opportunities for expanding management of farm forest resources.

KEYWORDS

farm; forest inventory; landowner survey;
United States; woodlands

INTRODUCTION

Indiana, Illinois, and Iowa encompass 38.2 million hectares (94.3 million acres) of land (Bureau of the Census 2000). About two-thirds of the land—25.4 million hectares (62.8 million acres) – is devoted to agriculture (USDA National Agricultural Statistical Service, 2005a). The characterization of the region as the nation's agriculture "heartland" is appropriate because much of the nation's corn is grown there. For instance, in 2000, nearly four of every 10 hectares of corn that was harvested in the United States and used for grain, was grown by the region's farmers (USDA National Agricultural Statistical Service, 2005b). Agriculture plays a

huge role in people's daily lives and is the cornerstone of the region's economy.

Woodland covers an estimated 4.7 million hectares (11.6 million acres), or about twelve percent, of the region's land area. Using data from the National Woodland Owners' Survey (Butler and Leatherberry, in press), we estimated that farmers own almost half of all woodland area in the region. Although farmer-owned woodlands are a relatively small proportion of the total land base, they represent an important component of both the natural and the social environments of the region. Farmer-owned woodland generally occurs along rivers and streams, or in island pockets--the so called "back forty,"--places too hilly or too rocky for row crops. In large part, it is because of its relative scarcity, that farmer woodland is so important. These woodlands are islands of biological diversity in the agricultural landscape. They are vital habitat for shrinking populations of

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mammals and reptiles. They provide cover and shelter for resident wildlife, as well as migratory waterfowl. People value woodlands for recreation and enjoyment of a more natural environment. Finally, timber and specialty crops generate income for farmers and jobs for mill workers and others in the forest products companies of the region.

Over the past several decades, as the agriculture sector has undergone consolidation and farmers have departed from the business, the number of farms has decreased. For instance, between 1997 and 2002 the number of farms in the region declined by almost 8 percent from approximately 243,000 to 224,000 (USDA National Agricultural Statistical Service, 2005b). Some farm woodland has been overrun by the expansion of rural housing and the creation of exurbia communities. The new owners hold woodland primarily for secluded home sites, for aesthetic reasons, and for private preserves. Most do not practice forestry management on the woodland they own. Farmers, however, are more likely to hold a more utilitarian view of woodland. They generally consider woodland as part of their total land portfolio, using it for a place to secure wood, firewood, shade for livestock, timber harvesting, and hunting. As pressure for access to woodland increases, more farmers are leasing land or charging access fees for such users as hunters. Some farmers have become more receptive to agroforestry practices that allow them to use their woodland for immediate cash flow (Garrett, 2003). Studies have found that owners say they hold land for a particular set of reasons, but often what they do with their land is not consistent with their stated intentions (Stone, 1970; Carpenter, 1985).

In this paper, we explore relationships between woodland owner intentions and actions, and the physical condition – volume and diversity – of the land they own. Our goal is to ascertain whether two databases maintained by the USDA Forest Service Forest Inventory and Analysis (FIA) program can be used to answer the question: Does the condition of a forest stand reflect the intentions and actions of its owner? We believe this question is relevant to agroforestry because farm woodlots in the Heartland region have the potential to produce additional income and other benefits to owners.

DATA SOURCES AND METHODS

We used databases from FIA and the National Woodland Survey (NWOS), both of which are maintained by the USDA Forest Service, FIA program. We used a subset of the FIA and NWOS data to explore relationships between landowners and their lands. The FIA forest resources inventory collects forest resources data annually from a sample of standard plots. FIA has divided the entire nation into non-overlapping hexagons, each of which contains about 2,400 hectares (6,000 acres). One plot is randomly selected from each hexagon. If the plot is forested, it is part of the sample. Each year one-fifth of the forested plots in the eastern states are measured. A complete state inventory consists of measuring and compiling data for all plots over a five-year period. Procedures for selecting FIA plots are described in McRoberts (1999).

The NWOS is the social counterpart to the FIA forest resources inventories. Following survey methods outlined by Dillman (2001), the NWOS uses a mail-back questionnaire to collect data annually from a sample of private woodland owners in each state that had an FIA plot on their land. Survey cycles range from 5 to 10 years, depending on the state. Each year, a randomly selected portion (10-20 percent) of the full sample of private owners in a state is invited to participate in the NWOS. Contact with landowners is made two years after forest resources data are collected from the plot. Sample size within a state depends on the number of FIA plots within the state. Therefore, during the first several years some states may not have enough samples to estimate state-level parameters precisely. Precision of the estimates increases as additional annual surveys are completed. A complete description of the NWOS study procedures is presented in Butler and Leatherberry (in press).

To distinguish farmer-owned woodland from other woodland, the NWOS asks whether the respondent owns a farm within 1.6 kilometers (one mile) of any woodland that is owned. A farm is defined as a place where \$1,000.00 or more is earned in most years from the sale of crops or animals. In Illinois, Indiana and Iowa, there were a total of 152 owners that had

responded that they owned a farm within one mile of the woodland owned. The terms woodland and forestland are interchangeable and apply to land that has at least ten well-spaced trees per acre and is not devoted to cropland, pasture, residential or other developed uses. We use woodland because most Heartland farmers generally do not consider themselves forestland owners. They perceive their undeveloped treed land as woodland.

