

Evaluating the Economic Impacts of Retention and Disposal Policies for County Tax-forfeited Land in Northern Minnesota

by

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Executive Summary

County-managed forest land, primarily known as tax-forfeited forest land (TFFL), consists of approximately 2.8 million acres found primarily across northern Minnesota. Although the title to these forest lands is held by the state of Minnesota, state law authorizes county governments to manage these lands for the benefit of local taxing districts. The legal framework that guides the management and use of TFFL also encourages county governments to manage this land base in a manner that provides “public benefits.”

County governments have the option to retain TFFL in public ownership and manage for multiple public benefits, or sell the land. The decision whether TFFL should be retained in public ownership for the production of public benefits or returned to private ownership is complex—one that encompasses a variety of economic, social, and political considerations.

This report describes the characteristics, uses, and management of 2.7 million acres of county-managed TFFL in 12 northern counties: Aitkin, Beltrami, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Itasca, Koochiching, Lake, Pine, and St. Louis. These counties collectively manage 96% of the state’s total TFFL acreage. The report describes the results of a survey of recent purchasers of TFFL regarding how the management and use of TFFL has changed following their sale from public to private interests. The report also describes the economic impacts associated with retaining TFFL in public ownership versus selling this land base to private interests.

Summary of TFFL Characteristics

Physical Description

Analysis of FIA and county forest inventory data was carried out to characterize the 2.7 million acres of TFFL in the 12-county study area. Important findings of this analysis include the following:

- Aspen is, by far, the most common covertype found on TFFL, comprising approximately 994,000 acres. As a percent of total forest land area, the aspen covertype is much more common on county-managed land than on other forest ownership categories in the 12 counties. Lowland hardwoods, tamarack, and black spruce covertypes are all less commonly found on county-managed TFFL than on other forest lands in the study area.
- The average tree age on TFFL is not significantly different than the average tree age on other forest lands, but certain covertypes have different age distributions. The average age of most forest covertypes is older on TFFL, but aspen and red pine covertypes are generally younger than surrounding forest land.
- For the most part, county-managed TFFL is more productive than other forest land in the 12-county study area. The average site index for most covertypes, including aspen, is higher on county-administered forest land than on other forest land ownerships. Only the white spruce, red pine, and cedar covertypes are less productive on TFFL than other ownerships in the study area.

Management of TFFL

Most counties with at least 6,000 acres of TFFL have established land departments for the purpose of managing the TFFL in their county. In 2005, 142 full-time equivalents (FTE) were employed by the 12 county land departments that participated in this study, with the number of FTEs in a county land department ranging from 1.4 to 58. In addition to the land commissioner, county land department personnel typically include foresters, forestry technicians, and timber and land appraisers. Seasonal staff is also frequently employed to assist in activities such as tree planting and timber stand improvement.

Common characteristics regarding the management of TFFL are:

- TFFL is managed to produce timber. Counties are committed to meeting the state's wood-based industry demand for wood fiber. Through the sale of standing timber, counties also generate considerable revenue for local taxing districts. The vast majority of all standing timber on TFFL is sold at public auction.
- Counties perform timber management activities to improve the quality and condition of the forest. Timber management activities commonly found on county forest lands include harvesting, pruning, thinning, and tree planting.
- TFFL managers utilize wildlife impoundments, hunter hiking trails, wildlife food plots, wildlife openings, and a variety of other wildlife improvement projects that protect and benefit a variety of wildlife species found in Minnesota's forests.
- Nearly all TFFL is open to the public for hunting, camping, hiking, bird watching, and other forms of public recreation. County-administered TFFL provides thousands of miles of hiking, skiing, horseback riding, and snowmobile trails. These lands also provide the public access to hundreds of lakes, streams, and canoe routes.

Estimated Market Value of TFFL

County land department and assessor offices estimated that in 2005, the estimated market value of the 2.7 million acres of TFFL in Minnesota's 12 northern counties was \$2.2 billion (\$818/acre). This value includes the value of both the land and timber, but excludes any structures. The per acre price of forest land is highly dependent on parcel size. An analysis of 2005 Minnesota forest land sale transactions found the median sale price of forested land parcels greater than 200 acres was \$623/acre; \$857/acre for parcels 101-200 acres, \$1,200/acre for parcels 41-100 acres, and \$1,405/acre for parcels 20-40 acres.

Financial Returns to Management of MN TFFL

Counties incur costs associated with the management of TFFL in the form of personnel, forest development, and operational costs. However, county-managed TFFL generates revenue from both direct sources (e.g., timber, gravel, leases) and indirect sources (e.g., payments in lieu of taxes, unrefunded gas taxes). Data provided by county land departments was used to help describe the net financial returns associated with managing TFFL in the 12-county study area.

Adjusted for inflation, the average annual net income generated from county-managed TFFL was nearly \$14.5 million from 2002-2005 (in 2005 dollars). Averaged over the 2.7 million acres of TFFL in the 12 county study area, this amounts to \$5.31 in annual net income per acre.

Net income from managing TFFL.

	2002	2003	2004	2005	Average 2002-2005
Total revenue	\$22,066,046	\$25,371,757	\$30,439,943	\$36,481,527	\$28,589,818
Total costs	\$12,985,325	\$14,405,725	\$15,315,009	\$15,668,218	\$14,593,569
Net income (current dollars)	\$9,080,721	\$10,966,032	\$15,124,934	\$20,813,309	\$13,996,249
Net income (2005 dollars)	\$9,865,059	\$11,588,727	\$15,548,432	\$20,813,309	\$14,453,882

Changes to TFFL Management and Use after County Disposal

Individuals and entities that purchased TFFL from counties over an eleven year period beginning in 1995 were surveyed (using a mailback questionnaire) to assess how the management and uses of these forests changed with a change in ownership. From 1995-2005, approximately 22,800 acres of county-administered TFFL was sold or exchanged to 432 different landowners. Of the TFFL owners that could be reached by the mail survey, 72% responded to the survey (294 out of 408). Based on the survey findings, some of the significant changes to TFFL management and use after county disposal are:

- **Parcel Characteristics.** The parcels of TFFL sold by counties from 1995-2005 ranged in size from 10 to 560 acres, with the average being 56 acres. An all-weather road was directly adjacent to more than half (53%) of these properties at the time of current landowner acquisition, yet approximately 10% of the properties did not have an all-weather road within 1 mile at the time of purchase.
- **Ownership.** Most (82%) of the TFFL was purchased by individuals and families. Nearly three-fourths of these owners owned other forest land in Minnesota at the time of purchase. One-fourth of the buyers live on or directly adjacent to this forest land, with an equal number (23%) living more than 100 miles away from the TFFL they purchased. The single most important reason these individuals purchase TFFL is for hunting—more than twice as many as the next most frequent response.
- **Timber Harvesting.** The sale of county TFFL has not resulted in a noticeable change in timber harvesting activity on these lands. Forty-one percent of the owners of former TFFL have either conducted a commercial timber harvest, or planned to carry one out in the next five years. Considering the maximum tenure for the buyers of TFFL was 10 years at the time of the survey and one-third of those who had not harvested indicated the timber was too small to be merchantable, there is no evidence suggesting the sale of TFFL has appreciably changed the total volume of timber harvested on these lands.
- **Forest Management Activity.** The level of investment made in specific forest management activities (e.g., pruning, thinning, tree planting) has not appreciably changed since the sale of the TFFL land. Sixty-six percent of new landowners have conducted or plan to conduct some type of silviculture activity, and another 10% plan to conduct wildlife improvement projects.
- **Professional Expertise in Forest Management.** When TFFL is sold, the level of professional expertise available to carry out forest management (e.g., silviculture, wildlife habitat improvement, timber harvesting) declines considerably. All counties prepare long-term forest management plans and employ natural resource professionals to guide

the management of their TFFL base. In contrast, only 25% of owners of former TFFL have spoken with a professional forester about how to manage their land and only 22% already have or plan to obtain a forest management plan.

- **Development and Structures.** At least 30% of the new owners plan to build a cabin or home on the forest land within the first 15 years, and 14% plan to build permanent roads. With the exception of leased structures (almost exclusively hunting cabins), counties do not permit permanent structures on TFFL.
- **Hunting Access:** When TFFL is sold to private owners, more than half of the land becomes posted to prohibit public trespass. In contrast, nearly all county-administered TFFL is open for public recreation, including hunting.
- **Parcelization and Fragmentation:** When TFFL parcels are sold to private owners, approximately 11% of the new owners plan to subdivide and sell at least a portion of their forest to another owner.
- **Long-term ownership:** At least 23% of the TFFL that was sold from 1995-2005 changed ownership within the first 10 years. Only 58% of the landowners say they have no plans to sell their land.

Comparison of Results to a Previous Tax-forfeited Landowner Survey

The results of a Minnesota TFFL study conducted in 1977 and the results obtained from this study were compared to identify changes in the characteristics and management strategies of individuals who purchased TFFL over a 30-year period. The significant differences between landowner responses in the two surveys were:

- The most common type of owner of former TFFL has changed from major corporations to families and individuals.
- The annual level (acres) of TFFL disposal has significantly decreased.
- More landowners are acquiring TFFL for hunting and other recreational purposes.
- Producing timber income and use as a seasonal or permanent residence are reasons for purchasing TFFL that have become less common.
- More TFFL owners are building recreation trails now (36%) than in the past (19%).
- Many more TFFL purchasers are posting their forest land against trespass now (51% currently; 63% plan to) than in the past (22%).

These findings indicate more landowners want to buy TFFL for the primary purposes of hunting and recreation. The simultaneous changes in forest land prices and landowner objectives suggest a significant increase in the demand for forest land that provides private hunting and outdoor recreation opportunities.

Economic Analysis of Retention Versus Disposal

An economic analysis was conducted to assess the full spectrum of benefits and costs associated with alternative TFFL retention and disposal policies.

Estimated change in net economic benefits (costs) associated with the sale of TFFL.^a

TFFL service or value	Net benefit (cost)
Market goods and services (timber, gravel, etc.)	(\$361,578,960)
Income from sale of TFFL	\$1,858,219,386
Loss of public hunting access	(\$3,642,516,482)
Total	(\$2,145,876,056)

^a Does not include other recreation opportunities (skiing, biking, hiking) and other ecosystem services (aesthetics, nutrient cycling, soil erosion prevention, non-use values)

From the public’s perspective, a disposal policy that sells all county-managed TFFL would substantially reduce net economic benefits. Based on the assumptions of this analysis, disposal of all 2.7 million acres of TFFL would reduce public benefits from market goods and services and hunting opportunities by approximately \$2 billion, largely due to the decrease in public hunting opportunities provided by these lands. We estimate that the cost of purchasing public hunting access rights to replace the acres of forest land open to public recreation lost after the sale of TFFL is \$1,338/acre of TFFL sold.

TFFL disposal would also reduce many other public benefits provided by TFFL ecosystem services that are difficult to quantify.

Summary of changes in other benefits provided by TFFL.

Public benefit	Retention	Disposal	Net change
<i>Other recreation opportunities</i>	2.7 million acres of public land available for skiing, hiking, camping, and other forms of recreation. Opportunities for developing a public recreational trail network.	1 million acres available for recreation activities; fragmented ownership pattern. Considerable challenge in developing a public recreational trail network.	Reduce area of public recreation land by 1.7 million acres. Reduce the opportunity to (and increase the cost of) developing a contiguous recreational trail network.
<i>Development/structures</i>	No new structures	30% of properties have houses and cabins; 14% of landowners construct permanent roads; 11% of land is subdivided	30% of properties have reduced ecosystem services due to development and construction.
<i>Management, professional expertise</i>	Sustainable land management for multiple uses	Only 22% have or will have a forest management plan; only 25% speak with a professional forester; approximately 75% actively manage the forest land.	Significant (~75%) reduction in management plans and profession forest management advice, but still active management on much of the land.

A TFFL disposal policy would generate a considerable one-time windfall in net income from the sale of forest land, which would primarily benefit the local taxing districts within the counties where the forest land was sold. In contrast, such a policy would result in a substantial and recurring loss in benefits from the nonmarket goods and services provided by TFFL (e.g., hunting and other forms of recreation).

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I. Introduction

There is a long history of debate over whether it is in society's best interest to keep public land resources under the management of government agencies or dispose of the lands to private ownership. This debate can be found at all levels of public land ownership, including federal (e.g., Gardner 1997; Loomis 2002), state (e.g., Minnesota Office of the Legislative Auditor 1983; Oregon Department of State Lands 2005), and local governments (e.g., Barlowe 1951; Ellefson et al. 1980). The wide range of benefits provided by forest lands make decisions regarding public versus private land ownership complex, difficult, and political.

Minnesota is one of only a few states that has a large area of forest land under county management (Smith et al. 1997, p. 62-63). County-managed forest land, primarily known as tax-forfeited forest land (TFFL), covers approximately 2.8 million acres in Minnesota. The management of TFFL in Minnesota is guided by MS § 282, which states: "It is the general policy of this state to encourage the best use of TFFLs, recognizing that some lands in public ownership should be retained and managed for public benefits while other lands should be returned to private ownership." Decisions regarding retention or disposal of such a large land base will have a significant impact on the condition and use of the land, as well as the benefits they provide.

This report provides background information on current TFFL management policies and the potential effects of a county land disposal policy. Funding for this study was provided by the Minnesota Association of County Land Commissioners (MACLC) and the Blandin Foundation. The information and analysis presented in this report is intended to help guide future decisions that promote the "best use" of Minnesota's TFFL.

The primary goal of this report is to describe and quantify the economic implications of selling or retaining MN TFFL. To do so, detailed information on the state's TFFL base (forest cover and associated conditions) and revenue and expenses associated with managing these lands were collected from county land departments. Additionally, owners of forest land formerly managed by county land departments were surveyed to assess how the use, management, and benefits provided from these lands has changed with a change in ownership. Using these data and additional information describing and quantifying certain nonmarket forest land benefits, an economic analysis was performed to assess the costs and benefits of county land retention/disposal policies, paying specific attention to both monetary and nonmonetary benefits associated with continued county-administration of these lands.

A. Background

Minnesota county governments have a long and rich history of policies and programs for the management of TFFL classified as "conservation"¹ in the 15 counties represented by the

¹ Section II.A gives a brief description of the land classification process. For a more complete summary of system used to classify TFFL and some of the criteria used, see Ellefson et al. (1980). Essentially, lands classified as "conservation" are lands that will likely remain in public (county) management, although it is possible for them to be removed from the conservation classification and sold to private landowners.

MACLC.² The vast majority of these lands, which total approximately 2.7 million acres, were once held in private ownership. However, as a result of failure to pay property taxes, these lands were eventually returned to public ownership. Just more than two million acres of the TFFL is classified by the USDA-Forest Service's Forest Inventory and Analysis Program as timberland³, accounting for 14% of the state's timberland base (Miles 2007). Initially it was the policy of the counties to return TFFL back to private ownership. This transfer back to private ownership began in the mid-1930s and was prevalent during much of the first half of the 20th century when tax forfeiture was a common phenomenon in northern Minnesota. The annual area of TFFL sold was highest in the 1960s, but significantly decreased in the next decade (Lothner et al. 1978) and sale activity has since remained at a low level (Baughman and Ellefson 1983). While the state of Minnesota holds the title to these lands in trust for the taxing district⁴, Minnesota Statute provides that land forfeited to the state for nonpayment of taxes and classified as conservation lands are to be under the management authority of county boards (MS §282). Through county land departments, TFFL is managed for a variety of timber and nontimber benefits.

An important public policy question regarding these lands is whether they should be retained in public ownership or returned to private ownership. Important financial benefits associated with retention in public ownership include receipts from timber sale and other activities (e.g., leases) and payments from the state of Minnesota to compensate for the inability to generate property tax revenue on TFFL. These lands also provide many important nonfinancial benefits to the public such as wildlife habitat, clean water, and public recreation opportunities such as hunting. Transferring TFFL to private ownership will generate substantial revenue from their sale, but may also result in a reduced investment in and commitment to forest management, loss of access for public recreation, and conversion of forest land to more developed uses on these lands. Divestiture of such lands could also result in additional service requirements (e.g., road development and maintenance, fire protection) that would increase financial burdens to local taxing districts. The debate over who should own TFFL has been longstanding, with no agreement over what land tenure arrangements are appropriate (Barlowe 1951; Ellefson et al. 1980; Baughman and Ellefson 1983).

B. Previous Studies

Studies have periodically been undertaken to evaluate the economic implications of various TFFL retention and disposal options and provide recommendations for the improved management and use of these lands. The most prevalent opinion for the first half of the 20th century was that it was in the public's best interest to return TFFL to private ownership (Barlowe 1951). Later, Dana et al. (1960) were less certain about the best use of TFFL, pointing out that "the differences in the point of view are due largely to the diversity of emphasis placed on different and objectives and to ignorance of the efficiency of various classes of ownership in attaining those objectives"(p. 220).

² Twelve of the 15 counties in the MACLC are participating in this study: Aitkin, Beltrami, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Itasca, Koochiching, Lake, Pine, and St. Louis.

³ According to the USDA-Forest Service's FIA Inventory Program, timberland is forest land that is capable of producing at least 20 cubic ft of wood per acre per year and is not legally reserved from timber harvest.

⁴ Most of the revenue is divided among the school district, county government, and local cities and townships.

After a 20 year lull in the research regarding Minnesota's county land management and disposal policies, a renewed interest developed in the 1980s. Ellefson et al. (1980) conducted a survey in Itasca County that described the condition and level of management on former TFFL. The data from this study appear to be the only information available on changes in land use and management activities on TFFL after it is sold to private owners. Baughman and Ellefson (1983) used a Delphi study of Minnesota forest policy experts, stakeholders, and facilitators in an effort to present politically feasible recommendations for county land ownership policies. Even the state's Office of the Legislative Auditor (1983) added to the discussion on TFFL disposal policies, but the report was more interested in the impacts on state revenue, so Minnesota Department of Natural Resources (MN DNR) lands were the major focus.

Most recently, MacKay and Ellefson (1996) analyzed the financial impacts of Itasca County forest land sale policies and programs. This study also demonstrated the complexity associated with examining alternative policies regarding retention versus disposal of TFFL. Since 1996, when this study was undertaken, considerable changes have occurred in the economic environment affecting forest land. Consider, for example, that in 1996 Minnesota forest land sale prices and aspen pulpwood prices averaged \$400 per acre and \$16 per cord respectively. In 2003, statewide forest land sale prices averaged more than \$1,250 per acre and aspen pulpwood stumpage prices approached \$30 per cord (Kilgore and MacKay 2007; MN DNR 2004a). These changes have likely had a significant impact on forest land management generally and TFFL specifically. Higher stumpage prices will result in greater timber sale revenue for the local taxing districts. At the same time, higher land values will increase county revenue (per acre) from the sale of TFFL. Given these significant economic changes, the financial benefits and costs associated with TFFL disposal has likely changed since the last analysis was completed in 1996.

In addition to a changing economic environment, Minnesota forest landowner motivations and private land management have also changed dramatically over the last few decades. A recent survey by Donnay (2005) describes some of the recent changes in Minnesota private forest landowner characteristics. Forest land is increasingly bought for recreational use and real estate investments, instead of for the purpose of building a primary or seasonal residence.

In light of these dramatic changes, an updated evaluation is needed to inform policy makers, resource managers, and the public about the financial and economic consequences of various TFFL retention and disposal options. Also, this report will be the first attempt to quantify important nonmarket benefits and costs when assessing county forest land disposal options in Minnesota.

C. Study Overview

Nearly all of the 2.7 million acres of TFFL in Minnesota are administered by 15 counties. Thirteen counties each manage at least 48,000 acres of TFFL (MACLC 2001). Of these 13 counties, 12 participated in this study: Aitkin, Beltrami, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Itasca, Koochiching, Lake, Pine, and St. Louis. Together, these 12 counties administer approximately 2,723,000 acres (96%) of TFFL in Minnesota.

This report begins by describing the characteristics and management of MN's TFFL base, including a description of the types of forests that exist, the estimated market value (EMV) of MN's TFFL, a description of Minnesota county land departments, the types and extent of revenue generated from and costs associated with managing TFFL, and a description of net revenue generated from the retention and management of MN TFFL (Section II). The sources of information presented in this section of the report were obtained from 2002-2005 county land department records.

Section III describes the current uses and management of private forest land that was once managed by county land departments. Included is a characterization of the owners of former TFFL, the characteristics of the TFFL purchased, past and future forest management activities, decisions regarding allowing the public to access these forests for recreation, TFFL turnover and parcelization activity, and past and future planned development of TFFL. The information contained in this section of the report was obtained from a mail survey of individuals and organizations that own TFFL sold from 1995-2005.

In Section IV, an economic analysis uses county land department data and landowner survey data to describe important monetary and nonmonetary costs and benefits associated with TFFL retention and disposal policies.

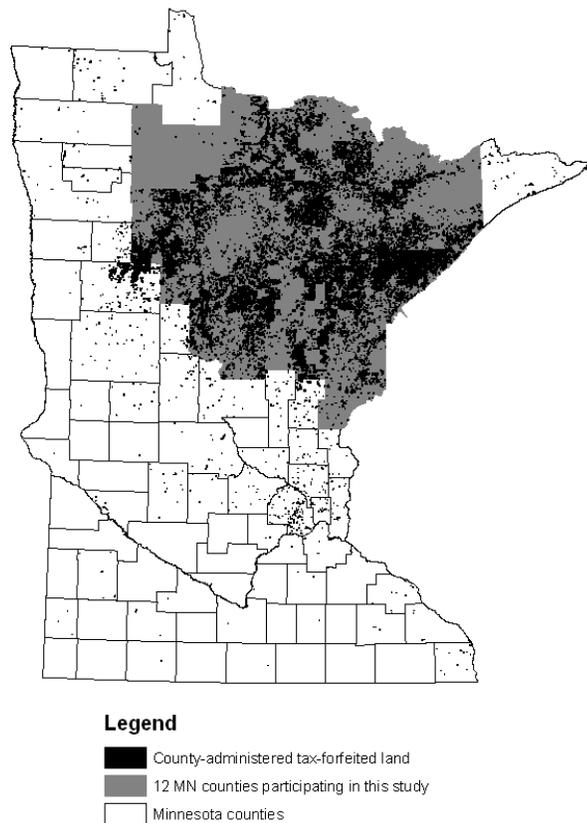


Figure 1. Map of MN TFFL.
Source: MnDNR data deli 2007

II. Characteristics and Management of Minnesota's TFFL

A. TFFL Classification

When land is forfeited to the state for failure to pay taxes, one of the first actions is for the counties to classify the land as “conservation” or “nonconservation”. The classification of lands as conservation or nonconservation must “encourage and foster a mode of land utilization that will facilitate the economical and adequate provision of transportation, roads, water supply, drainage, sanitation, education, and recreation; facilitate reduction of government expenditures; conserve and develop the natural resources; and foster and develop agriculture and other industries in the districts and places best suited to them” (MS §282).

The classification of lands as conservation means that the land will be retained by the state and managed by the county; lands classified as nonconservation are to be sold at a public auction. When making the decision whether to retain or dispose of the land, counties are directed to consider “the present use of adjacent lands, the productivity of the soil, the character of forest or other growth, accessibility of lands to established roads, schools, and other public services, their peculiar suitability or desirability for particular uses and the suitability of the forest resources on the land for multiple use, sustained yield management” (MS §282).

In recent years, very little private forest land has been forfeited to the state of Minnesota as a result of failure to pay property taxes. Most of the current TFFLs were originally classified as conservation more than 30 years ago, but some counties (e.g., Aitkin) will occasionally review the classification of their tax-forfeited parcels.

The statutory language guiding land classification is rather vague. Consequently, although county land classification must be approved by the MN DNR, the decision whether land should be retained is open to a significant level of county discretion. Individual counties have their own criteria to identify lands for disposal, but nonconservation lands usually have at least one of the following characteristics:

- **Small, isolated parcels-** Small parcels that are isolated from the rest of the TFFL base and too small to manage for timber and wildlife recreation (~20 acres) have a greater chance of disposal.
- **Landlocked parcels-** Landlocked parcels are parcels of public lands that are completely surrounded by private property and are not accessible by public roads. Consequently, the public is not guaranteed access to these lands for recreation, nor are loggers assured of access to any timber purchased through public auction.
- **Parcels near existing infrastructure-** Lands that have direct access to existing utilities and public roads are often identified for disposal. An exception to this criterion may be when the parcel provides the only access to other public lands.

Currently, most counties retain a large majority of their TFFL to maintain a working forest land base; few counties have an aggressive disposal policy (see Section III). Instead, most county efforts concentrate on consolidating their existing TFFL base. To this end, counties often identify lands that are suited for disposal (i.e., isolated, landlocked, near existing infrastructure) and exchange them for parcels that are near existing TFFL.

B. Description of Minnesota’s TFFL

1. Extent

Together, the 12 counties participating in this study administer approximately 2,723,000 acres of TFFL (MACLC 2001). All 12 counties administer at least 48,000 acres of TFFL. St. Louis County administers the largest area, slightly more than 900,000 acres, and Pine County manages the least, 48,900 acres (Figure 2).

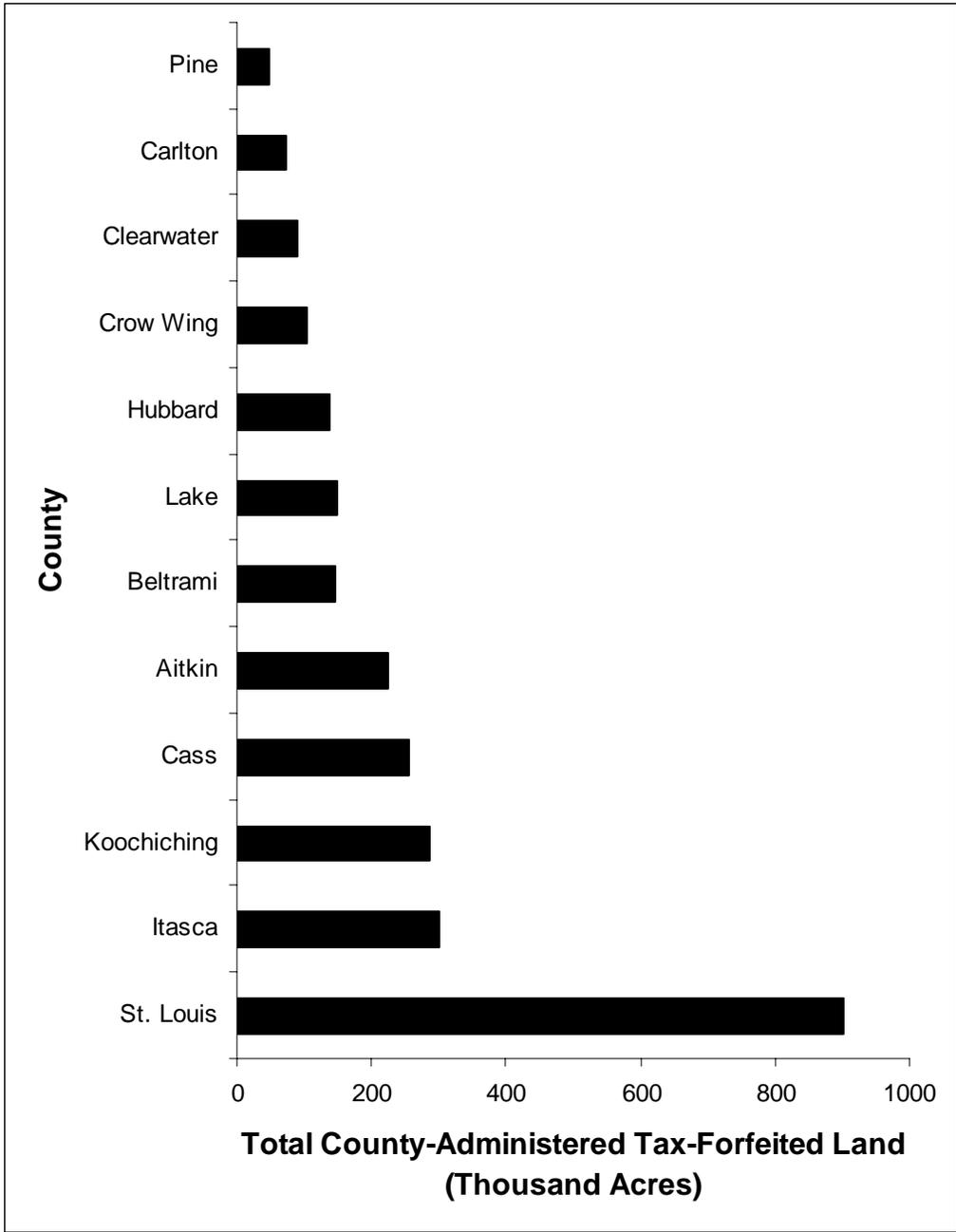


Figure 2. Distribution of county-administered TFFL by county.

Of the approximately 2.7 million acres of TFFL managed by Minnesota county governments, 2.1 million acres (75%) are classified as forest land—roughly 18% of the area’s total forest land base according to the most recent Forest Inventory and Analysis (FIA) data collected by the USDA-Forest Service (Figure 3) (Miles 2007).⁵ The remaining 600,000 acres are classified as wetland, public water, and nonforest land (e.g., agricultural land, and brushland).

⁵ This report refers to all 2.7 million acre of county-managed tax-forfeited land as “TFFL”, even though not all of the land is classified as forest land by FIA.

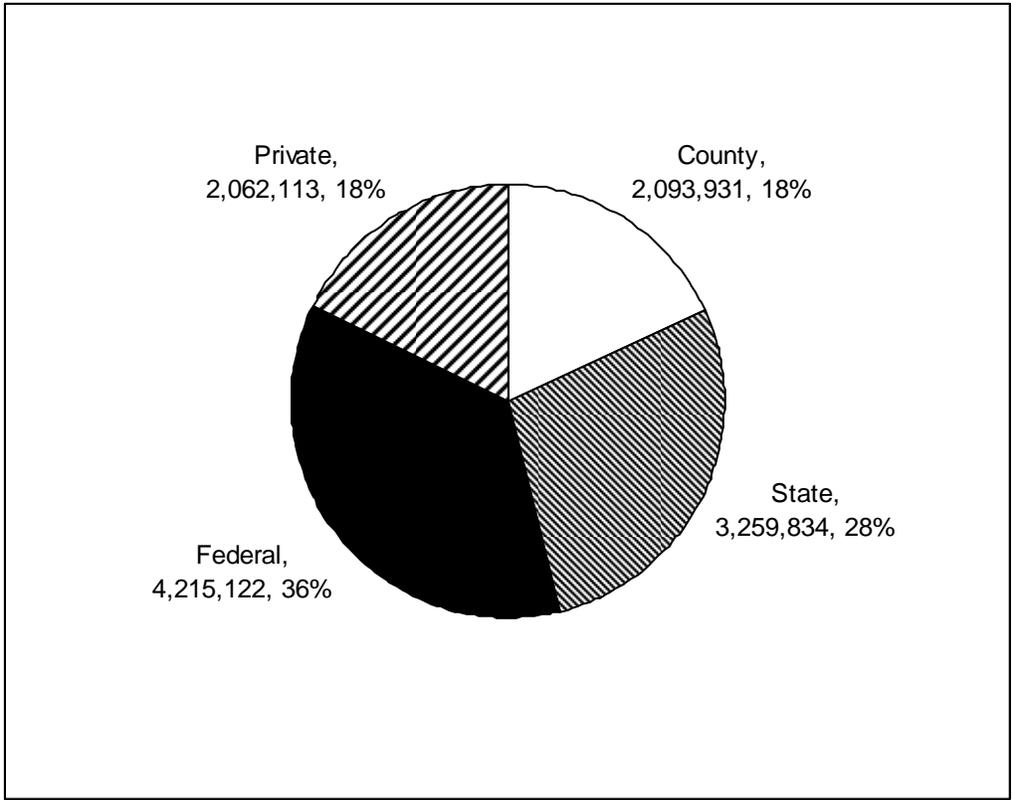


Figure 3. Forest land distribution in the 12 counties by ownership class (acres).
 Source: USDA-FS FIA Data (Mills 2007)

Of the 2.1 million acres of county-administered forest land, individual county inventory efforts contain detailed data on 1.95 million acres.⁶ Most county forest inventories classify TFFL by covertime, age class, and site index. Combining the individual county forest land inventory data for all 12 counties participating in this study provides a description of the current forest land base under county management.

2. Forest covertypes

County-administered forest land contains a number of different groupings of forest tree species, commonly referred to as forest covertypes. Aspen is, by far, the most common forest covertime found on TFFL, covering approximately 994,000 acres or about half the 12-county TFFL base (Figure 4). Lowland black spruce, birch, and northern hardwoods are also common TFFL covertypes, each containing more than 100,000 acres. White pine, stagnant spruce, and upland black spruce are the least common covertypes, all covering less than 10,000 acres.

⁶ Not all forest land information is available in the county inventories. Data is missing for various reasons. Some less productive lands (i.e., low site index) were not included. Also, some of the lands could not be assigned a proper site index or age class.

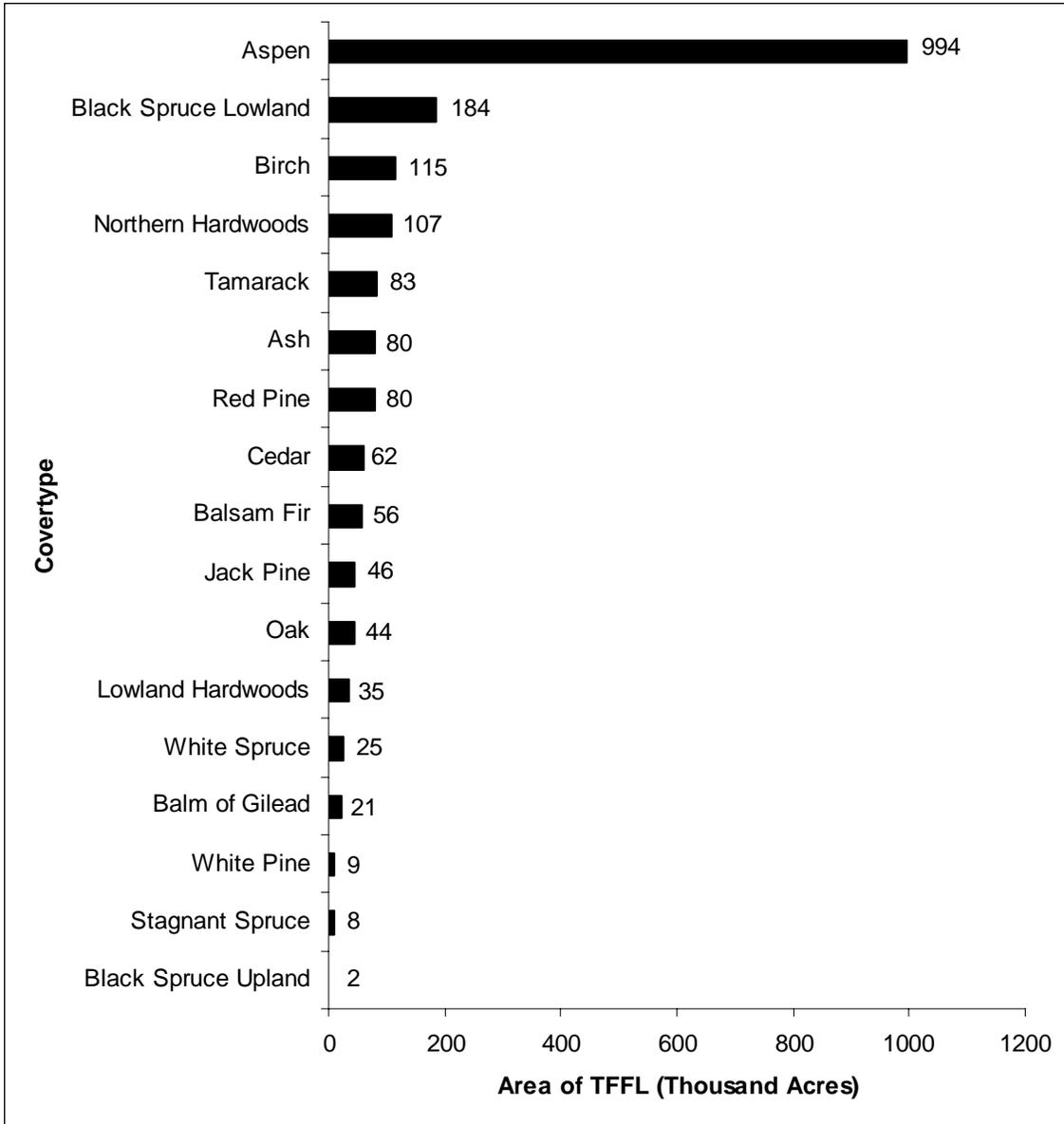


Figure 4. Distribution of TFFL by forest covertype.

