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# Farmers' objectives toward their woodlands in the upper Midwest of the United States: implications for woodland volumes and diversity

**W. Keith Moser · Earl C. Leatherberry · Mark H. Hansen · Brett J. Butler**

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**Abstract** This paper reports the results of a study that explores the relationship between farm woodland owners' stated intentions for owning woodland, and the structure and composition of these woodlands in the states of Illinois, Indiana and Iowa in the upper Midwest of the United States. Data from two sample-based inventories conducted by the USDA Forest Service, Forest Inventory and Analysis (FIA) program were combined for this analysis—the FIA forest resources inventory and the National Woodland Owner Survey (NWOS). We looked for relationships between product value and investment in woodlands, as reflected in volumes and tree quality. We also examined whether measures of diversity reflected specific management focus. Our results partially supported our hypotheses. Woodland-focused ownership reasons were found to have larger volumes and individual tree sizes. We found that a passive woodland ownership reason—that woods were "part of the farm"—generally had lower volumes per hectare. Although we were not able to differentiate between different forest product classes and measures of volume, we did find that those landowners who harvested veneer had more volume than those who harvested for firewood. Woodland owners who salvage-harvested their woodlands—a harvesting reason that is more reactive than proactive—exhibited lower volumes per hectare than those who harvested for more proactive, product-focused reasons. Biodiversity was also found to be related to the ownership focus and harvest intent. Generally, there was lower diversity in overstory species when the woodland was viewed merely as "part of the farm," when the product harvested was fence posts and when timber was harvested for salvage or land clearing. The small sample size limits our analysis, but we can conclude that focusing the woodland owners on management of their woodlands—regardless of what the specific management goals might be—should increase productivity and biodiversity of those woodlands.

**Keywords** Farm · Forest inventory · Landowner survey · United States · Woodlands



W. K. Moser (✉) · E. C. Leatherberry · M. H. Hansen
USDA Forest Service, Northern Research Station, 1992 Folwell Ave., St. Paul, MN 55108, USA
e-mail: wkmoser@fs.fed.us

B. J. Butler
USDA Forest Service, Northern Research Station, Amherst, MA, USA

## Introduction

Conventional agroforestry involves the integration of some form of crop or pastoral agriculture with the presence of tree species used for wood, protection,

and/or non-timber forest products on the same piece of land (Rule et al. 1994). In this paper, we define agroforestry in a more spatially-oriented way by looking at farmers who also own woodlands, rather than just those farmers who have integrated trees and agriculture into a more traditionally-defined agroforestry system. We compared owners' attitudes (as stated in a questionnaire-based survey) with observations of their woodlands (as measured on an inventory plot) for farm woodland owners in the states of Illinois, Indiana, and Iowa in the Upper Midwest of the United States.

Indiana, Illinois, and Iowa encompass 38.2 million hectares of land (Bureau of the Census 2000). About two-thirds of the land-25.4 million hectares—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 maize is grown there. For instance, in 2000, nearly four of every 10 ha of maize that was harvested in the United States and used for grain, were in this region (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, or about 12%, of the region's land area (Woodall et al. 2005; Leatherberry et al. 2006; Crocker et al. 2006). Using data from the National Woodland Owner Survey (Butler and Leatherberry 2004; Butler et al. 2005), 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 social environments of the region. Farmer-owned woodland generally occurs along rivers and streams, or in island pockets—the so-called "back forty," which are places too hilly or too rocky for row crops. In large part, farm woodland is so important because of its relative scarcity. These woodlands are islands of biological diversity in the agricultural landscape. They are vital habitat for shrinking populations of mammals and reptiles. People value woodlands for a wide range of reasons, including recreation, aesthetics, ecosystem services, income generation, heritage value, and bequest value to future generations. 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% from approximately 243,000 to 224,000 (USDA National Agricultural Statistical Service 2005b). Some farm woodland has been lost as rural housing has expanded and exurban communities have been created. The new owners hold woodland primarily for secluded home sites, for aesthetic reasons, and for private preserves (Butler and Leatherberry 2004). Even though they may not practice industrial forestry management on the woodland they own, farmers may be 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, hunting, or holding land for its future value. 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 while owners say they hold land for a particular set of reasons, often what they do with their land is not consistent with their stated intentions (Stone 1970; Carpenter 1985).

There is a hierarchy of economic value per unit of wood that starts at veneer, the most valuable, and declines to firewood, the least valuable. An implication of this hierarchy is that the more valuable (profitable) the forest product, the more it will pay to invest in management for that product (see Smith 1986). Value is not purely a phenomenon of forest products, however. A non-forest product objective, such as aesthetics, recreation, or biodiversity, should also be related to an owner's particular "vision" of a forest (Bengston 1994). Therefore, we would expect to see a correlation between ownership and management goals, and woodland structure and species mix.