To derive indicators of owner intentions in owning woodland we used two questions. The first, a closed-ended question, asked owners to rate the importance of a series of possible reasons for owning woodland on a seven-point Likert scale. A reason was deemed “important” if it was cited as very important (Likert value = 1) or important (value = 2). The second set of questions asked whether the owner had ever harvested trees from any of the woodland owned since the owner has owned it. If the answer was yes, we inquired about types of products harvested. In our analysis harvest intention refers to the type of product removed from the woods. We assumed the action of harvesting was indeed the intended behavior. Next, we used another closed-end question to determine why timber was harvested.

A closed-ended question was used to ask respondents to rate the following potential reasons for owning woodland on a 7-point Likert (1967) scale from “very important” to “not important:”

- To enjoy beauty or scenery;
- To protect nature and biologic diversity;
- For land investment;
- As part of my home, vacation home, farm, or ranch;
- For privacy;
- To pass land on to children or other heirs;
- For production of firewood or biofuel;
- For production of timber products;
- For cultivation/collection of non-timber forest products;
- For hunting or fishing;
- For recreation, other than hunting or fishing; and
- Other.

Although the closed-ended form is far from exhaustive, it provides valuable data for

quantifying the reasons people own woodland. Each rating depends on the respondent’s interpretation or definition of what is implied by the statement.

To obtain information about farmer timber-harvesting activities, respondents were asked if trees were harvested or removed from the land they owned. If a respondent indicated that trees were harvested or removed, a closed-ended question was asked about what types of products were removed---veneer logs, sawlogs, pulpwood, firewood, or posts or poles. Next, respondents were asked to indicate which of the following (one or more) reasons influenced the decision to harvest:

- To achieve objectives in management plan;
- Trees were mature;
- To clear land for conversion to another use;
- Needed the money;
- Needed wood for own use;
- Price was right;
- To improve hunting opportunities;
- To improve scenic and recreational opportunities;
- To improve scenic quality;
- To remove trees damaged by a natural catastrophe;
- To improve quality of remaining trees; or
- Other.

Data describing the condition of woodland owned were obtained from the FIA plot that was measured on the owner’s land. The FIA plot-based measures of woodland forest resources examined are:

- Volume per acre;
- Average volume per tree;
- Percent growing stock;
- Growth per acre – only on some plots;
- Mortality per acre—only on some plots;
- Number of tree species present; and
- Diversity (Shannon index for species, diameter and height diversity).

The FIA plot measures all trees 12.7 cm (5 inches) diameter and larger on 4 - 0.017 ha (1/24th acre) circular plots (7.31 meters or 24 feet radius) and all trees 2.54 cm (1 inch) diameter and larger on 4 - 0.00135 ha (1/300th acre) circular plots (2.1 meters or 6.8 feet radius). Typically 30-70 trees were measured on each owner’s land. Although this sampling does

not represent a full-scale inventory of all of the respondent's woodland, it is a valid, unbiased measure of the woodland.

The Shannon index H' was computed for each plot using the formula $-\sum p_i \ln(p_i)$, where p_i is the relative number of trees within a categorical attribute (here species, diameter class or height class) that were found on the plot (Magurran, 2003). The diameter classes used here were 5-cm (1.97") wide classes, and the height classes were 3-m (9.8-ft) wide classes. Only trees where heights were observed and with diameters 12.7 cm (5") and larger, are considered in the computation of the height diversity measures. The Shannon index combines measures of evenness and diversity into a single index. High values of H' indicate a large number of different classes, each being present in relatively equal abundance. The exponent function of the Shannon index ($e^{H'}$) can be interpreted as the number of different values that have been found had all classes been in equal abundance.

RESULTS AND DISCUSSION

Setting

Over the past decade, privately owned woodland area in the Heartland region has remained stable at about 3.7 million hectares (9.2 million acres). Most of the woodland in the region is populated with hardwood stands. However, in some areas, eastern redcedar is expanding into woodland stands and abandoned pastures and fields (Schmidt and Leatherberry, 1995). Much of the region's woodland stands contain larger diameter trees. An estimated 65 percent, or 2.42 million hectares (5.98 million acres), of private woodland have stands with a plurality of stocking in trees more than 28 centimeters (11.0 inches) in diameter at breast height (DBH, 1.37 meters (4.5 feet) above ground level). The substantial area of large-diameter stands indicates maturing woodland.

Using NWOS data, we estimated that there are approximately 230,000 farm woodland owners in the Heartland region. Farmers that own woodland are a subset of the 570,000 family forest owners in the region. They hold an estimated 2.14 million hectares (5.3 million

acres) or about two-thirds of the family-owned woodland in the region. Farmer-owned woodland is well distributed throughout the region. In Iowa, 75 percent of the family-owned woodland is part of a farm, followed by 69 percent in Illinois, and 51 percent in Indiana. Of the 152 respondents, 102 indicated that they conducted some type of harvesting during the time they have owned the forestland.