The range of different covertypes found on TFFL is not unique to county ownership. However, county-managed lands appear to have a slightly different covertype distribution than the other forest land in the area (Figure 5). On a percentage basis, aspen accounts for a much larger portion of the covertypes present on TFFL than the other forest land ownership groups (public and private) in the area. Conversely, lowland hardwood, black spruce, balm of gilead, and tamarack covertypes are less prevalent on TFFL in relation to the rest of forest land.

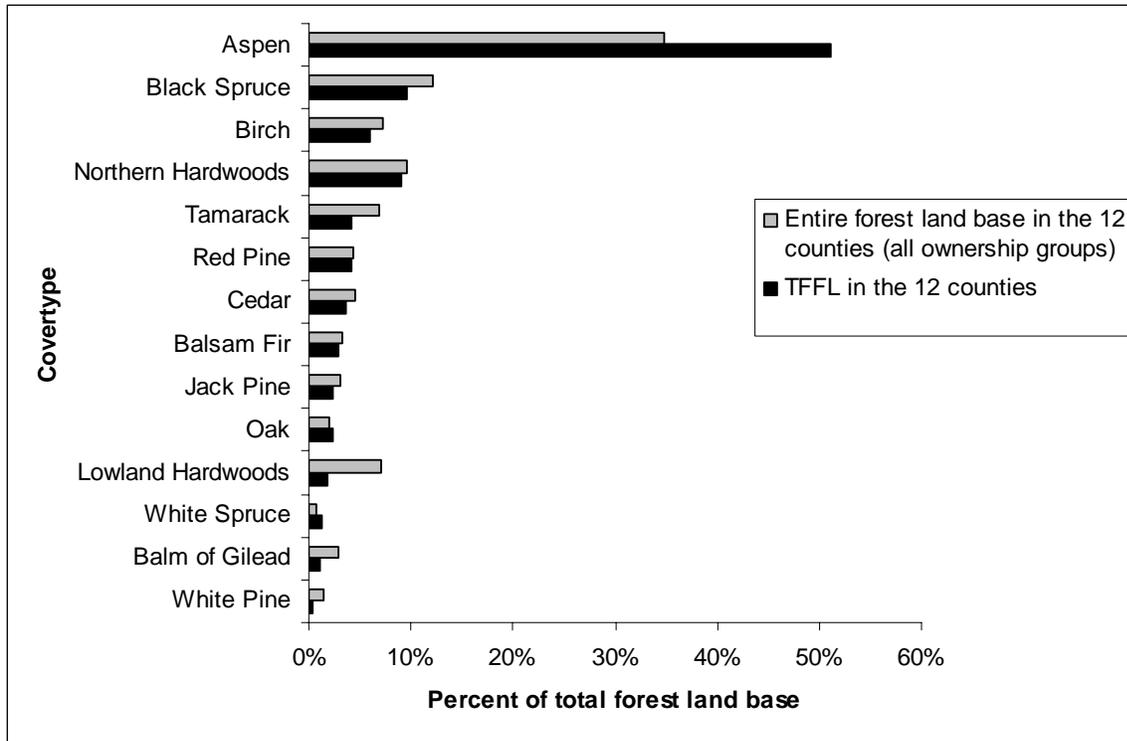


Figure 5. Distribution of covertypes on TFFL in 12 county area and covertypes on entire MN forest land base. Source: County inventory data and FIA data (Miles 2007)

3. Age class distribution

The distribution of TFFL by age class varies greatly between different covertypes. Figure 6 shows the median age for major forest covertypes in the 12 counties. Cedar (93 years) and white pine (83 years) stands are generally the oldest, while aspen (33 years) and white spruce (31 years) stands are much younger.

The median age class for all forest land in the 12-county study area is 51 years old, and the median age class for all TFFL in the 12 counties is 52 years old (Figure 6) (Miles 2007)—suggesting no significant difference between the forest age on county-managed TFFL and other ownership groups. However, the median stand ages differ within certain covertypes. For example, the median age of county-administered balm of gilead, birch, balsam fir, and hardwood stands is higher on TFFL than other forest land ownership groups in the area. Alternatively, aspen and red pine stands are slightly younger on TFFL than on other forest land in the 12 counties.

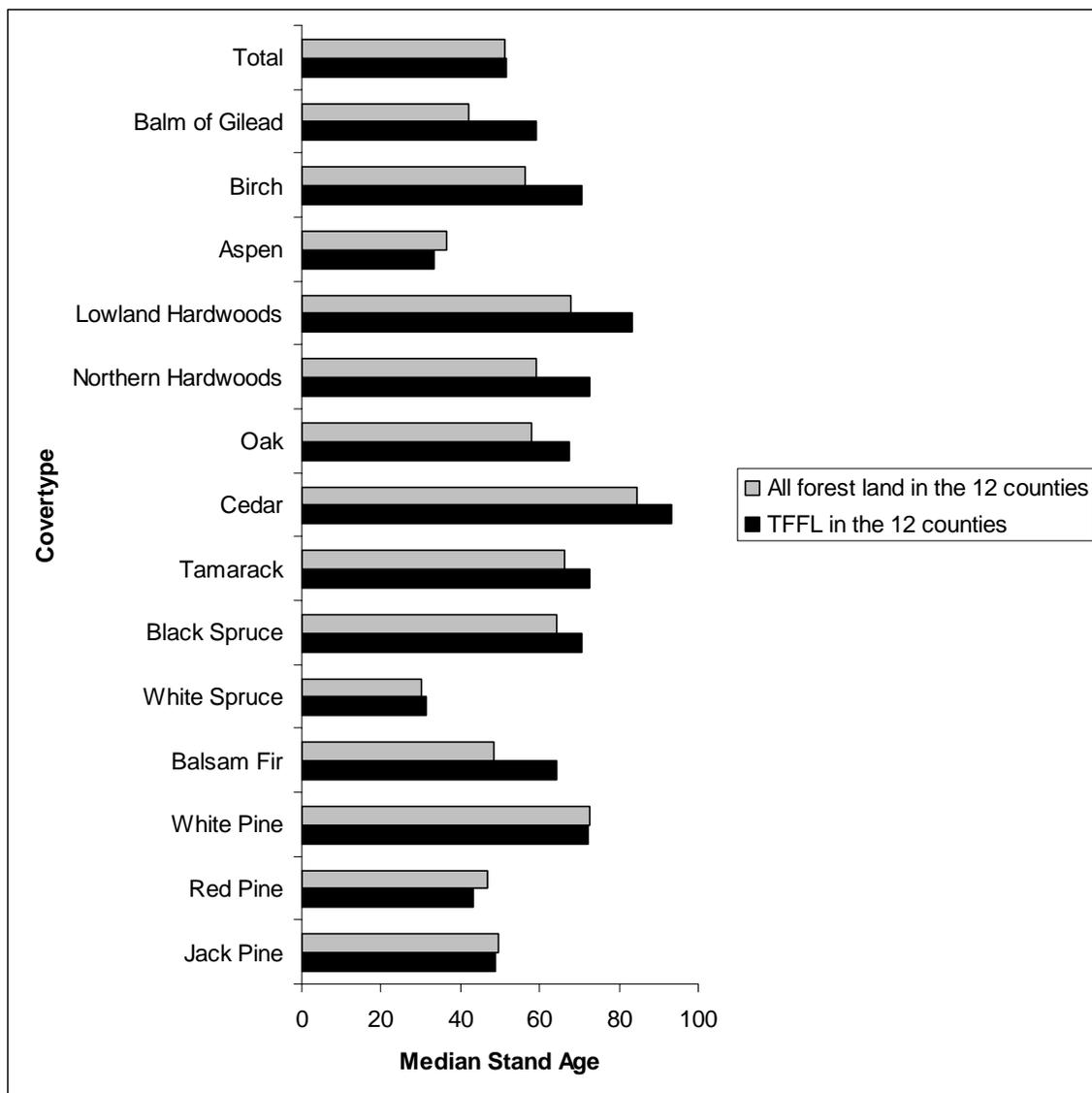


Figure 6. Median stand age by covertypes on 12 county TFFL and entire 12 county forest land base. Source: County inventory data and FIA data (Miles 2007).

Appendix A provides greater detail of TFFL age class distributions for each covertypes.

4. Site quality

Site index is a common measurement of site quality in the Lake States. Similar to age class distribution, the site quality of TFFL is very diverse. Since site indices are species specific, the absolute value of the average site index for all covertypes does little to help describe overall TFFL site quality. Instead, Figure 7 shows the average site indices by covertypes for county-administered TFFL and forest land in all ownership categories for the 12 counties. Lowland hardwood, black spruce, birch, and aspen stands on county-administered lands are, on average, on higher quality sites than the same covertypes on other ownership groups in the area. Only

white spruce, red pine, and cedar TFFL covertypes have a lower average site index than the surrounding forest land.

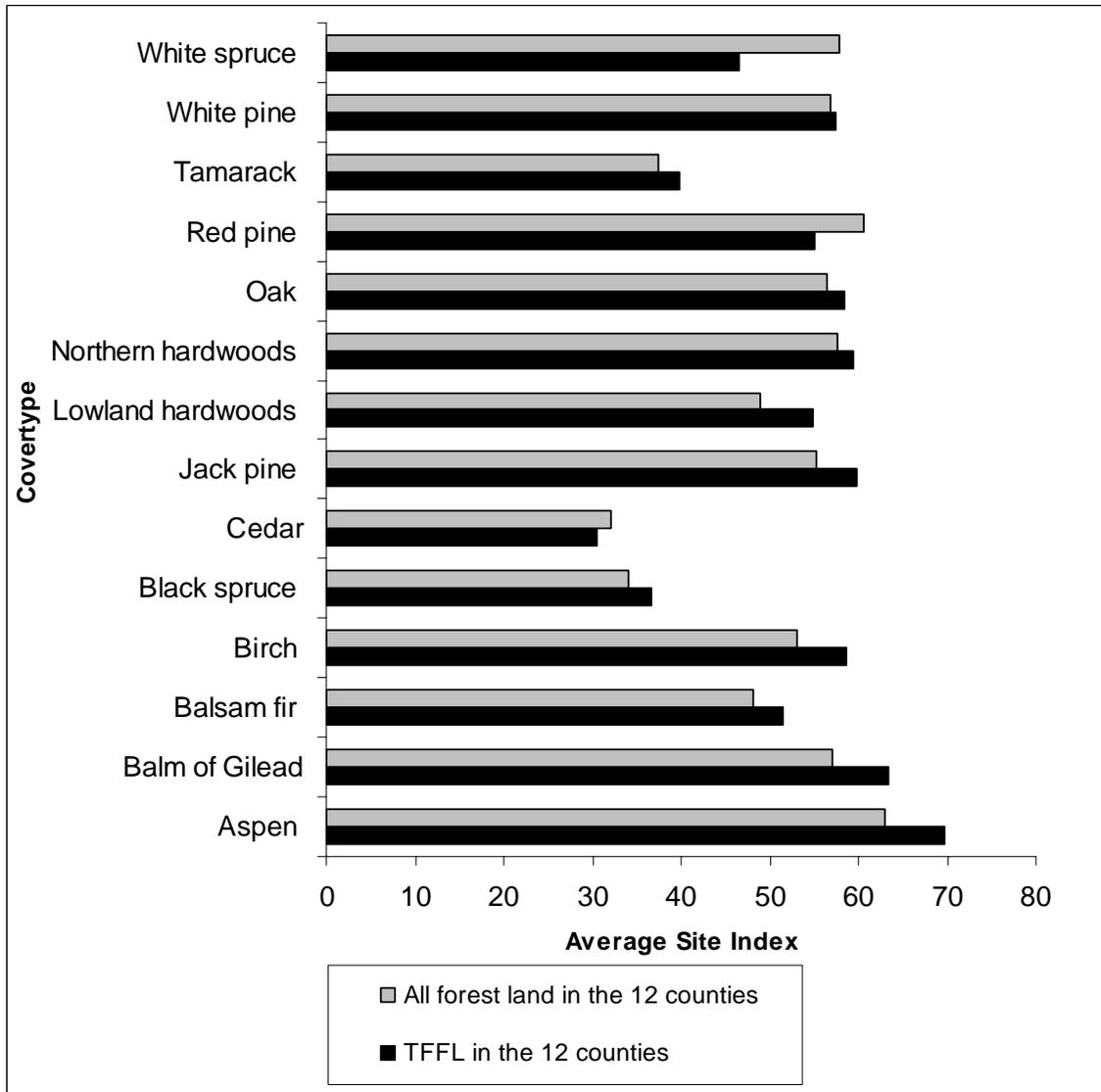


Figure 7. Average site index by covertypes in the 12-county area.
 Source: County Inventory Data and FIA data (Miles 2007)

Appendix B provides more detailed information on the distribution of TFFL by site indices and covertypes.

5. Summary of TFFL characteristics

The 2.7 million acres of county-managed TFFL in 12 northeastern Minnesota counties comprises 18% of the entire forest land base for the area. FIA and county inventory data help describe forest land characteristics on TFFL and other forest land ownership groups. Some of the significant results from a brief review of the forest land data are:

- Aspen is, by far, the most common TFFL coertype (994,000 acres). As a percent of the total forest land area, it is much more common on county-managed land than on the rest of the forest land in the 12 counties. In contrast, lowland hardwoods, tamarack, and black spruce coertypes are all less common on county-managed TFFL than on other forest lands in the area.
- The overall age of all the trees on TFFL does not appear to be significantly different than other forest lands, but certain species appear to be managed differently. Most coertypes are older on TFFL, but aspen and red pine stands are generally younger than surrounding forest land. This may suggest that two of the most heavily, commercially managed Minnesota tree species are harvested on a shorter rotation on TFFL; yet the other coertypes are harvested on a longer rotation.
- For the most part, county-managed TFFL is more productive than the surrounding forest lands. The average site index for most coertypes, including aspen, is higher on county land than on the rest of the forest land in the 12 counties. The only TFFL coertypes that are less productive are white spruce, red pine, and cedar.

C. Market Value of Minnesota's TFFL

County Land Departments and Assessor's Offices estimated that in 2005 the 2.7 million acres of TFFL in Minnesota's 12 northern counties was valued at approximately \$2,227,161,351. This estimated market value is based on land and timber and excludes the value of any structures.

D. Minnesota County Land Departments

1. Organization

MS §282.01 states that counties are responsible for managing TFFL classified as "conservation." With a few exceptions, most counties with more than 6,000 acres of TFFL have established county land departments for the purpose of managing the TFFL located in their county. Organizationally, the land commissioner, appointed by the county board, is the head of the land department and responsible for supervising and administering the policies and programs directed at TFFL. Although state policies and locally elected officials have substantial influence over the management of these lands, land commissioners play a pivotal role in county forest land management (McCann and Ellefson 1980).

2. Functions

The responsibilities of a county land department vary considerably among counties. However, most land departments include some combination of the following functions:

- forestry.
- fish and wildlife.
- parks and recreation.
- soil and water conservation.
- surveying.
- engineering.
- administration of leases, easements, and land sales.

As the principal agent of county forest land management, the land commissioner is charged with managing all county lands currently administered for purposes of producing forest-related amenities (e.g., timber, water, wildlife, etc). Land commissioners usually devote much of their time to the administration of a timber management program. However, other land department responsibilities commonly include land classification, land exchanges and sales, recreation and wildlife management, administrative duties, and public affairs (McCann and Ellefson 1980). Figure 8 illustrates how one Minnesota county land department organizes its personnel and functions.

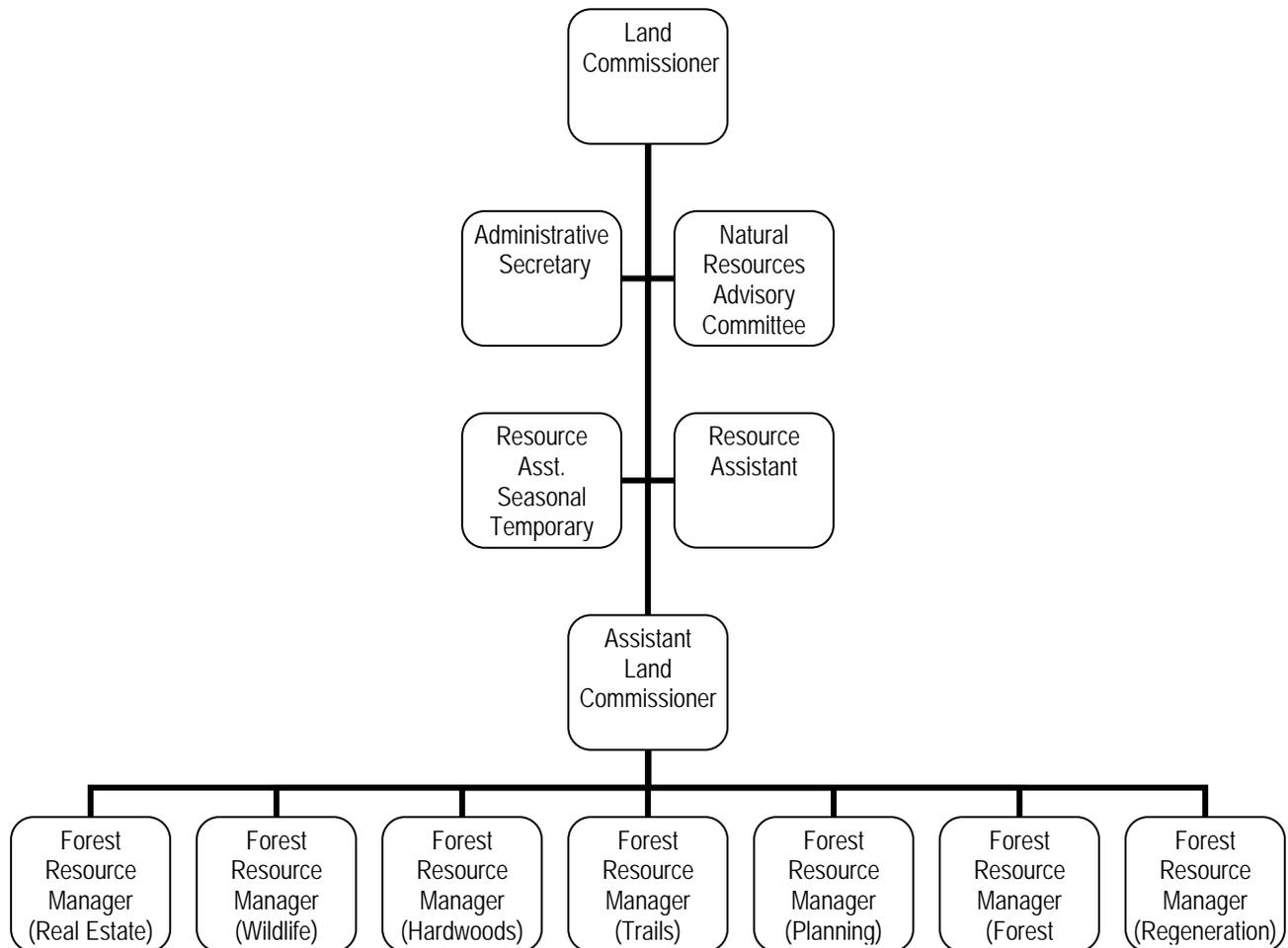


Figure 8. Example of county land department organization, functions, and personnel (Cass County).

3. Personnel

Management of TFFL in Minnesota requires a range of professional expertise. From 2002 through 2005, the average number of full-time equivalents (FTE) working to administer the forestry programs in the 12 counties studied ranged from as few as 1.4 per county (Pine) to 58 (St. Louis). In total, 142 FTEs were employed by the 12 county land departments in 2005. Specific professional expertise employed within a county land department is a function of the department’s programs. However, land department personnel typically include foresters,

forestry technicians, and timber and land appraisers. Seasonal staff is also frequently employed to assist in activities such as tree planting and timber stand improvement.

4. County management of TFFL

MS § 282 requires all TFFL classified as conservation be devoted to the purposes of “forestry, water conservation, flood control, parks, game refuges, controlled game management areas, public shooting grounds, or other public recreational or conservation uses, and managed, controlled, and regulated for such purposes.” Following MS § 282, county land departments manage TFFL for multiple uses and sustained yield (MACLC 2001).

Summary of TFFL Management

All counties manage the TFFL in their jurisdiction according to the specific site conditions, but a few general characteristics are common to nearly all county-managed TFFL:

- TFFL is managed to produce timber. Counties are committed to meeting the local industry’s demand for wood products, as well as generating adequate revenue for local taxing districts through the sale of standing timber. The vast majority of all standing timber on TFFL is sold at public auction.
- Counties perform timber management activities to improve the quality and condition of the forest. Some of the timber management activities that are common on county forest lands include harvesting, pruning, thinning, and tree planting (MACLC 2001).
- TFFL managers utilize wildlife impoundments, hunter hiking trails, wildlife food plots, wildlife openings, and a variety of other wildlife improvement projects that protect and benefit a variety of wildlife species found in Minnesota’s forests.
- Nearly all TFFL is open to the public for hunting, camping, hiking, bird watching, and other forms of public recreation. County-administered TFFL provides thousands of miles of hiking, skiing, horseback riding, and snowmobile trails. These lands also provide the public access to hundreds of lakes, streams, and canoe routes (MACLC 2001).

County land departments employ forest professionals, create forest management plans, and many have their forest land base third-party certified—all of which help ensure proper management and stewardship of the forests’ resources.

Professional Expertise

To help effectively manage TFFL for a wide variety of public benefits, county land departments employ forest professionals. Each of the 12 county land departments employs at least one forester or natural resource manager, providing scientific and professional expertise in making complex decisions regarding the management of TFFL.

Forest Management Plans

In addition to professional foresters, all 12 county land departments have a forest management plan for their TFFL. Counties do not, however, have one uniform plan or prescription for the management of forests under their jurisdiction (MACLC 2001). Each county manages its individual forested parcels differently—depending on site productivity, species that grow best on the site, and the demands placed on the land by the public (MACLC 2001). The level of

specificity and complexity of each forest management plan differs, but each plan describes general strategies for the long-term management of the land.

Third-Party Certification

Forest certification is the process whereby an independent organization develops standards of good forest management (usually following local best management practices) and an independent auditor verifies that management agencies are meeting these standards. Subsequently, wood that is harvested and sold is identified as having come from lands that meet certain environmental standards. Much of the county-managed TFFL is third-party certified.⁷ County forest land certification is another example of how county land departments ensure TFFL is managed sustainably.

E. Revenue Derived From Minnesota TFFL

TFFL is held in trust by the state, but counties are responsible for administration and management of these lands, and are the beneficiaries of any revenue derived from them. Revenue generated from county-administered TFFL comes from both direct sources, such as timber sales and land leases, and indirect sources, such as payments in lieu of taxes and unrefunded gas tax payments (details about county revenue sources are discussed below). The majority of revenue generated from TFFL is distributed among the local taxing districts. Revenue associated with the management or sale of TFFL must be allocated according to an apportionment formula described in MS § 282.08 - 282.09. Net revenue (gross revenue less administrative, operational, and management expenses associated with managing TFFL) is apportioned according to the formula specified in MS § 282.08, subdivision 4 as follows: up to 30% can be used for timber development activities and up to 20% can go toward acquisition and maintenance of county parks and recreation areas. Of the remaining revenue, 40% goes to the county, 20% goes to the local town or city government, and 40% goes to school district(s) within the county. Special legislation allows exceptions to this distribution formula for certain counties (e.g., Itasca).

In summary, revenue generated from the management and disposal of TFFL is used to cover the costs of county land department operations (MacKay and Ellefson 1996). The remaining net revenue is subsequently divided among county and townships, cities, and school districts located within the county.

1. Direct revenue

This report divides revenue generated from TFFL management into two different categories: direct revenue and indirect revenue. For purposes of this report, direct revenue is defined as revenue that is generated through the management and use of the land. To be considered direct revenue, the county must be involved in a transaction that results in a good or service provided to

⁷ As of July 2007, eight counties are FSC and/or SFI certified, or in the process of obtaining certification: Aitkin, Carlton, Cass, Clearwater, Crow Wing, Itasca, Koochiching, Lake and St. Louis.

a willing purchaser and, in exchange, the county receives monetary compensation. Examples of direct revenue sources from TFFL include timber sales, land leases, and gravel sales.⁸

Table 1 shows the total direct revenue from managing TFFL from 2002 and 2005 among the 12 study counties. Revenue from timber sales is clearly the largest source of direct revenue from TFFL. The average annual timber sale revenue from 2002 to 2005 was \$24,915,606. Land lease receipts (\$531,891), gravel receipts (\$642,170) and various “other” sources (\$347,199) account for the remaining portion of direct revenue received by these counties from the management of TFFL. Together, these direct revenue sources generated approximately \$26.4 million in revenue each year to the 12 counties during the four-year study period and steadily increased at an average annual rate of 20%.

Table 1. Direct revenue generated from administration of county lands.

	2002	2003	2004	2005	Average 2002-2005
Timber receipts	\$18,619,707	\$21,783,092	\$26,747,403	\$32,512,221	\$24,915,606
Lease receipts	\$543,433	\$543,619	\$518,208	\$522,304	\$531,891
Gravel	\$546,194	\$601,385	\$759,124	\$661,975	\$642,170
Other	\$274,954	\$321,660	\$243,423	\$548,759	\$347,199
Total direct revenue	\$19,984,288	\$23,249,756	\$28,268,158	\$34,245,259	\$26,436,865
(% annual change)		(+16%)	(+22%)	(+21%)	(+20%)

2. Indirect revenue

Indirect revenue is defined for purposes of this report as any revenue generated from managing TFFL that is not the result of the sale of a good or service. Indirect revenue primarily comes from government payments, grants, or contracts and is typically a function the total area of TFFL managed by each county. The most common examples of indirect revenue counties receive that are tied to the management of TFFL are state payments in lieu of taxes (PILT) and unrefunded gas tax receipts.

Payment in Lieu of Taxes (PILT)

The state of Minnesota makes annual payments to counties based on the acreage of “natural resource lands” to which the state holds title within each county (MacKay and Ellefson 1996). The rationale for these payments is that since these public lands do not generate property taxes for local governments, the PILT will make up for the loss of these potential revenues. The basis for these distributions is in MS § 477A and the payment amount to the county depends on the type of land and total acreage managed. County data indicates that PILT produced average annual revenue of \$1.8 million for the twelve counties in this study from 2002 to 2005 (Table 2).

Unrefunded Gas Tax

Counties also receive payments from the state for unrefunded taxes paid on gasoline and special fuels used to operate motor vehicles on forest roads (McKay and Ellefson 1996). Money from this account is transferred to counties for “constructing, reconstructing, acquiring, and

⁸ Revenue from the sale of TFFL is not included in our assessment of revenue derived from TFFL because we are attempting to determine the returns to retaining and managing TFFL. Revenue from land sales is the revenue associated with TFFL disposal, not retention.

maintaining county management access roads, including the acquisition of rights-of-way or easements as may be needed” (MS § 89.72). In contrast to PILT, unrefunded gas tax payments are only distributed based on the relative proportion of county-administered *commercial* forest land, but not unproductive forest land⁹. Average annual payments from the unrefunded gas tax were approximately \$342,000 per year (Table 2).

Table 2. Indirect revenue generated from county-administered lands in the 12 counties.

	2002	2003	2004	2005	Average 2002-2005
PILT	\$1,735,176	\$1,760,038	\$1,821,803	\$1,888,609	\$1,801,407
Unrefunded gas tax	\$335,488	\$340,534	\$346,226	\$347,494	\$342,436
Other indirect revenue	\$11,094	\$21,429	\$3,756	\$165	\$9,111
Total indirect revenue	\$2,081,758	\$2,122,001	\$2,171,785	\$2,236,268	\$2,152,953
(% annual change)		(+2%)	(+2%)	(+3%)	(+2%)

Total average annual indirect revenue from 2002 to 2005 for the 12 counties was \$2.15 million. Payments in lieu of taxes constituted the major source of indirect revenue provided to local government as a result of TFFL management (84%), generating approximately \$1.8 million of revenue to the 12 counties. Total indirect revenue increased slightly over the four-year period.

3. Total revenue from managing TFFL

Total revenue (both direct and indirect) received by the 12 counties from the management of TFFL from 2002-2005 was approximately \$28.6 million per year (Figure 9). Considering there are approximately 2.7 million acres of TFFL, each acre of forest land produced an average of \$10.50 per year. Timber sales were clearly the largest source of revenue—accounting for 87% of the total. Revenue from timber sales also grew at a consistently high rate during the four-year period.

F. Costs Associated with Managing Minnesota TFFL

County governments assume a variety of costs associated with the management of TFFL. Resources must be spent to establish, maintain, and harvest timber resources on these lands, as well as maintain access to these lands for recreation purposes. Such costs can be separated into three major categories: personnel, forest development, and operational. All three expense categories are a significant portion of the total cost of managing TFFL (Figure 10).

⁹ Commercial forest land is typically defined as forest land that is capable of producing 20 or more cubic feet of merchantable volume per acre per year, excluding lands that are withdrawn from timber production by statute or administrative regulation. Commercial forest land is a subset of all forest land.

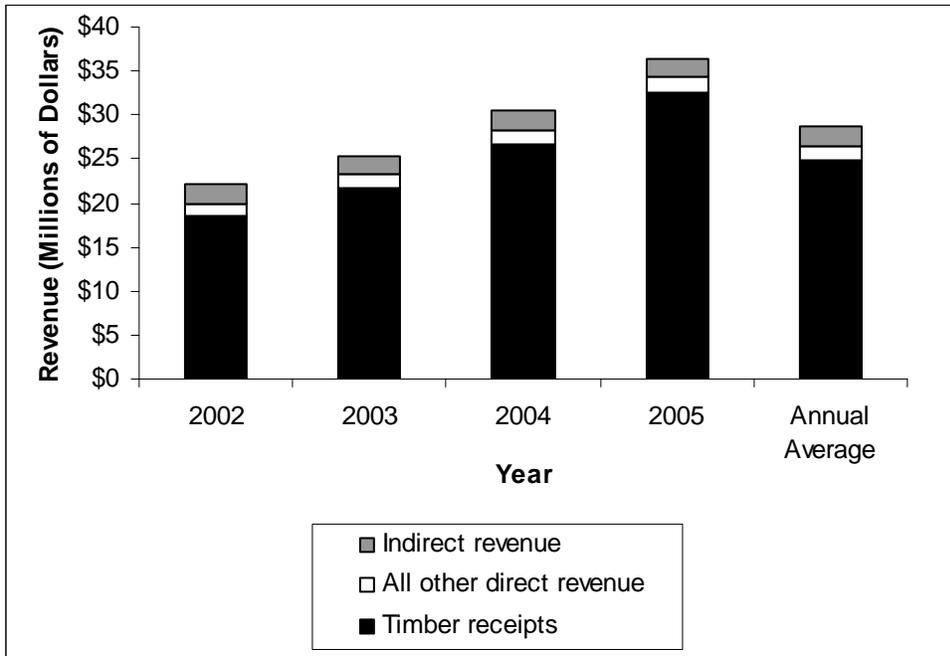


Figure 9. Total revenue generated from county-administered lands in the 12 counties.

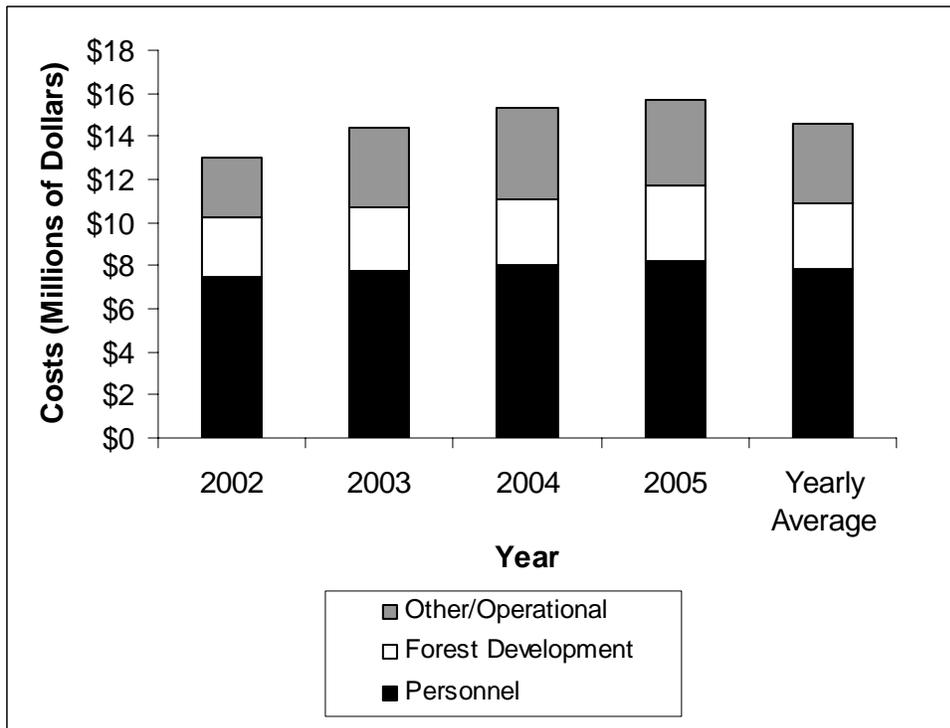


Figure 10. Costs associated with managing TFFL in the 12 counties.

1. Personnel

The land departments in the 12 counties employ an average of 142 FTEs at an estimated cost of \$7,863,957 per year (Table 3). Personnel costs (i.e., salary and fringe) are the largest expense associated with TFFL management; accounting for just over half the total annual costs incurred by the land departments.

2. Development

Forest development activities include land management and related activities such as site preparation, tree planting, timber stand improvement, and forest road development. Together, forest development costs averaged approximately \$3.1 million per year from 2002-2005 for the 12 counties. On a per acre basis, this amounts to approximately \$1.13 invested annually in TFFL forest development costs.

3. Operational

Operational costs are primarily administrative costs associated with the operating the county land department. They include, but are not limited to, rent, telephone, office supplies, postage, and building utilities and maintenance. Total operational costs averaged \$3.7 million per year between 2002 and 2005.

Table 3. Costs associated with managing TFFL in the 12 counties.