In this paper, we explore relationships between farm woodland-owners' intentions and the physical condition—volume and diversity—of the land they own. Our goal is to use data from two inventories conducted by the USDA Forest Service Forest

Inventory and Analysis (FIA) program to answer the question: Does the condition of a farm forest stand reflect the intentions and actions of its owner? This question is relevant to agroforestry because farm woodlands in the "Heartland" region of Indiana, Illinois, and Iowa have the potential to produce additional income and other benefits to farmers and society.

## Data sources and methods

We used data from the FIA forest resources inventory and the National Woodland Survey (NWOS), both of which are national inventories maintained by the FIA program. In this study, we use these data to analyze farmers' attitudes and actions in three of the Midwestern States (the "Heartland"): Indiana, Illinois and Iowa. The FIA forest resources inventory collects forest resources data annually from a sample of standard plots (McRoberts 1999). FIA has divided the entire nation into non-overlapping hexagons, each of which contains about 2,400 ha. Each hexagon contains at least one plot. Inventories are conducted on a state-by-state basis under the same basic design; the sampling intensity (number of plots per hexagon) of the inventory differs by state. In the three states in our study region, one-fifth of the forested plots are measured each year. A complete state inventory consists of measuring and compiling data for all plots over a 5-year period. We used data from the latest cycles of the annual inventory in Illinois (2001–2003) and, Indiana and Iowa (1999–2003).

The NWOS is the social complement to the FIA forest resources inventories. The NWOS uses a self-administered questionnaire to collect data annually from a subset of private woodland owners with an FIA plot on their land. A complete description of the NWOS study procedures is presented in Butler et al. (2005). Our NWOS data came from the surveys of 2002 and 2003.

To distinguish farmer-owned woodland from other woodland, the NWOS asks whether the respondent owns a farm within 1.6 km of any woodland that is owned. A farm is defined as a place where $1,000 or more is earned in most years from the sale of crops or animals. In Illinois, Indiana, and Iowa, 152 owners responded that they owned a farm within 1.6 km of the woodland owned. We consider the terms "woodland" and "forestland" to be interchangeable[1] We use woodland because most farmers in this region generally do not consider themselves "forestland" owners; they perceive their undeveloped treed land as their woodland, their woods, their woodlot, or simply their trees.

To develop indicators of owner intentions in owning woodland we used two questions. The first asked owners to rate the following potential reasons for owning woodland on a 7-point Likert (1932) scale from "very important" to "not important:"

- To enjoy beauty or scenery (we refer to this category as "Aesthetics");
- To protect nature and biologic diversity ("Biodiversity");
- For land investment ("Invest");
- As part of my home, vacation home, farm, or ranch ("Part of farm");
- For privacy ("Privacy");
- To pass land on to children or other heirs ("Legacy");
- For production of firewood or biofuel ("Firewood");
- For production of timber products ("Timber");
- For cultivation/collection of non-timber forest products ("NTFP");
- For hunting or fishing ("Hunting"); and
- For recreation, other than hunting or fishing ("Recreation").

Although our list is far from exhaustive, it nonetheless 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 woodland-harvesting activities, respondents were asked if trees had ever been harvested or removed from the land they owned. If a respondent indicated that trees were harvested, we asked about what types of products were

[1] FIA defines forest land as land that is at least 10% stocked by forest trees of any size, or land formerly having such tree cover, and is not currently developed for a nonforest use. The minimum size is 0.405 ha in area and the minimum width is 36.6 m. The NWOS defines woodland as land at least 0.405 ha in size and 36.6 m wide and having at least 25 well-spaced trees per hectare or such land where trees were removed and will grow again. For the purposes of our analysis, we consider these two definitions to be equivalent.

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 (we refer to this category as "Plan");
- Trees were mature ("Mature");
- To clear land for conversion to another use ("Clear land");
- Needed the money ("Money");
- Needed wood for own use ("Use");
- Price was right ("Price");
- To improve hunting opportunities ("Hunting");
- To improve scenic and recreational opportunities ("Recreation");
- To remove trees damaged by a natural catastrophe ("Salvage"); or
- To improve quality of remaining trees ("Remaining trees").

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 that we examined are:

- Volume per hectare;
- Average volume per tree;
- Diversity (Shannon index for species, diameter, and height diversity).

The FIA plot measures all trees 12.7 cm diameter and larger on four 0.017 ha circular plots (7.31 m radius) and all trees 2.54 cm diameter and larger on four 0.00135 ha circular plots (2.1 m radius) on a base grid of 1 plot per approximately 2,400 ha. Typically 30–70 trees were measured on each plot. Although this sampling does not represent a full-scale inventory of all of the respondent's woodland, the single FIA plot measured on the respondent's woodland provides an unbiased estimate of this woodland (McRoberts 1999) across the region.

