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Financial Effects of the 2017 Tax Cuts and Jobs Act on Nonindustrial Private Forest Landowners: A Comparative Study for 10 Southern States of the United States

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Abstract

Changes in tax codes applicable to timberland investments can affect tax treatment of timber revenues and expenses. The 2017 Tax Cuts and Jobs Act (TCJA) is regarded as the most expansive overhaul of tax codes in the United States since 1986; however, our understanding of its effects on timberland investments for family forest owners has yet to be explored. Using the discounted cash-flow method, we estimated and compared effects of TCJA on land expectation value (LEV) and net tax from managing timberland for two classifications of median-income family forest owners in 10 southern states. Results showed a decrease in LEV and net tax for both material participants and investors, with a greater effect on landowners managing timberland as investments. Thus, owning timberland can become less beneficial under the current law for median-income family forest landowners.

Study Implications: Family forests occupy a large portion of the total forest area in the United States and provide various goods and services to society. Taxes and tax policies are regarded as important issues for these landowners because policies could ultimately influence timberland investment, ownership structure, and management activities. After the 2017 tax reform, landowners became concerned about the effect of the new act on profitability and financial return from timberland investment. Here, we attempt to provide a better understanding of tax effects by estimating change in net benefit of owning and managing timberland under the current law compared with the previous law in 10 southern states. For policymakers, this study can provide insight into the importance of considering unique characteristics of timberland investment during the tax policy design and evaluation process. For landowners, this study can facilitate the timberland investment decisionmaking process and serve as a guide to the effects of the new tax rules on returns.

Keywords: family forest, financial analysis, forest taxation, tax reform, timberland investment

Forestland in the United States occupies about 766 million acres, representing 34 percent of the total land area in the country. About 58 percent of the total forestland is privately owned, and the proportion is even higher in the US South ([Oswalt et al. 2019](#)).

According to the USDA Forest Service, 69.3 percent of southern private forestland is noncorporate ([Oswalt and Smith 2014](#)). Family forests not only provide a plethora of ecosystem services to landowners and communities but also support the national timber

supply. Different federal- and state-level policies affect investment and management decisions in family forests. Federal income tax is of special interest to landowners because it accounts for a larger portion of total forest-related tax liabilities and imposes a heavy tax burden for most family forest owners (Cushing and Newman 2018). Additionally, federal income tax policies are subjected to frequent changes, thereby potentially influencing timber management activities and creating an unpredictable tax environment for landowners. In fact, about 6,500 changes to the federal income tax codes were observed between 1986 and 1998 (Cushing 2006). As a result, it can be challenging and confusing for family forest landowners to remain up-to-date with changes in the tax codes applicable to timberland investments and to understand how they will be affected by those changes. Forest-related taxes have been continuously ranked as top family forestry issues in the *National Woodlands* publication by the National Woodland Owners Association (Argow 2016).

Reformation of tax policies can influence tax treatment of timber revenues and expenses; therefore, it can have a potential effect on the profitability of timberland investment. With considerable variations in tax rules across tax classifications (Greene et al. 2013a), the effects of tax reform could be different for each classification. As federal tax policies have experienced frequent changes in the past three decades, a number of studies have provided periodic updates in regard to timber taxation (Haney et al. 2001, Greene et al. 2013a) and have examined the economic effects on nonindustrial private forest (NIPF) landowners (Greene and Kluender 1989, Dangerfield and Gunter 1991, Straka and Greene 2007). The Forest Service publishes annual and periodic guides and tips on timber taxation for forest landowners. Similarly, the National Timber Tax website is an information portal on federal and state timber tax laws. In addition, the “Timber and Taxes” section in the quarterly *National Woodlands* magazine discusses current timber taxation issues and policies.

Greene and Kluender (1989) analyzed the effects of the Tax Reform Act of 1986 using Arkansas as a sample state. They modeled the effects of this act on three categories of NIPF owners by comparing net timber income and land expectation values (LEV) before and after the tax reform. Dangerfield and Gunter (1991) evaluated the long-run effects of the same act on noncorporate timber income in the US South by

comparing the after-tax equal annual equivalent under three tax scenarios: before the act and after the act without capital gain exclusion both as an active business and as a passive business. They found that the act decreased the equal annual equivalent for all analyzed scenarios. Overall, their study showed a negative effect from elimination of 60 percent exclusion of capital gain and adoption of passive loss rule on an NIPF landowner's income. After the passage of the American Jobs Creation Act of 2004, Straka and Greene (2007) assessed the financial effects of changes in reforestation cost tax incentives on private forest owners actively managing timberland as material participants. Comparison of after-tax LEV in three tax scenarios for landowners with different nontimber ordinary income levels and acreage size showed that the act was mostly beneficial to high-income landowners over the previous law. They also pointed out that the previous law was more favorable for landowners with small forest holdings. Moreover, the effects of one or two levels of tax or a combination of different taxes have been analyzed for different regions in the United States (Bailey 1999, Cushing and Newman 2018).

The recently passed 2017 Tax Cuts and Jobs Act (TCJA) is considered the most extensive overhaul of income tax codes since 1986. Its effect on profitability of timberland investment for family forest owners has yet to be explored. Furthermore, most of the reviewed literature is focused on either the effect of a certain law at the regional level or the effect of different types of tax at the state level (Straka and Greene 2007, Smith et al. 2008). A statewide comparison is lacking, especially for the US South, to explore the net financial benefit of investing in timberland before and after the tax reform. In addition, no study has provided a clear idea of the variation in tax effects by the landowner's tax classification. Thus, this study aims to fill the gap by analyzing and comparing the effects of TCJA on median-income family forest landowners managing timberland as a business or as an investment for the 10 southern states.¹ Also, this study attempts to assess the pure tax effect of TCJA on landowners. Results could improve decisionmakers' understanding of the financial performance of timberland investments by median-income family forest landowners on an after-tax basis.

Change in Tax Codes by TCJA Related to Family Forest Owners

The TCJA (Public Law 115-97) is the tax legislation that was signed into law in December 2017. It is considered the most expansive tax legislation since the

Tax Reform Act of 1986. Current changes in federal income tax codes may change tax treatment for different types of properties based on their tax circumstances, which could potentially affect the timberland investment decisions of family forest owners. Thus, it is critical to identify changes in the tax reform and evaluate their effects on the financial returns of timberland investments.