	2002	2003	2004	2005	Average 2002-2005
Personnel	\$7,516,746	\$7,765,676	\$7,991,630	\$8,181,774	\$7,863,957
Forest development	\$2,731,347	\$2,916,349	\$3,066,145	\$3,543,045	\$3,064,222
Other/Operational	<u>\$2,737,232</u>	<u>\$3,723,700</u>	<u>\$4,257,234</u>	<u>\$3,943,399</u>	<u>\$3,665,391</u>
Total costs	\$12,985,325	\$14,405,725	\$15,315,009	\$15,668,218	\$14,593,569
(% annual change)		(+11%)	(+6%)	(+2%)	(+6%)

The 2002-2005 average annual cost of managing TFFL was \$14,593,569, or \$5.36 per acre per year. Total annual direct costs increased every year during the four year period, ranging from a 2% increase from 2004-2005 to a 11% increase from 2002-2003, with an annual average of 6% during this period—a relative increase that was considerably less than the% increase in revenues over the same period (Table 1).

G. Returns to Management of Minnesota TFFL

1. Net income

County governments have expressed interest in better understanding the financial efficiency by which TFFL is managed. A useful metric for measuring financial efficiency is the net returns associated with managing TFFL, which is analogous the profit associated with a private business. Total revenue from managing TFFL is the sum of direct revenue (Table 1) and indirect revenue (Table 2). Total net income generated from management of TFFL is the total revenue minus the total costs (Table 3). Table 4 shows that for the 12 counties, the total average annual net income from managing TFFL was \$13,996,249 from 2002-2005, or \$5.14 per acre per year. Net income

more than doubled in just three years, from \$9 million in 2002 to nearly \$21 million in 2005. During the four-year period, total net income increased 21-38% each year, with a 32% average annual increase.

Table 4. Net income from managing TFFL.

	2002	2003	2004	2005	Average 2002-2005
Total revenue	\$22,066,046	\$25,371,757	\$30,439,943	\$36,481,527	\$28,589,818
Total costs	<u>\$12,985,325</u>	<u>\$14,405,725</u>	<u>\$15,315,009</u>	<u>\$15,668,218</u>	<u>\$14,593,569</u>
Total net income	\$9,080,721	\$10,966,032	\$15,124,934	\$20,813,309	\$13,996,249
(% annual change)		(+21%)	(+38%)	(+38%)	(+32%)

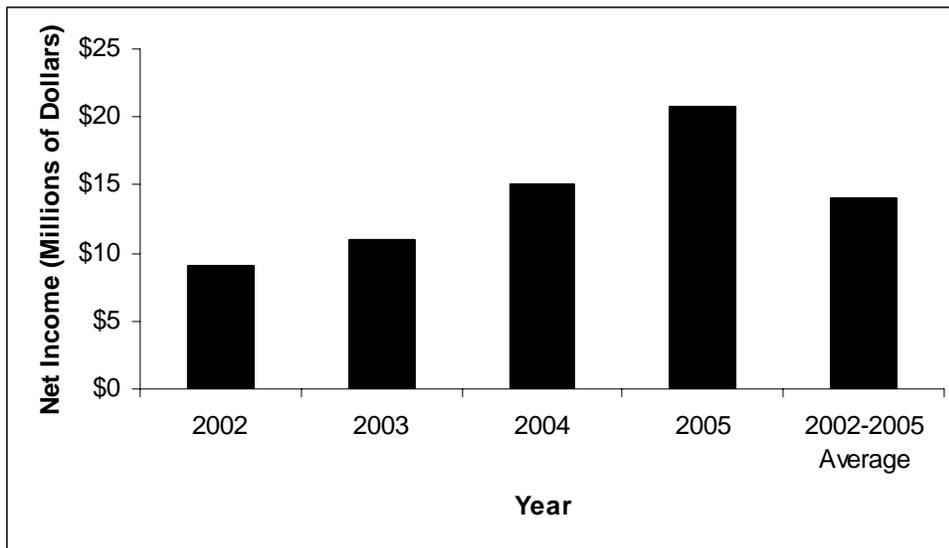


Figure 11. Net income from managing TFFL among the 12 counties.

From 2002 to 2005, the total net income generated from county-administered, tax-forfeited forest land was nearly \$14 million per year. Assuming most of the net income is generated from forest land, the average annual net income per acre of forest land is \$5.14 (Table 5)¹⁰.

Table 5. Average annual net income per acre from TFFL (2002-2005).

Average annual revenue per acre	\$10.50
Average annual costs per acre	<u>\$5.36</u>
Average Annual Net Income per Acre	\$5.14

2. Comparison to other Minnesota public land management agencies

Public forest land management occurs at various levels of government in Minnesota (i.e., local, state, federal). Counties manage a large portion of the forest land in Minnesota, but the two largest public forest land management agencies are the USDA-Forest Service (2.46 million acres) and the MN DNR (4.24 million acres) (Miles 2007). A brief review of some revenue and

¹⁰ The annual net income is not adjusted for inflation. See Appendix D for inflation adjusted net income.

costs data from all three agencies will help describe the relative level of financial efficiency with which county land departments operate.

An important note in this analysis is that each government agency is guided by different laws, rules, policies, and management goals. For example, financial return to land management is one of many goals that land management agencies try to achieve. Yet in the case of the USDA-Forest Service management, generating a positive financial return is not an explicit goal of the agency. Additionally, land management responsibilities and associated costs vary among public land managers (e.g., federal and state governments have wildfire suppression responsibilities, state government provides technical assistance to private forest landowners). Consequently, any assessment of returns to forest management among these agencies needs to keep these distinctions and comparison limitations in mind. The following comparison of public forest land financial returns is only meant to provide a broad description of the relative financial efficiency of county land departments. In no way does it describe the overall management performance of each agency.

National Forests

The USDA-Forest Service management of national forests is guided by the Multiple Use Sustained Yield Act (MUSYA)¹¹, a law that does not require the USDA-Forest Service to make a profit. Instead, the USDA-Forest Service has focused its management objectives on providing public recreation and other environmental benefits, with very little concentration on timber production and net revenue.

In Minnesota, the USDA-Forest Service manages more than 2 million acres of forest land in the Chippewa and Superior National Forests. Evidence from a study by Leal (1995) indicates that from 1990 to 1993 St. Louis County was able to generate a profit from timber sales (\$8.44 per thousand board ft) while the USDA-Forest Service lost money (-\$15.83 per thousand board ft) (Table 6). For every dollar St. Louis County invested in the management of TFFL, it received \$1.69 in return from timber sale revenue. In contrast, the timber sale revenue in Superior National Forest was only \$0.54 for every dollar invested. Most of the financial efficiency gains were made from keeping timber sale program costs low (\$12.31 vs. \$34.12).

Table 6. Average St. Louis County and Superior National Forest 1990-1993 timber sale revenue and cost data (per MBF sold).

	Revenue	Costs	Net Income	Revenue/Cost Ratio
St. Louis County Land	\$20.75	\$12.31	\$8.44	1.69
Superior National Forest	\$18.29	\$34.12	-\$15.83	0.54

Source: St. Louis County Land Department (1994); USDA Timber Sale Programs Annual Reports (1990-1993) in Leal (1995).

Assuming forest management and timber sale programs have not significantly changed over the last 15 years, this evidence suggests that, from a financial standpoint, county land departments operate more efficiently than their federal counterpart.

¹¹ See 16 U.S.C. 531 (a) (1988).

School Trust Lands

Lands set aside in trust for the support of schools are known as School Trust lands. The MN DNR manages school trust lands and generated nearly \$4 million in annual net income from forest related activities from 2002 to 2005 (Table 7) (MN DNR 2004b; MN DNR 2006).¹² During this period, average net income per acre of school trust land was \$1.59; compared to \$4.11 in income from direct revenue for every acre of TFFL. However, land characteristics may differ between TFFL and school trust land, making net income per acre a misleading indicator of financial performance.¹³ Instead, the ratio of revenue to costs was calculated to compare the relative financial efficiency of forest management activities. Results from this calculation reveal that for every \$1 spent by the county land departments there was \$1.77 of forest related revenue; for every \$1 spent by the MN DNR there was \$1.67 of forest related revenue.

Table 7. 2002-2005 financial returns to forest management on TFFL and School Trust Lands.

	Acres ¹⁴	Average Revenue	Average Costs	Average Net Income	Net Income per Acre	Revenue/Cost Ratio
TFFL	2,723,000	\$25,794,696	\$14,593,569	\$11,201,127	\$4.11	1.77
School Trust	2,500,000	\$9,931,031	\$5,947,750	\$3,983,281	\$1.59	1.67

Source: MN DNR (2004b); MN DNR (2006); County Land Department Data 2002-2005.

Results from the data in Table 7 are inconclusive, but they suggest the financial efficiency of TFFL management is similar to the efficiency of MN DNR school trust land management.

Summary of Financial Returns

In summary, financial return is only one of many goals that are important to consider when assessing county TFFL management performance. County land departments are able to generate significant amounts (\$5.14 per acre per year) of net income for local taxing districts. This financial return to management appears to be significantly higher than national forests in Minnesota and similar to that of MN DNR managed school trust lands.

¹² The analysis in this section will look at the total revenue generated from forestry related activities, which include timber sales, leases, and other sources of direct revenue (not including gravel). Mineral receipts and indirect revenue are not included because they do not help explain forest management efficiency.

¹³ TFFLs were privately owned at one time and much of the current TFFL is productive timberland. In contrast, much of the best school trust agricultural and timberlands were sold to private interests by 1900 (MN DNR 2006). This may mean that the TFFLs have higher timber productivity potential.

¹⁴ The state owns the surface rights to 2.5 million acres, but it is unclear how much of this land is forested. Therefore, this analysis looks at net income per acre of total land, instead of just forest land.

III. Characteristics and Management of Former Minnesota TFFL

A. Introduction

An important objective of this study is to evaluate the economic impacts of various TFFL retention and disposal options. To do so requires a thorough understanding of how the management and use of TFFL would change if the land is sold to private interests. This information is essential to being able to accurately identify the economic conditions that would exist if the policy option of disposing TFFL was implemented compared to the economic conditions absent the policy.

This section of the report describes the ownership objectives and land management practices of private forest land that was at one time managed by county land departments. To obtain information describing the condition and management of former TFFL and predict the future condition of TFFL if it is sold, owners of former TFFL were surveyed using a mail questionnaire. The questionnaire asked these owners about their reasons for owning and purchasing the forest land, characteristics of the land, past and planned forest management activities, building development on the land, public access restrictions, and future plans for the land. The report assumes the actions and attitudes of owners of recently disposed TFFL are the best prediction of what to expect with respect to the uses and management of TFFL if the land is, in fact, sold. The results from the survey are used to describe and contrast the uses and management of TFFL under public versus private ownership and subsequently, in Section IV, to evaluate the economic impacts of TFFL retention and disposal policy options.

B. Survey Methods and Implementation

1. Survey population

Owners of forest land that was at one time managed by county land departments were identified using tax records from 10 of the 12 counties participating in the study¹⁵. These ten counties provided the addresses of all owners of TFFL that was sold or exchanged from 1995 and 2005. Surveys were only sent to owners of TFFL 20 acres or greater at the time the land was sold by the county, as it was assumed that smaller parcels (less than 20 acres) may be part of a different land market with different landowner goals and land management practices. The entire population of TFFL purchasers that met the study selection criteria was surveyed—a total of 432 owners.

2. Survey design and implementation

Survey design and implementation followed the process identified by Dillman (2000). Survey participants were contacted on five separate occasions. First, an initial pre-notice letter was sent to landowners notifying them that they would receive a questionnaire in approximately one week. A questionnaire was sent approximately one week later, along with a cover letter describing the purpose of the survey and a stamped and addressed return envelope. A postcard was sent approximately one week later to thank all respondents who had completed the questionnaire and encourage nonrespondents to do so. Approximately ten days after the postcard

¹⁵ Cass and Hubbard counties did not dispose of any TFFL between 1995 and 2005.

was mailed, a second copy of the questionnaire and cover letter was sent to all nonrespondents. A final notice letter was mailed to all participants who had not yet responded one week after sending the second questionnaire.

In an effort to increase the survey response rate, all letters were hand-signed by the survey administrators. Also, respondents were informed that completing the questionnaire is completely voluntary and that individual responses would be kept confidential—only summary data would be reported. Parcel identification numbers were used to track which questionnaires were returned, but responses were no longer associated with the landowner's name or address after the questionnaire was returned.

The survey was administered in the summer of 2006. Pre-notice letters were sent on July 24th and the survey process lasted for approximately six weeks until the final notice letters were sent on September 9th. A copy of the landowner survey can be found in Appendix C.

3. Survey response rate

Four hundred and nineteen questionnaires were sent to all TFFL owners that met our population criteria¹⁶. A total of 314 individuals or organizations responded to the questionnaire. Of the 314 responses, 11 landowners indicated that they had already sold the land and were subsequently removed from the survey population. Therefore, the total survey response rate was 74% (303 out of 408). Nine questionnaires were returned incomplete, resulting in a 72% (294 out of 408) usable response rate.

Of the 294 usable responses, 43% were returned immediately after the first survey was sent. Another 36% responded after receiving the reminder postcard. Fifteen percent returned the questionnaire after receiving the second survey and 6% returned it after the final notice letter was sent.

A nonresponse bias check was performed to ensure the population of survey respondents was not significantly different from nonrespondents. A t-test was used to evaluate whether respondents owned significantly different amounts of forest land acreage than survey nonrespondents. The results of the t-test ($p=0.085$) suggest that the survey participants may have been more likely to respond if they had purchased more TFFL. However, when the three largest TFFL owners (all of whom own more than 390 acres of county-managed TFFL) are removed from the sample, the results of the t-test ($p=.334$) do not allow for the rejection of the null hypothesis. Overall, the results from the nonresponse bias tests suggest that there is no significant difference in mean acres acquired between survey respondents and nonrespondents, suggesting the results are reflective of the purchasers of TFFL over the last ten years. The survey response rate varied by county where the forest land is located, but at least 50% of the purchasers of TFFL forest land in each county responded to the survey (Figure 12).

¹⁶ There were originally 432 questionnaires, but 13 addresses were invalid and we were unable to attain the landowners' proper address.

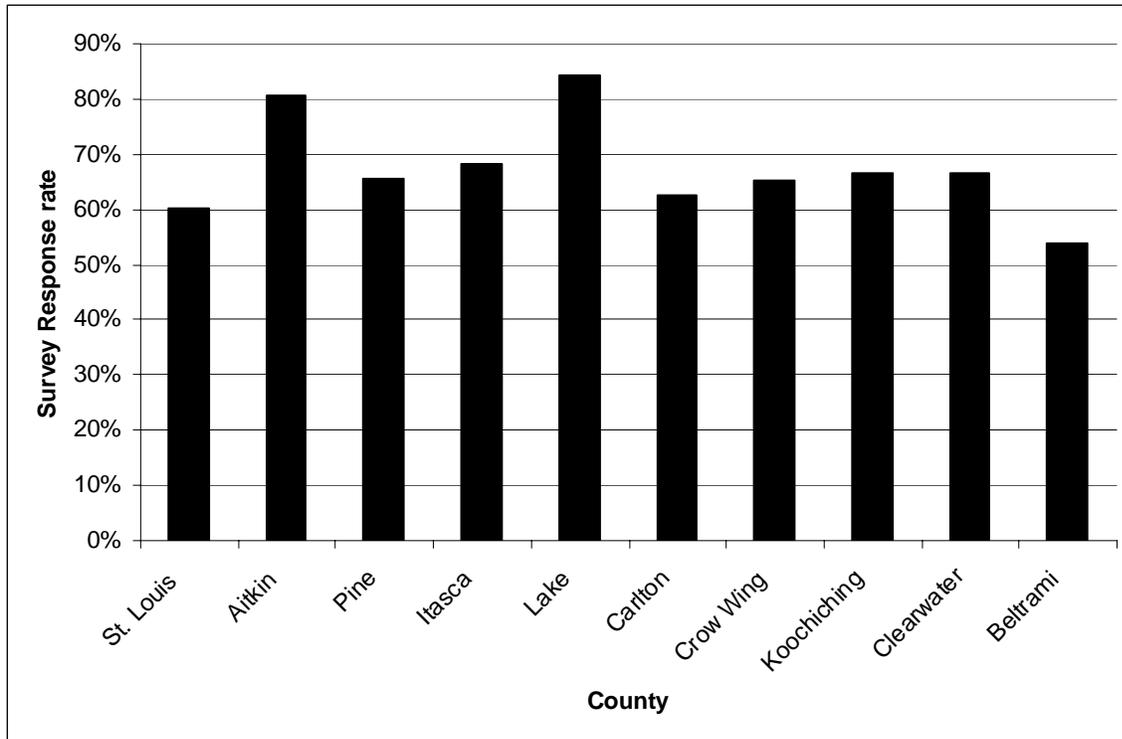


Figure 12. Survey response rate by county.

C. Results

1. Characteristics of owners of former TFFL

Demographics

The owners of former TFFL are a diverse population. Approximately 82% of TFFL sold or exchanged between 1995 and 2005 is owned by individuals or families; the rest is owned by forest industry companies (3%), other companies or corporations (6%), nonprofit organizations (5%), Native American tribes (2%), and other government entities (2%) (Table 8)¹⁷.

Table 8. Type of owner of TFFL sold or exchanged between 1995 and 2005.

Type of Owner	Acres	Percent
Family or Individual	18741	82
Non-Forest Industry Company	1348	6
Non-profit Organization	554	5
Forest Industry	140	3
Native American Tribe	599	2
Other Government/Public Entities	548	2

¹⁷ Owner type was determined by looking at the landowner name and address on county tax records.

The average survey respondent was 52 years old at the time they completed the questionnaire; the youngest owner was 22 years old and the oldest was 84 years old. In addition to the TFFL parcel that was the subject of the survey, many respondents (73%) own other forest land parcels in Minnesota. The median number of forest land acres and parcels owned among survey respondents is 100 and 2, respectively, with the most common purchasers owning 40 acres and one parcel of forest land.

Most TFFL owners described the location of their permanent residence as being in a rural area (54%) (Figure 13). A considerable number of responding landowners also live in small (14%) or large towns (13%). Residents of metropolitan areas (7%) and surrounding suburbs (12%) are the least common TFFL owners.

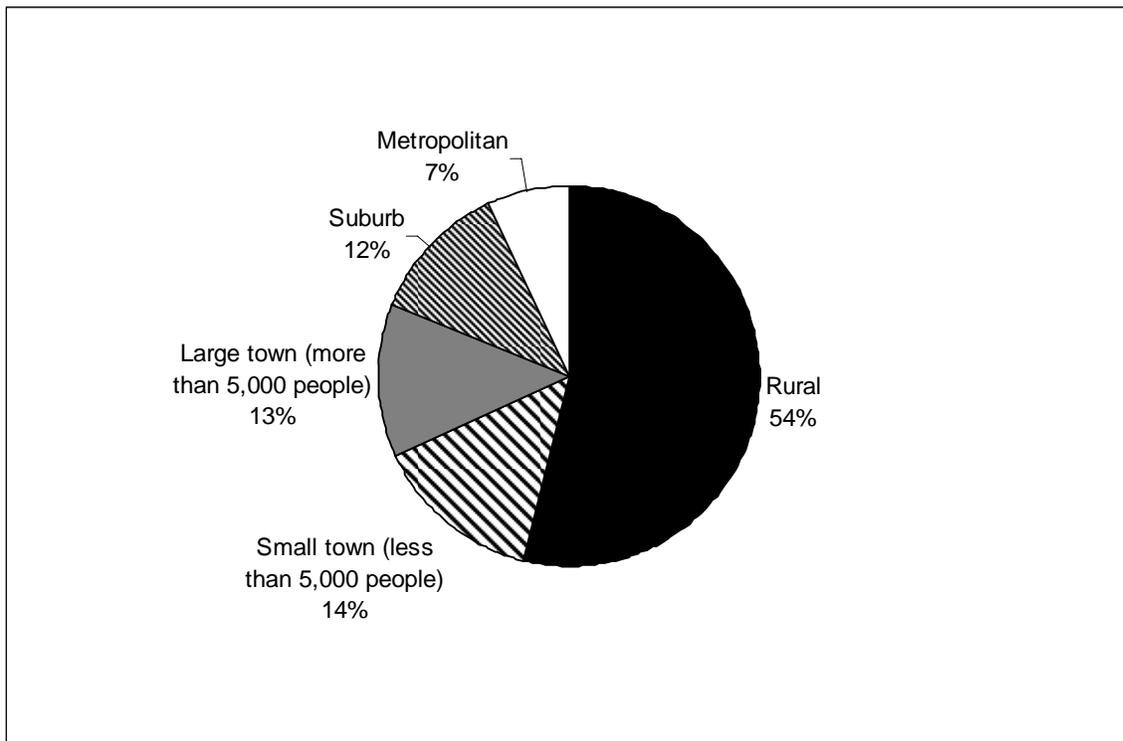


Figure 13. Location of primary residence for owners of former TFFL.

Landowner Proximity to TFFL

The proximity of a landowner's permanent residence to their former TFFL varies greatly. Figure 14 provides a breakdown of the distance from the landowners' permanent residence to the TFFL. Twenty-five percent of the landowners live on, or directly adjacent to, the former TFFL and another 28% live within 25 miles of the land. Additionally, 24% of the owners live 26-100 miles away and a nearly equal number (23%) live more than 100 miles away from the TFFL they purchased.

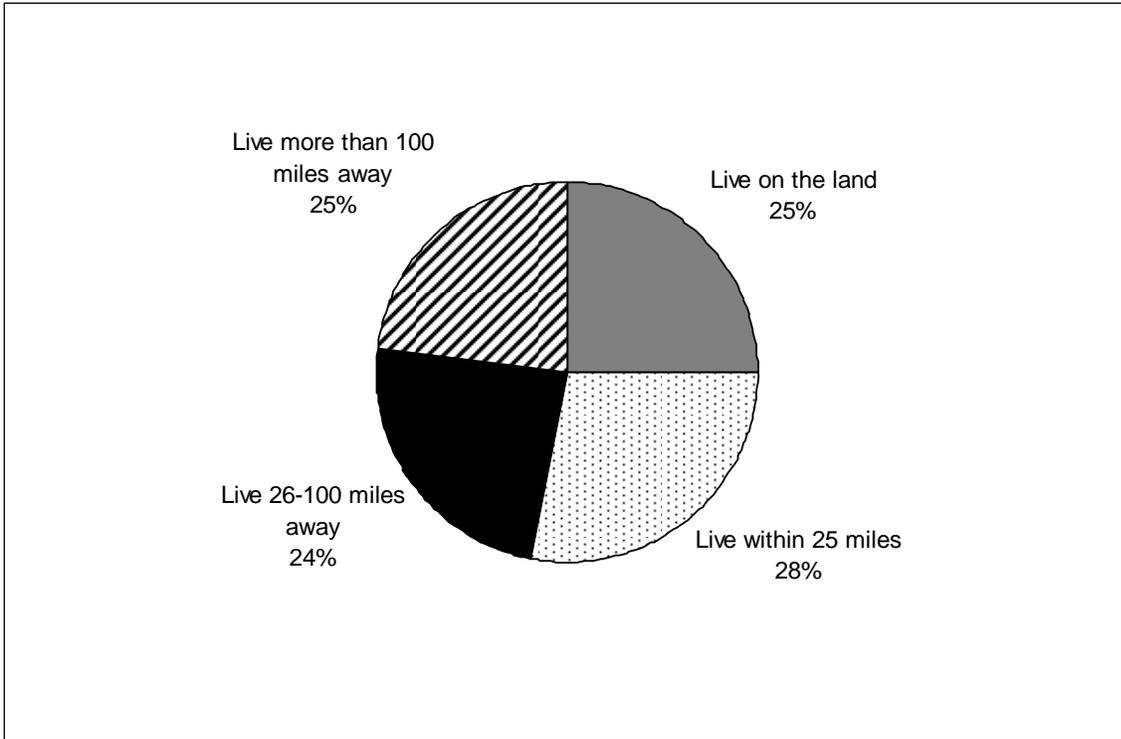


Figure 14. Distance between landowner primary residence and former TFFL.

Time and Method of TFFL Acquisition

Survey results indicate that TFFL has been sold at a relatively stable rate for the past ten years. Figure 15 shows the proportion of survey respondents who acquired the former TFFL 0-3 years ago (29%), 4-6 years ago (30%), 7-9 years ago (21%) and more than 9 years ago (20%), suggesting a relatively even distribution in the rate of TFFL disposal over the study period.

Although most of the TFFL owners (65%) bought the land directly from the county (Figure 16), 23% of the current TFFL owners acquired the land from someone other than the county. This suggests nearly one-fourth of all TFFL that has been sold since 1995 has already changed ownership at least once. Six percent of the current landowners acquired their forest land through a land exchange with the county.

2. Characteristics of TFFL sold

Location

According to county tax records, approximately 22,800 acres of TFFL were sold or exchanged between 1995 and 2005. The total acres of TFFL owned by the survey respondents is 16,298 acres, or 71% of the TFFL sold during this 11-year period. St. Louis County disposed of the largest amount of TFFL during this period (4,858 acres), followed by Pine (3,833 acres) and Aitkin (3,325 acres) counties (Figure 17). Beltrami County sold or exchanged of the smallest area of TFFL in the last ten years (784 acres).

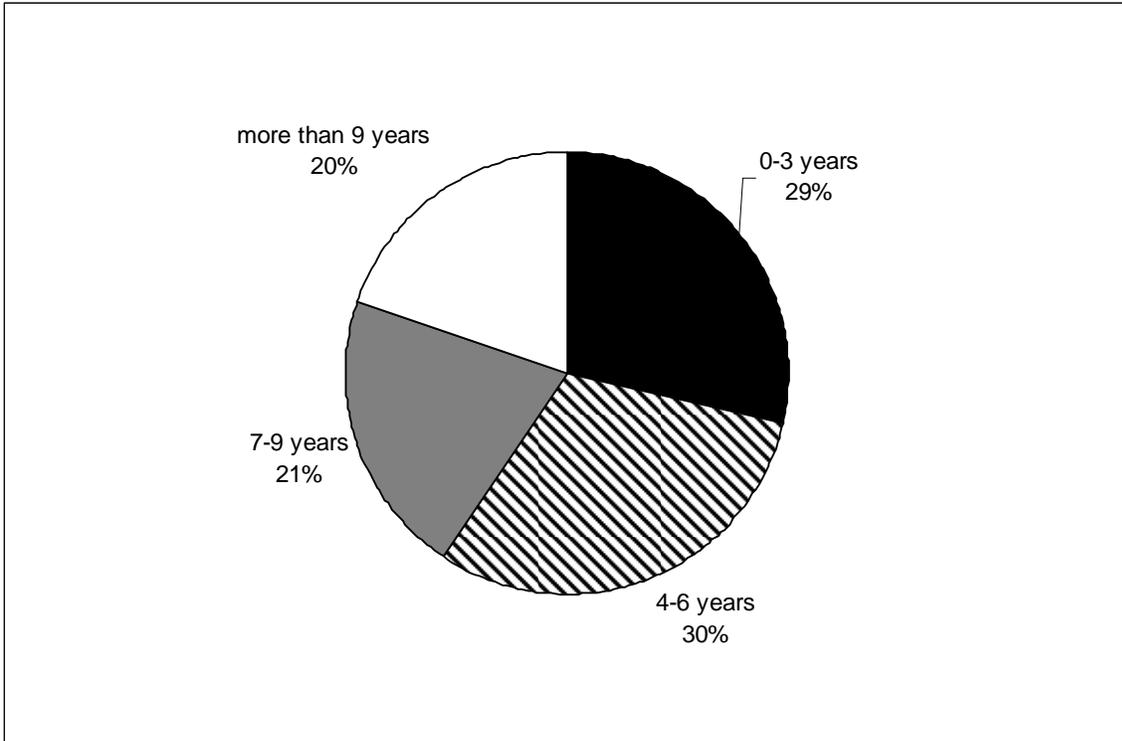


Figure 15. Length of ownership for current owners of TFFL disposed of in the last 10 years.

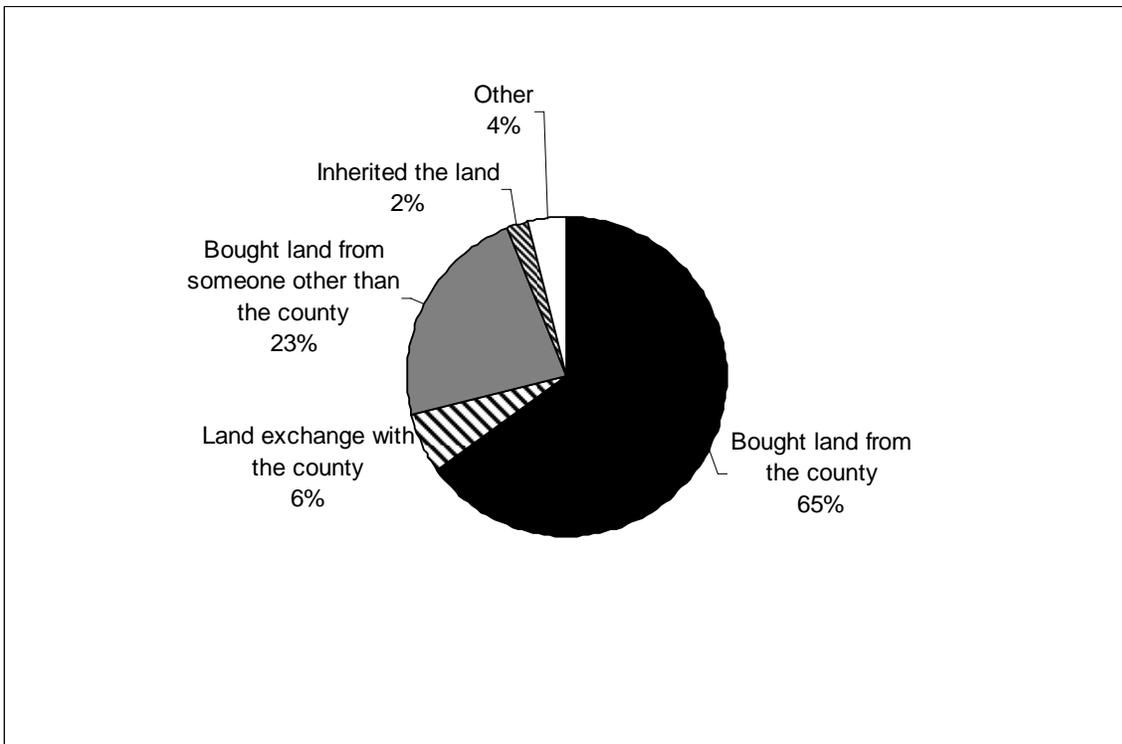


Figure 16. Landowner method of acquiring former TFFL.

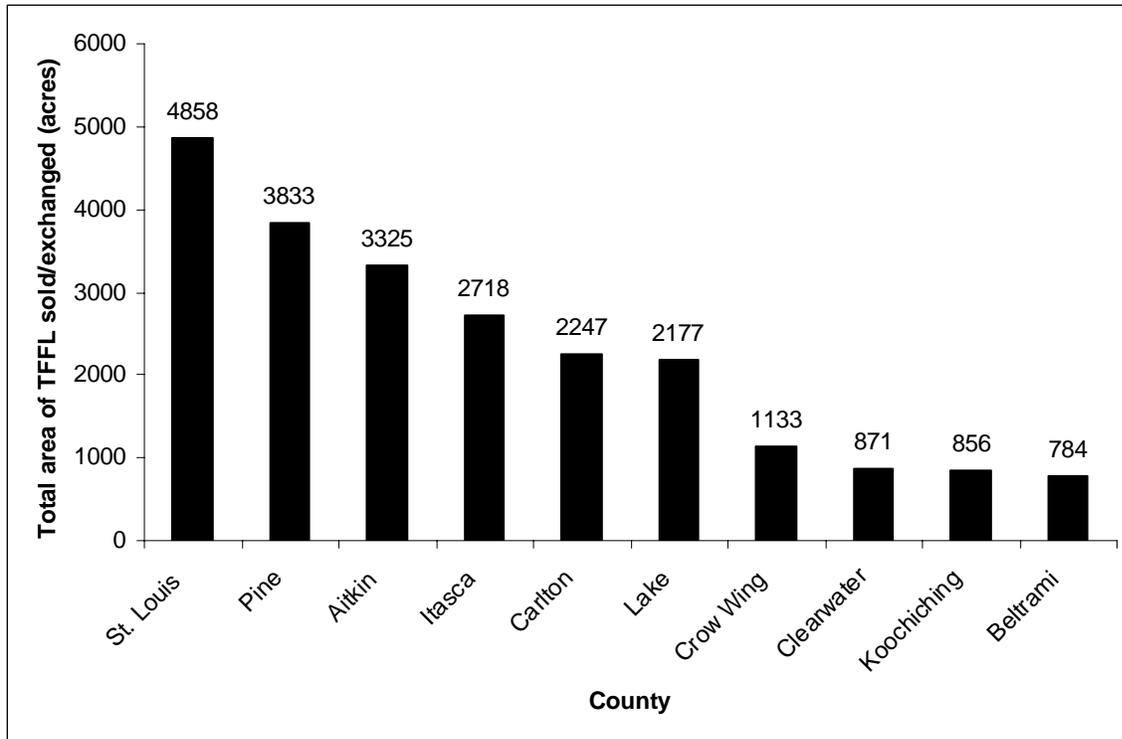


Figure 17. Distribution of TFFL sold or exchanged between 1995 and 2005 by county.

Figure 18 illustrates the percent of each county's TFFL land base (in year 2000) sold or exchanged between 1995 and 2005. Most counties sold or exchanged less than 1.5% of their total TFFL land base, indicating they retained a large portion of their TFFL base during this period. The only exceptions were Pine County (which sold more than 7% of its total TFFL base) and Carlton County (which sold approximately 3% of its TFFL) during the same period.

Altogether, the 12 counties sold or exchanged a total of less than 1% of the entire TFFL base between 1995 and 2005.

Size of Parcels

The average size of TFFL parcels purchased from 1995-2005 is 56.39 acres, with the median and mode parcel size being 40 acres¹⁸. The largest single parcel of former TFFL purchased in our study is 560 acres and the smallest is 10 acres¹⁹. More than half of survey respondents own between 35 and 72 acres of former TFFL.

Surrounding Land Characteristics

The questionnaire asked landowners about the characteristics of private forest land surrounding their property, as adjacent land characteristics could potentially have a significant impact on private landowners' management decisions and uses of the property. First, the questionnaire requested landowners describe the level of housing development on private forest lands

¹⁸ To be included in the study the TFFL sold must be at least 20 acres.

¹⁹ It is possible for some of the TFFL to be less than 20 acres now because some have been subdivided since disposal.

surrounding the former TFFL. Survey responses indicate that the level of housing development surrounding former TFFL varies greatly (Figure 19). Twenty-five percent of forest land is in areas where little (less than 25%) of the surrounding private forest lands have houses or cabins, while 22% of the lands have some (25-49%) surrounding development and 20% of the land is surrounded by a large (50-74%) amount of development. Only 14% of the land is in areas where the owners perceive almost all (greater than 75%) surrounding private forest land is developed with houses or cabins. Seven percent of the responding landowners did not or could not characterize the level of housing development on surrounding lands, and 2% indicated their land is not surrounded by any private forest land.