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 reasons. We examined the Shannon diversity index for species ($H_{spp}'$), diameter ($H_{dia}'$), and height ($H_{ht}'$) with respect to ownership reason, harvest reason, and products harvested.

The Shannon index ($H'$) was computed for each plot using the formula $-\Sigma p_i \ln(p_i)$, where $p_i$ is the relative number of trees within a categorical attribute (species, diameter class, or height class) that were found on the plot (Magurran 1988). The diameter classes used here were 5-cm classes, and the height classes were 3-m classes. Only trees where heights were observed and with diameters 12.7 cm and larger, are considered in computing the height diversity measures. The Shannon index combines measures of evenness and diversity into a single index.

## Results and discussion

### The setting

Over the past decade, privately owned woodland area in the Heartland has remained at about 3.7 million hectares, although in the prior three decades, forest areas steadily increased as abandoned farmland was reforested and grazing practices changed (Woodall et al. 2005; Leatherberry et al. 2006; Crocker et al. 2006; Schmidt et al. 2000a, b; Brand and Walkowiak 1991). Most of the woodland in the region is classified as hardwood stands. In some areas, however, eastern redcedar (*Juniperus virginiana*) is expanding into woodlands and abandoned pastures and fields (Schmidt and Leatherberry 1995). Much of the region's woodland stands contain larger diameter trees. An estimated 65%, or 2.42 million hectares, of private woodland have stands with a plurality of stocking in trees more than 28 cm in diameter at breast height (DBH, 1.37 m above ground level). The substantial area of large-diameter stands indicates that maturing woodland dominates the region's forested area.

Using NWOS data, we estimated that there are approximately 230,000 farm woodland owners in the Heartland region (quite similar to the USDA National Agricultural Statistical Service (2005b) numbers quoted earlier in this article). Farmers who own woodland are a subset of the 570,000 family forest owners in the region. Farmers hold an estimated

2.14 million hectares or about two-thirds of the family-owned woodland in the region[2]. Farmer-owned woodland is well distributed throughout the region. In Iowa, 75% of the family-owned woodland is part of a farm, followed by 69% in Illinois, and 51% in Indiana.

The most common reason stated for owning woodland was that the woodland was "Part of farm" (41%), with no other single reason mentioned by more than 8% of the owners ("Hunt" 8%, "Pasture" 8%, "Enjoy woods" 8%, "Invest" 5%, "Wildlife" 4%, "Aesthetics" 3%, "Biodiversity" 3%, "Legacy" 3%, "Recreation" 3%, "Firewood" 2%, "Timber" 2%, "NTFP" 1%, and "Privacy" 1%). Of those woodland owners who indicated that they harvested forest products from their land, we asked which forest products they harvested. We received responses from 102 landowners, including some answering "yes" to more than one category. The most frequent product was "Sawtimber" 75%, followed by "Firewood" at 50%, with other products mentioned less frequently ("Pulpwood" 14%, "Veneer" 9%, "Posts" 4%, "Other" 3%, and "Unknown" 1%). We also asked the woodland owners why they harvested their forests. Their harvest reasons were: "Mature" 54%, "Remaining trees" 45%, "Salvage" 33%, [Personal] "Use" 25%, "Price" 20%, "Money" 19%, "Plan" 18%, "Clear land" 14%, "Recreation" 7%, "Hunting" 4%, and "Other" 1%.

Figures 1–7 display the average of the various FIA plot attributes (e.g., volume per hectare, volume per tree, and Shannon index) observed on respondents' woodlands broken down by various ownership-response classes. In all figures, the error bars represent the standard error about the mean attribute, and the number of the respondents in the class is shown. We did not consider those classes with a small number of responses (less than five) unless they were significantly different from other classes. The total number of respondents (152) is relatively small and many of the differences that are discussed in the following sections are large, but not all of them are statistically significant at $\alpha = .05$ level. The following discussion is meant to highlight trends that we are seeing in the data.

[2] Family forestland owners are people who have a familial relationship, or who have a relationship based on common interests or goals (Leatherberry 2003).

## Volume

The average volume of all live trees per hectare was 75.59 $m^3$. When we compared volume per hectare with reasons farmers own woodland, we found that owners who rated "Aesthetics" and "Enjoy woods" as important appeared to have higher volume per hectare on their land (Fig. 1a) and larger average tree sizes (Fig. 1b). Owners with low volume per hectare were those who held woodland for "Hunting" or "Part of the farm." The "Investment" and "Hunting" respondents had lower mean individual tree volumes.