Table 1 shows the percentage of respondents by primary reason for owning woodland. Table 2 shows the percentage of the 102 respondents who indicated that they harvested on their land, and what and why they harvested. Individual cell size was rather small, precluding any statistical analysis and demanding we look only at correlations.

Table 1. Percentage of respondents by primary reason for owning woodland.

Aesthetics	2%
Biodiversity	3%
Invest	5%
Part of Farm	40%
Privacy	1%
Legacy	3%
NTFP ¹	1%
Firewood	1%
Timber	1%
Hunt	7%
Recreate	3%
Pasture	8%
Wildlife	4%
Enjoy Woods	8%

¹ Non-timber forest products. Total does not equal 100% as not all respondents indicated a reason.

VOLUME

Volume by reason for ownership

The average volume of all live trees per hectare was 75.59 cubic meters. When we compared volume per hectare with reasons farmers own woodland, we found that owners who rated aesthetics, enjoying the woods and timber as important have the highest volume per

Table 2. Percentage of the 102 respondents who indicated they harvested their woodlands, by products harvested during their ownership and by harvest goals. Harvest goal is the purpose behind the harvest, e.g., as part of a management plan, to maintain or improve hunting, etc.

Product harvested	
Sawtimber	75%
Veneer	9%
Pulpwood	14%
Fire	50%
Posts	4%
Other	3%
Unknown	1%
Primary goal of harvesting	
Plan	18%
Mature	54%
Clear for Conversion	14%
Money	19%
Use	25%
Price	20%
Hunt	4%
Recreate	7%
Salvage	33%
Remaining Trees	45%
Other	1%

For each response, the total will exceed 100% as some respondents indicated more than one product or more than one goal.

hectare on their land (Fig. 1). Owners with low volume per hectare were those who held woodland for privacy, firewood production, and cultivation/collection of non-timber forest products. This finding suggests that farmers who rate personal enjoyment as important have fairly well-stocked stands with larger trees. Such stands tend to be visually diverse, with an open understory that allows for visual penetration.

Interestingly, the owners most concerned with aesthetics (the “aesthetics” and “enjoy woods” categories) had the largest average tree size in the study (Fig. 2). Mainly because of the high number of trees per hectare, the “biodiversity” owners had some of the lowest

mean volumes, although still greater than those of the “firewood”, “privacy” and “non-timber forest products” (“NTFP”) respondents.

Volume by harvest and harvest goal

Comparing volume to harvest and harvest goals, we found that higher volumes were associated with farmers who had harvested veneer logs or other products for which they probably received cash (Fig. 3). Generally, owners harvest firewood for their own use and probably remove deformed or less desirable trees. These findings suggest that farmers who harvested for income in the past maintained some level of forest management in their stands. Perhaps those owners view woods as a source to be tapped periodically for income. Farmers who harvested firewood may have lower volume per hectare because they may not have conducted stand improvement activities after removal. These contentions are supported, to some extent, by findings that farmers with harvesting goals that have income implications (i.e., achieve management objectives, needed the money, tree matures, and price was right) all have fairly high volumes per hectare.

Looking at volume per hectare, we are not surprised by the higher volume for those properties where the landowner intends to harvest veneer. Veneer bolts have strict minimum size requirements, often 30 to 40 cm (12 - 16 inches) minimum diameter (Rast et al., 1973), so one might conclude that those harvesting for veneer have many large trees. The following graph (Fig. 4) shows, however, that the large trees are not the “veneer” landowners’ only trees: note how the per-tree volume is relatively low compared to other harvest intention categories.

Growing-stock volume is a standard measure of the merchantable sound wood in trees of commercial species. Live volume is total wood volume in trees of all species (including noncommercial species). Growing stock does not usually equal all live volume because: 1) growing stock does not include rough and rotten trees, whereas all live tree category does; 2) growing stock volume excludes the volume in the cull portion of the trees; and 3) growing stock excludes certain non-merchantable

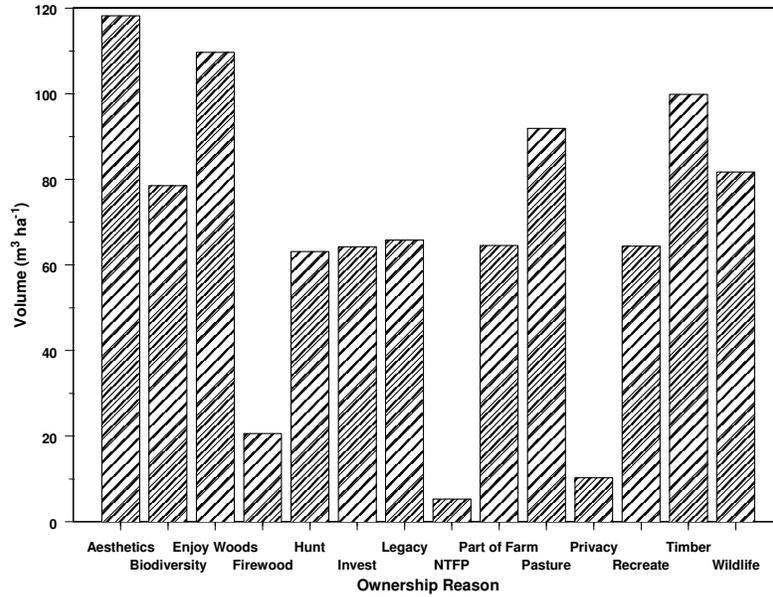


Figure 1. All live volume in cubic meters per hectare vs. reason for owning the land.