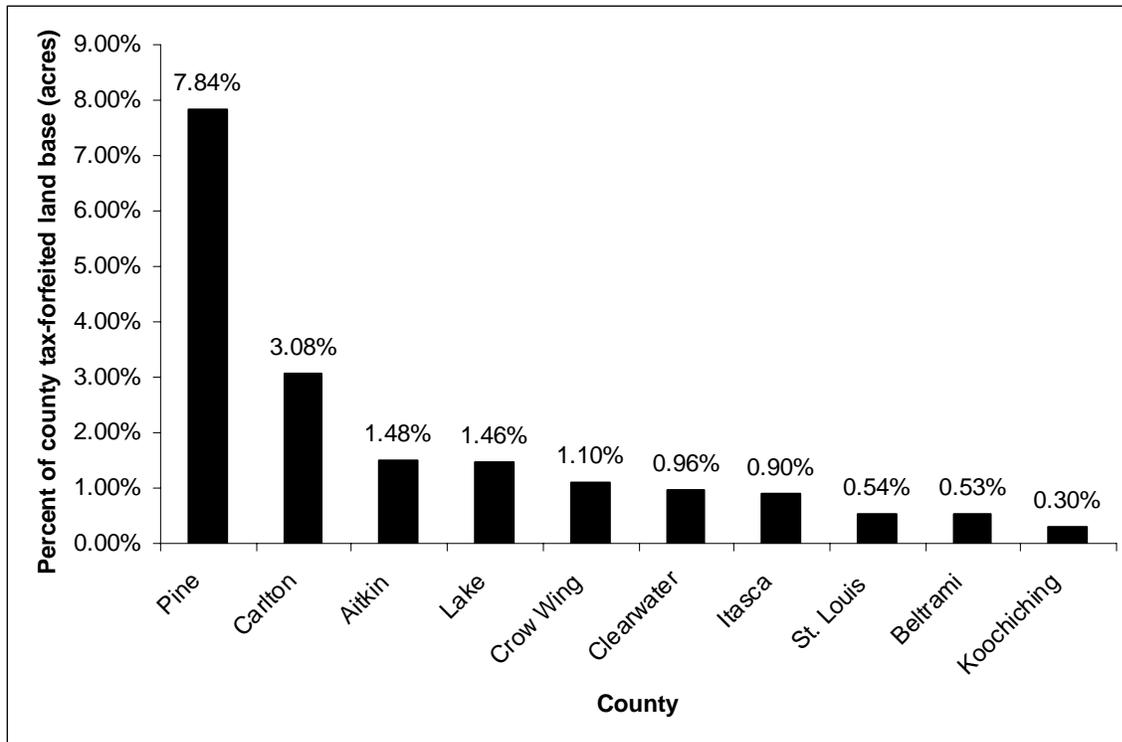


Figure 18. Percent of total TFFL base (in 2000) that was sold or exchanged between 1995 and 2005.

The questionnaire also asked landowners to depict the level of public access restrictions on surrounding private forest lands. Thirty-seven percent of former TFFL is in areas where most (greater than 75%) of the surrounding private forest land is posted against trespass, and another 20% is in areas where much (50-74%) of the surrounding private land is posted (Figure 20). Fifteen percent of the former TFFL is in areas with some (25-49%) access restrictions on surrounding private lands and another 15% of the former TFFL has few (less than 25%) trespassing restrictions on surrounding private lands.

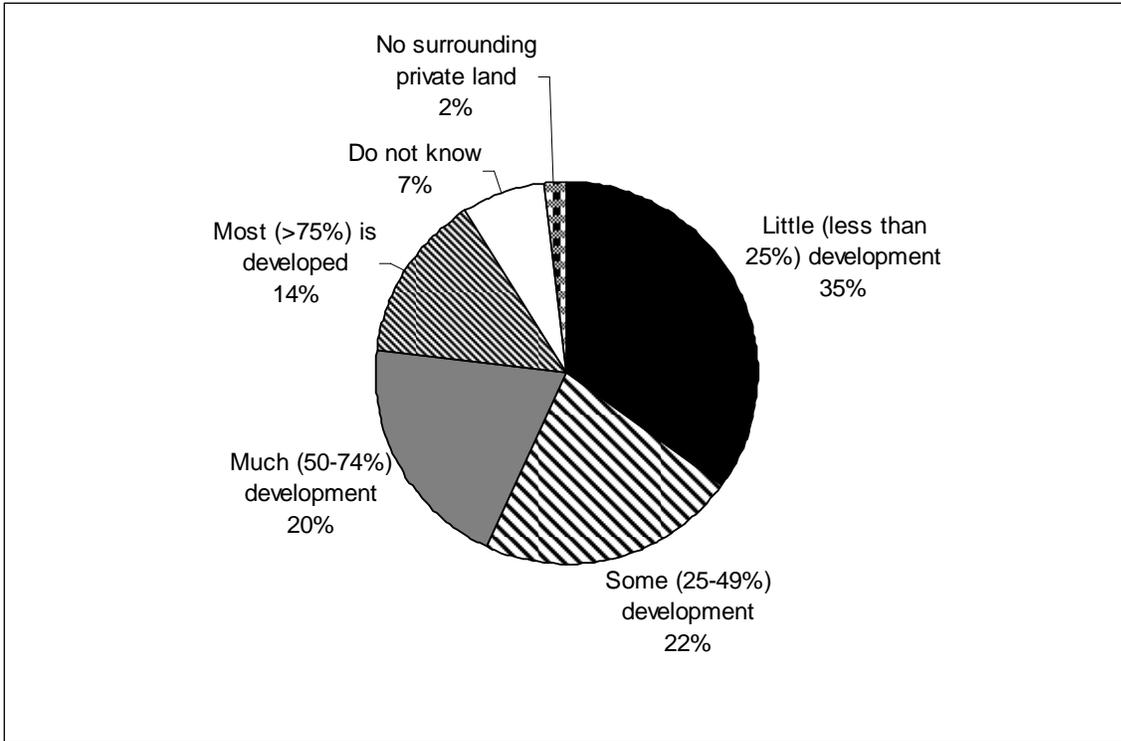


Figure 19. Level of development on private forest land surrounding former TFFL measured by the proportion private forest lands surrounding TFFL that have houses or cabins.

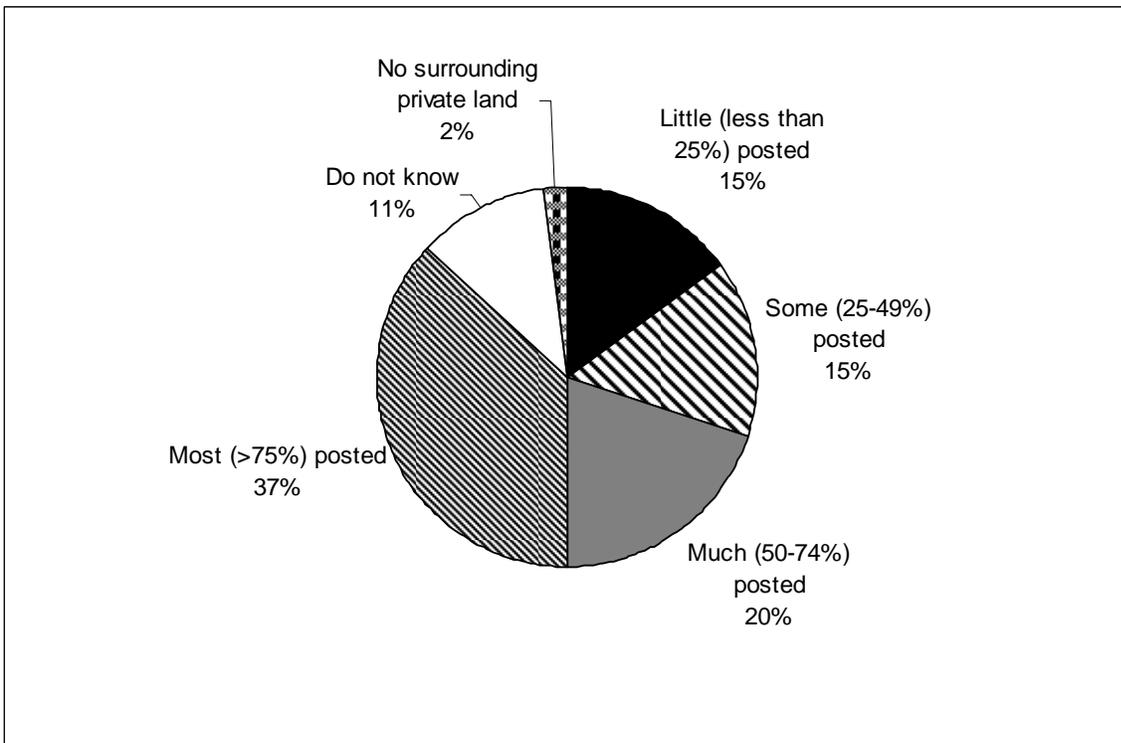


Figure 20. Level of public access restriction on land surrounding former TFFL measured by the proportion of surrounding private forest lands that are posted against trespass.

Road access

In an effort to describe the level of road access to former TFFL properties, the questionnaire asked landowners how close their forest land was to an all-weather road. Figure 21 summarizes the level of road access for TFFL sold within the past decade. An all-weather road was directly adjacent to more than half (53%) of the properties at the time of current landowner acquisition. Six percent of the properties had a road within a quarter mile, and 31% had a road between a quarter to one mile away. Approximately 10% of the properties did not have an all-weather road within one mile at the time of purchase.

Only 4% of the forested properties that did not have an all-weather road directly adjacent at the time of acquisition are directly accessible now, suggesting road development (public or private) to improve access is quite uncommon. The vast majority of properties that were not accessible continue to be inaccessible.

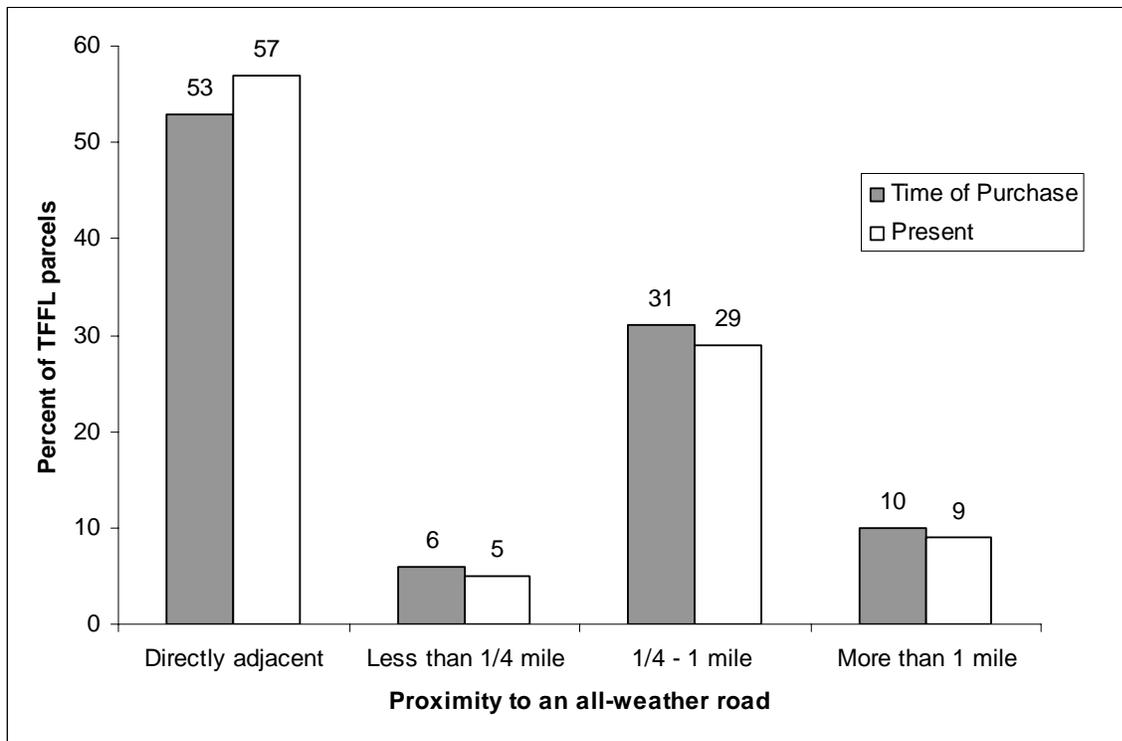


Figure 21. Past and current proximity of TFFL to an all-weather road.

Hunting Opportunities

Since hunting is such a popular activity throughout Minnesota and previous studies suggest it is often a primary reason for purchasing forest land in Minnesota (Donnay 2005), the survey asked landowners about the hunting opportunities that are available on former TFFL. More than half the landowners perceived their forest land offers either good or excellent hunting opportunities (30% and 25%, respectively) (Figure 22). Another 30% said that the hunting on their property was average. Only 8% of the landowners felt the hunting opportunities were poor or very poor.

When response categories are combined, a large portion of responding landowners (85%) indicated that their property offered average to excellent hunting opportunities. It is difficult to gauge the reliability of these estimates because the survey responses are very subjective and dependent on the landowners' preconceived standard and knowledge of which lands offer good hunting opportunities. However, these results provide a general description of the quality of hunting and also describe how the landowners perceive the hunting opportunity on their land. The importance of the landowner's perception of hunting opportunities will be important in later analyses of landowner objectives and management decisions.

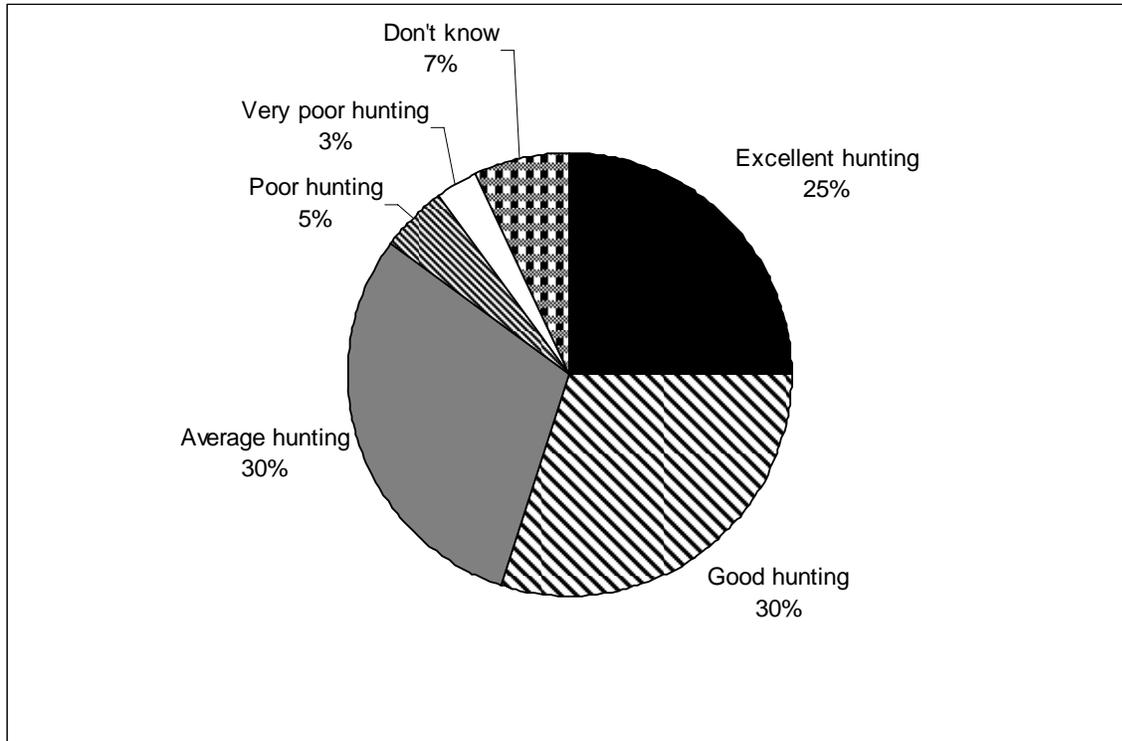


Figure 22. Landowner perception of hunting opportunities provided on former TFFL.

3. Reasons for owning forest land

The questionnaire asked landowners about their reasons for purchasing and owning TFFL. Results from landowner responses may provide insight into past and planned future land management and uses. Owners of former TFFL indicated that they own forest land for a wide range of reasons. Many of the purchasers responded that there were multiple important reasons for acquiring their forest land. The questionnaire asked owners to rate (on a five-point scale with five indicating very important and one indicating not at all important) how important the following reasons were for owning the forest land they purchased: solitude or privacy, hunting, ability to pass land on to family or friends, wildlife watching, other recreation (not hunting or wildlife watching), real estate investment, proximity to areas of personal interest, use as a permanent or seasonal residence, and ability to generate income from timber sales. On average, landowners indicated that solitude and privacy, hunting, the ability to pass the land on to family or friends, wildlife watching, and other recreation were the most important reasons for owning their forest land (Figure 23). Reasons for acquiring the land that were not consistently important

included its use for a permanent or seasonal residence and generating income from timber management.

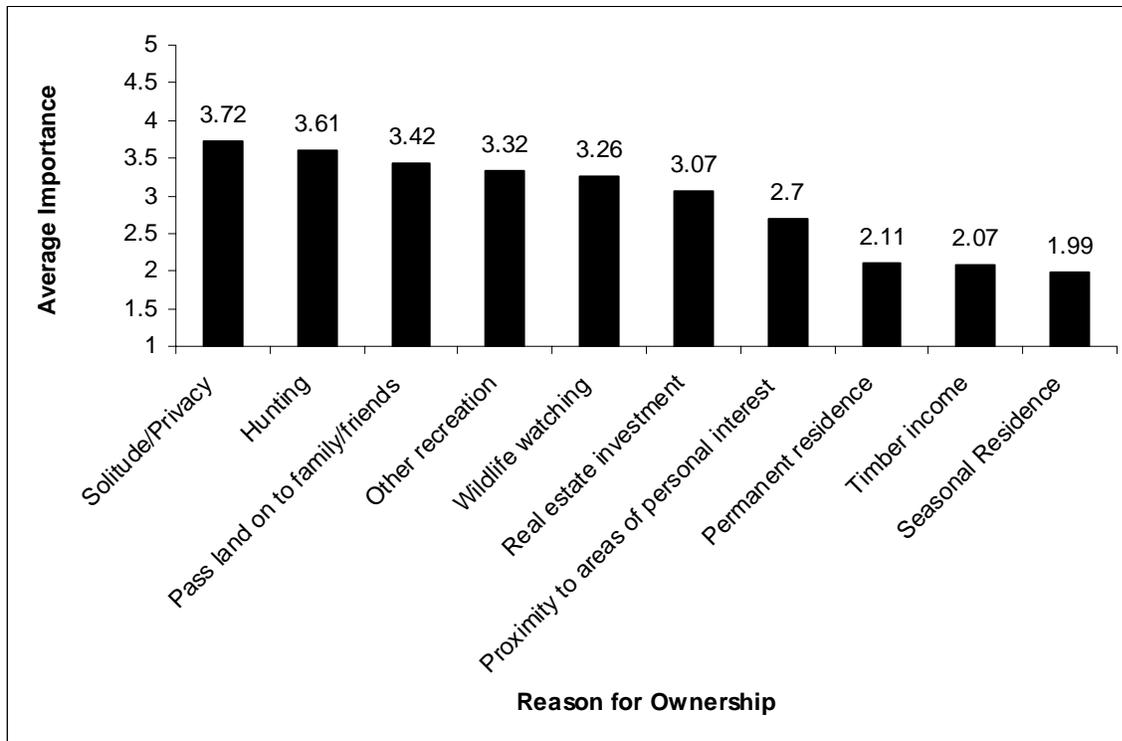


Figure 23. Importance of various reasons for owning former TFFL.²⁰

The questionnaire also asked the owners of former TFFL to identify the single, most important reason for purchasing their forest land. Unlike the previous question, the intent of this question was to allow respondents to identify the *primary* reason for purchasing the forest land. Thirty-four percent of the respondents indicated hunting was the single most important reason for purchasing TFFL—more than twice as many as the next most frequent response (Figure 24). Real estate investment, adjoining other lands, and use as a permanent residence were also common primary reasons for purchasing the forest land. Once again, use as a seasonal residence and ability to generate income from timber sales were not important reasons for private ownership.

Many of the reasons for owning the forest land that were important in Figure 23, such as watching wildlife, other recreation, and passing land on to family and friends, were not the most important reason for purchasing TFFL. Instead, landowner responses suggest they are secondary or tertiary reasons for purchasing and owning the forest land.

As a follow-up to the question about the most important reason for acquiring the TFFL, landowners were asked about their single most important reason for currently owning former

²⁰ 1=Not at all important; 5=Very Important

TFFL. The distinction between these two questions is subtle, yet important. The first asks what the most important reason was at the time of purchase, while the second asks what the most important reason for owning the land is today. A comparison of responses to these two questions may indicate how landowners' reasons for ownership change over time.

The results suggest that hunting is still the biggest reason for owning the land, with 27% of landowners indicating it is the primary reason for ownership (Figure 24). However, there was a significant decrease in the portion of landowners that identified hunting as the most important reason for ownership now compared to when the property was purchased (-7%), suggesting that the importance of hunting decreases for many landowners as time passes. Real estate investment, solitude and privacy, and other recreation were all primary reasons for owning the land that increased from the time of purchase to the present, suggesting these reasons for ownership may become more important over time.

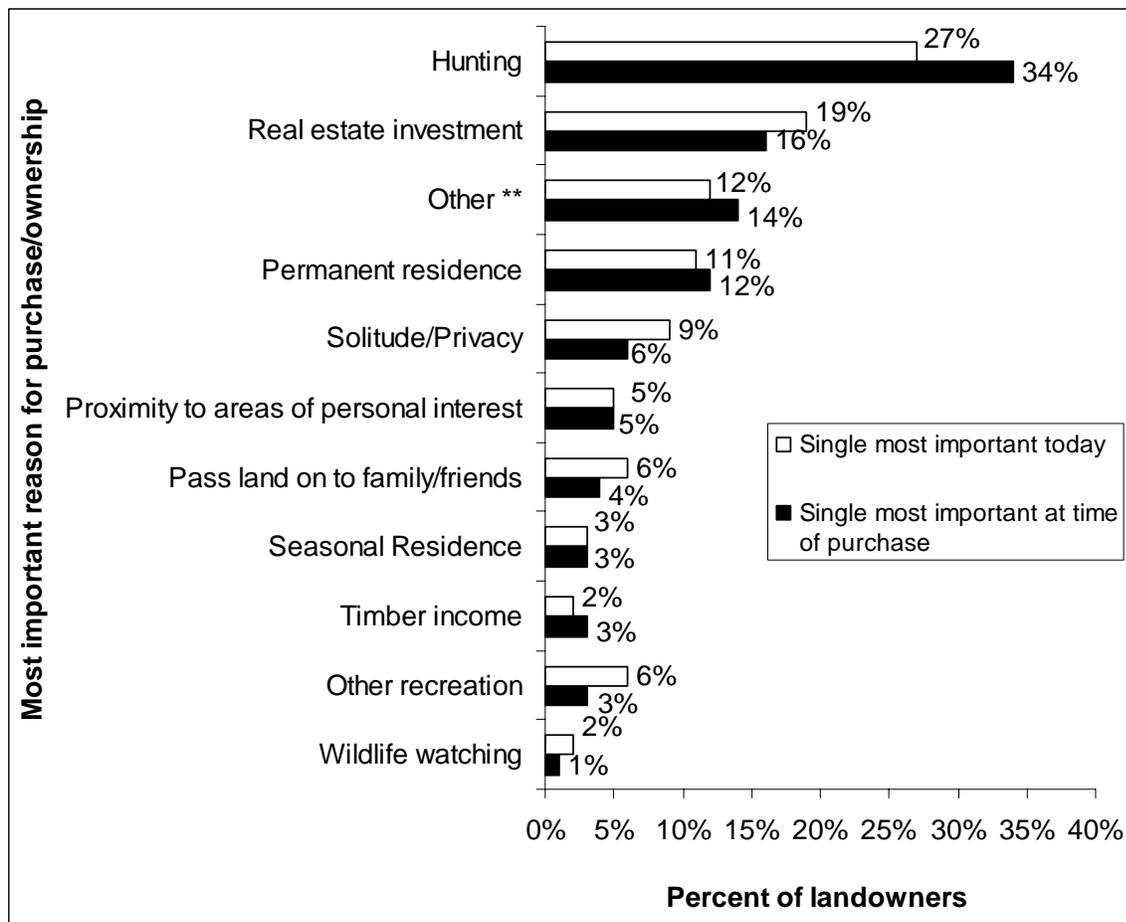


Figure 24. Primary reason for ownership at time of acquisition and currently.²¹

²¹ Most “other” reasons for acquiring the land were either: (1) to adjoin adjacent lands or (2) to convert to farmland.

4. Forest management on former TFFL

The questionnaire requested information from the purchasers of TFFL on how they have invested in and managed the forest land, as well as their future management and investment intentions. This information can be used to contrast the differences in land management intensity under county ownership (i.e., land retention) and management intensity under private ownership (i.e., land disposal). Land management is a broad term that can include many activities ranging from implementing practices recommended in a forest management plan to conducting wildlife habitat improvement projects.

Existence of a Forest Management Plan

According to survey responses, many owners of former TFFL have not received any professional advice about forest management options since acquiring the land. Only 27% of the respondents said they sought advice from or had been contacted by a professional forester (Figure 25), and even fewer landowners have a written management plan for their property (Figure 26). Only 15% of the property owners have a written forest management plan prepared, and another 7% plan to obtain one in the next five years. Survey results suggests that when the land is sold to private owners, only one-quarter of the landowners are receiving advice from professional foresters and even fewer have a management plan or intend to obtain one.

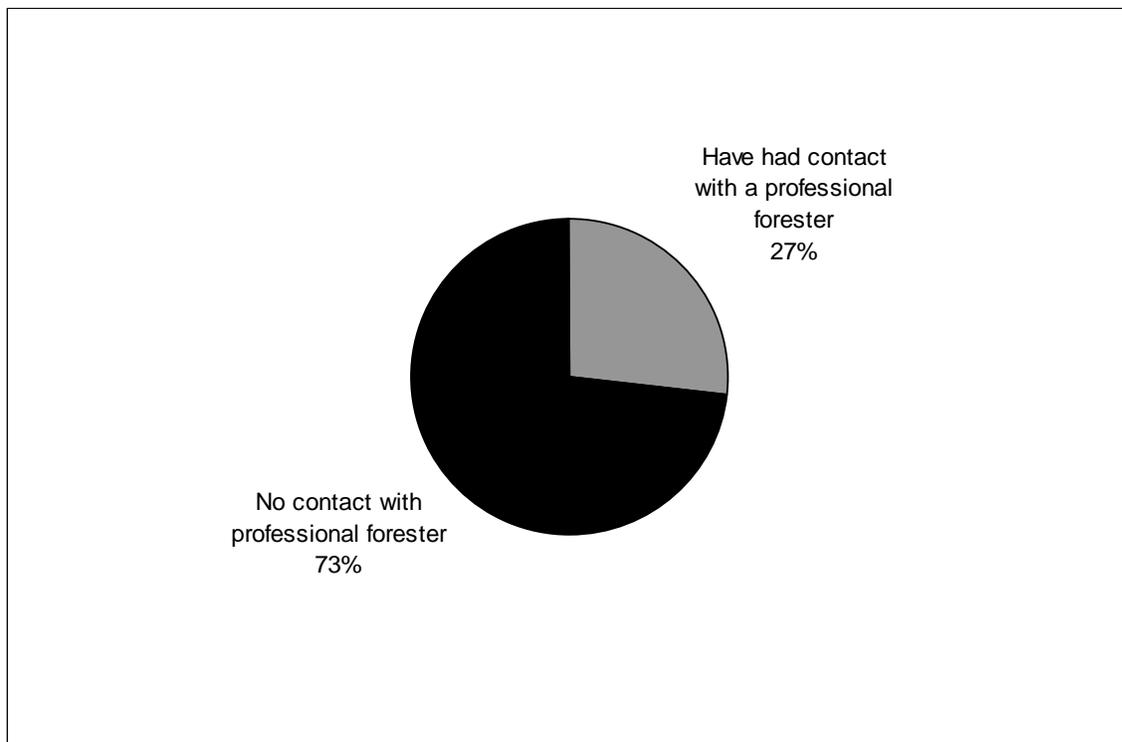


Figure 25. Portion of landowners who have had contact with a professional forester since acquiring the TFFL.

Timber Harvesting

When asked whether or not they have harvested timber since acquiring TFFL, only 25% of the responding landowners indicated that they have commercially harvested timber on the property (i.e., harvesting other than for firewood) (Figure 27).

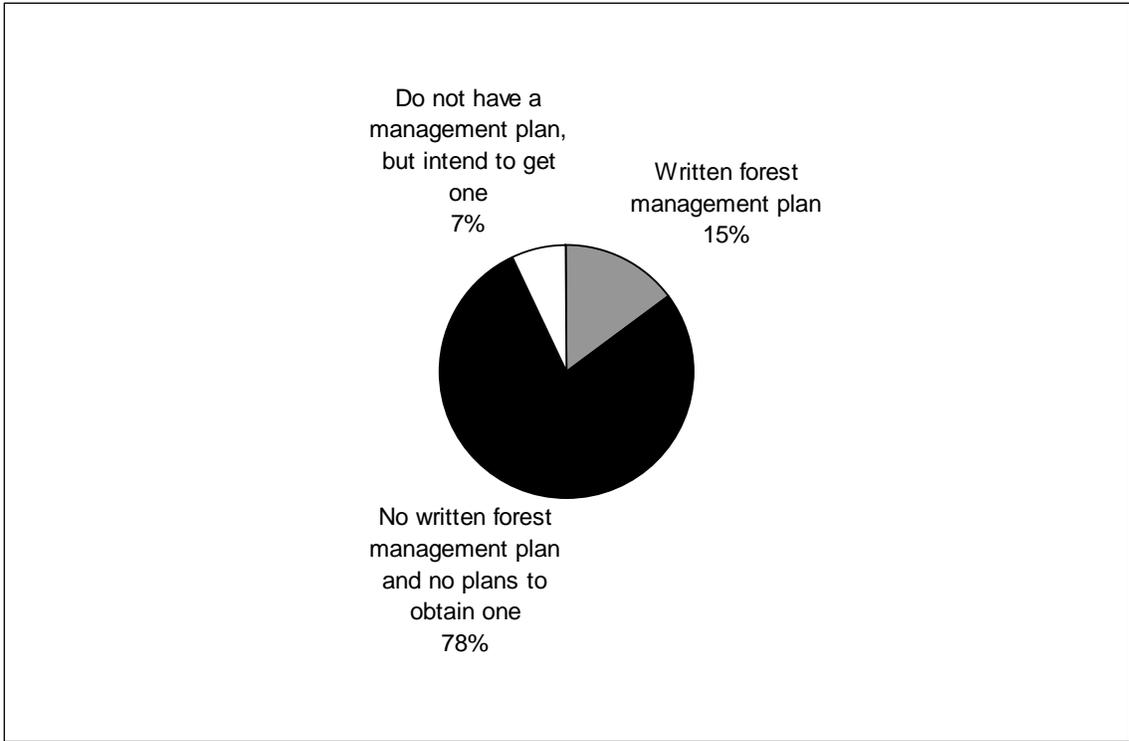


Figure 26. Portion of landowners who have a written forest management plan or intend to obtain one.

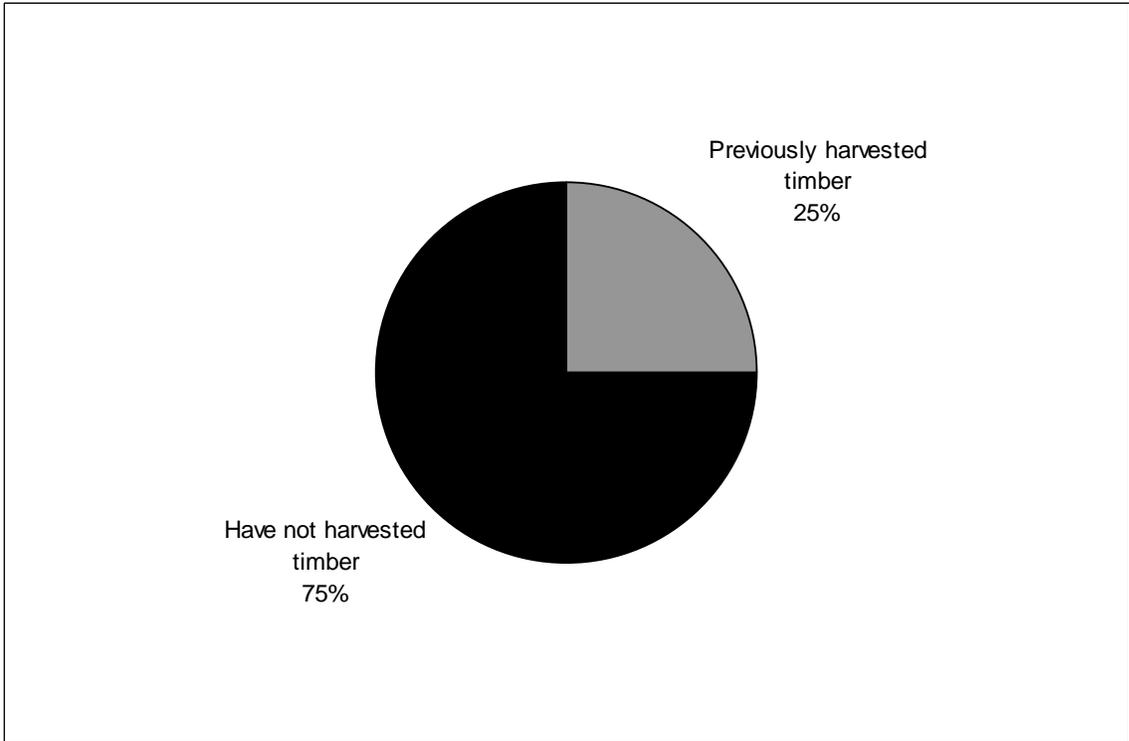


Figure 27. Portion of landowners who have harvested timber since acquiring the TFFL.

Given the long time horizon for forest management activities and the various reasons for owning forest land (Figure 24), there are many reasons why landowners have not harvested timber (Figure 28). Of the 75% of landowners who have not conducted a commercial timber harvest, one-third (33%) indicated they have not done so over concern about altering the way the forest looked. Another 31% said that they have not harvested timber yet because they felt the timber was not large enough to sell. Other important reasons for not harvesting timber include: the forest land was harvested before acquisition (15%), there is no access to the land (5%), the owner has not had time to harvest (5%), the owner is worried about destroying wildlife habitat (5%), the owner does not know who to contact to harvest (4%), and the owner feels that harvesting is ethically inappropriate (2%). Of the landowners who have harvested timber on their forest land, most have harvested in the last three years (61%).

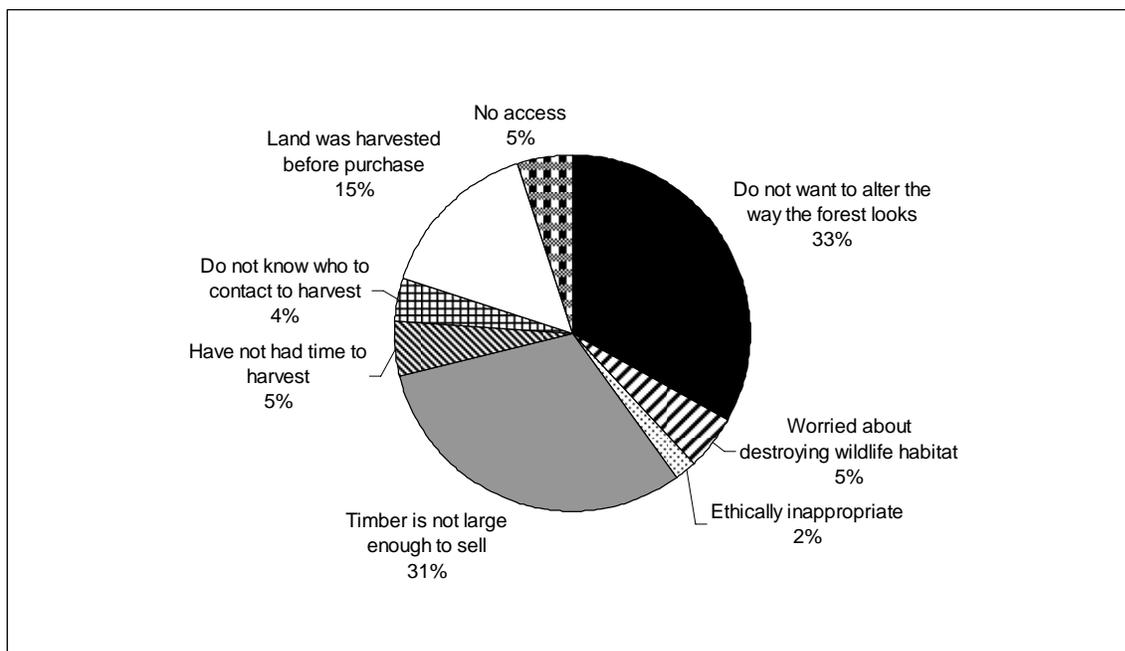


Figure 28. Landowner reasons for not harvesting timber.

