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# Discount Rates for Nonindustrial Private Forest Landowners in Mississippi: How High a Hurdle?

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**ABSTRACT:** *Mississippi forest landowners were surveyed to determine average discount rates or “hurdle rates”—the lowest rates of return they consider acceptable—for 3 nonforestry investments, and for 5, 15, and 25 yr forestry investments. The survey included 829 individuals who owned at least 20 ac of uncultivated land and had harvested timber during a recent 5 yr period; survey results are therefore oriented toward commercially active forest landowners. On average, the private nonindustrial forest landowners included in the survey expect timberland investments to earn higher rates of compound interest than relatively low-risk bank savings accounts and certificates of deposit. Relatively short-term (5 yr) timberland investments, however, have lower minimum rates of return than stocks, bonds, and mutual funds. With forestry investments, all else equal, Mississippi nonindustrial private forest landowners prefer shorter time periods—average hurdle rates in nominal terms before taxes were 8.0% for forestry investments lasting 5 yr, 11.3% for those lasting 15 yr, and 13.1% for those lasting 25 yr. Household income significantly influenced the lowest rate of return considered acceptable for 5 yr forestry investments—the rate was 9% for landowners with annual incomes above \$50,000 and 7.4% for landowners with annual incomes below \$50,000. On a hurdle rate basis, higher income private landowners in Mississippi generally find forestry investments lasting 15 yr to be competitive with stocks, bonds, and mutual funds. However, Mississippi landowners’ 13.1% required rate of return for 25 yr forestry investments was higher than the rate considered acceptable for the other investments included in the survey. Reforestation tax incentives, cost-shares, and related public policies that reduce the front-end costs incurred by NIPF landowners tend to increase the projected rate of return for relatively long-term reforestation investments. *South. J. Appl. For.* 26(1):26–31.*

**Key Words:** Discount rates, nonindustrial, NIPF, hurdle rates, interest rates, investments.

Discount rates are annual rates of compound interest that are used to account for the time value of cash flows. The discount rate for a specific capital project can be defined as the minimum annual rate of compound interest an investor would consider acceptable for that investment. This minimum acceptable rate of return is sometimes referred to as a “hurdle rate,” or a “guiding rate of return” (Duerr 1993). For some investors and some specific projects, the choice of a discount rate may be based on the rate of return that can be earned in alternative investments of comparable duration, scale, liquidity, and risk; in such cases the discount rate may be

referred to as the “alternative rate of return.” With other investors and projects, the appropriate minimum rate of return is the interest rate paid on borrowed funds, or a combination of debt and equity capital; in these cases the discount rate is often called the “cost of capital.”

Choosing a discount rate is particularly important in evaluating forestry investments, where significant amounts of capital may be invested for relatively long time periods. When landowners decide to harvest a particular stand of timber, for example, in some cases they make the decision based on their ability to earn a higher rate of return on the capital in other investments. This type of decision has been generally referred to as “financial maturity” analysis, and these methods have a long history of application in forestry, particularly in the management of hardwood timber stands (Goodson and Bullard 1997). Also, when nonindustrial private forest (NIPF) landowners spend money for site prepara-

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tion, planting, competition control, and other silvicultural practices, they are usually investing with an expectation of earning competitive financial returns. The rate of return has long been a popular measure of the competitiveness of forestry investments among NIPF landowners (Foster 1984).