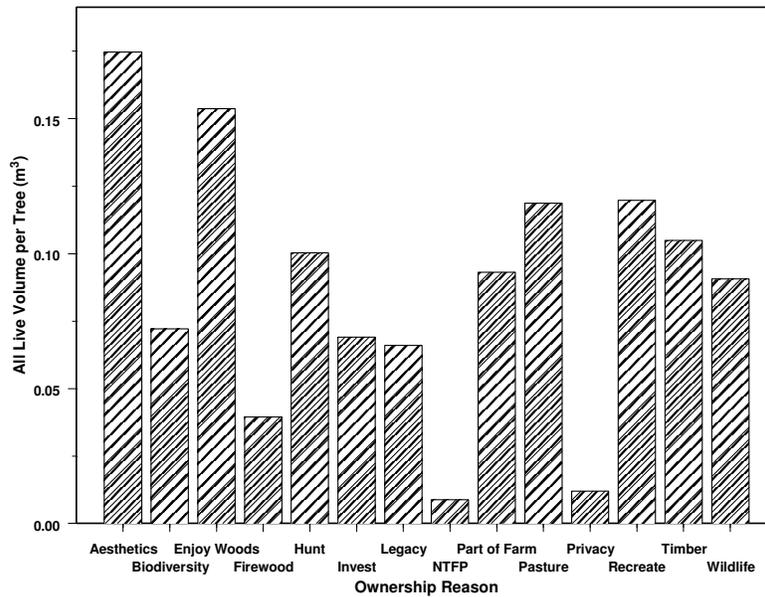


Figure 2. All live volume per tree in cubic meters vs. reason for owning the land.

species. Woodlands with a high percentage of their live volume in growing stock are an indicator of higher quality timber and good timber management practices over the stand’s development. Only “timber” and “NTFP” owners had plots with 100% of the volume considered to be growing stock. “Privacy” and

“pasture” had the lowest percentage (Fig. 5). Given “privacy’s” low volume per hectare (see Fig. 1), one might surmise that the owner has a dense stand of smaller trees, which may be of non-merchantable species. The lower volume of growing stock in stands that are used as pasture

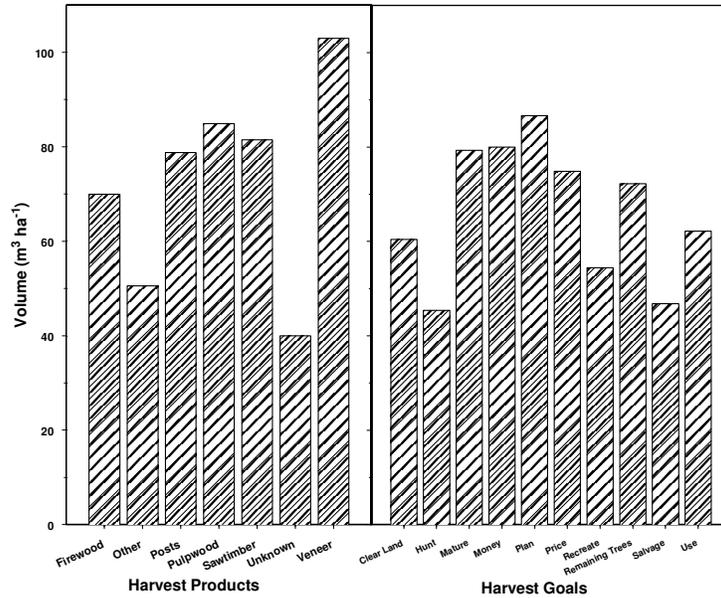


Figure 3. All live volume per hectare vs. harvest products and harvest goals. Categories: “Sawtimber” through “Unknown” are harvest products, “Plan” through “Remaining Trees” are harvest goals.