The long time horizon of forest land management makes it difficult for a survey of a short (up to ten years) land ownership period to determine which forest land will eventually be harvested. Many of the reasons landowners give for not harvesting timber (e.g., the timber is not large enough to sell, owners have not had time or do not know who to contact to harvest timber) suggest some landowners who have not harvested timber intend to do so in the future.

Survey questions about future forest land management intentions asked landowners whether they planned to conduct commercial timber harvests or timber stand improvements in the next five years. Responses to these questions, combined with responses about past harvesting practices, can more accurately describe how many people will produce timber on their forest land. Figure 29 shows the distribution of landowners who have already harvested timber or intend to harvest timber in the next five years. Half of the owners of former TFFL have previously harvested timber on their forest land, or plan to harvest sometime in the next five years.

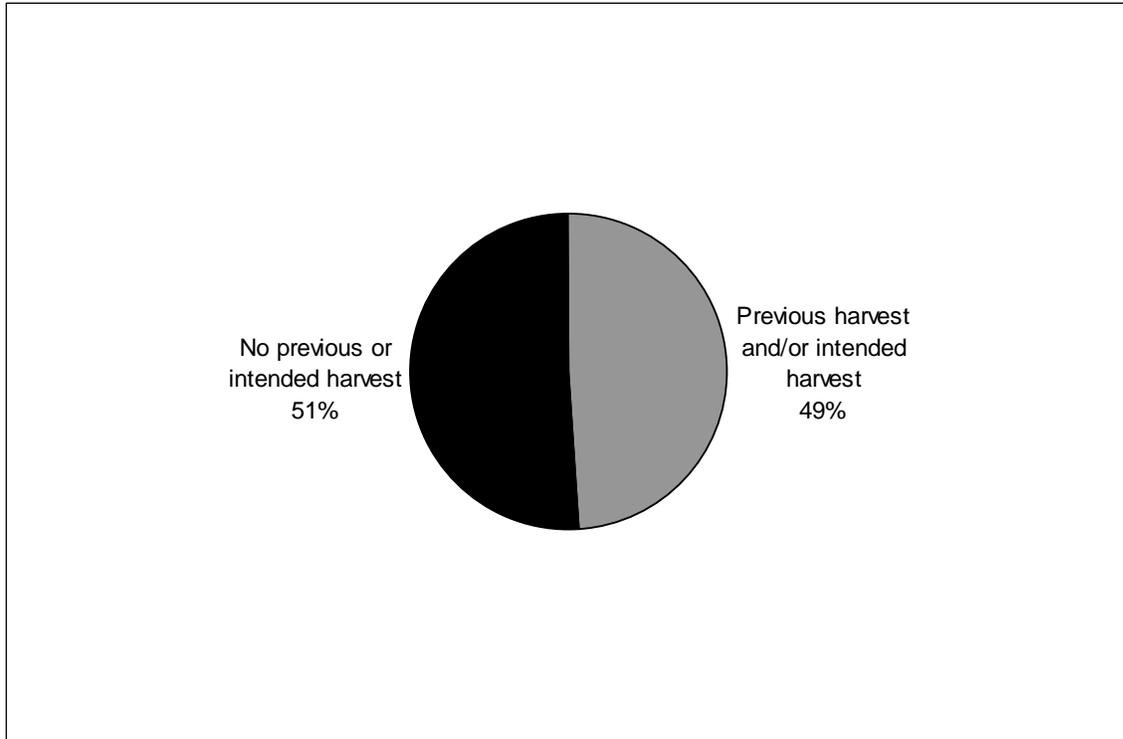


Figure 29. Portion of landowners who have harvested timber or intend to harvest timber in the next five years.

Other Management/Silvicultural Activities

Timber harvesting is only one of many forest management activities that can be conducted on forest land. The survey asked landowners if they have conducted, or intend to conduct, a variety of wildlife improvement or silvicultural activities.

Habitat improvement projects, such as food plots, are the most common forest management activity applied by purchasers of former TFFL (Figure 30). Fifty-one percent of the respondents indicated they have conducted, or intend to conduct, some type of wildlife habitat improvement project in the near future. Planting trees (40%) and timber stand improvement projects (34%), such as thinning and pruning, are also common management activities that are planned. Another common use and management activity that is done on former TFFL is conversion to a farm or pasture. According to comments provided by the survey respondents, much of the TFFL that was sold to private owners was harvested before it was sold, possibly facilitating the conversion of former TFFL to farmland.

There are a wide variety of management options available for improving forest health, productivity, or wildlife habitat potential of forest land. Figure 31 shows the aggregated level of previous or planned activity on former TFFL. Sixty-six percent of responding landowners have conducted, or plan to conduct, some type of silviculture activity²², and another 10% do not plan to conduct silvicultural activities, but will conduct wildlife improvement projects. Results from

²² Silviculture activity in this instance includes tree planting, timber stand improvements, commercial harvests, or obtaining written management plans.

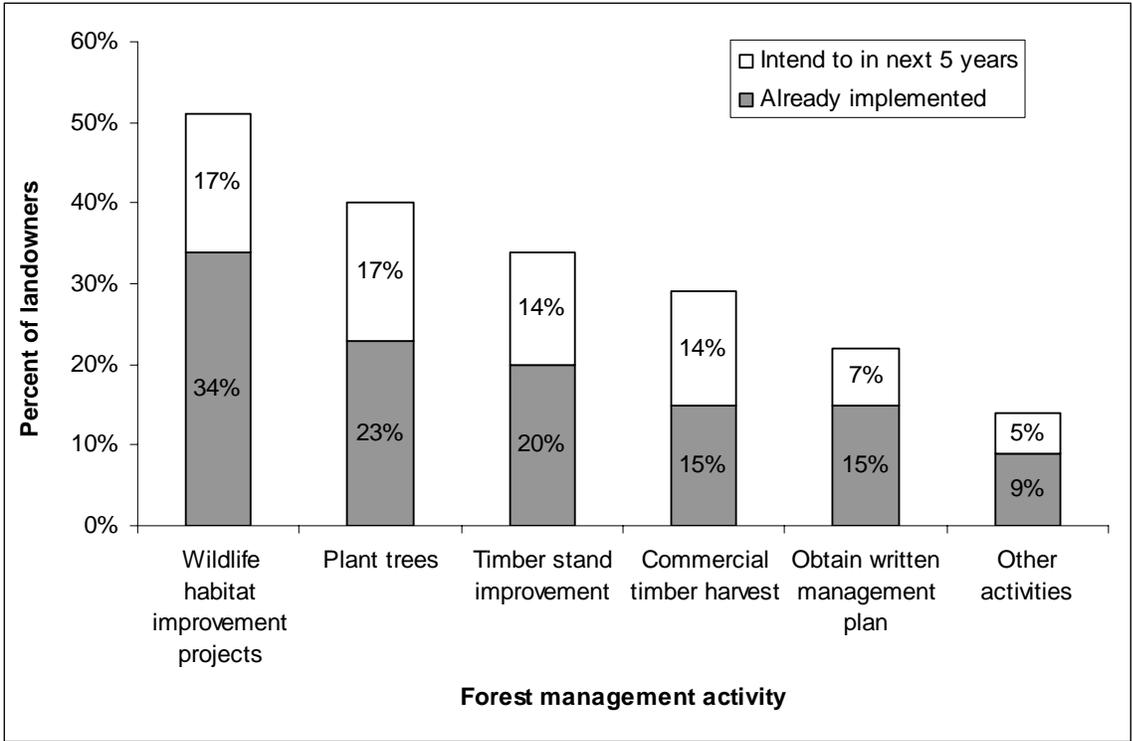


Figure 30. Level of previous and intended forest management activity on TFFL.²³

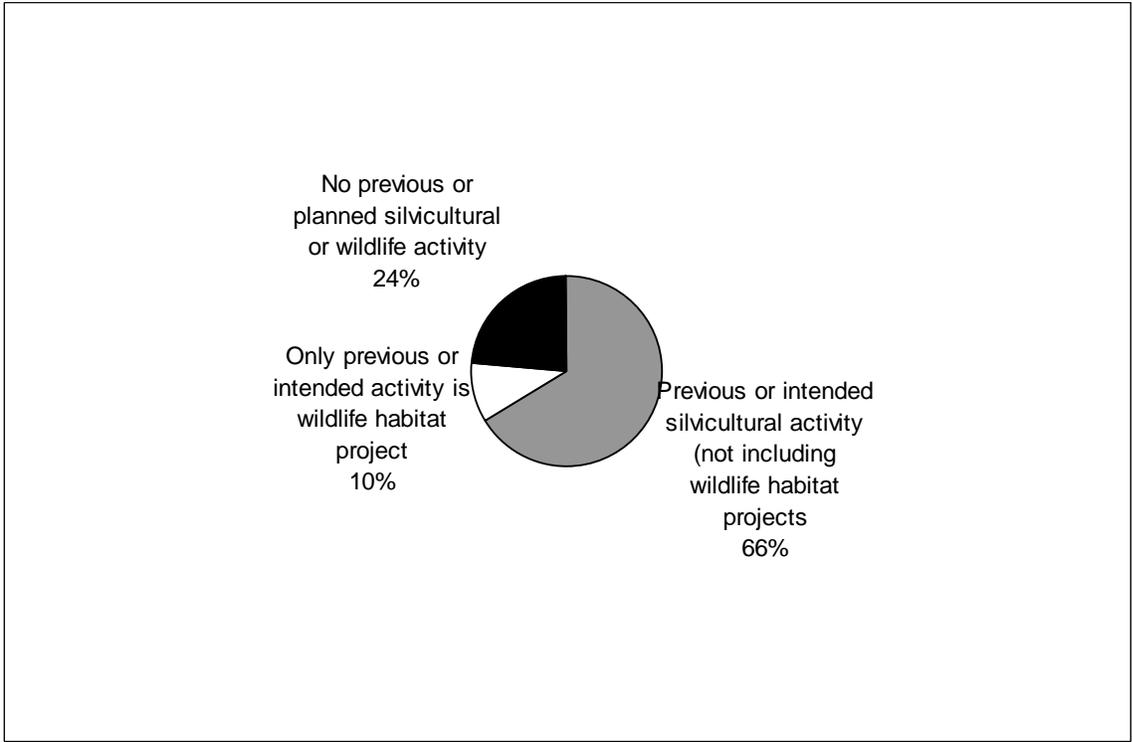


Figure 31. Portion of landowners who have conducted, or intend to conduct, at least one type of forest management activity.

²³ Most “other” activities consisted of clearing the land for farming or grazing.

Figure 25 and Figure 26 suggest that only one-quarter of the owners of former TFFL are managing their forest with the help of a professional forester. However, Figure 31 suggests that while many landowners may not have forest management plans, many of them are still actively managing their land in some way.

5. Public Hunting Access

Change in public access to forest land are an important aspect of evaluating TFFL retention and disposal options, as public recreational access is an important benefit provided by TFFL. With the survey data indicating hunting is the single most important reason that many TFFL purchasers own their forest land (Figure 24), public hunting opportunities, which are provided on county-managed forest lands, may be restricted when the land is divested to private interests (through either sale or exchange). These impacts could be especially severe in areas with high levels of prohibited public hunting access on former TFFL.

Posting the land against trespassing

The survey results indicate approximately 51% of former TFFL parcels are currently posted against public trespass (Table 9, Figure 32). Fifty-seven percent of these properties have been posted in the past, and 63% of the property owners say that they plan to post their lands to restrict hunting access in the future. In addition to having a substantially higher proportion of owners who plan to post the land in the future compared to current posting practices, an additional 13% are not sure suggesting the actual level of future posting practices could be higher than 63%.

Table 9. Degree of past, current, and planned future restrictions on public access to TFFL.

	Yes	No	Unsure
Previously posted against trespass?	57%	42%	2%
Currently posted against trespass? ²⁴	51%	46%	3%
Plan to post against trespass?	63%	24%	13%

Landowners were also queried whether, if asked, they would give permission to hunt on their forest land. Only 18% of the landowners said they would give permission to other hunters to use their land if asked (Figure 33). However, a high portion (35%) of the landowners said they might be willing to permit access to others for hunting, but only under certain circumstances. The majority of landowners who responded this way indicated they would do so only to people they knew or could trust to be responsible hunters. Nearly half of the responding landowners indicated they would never give permission to hunters to use their forest land.

²⁴ Twenty-three landowners skipped the question asking about current access restrictions, possibly due to the format of the questionnaire.

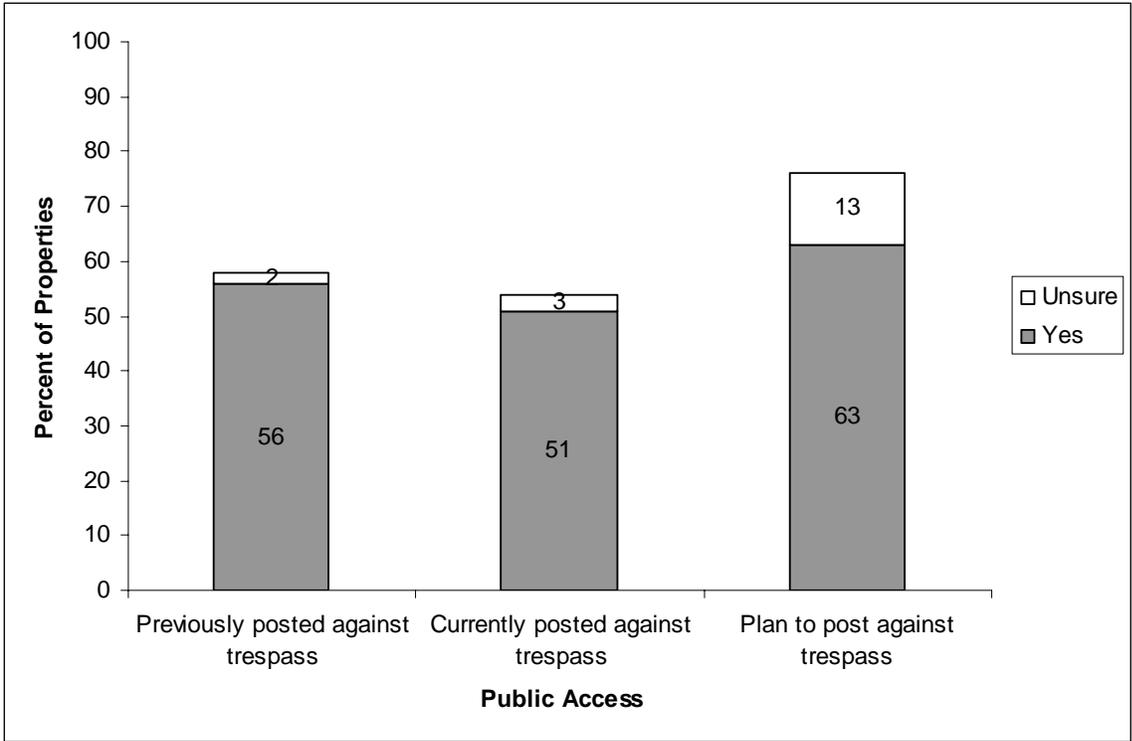


Figure 32. Past, current, and planned future restrictions on public access to former TFFL.

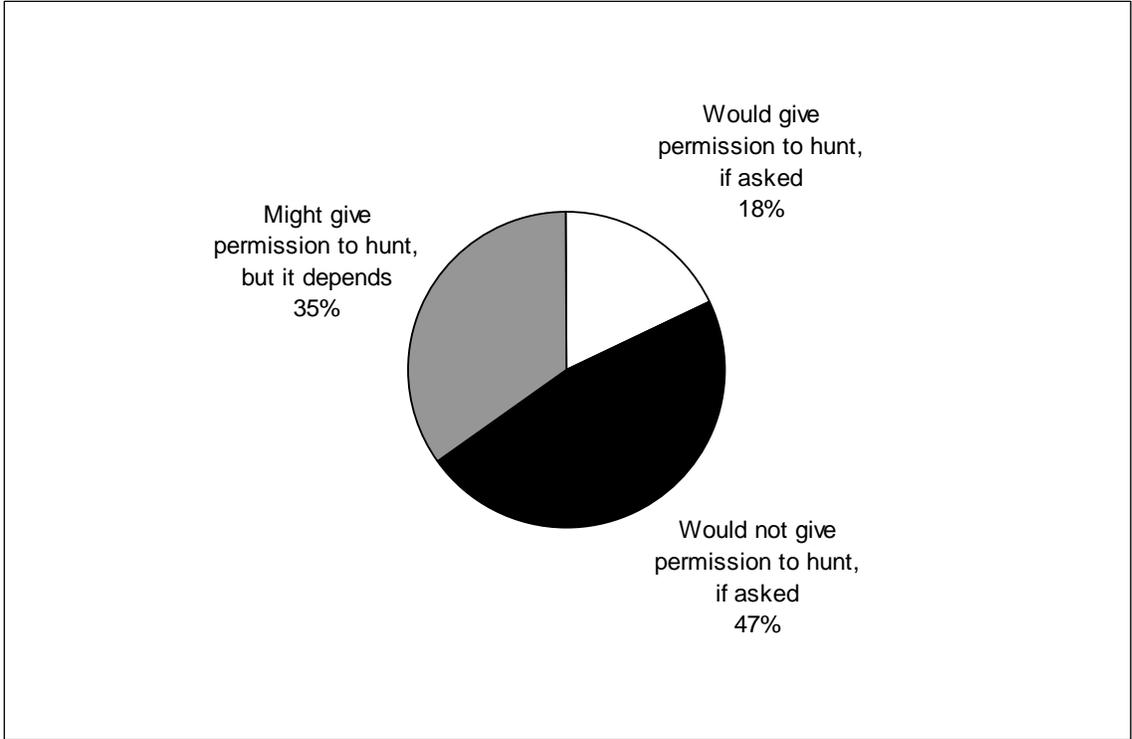


Figure 33. Portion of landowners who would give permission to hunters if they asked to hunt on their land.

Hunting leases

Only 3% of the landowners responding to the survey indicated that they have leased land for hunting at some time (Figure 34).

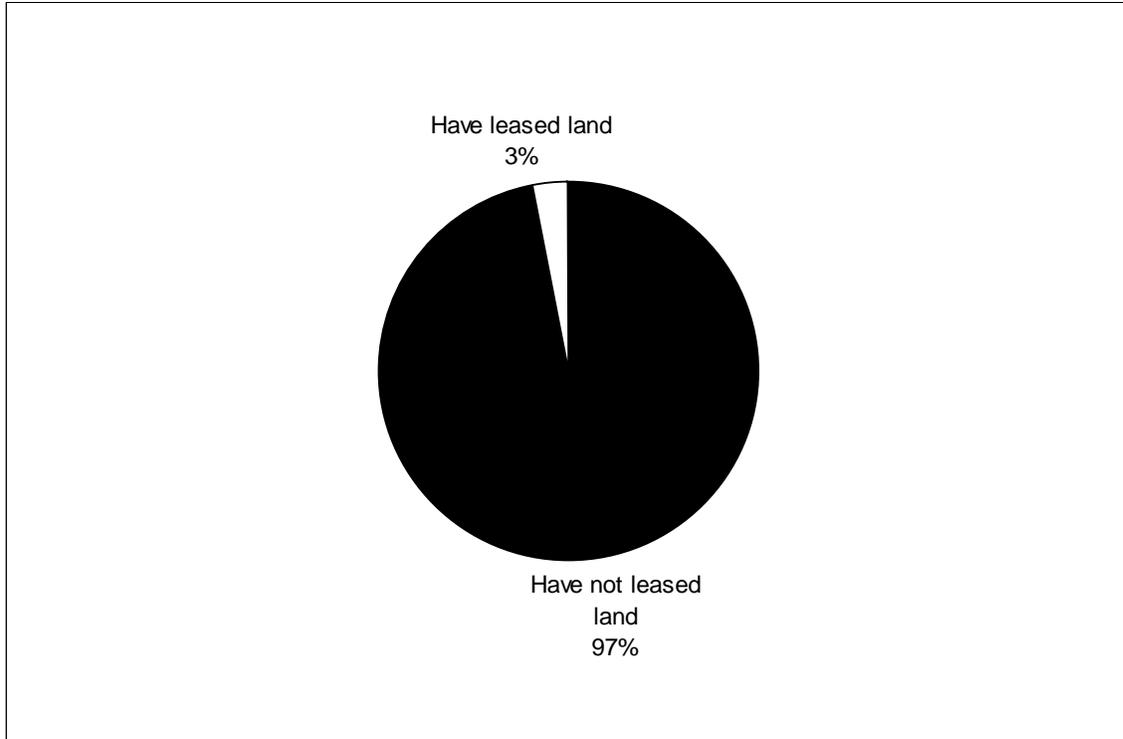


Figure 34. Portion of landowners who have leased their land for hunting.

6. Uses of and improvements to former TFFL

One concern associated with the sale of TFFL to private owners is subsequent land development activity that may occur on these lands. Many development projects, such as building cabins, homes, and roads, can reduce or eliminate many public benefits (e.g., wildlife habitat, aesthetics, improved water quality) commonly associated with undeveloped forest land. To better understand past and planned future development activity on former TFFL, the current owners were asked to identify the types of structures erected or improvements made on the land since purchasing the property, as well as development and improvement planned in the next five years.

Structures and Improvements

The purchasers of TFFL were asked a series of questions about past and intended future development activity on the land. Figure 35 summarizes landowner responses to these questions by illustrating the portion of landowners who have already built structures or made improvements, or plan to do so in the next five years.

Constructing recreation trails is the most common improvement (or intended improvement) made to former TFFL (45%). Fourteen percent of the responding landowners have either already

built a permanent road²⁵ on their property or intend to build one in the next five years. Also, the survey responses suggest that approximately 15% of owners of former TFFL plan to build a home in the next five years and another 16% plan to build a cabin. Sheds and livestock fences are other structures that have been or are planned to be built on former TFFL, although the occurrence of both is fairly modest (16% and 9%, respectively).

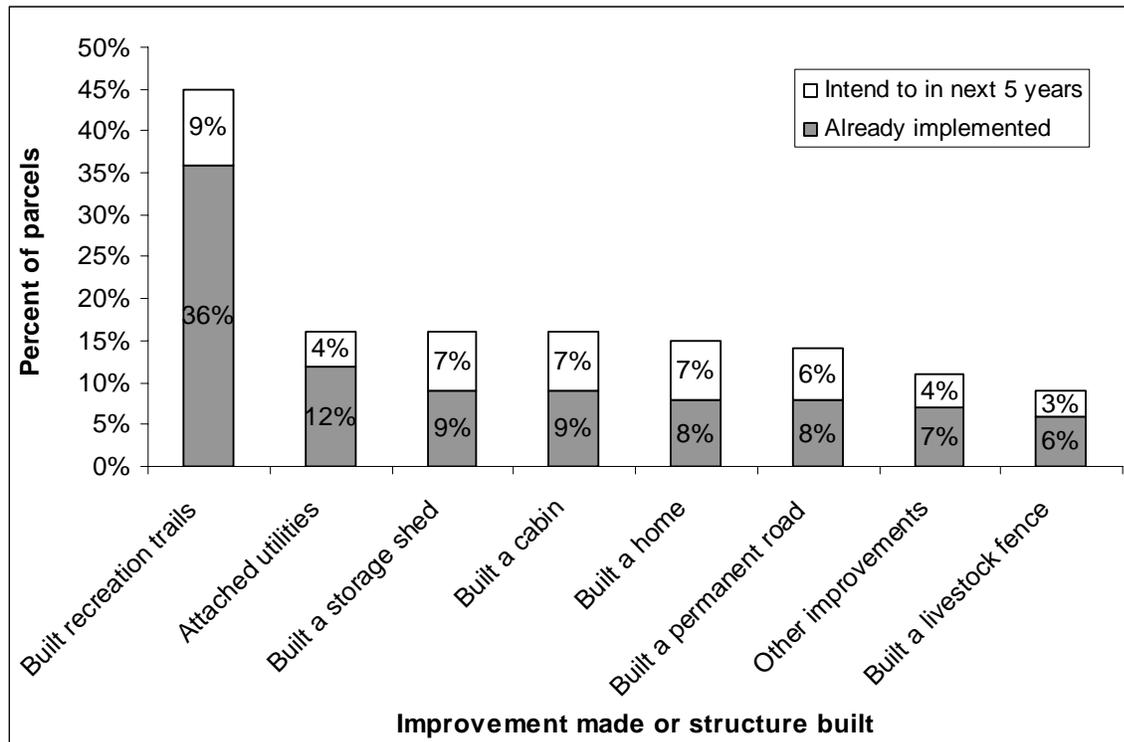


Figure 35. Portion of TFFL properties with a previous or planned structure or improvement made.

Figure 36 depicts the combined existing and planned home and cabin development on former TFFL. Residential development (permanent or seasonal) has occurred or is planned to occur in the near future (the next five years) on approximately one-third of TFFL sold from 1995-2005.

Figure 37 takes this analysis a step further by describing the presence of any previous or planned development or improvements on the property, including: building recreational trails or roads, attaching utilities, and constructing livestock fences. When these other development activities are considered along with home or cabin construction, some type of structure or improvement is either built or planned on seven of every ten parcels of former TFFL whose owners responded to the survey.

²⁵ A permanent road is not necessarily the same thing as an all-weather road. Therefore, there is a slight difference in the questions, and the subsequent interpretation, about the proximity to an all-weather road and the construction of a permanent road.

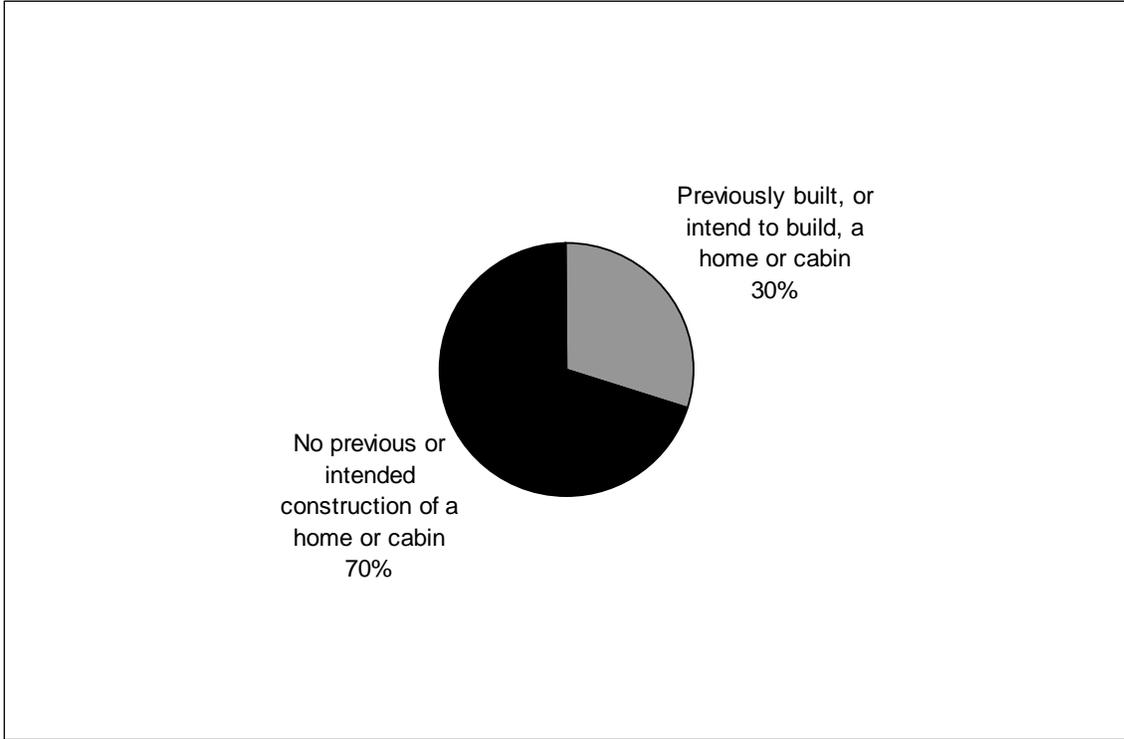


Figure 36. Portion of former TFFL with previous or planned construction of a home or cabin.

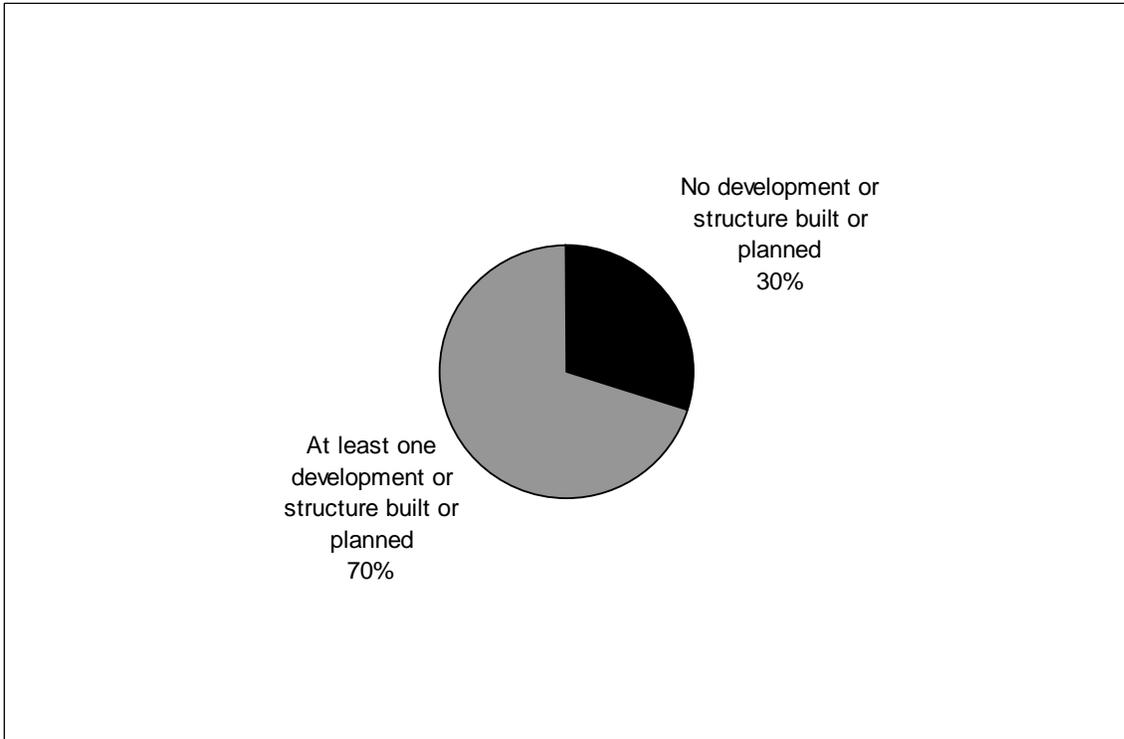


Figure 37. Portion of properties that have built, or plan to build, at least one type of improvement or structure.

7. Turnover and parcelization

Recent research suggests parcelization, or the subdivision and sale of forest land, in northern Minnesota may be increasing (Kilgore and MacKay 2007). Parcelization is often considered an indicator for future development in an area (Gobster and Rickenback 2004). Replacing forest lands with homes, cabins, and other structures can significantly reduce the public benefits commonly associated with open forest land. A description of the magnitude of TFFL parcelization is essential to assessing the potential economic impacts of county land disposal policies.

Land that is frequently sold to new owners is considered to have a high rate of turnover. A high turnover rate can be problematic for forest land, as many forest management activities (e.g., tree planting) require a long planning horizon often spanning several decades.

Past and future subdivision/parcelization

Owners of former TFFL were asked whether they ever subdivided and sold part of their forest land. Only 6% of responding landowners said they subdivided and sold the TFFL they purchased (Figure 38), suggesting parcelization of former TFFL is a very infrequent occurrence. This finding needs to be tempered by the fact that the longest tenure for owning former TFFL among the survey participants is ten years. Over time, the number of TFFL tracts that are parcelized will certainly increase. What is not known is how the rate of parcelization will change over time. Of the landowners who have subdivided their forest land, most (54%) only sold one parcel of land, yet 23% subdivided and sold at least four parcels from the original TFFL they purchased.

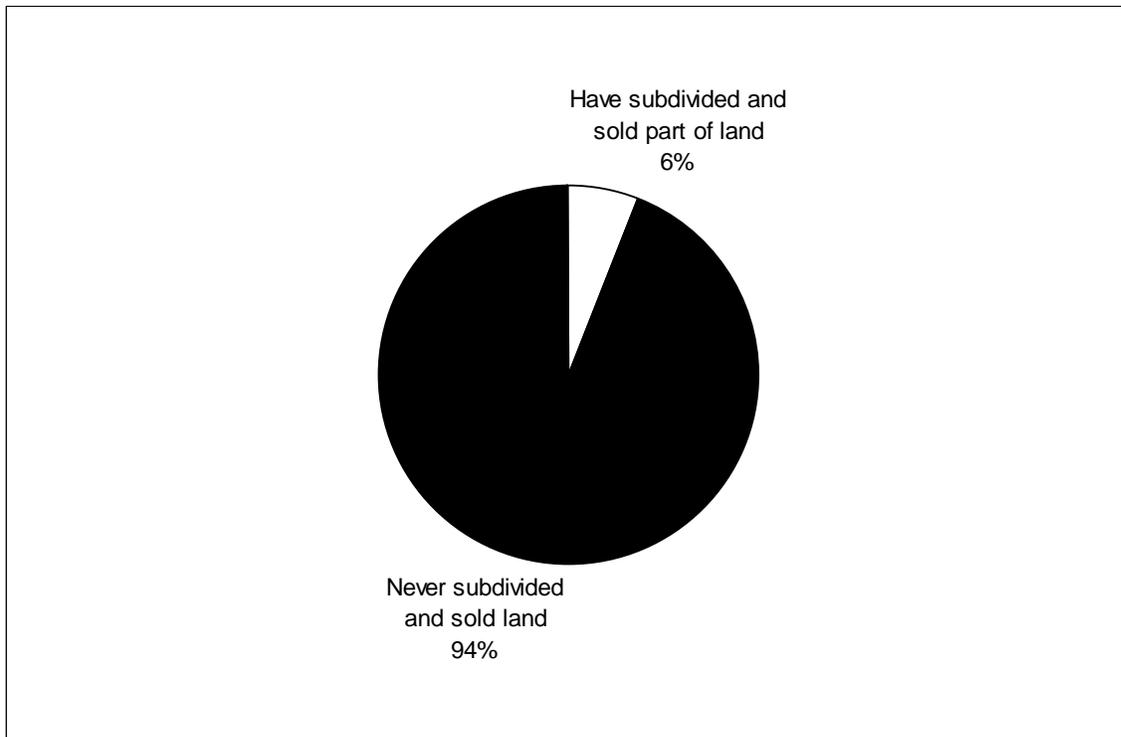


Figure 38. Portion of landowners who have subdivided and sold part of former TFFL.