Comparing volume per hectare to harvest products and the principal reason for a harvest, we found that higher volumes were associated with farmers who had harvested veneer logs compared to firewood (Fig. 2). We were not surprised by the higher volume for those properties where the landowner is harvesting veneer. Veneer bolts have strict minimum size requirements, often 30–40 cm minimum diameter (Rast et al. 1973), so we might conclude that those harvesting for veneer have many large trees, or have woodlands of sufficient site quality that can grow these high-quality trees. Farmers who harvest firewood may not have these higher-site woodlands.

Figure 3 illustrates, however, that the large trees might not be the "veneer" landowners' only trees: the per-tree volume was not significantly greater than other harvest intention categories. Another explanation might be that the veneer trees were already harvested and the current structure reflects the results of their harvest reasons, or that there is sufficient stocking of smaller trees in these stands to ensure future veneer production. Stands with a high volume per tree may contain only a few large trees per hectare, with trees not typically obtaining veneer quality because of limbs.

We found that farmers with harvesting reasons that have income implications (i.e., achieve management objectives, needed the money, tree matures, and price was right) had relatively higher volumes per hectare (Fig. 4) than did salvage harvesters. Salvage, however, is by definition involuntary and reactive in nature, so the landowners' choices may well have been constrained by the amount of wood available after some storm or insect or disease attack.

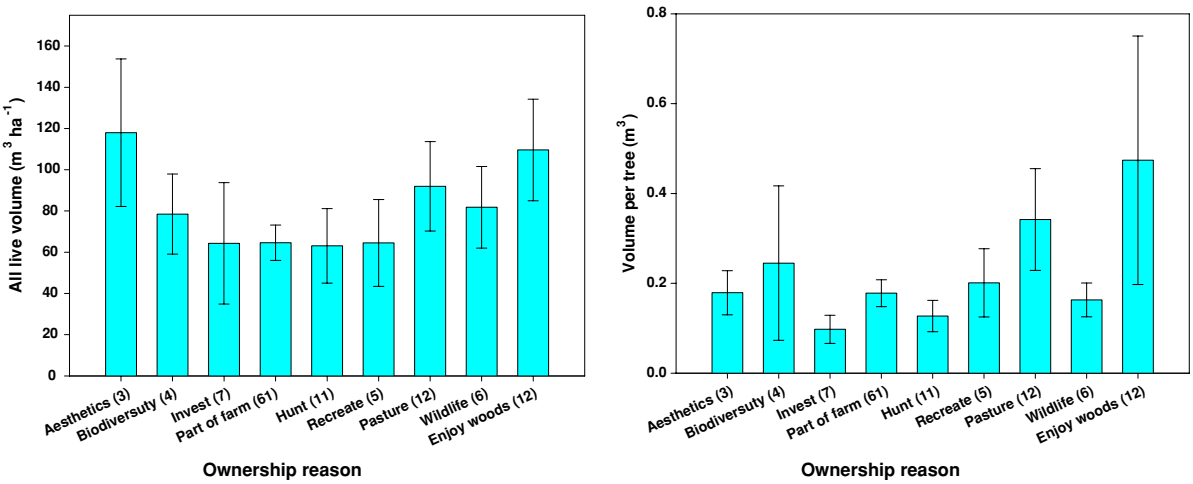


**Fig. 1** All live volume in cubic meters per hectare (**a**, left) and all live volume per tree, in cubic meters (**b**, right), vs. reason for owning the land in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