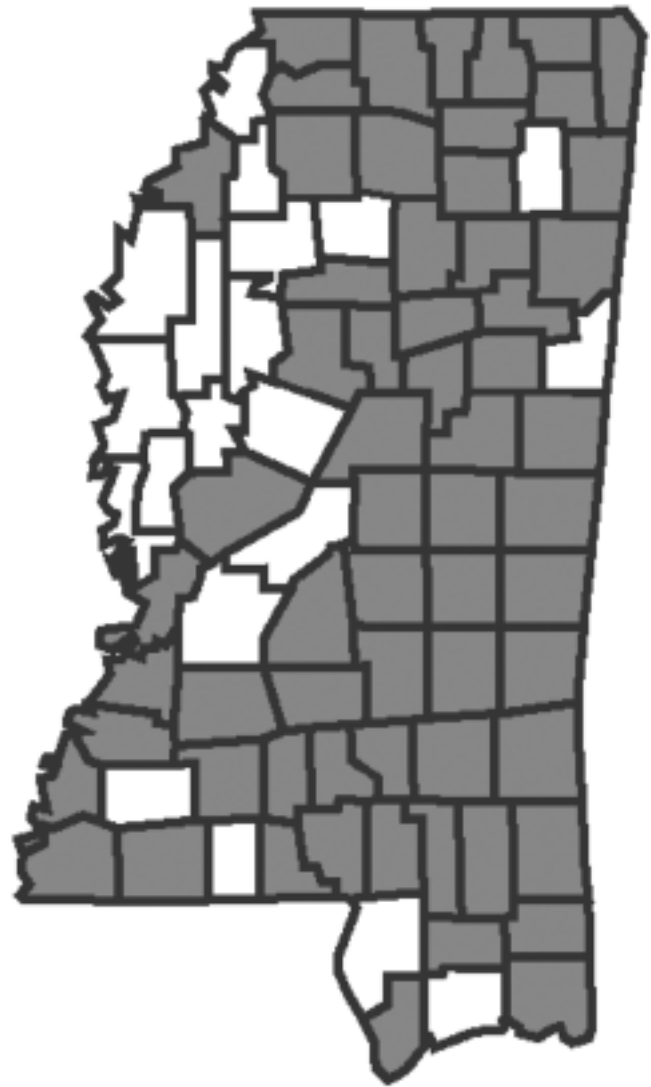
How high do rates of return have to be for forestry investments before NIPF landowners consider them “competitive?” Individual forest landowners differ, of course, in total wealth, current income, earning and borrowing opportunities, age, aversion to risk, and many other ways that impact the lowest rate of return they consider acceptable for specific forestry investments. Also, potential timber and timberland investments vary in scale, duration, risk, and other important characteristics that can affect the minimum rate of return individual landowners consider acceptable for various silvicultural practices. For these reasons it is impossible to select a single discount rate that applies to all NIPF landowners and potential forestry investments. We can, however, assess the rate of return expectations of NIPF landowners in the aggregate. In a 1982 survey of North Carolina NIPF landowners, for example, Kronrad and de Steiguer (1983) found that a higher rate of return was desired for forestry investments that were longer term. For 5 yr forestry investments, for example, North Carolina landowners’ average rate of return goal was 13.2% before taxes in nominal terms; the same landowners specified a desired rate of 15.1% for 25 yr forestry investments.

In this article, we summarize discount rate information collected in a recent survey of Mississippi NIPF landowners. We present minimum acceptable rates of return on a before-tax basis for three nonforestry investments, and for 5, 15, and 25 yr forestry investments with and without inflation. We also examine the influence of income, type of ownership, and perceptions of risk on the minimum rate of return the state’s NIPF landowners consider acceptable for forestry and nonforestry investments.

## Methods

Discount rate information was collected as part of a survey of pine reforestation on NIPF lands in Mississippi. The telephone survey was conducted in spring 2000 by the Survey Research Unit of the Social Science Research Center at Mississippi State University. Mississippi landowners were interviewed who owned at least 20 ac of uncultivated land, and who had sold timber between January 1, 1994 and December 31, 1998. Survey results should be viewed considering the specialized nature of the sample. Sixty-two of the state’s 82 counties were included in the survey sample (Figure 1). The counties not sampled in the survey were primarily in the Delta area of the state, where most forestland is in hardwood timber types. Some non-Delta counties were also excluded from the sample, however, because NIPF landowner records were not available at the time of the survey.

In conducting the survey, 7,392 Mississippi landowners were contacted by telephone. Of those contacted, 340 refused to be “screened” or interviewed, 6,223 were screened but did not meet the criteria for harvest activity and tract size, and 829

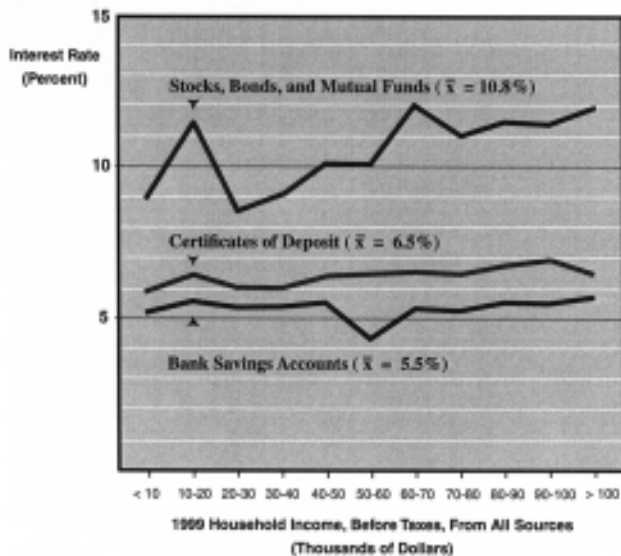


**Figure 1. NIPF landowners were interviewed in 62 of Mississippi’s 82 counties (shaded counties were included in the survey).**