Landowners were also asked about their future ownership intentions for the land. Seventy-five percent of landowners responded that they have no intention of selling the land (Figure 39). Another 13% said that they plan to sell the entire parcel intact, without any prior subdivision. Only 7% of the landowners plan to subdivide and sell part or all of their land.

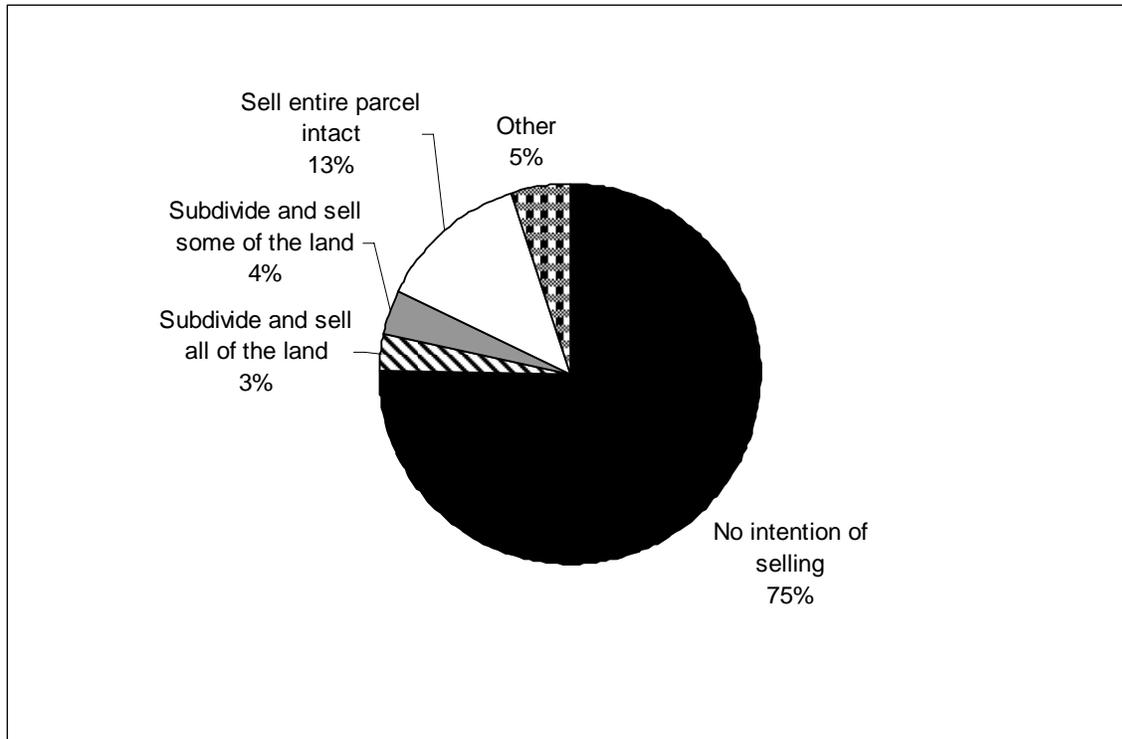


Figure 39. Landowner intentions for retention, subdivision, or sale of former TFFL.

Total Expected Parcelization on Former TFFL

Combining the results presented in Figure 38 and Figure 39, 85% of the owners of former TFFL indicated they have neither subdivided nor plan to subdivide their forest land (Figure 40). Survey results indicate that 11% of landowners have either subdivided former TFFL (6%), or plan to subdivide the land in the future (5%).

Turnover

Figure 16 describes how TFFL owners acquired the land. This data can also provide information about the level of TFFL turnover in the past ten years. Twenty-three percent of current landowners bought the former TFFL from someone other than the county. Since counties originally sold or exchanged all former TFFL, one can reasonably assume that these properties must have been sold at least once since they have been in private ownership. Also, during the survey administration process, 11 landowners indicated they no longer own the former TFFL in question and, therefore, did not complete the survey. Together, these results suggest that at least one-quarter of the TFFL has already changed ownership at least once since county disposal. What could not be gleaned from the survey responses is whether those parcels that had been re-sold were portions of the original TFFL parcel or the entire parcel. If the former, the study results underestimate the level of parcelization activity occurring on these lands.

Figure 39 summarizes landowner responses about the expected future turnover of former TFFL. These results also indicate that approximately 25% of landowners plan to sell at least part of their property in the future. The landowners did not provide a timeline for the future sale of their land, but if we assume that they plan to sell it sometime in the next ten years, the results are consistent with what are presented in Figure 16. Approximately 25% of the former TFFL is being sold every ten years.

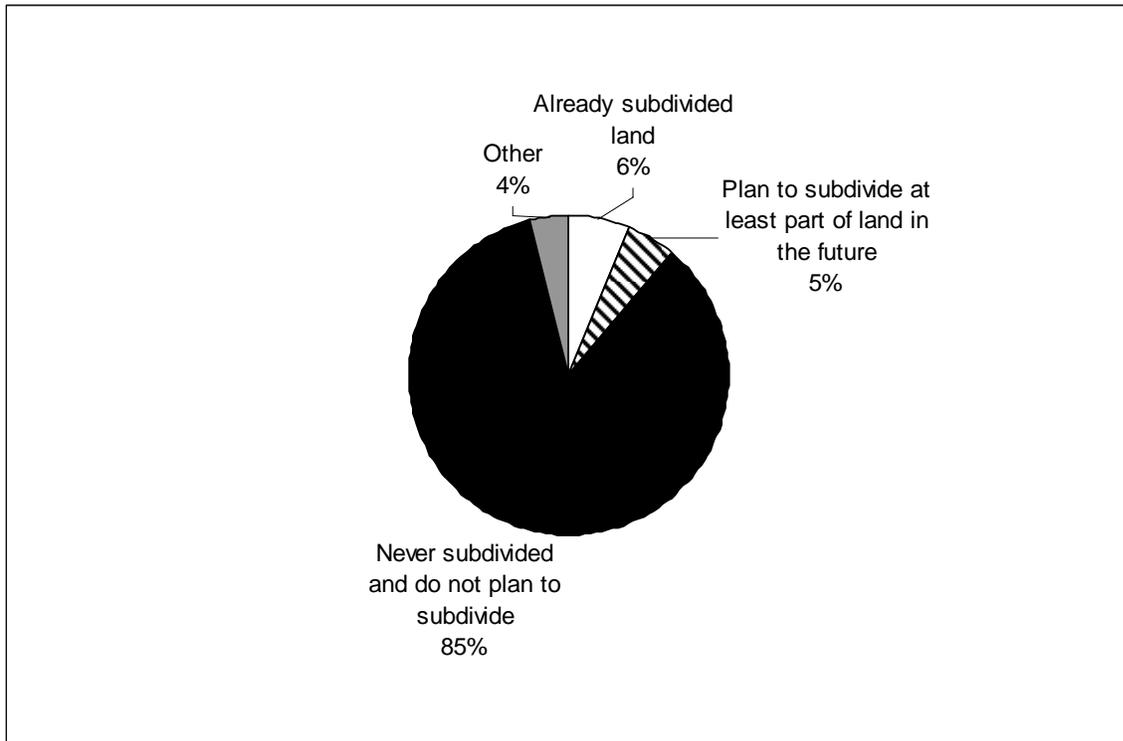


Figure 40. Portion of landowners who have subdivided or plan to subdivide former TFFL in the future.

Combining survey responses regarding past land turnover and future intentions for land ownership provides an estimate of which former TFFL has been sold or will be sold sometime in the future (Figure 41). Alternatively, it provides the proportion of land that is likely to stay under constant ownership for a long period of time. Approximately 58% of purchasers of TFFL have never sold their land and do not plan to sell it anytime in the future. This landowner population may provide ownership continuity that is important for successfully implementing many forest management practices that produce valuable forest benefits, such as timber, recreation, biodiversity, and clean water (Brooks 2003; Alig 2005; Kline and Alig 2005; Gustafson and Loehle 2006).

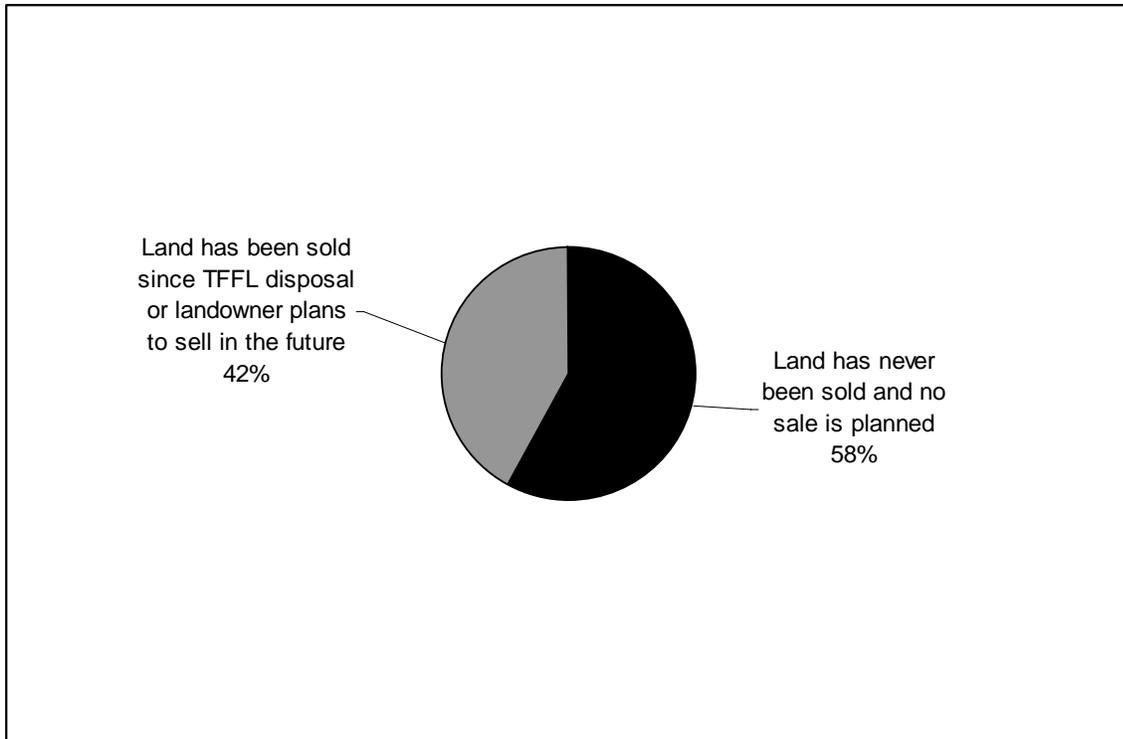


Figure 41. Portion of former TFFL that is likely to stay with the same owner for a long period of time.

D. Summary of Results from Landowner Survey

1. Characteristics of TFFL sold or exchanged

- According to county tax records, approximately 22,800 acres of county-managed TFFL was sold or exchanged between 1995 and 2005. St. Louis County sold or exchanged the largest amount (4,858 acres) and Beltrami County sold the least (784 acres). With the exception of Pine County (7%) and Carlton County (3%), most counties sold or exchanged less than 1.5% of their total TFFL base during this 11-year study period.
- The most common TFFL sale size during this time was 40 acres and most sales were between 35 and 72 acres, with an average sale of 56 acres.
- Fifty-seven percent of former TFFL is directly adjacent to an all-weather road and the road access appears to be slowly increasing.
- Current owners of former TFFL believe that most (55%) of the land offers good or excellent hunting opportunities. Very few owners (8%) think that the land offers poor hunting opportunities.

2. Characteristics of owners of former TFFL

- The vast majority of former TFFL is owned by individuals or families (82%).
- Many TFFL owners (73%) also own at least one other forest land property in Minnesota in addition to the TFFL they purchased between 1995 and 2005.

- Most TFFL owners live in rural areas (54%). Owners of former TFFL that live in metropolitan or suburban areas are the least common ownership groups (7% and 12% respectively).
- The proximity of the former TFFL to the landowner's primary residence varies greatly and is fairly evenly distributed across a gradient of distances (residence on site, < 25 miles, 26-100 miles, >100 miles).
- Most landowners (71%) acquired the land from the county via county auction or land exchange, but 23% of current owners bought the land from someone other than the county, indicating that these lands have already been sold at least once since county disposal.

3. Reasons for purchasing and owning former TFFL

- Solitude and privacy, hunting, wildlife watching, other recreation, and the ability to pass land on to family or friends were all important reasons for purchasing TFFL. Interestingly, most of the aforementioned benefits are also provided to the public during county ownership of TFFL.
- Using the land for a permanent residence, a seasonal residence, or to produce timber from income were less important reasons for owning former TFFL. In contrast to the most important reasons for ownership mentioned above, these benefits are much more private and the owner can only realize the benefits if they own the land.
- Thirty-four percent of the landowners indicated that hunting was the primary reason for purchasing the TFFL. However, hunting becomes a less frequent justification for ownership as the length of ownership increases. It is often replaced by real estate investment and solitude or privacy.
- Timber income is not a common reason for purchasing or owning TFFL.
- Wildlife watching, other recreation (not hunting), and the ability to pass land on to family or friends were all identified as important reasons for owning forest land, but appear to be secondary or tertiary reasons for owning TFFL.

4. Forest management activities on former TFFL

- Approximately one-quarter of landowners have spoken with a professional forester since acquiring the TFFL.
- Fifteen percent of landowners have a written forest management plan and another 7% intend to obtain one in the next five years.
- Twenty-five percent of the landowners have commercially harvested timber since acquiring the land (within ten years of ownership), with many reasons for not harvesting timber cited, one-third being the timber is too small to be merchantable.
- Half of the owners have either harvested timber or intend to harvest timber in the next five years.
- Wildlife habitat improvement projects (e.g., food plots) are the most common forest management activity.
- Although only 22% of landowners have or intend to obtain a forest management plan, considerable forest management activity occurs on TFFL. Sixty-six percent of landowners have implemented or plan to conduct some type of silvicultural activity, and another 10% have or will undertake a wildlife improvement project.

5. Public hunting access on former TFFL

- Fifty-one percent of former TFFL is currently posted against trespassing, but 63% of landowners plan to post the land in the future.
- A significant portion of landowners (13%) are still undecided about whether or not to post their land in the future.
- Approximately half the owners whose land is currently posted would be willing to give permission to hunters that asked to use their land, given certain conditions are met.
- Very little former TFFL is leased for hunting (3%).

6. Uses of and structures built on former TFFL

- Recreational trails are the most common improvement/structure made on former TFFL (45%).
- Thirty percent of landowners have already built a house/cabin, or plan to do so the next five years.
- Seventy percent of landowners have made, or intend to make, some type of improvement or structure on the land.

7. Turnover and parcelization of former TFFL

- Six percent of landowners have already subdivided and sold at least part of their land. Another 5% of landowners plan to subdivide and sell some of their land.
- At least 23% of the county TFFL that was disposed of between 1995 and 2005 has already been sold at least once.
- Fifty-eight percent of landowners have never sold their TFFL, nor do they ever plan to sell it in the future.

E. Comparison of Results to Previous Studies

A survey of Itasca County TFFL purchasers conducted by Ellefson et al. (1980) represents the only other available information on the characteristics of purchasers of former TFFL. A comparison of the Ellefson et al. (1980) results to the results obtained in this study helps describe the changes in tax-forfeited landowner characteristics and management strategies between 1977 and 2005. Significant differences between landowner responses in the two surveys are²⁶:

- The most common type of owner of former TFFL has changed from major corporations to families and individuals. Between 1960 and 1977, 77% of the TFFL sold in Itasca County was sold to major corporations and only 25% was sold to families and individuals. In contrast, 82% of TFFL sold or exchanged between 1995 and 2005 is owned by families or individuals, while only 9% is owned by corporations.
- The annual level of TFFL disposal has decreased. There were 130,000 acres (7,222 acres per year) of TFFL sold between 1960 and 1977 in Itasca County alone. Only 22,800

²⁶ The survey population in this report is not the same as the Ellefson et al. (1980) report. The Ellefson et al. (1980) survey population was Itasca County TFFL purchasers; not all 12 counties being studied here. The analysis and recommendations in this report will assume the populations are essentially identical, but the distinction must be noted.

acres (2,073 acres per year) were sold or exchanged in the entire 12-county study area between 1995 and 2005.

- More landowners are acquiring TFFL for the hunting and other recreational opportunities on the land. Twenty-five percent of 1960-1977 purchasers acquired the land for recreation; compared to 37% of the most recent TFFL purchasers. Real estate investment is also a more common reason for owning TFFL now (16%) than it was in the past (9%).
- Reasons for purchasing TFFL that have become less common are: producing timber income and use as a seasonal or permanent residence.
- More TFFL owners are building recreation trails now (36%) than in the past (19%).
- Many more TFFL purchasers are posting their forest land against trespass now (51% currently; 63% plan to) than in the past (22%).

One surprising result from this comparison is that, despite a significant increase in stumpage prices in recent years (Kilgore and MacKay 2007), producing income from timber is still not a common reason for purchasing TFFL. In fact, it is an even less common reason for purchasing forest land now than it was 25 years ago.

Another surprising result is that building a permanent or seasonal residence is a less frequent reason for purchasing TFFL now than it was in the past. The increase in forest land prices (Kilgore and MacKay 2007) does not appear to be correlated to higher demand for land used to build homes and cabins.

These results suggest that neither higher stumpage prices nor development pressure are the primary reason for an increase in TFFL prices. Instead, more landowners want to buy land for the primary purposes of hunting and recreation. This new population of landowners that purchases TFFL for hunting and recreation is also managing and using the land differently. For example, more TFFL owners are building recreational trails and posting their land against trespass—activities that are consistent with the owner objectives of hunting and recreation.

Other forest landowner surveys have found similar changes in Minnesota landowner motivations (Donnay 2005; Butler and Leatherberry 2004). The simultaneous changes in forest land prices and landowner objectives show a significant increase in the demand for forest land that provides private hunting and outdoor recreation opportunities.

F. Changes to TFFL Management and Use after County Disposal

Section II describes the general characteristics and management strategies for county-administered TFFL. In contrast, the results from the landowner survey (Section III.C) provide an empirical description of how TFFL is used and managed after county disposal. Quantitative and qualitative differences between the two different TFFL ownership scenarios will become the basis for our analysis of different retention and disposal policies. Some of the significant changes to TFFL management and use after county disposal are:

- **Timber Harvesting.** The sale of county TFFL has not resulted in an appreciable change in timber harvesting activity on these lands. Forty-one percent of the owners of former TFFL have either conducted a commercial timber harvest, or planned to carry one out in

the next five years. Considering the maximum tenure for the buyers of TFFL was ten years at the time of the survey and one-third of those who had not harvested indicated the timber was too small to be merchantable, there is no evidence suggesting the sale of TFFL has appreciably changed the volume of timber harvested after these lands.

- **Professional Expertise:** The level of professional expertise available to carry out land management (e.g., silviculture, wildlife, timber harvesting) is considerably lower on privately owned TFFL. All counties employ at least one forester or natural resource manager to help manage their TFFL base. In contrast, only 25% of owners of former TFFL have spoken with a professional forester about how to manage their land.
- **Forest Management Plan:** The level of professional expertise available to develop and implement land management planning is also considerably lower on privately owned TFFL. All counties have a forest management plan for their TFFL, while only 22% of
- **Forest Management Activity.** The level of investment made in specific forest management activities has not appreciably changed since the sale of the TFFL land. Sixty-six percent of new landowners have conducted, or plan to conduct, some type of silviculture activity, and another 10% plan to conduct wildlife improvement projects.²⁷
- **Development and Structures:** With the exception of structures (almost exclusively hunting cabins) that exist on leased TFFL, counties do not build permanent structures on TFFL. However, when the land is sold or exchanged, at least 30% of the new owners plan to build a cabin or home on the forest land.
- **Hunting Access:** Nearly all of the county-administered TFFL is open for public recreation access, including hunting access. When the land is sold to private owners, 51-63% of the land is posted against trespass.
- **Parcelization and Fragmentation:** When TFFL parcels are sold to private owners, approximately 11% of the landowners plan to subdivide and sell at least part of it to another owner. Also, TFFL parcels are typically less than 100 acres and owned by a diverse group of primarily families and individuals.
- **Long-term ownership:** As evidenced by the presence of forest management plans and enrollment in third-party forest land certification programs, county land departments manage TFFL for a wide variety of sustainable, long-term benefits. Long-term management strategies are no longer present on much of the TFFL after it is sold to private owners. At least 23% of the TFFL changes ownership within the first 11 years and only 58% of the landowners say they have no plans to sell their land.

Comparing these two alternate ownership scenarios illustrates the difference in TFFL land management and uses under land retention versus disposal policies. These results will be used in the economic analysis of TFFL disposal policies in Section IV.

²⁷ In this case, silvicultural activity is defined as timber stand improvement, tree planting, commercial timber harvest, or obtaining a forest management plan.

IV. Assessing the Economic Impacts Associated With Policies for Retaining Versus Selling Minnesota TFFL

A. Introduction

One of the major goals of this report is to conduct an analysis of the economic effects of TFFL retention versus disposal policies. A variety of economic tools may be used to analyze the efficiency of public land ownership. For example, one way to analyze the efficiency of public land ownership is through a financial analysis that only considers monetary benefits and costs for the government (Appendix D). Financial analyses help public agencies assess their ability to achieve adequate levels of funding for public projects, but ultimately public land management performance is measured by more than simply financial performance. As pointed out by O’Laughlin and Cook (2001):

“Financial performance criteria have limited utility in comparing endowment trust land assets to other financial assets. . . . [public lands] are not the same thing as shares of stock in a corporation, because land provides environmental and social values as well as financial return. Policy decisions that guide trust land managers have been, and likely will continue to be, a balancing of financial, environmental, and social concerns.”(p. 4)

One way to incorporate important environmental and social concerns is through an economic analysis. The perspective of an economic analysis is much broader than a financial analysis. Instead of looking at only the monetary costs and benefits of a specific project, an economic analysis considers social welfare, or the total net social benefits.²⁸ Economic analyses are crucial for most natural resource policies or projects because many of their costs and benefits are not monetized and, therefore, would not be accounted for in a financial analysis.

An economic analysis expands the perspective beyond the scope of a financial analysis to assess how TFFL disposal would impact the social welfare of Minnesota residents. Similar to a financial analysis, the economic analysis compares the net benefits associated with TFFL retention and disposal. However, the economic analysis assesses whether a TFFL disposal policy improves the total social welfare, not simply the financial status of local taxing districts.

First, background information on economic theory economic analysis methodology is presented; specifically, benefit-cost analysis, discounting, and nonmarket benefits. Then, the major underlying assumptions associated with conducting the economic analysis are discussed. Next, the public benefits provided by TFFL retention and disposal options are described. Finally, the public benefits are compared to assess the net economic benefits of TFFL retention and disposal policies.

²⁸ The term “welfare” will be discussed later in this section. In an economic context, welfare is often synonymous with terms such as “happiness” and “satisfaction”. Also, not all economic analyses consider social welfare, but, for the purposes of this report, we use the term “economic analysis” to imply an analysis of social welfare.

B. Concepts and Background Information on Methods Employed

A complete and correct interpretation of an economic analysis requires some basic background in economic theory and methodology. This section provides a brief description of relevant economic theory and how it is applied in the economic analysis of alternative TFFL retention and disposal policies.

1. Benefit-cost analysis

Benefit-cost analysis is a tool originally developed in the 1930s to help policy makers evaluate alternative natural resource project proposals (Field 2003). Since then, benefit-cost analysis has become a common technique used to evaluate a variety of public project proposals (e.g., transportation). Numerous academic papers and texts are available for readers interested in obtaining more background information on benefit-cost analysis methods than is presented in this report (e.g., Mishan 1971; Sassone and Schaffer 1978; Boardman et al. 2001; Tresch 2002).²⁹

Benefit-cost analysis involves measuring, summing, and comparing the benefits and costs of a public project or program to determine which action provides society with the most economically efficient use of its resources among available alternatives (Field 2003; Swanson and Loomis 1996). In brief, preparing a benefit-cost analysis entails the following five basic steps:

- 1) Define the perspective from which the analysis will be conducted (i.e., who the analysis is being prepared for).
- 2) Describe the policy, project, or program alternative(s) under study.
- 3) Quantify the inputs and outputs that is, all the physical consequences that will occur from each policy, project, or program under consideration.
- 4) Estimate the values of all inputs and outputs; in effect, estimate the benefits and costs.
- 5) For each policy, project, or program under consideration, compare all benefits and costs at a common point in time.

While the concept of a benefit-cost analysis is relatively straightforward, its implementation can be extremely complex. According to Tresch: “[benefit-cost analysis] is as much an art as a science, for which the rule of reason is every bit as important as strict analytical rigor” (2002, p. 476). A useful, reliable benefit-cost analysis requires careful attention to each of the above steps. The following sections describe some of the important considerations when performing a benefit-cost analysis and many of the associated techniques and principles.

2. Financial versus economic analysis

A benefit-cost analysis may one of two types: a financial benefit-cost analysis or economic benefit-cost analysis.³⁰ A financial benefit-cost analysis views a project strictly from the

²⁹ See Boardman et al. (2001, pp. 489-510) for a list of examples of benefit-cost analyses.

³⁰ Often the term “benefit-cost analysis” is strictly used to refer to an economic analysis such as the one used in this report. However, for the purposes of this report, we will refer to both the economic and financial analysis as a type of benefit-cost analysis.

perspective of the entity providing the capital needed to finance the project (i.e., the investor), and only examines benefits and costs to the extent they impact the project's financial performance (i.e., benefits and costs that can be measured by market prices). In other words, a financial benefit-cost analysis examines a project's financial efficiency strictly from the investor's point of view. Since unrealized or nonmarket benefits and costs do not, by definition, impact a proposed project's profitability, they are not considered in a financial benefit-cost analysis. A financial benefit-cost analysis of TFFL retention versus disposal is conducted in Appendix D.

In contrast, an economic benefit-cost analysis examines how a proposed project impacts the welfare of society in general. As such, the scope of the economic benefit-cost analysis is expanded to include the impacts to a larger population. An economic benefit-cost analysis includes (with few exceptions) those benefits and costs that would be considered in a financial benefit-cost analysis (benefits and costs that can be measured by readily observed market prices) as well as those benefits and costs that are not priced in the marketplace but never-the-less represent benefits or costs to society (Morton 1999; Loomis and Walsh 1992; Pearse 1990). This section of the report conducts a modified economic benefit-cost analysis of TFFL retention versus disposal policies.³¹

3. Measures of benefits

An important difference between an economic and financial analysis is the metric used to measure benefits and costs. Financial analyses use strictly monetary revenues and costs to assess a project's financial efficiency. However, since economic analyses view projects from a social perspective monetary payments cannot be the sole measure of benefits.

The two primary measures of economic benefits (welfare) are consumer surplus and producer surplus.³² Consumer surplus is the difference between the maximum a consumer is willing to pay for a good or service and what the consumer has to pay to consume that good or service. In other words, consumer surplus is the benefit associated with consumption minus the costs that are required to consume. Similarly, producer surplus is the difference between the minimum a producer is willing to accept in exchange for providing a good or service and what a producer actually receives in exchange for the good or service. Aggregate producer profit (total revenue minus total costs) is an approximate measure of producer surplus.³³ The sum of consumer and producer surplus provides a measure of total economic surplus, or total social welfare.

³¹ It may be argued that the economic analysis conducted in Section IV is not a true benefit-cost analysis because it does not consider all social costs and benefits and the shadow prices used for some nonmarket values may not fit into the standard benefit-cost analysis framework. Benefit-costs analyses usually assess government regulatory programs, not land retention versus disposal decisions. However, Section IV applies a modified benefit-cost methodology to assess TFFL retention and disposal.

³² Welfare economics is a field of economics that attempts to assess the overall well being of society. Welfare economics focuses on issues of efficiency and equity. This analysis will primarily use welfare economics to estimate net benefits to society. Issues of equity will be discussed, but not through welfare economic techniques.

³³ See Nicholson (2005, pp. 145-150) for a more technical description of consumer and producer surplus.

The economic analysis of TFFL retention versus disposal uses producer and consumer surplus to measure benefits and costs. Where estimates of producer or consumer surplus are not reliable, the analysis uses evidence from related markets or describes TFFL physical changes.

4. Nonmarket values

Another important difference between financial and economic analyses is the treatment of nonmarket goods and services. By definition, nonmarket goods and services are not bought and sold in a competitive market and are therefore ignored in standard financial analyses. However, since nonmarket goods and services often provide significant economic benefits, particularly with respect to public resources such as TFFL, they are an important component of an economic analysis.

Nonmarket values are particularly important for environmental and natural resource analyses because many of the goods and services are nonmarket.³⁴ For example, forests produce many valuable goods and services that have nonmarket characteristics, such as recreation, improved water quality, carbon sequestration, and aesthetics. As a result, when decisions are left to the private sector, these goods and services may be underprovided. In an effort to fully account for *all* benefits and costs, public agencies use economic analyses that consider both market and nonmarket goods and services to help inform policy decisions.

Estimating Nonmarket Benefits: Contingent Valuation

If public projects and policies are going to be evaluated from an economic perspective, all economic benefits and costs need to be expressed in equivalent or commensurate units before they can be properly compared (Swanson and Loomis 1996). Without an established market to buy or sell these goods and services, it is very difficult to estimate society's willingness to pay (WTP) for these goods and services. Thus economists have spent a considerable amount of time developing techniques to help estimate the value of nonmarket goods and services.

While nonmarket goods and services are an important part of any economic analysis, there is still much debate over how (and whether) they can be estimated properly. The most common technique for estimating the value of nonmarket goods and services, and the primary technique used in this analysis, is contingent valuation (Carson et al. 2001).³⁵ Contingent valuation (CV) is a survey technique based on the straightforward idea that people's WTP can be determined by asking them directly (Field 2003). A CV survey attempts to estimate nonmarket values by asking how much people would be willing to pay for a specific increase in the level of nonmarket goods and services, or how much they would be willing to accept to compensate for reduced nonmarket benefits. The WTP or willingness to accept (WTA), estimates can then be

³⁴ For natural resource issues, many of the nonmarket goods and services fall under the category of "public goods." For a more complete description of common characteristics of public goods, see Nicholson (2005) pp. 595-597.

³⁵ The US Water Resources Council (1979, 1983) and the US Department of Interior (1986) have both endorsed contingent valuation as a method for valuing nonmarket goods and services. In 1992, a prestigious panel of economists concluded that the contingent valuation method is a reliable starting point (Arrow et al. 1996). Since then, contingent valuation has been a common nonmarket valuation technique and continues to be an integral part of benefit-cost analysis (see Carson et al. 1995).

used to provide an estimate of nonmarket benefits and costs associated with a certain project or policy.

CV methods are often criticized for a variety of possible biases, such as hypothetical bias, survey bias, and strategic bias.³⁶ Does a hypothetical WTA/WTP response reflect a person's true value of the resource? Comparisons of real markets with hypothetical WTP responses suggest that stated WTP can be, in fact, an accurate estimate of true WTP (Bishop and Heberlein 1979; Brookshire et al. 1982; Welsh 1986). However, the accuracy of each CV study is highly variable and depends on the specific survey methods and characteristics.

5. Discounting

Benefit-cost analysis involves estimating and comparing the benefits and costs associated with an independent project—a process that can be simple if all benefits and costs occur at the same time. However, many investments—especially ones in timberland and forest management—include a series of benefits and costs occurring over a long time horizon. To compare them across time, analysts *discount* future costs and benefits so that they are all presented in a common metric—present value.

Discounting is based on economic theory and empirical evidence that suggests people value a dollar today more than a dollar in the future, reflecting the view that individuals prefer consumption today rather than deferring an equal level of consumption into the future.³⁷ Stated somewhat differently, a benefit received in the future is considered less valuable than if it were received today.³⁸ The benefits forgone by not consuming today are called *opportunity costs*.

Discounting is a standard financial and economic analysis technique that allows investors and analysts to compare benefits and costs that occur at different times in a common metric—present value. Equation 1 shows how a future benefit or cost (A) can be discounted to the present value (PV) using an annual discount rate (r) that reflects the opportunity costs of having to wait to receive a benefit.

$$PV = \frac{A}{(1+r)^t} \quad (1)$$

where:

A is the future benefit or cost

r is the discount rate (annual)

t is the year in which the benefit or cost occurs

³⁶ For example, Price (2000) and Hausman (1993) are both critical of contingent valuation as a nonmarket valuation technique.

³⁷ The rationale for discounting and valuing present consumption over future consumption is heavily debated and not always consistent. A review of theories for why people value current consumption more than future consumption can be found in Trostel and Taylor (2001).

³⁸ Similarly, costs borne in the future are worth less than costs incurred today.

Two factors influence the PV of a fixed future benefit or cost (A): the year the benefit or cost is received (t) and the discount rate (r). The higher the discount rate, the less value future events have in present value terms. Similarly, the longer someone has to wait to receive a benefit (i.e. t becomes larger), the less it is worth in present value terms.

6. Net present value

Capital budgeting is a standard financial analysis tool used to decide how to invest money so that its value is maximized and it is commonly used to evaluate land and resource management decisions (Klemperer 1996). Discounted cash flow, internal rate of return, and benefit-cost ratio are all examples of capital budgeting techniques and evaluation criteria. According to O’Laughlin and Cook (2001), discounted cash flow is a procedure well suited to the analysis of almost all financial investments, including forestry.

As the name suggests, discounted cash flow analysis discounts all current and future benefits and costs associated with a particular project. Once future values have been discounted to present value terms, all costs can be subtracted from the benefits to calculate the net present value (NPV) of a particular project (Equation 2).

$$(2) \quad NPV = \sum_t^n \frac{B_t}{(1+r)^t} - \sum_t^n \frac{C_t}{(1+r)^t}$$

where: C is costs

B is benefits

r is the discount rate (annual)

n is the length of project (years)

t is the year in which the benefit or cost occurs

7. Choice of discount rate

The discount rate reflects the relative weight to be given to benefits and costs occurring in different years (Field 2003). Due to the long-term nature of forest ownership and management, discount rates dominate much forestry decision analysis (Davis and Johnson 1987).

The choice of an appropriate rate to discount future costs and benefits is a complex process. This section discusses two important considerations when selecting and using a discount rate: real versus nominal rates and private versus social rates.³⁹

Real vs. Nominal

Inflation, or the general rise in price of all goods and services in an economy (Klemperer 1996), is one component of market interest rates. Discount rates can be expressed as either real (inflation-excluded) or nominal (inflation-included) rates. The rate of return earned on investments measured in nominal values is typically called the *nominal* interest rate (Klemperer

³⁹ For a more complete discussion of public discount rate considerations, see Boardman et al. (2001) and Kohyama (2006).

1996). Most market interest rates (e.g., advertised loan or savings rates) are expressed as nominal interest rates—rates that *have not* been adjusted for inflation. Alternatively, future values are sometimes expressed in constant values, or values that *have* been adjusted for inflation. Future values expressed in constant (inflation adjusted) dollars are discounted using *real* (inflation adjusted) interest rates.

For example, if a nominal interest rate is 6%, but the expected annual inflation is 2%, then the real (inflation adjusted) interest rate is approximately 4%.⁴⁰ Therefore, if a future payment of \$100 is in current dollars (i.e., the payment will literally be \$100), then a nominal interest rate is used to discount the payment. However, if a future payment is expressed as \$100 in constant (inflation-adjusted) dollars (i.e., the actually payment is more than \$100, but inflation means that the money is only able to buy approximately \$100 worth of today's goods and services), then real interest rates are used to discount the payment to a present value.