Overall, most of the forest-related tax provisions are retained. Among the changes, individual ordinary income tax rates were lowered, and bracket thresholds were increased and indexed to inflation. For example, the highest rate of 39.6 percent was lowered to 37 percent, and its bracket threshold of \$470,700 was increased to \$600,000 for a married couple filing jointly. In other words, higher ordinary income is taxed at a lower rate in the post-TCJA status in comparison with the pre-TCJA status. Although the standard deduction was increased from \$12,700 to \$24,000 for married couples filing jointly, the personal exemption was repealed (\$4,050 per person). TCJA also eliminated miscellaneous itemized deductions, which could be disadvantageous to individual landowners holding timberland as an investment. Under the current law, investors are not able to deduct any ordinary and necessary forest management expenses if they elect to itemize deductions. Although investors are still allowed to claim an itemized deduction for qualified state and local taxes, many of them may find that it is not beneficial anymore because of the lifted standard deduction. All these changes are expected to influence a family forest owner's tax savings on ordinary income from owning and managing timberland. Additionally, the TCJA retains the tax rates on long-term capital gain. However, the tax brackets for capital gain are no longer tied to the ordinary income tax brackets. Under the current law, the thresholds for long-term capital gain tax brackets are indexed using the chained consumer price index for all urban consumers, a slower-growing method of calculating cost-of-living increases. For instance, the lowest bracket was raised from \$75,900 to \$77,200, and the highest bracket was raised from \$470,000 to \$479,000. This slight change in bracket thresholds may have some effect on landowners' capital gain taxes from timber sales. The act also temporarily increased the bonus depreciation from 50 percent to 100 percent of the cost of qualified property and expanded the Section 179 of the 26 US Code deduction and its phase-out limit (Wang 2018). However, it should be noted that most of the changes

to individual tax provisions are temporary up to 2025 and will revert back to the pre-TCJA status thereafter.

Materials and Methods

To conceptualize the effects of the TCJA on family forest owners, we followed the concept of LEV introduced in the Faustmann model (Faustmann 1995), which estimates after-tax LEV from timberland investment. LEV from timberland can be defined as the net financial benefit of managing timberland in perpetuity under a specific forest management regime. In addition, the pure tax effect of the tax reform was evaluated by estimating per acre net tax, which is defined as the net present value of forest-related tax expenses and tax savings on ordinary income because of owning and managing timberland. This study compared per acre after-tax LEV and net tax before and after the TCJA for 10 southern states: Alabama (AL), Arkansas (AR), Florida (FL), Georgia (GA), Louisiana (LA), Mississippi (MS), North Carolina (NC), South Carolina (SC), Texas (TX), and Virginia (VA).

Data

Quarterly stumpage prices by state were obtained from Timber Mart-South. Ten-year average prices of three products, pulpwood (PW), chip-n-saw (CNS), and sawtimber (ST), between 2009 and 2018 were employed (Table 1). Timber yield by product classes was obtained using the loblolly pine growth and yield model provided by the Plantation Management Research Cooperative. Based on the literature (e.g., Zhao et al. 2016, Gopalakrishnan et al. 2019) and consulting with Plantation Management Research Cooperative at the University of Georgia, a site index of 70 at age 25 and a planting density of 600 loblolly seedlings per acre were assumed for the base case. Final harvest of the stand was at age 24, which maximizes before-tax LEV, with the yield of PW = 51.36, CNS = 82.17, and ST = 5.05 in tons/acre. Similar to Cushing and Newman (2018), a common yield function was used for all states because our goal was to examine the effects of taxes and not the relative productivity of forestry. Establishment and forest management costs were collected from the report on costs and trends for southern forestry practices (Maggard and Barlow 2017). Establishment cost included site preparation and seedling and planting costs, whereas forest management cost included the annual boundary line maintenance cost. For this analysis, we used an average

Table 1. Stumpage price, property tax, state income tax rate, median income, and required rates of return in nominal terms for 10 southern states.

State	Stumpage price (\$)			Property tax (\$/acre)	State income tax rate (%)	Median income (\$)	Discount rate (%)
	PW	CNS	ST				
AL	9.52	16.55	25.54	2.00	5	46,257	5.12
AR	7.94	15.83	23.42	1.25	7*	44,334	4.46
FL	12.50	19.40	28.03	3.22	0	50,860	5.40
GA	10.52	17.05	26.33	5.51	6	53,559	5.07
LA	9.78	16.92	27.15	2.20	6	45,146	5.30
MS	8.00	15.22	25.15	2.70	5	41,754	4.94
NC	8.28	17.63	25.70	1.60	6	50,584	4.91
SC	10.18	17.62	26.34	2.75	7*	49,501	4.59
TX	8.84	14.54	27.73	3.15	0	56,565	5.15
VA	10.31	17.47	22.37	3.07	6	68,114	4.46

Note: CNS, chip-n-saw; PW, pulpwood; ST, sawtimber.

*AR taxes 50 percent and SC taxes 56 percent of gain.

cost of \$78.96/acre for site preparation and \$55.60/acre for hand planting of bareroot loblolly pine seedlings. With \$0.08 as the price of each seedling, total establishment cost was \$182.56/acre in nominal terms. Additionally, it was assumed that \$1.36/acre was spent annually to manage forestland (Godar Chhetri et al. 2019).

Information on timberland property tax under preferential assessment programs was acquired from Li and Izlar (2018) and Izlar and Li (2017). For federal and state income tax purposes, a married couple without dependents that files jointly was assumed. Under the base case, income tax effects were analyzed for median-income owners with 75 acres of timberland because about three-fourths of family forests are larger than 50 acres in the South (Butler and Leatherberry 2004). Median nontimber income for the 10 southern states, as shown in Table 1, was based on the report by the United States Census Bureau (Guzman 2017).

Marginal federal and state tax rates on ordinary income were collected for the tax years 2017 and 2018 (Tax Foundation 2019). Federal and state tax rates were applied to median-income family forest owners to identify opportunities for tax savings on ordinary income from managing timberland. Among the 10 southern states, FL and TX levy no state taxes on ordinary income. Income from the sales of standing timber held for over one year is treated as long-term capital gain and is taxed at a lower rate than ordinary income.² At the federal level, marginal capital gain tax rates for the tax years 2017 and 2018 were used to estimate taxes on timber income. At the state level, however, long-term capital gain was taxed at the same

rate as ordinary income because of the lack of preferential rates for capital gain as stated by the state income tax laws. Thus, states without state income tax (FL and TX) did not have capital gain taxes. In AR and SC, only 50 percent and 56 percent of gain is taxed, respectively. The required rates of return used in this study for the 10 southern states are shown in Table 1. These rates for family forest owners are lower than those for institutional timberland investors provided by Cascio and Clutter (2008).