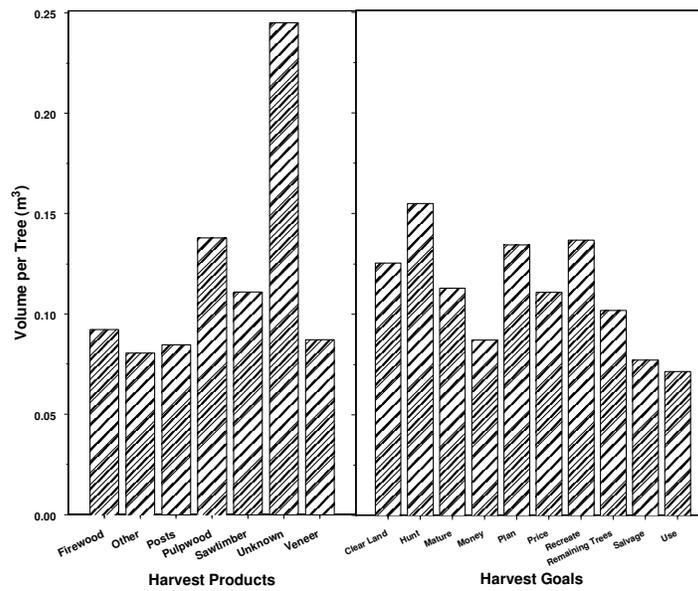


Figure 4. All live volume per tree in cubic meters vs. harvest and harvest goals. Categories: “Sawtimber” through “Unknown” are harvest products, “Plan” through “Remaining Trees” are harvest goals.

demonstrates the impact domestic animals can have on tree density and growth.

Volume by farm size

Farm size may have a variety of effects on the structure and use of the woodland. If the woodland is a large proportion of the farmer’s

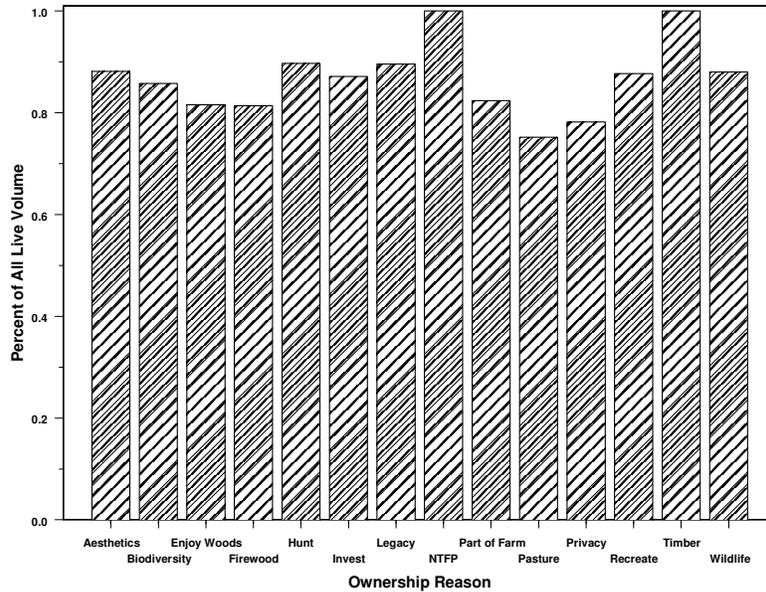


Figure 5. Growing stock as a percentage of all live volume.

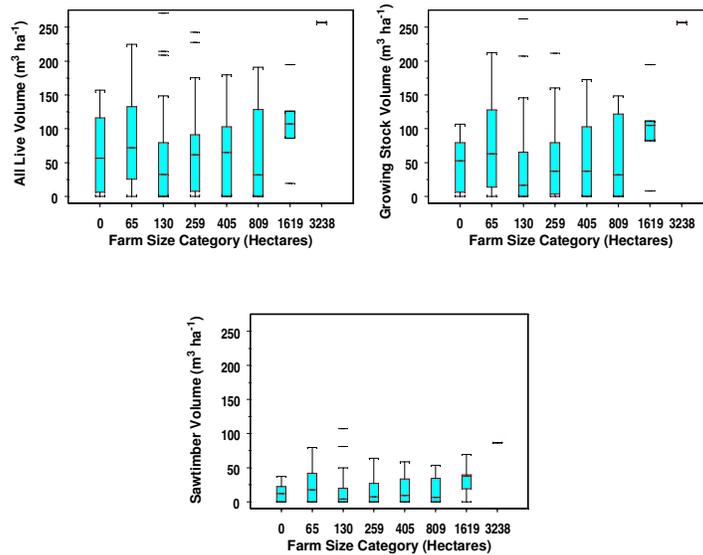


Figure 6. Boxplots of volume (All Live Trees, Growing Stock and Sawtimber) per hectare vs. farm size category (Hectares). The English unit equivalents of the farm size categories are: 0 (hectares) = 0 acres, 65 = 1 - 160 acres, 130 = 161 - 320 acres, 259 = 321 - 640 acres, 405 = 601 - 1,000 acres, 809 = 1,001 - 2,000 acres, 1619 = 2,001 - 4,000 acres, and 3238 = 4,001 - 8,000 acres.

land base, the landowner might be a) more cautious in use of the resource, or b) more aggressive in the use of the resource as it potentially represents a greater percentage of the land’s benefit stream. The owner may optimize

the use of a limited asset – land (Kurtz, 2000) or may diversify investment portfolio (Altieri, 1987). Conversely, if the forestland is a small portion of the land, the landowner might be a) cautious in use of the resource as it represents a

relatively scarce (and hence, valuable) resource, or b) indifferent or only intermittently interested in utilization because the owner is busy managing the main business, the farm operations.

