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ANALYSIS

Willingness to pay for forest amenities: The case of non-industrial owners in the south central United States

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Abstract

We analyze the willingness to pay for non-timber values (NTV) by non-industrial private forest (NIPF) landowners of uneven-age mixed species forest stands in the south central United States. The preferences of NIPF owners are revealed by the way they manage their timber. Many NIPF owners maintain a more diverse and natural stand structure than that of a more profitable even-aged industrial plantation. In so doing, the average NIPF owner was willing to forego 60% of the timber profit for the NTV of their more natural stands compared to a less diverse industrially managed even-aged plantation.

Keywords: Non-timber valuation; Natural forest; Revealed preference; Forestry; Growth model

1. Introduction

Optimal management of the many services provided by forests requires an assessment of their price. Prices are needed to compare the multiple uses of public forests or to establish the optimal level of funding for some services. This is also true for private lands to the extent that many government policies are meant to influence private owners.

Prices for some goods provided by the forest are revealed by market transactions. Timber and grazing rights, for example, are bought and sold at prices that can be used in benefit cost analysis. But, many other services are not traded in markets. As environmental services, they are public goods, so due to the "free riding" effect (Wicksell, 1896) forests tend to be undervalued when priced for timber only. Forests also provide amenities, such as scenic beauty and the value of simply being there (existence value) that should be considered in a complete valuation.

Methods to estimate the value of these non-market goods and services include contingent valuation and conjoint analysis that poll individuals to obtain their willingness to pay for amenities. Revealed preference methods instead use observations on how decision makers actually trade off market goods and amenities. Well-known variations of the revealed preference approach include the travel cost and hedonic pricing method (Anderson and Bishop, 1986).

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The preference of owners for the non-timber value of forests is also revealed by their willingness to forgo timber revenues to enjoy more forest amenities. Lee (1997) studied the revealed preference of forest owners for forest amenities in even-aged southern pine stands. She derived the value of stand features such as diversity and scenic beauty.

Scarpa et al. (2000) estimate the non-timber value (NTV) of uneven-aged northern hardwood stands to forest owners, by comparing their actual management to the most profitable alternative. They find that the average non-industrial private forest (NIPF) owner is willing to forgo \$25 ha^{-1} $year^{-1}$ in timber profit for the improved amenities obtained with a more conservative management.

In this paper, we examine revealed willingness to pay of southern NIPF owners for the amenities of mixed age and mixed species forests instead of the less natural, but more profitable, even-aged loblolly plantations managed by the forest industry. In this forest ecotype the timber profit maximizing alternative is often even-aged loblolly pine silviculture (Redmond and Greenhalgh, 1990; Hotvedt and Ward, 1990; Stokes et al., 1993; Chang, 1990; Guldin and Guldin, 1990), which is in stark contrast to the diversity of a mixed age, mixed species stand. In addition to the diminished diversity of even-aged stands, many people dislike the clear-cut harvest method usually employed (Hill, 1992; Guldin, 1996). Gan et al. (2000) found that the public also prefers the benefits of non-consumptive activities, wildlife habitat and biodiversity on forests with the least intrusive silviculture.

2. Methods

2.1. Value of forest amenities in a diverse stand

Raunikar et al. (2000) examined the economics of managing stands with trees of diverse species and ages in the south central United States. We presume that, in these natural-looking stands, the owners realize more NTV than in monospecific even-aged stands. The components of NTV are benefits that NIPF owners recognize and value (Luloff et al., 1993). NIPF owners might value the enhanced game habitat that a diverse forest provides as a private good to them. Or, they might prefer the beauty of a diverse stand, which enhances the enjoyment of their land, another private good. They also might value the existence of more wild land, a public good. But they may not consider how others value that same public good. Because of this, the non-market value of the land will be more to society than to the NIPF owner alone and the public good will be under-provided (Samuelson, 1954).

Although it excludes the larger social non-market value of a forest, understanding the private NTV of forests revealed by owner behavior is an important part of understanding total social value. NIPF owners of mixed age mixed loblolly and hardwood stands must value the attendant amenities at least as much as the timber income they forego by not replacing their stand by an industrial even-aged pine plantation. Poor information and capital scarcity may also help explain why an owner would fail to fully maximize timber profits. But, a rational owner in a free market should not be limited in a major way by these constraints.

To summarize, the opportunity cost of using a more natural, but less profitable silviculture can be viewed as a lower bound on the non-timber value that it provides. An operational measure of this NTV is:

$$\mathrm{NTV} = \mathrm{MAX}[0, (\mathrm{EAI_a} - \mathrm{EAI_n})] \quad (1)$$

Where $\mathrm{EAI_a}$ is the potential equivalent annual income from a plantation and $\mathrm{EAI_n}$ is the equivalent annual income from a naturally regenerated stand of mixed age and species, on the same land. The lower bound of zero means that, as a price, the NTV cannot be negative.

2.2. Data

2.2.1. Sample of plantations and natural stands

The stand data came from 1-acre plots of the Forest Inventory and Analysis (SoFIA) database for the south central region of the United States (Southern Forest Experiment Station, 2003). The selected plots had been measured at both of the last two surveys (separated by 6 to 11 years). Among these plots, we defined as “plantations” those that were on industrially owned, artificially regenerated, even-aged, loblolly pine lands in the two surveys. Thus, the plantation plots, of which there were 457, were long-term industrial plantations and not in transition from another mode. We defined as “natural” plots those that were in the loblolly pine-hardwood type, natu-