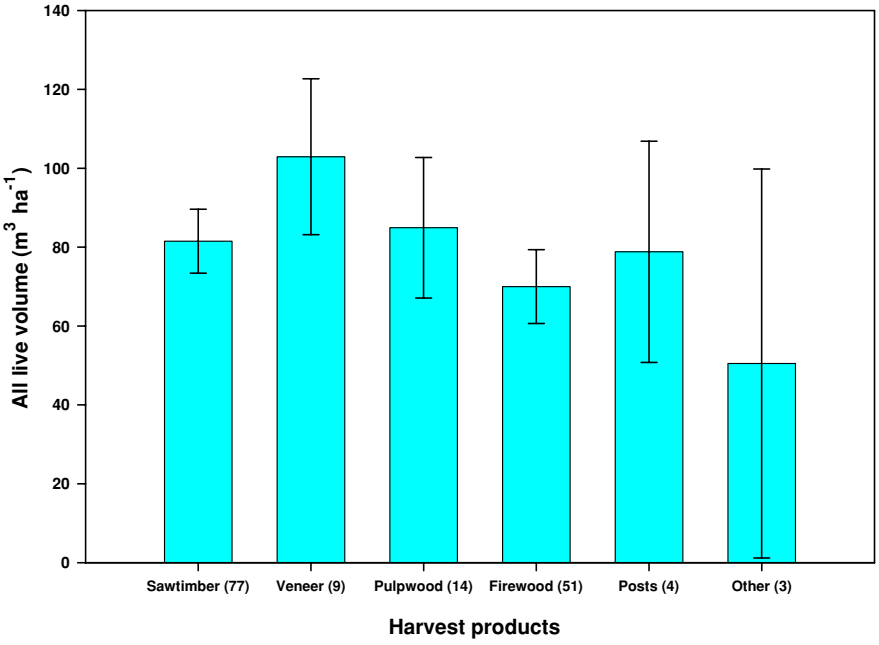


**Fig. 2** All live volume per hectare in cubic meters vs. harvest products in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

## Diversity

We found no difference between the number of tree species by any category of ownership or harvesting. Given the regional nature of our study, climatic and phytosociological factors probably limited the number of overstory tree species, rather than specific management practices. Accordingly, we investigated a more detailed metric of biodiversity, the Shannon index (Magurran 1988). Looking at Shannon diversity indices, we found that the ownership reasons "Biodiversity" and "Invest" had significantly higher values for the Shannon Index for species ($H_{spp}'$) compared to "Part of farm" or "Pasture" categories (Fig. 5). There were no significant differences in diameter diversity ($H_{dia}'$), except that "Wildlife" was significantly larger than "Part of farm." Looking at height diversity ($H_{ht}'$), "Aesthetics" was significantly

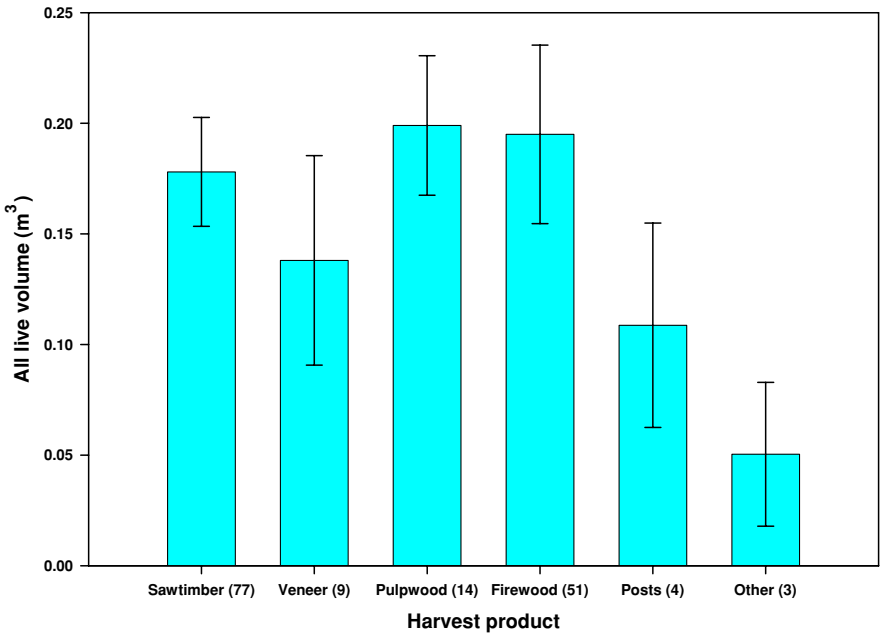


**Fig. 3** All live volume per tree, in cubic meters, vs. harvest products in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