completed the telephone interview. Survey data were analyzed using the Statistical Package for the Social Sciences (SPSS, Inc. 1999), and the Statistical Analysis System (SAS Institute 1996). Analysis of variance procedures were used to test for statistically significant differences among the average discount rates. Specifically, Duncan’s multiple range test was used to compare multiple discount rate means (Freund and Wilson 1993). All of the tests for differences among means were performed using a significance level of 5%

## Results

As mentioned in the Methods section, our survey involved a specialized sample of Mississippi NIPF landowners—those who owned at least 20 ac of uncultivated land, and who had sold timber during a recent 5 yr period. The following results should be viewed considering the sample’s specialized nature. Since owners of very small tracts were not included, for example, our results are biased toward owners of tracts that are more likely to be commercially viable. Also, since landowners in our survey had harvested timber in recent years the survey may over-represent landowners with an interest in commercial forestry.



**Figure 2. The lowest interest rate deemed “acceptable” by NIPF landowners in Mississippi for three nonforestry investment alternatives, by household income.**

### Nonforestry Investments

Forest landowners today have wide-ranging alternatives for capital investment. These alternatives affect the willingness of many landowners to invest in forestry practices. Mississippi NIPF landowners were asked the following question relating to three nonforestry investments:

*What is the lowest interest rate you consider acceptable for each of the following ...*

- A bank savings account?
- A certificate of deposit (CD)?
- Money invested in stocks, bonds, and mutual funds?

Results for this question were evaluated by income level (Figure 2); average interest rates were compared using a  $\alpha = 0.05$  level of significance. Household income did not have a statistically significant impact on the minimum interest rate considered acceptable for bank savings accounts or CDs. With stocks, bonds, and mutual funds, however, income level did have a significant influence on the minimum acceptable rate of return. The average rate specified for these investments by Mississippi NIPF landowners with 1999 household incomes greater than \$50,000 was 11.5% ( $n = 168$ ); for households with incomes below \$50,000 the average rate was 9.5% ( $n = 101$ ). The higher rate specified for stocks, bonds, and mutual funds by

higher income NIPF landowners may reflect their greater awareness of opportunities in these types of investments. The higher rates for higher income landowners may also reflect greater levels of participation in financial investments in recent years when many such investments have yielded relatively high rates of return. As expected, the overall average rate of return considered acceptable for stocks, bonds, and mutual funds (10.8%,  $n = 346$ ) was significantly higher than the average minimum rate for investments with guaranteed returns like CDs (6.5%,  $n = 523$ ) and savings accounts (5.5%,  $n = 517$ ).

## Forestry Investments

### Length of Investment

If all other factors are equal, Mississippi NIPF landowners require higher rates of return as the period of time lengthens on forestry investments, as shown by the average responses to the multipart question in Table 1. The average interest rates in Table 1 can be interpreted as average discount rates for NIPF landowners in Mississippi for timberland investments. The nominal, before-tax discount rates are significantly different from each other ( $\alpha = 0.05$ ). Since average “hurdle” rates are significantly lower for shorter investment periods, NIPF landowners in Mississippi prefer shorter term forestry investments (all else equal). As previously discussed, Kronrad and de Steiguer (1983) found a similar preference in a 1982 survey of North Carolina NIPF landowners. After adjusting for the 6.2% rate of inflation in 1982, Kronrad and de Steiguer’s results were 6.6% (5 yr) and 8.4% (25 yr) rates of return in “real” terms before taxes. Higher hurdle rates for longer term timberland investments may reflect the relative illiquidity of forestry investments, greater uncertainty about future timber prices and market demand, as well as production risks that may be perceived as greater over longer time periods. Liquidity concerns are consistent with the liquidity preference theory of the term structure of interest rates (Hicks 1946). In an uncertain world, all else equal short-term investments are more desirable than longer term investments because they are more liquid (Malkiel 1987). Higher hurdle rates are considered to include a “liquidity premium” that increases with the term-to-maturity of the investment. In bond markets, for example, it has been found that issues that mature in 20–30 yr have liquidity premiums of one to two percentage points over the rate for short-term issues (Lee 1985, Brigham 1982).