We estimated all live, growing stock and sawtimber volume per hectare based on FIA plot data (Fig. 6). Responses suggest that small-farm owners are cautious in using woodland resources. Median volume per hectare was slightly higher on the smaller farms. Perhaps the timber represented a proportionally more valuable resource on the smaller tracts, and was hence treated more cautiously. It was noteworthy that the volume per hectare dropped between the <65 hectare (<160 acre) and 65-130 hectare (160-320 acre) farm sizes then slowly increased. Is there something about the 65-130 hectare size that might encourage landowners to more completely utilize their resources? Are the < 65 hectare tracts more likely to belong to hobby farmers who are not active in farm or woodland management, thus reducing the opportunities or need for forest utilization? Or do such small tracts represent the only forested resource the landowner has for forest products, resulting in the farmer going to the woodyard more often than she otherwise might?

DIVERSITY

As an ecologically-based land management approach, agroforestry practices should maintain ecological diversity and processes that are sustainable in the long run (Lassoie and Buck, 2000). Since biodiversity was listed as a reason to own woodlands, we calculated simple measures of diversity and compared them to reason for ownership and harvest products and goals.

Diversity (species and structural) by reason for ownership

The highest number of species occurred on land that the owner owned for timber and wildlife management, even higher than the land owned for biodiversity (Fig. 7).

Biodiversity, investment, legacy, timber and wildlife categories had the highest values for the Shannon Index for species (Fig. 8). The highest levels for Shannon index for diameter were the aesthetics, timber, wildlife and biodiversity ownership reasons. Those same four categories also exhibited the highest height diversity. Although a high correlation would be expected between the two measures of tree size (Oliver and Larson, 1996), height growth tends to slow as trees get taller and/or older.

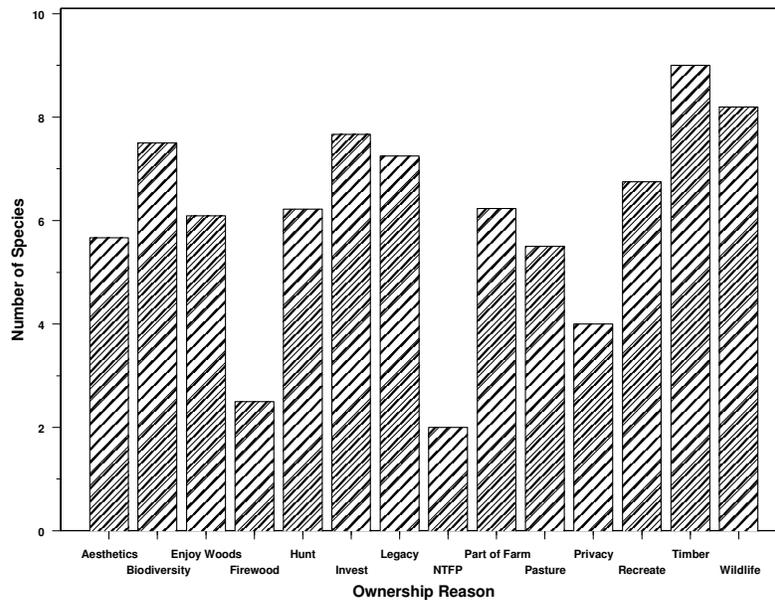


Figure 7. Number of species vs. reason for owning woodland.

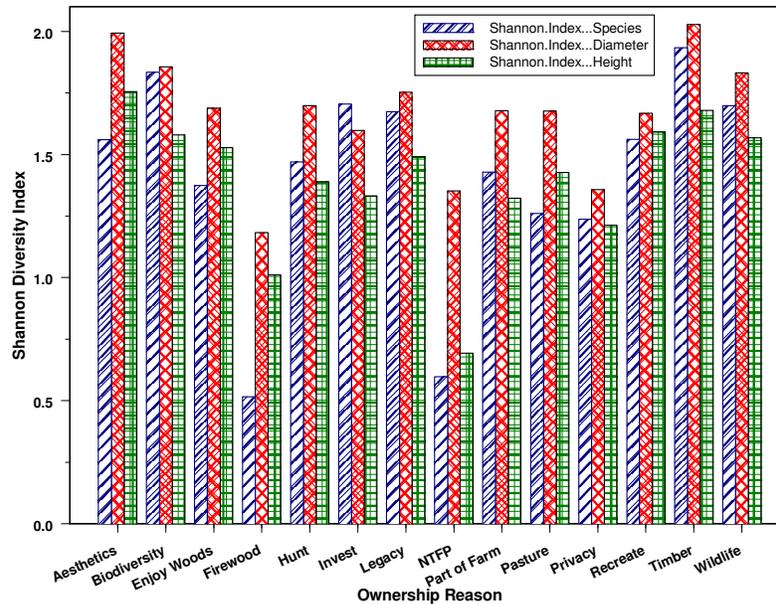


Figure 8. Shannon index for species, diameter and height vs. reason for owning woodland.