Discounted Cash-Flow Method

Our analysis is based on the standard discounted cash-flow approach. Assuming the same timber management regime in perpetuity, we aim to find after-tax LEV and net tax from managing timberland under the previous and current tax laws. After-tax LEV is defined as

$$LEV = \frac{\left[\sum_{t=0}^N ((R_t - C_t) - CGR * (R_t - SC_t - DE_t) - OIR * (R_t - SC_t - DE_t) + FTS_t + STS_t) * (1 + r)^{-t} \right] * (1 + r)^N}{(1 + r)^N - 1} \quad (1)$$

where $FTS_t = TNTI_{nfo} - TNTI_{fo}$ and $STS_t = TNTI_{nfo} - TNTI_{fo}$ are the federal and state tax savings, respectively, on nontimber income calculated by taking the difference of taxes on nontimber income for non-forest owners (*nfo*) and forest owners (*fo*). Federal and state ordinary income tax rates were used to calculate $TNTI_{nfo}$ after nontimber income was reduced by the standard deduction and personal exemption. $TNTI_{fo}$ was similarly

calculated by further reducing nontimber income by reforestation deduction and annual costs on timber management. R_t is the timber revenue, C_t is the up-front establishment and annual costs, CGR is the effective capital gain tax rate, SC_t is the sales cost, DE_t is the timber depletion deduction, OIR is the effective state ordinary income tax rate, N is the rotation age, r is the nominal discount rate, and the subscript t indicates time.

Using the present value of annual property tax (PT_t), federal income tax (FC_t) and state income tax (SC_t) on timber sales, and yearly tax savings on ordinary income obtained from equation 1, net tax (NT) was calculated as

$$NT = \left(\sum_{t=0}^N \frac{FTS_t + STS_t}{(1+r)^t} \right) - \left(\sum_{t=0}^N \frac{PT_t + FC_t + SC_t}{(1+r)^t} \right). \quad (2)$$

Our study did not include harvest tax in the analysis of LEV and net tax because only GA, LA, and MS out of the 10 southern states levy severance tax, and its effect on timberland management decisions is minimal (Greene et al. 2013b). Percentage change in LEV (equation 3) and per acre change in net tax because of the tax reform (equation 4) were compared across states:

$$\text{Percentage change in LEV} = \left(\frac{NG_{post} - NG_{pre}}{NG_{pre}} \right) * 100, \quad (3)$$

$$\text{Change in NT (\$/acre)} = NT_{post} - NT_{pre}. \quad (4)$$

Tax Scenarios

For federal income tax purposes, a forest landowner's timberland holding can be classified as trade/business, investment, or personal use based on the purpose of the holding and the intensity of management activities. Because personal use has very limited deduction opportunities, we only considered family forest owners managing timberland as a business (material participants) or as an investment (investors).³ LEV and net tax were modeled for these ownership types in light of two tax scenarios: pre-TCJA and post-TCJA. Federal and state income tax laws that were in effect prior to and after TCJA were used.

For timberland held in a business prior to TCJA, the reforestation cost up to \$10,000 was expensed, and the rest was amortized over eight years under the half-year convention rule. Ordinary and necessary

forest management expenses, as well as property taxes, were currently deducted against nontimber income. In addition, the standard deduction and personal exemption were deducted from the nontimber income. After TCJA, all remained the same except that lower ordinary income tax rates, separate capital gain tax brackets, higher standard deduction, and zero personal exemption were used.

For timberland held as an investment, two tax situations were defined based on whether the standard or itemized deduction was elected. Under the pre-TCJA scenario and when the standard deduction was elected, property taxes were capitalized with other operating expenses and carrying charges and were not recovered via depletion until timber sales. Alternatively, when the itemized deduction was elected (if aggregated miscellaneous itemized deduction exceeds 2 percent of adjusted gross income), ordinary and necessary forest management expenses along with property taxes were currently deducted against nontimber income in a similar way as to a business. Under the post-TCJA scenario and when the standard deduction was elected, property taxes were similarly capitalized, but taxes were calculated with new ordinary income tax rates, capital gain tax brackets, standard deduction, and personal exemption. For the itemized deduction, however, ordinary and necessary forest management expenses could no longer be deducted because of the repeal of the miscellaneous itemized deduction under the current law. Hence, only property tax was deducted against nontimber income, and forest management expenses were capitalized and recovered via depletion on timber sales. Table 2 depicts an example of base-case cash flow post-TCJA for median-income landowners holding timberland in a business. Detailed calculations for Table 2 are presented in the appendix. The federal tax base is used as a starting point to calculate state taxable income in most of the southern states. Although AL, AR, and MS do not link to the federal tax base, we assume that all 10 states use adjusted gross income as their tax base and recognize reforestation cost deduction and amortization for state income tax purposes.

Sensitivity Analysis

To test the effect of critical input parameters on LEV and net tax, a sensitivity analysis was performed with respect to site productivity and land holding acreage. First, we considered lower productivity with a site index of 60 at age 25. Final harvest of the stand was at age 24 with the yield of PW = 53.35, CNS = 46.84, and ST = 0.51 in tons/acre. Second, we increased land

Table 2. Example of base-case cash flow post-TCJA for median-income landowners holding 75 acres of timberland in a business in Georgia.

Year	Net timber income (\$)	Federal tax savings on nontimber income (\$)	State tax savings on nontimber income (\$)*	After-tax net income (\$)
0	(14,207.25)	1,288.08	646.74	(12,272.44)
1	(515.25)	125.12	62.56	(327.57)
2	(515.25)	125.12	62.56	(327.57)
3	(515.25)	125.12	62.56	(327.57)
4	(515.25)	125.12	62.56	(327.57)
5	(515.25)	125.12	62.56	(327.57)
6	(515.25)	125.12	62.56	(327.57)
7	(515.25)	93.48	46.74	(375.04)
8	(515.25)	61.83	30.92	(422.51)
9	(515.25)	61.83	30.92	(422.51)
10	(515.25)	61.83	30.92	(422.51)
11	(515.25)	61.83	30.92	(422.51)
12	(515.25)	61.83	30.92	(422.51)
13	(515.25)	61.83	30.92	(422.51)
14	(515.25)	61.83	30.92	(422.51)
15	(515.25)	61.83	30.92	(422.51)
16	(515.25)	61.83	30.92	(422.51)
17	(515.25)	61.83	30.92	(422.51)
18	(515.25)	61.83	30.92	(422.51)
19	(515.25)	61.83	30.92	(422.51)
20	(515.25)	61.83	30.92	(422.51)
21	(515.25)	61.83	30.92	(422.51)
22	(515.25)	61.83	30.92	(422.51)
23	(515.25)	61.83	30.92	(422.51)
24	139,497.70	61.83	30.92	117,411.16

Note: TCJA, 2017 Tax Cuts and Jobs Act.