**Table 1. The lowest before-tax interest rate acceptable to NIPF landowners in Mississippi for 5 yr, 15 yr, and 25 yr timberland investments, with and without inflation, 2000.**

	Average response	
	Nominal	Real*
	.....(%) .....	
What is the lowest interest rate you consider acceptable for each of the following ...		
• A timberland investment lasting 5 yr?	8.0 ( $n = 250$ )	5.7
• A timberland investment lasting 15 yr?	11.3 ( $n = 250$ )	8.9
• A timberland investment lasting 25 yr?	13.1 ( $n = 220$ )	10.7

\* The real rates shown are the nominal (inflated) rates obtained in the survey, adjusted for inflation using the formula below (Bullard and Gunter 2000). The rate of inflation used was 2.2%, the annual rate of increase reported for the Consumer Price Index for 1999 (Federal Reserve Bank of Minneapolis 2000).  
 $Real\ Rate = [(1 + Nominal\ Rate\ of\ Interest) / (1 + Annual\ Rate\ of\ Inflation)] - 1$ .

### *Ownership Category*

Of the 829 Mississippi NIPF landowners interviewed, a total of 794 (96%) were sole ownerships ( $n = 297$ ), co-owners with spouse ( $n = 344$ ), or co-owners with other family members ( $n = 153$ ). In general there were no statistically significant differences in forestry or nonforestry discount rates among ownership categories. The survey also included 21 respondents who represented estates ( $n = 16$ ) and trusts ( $n = 5$ ). The discount rates specified as minimally acceptable by estates and trusts for 5 yr, 15 yr, and 25 yr timberland investments were not significantly different ( $\alpha = 0.05$ ) from the discount rates of other NIPF landowner categories.

### *Landowner Income*

We also compared discount rates for 5, 15, and 25 yr forestry investments for two broad categories of household income. Mississippi NIPF landowners in households with incomes greater than \$50,000 had significantly higher ( $\alpha = 0.05$ ) minimum rate of return expectations for 5 yr forestry investments (9.0%,  $n = 121$ ) than landowners with household incomes below \$50,000 (7.4%,  $n = 75$ ). Discount rate differences for the two income categories were not statistically significant for 15 yr and 25 yr forestry investments.

### *Regenerators vs. Nonregenerators*

All of the landowners interviewed in our spring 2000 survey had sold timber in Mississippi during the 5 yr period between January 1, 1994 and December 31, 1998. Of the 829 respondents, 427 had actively provided for pine regeneration on their harvested land, while 402 had not provided for regeneration. Before the survey, we anticipated that nonregenerators would have higher rate of return expectations than regenerators. That is, we expected that the specified hurdle rate would help explain how landowners behaved in terms of regeneration decisions. This was not the case, however; the hurdle rates for 15 yr and 25 yr timberland investments were not significantly different for regenerators and nonregenerators. Most of the 402 nonregenerators (75%) responded that "rate of return on reforestation investments is too low" was of no importance ( $n = 282$ ) or low importance ( $n = 20$ ) in their decision not to provide for pine regeneration. However, these landowners also placed low importance on lack of cost-sharing funds, unsuitability of land for pine, the length of time involved in reforestation investments, uncertainties of future land use, and risks associated with drought, fire, wind, insects, and disease. Since none of these reasons were considered important, and since their rate of return expectations were similar to regenerators, an important reason for not regenerating to pine may be some NIPF landowners' lack of knowledge about the rates of return that can be earned in pine plantation investments, especially when cost shares, tax incentives, and other measures are used to lower the front-end costs.