The treatment of inflation in the interest rates used to discount future best rates is important in conducting financial and economic benefit-cost analyses. Either rate (i.e., a rate that includes inflation, a rate that excludes inflation) can be used to discount future benefits and costs. However, nominal interest rates must be used when discounting the nominal value of future benefits and costs, and real interest rates must be used when discounting real (inflation-adjusted) future benefits and costs.

All analyses performed in this study will use real discount rates and constant (inflation-adjusted) dollars. One important advantage to performing a forest investment analysis in real terms is the ease in which future benefits and costs can be estimated. If all future prices (for both benefits and costs) are expected to increase at the rate of inflation (a common and valid assumption for projects with long time horizons), today's prices can be used to estimate future project revenues and costs. Because future project benefits and costs are presented in constant dollars, real interest rates are used to discount future values to present value terms.

Private Versus Social Discount Rates

Each individual, corporation, and public agency gives different weight to future benefits and costs. Therefore, every financial and economic benefit-cost analysis has its own unique discount rate. Private individuals and corporations that perform financial benefit-cost analyses typically use an alternative rate of return (ARR) on private investments to discount future benefits (Zinkhan and Cabbage 2001). Simply put, the ARR, or private discount rate, for an individual or corporation is the rate of return (annualized) that could be received if resources were invested elsewhere. In most cases, the ARR is the rate an investor could receive by investing the money in stocks, bonds, or some other investment opportunity that yields positive returns.

Some economists argue that a private discount rate is also an appropriate social discount rate for all public agency project decisions (e.g., Harberger 1969). However, the prevailing attitude among economists is that society values future events differently than individuals and

⁴⁰ The correct conversion from nominal interest rates (i) to real interest rates (r), based on an inflation rate (m) is calculated by the formula: $r = \frac{i - m}{1 + m}$ resulting in a real interest rate of 3.92%.

corporations, and that the appropriate discount rate for public projects should be different than that of private projects.⁴¹ Therefore, a different discount rate—a social discount rate—should be used to weigh future benefits and costs of public projects.

Determining a proper social discount rate to reflect the public's time preference a difficult process that has received a considerable attention from economists.⁴² Efforts to identify the appropriate social discount rate have been longstanding and continue to develop.⁴³ Despite the wealth of literature addressing this issue, economists have yet to reach a consensus on what the appropriate discount rate should be for an economic benefit-cost analysis. Subsequently, various public agencies and departments have undertaken their own efforts to establish appropriate social discount rates for analyzing public policies or projects.⁴⁴

Examples from Public Agencies

In 1992, the Office of Management and Budget (OMB) used the marginal pre-tax rate of return on an average investment in the private sector to justify using a 7% real discount rate for analyzing public policies projects. It further recommended using 5% and 9% real interest rates when carrying out a sensitivity analysis for the project or policy.⁴⁵ However, for cost effectiveness analysis and asset sale analysis, the OMB suggested using the US Treasury borrowing rates instead of average returns to private investments. This borrowing rate is typically significantly lower than the rate used to evaluate public investments and programs. The recommended discount rate for cost-benefit analysis is updated annually, and a recent update suggests using a 3% real rate of return for long-term (30+ years) investments.⁴⁶

The Congressional Budget Office (CBO) generally uses a social rate of time preference in its economic benefit-cost analyses.⁴⁷ After conducting an analysis of real government Treasury bill rates, the CBO determined the appropriate real social discount rate is 2% (Bazon and Smetters 1999). The CBO also recommends conducting a sensitivity analysis of plus and minus 2% around this rate.

Public natural resource agencies have also developed their own discount rates for conducting benefit-cost analyses. Based on a review of alternate discount rate determinations and suggestions by other economists (Musgrave and Musgrave 1976), the USDA-Forest Service

⁴¹ See Baumol (1968), Arrow and Lind (1970), and Lind (1982).

⁴² Feldstein (1964), Baumol (1968), and Arrow and Lind (1970) were all influential papers that contributed to the theory of social discount rates and intertemporal discounting. For practical purposes, the US Environmental Protection Agency (2000), Boardman et al. (2001, pp. 227-265) and Kohyama (2006) all provide overviews of the processes used to select social discount rates and the various social discount rates used by federal agencies.

⁴³ E.g., Ramsey (1928); Marglin (1963); Baumol (1968); Harberger (1968); Arrow and Lind (1970); Arrow and Kurtz (1970); Bradford (1975); Lind (1982); Arrow et al. (1996); Portney and Weyant (1999); Tresch (2002); Azar (2007).

⁴⁴ The description of OMB and CBO discount rates is largely based on Kohyama's *Selecting Discount Rates for Budgetary Purposes* (2006).

⁴⁵ OMB *Circular A-94*

⁴⁶ 2007 revision of discount rates for OMB *Circular A-94*.

⁴⁷ To calculate certainty equivalents, predicted outcomes are adjusted to reflect the degree of risk in an investment. Once all units are expressed in certainty equivalents, a social rate of time preference can be used to discount all expected outcomes. See Lind (1982) and Arrow et al. (1996) for more details about calculating certainty equivalents.

recommends a 4% real discount rate for long-term land and resource planning. This rate is based on the real earnings rates of Aaa corporate bonds (Row et al. 1981). At the state level, the Idaho Department of Lands and the Oregon Department of State Lands both used a 5% real discount rate to recently evaluate forest land retention versus disposal options (O’Laughlin and Cook 2001; Oregon Department of State Lands 2005).

Public agency discount rates, as well as the methods used to justify the rates, vary substantially. Overall, a review of public discount rates reveals that, although discount rates can sometimes dominate long-term project analysis, there is still no agreed-to standard social discount rate that should be used when analyzing public policies or projects. Due to the uncertainty surrounding this issue, most agencies suggest conducting a sensitivity analysis that re-assesses the project’s economic efficiency using a range of discount rates.

8. Net economic effects

Typically, “economic efficiency” is the standard by which economists determine whether a policy is socially desirable. The strictest criterion for economic efficiency, Pareto efficiency, requires that all parties are made better off as a result of a reallocation of resources.⁴⁸ To apply this criterion to the policy issue of whether to retain or dispose of TFFL, society is divided into two separate groups: (1) current TFFL owners and (2) potential TFFL purchasers. Given these two separate groups, a disposal policy is only Pareto efficient if both groups, TFFL purchasers and current TFFL owners, are made better off as a result of the transaction. This is significant because, for the economic analysis of TFFL retention versus disposal, only net economic effects to TFFL owners are discussed. The analysis assumes that TFFL purchasers will be made better off as a result of a disposal policy. Therefore, the analysis only analyzes the net economic effect to current TFFL owners.

Also, the economic analysis of TFFL retention versus disposal uses a modified economic efficiency analysis. The goal remains to identify the socially desirable TFFL policy. Unfortunately, many of the TFFL economic benefits are difficult to estimate because they are nonmarket goods and services. The economic analysis describes the net change in economic benefits and, whenever possible, assigns a value to these changes. However, in some instances, the analysis describes the physical condition of TFFL or uses surrogate markets to estimate value. This technique does not explicitly answer the question of whether a TFFL disposal policy is economically efficient, but it ultimately meets the goals of the economic analysis by describing the net economic effect to society associated with alternative TFFL ownership policies.

⁴⁸ The Pareto criterion, named after an Italian economist, is the strictest criterion for efficiency and it frequently supports the “status quo” policy alternative. Therefore, this analysis may be inherently biased toward TFFL retention. See Nicholson (2005, pp. 357-358) for a description of the Pareto criterion for economic efficiency.

C. Data

The following data sources were used to conduct the economic analysis:

- All 2002-2005 county revenue and expense data were collected and submitted by the 12 county land departments participating in this study. Also, the estimated market value (EMV) of all county-administered TFFL was obtained from county assessor offices in each of the 12 counties. A more detailed description of these data is in Section II and Appendix D.
- The landowner survey data described in Section III are used to describe and estimate the characteristics of TFFL after it is sold.
- A 2001 survey by the US Department of Interior Fish and Wildlife Service (USFWS) called the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) is used to estimate the amount and distribution of hunting and wildlife recreation activity on TFFL.⁴⁹
- A review of nonmarket valuation studies throughout the U.S. yielded two data sources.⁵⁰ First, the contingent valuation portion of the 2001 FHWAR survey is used to estimate the value of TFFL public hunting opportunities.⁵¹ Second, a USDA-Forest Service report by Rosenberger and Loomis (2001), which utilizes a meta-analysis to estimate the value of a wildlife watching trip in the US, is used to estimate the value of public wildlife watching on TFFL.⁵²
- Data on Minnesota private landowners' WTA compensation to allow public access comes from a 2006 survey of more than 1,000 Minnesota family forest landowners (Kilgore et al. 2008).

D. Project Description and Expected Physical Results

Economic analysis requires a clear description of the project parameters and the expected physical consequences that follow. For purposes of this study, the “With/Without” principle is used to identify and analyze project impacts. This principle states the conditions (and associated benefits and costs) that will occur if the project is implemented are compared to the conditions (and associated benefits and costs) that will occur if the project is not implemented (Field 2003).

The “without” condition in this analysis is a policy whereby the 12 counties retain and manage TFFL. This report assumes that if county-managed TFFL is not sold, these lands will essentially remain unchanged in their amount and quality.⁵³ It is further assumed that county land departments will continue to manage this land base as described in Section II, producing the same types and level of forest related goods and services, both market and nonmarket.

⁴⁹ See Appendix D of the MN FHWAR survey for details regarding the sampling procedures and survey methods (USFWS 2003a).

⁵⁰ The most appropriate nonmarket valuation estimates were chosen based on similarities in geography, environmental conditions, and social characteristics.

⁵¹ See USFWS (2003b) for a complete description of the CV survey population, survey methods, and method of calculating mean WTP per hunting day.

⁵² See Rosenberger and Loomis (2001) for a complete description of the “meta-analysis” used to estimate the value of a wildlife watching day.

⁵³ This is a critical assumption that is supported by most county forest management plans.

Assuming identical TFFL physical conditions in the future and constant real prices, annual net income will also remain at 2002-2005 levels.

The policy alternative analyzed in this study, or the “with” condition, is one in which nearly all county-administered TFFL in the 12 northern Minnesota counties is sold.⁵⁴ Under this policy alternative, approximately 2.7 million acres of county-administered TFFL would be sold. Subsequently, the counties would no longer manage the land and local taxing districts would lose the annual net income from managing TFFL. Instead of annual income from management activities, the counties would receive payment associated with the sale of TFFL.

E. Assumptions Used in the Economic Analysis

Any project analysis involving predictions about financial, physical, and social impacts must make various assumptions. The following section summarizes some of the important assumptions made in conducting the baseline economic analysis of competing policies to retain or sell TFFL. Baseline economic assumptions are based on a combination of empirical evidence, economic theory, and the authors’ best judgment about future conditions:

- *Social Discount Rate = 3%*
As described in Section IV.B.7, the economic literature has yet to come to a consensus regarding the appropriate discount rate for evaluating public projects and policies. After a review of the economic literature and relevant public agency discount rates, a 3% discount rate is used as the discount rate for conducting the financial benefit-cost analysis. Other public agencies, such as the OMB, use a 3% discount rate. This rate is also supported by economic literature on social discount rate theory (Boardman et al. 2001).
- *County TFFL Management Will Not Change*
The analysis assumes counties will continue to manage TFFL sustainably and for multiple uses. In other words, they will continue to manage the land as described in Section II. Additionally, the analysis assumes the inputs required to manage the land (e.g., labor, equipment, office supplies) and the level of benefits produced, both market (e.g., timber and gravel) and nonmarket (e.g., public hunting, wildlife habitat, water quality, etc.), will remain at the 2002-2005 levels.
- *10 Year Disposal Period*
The study assumes that, in the case of a TFFL disposal policy, TFFL would be sold over a 10-year period. The 10-year period was chosen as an estimate for the shortest reasonable time period for a large-scale public land divestiture project. During the 10-year disposal period, one-tenth of the TFFL base in the 12 counties (272,300 acres) would be sold annually.
- *Stumpage Prices and Net Income Will Increase at the Rate Of Inflation*
According to Washburn and Binkley (1993), US stumpage prices have, on average, increased at the rate of inflation. Given this information, and examples from other forestry investment analyses (e.g., O’Laughlin and Cook 2001), this report assumes

⁵⁴ MS § 282.018 states that counties may not dispose of land that is adjacent to lakeshore property unless it has less than 150 ft of waterfront.

stumpage prices will increase over time at the rate of inflation. Since timber sales are the largest source of revenue, the study also assumes that net income generated from county managed TFFL will increase at the rate of inflation. In other words, all future annual net income from the management of TFFL is expected to equal the average net income realized by counties from 2002-2005 (in real terms).

Revenue from future market possibilities are ignored under this assumption. Markets for woody biomass energy, carbon sequestration, and various watershed services are still in the developing stages and counties do not currently receive revenue for any of these services. However, at some point in the future, as these markets develop, they could be a significant TFFL revenue source.

- *Market Value of TFFL = \$800, But Highly Variable*

County assessors estimated the average market value of TFFL in 2005 was \$817 per acre.⁵⁵ The study assumes that the EMV of TFFL will appreciate at the rate of inflation. See Appendix D for a more complete analysis of forest land prices and their effect on disposal options.

- *Local Tax Levy is Independent of Property Values*

Placing TFFL back on the tax roll under a disposal policy increases a taxing district's total taxable base but does not, by itself, generate additional revenue to the taxing district. Total tax revenue is determined by the tax levy imposed by local units of government, not property values. Also, county government service costs (e.g., road development and maintenance, fire and safety) will likely increase with the sale and subsequent development of some parcels of TFFL. Due to the dynamic relationship between tax levies, tax bases, service costs, and tax rates, this financial analysis of county-managed TFFL ignores the property tax implications of a disposal policy.

- *All individuals who derive benefit from TFFL have standing.*

In other words, all individuals who derive benefit from TFFL are considered when economic costs and benefits are computed. This group includes residents of the 12 counties, TFFL recreational users, and all individuals who benefit from TFFL ecosystem services. The determination of who has standing in an economic analysis is often controversial, but typically the decision of standing comes down to the judgment of the analyst (Whittington and MacRae 1986). In this analysis, any individual who benefits from TFFL is included in the computation of costs and benefits.

- *Future TFFL purchasers make up a small portion of the citizens who currently benefit from county-managed TFFL.*⁵⁶

For the economic analysis, we divide society into two distinct groups: (1) the current owners of TFFL (broadly defined as the public) which includes nearly all individuals who benefit from TFFL, and (2) the purchasers of TFFL. Realistically, TFFL purchasers and owners are not completely distinct groups, but this overlap can be problematic when trying to calculate the public benefits and costs associated with TFFL disposal.

Therefore, a simplifying assumption is made that TFFL purchasers and current owners

⁵⁵ This analysis ignores the transaction costs counties incur when they sell TFFL because, relative to the sale price, the costs of selling the land are very small. Ellefson and MacKay (1996) estimated costs of selling TFFL to be \$3-8 per acre. Even when adjusted for inflation, this cost represents a very small fraction of today's price of Minnesota forest land (~\$1200/acre).

⁵⁶ This is one necessary assumption if the Pareto criterion for economic efficiency is to be used.

are two separate groups and that only the benefits and costs that accrue to current TFFL owners can be calculated.⁵⁷

- Once sold to private owners, all TFFL will be managed and used in a manner similar to recently purchased TFFL.
The results from the landowner survey described in Section II are used to predict the future uses and management of TFFL under a disposal policy. Landowner motivations and activities may change over time, but the survey results provide the best estimate for future activities on TFFL under a disposal policy.⁵⁸
- If TFFL is posted against trespass, public recreation opportunities these lands provide will be lost.
The survey of purchasers of TFFL from 1996-2005 found that 63% of these owners currently or plan to post their forest land against trespass. Consequently, a disposal policy will result in a considerable portion of the TFFL land being posted against public trespass once sold and the public recreation opportunities associated with these lands lost.

This is not an exhaustive list of study assumptions—many other assumptions are made in carrying out the economic analysis. As appropriate, these additional assumptions will be clearly identified throughout the body of the analysis.

F. Economic Assessment of Land Retention

Currently, county-managed TFFL produces a wide variety of public benefits, including net income to local taxing districts, public recreation opportunities, and other environmental services. A retention policy would result in continued county-management of 2.7 million acres of Minnesota forest land. Under the assumptions of this analysis, counties would continue their commitment to sustainable forest management practices with the following characteristics:⁵⁹

- Counties will manage TFFL to produce primary forest products that support local wood products industries.
- Counties will manage the land to improve and maintain the quality of the forest and the surrounding environment.
- Counties will utilize a variety of management techniques to protect and enhance wildlife populations throughout Minnesota.
- TFFL will be managed to enhance recreation opportunities and will remain open to the public for a variety of recreational opportunities such as hunting, camping, hiking, bird watching, and cross-country skiing.

The uses and management practices of TFFL under a retention policy would provide many economic benefits, both market and nonmarket. A description and estimates of the level of public economic benefits under a TFFL retention policy are as follows.

⁵⁷ From this point forward, the term “public” will refer to all individuals that benefit from county-administered TFFL; in other words, TFFL “owners”.

⁵⁸ See Section II for a complete description of the results from the landowner survey.

⁵⁹ See Section II for a more complete description of current county management practices.

1. Market benefits from TFFL retention

Net income from the sale of TFFL timber, gravel, and leases are the primary market benefits generated from TFFL management. Counties sell approximately 654,000 cords of wood a year and generate an average of \$24.9 million in annual revenue for local taxing districts.⁶⁰ Gravel and lease receipts generate revenue of \$642 thousand and \$532 thousand, respectively. After subtracting all forest development, administrative, and operational costs, counties generate approximately \$12.3 million (\$4.53/acre) in real annual net income from the sale of TFFL market goods and services (Table 10).⁶¹

Table 10. Market based economic benefits derived from TFFL.

	2002	2003	2004	2005	Annual Average
Direct revenue	\$19,984,288	\$23,249,756	\$28,268,158	\$34,245,259	\$26,436,865
Costs	\$12,985,325	\$14,405,725	\$15,315,009	\$15,668,218	\$14,593,569
Net income (current dollars)	\$6,998,963	\$8,844,031	\$12,953,149	\$18,577,041	\$11,843,296
Net income (2005 dollars)	\$7,827,549	\$9,528,948	\$13,445,368	\$18,577,041	\$12,344,727

The NPV of a perpetual stream of income from the sale of TFFL market goods and services discounted at 3% is \$411,490,884 (\$151/acre). This value assumes constant real net income and does not address emerging markets for revenue such as woody biomass and carbon credits.⁶² Net income from TFFL market benefits is distributed to local taxing districts and the benefits are (theoretically) realized by the citizens of the managing counties through either: (1) more public services, or (2) lower property tax levies.

2. Nonmarket goods and services

Recreation

One of the most valuable nonmarket benefits provided by county-administered TFFL is public recreation. Minnesota's public forest land supplies a large portion of the state's outdoor recreation opportunities. Common types of recreation on public land include hunting, hiking, bird-watching and skiing. Nearly all of Minnesota's public forest land is open to public recreation, 24% of which is county-managed TFFL (Figure 42).

Hunting is one of the more popular recreational activities in Minnesota. The 2001 National Survey of FHWAR conducted by the USFWS estimates there are approximately 597,000 hunters that hunt in Minnesota 8,437,000 days per year (Table 11). The survey also estimates that approximately 2.81 million (33%) of the total hunting days take place on public land.

⁶⁰ MN Public Stumpage Price Review 2005

⁶¹ This estimate is based on the average real net income from 2002-2005, using only direct revenue sources (Appendix D). From an economic perspective, indirect revenue (e.g., PILT, gas tax) is simply a transfer of resources, not a true benefit to society, so it is not included as an economic benefit.

⁶² The sources of market-based benefits derived from TFFL are dynamic. For example, markets are currently developing for woody biomass derived from the nonmerchantable portion of trees (e.g., tops, limbs, branches). To the extent such new markets become established, they will expand the sources of revenue from TFFL.

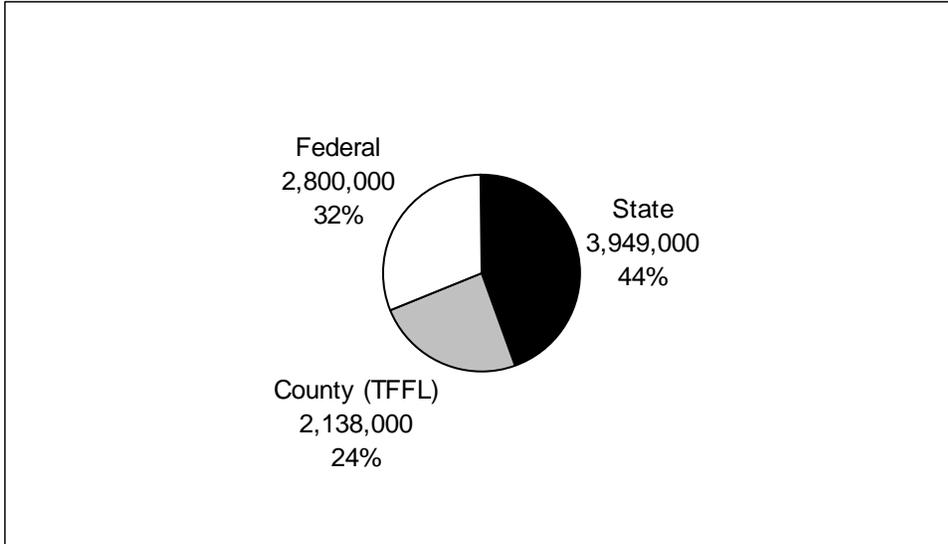


Figure 42. Distribution of MN public forest land (in acres).

Source: USDA-Forest Service FIA (Mills, 2007).

Table 11. Minnesota hunting in 2001 (age 16+).

# of hunters	597,000
Total days hunting	8,437,000
Total days hunting on public land	2,813,000
% total days hunting on public land	33

Source: USFWS (2003a)

If the number of hunting days on public land is evenly distributed across different ownership classes⁶³, approximately 928,290 days are spent hunting on county-managed TFFL annually (Table 12).

Table 12. Estimated hunting days spent on county-managed TFFL.

Days hunting on public land	2,813,000
Days hunting on TFFL (Days hunting on public land * % of public land that is TFFL)	928,290

Other forms of recreation, such as wildlife watching, hiking, biking, and cross-country skiing take place on TFFL as well, but there is very little data collected on participation rates. Therefore, even though these are important TFFL benefits, we are not able to accurately estimate the number of TFFL users.

It should also be noted that one important recreational public benefit associated with county-managed TFFL is the ability to create and maintain large, contiguous networks of public recreational trail systems. County land departments with large blocks of contiguous TFFL property can more readily develop public recreational trail systems than when public land ownership is fragmented among private land holdings. A substantially fragmented forest land

⁶³ Assumption: 32% of hunting days on public land take place on federal land, 24% take place on county land, and 44% take place on state land (See Figure 42).

ownership pattern makes it nearly impossible to acquire the access rights required of extensive public recreational trail systems.

Other Environmental Services

Recreation is only one of the nonmarket benefits provided by forest land. Some other nonmarket forest benefits are:

- climate regulation
- wildlife habitat
- soil erosion control
- nutrient cycling
- aesthetics
- cultural resource
- non-use values (e.g., existence value⁶⁴)

Counties' utilization of Minnesota's Timber Harvesting and Forest Management Guidelines (TH/FM guidelines), long-term forest management plans, and third-party certification demonstrates a commitment to sustainable forest management practices.⁶⁵ This report assumes that, under a retention policy, counties will continue sustainable forest management practices that generate many of the important environmental services listed above.

Once again, the nonmarket nature of these public benefits makes them difficult to quantify. Due to insufficient data and concerns about the appropriateness of transferring nonmarket value estimates from other sources, this report does not attempt to estimate the value of these environmental services.⁶⁶ In the future, as more forest product and service markets develop, some of the TFFL benefits listed above (e.g., carbon sequestration) may be bought and sold in a competitive market. If one or more of these markets become established, the values associated with some of the nonmarket benefits listed above can be quantified; thus provide a more complete characterization of the total economic value of Minnesota's TFFL.

G. Economic Assessment of Land Disposal

Under a TFFL disposal policy, 2.7 million acres would be sold over a 10-year period, dramatically altering the type and extent of TFFL public benefits. This section of the report describes and estimates the public benefits and costs associated with a TFFL disposal policy.

⁶⁴ Non-use values, such as existence value, are a benefit that a person receives from a natural resource without ever using any of the goods and services. In other words, people receive a benefit from the knowledge that the resource exists, even though they never plan to use or visit the resource.

⁶⁵ See Section II.

⁶⁶ The literature on the value of nonmarket ecosystem services is rich, but the results are extremely variable and often site specific. Krieger (2001) estimated the value of all forest ecosystem services through a review of various studies, including climate regulation (\$57.10/acre), erosion control and sediment retention (\$38.80/acre), and nutrient cycling (\$146.10/acre), but the authors of this report feel the results are not reliable.

1. Market benefits

The timing and magnitude of TFFL market benefits would be dramatically different under a TFFL disposal policy. Instead of steady annual income from timber, gravel, and leases, local taxing districts would receive a large financial windfall over a 10-year period from the sale of TFFL. The baseline analysis assumes TFFL would sell for an average of \$800/acre. The estimated total financial NPV (less indirect payments such as PILT) generated under a disposal policy would be \$1.91 billion (Table 13).⁶⁷

Table 13. Financial NPV of TFFL disposal for various land prices.

Land Prices (per acre)	NPV of Disposal
\$1,200	\$2,837,241,003
\$1,000	\$2,372,686,156
\$800	\$1,908,131,310
\$600	\$1,443,576,463
\$400	\$979,021,617
\$200	\$514,466,770

2. Nonmarket benefits and costs

Nonmarket benefits, which represent a significant portion of the benefits provided by TFFL, are highly dependent on the physical condition of the land. Describing the future physical characteristics of TFFL under a retention policy is relatively straightforward because county land management policies and associated practices have been consistent across counties and over time. However, projecting future TFFL physical conditions under a disposal policy is much more difficult because purchasers of former county-managed TFFL are a diverse group, with a wide range of motivations for purchasing TFFL.

Fortunately, the survey of purchasers of former TFFL helps predict future use and management under a disposal policy. A complete description of the survey results is in Section III. Based on the results from the survey and some simplifying assumptions about future TFFL purchasers, it is expected that a disposal policy will result in the following land ownership, management, and use patterns for 2.7 million acres of TFFL:

Ownership

- 82% of owners will be individuals or families, most of who already own at least one other forest land property in Minnesota.

Forest Management

- Only one-quarter of TFFL owners will speak with a professional forester within the first ten years of purchasing the land.
- Twenty-two percent will obtain a written management plan in the first 15 years.
- Approximately half of the owners will intend to harvest timber after acquiring the land.

⁶⁷ Notice the NPV of disposal is slightly less than the NPV of disposal described in the financial analysis (Appendix D). This is due to the fact that the economic analysis only considers direct income (timber, gravel, etc.) as an economic benefit; it does not include transfer payments such as PILT.

- Sixty-six percent will conduct some type of silvicultural activity. Another 10% conduct wildlife improvement projects.
- Approximately 58% of owners will plan to keep their land for an extended period of time.

Public Recreation

- Sixty-three percent of TFFL owners will post their land against public trespass.
- Approximately half of landowners who post their land will be willing to let people hunt on their land, given certain conditions are met.⁶⁸

Uses and structures

- Approximately 45% of owners will build recreational trails.
- Thirty percent of the landowners will build a house or cabin.
- Fourteen percent will construct a permanent road.
- Seventy percent will build a structure or make some other “improvement” on the land.
- Approximately 11% of the parcels will be subdivided.

Many of these changes will have significant effects on the type and level of public benefits provided by former county-managed TFFL. In some instances, such as with recreation, estimates of the changes in public benefits were possible, but quantifying the monetary value associated with changes to water quality, aesthetics, non-use values, and other environmental services are very difficult. When no or inadequate information exists to estimate the economic value of these types of services provided by TFFL, this report describes predicted changes to the physical condition of the land.

Recreation

Approximately 928,290 hunting days and 1,048,133 wildlife watching days are spent on the 2.7 million acres of current county-managed TFFL. The survey of individuals and entities that purchased TFFL over the past decade found 63% of these lands are now posted against public trespass. Applying this information to the entire TFFL land base, an estimated 1.7 million acres will be posted against trespass after county disposal, with an estimated 1 million acres of TFFL remaining open to public access.

Results from a recent survey conducted at the University of Minnesota can be used to estimate the cost of re-acquiring public hunting access on 1.7 million acres if the state’s TFFL base is sold (Kilgore et al. 2008). This 2006 contingent valuation (CV) survey asked Minnesota family forest owners what they would be willing to accept in compensation for keeping their forest land open to the public for hunting access. The survey results, shown as a logistic regression model, are in Figure 43. The graph shows the probability a forest landowner would be willing to keep their land open for public recreation access given a range of annual payment amounts. The dashed line represents the probability a random landowner would accept the payment; the solid line represents the probability a landowner who currently posts his or her land would accept the payment.

⁶⁸ Most often, this means that they must know, or trust, that the persons on their land will act responsibly.

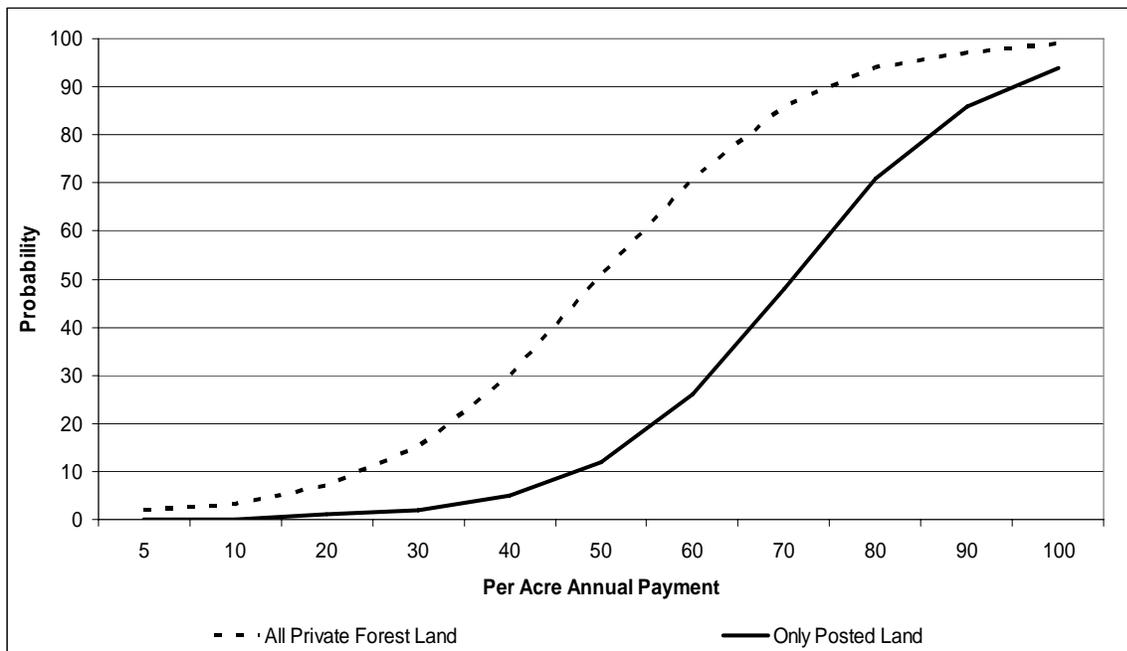


Figure 43. Estimated probability of acquiring public hunting access rights on Minnesota family forest land. Source: Kilgore et al. (2008)

Using results from the landowner CV survey, and other important information about forest land ownership in the area, the cost (in present value terms) of purchasing public hunting access rights to replace the acres of forest land open to public recreation lost after the sale of TFFL was estimated at \$3.6 billion (\$1,338/acre of TFFL sold) (Table 14).

Another loss of public benefits associated with disposal is the inability to create and maintain a contiguous recreational trail system. If TFFL is owned by a large number of families and individuals, many of whom post their land against trespass, then it is likely that the recreational trail system developed by county land departments would become obsolete. Most of the public benefits associated with these public recreational trails would be lost.

Other Environmental Services

As previously discussed, environmental services are difficult to estimate; therefore, this report simply describes future forest land management and uses, without any quantitative description of the change in services or the value of these services.

Under a TFFL disposal policy, much of the land would still provide valuable ecosystem services. An estimated 30% of these landowners will build a house or cabin on the property and 14% of landowners will construct a permanent road. Also, only 11% are expected to subdivide the TFFL parcel they purchased. These estimates suggest that while some of the land will be developed, a large portion of the land will likely remain undeveloped forest land.

Table 14. Estimated cost of replacing lost recreational opportunities after TFFL disposal.

Row	Value	Descriptions	Remarks
A	2,844,900	Acres of family forest land acres in the study area (before sale) ⁶⁹	
B	2,723,000	Acres of TFFL sold under a disposal policy	
C	82%	Percent of TFFL that is sold to family forest owners ⁷⁰	
D	2,232,860	Acres of TFFL that become family forest land after disposal	B*C
E	5,077,760	Total family forest land acres in the study area (after sale)	A+D
F	63%	% of family forest land that will be posted ⁷¹	
G	3,198,989	Acres of posted family forest land in the study area	E*F
H	1,715,490	Acres that are needed to replace lost TFFL recreation	B*F
I	54%	Percent of owners that are needed to sell hunting access rights ⁷²	H/G
J	\$72.50	Per acre payment needed to replace lost public access	Figure 43
K	3%	Discount rate	
L	\$3,642,516,482	Capitalized cost ⁷³	
M	\$1,338	Capitalized cost per acre of TFFL	L/B

Forest management can also impact the condition of the land and the level of environmental services. An estimated 25% of landowners are expected to contact a professional forester for advice on how to manage their land and 22% are expected to obtain a written forest management plan for their property. Sixty-six percent of the landowners are expected to conduct some type of silvicultural activity on their property within the first 15 years, and another 10% are projected to conduct a wildlife habitat improvement project. Clearly, the level of professional expertise used for management is likely to significantly decrease under a retention policy, but much of the land will still be actively managed.

H. Net Change in Economic Value Associated with TFFL Disposal

A comparison of the public benefits associated with TFFL retention versus disposal is used to evaluate the economic efficiency of each option. Benefits are estimated for market goods and services, and two recreation activities: hunting and wildlife viewing. For environmental services that are more difficult to measure, changes to land management and uses that may affect the condition of the forest land are described.

⁶⁹ Miles et al. (1995), Minnesota Forest Statistics, 1990, Revised.

⁷⁰ Section II, Table 8.

⁷¹ Section III, Table 9. Also assumes that families that purchase TFFL will post their land at the same rate as all other organizations.

⁷² Assumes landowner probability of accepting the payment does not depend on the size of the parcel—an assumption that is supported by the results in Kilgore et al. (2008).

⁷³ Assumes the public access rights for 1.7 million acres will be purchased over a 10 year period (i.e., 170,000 acres of perpetual public access rights will be secured each year for a 10 year period).

1. Market benefits

A summary of the estimated public benefits generated from the sale of market goods and services under retention and disposal is shown in Table 15. Counties can generate market benefits (i.e., net income) two ways: direct annual income (i.e., the sale of forest goods and services, such as timber, gravel, and leases) and the sale of TFFL. This analysis estimates that a TFFL disposal policy would generate approximately \$1.5 billion more net income than a retention policy.