*Tax base for state income tax is the federal adjusted gross income in GA. Tax saving effect of reforestation cost deduction and amortization is considered along with property taxes and annual management costs. Year 24 net timber income is timber revenue after sales cost (10 percent of revenue) and annual cost. Federal (\$13,778.50) and state (\$8,400.78) taxes on timber income were calculated by using federal and state capital gain tax rates, respectively. After-tax land expectation value in GA is \$353.23/acre. Detailed calculations are presented in the appendix.

holding acreage to 100 acres and 150 acres. Then, results were compared with those of the base case.

Results

After-Tax LEV for Timberland Held in a Business

Prior to TCJA, after-tax LEV varied among the 10 southern states with the lowest LEV of \$316.91/acre in TX and the highest LEV of \$548.51/acre in SC (Table 3). After TCJA, after-tax LEV was unanimously lower, but the ranking remained the same. To estimate the effects of the TCJA, percentage change was calculated. Results showed a reduction in LEV after the tax reform in all states. The greatest effect was in GA with a decline of 2.23 percent, whereas the lowest effect was

in AR with a decline of 0.63 percent. This decline was attributable to lower ordinary income tax savings from managing 75 acres of timberland for a median-income material participant under the current tax law.

After-Tax LEV for Timberland Held in an Investment

Regardless of the tax law and the deduction method, the ranking of LEV for median-income investors remained unchanged with TX being the lowest and SC being the highest (Table 3). However, TCJA reduced after-tax LEV of median-income family owners in 10 southern states whether the standard or itemized deduction was used, thereby making the current law less beneficial to them. Both before and after TCJA, LEVs from the election of standard deduction were

Table 3. After-tax land expectation value (LEV; \$/acre) pre- and post-TCJA and percentage change in LEV for timberland held as a business or as an investment.

State	Business			Investment					
				Standard deduction			Itemized deduction		
	Pre-TCJA	Post-TCJA	% Δ	Pre-TCJA	Post-TCJA	% Δ	Pre-TCJA *	Post-TCJA	% Δ
AL	387.74	382.75	-1.29	380.64	377.62	-0.79	387.74	380.68	-1.82
AR	503.80	500.62	-0.63	496.33	494.91	-0.29	503.80	497.64	-1.22
FL	458.73	451.20	-1.64	451.29	446.62	-1.03	458.73	449.84	-1.94
GA	361.30	353.23	-2.23	345.52	341.92	-1.04	361.30	351.01	-2.85
LA	357.15	352.64	-1.26	350.78	348.29	-0.71	357.15	350.98	-1.73
MS	347.43	342.41	-1.44	338.76	337.85	-0.27	347.43	340.88	-1.89
NC	438.25	431.64	-1.51	431.39	426.80	-1.06	438.25	429.42	-2.01
SC	548.51	541.16	-1.34	537.08	532.41	-0.87	548.51	538.26	-1.87
TX	316.91	310.46	-2.04	309.47	305.83	-1.18	316.91	309.06	-2.48
VA	521.82	515.38	-1.23	511.24	507.98	-0.64	521.82	513.11	-1.67

Note: TCJA, 2017 Tax Cuts and Jobs Act.

*This scenario for investment is similar to material participants' pre-TCJA scenario because investors can currently deduct all annual expenses in the year they occur.

lower than those from the election of itemized deduction. Therefore, using the standard deduction diminished the tax benefit for median-income family forest investors.

The effects of TCJA on investors depended on whether the standard deduction or itemized deduction was elected. When the standard deduction was elected, reduction in LEV ranged from 0.27 percent in MS to 1.18 percent in TX with an average of 0.79 percent for the 10 southern states. When the itemized deduction was elected, LEV was more adversely affected with the highest decrease of 2.85 percent in GA, the smallest decrease of 1.22 percent in AR, and an average decrease of 1.95 percent for the 10 southern states. Again, this is because ordinary and necessary forest management expenses cannot be deducted under the current tax law.

Our results showed an equal or higher after-tax LEV for material participants than investors under all tax scenarios, which confirms that operating medium-size timberland as a business for federal income tax purposes gives the most tax benefits to median-income family forest owners. In contrast, investors are more severely affected by the current law, especially if the itemized deduction is used.

Net Tax for Timberland Held in a Business

Prior to TCJA, we found that tax expenses outweighed tax savings in all states (Figure 1). The net tax ranged from -\$46.15/acre in AR to -\$116.06/acre in GA. This is due to lower state income tax from taxing only 50

percent of gain in AR and high property tax in GA. All in all, negative net taxes before TCJA were due to the higher tax expense on timberland than tax savings for median-income landowners. After TCJA, all states had more negative net taxes because of less tax savings from lower federal tax rates. The greatest decrease of \$5.60/acre was observed for GA, whereas the lowest decrease of \$2.06/acre was for AR. In states without state income taxes (FL and TX), the decrease in net tax was relatively large at \$5.39/acre and \$4.52/acre, respectively.

Net Tax for Timberland Held in an Investment

The net tax effect of TCJA was analyzed for two tax situations: electing the standard deduction versus electing the itemized deduction. Prior to TCJA and when the standard deduction was elected, net taxes were considerably more negative ranging from -\$51.00/acre in AR to -\$127.02/acre in GA (Figure 1). Alternatively, when the itemized deduction was elected, net taxes for all states were similar to those of material participants.

Based on our assumption of family forest owners' profiles and timberland holding sizes, the current law made net tax more negative for investors in all 10 southern states. When the standard deduction was elected, net tax was reduced by \$2.21/acre on average with the greatest decrease of \$3.35/acre in FL and the lowest decrease of \$0.62/acre in MS. In contrast, when the itemized deduction was elected, net tax was reduced by \$5.53/acre on average ranging from \$3.99/acre in AR to \$7.14/acre