Of the landowners who provided for pine regeneration after harvest, 70% placed high levels of importance on the advice of a professional forester, while 75% of the nonregenerators received no advice or assistance from a professional forester. The potential for future profits in forestry investments was high in importance with regenerators. Of the 427 NIPF landowners in our survey who provided for

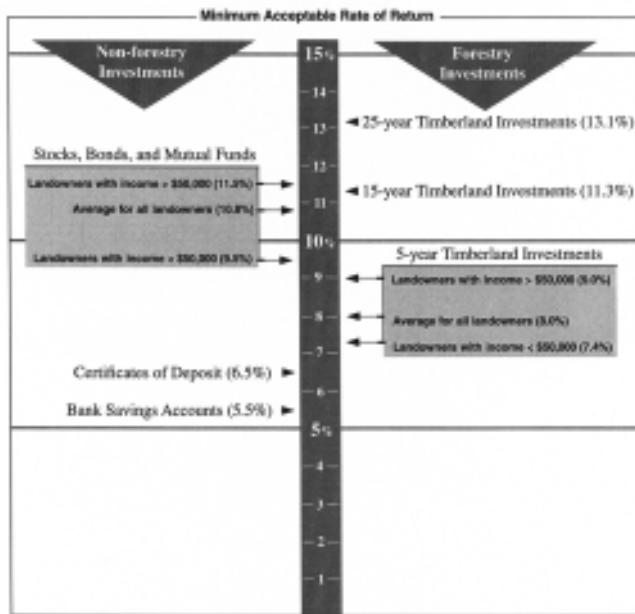
pine regeneration, 84% said the statement "it was an economic decision in anticipation of future profits from forest production" was of high ( $n = 311$ ) or moderate ( $n = 48$ ) importance in their decision to regenerate to pine. The regenerators in our survey also placed a high level of importance on resource stewardship. Among regenerators, 96% said to "conserve the natural environment and provide for future generations" was of high ( $n = 385$ ) or moderate ( $n = 26$ ) importance in their decision to provide for pine regeneration.

### *Perceptions of Risk*

Discount rates are often adjusted by investors to compensate for the level of uncertainty associated with the costs and revenues projected for alternative investments (Trippi 1989). In general, higher rates of return are required for forestry investments with greater levels of uncertainty about the future than for lower risk investment alternatives (Klemperer 1996). Of the 829 Mississippi NIPF landowners interviewed in our survey, however, only 98 felt that forestry investments were more risky than "other potential investments" by enough to justify using a higher discount rate. Landowners did specify higher discount rates for longer term forestry investments, however, and as previously discussed, landowners may feel that longer term timberland investments simply involve greater uncertainties about future revenues and costs. They may also perceive that with longer time periods there is a greater likelihood that the financial illiquidity often associated with forest-based assets will be a problem. The higher discount rates specified by Mississippi NIPF landowners for longer term forestry investments may therefore be an intuitive accounting for the greater uncertainties associated with longer time periods.

### **Forestry vs. Nonforestry Investments**

In general, Mississippi NIPF landowners expect timberland investments to earn a higher rate of return than low risk, relatively high liquidity investments like bank savings accounts and CDs. However, the minimum earnings rate considered acceptable for 5 yr forestry investments (8% average for all households) is lower than the 10.8% average hurdle rate for stocks, bonds, and mutual funds (Figure 3). The minimum rate for 15 yr timberland investments (11.3%) is almost equal to the hurdle rate specified for stocks, bonds, and mutual funds by higher income respondents (11.5%). On the basis of the rate of return considered minimally acceptable, therefore, higher income NIPF landowners view short-rotation (e.g., 15 yr) forestry investments and relatively short-term practices like mid-rotation fertilization or herbicide application as being competitive with stocks, bonds, and mutual funds. This is important considering the increasing number of higher income NIPF landowners in the South (Birch 1997), and considering timber price and utilization trends that in many areas of the South are leading to greater emphasis on relatively short-rotation, more intensively managed pine plantations (Bullard and Daniels 1998). Timberland investments lasting 25 yr or more, meanwhile, are expected to generate a significantly higher rate of return (13.1%) than the three nonforestry investment alternatives included in the survey.