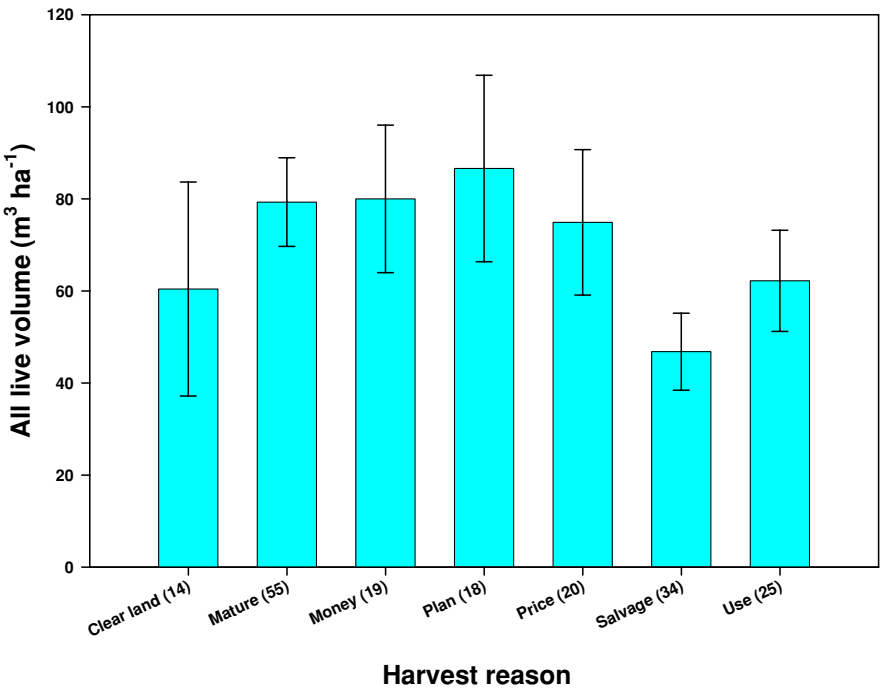


**Fig. 4** All live volume per hectare in cubic meters vs. harvest reasons in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

higher than "Invest" and "Part of farm." "Recreation" and "Wildlife" Shannon values were also higher than "Part of farm."

Among those who indicated that they harvested their woodlands at some time in the past, the Shannon index for species ($H_{spp}'$) for "posts" was significantly less than everything else except for the "other" category (Fig. 6). The $H_{dia}'$ value for firewood was significantly less than that of "veneer" and "pulpwood." Finally, $H_{ht}'$ for "posts" and "firewood" categories were significantly less than the "pulpwood" and "sawtimber" values.

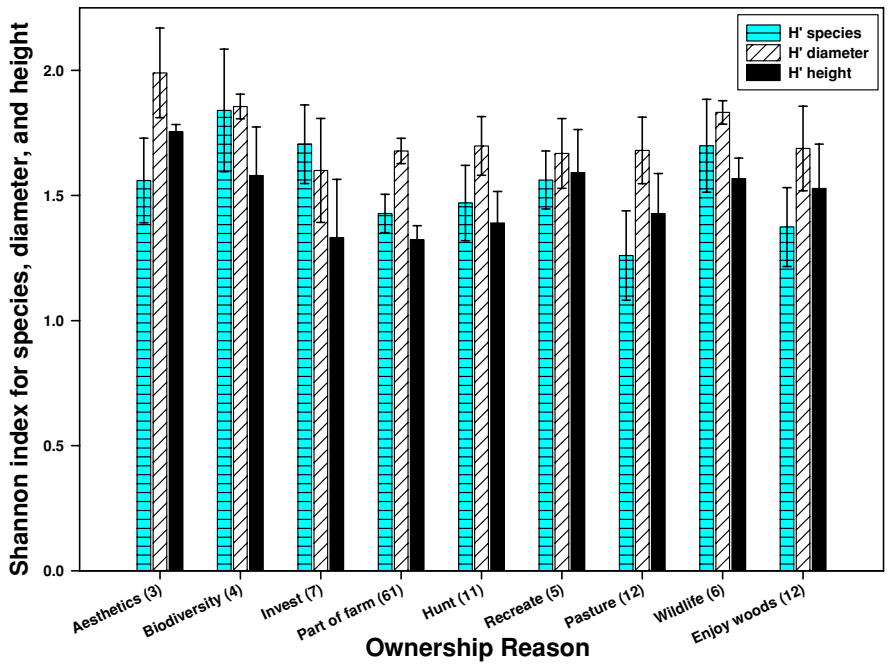


**Fig. 5** Shannon index for species, diameter and height vs. reason for owning woodland in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