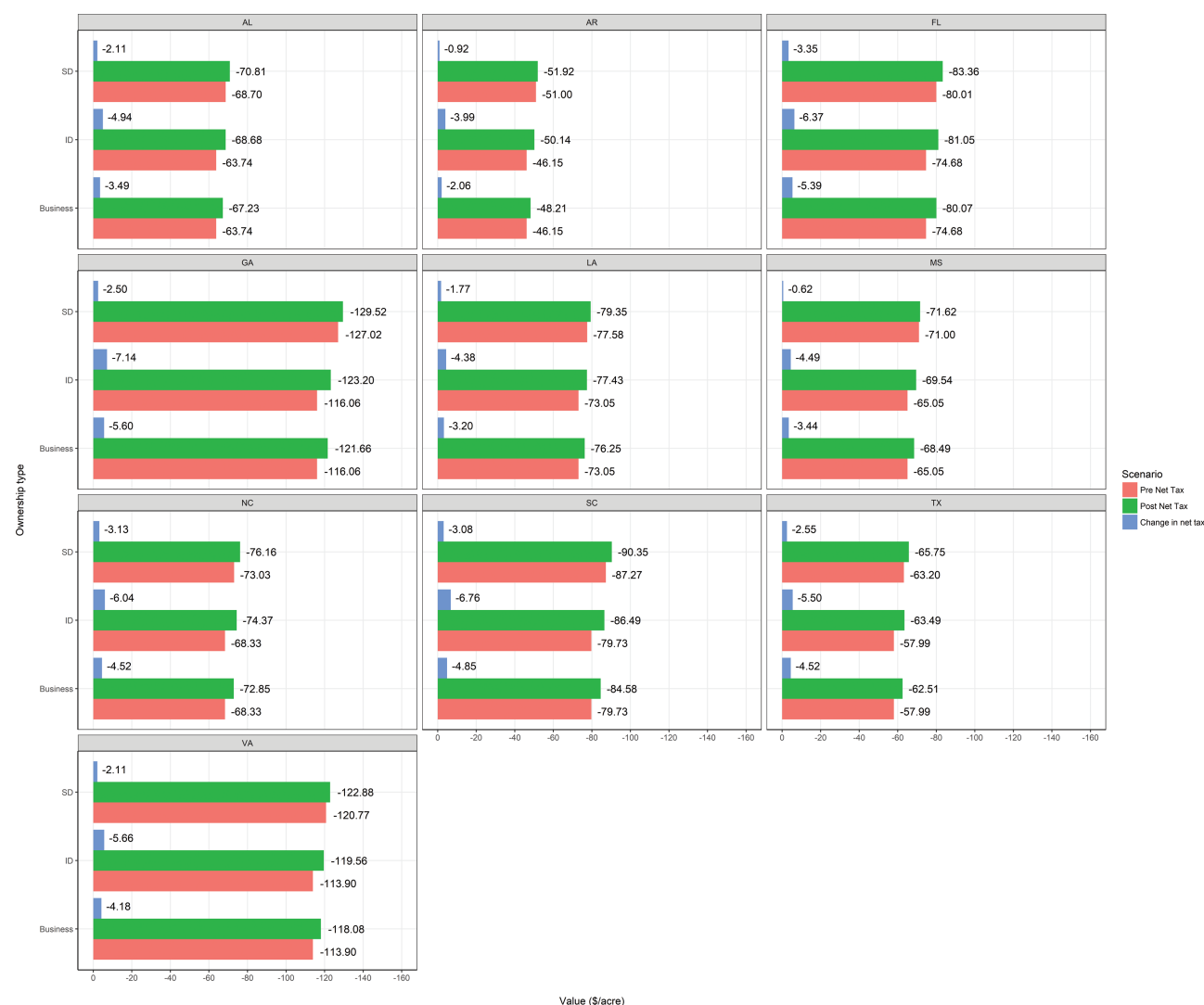


Figure 1. Net tax (\$/acre) pre- and post-TCJA and change in net tax for business and investment. Standard deduction (SD) and itemized deduction (ID) are two tax situations for timberland held as an investment. TCJA, 2017 Tax Cuts and Jobs Act.

in GA. Thus, the greater effect of TCJA was observed for investments using the itemized deduction because of the repeal of the miscellaneous itemized deduction in the current law, which prevents landowners from deducting ordinary and necessary forest management expenses in the year they are incurred.

By and large, timberland managed as an investment yielded equal or lower net tax than timberland managed as a business in all analyzed tax scenarios across the 10 southern states. Current law reduced net tax for both ownership types with a larger effect on investors electing the itemized deduction.

Results of Sensitivity Analysis

When site productivity was decreased (site index = 60),⁴ after-tax LEV decreased by over 50 percent compared with the base case under both

tax scenarios and for both ownership categories. However, the ranking remained the same as the base case with the lowest LEV in TX and the highest in SC (Tables 4 and 5). Compared with the pre-TCJA scenario, reduction in after-tax LEV was larger in all states than the base-case scenario. For business, LEV decreased most by 5.70 percent in TX and least by 1.29 percent in AR. For investment, the highest reduction in LEV was by 7.22 percent in GA when the itemized deduction was used. Similar to material participants, the lowest reduction in LEV was by 0.59 percent in AR when the standard deduction was used.

When landholding size was increased to 100 acres and 150 acres, after-tax LEV decreased more under both tax scenarios and for both categories of median-income family forest owners, but the ranking was unchanged. In comparison with the base case, post-TCJA LEV declined at a greater degree in all states.

Table 4. After-tax land expectation value (LEV; \$/acre) pre- and post-TCJA and percentage change in LEV for business with a lower site index or a larger timberland holding.

State	Timberland acreage								
	Site index 60			100 acres			150 acres		
	Pre-TCJA	Post-TCJA	% Δ	Pre-TCJA	Post-TCJA	% Δ	Pre-TCJA	Post-TCJA	% Δ
AL	175.71	170.72	-2.84	375.95	370.20	-1.53	364.16	357.65	-1.79
AR	246.15	242.97	-1.29	489.44	484.70	-0.97	475.09	467.55	-1.59
FL	220.87	213.35	-3.40	448.54	440.49	-1.79	438.12	429.78	-1.90
GA	142.39	134.33	-5.66	350.27	341.32	-2.56	339.24	329.40	-2.90
LA	153.87	149.37	-2.92	346.05	340.69	-1.55	334.84	327.75	-2.12
MS	137.45	132.44	-3.64	335.06	327.68	-2.20	320.74	312.95	-2.43
NC	200.21	193.60	-3.30	426.04	418.78	-1.70	413.55	405.91	-1.85
SC	276.43	269.08	-2.66	534.56	526.68	-1.47	520.60	512.19	-1.62
TX	113.36	106.90	-5.70	307.21	300.01	-2.34	297.51	289.57	-2.67
VA	253.43	246.99	-2.54	512.60	505.16	-1.45	503.39	494.94	-1.68

Note: TCJA, 2017 Tax Cuts and Jobs Act.

Table 5. After-tax land expectation value (LEV; \$/acre) pre- and post-TCJA and percentage change in LEV for investment with a lower site index or a larger timberland holding.