**Figure 3. The hurdle rate, or minimum rate of return considered acceptable by Mississippi NIPF landowners, for selected forestry and nonforestry investments in nominal, before-tax terms, 2000.**

## Summary and Conclusions

Financial considerations are very important to many NIPF landowners, and choosing an appropriate discount rate, or a minimum acceptable rate of return, is central to the process of evaluating forestry investments. In the spring of 2000, over 800 Mississippi NIPF landowners who had sold timber during a recent 5 yr period were surveyed by telephone to determine the discount rates they consider acceptable for selected forestry and nonforestry investments. In nominal, before-tax terms, their minimum acceptable rate of return averaged 5.5% and 6.5% for bank savings accounts and CDs, respectively. The lowest rate of return considered acceptable for these relatively low-risk investments did not differ significantly for NIPF landowners of different income levels. Average hurdle rates for stocks, bonds, and mutual funds, however, did vary by broad income levels. The nominal, before-tax minimum acceptable rate of return for stocks, bonds, and mutual funds averaged 11.5% for landowners with household incomes above \$50,000; the average was 9.5% for landowners with incomes below \$50,000.

In general, Mississippi NIPF landowners prefer shorter term forestry investments over longer term forestry investments. This is shown by the lower rates of return they consider acceptable for shorter term forestry projects. In nominal, before-tax terms, forestry hurdle rates averaged 13.1% for forestry investments lasting 25 yr, and 11.3% for those lasting 15 yr. With timberland investments lasting only 5 yr, however, the landowners specified lower hurdle rates, and they were significantly different for two broad categories of household income. Landowners with incomes above \$50,000 had an average minimum acceptable rate of return of 9.0% for 5 yr forestry investments, while landowners with incomes below \$50,000 averaged 7.4%.

Higher hurdle rates for longer term investments are often observed in financial markets when investors expect inflation to be relatively high in the future (Nelson 1987). With forestry investments, however, land and timber assets tend to rise in value with or ahead of inflation (Kelly 1996), so general price trends do not explain forest landowners' higher rate of return expectations for longer time periods. NIPF landowners may expect higher rates of return for longer term forestry investments to offset the greater price and production uncertainties, as well as the greater illiquidity associated with longer time periods.

Mississippi NIPF landowners require higher rates of return for forestry investments than for low-risk savings accounts and CDs. However, the minimum rate of return expected for 5 yr forestry investments is significantly lower than the hurdle rate for stocks, bonds, and mutual funds. Landowners with household incomes above \$50,000 expect 5 yr forestry investments to earn at least 9% in nominal, before-tax terms, for example, while they expect stocks, bonds, and mutual funds to earn at least 11.5%. Landowners with incomes less than \$50,000 had an average hurdle rate of 7.4% for 5 yr forestry investments, but 9.5% for stocks, bonds, and mutual funds.

Timber can be considered "financially mature" when its rate of value growth drops below the rate of interest that can be earned in alternative investments of comparable duration, liquidity, and risk (Mills and Callahan 1979). Using financial maturity as a guide, our results indicate that higher income landowners are more likely to sell timber that is merchantable to reinvest the funds in alternative investments—higher income landowners specified higher hurdle rates for 5 yr timber investments than did lower income landowners. This conclusion should not be overstated, however, since our survey also indicated that while financial returns are very important to NIPF landowners, other, nonfinancial, concerns are also of great importance. A very high percentage of landowners who invested in pine regeneration, for example, said that concern for the natural environment and providing for future generations was of moderate or high importance in their forestry decisions.

Minimum returns expected for 15 yr and 25 yr forestry investments did not vary significantly by income level. The average hurdle rate for 15 yr forestry investments was 11.3%, which is almost identical to the 11.5% hurdle rate specified for stocks, bonds, and mutual funds by NIPF landowners with household incomes above \$50,000. The number of NIPF landowners with relatively high incomes is increasing in Mississippi and the South, and these landowners' average hurdle rates for short-rotation (e.g., 15 yr), intensive forestry practices are similar to those specified for stocks, bonds, and mutual funds. On average, higher income landowners also have similar hurdle rates for relatively short-term silvicultural investments such as midrotation competition control and midrotation fertilization of pine plantations.

For forestry investments lasting 25 yr, however, a significantly higher hurdle rate (13.1%) was specified by Mississippi NIPF landowners. Reforestation tax incentives and cost-share programs are public policy mechanisms that have

been used to encourage active forest management on NIPF lands. These programs reduce the front-end costs of longer term investments in stand regeneration practices, and they tend to increase the projected rate of return for relatively long-term reforestation investments. NIPF landowners in our survey who chose to invest in pine regeneration following harvest placed high value on economic considerations, and a high percentage received assistance from a professional forester. Most of the landowners who did not regenerate to pine, meanwhile, received no assistance from a professional forester, and many may therefore have been relatively uninformed of reforestation options and their potential economic benefits.

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