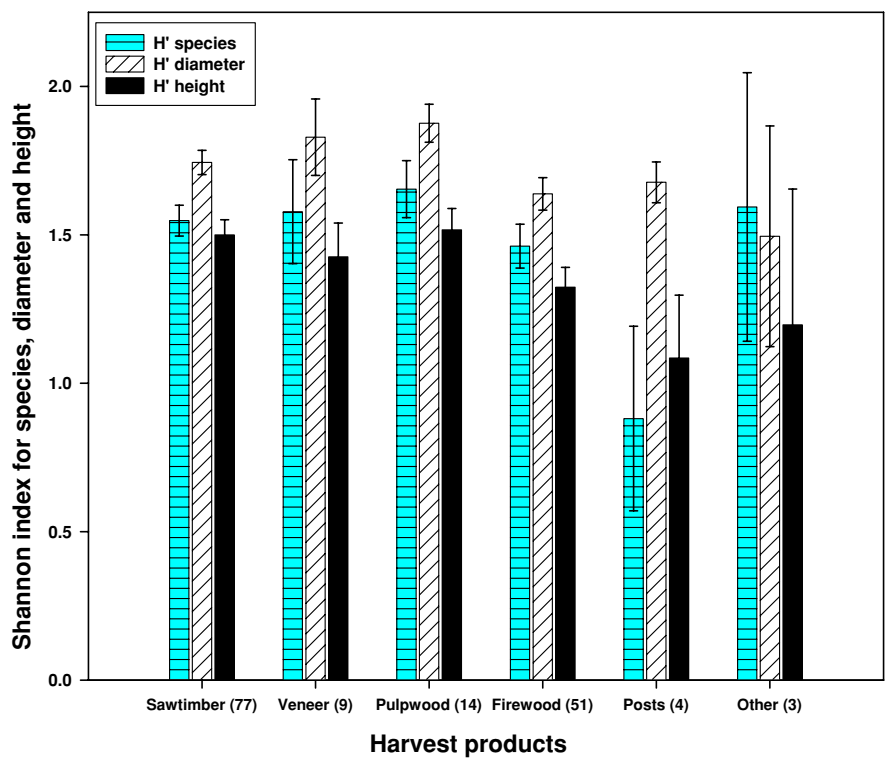


**Fig. 6** Shannon indices for species, diameter and height vs. harvest products in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

Harvest reasons that either focused on land use change or were a reaction to external influences ("Clear land" and "Salvage") appeared to have a negative effect on measures of diversity, relative to other choices. Species diversity ($H_{spp}'$) on properties that harvested trees to "Clear land" was significantly

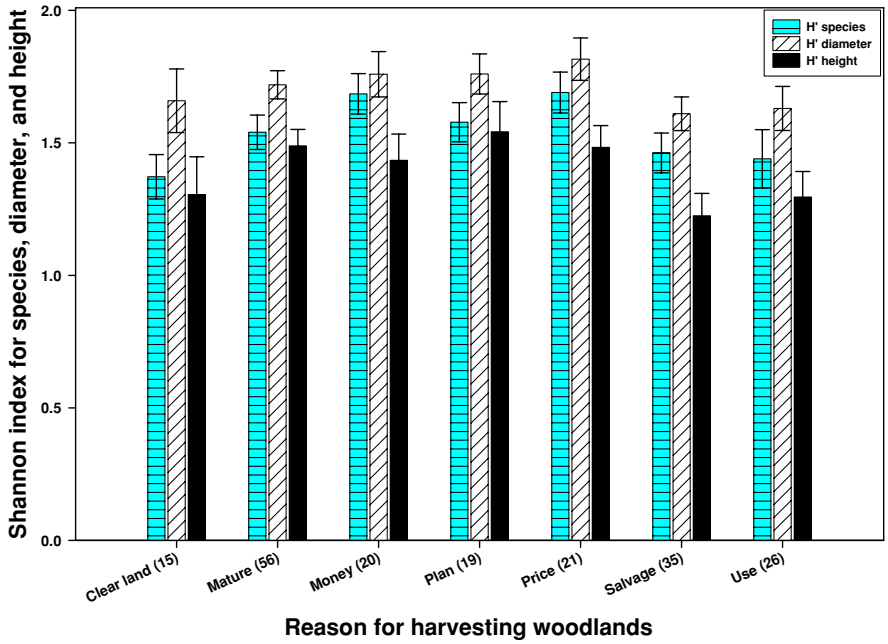


**Fig. 7** Shannon indices for species, diameter and height vs. harvest reasons in woodlands owned by farmers in Indiana, Illinois and Iowa, USA. Numbers in parentheses along category axis represent the number of "yes" responses. Error bars represent the standard error of the mean

less than "Mature," "Money," and "Price" categories. "Salvage" had a significantly lower $H_{spp}'$ than either "Price" or "Money" (Fig. 7). The Shannon index for diameter ($H_{dia}'$) on "salvage" was less than "Mature," "Money," "Price," or "Plan." The Shannon index for height ($H_{ht}'$) for "Salvage" was significantly less than $H_{ht}'$ for "Mature," "Money," "Plan," or "Price." $H_{ht}'$ on properties where harvesting was conducted for (personal) "Use" was significantly less than "Mature," "Plan," or "Price."

It is worth noting the low values of Shannon index height for posts as a harvest product (Fig. 6) and salvage as a harvesting reason (Fig. 7). As we mentioned before, posts are often "mined" from dense stands of otherwise unmerchantable trees and there is no economic value in their becoming too tall, hence the low height diversity. Salvage implies disturbance or some other condition that required further management. For example, wind or ice storms may have damaged large trees or "topped" individuals (stems broken off at the top), requiring harvesting that resulted in lower height diversity.