State	Tax situation	Timberland acreage								
		Site index 60			100 acres			150 acres		
		Pre-TCJA	Post-TCJA	% Δ	Pre-TCJA	Post-TCJA	% Δ	Pre-TCJA	Post-TCJA	% Δ
AL	SD	168.61	165.59	-1.79	368.85	365.07	-1.02	357.06	352.52	-1.27
	ID	175.71	168.65	-4.02	375.95	368.12	-2.08	364.16	355.57	-2.36
AR	SD	238.68	237.26	-0.59	481.98	479.24	-0.57	467.62	462.30	-1.14
	ID	246.15	240.00	-2.50	489.44	481.95	-1.53	475.09	464.82	-2.16
FL	SD	213.43	208.77	-2.18	441.10	435.91	-1.18	430.91	425.21	-1.32
	ID	220.87	211.99	-4.02	448.54	439.13	-2.10	438.12	428.42	-2.21
GA	SD	126.61	123.01	-2.84	334.49	330.10	-1.31	323.46	318.18	-1.63
	ID	142.39	132.11	-7.22	350.27	339.09	-3.19	339.24	327.18	-3.56
LA	SD	147.50	145.01	-1.69	339.68	336.34	-0.98	328.57	324.00	-1.39
	ID	153.87	147.70	-4.01	346.05	339.03	-2.03	334.84	326.32	-2.54
MS	SD	128.78	127.87	-0.71	326.39	323.12	-1.00	313.58	308.39	-1.66
	ID	137.45	130.91	-4.76	335.06	326.15	-2.66	320.74	311.43	-2.90
NC	SD	193.35	188.76	-2.37	419.17	413.93	-1.25	406.90	401.07	-1.43
	ID	200.21	191.38	-4.41	426.04	416.55	-2.23	413.55	403.68	-2.39
SC	SD	264.99	260.32	-1.76	523.12	517.98	-0.98	509.16	503.50	-1.11
	ID	276.43	266.18	-3.71	534.56	523.80	-2.01	520.60	509.31	-2.17
TX	SD	105.91	102.27	-3.44	299.77	295.39	-1.46	290.06	284.95	-1.76
	ID	113.36	105.50	-6.93	307.21	298.62	-2.80	297.51	288.18	-3.14
VA	SD	242.85	239.59	-1.34	502.02	497.76	-0.85	492.81	487.54	-1.07
	ID	253.43	244.72	-3.44	512.60	502.89	-1.89	503.39	492.67	-2.13

Note: ID, itemized deduction; SD, standard deduction; TCJA, 2017 Tax Cuts and Jobs Act.

At 100 acres, the decline in LEV for business ranged from 0.97 percent in AR to 2.56 percent in GA with an average of 1.76 percent for the 10 southern states.

For investment, LEV was more severely affected when the itemized deduction was elected rather than the standard deduction. On average, LEV declined by

2.25 percent ranging from 1.53 percent in AR to 3.19 percent in GA. Percentage decrease in LEV was even higher when the landholding size was increased to 150 acres, with an average for the 10 southern states of 2.06 percent for business, 1.38 percent for investment when electing the standard deduction, and 2.56 percent when electing the itemized deduction. In summary, median-income family forest owners managing medium-size timberlands in lower-productivity sites would be more affected by the tax reform than those managing larger timberlands in higher-productivity sites, and those managing timberlands in less productive sites as an investment using the itemized deduction would be most affected after TCJA.

With respect to sensitivity analysis on net tax, both pre- and post-TCJA net taxes were higher than the base

case for lower site index, but they were lower than the base case for a larger timberland holding (Figure 2 and Table 6). However, per acre reduction in net tax after TCJA was similar to that of the base case. With lower site productivity, net taxes decreased in all states with a respective decrease of \$4.13/acre and \$5.53/acre on average for business and for investment with the itemized deduction. When landholding size was increased to 100 acres, decrease in net tax ranged from \$3.07/acre in AR to \$6.22/acre in GA with an average for the 10 southern states of \$4.80/acre for business. For investment using the itemized deduction, net tax was more negative with the lowest decrease of \$4.86/acre in AR, the highest decrease of \$7.76/acre in GA, and average decrease of \$6.18/acre for the 10 southern states. Pre- and post-TCJA net taxes with 150 acres of timberland

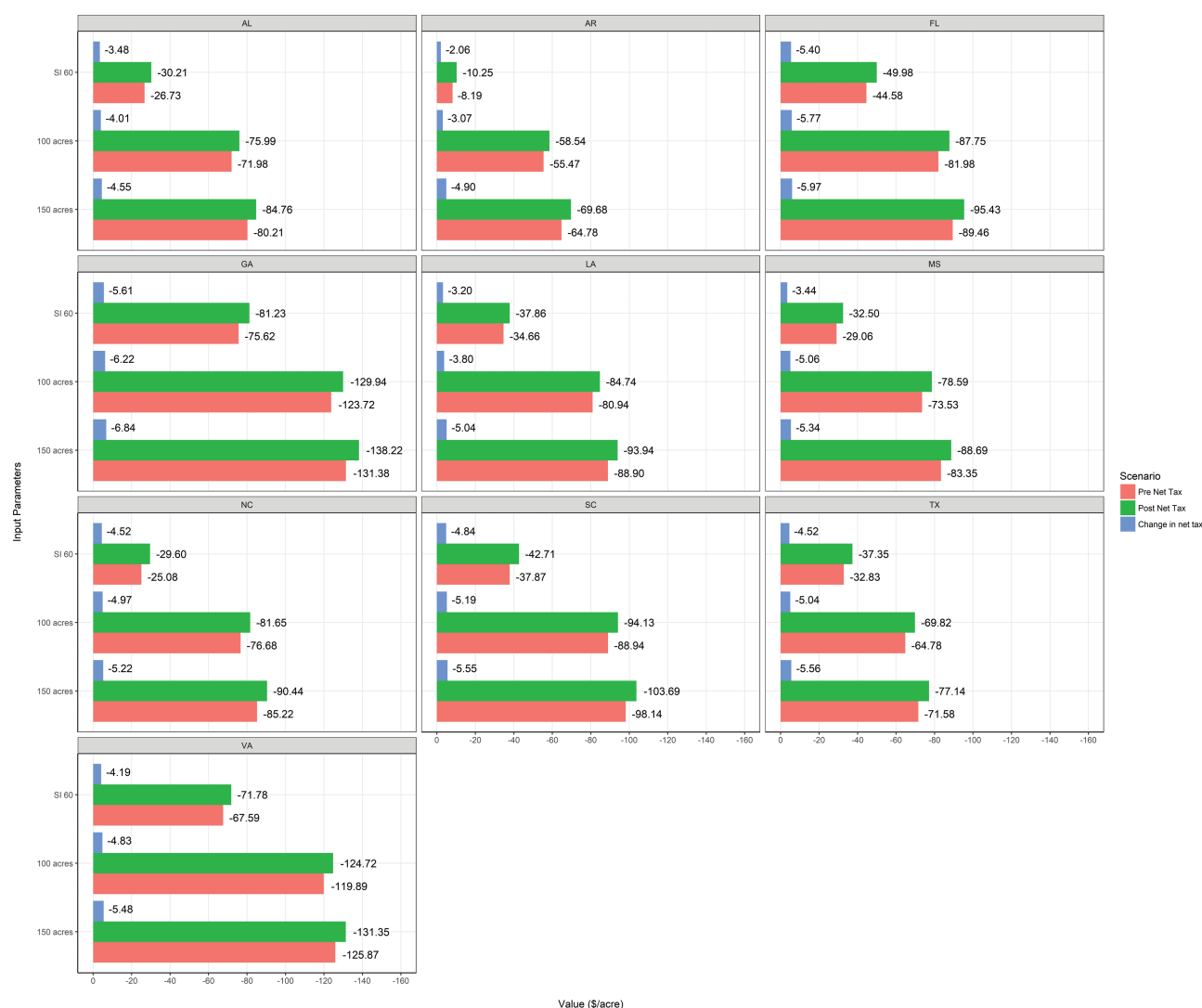


Figure 2. Net tax (\$/acre) pre- and post-TCJA and change in net tax for business with a lower site index or a larger timberland holding. TCJA, 2017 Tax Cuts and Jobs Act.