The most significant differences in the three diversity indices were for the NTFP and firewood. For both categories, species and height diversity were low and diameter diversity was much higher. A forest used primarily for firewood might have this structure if a) removals emphasized certain species, and b) they occupied a certain level of the overstory. For example, a farmer might harvest red maple, a species which rarely dominates in the overstory, but is more frequently a lower-canopy/midstory species. The farmer thus eliminates the mid-story and many maples, reducing height and species diversity. In the case of NTFP owners, it depends upon the non-timber forest product they are harvesting. For example, an appropriate harvesting regime to encourage morel (mushroom) production would include a light thinning of the overstory and upper midstory, creating potential substrate from the dead stumps and root systems of the harvested trees. If a small suite of species occupied this canopy stratum, conceivably one could achieve these relative structures of height, diameter and species diversity.

Diversity (species and structural) by harvest and harvest goal

Among those who indicated that they harvested their woodlands at some time in the past, the number of species was relatively high except for those who harvested for posts and for unknown products (Fig. 9). The common method of producing posts is with single-species, even-aged stands. Among the harvest goals, the lowest averages were for clear land for conversion and salvage. The lower number of species could be the result of previous harvests or some other disturbance.

The Shannon index for species is generally high across the board, except for harvest – posts (Fig. 10). Those properties where posts were harvested exhibited markedly lower species diversity and lower height diversity than the other harvest categories. The highest species diversity occurs where the harvest goal was to improve hunting. This seems logical, as most wildlife species need a mixture of forage, cover and transition zones, a suite of habitats more likely present in diverse forests (Hicks, 1998).

Another alternative might be that a previously dense forest could have been heavily harvested and have different, perhaps early-successional, species occupying the newly-released growing space, meaning that the present

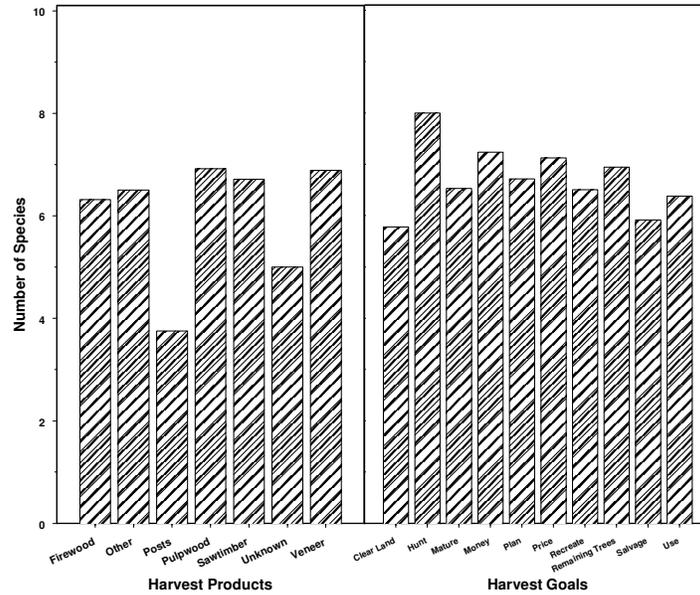


Figure 9. Number of species vs. harvest and harvest goals. Categories: “Sawtimber” through “Unknown” are harvest products, “Plan” through “Remaining Trees” are harvest goals.

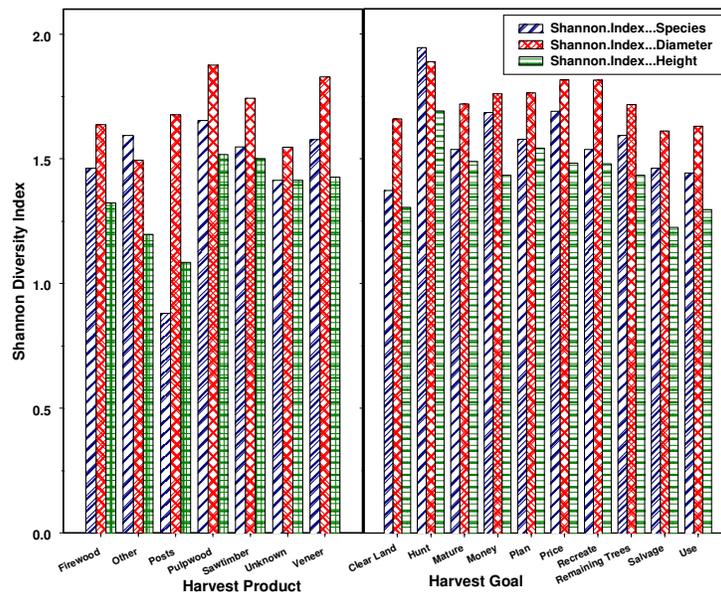


Figure 10. Shannon index for species vs. harvest and harvest goals. Categories: “Sawtimber” through “Unknown” are harvest products, “Plan” through “Remaining Trees” are harvest goals.

diversity occurred in spite of management intentions, not because of them.

The highest indices for diameter diversity were for harvest products – pulpwood and harvest goals – wildlife. Overall, diameter diversity was higher than species diversity. If species and diameter diversity were the same,

one might conclude that the diameter diversity was purely a result of the different species’ life history strategies. While there is a certain amount of phenotypic variation in any stand and there certainly could be several potential management scenarios, in this case we suggest that there might have been a series of low- to

moderate-intensity disturbances that created variable densities and age classes in the stand.