## Conclusions

Our goal was to evaluate whether the woodland each owner possessed truly reflected her/his goals, intentions, and actions. It is generally recognized that investment in timber stand improvement can improve the value of a stand and subsequent income from harvesting (Smith 1986). This supposition, in turn, suggests that woodland owners who derived significant income from their trees and viewed their forests as a source to be tapped periodically for income would engage in practices that would maintain or enhance income-generating opportunities. Conversely, woodland owners who did not view their trees as a source of substantial income would have less incentive to invest in the woodlands. Therefore, we would expect to see a correlation between revenue and stand structure. For example, farmers who harvested firewood may have lower value per hectare because they may not have conducted stand improvement activities after removal.

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 who claimed to be interested in aesthetics or enjoying the woods generally had higher volumes per hectare than those who owned woods because they were part of the farm. Those landowners interested in enjoying the woods had larger trees than those owners who owned woodland for wildlife, hunting, or investment

purposes. Woodland owners who salvage-harvested their woodlands—a harvesting reason that is more reactive than proactive—exhibited lower volumes per hectare than those who harvested for more proactive, product-focused reasons.

We found that those farmers with income-generating harvest reasons had higher volumes per hectare than those who harvested for salvage purposes. While there was no difference between the different income-generating goals, the lower amount for salvage probably reflects the reactive nature of salvage harvesting and the results of the damage—wind, ice, insects, or disease—that necessitated the salvage in the first place. Farmers who harvested firewood had a lower volume per hectare. Whether a great deal of firewood had been harvested before our latest inventory or there was not much usable wood volume to begin with, it appears that firewood harvesters had less incentive to maintain inventory in their woodlands.

Biodiversity was also affected by the ownership focus and harvest intent. Generally, there was lower diversity in overstory species when the woodland was viewed merely as "part of the farm," when the product harvested was fence posts, and when the harvest reason was timber salvage or land clearing.

Looking at harvested products, the two categories representing the least potential return—firewood and posts—exhibited the least diversity. The common method of producing posts is with single-species, even-aged stands. The higher $H_{dia}'$ (diameter diversity) compared to $H_{spp}'$ and $H_{ht}'$ for posts suggests that such landowners may be interested only in a particular size of tree for posts and may leave those larger or smaller in diameter for other uses, if any. Furthermore, particular species frequently used for posts, such as osage-orange (*Maclura pomifera*) or eastern redcedar (*Juniperus virginiana*), are likely to grow either in monocultures or with relatively few other species (Burton 1990; Lawson 1990), which would explain the low species diversity. The tendency to harvest a tree as soon as it grows to "post-size" might explain the limited height diversity. The combination of the growth habits of the particular species used for posts and the lower economic value suggests that the landowners might have "mined" the stands, taking advantage of the resource present when the need arose, rather than planning and investing in the woodlands.

The product category that displayed the largest differences between the three diversity indices was posts. Species and height diversity were low and diameter diversity was much higher. We have already discussed the scenarios for harvest of posts, and how the species' habit and the narrow range of utilization specifications for fence posts limits which trees are harvested. A similar situation is firewood harvesting. A forest used primarily for firewood might have this structure if removals emphasized certain species and those species occupied a certain level of the overstory. For instance, a farmer might harvest red maple (*Acer rubrum*), a species that rarely dominates in the overstory, but is more frequently a lower-canopy/midstory species. The farmer thus eliminates the midstory and many maples, reducing height and species diversity.

Among reasons for harvesting, the highest species diversity occurs where the harvest reasons were "Money" or "Price." This result seems paradoxical, as we might expect that a management goal such as wildlife, where most species need a mixture of forage, cover and transition zones, would create 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; in that case, the present diversity occurred in spite of management intentions, not because of them.

While the small sample size limits our analysis, we can conclude that efforts to increase productivity, value-added generation, and biodiversity would achieve the greatest gains by focusing the woodland owners on management of their woodlands, regardless of what the specific management goals might be.

Combining the annual FIA forest resources inventory database and information from the NWOS has the potential to answer questions about farm-woodland owner intentions and impacts. We were limited by the relatively low number of respondents in our sample, the high variability of the resource being sampled across three states, and the potential inaccuracy of one plot representing the entire woodland resource of a landowner. Nonetheless, our analysis suggests some interesting relationships and raises a number of important questions. Proactive farm woodland management has the greatest impact on biodiversity. Efforts to increase diversity on the farm

woodland landscape should focus on increasing farmers' actively planning for and practicing of woodland management, which can also provide opportunities for additional benefits of recreation opportunities, woodland aesthetics, and forest products availability.

By the very demands of their work, farmers tend to be utilitarian in their attitude. Yet, the diverse outlooks of the landowners—not a strictly timber orientation—reflect the place the woodlands occupy within the overall physical (and mental) landscapes of the farmers. Their management of farm woodlands has intentional and unintentional (and often unappreciated) benefits for society in providing increased diversity for the agricultural landscape.

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