Table 6. Net tax (\$/acre) pre- and post-TCJA and change in net tax for investment with a lower site index or a larger timberland holding.

State	Tax situation	Timberland acreage								
		Site index 60			100 acres			150 acres		
		Pre-TCJA	Post-TCJA	Δ	Pre-TCJA	Post-TCJA	Δ	Pre-TCJA	Post-TCJA	Δ
AL	SD	-31.68	-33.79	-2.11	-76.93	-79.57	-2.64	-85.17	-88.34	-3.17
	ID	-26.73	-31.66	-4.93	-71.98	-77.44	-5.46	-80.21	-86.21	-6.00
AR	SD	-13.03	-13.96	-0.93	-60.31	-62.09	-1.78	-69.63	-73.08	-3.45
	ID	-8.19	-12.18	-3.99	-55.47	-60.33	-4.86	-64.78	-71.45	-6.67
FL	SD	-49.92	-53.26	-3.34	-87.32	-91.03	-3.71	-94.62	-98.71	-4.09
	ID	-44.58	-50.95	-6.37	-81.98	-88.73	-6.75	-89.46	-96.40	-6.94
GA	SD	-86.59	-89.09	-2.50	-134.68	-137.73	-3.05	-142.35	-146.01	-3.66
	ID	-75.62	-82.77	-7.15	-123.72	-131.48	-7.76	-131.38	-139.76	-8.38
LA	SD	-39.19	-40.96	-1.77	-85.46	-87.84	-2.38	-93.36	-96.60	-3.24
	ID	-34.66	-39.04	-4.38	-80.94	-85.93	-4.99	-88.90	-94.96	-6.06
MS	SD	-35.01	-35.63	-0.62	-79.48	-81.72	-2.24	-88.26	-91.82	-3.56
	ID	-29.06	-33.55	-4.49	-73.53	-79.64	-6.11	-83.35	-89.74	-6.39
NC	SD	-29.78	-32.91	-3.13	-81.38	-84.96	-3.58	-89.76	-93.75	-3.99
	ID	-25.08	-31.12	-6.04	-76.68	-83.17	-6.49	-85.22	-91.96	-6.74
SC	SD	-45.41	-48.49	-3.08	-96.48	-99.86	-3.38	-105.68	-109.42	-3.74
	ID	-37.87	-44.62	-6.75	-88.94	-96.03	-7.09	-98.14	-105.58	-7.44
TX	SD	-38.04	-40.59	-2.55	-70.00	-73.06	-3.06	-76.79	-80.38	-3.59
	ID	-32.83	-38.33	-5.50	-64.78	-70.80	-6.02	-71.58	-78.11	-6.53
VA	SD	-74.46	-76.58	-2.12	-126.75	-129.52	-2.77	-132.74	-136.15	-3.41
	ID	-67.59	-73.25	-5.66	-119.89	-126.19	-6.30	-125.87	-132.83	-6.96

Note: ID, itemized deduction; SD, standard deduction; TCJA, 2017 Tax Cuts and Jobs Act.

holding were more negative than those with 100 acres; the average decrease in net tax for the 10 southern states was \$5.44/acre for business and \$6.81/acre for investment using the itemized deduction.

Discussion and Conclusions

Although many studies have examined the effects of tax legislation changes on family forest owners, studies comparing the after-tax net benefit of owning timberland under the previous and current laws for different tax classifications of landowners have been sparse. The approach of after-tax LEV used in this study differs from the regular LEV calculation as it takes tax savings on ordinary income from owning timberland into account at both the federal and state levels. Using this method, our analysis demonstrated reductions in after-tax LEV and net tax for all analyzed classifications of median-income family forest owners in the US South after TCJA.

Although capital gain tax on timber income after TCJA was lower, lower tax savings on ordinary income diminished the financial benefit of owning timberland.

In most of the tax situations analyzed for both ownership categories, AR experienced the lowest decrease in after-tax LEV. The effects of TCJA were considerably larger on median-income landowners in GA, NC, and TX as the percentage decrease in LEV was above the average for the 10 southern states. Relatively higher LEVs were noted in AR and SC because only some percentage of gain is taxed at the state level. Regardless, LEV decreased after TCJA because of lower federal tax savings on ordinary income. Overall, owning and managing medium-size timberland becomes less beneficial from the tax perspective to median-income family forest owners, especially to investors electing the itemized deduction after TCJA.

Similar to the LEV results, decrease in net tax was greater for investors electing the itemized deduction. Although the total tax expenses after TCJA were lower, lower tax savings decreased net tax for median-income family forest owners managing medium-size timberlands. In states without state income taxes, there were neither tax savings nor capital gain taxes on timber income at the state level. Thus, decrease in net tax after TCJA was primarily due to lower federal

tax savings on ordinary income. Although it is not incorporated into our analysis, we acknowledge that some states have special provisions on reforestation cost deduction. For example, MS provides a reforestation tax credit up to 50 percent for approved reforestation expenses (capped at \$10,000) in the year of reforestation (Department of Revenue 2011). Such an incentive would lower income tax liability on ordinary income and increase the after-tax LEV of owning timberlands in MS.

The sensitivity analysis showed that our results were highly sensitive to the site productivity. Regarding the sensitivity of results to other input parameters, higher final harvest age and discount rate correspond to higher percentage reduction in after-tax LEV. However, our results were nearly the same as those at slightly higher harvest ages and discount rates. All else being equal, landowners with timberlands in lower-productivity sites or with larger acreage would experience a greater reduction in LEV than those with timberlands in higher-productivity sites. Although taxes on gains from timber sales were roughly the same before and after TCJA, LEV decreased because of lower tax savings on ordinary income. Therefore, TCJA had a greater effect on median-income landowners owning medium-size timberlands with lower productivity. In summary, the current law lowered the after-tax LEV and net tax of owning and managing timberland for median-income family forest owners. In a broader context, the negative effect of the tax reform may influence the national supply of timber products, social values, and amenities. Future studies can investigate landowners' willingness to invest in timberlands following the tax reform and the effect of tax reform on hardwood investments and other timberland investments with intensive silvicultural treatments.