It is worth noting the marked difference in Shannon index height – harvest posts and harvesting goals – salvage. As we mentioned before, posts are often “mined” from dense stands of otherwise unmerchantable trees and there is no value in their becoming too big (or tall), hence the low height diversity. Salvage implies disturbance or some other condition precluded further management. For example, wind may have blown down large trees or “topped” individuals (broken off at the top), resulting in lower height diversity.

Diversity (species and structural) by farm size

We examined the number of species and the Shannon index for species as a function of farm size (Fig. 11). We used a logarithmic scale because most of our respondents were concentrated in the smaller farm size, and a log scale allowed greater visual separation of individual respondents. We did not find evidence of any relationship between farm size and the number of tree species. Adding evenness to our analysis (in the calculation of the Shannon index for species) did not materially improve the relationship between farm size and forest diversity.

CONCLUSIONS

Our goal was to evaluate whether the forestland each owner possessed truly reflected her/his goals, intentions and actions. We must be cautious with such a small sample parsed into several categories, but our data suggest some intriguing relationships. Landowners who claimed to be interested in timber products generally had higher volumes per hectare. Those landowners interested in aesthetics or enjoying the woods frequently had larger trees, although not necessarily higher per-hectare volumes.

Within certain broad parameters, our efforts to establish a relationship between ownership objectives and harvest goals and the woodland structure and composition bore fruit. Landowners interested in income potential generally had higher volumes on their woodlands. Those who valued the aesthetic or enjoyment benefits of owning woodlands had fairly well-stocked stands and the largest volumes per tree. Examining harvest products and goals, we found that those farmers with income-generating goals had higher volumes per hectare. Farmers who harvested firewood had a lower volume per hectare. Timber and NTFP had 100% of their all live volume in growing stock, which is a measure of the merchantable sound wood in trees. Privacy and pasture had the lowest percentage of all live in growing stock. Regarding farm size, we found that the median

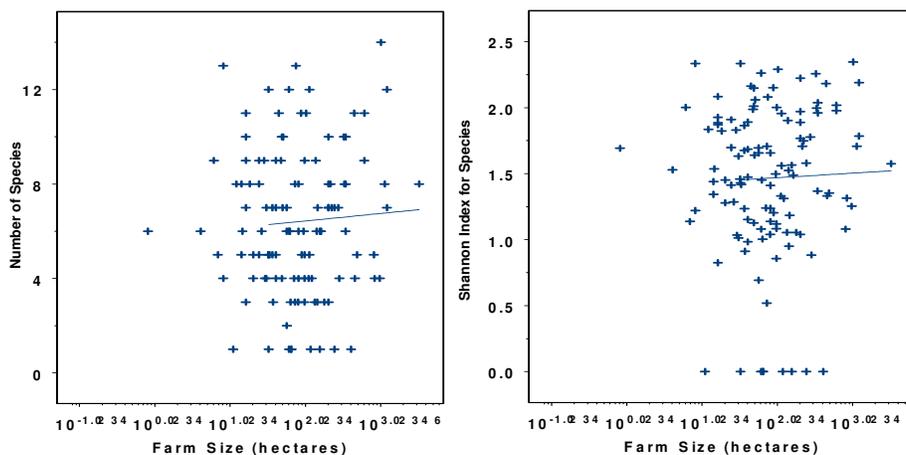


Figure 11. (Left) Number of species (“species richness”) vs. farm size. (Right) Shannon index for species vs. farm size. Farm size axis is logarithmic scale. Regression line is \log_{10} .

volume per hectare was slightly higher on smaller farms, but generally there was little difference.

Differences in diversity measures did track ownership and harvest categories. The highest number of species was on land owned for timber and wildlife and management purposes. The Shannon index for species was highest on biodiversity, investment, legacy, timber and wildlife properties. Shannon index for diameter and height was highest on aesthetics, timber, wildlife, and biodiversity farms. The largest differences between the Shannon indices for species, height and diameter were for NTFP and firewood properties, with low species and height diversity and higher diameter diversity.

When examining harvest products and goals, we found that diameter diversity was similar across categories. The number of species and the Shannon index for species was generally high except for posts and unknown categories. Posts/poles are generally grown in stands of the same size and species, which was reflected in the low species diversity values. The highest diversity numbers were on properties harvested for wildlife reasons, probably intended to create the diversity of habitat types that most huntable wildlife require. We found no relationship between farm size and any diversity measure.

We believe that our analysis has shown that the annual FIA forest resource inventory database when tied to information from the NWOS has great potential to answer relevant questions such as the one above. Our analysis presents some interesting relationships and raises a number of important questions. This study will be expanded to other states in the Midwest region, where we hope to further define the connections between owners' attitudes and actions and forest structure. We will explore more fully the relationships and questions suggested here, along with conducting new analysis, as the NWOS database becomes more populated. Data are added to both FIA databases annually, which allows researchers to monitor trends and identify emerging situations. As changes in the agriculture sector and population shifts alter the rural landscape of the Heartland, FIA data can provide insight into emerging trends in the region.

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