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Endnotes

1. Family forests are mostly managed by owners with annual household income between \$25,000 and \$100,000 in the United States (Butler 2008). Of the selected 10 southern states, median ordinary income

is between \$41,000 and \$70,000 (Guzman 2017). Hence, using median income is both reasonable and representative of typical family forest owners.

2. Holding time period and ways of disposal must be considered for timber sales to qualify as long-term capital gains. Sales of standing timber held in an investment or a business (election under Section 631(b) of the 26 US Code) for over a year are long-term capital gains. Both outright and pay-as-cut sales of business standing timber qualify. However, sales of felled timber are ordinary income unless there is an election under Section 631(a) of the 26 US Code.
3. Timber can also be held as a business in which landowners do not materially participate (passive participants). However, that is not the focus of this article.
4. We have also conducted sensitivity analysis on site index = 85. Major conclusions remain the same. Results are available from the authors on request.

Appendix: Detailed calculations for Table 2

NTI: nontimber income

SD: standard deduction

PE: personal exemption

AC: annual cost

TR: timber revenue

SC: sales cost

Ref: reforestation cost deduction and amortization

A. Net timber income:

$$AC = (1.36 + 5.51) * 75 = (515.25)$$

$$\text{Year 0 total reforestation costs: } (13,692) + AC (515.25) = (\$14,207.25)$$

$$\text{Year 1–23: } AC = (\$515.25)$$

$$\text{Year 24: } TR (155,569.90) - SC (15,556.99) - AC (515.25) = \$139,497.70$$

- B. Federal tax savings on nontimber income: As shown in Table 2, reforestation costs and annual expenses were currently deducted from nontimber income for timberland held as a business to calculate federal tax savings.

1. Taxable income:

- Taxable ordinary income without timber (Year 0 to 24): $NTI (53,559) - SD (24,000) - PE (0) = \$29,559$
- Taxable ordinary income with timber:

Reforestation deduction: With the up-front expense of \$182.56/acre, the total reforestation cost for 75 acres of timberland in Georgia was \$13,692. Current deduction and amortization was calculated in the following way:

$$\text{Year 0: } 10,000 + \frac{1}{14} * (13,692 - 10,000) = \$10,263.71$$

$$\text{Year 1–6: } \frac{1}{7} * (13,692 - 10,000) = \$527.43$$

$$\text{Year 7: } \frac{1}{14} * (13,692 - 10,000) = \$263.71$$

These expenses were currently deducted from the landowner's nontimber income (\$53,559 in Georgia). All intermediate

computations were done for the total 75 acres. The reforestation deduction and amortization was not calculated on a per acre basis.

$$\text{Year 0: } NTI (53,559) - Ref_{Y0} (102,63.71) - SD (24,000) - PE (0) - AC (515.25) = \$18,780.04$$

$$\text{Year 1-6: } NTI (53,559) - Ref_{Y1-6} (527.43) - SD (24,000) - PE (0) - AC (515.25) = \$28,516.32$$

$$\text{Year 7: } NTI (53,559) - Ref_{Y7} (263.71) - SD (24,000) - PE (0) - AC (515.25) = \$28,780.04$$

$$\text{Year 8-24: } NTI (53,559) - SD (24,000) - PE (0) - AC (515.25) = \$29,043.75$$

2. Taxes using federal income tax brackets:

- Taxes on ordinary income without timber (Year 0–24):
(29,559 – 19,050) * 0.12 + 1,905 = \$3,166.08
- Taxes on ordinary income with timber:
Year 0: 18,780.04 * 0.10 = \$1,878.00
Year 1–6: (28,516.32 – 19,050) * 0.12 + 1,905 = \$3,040.96
Year 7: (28,780.04 – 19,050) * 0.12 + 1,905 = \$3,072.60
Year 8–24: (29,043.75 – 19,050) * 0.12 + 1,905 = \$3,104.25

3. Tax savings: Taxes on ordinary income with timber were subtracted from taxes on ordinary income without timber.

Filing status: Married filing jointly and surviving spouse

Taxable income (TI)	Income tax due
\$0–\$19,050	10% of taxable income
\$19,051–\$77,400	\$1,905 plus 12% of TI over \$19,050
\$77,401–\$165,000	\$8,907 plus 22% of TI over \$77,400
\$165,001–\$315,000	\$28,179 plus 24% of TI over \$165,000
\$315,001–\$400,000	\$64,179 plus 32% of TI over \$315,000
\$400,001–\$600,000	\$91,379 plus 35% of TI over \$400,000
\$600,001 and more	\$161,379 plus 37% of TI over \$600,000

$$\text{Year 0: } 3,166.08 - 1,878.00 = \$1,288.08$$

$$\text{Year 1–6: } 3,166.08 - 3,040.96 = \$125.12$$

$$\text{Year 7: } 3,166.08 - 3,072.60 = \$93.48$$

$$\text{Year 8: } 3,166.08 - 3,104.25 = \$61.83$$

C. Federal income tax on timber income (Year 24): Annual costs were not subtracted from timber revenue to obtain capital gain tax from timber. Instead, they were deducted from the ordinary income and result in tax savings.

Capital gain from timber: $TR (155,569.90) - SC (15,556.99) = \$140,012.90$ and NTI after deductions is from step 1.

Total taxable income: Capital gain from timber + NTI after deductions

$$= 140,012.90 + 29,043.75 = \$169,056.70$$

Tax on timber income was calculated using capital gain tax rate: $(169,056.70 - 77,200) * 0.15 = (\$13,778.50)$

State tax and state tax savings on timber income were similarly calculated using individual state income tax rates shown in Table 1.

D. After-tax net income: Federal and state capital gain taxes on timber income were subtracted from net timber income, whereas federal and state tax savings on nontimber income were added.

$$\text{Year 0: } (14,207.25) + 1,288.08 + 646.74 = (\$12,272.44)$$

$$\text{Year 1–6: } (515.25) + 125.12 + 62.56 = (\$327.57)$$

$$\text{Year 7: } (515.25) + 93.48 + 46.74 = (\$375.04)$$

$$\text{Year 8–23: } (515.25) + 61.83 + 30.92 = (\$422.51)$$

$$\text{Year 24: } 139,497.70 - 13,778.50 - 8,400.78 + 61.83 + 30.92 = \$117,411.16$$

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