Table 15. NPV of market benefits under TFFL retention versus disposal.

Market Benefit	Retention	Disposal⁷⁴	Change Associated with Disposal
Direct Annual Income	\$411,490,884	\$49,911,924	-\$361,578,960
Sale of TFFL	NA	\$1,858,219,386	\$1,858,219,386
Total	\$411,490,884	\$1,908,131,310	\$1,496,640,426

2. Nonmarket benefits and costs

Recreation

All 2.7 million acres of TFFL will remain open for public recreation access under a retention policy. A TFFL disposal policy would reduce the amount of land available for public recreation by an estimated 1.7 million acres. To fully compensate for the loss of public recreation, it would cost an estimated \$3.6 billion (in present value terms) to purchase in perpetuity the public access rights to 1.7 million acres of privately owned forest land in the 12 counties (Table 16).

Table 16. Cost of providing 2.7 million acres of public recreation access under TFFL retention versus disposal policies.

Cost	Retention	Disposal	Change Associated with Disposal
Cost of Providing Public Access	0	(\$3,642,516,482)	(\$3,642,516,482)

A disposal policy would also likely greatly reduce amount of contiguous recreational trails on TFFL. The fragmented ownership pattern would make it difficult to achieve the level of coordination needed to develop a significant recreational trail network.

Other Ecosystem Services

A TFFL disposal policy would have a significant impact on other ecosystem services, such as aesthetics, nutrient cycling, soil erosion prevention, and non-use values. Unfortunately, these other TFFL ecosystem services are extremely difficult to value. Since reliable estimates of value are unavailable, Table 17 describes predicted changes to the physical condition of TFFL under a disposal policy.

⁷⁴ We assume that TFFL disposal would occur over a ten year period, therefore, the land that is not sold until the end of the period will still generate some annual income from timber, gravel, and leases.

Table 17. Summary of TFFL physical condition under retention and disposal policies.

Landowner Activity	Retention	Disposal⁷⁵	Change Associated with Disposal
Development, Structures, and Subdivision	No new structures	30% of properties will have houses and cabins, 14% will build permanent roads, 11% of land will be subdivided.	30-50% of properties will have reduced ecosystem services from development and construction.
Management and long-term planning	Sustainable land management for multiple uses	Only 22% of the land will have a management plan, but approximately 66-75% of landowners actively manage the forest land.	Significant (~75%) reduction in long-term, professional planning and management, but still a lot of management activity.

Most development (e.g., building houses and cabins, building roads, subdividing parcels) on former TFFL will likely decrease the level of forest ecosystem services and associated public benefits. The effects of decreased professional forest management are less certain, but they may adversely affect overall ecosystem services as well.⁷⁶

3. Further analysis of TFFL public recreation

Since public recreation on TFFL is such an integral part of the economic analysis, the authors feel it deserves more attention. The baseline economic analysis used a contingent valuation (CV) survey of Minnesota forest landowners to estimate the cost of acquiring public access rights to private forest land to compensate for the loss of TFFL public recreation opportunities. However, it did not provide an estimate of how much TFFL users value public recreation opportunities. Therefore, in this section, an alternative technique uses two nonmarket valuation studies to estimate the value of lost public hunting and wildlife watching opportunities under a disposal policy. The results are then compared to the baseline analysis.

The 2001 FHWAR survey included a CV question that can be used to determine the economic benefit (i.e., consumer surplus) a hunter experiences with a day of hunting. Fifty-five Minnesota deer hunters were asked what the maximum amount they would be willing to pay, in addition to the recreational expenses, to go on a deer hunting trip in Minnesota. FHWAR CV survey results are summarized in Table 18. The mean additional WTP per deer hunting day, beyond the costs already incurred, was \$46.⁷⁷ Thus, the estimated economic benefit associated with one day of deer hunting in Minnesota in 2001 was \$46.⁷⁸ Adjusted to 2005 dollars, the estimated average value of deer hunting in Minnesota is \$53.40 per day.

⁷⁵ Fifteen years after disposal.

⁷⁶ Lower levels of forest management could either increase or decrease the level of TFFL ecosystem services, depending on the ecosystem service we are valuing. For example, timber harvesting may enhance wildlife habitat and forest health, but it may also decrease the forest aesthetic value.

⁷⁷ This estimate is consistent with other hunting valuation studies. First, results from the FHWAR survey of 90 hunters in Wisconsin suggest that the consumer surplus associated with a hunting day in Wisconsin is also \$46. Through a review of recreation demand studies, Rosenberger and Loomis (2001) found that the average consumer surplus gained during a big game hunting day was \$43.17, and \$35.70 for small game hunting (both in 1996 dollars).

⁷⁸ See USFWS (2003b) for a more complete description of how economic benefits of recreation trips are measured.

Table 18. Estimate of the value of Minnesota deer hunting.

	Mean	Standard error
Value (consumer surplus) per day (2001 dollars)	\$46.00	\$10.00
Inflation adjusted value (2005 dollars)	\$53.40	\$11.61

Source: USFWS (2003b)

Assuming the value of all hunting experiences (e.g., big game, small game, etc.) are equal,⁷⁹ if there were 928,290 annual hunting days on county-managed TFFL in 2005, the total estimated value of TFFL hunting opportunities in 2005 would be \$49,570,686 (\$18.20/acre). Assuming the number of hunting days and the value of a hunting day remain constant, the NPV of a perpetual stream of TFFL hunting opportunities is approximately \$1,652,356,200 (\$607/acre) (Table 22).

County-managed TFFL provides many other recreational benefits in addition to hunting. For example, individuals enjoy visiting forests to observe, photograph, and feed wildlife; all of which will be referred to as “wildlife watching” for the remainder of this report. In 2001, approximately 634,000 individuals made trips away from their home for the main purpose of watching wildlife in a natural setting (Table 19). They spent a total of 13.23 million days watching wildlife and 78% visited a public area at least once.

Table 19. Minnesota wildlife watching in 2001.

Total number of wildlife watchers	634,000
Total days wildlife watching	13,234,000
Percent of wildlife watchers who visited public land	78%

Source: USFWS (2003a).

Assuming 33% of all wildlife watching days occurred on public land, approximately 4.37 million days were spent wildlife watching on public land in 2001 (Table 20).⁸⁰ If wildlife watching is evenly distributed across public forest land ownership classes, then 1.05 million days of wildlife watching occurred on county-managed TFFL.

Table 20. Estimated wildlife watching days on TFFL

Number of wildlife watching days on public land (total # of wildlife watching days * % recreation days spent on public land)	4,367,220
Number of wildlife watching days on TFFL (# wildlife watching days on public land * % of public land that is TFFL)	1,048,133

The CV component of the FHWAR survey also asked wildlife watchers about their additional WTP for a wildlife-watching trip in Minnesota. Survey results suggested a mean economic

⁷⁹ Evidence from Rosenberger and Loomis (2001) suggests that big game hunting is slightly more valuable than other types of hunting, however, there is not enough information specific to Minnesota hunting to accurately estimate the value of these other hunting experiences. Therefore, we simply use the value of big game hunting to estimate all hunting types, which may overestimate the total hunting value.

⁸⁰ Assumption: It is unreasonable to assume that all 78% of wildlife watchers that use public land use public land exclusively. Therefore, we use the data from hunting in Minnesota to estimate the% of total recreation days spent on public land (33%, from Table 11).

value of \$46 per day for wildlife watching. However, unlike the deer hunting CV results, the standard error of the estimate was very high and not statistically different from zero at the 95% confidence level.

Instead of using the FHWAR survey, this analysis uses a report by Rosenberger and Loomis (2001) to estimate the value of wildlife watching in Minnesota. Based on a review of 16 studies, they estimated that the mean value (in 1996 dollars) of a wildlife watching day in the US is \$30.67 (S.E.=1.38) (Table 21).

Table 21. Estimate of wildlife watching value in the US.

	Mean	Standard error
Value (consumer surplus) per day (1996 dollars)	\$30.67	\$1.38
Inflation adjusted value per day (2005 dollars)	\$42.90	\$1.93

Source: Rosenberger and Loomis (2001).

Assuming the results are transferable to wildlife watching in Minnesota, the average economic value of a day of wildlife watching in 1996 in Minnesota was \$30.67.⁸¹ Adjusting for inflation, the estimated value of a Minnesota wildlife-watching day in 2005 dollars is \$42.90. If 1.05 million wildlife watching days occur on TFFL, then the total annual value of wildlife watching on TFFL is \$44,964,906 (\$16.51/acre) and the NPV of a perpetual stream of annual wildlife watching is \$1,498,830,190 (\$550/acre) (Table 22).

Table 22. NPV of TFFL hunting and wildlife watching opportunities.

NPV of hunting benefits (<i>annual hunting benefits / discount rate</i>)	\$1,652,356,200
NPV of wildlife watching benefits (<i>annual wildlife watching benefits / discount rate</i>)	\$1,498,830,190
Total NPV of TFFL hunting and wildlife watching benefits	\$3,151,186,390

The estimated total value (in present value terms) of TFFL hunting and wildlife watching opportunities is \$3,151,186,390 (\$1,157/acre) (Table 22). If it is assumed that, under a disposal policy, 63% of all TFFL recreation days are lost because the land will become posted, then the estimated value of lost public TFFL recreation opportunities is \$1,985,247,426 (Table 23).

Table 23. Value of lost TFFL hunting and wildlife watching under disposal policy.

Total value of TFFL recreation	\$3,151,186,390
TFFL recreation opportunities lost under a disposal policy	63%
Total value of lost TFFL recreation under disposal policy	\$1,985,247,426

⁸¹ Combined with the \$46/day estimate from the FHWAR survey, the estimate from Rosenberger and Loomis (2001) provides more support that estimates of \$30-45 per day of wildlife viewing are realistic. The authors recognize that the \$30.67/day estimate may not meet the requirements for a proper benefit transfer (Rosenberger and Loomis 2001). However, we feel that the need to provide an estimate of TFFL wildlife watching value outweighs the inherent inaccuracies that arise as a result of the simple benefit transfer.

The alternative estimate of the value of lost TFFL recreational value (Table 23) should be met with a certain level of skepticism. This analysis assumes that, under a disposal policy, the value of all recreation days that took place on TFFL that becomes posted (63%) will be lost. In reality, individuals who previously used TFFL will not stop all recreation trips. Recreation days may decrease, but many people will find other land to use and the value of all hunting and wildlife watching days will not be lost under a disposal policy. Therefore, \$1.99 billion is an estimate of the *maximum* value of lost public hunting and wildlife watching opportunities under a disposal policy—the true value of lost recreation is likely significantly lower.⁸²

Summary of Alternate Estimate of Lost Public Recreation

Results from the CV portion of the FHWAR survey and a report by Rosenberger and Loomis (2001) indicate that county-managed TFFL provides 928,000 hunting days and 1.05 million wildlife watching days worth approximately \$3.2 billion. Assuming 63% of TFFL recreation days will be lost under a disposal policy, the net loss in public benefits is \$1.99 billion.

However, the value of *lost* recreational opportunities under a disposal policy is almost certainly less than \$1.99 billion because recreational users will find other forest land to use.

I. Summary of Economic Analysis

Table 24 summarizes the results of the baseline economic analysis of TFFL retention versus disposal. The economic analysis assessed changes in the economic benefits associated with the sale of TFFL. It did so by considering many of the nonmarket goods and services provided by TFFL.

The results from the economic analysis suggest that a policy to completely dispose of TFFL would likely decrease net economic benefits, primarily due to the loss of public recreation opportunities. Local governments would receive significantly higher levels of funding, but the loss in public recreation opportunities greatly outweighs this financial gain. Looking at only market goods and services (e.g., timber, gravel) and public recreation opportunities, we estimate that a disposal policy could reduce public economic benefits by as much as \$2.1 billion. In addition to lost recreation benefits, the reduced ecosystem services that result from increased development on TFFL would make a disposal policy even less desirable.

⁸² The results of both public recreation analyses indicate that if all TFFL is sold, the counties should not use the proceeds to re-acquire access rights to maintain public recreation opportunities. The maximum value of lost recreation opportunities is \$1.99 billion (Table 23), but the cost of purchasing public recreation opportunities is \$3.6 billion. Therefore, under a disposal policy, it would not be a wise use of public resources to re-acquire the full amount of public access rights.

Table 24. Summary of results from the TFFL economic analysis.

Public benefits/costs	Retention	Disposal	Net change associated with disposal
Market benefits			
<i>Income from timber, gravel, leases</i>	\$411,490,884	\$49,911,924	(\$361,578,960)
<i>Income from land sales</i>	\$0	\$1,858,219,386	\$1,858,219,386
Nonmarket			
<i>Recreation</i>			
<i>Cost of providing public recreation access</i>	\$0	(\$3,642,516,482)	(\$3,642,516,482)
<i>Recreational trail network</i>	Large, contiguous recreational trail network	Fragmented ownership pattern with smaller trail network	Significant decrease in contiguous recreational trail creation and maintenance
<i>Other ecosystem services</i>			
<i>Development/structures</i>	No new structures	30% of properties have houses and cabins, 14% of landowners construct permanent roads, 11% of land is subdivided.	30% of properties have reduced ecosystem services due to development and construction.
<i>Management, long-term planning</i>	Sustainable land management for multiple uses	Only 25% of the land will have a management plan and only 58% of owners plan to keep the land long-term, approximately 3/4 of landowners actively manage the forest land.	Significant (~75%) reduction in management plans and profession forest management advice, but still active management on 75% of the land.
Change to public benefits associated with a TFFL disposal policy^a	<i>Estimated net change in economic benefits: (\$2,145,876,056)</i>		

^a *Additional changes where economic benefits are not estimated:* 30% of properties will have homes or cabins, 14% will have permanent roads, and 11% will be subdivided; only 25% of landowners will contact a professional forester, but 75% will perform some type of management activity.

J. Analysis of Uncertainty

The large number of assumptions made in the economic analysis make it difficult to perform a sensitivity analysis similar in extent to the one performed in the financial analysis (Appendix D). Therefore, only three major sources of uncertainty in the economic analysis are discussed further. This discussion is intended to aid in the interpretation of the TFFL economic analysis results.

1. Other ecosystem services

One source of uncertainty is the treatment of TFFL ecosystem services. The value of *other* TFFL ecosystem services, including aesthetics, nutrient cycling, and soil erosion prevention were not estimated in the economic analysis due to the lack of reliable valuation data. However, if county governments want to assess the total economic benefits associated with TFFL retention versus disposal policies, these ecosystem services must be incorporated into the decision making

process. From an economic perspective, they are important TFFL benefits that cannot be ignored.

2. Separating TFFL purchasers and TFFL sellers

Generally, economic analyses are performed from society's perspective. In this case, society, or the *public*, is defined as all individuals who benefit from county-managed TFFL and do not purchase TFFL. The economic analysis of a disposal policy ignores all benefits that accrue to individuals who purchase TFFL. Once again, this is an aspect of the economic analysis that may provide uncertainty and/or bias. Since the benefits to TFFL purchasers are ignored in the economic analysis, the net economic benefits of a disposal policy are likely underestimated and the analysis is inherently biased towards TFFL retention.

3. Lost public recreation

Public recreation was the only TFFL nonmarket value quantified in the economic analysis. The baseline analysis estimated that the cost associated with lost public recreation under a TFFL disposal policy would be \$3.6 billion (\$1,338/acre). However, the interpretation of this estimate of TFFL recreation value must be clarified.

The baseline economic analysis used data from a recent Minnesota landowner CV survey to estimate what it would cost to keep 2.7 million acres of forest land open for public hunting under a disposal policy. Under a disposal policy, it would cost approximately \$3.6 billion to purchase sufficient public access rights from private landowners to compensate for a loss of public recreation opportunities. This is *not* an estimate of how much the public (i.e., TFFL sellers) values recreation opportunities that are lost under a disposal policy. Instead, it estimates what it would cost the public to maintain current levels of recreation opportunities under a disposal policy.

K. Distribution of Economic Benefits

Comparing economic costs and benefits is only a part of the policy decision-making process. Economists and political scientists recognized long ago that policy decisions are not solely based on the magnitude of benefits and costs. Instead, the distribution of benefits amongst different segments of society often guides policy creation. To address this limitation, this section describes the effect a TFFL disposal policy would have on different groups of people who derive benefit from TFFL.

One strategy used to assess the distribution of economic benefits is to identify the winners and losers associated with a policy change. This technique identifies and describes the segments of society that benefit from a policy (i.e., winners), and those that are adversely affected (i.e., losers). While not highly technical, a description of winners and losers provides important information that can be used to make difficult policy decisions that balance financial, economic, scientific, social, and political criteria.

The analysis of the distribution of TFFL public benefits focuses on two major segments of society: (1) individuals who live in the 12 counties that currently manage TFFL, and (2) individuals who do not live in the 12 counties.

Broadly, results from the economic analysis suggest that individuals who primarily benefit from TFFL nonmarket goods and services will be negatively affected by a disposal policy and individuals who primarily benefit from increased local government funding will be positively affected. A TFFL disposal policy will reduce the area of forest land that is open for public recreation by approximately 63%. Also, increased development may impact wildlife populations, nutrient cycling, soil erosion, aesthetics, and nonuse values. For the individuals who currently benefit from these TFFL nonmarket goods and services, a TFFL disposal policy would have significant adverse effects.

The change in characteristics of TFFL public benefits (i.e., fewer nonmarket goods and services, more financial benefits) has important distributional implications (Table 25). First, a disposal policy would significantly enhance the financial status of the 12 counties and benefit many of the residents. Counties would receive approximately \$1.5 billion more net income from TFFL disposal, nearly all of which would benefit residents in the 12 counties through reduced total local property tax levies. On the other hand, most costs associated with a disposal policy would affect residents that benefit from TFFL nonmarket goods and services, such as public recreation. Therefore, individuals who do not live in the 12 counties (or own real estate in this area) would lose valuable nonmarket goods and services provided by county-managed TFFL, while not receiving any of the financial benefits from the land sale.

Table 25. Summary of the distribution of TFFL benefits under a disposal policy.

Segment of Society⁸³	Gains	Losses	Overall Change
Residents of 12 counties	One-time financial gain for local governments	Reduced nonmarket benefits (e.g., recreation)	+ Likely a net increase in economic benefits
TFFL users not in the 12 counties	Very few	Reduced nonmarket benefits (e.g., recreation)	- Likely a net decrease in economic benefits

Current Minnesota law provides little guidance on the appropriate distribution of public benefits. MS§282.01 specified that TFFL should be managed for public benefits, but it is unclear whether the relevant public includes only residents of the 12 counties, or all users. Policy makers should be aware that a TFFL disposal policy would benefit Minnesota residents who live in the 12 counties and primarily benefit from increased local government funding. Alternatively, residents who live outside the 12-county area and who primarily benefit from the nonmarket TFFL goods and services will be adversely affected.⁸⁴

⁸³ Notice that the three categories are not mutually exclusive. Also, purchasers of TFFL are not included in the analysis of public economic benefits.

⁸⁴ Recall this analysis only examined benefits to TFFL sellers (i.e., the public), not TFFL purchasers. A disposal policy would certainly benefit TFFL purchasers; likely a middle-high income class of residents.

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Appendix A: Distribution of TFFL by Covertypes and Age Class

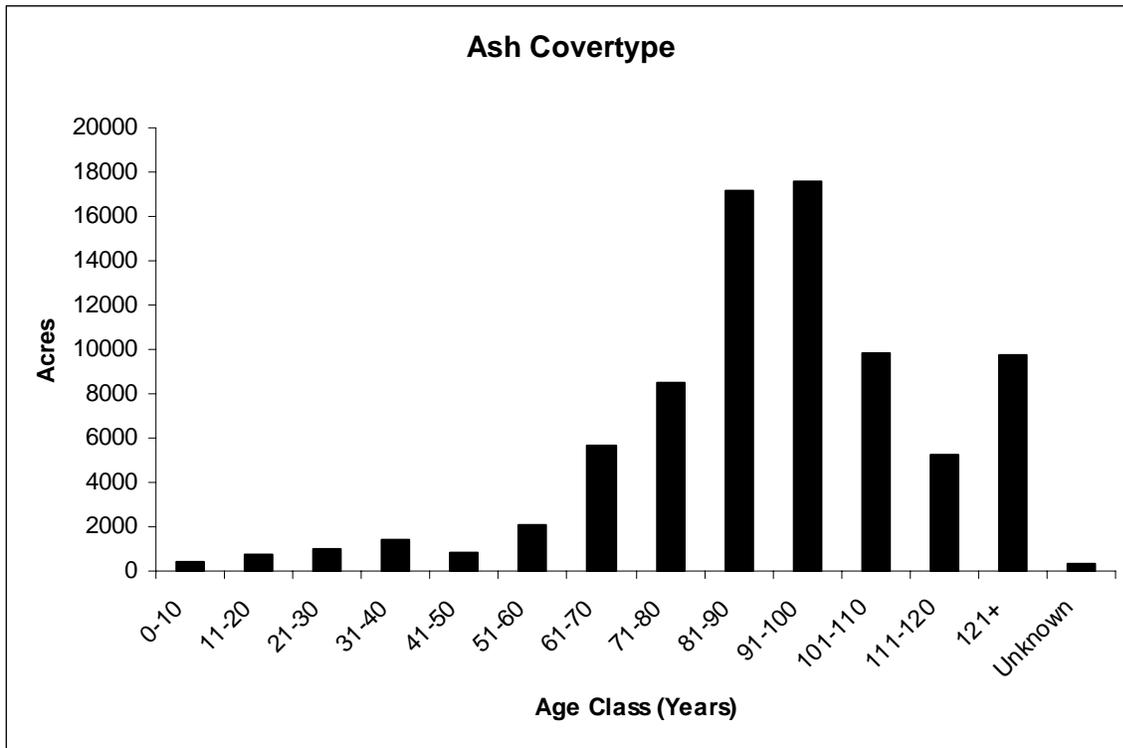


Figure A.1. Area of ash covertypes by age class.

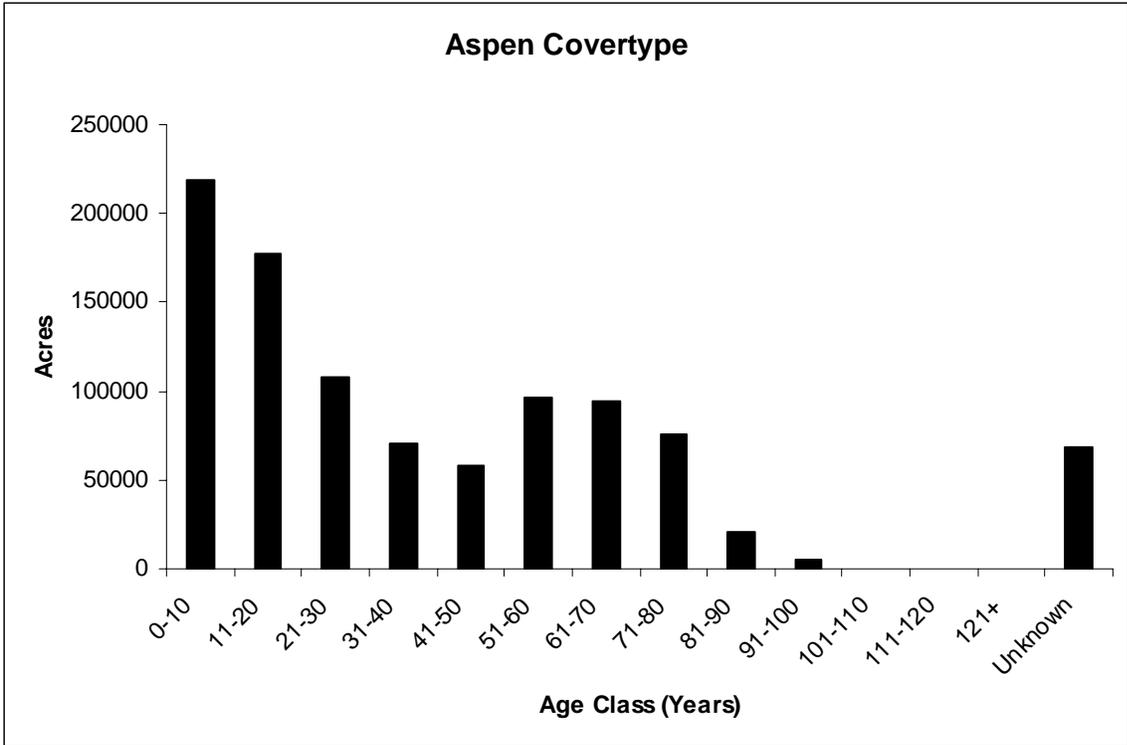


Figure A.2. Area of aspen covertypes by age class.

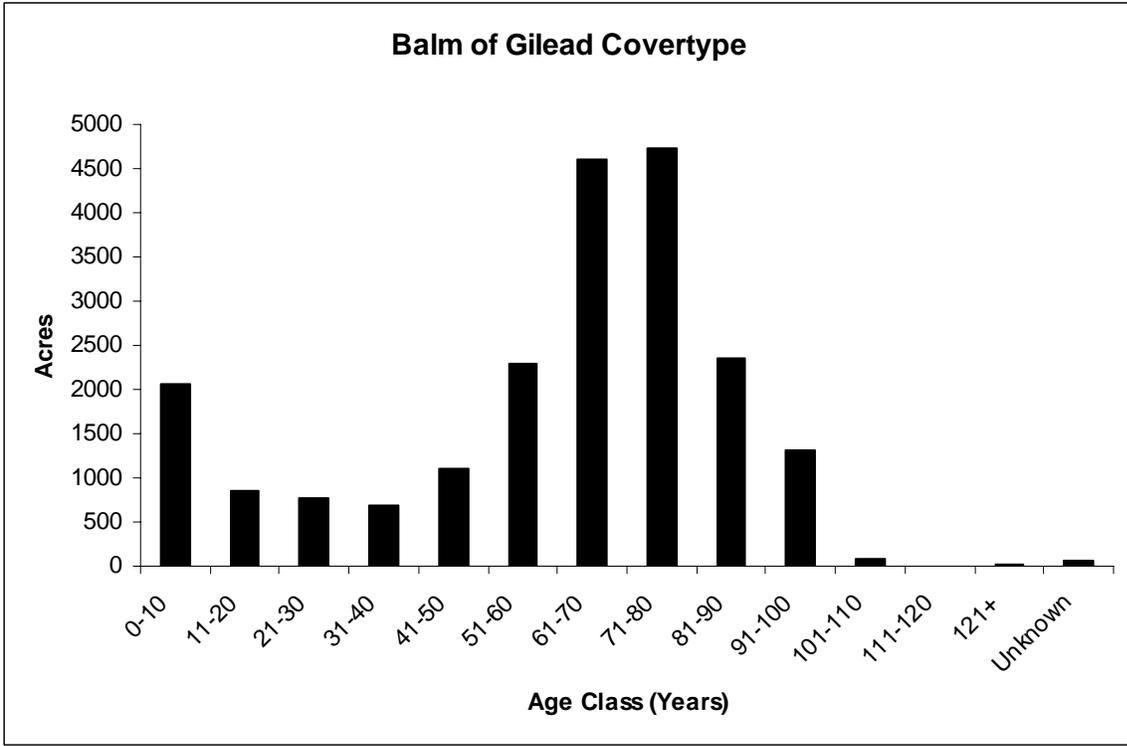


Figure A.3. Area of balm of gilead covertypes by age class.

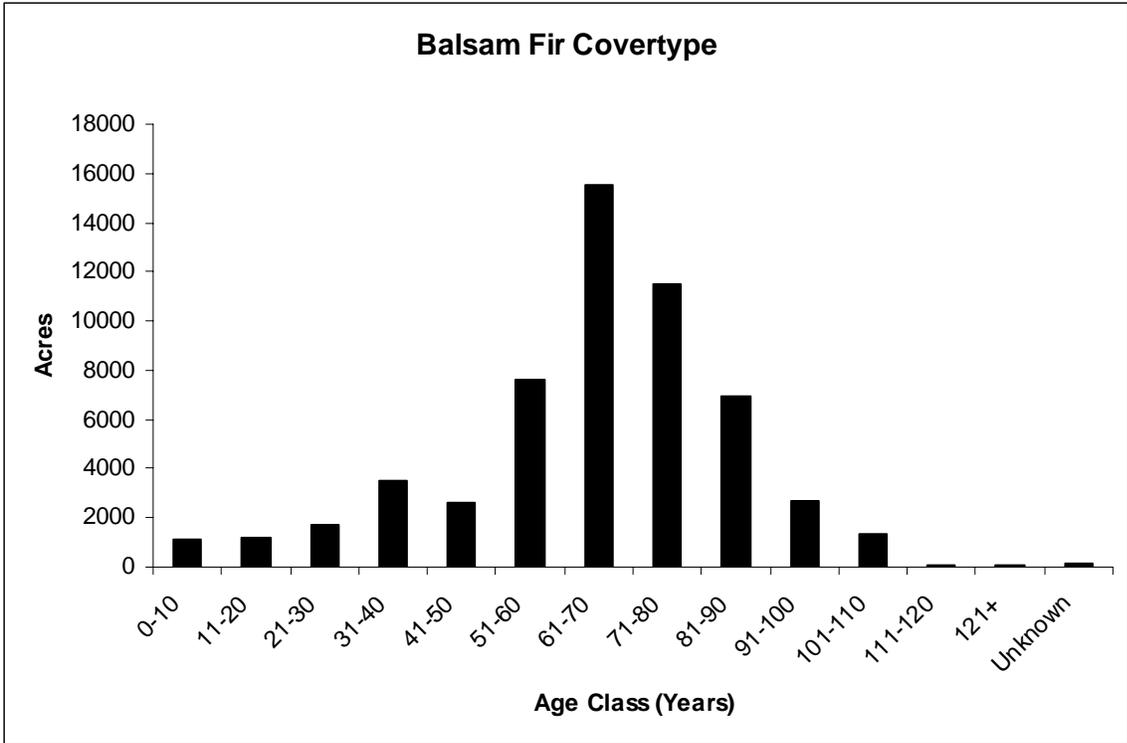


Figure A.4. Area of balsam fir covertypes by age class.

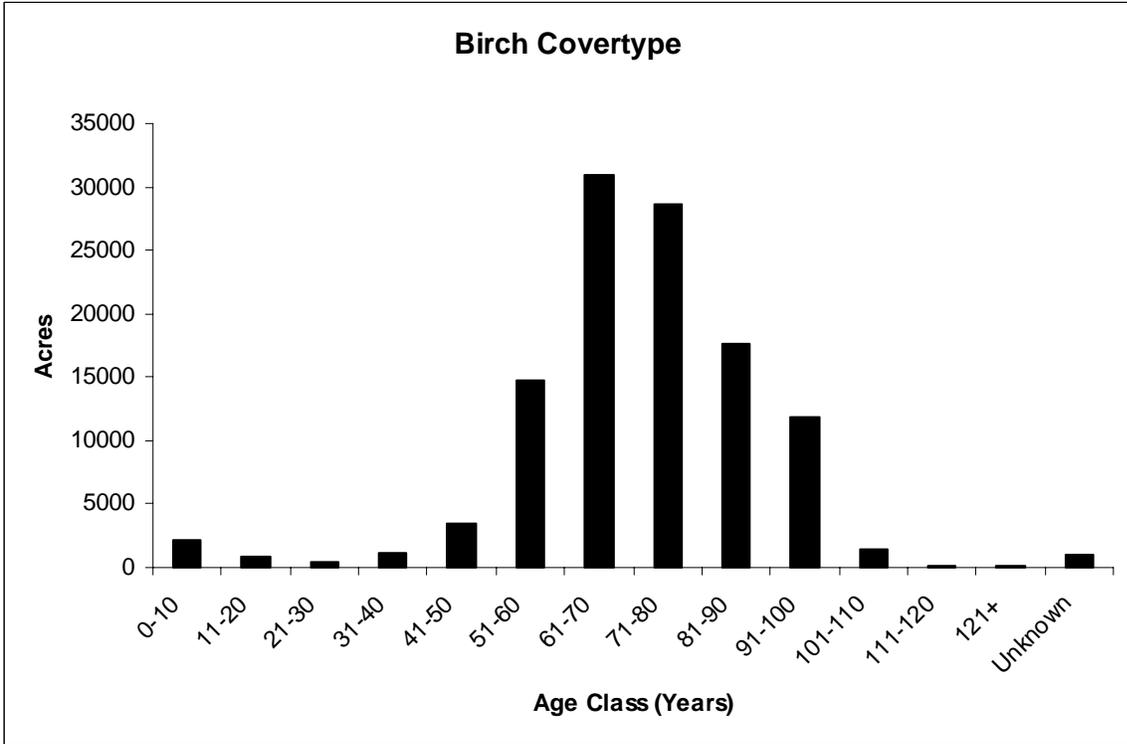


Figure A.5. Area of birch covertypes by age class.

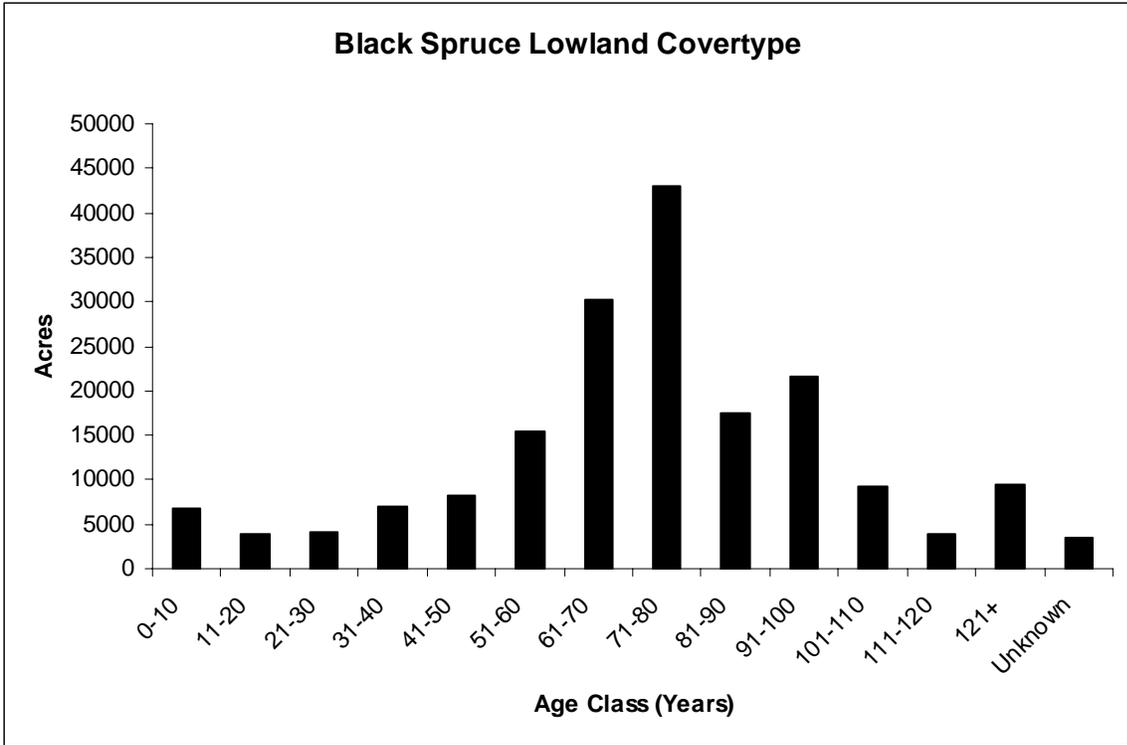


Figure A.6. Area of black spruce lowland covertypes by age class.

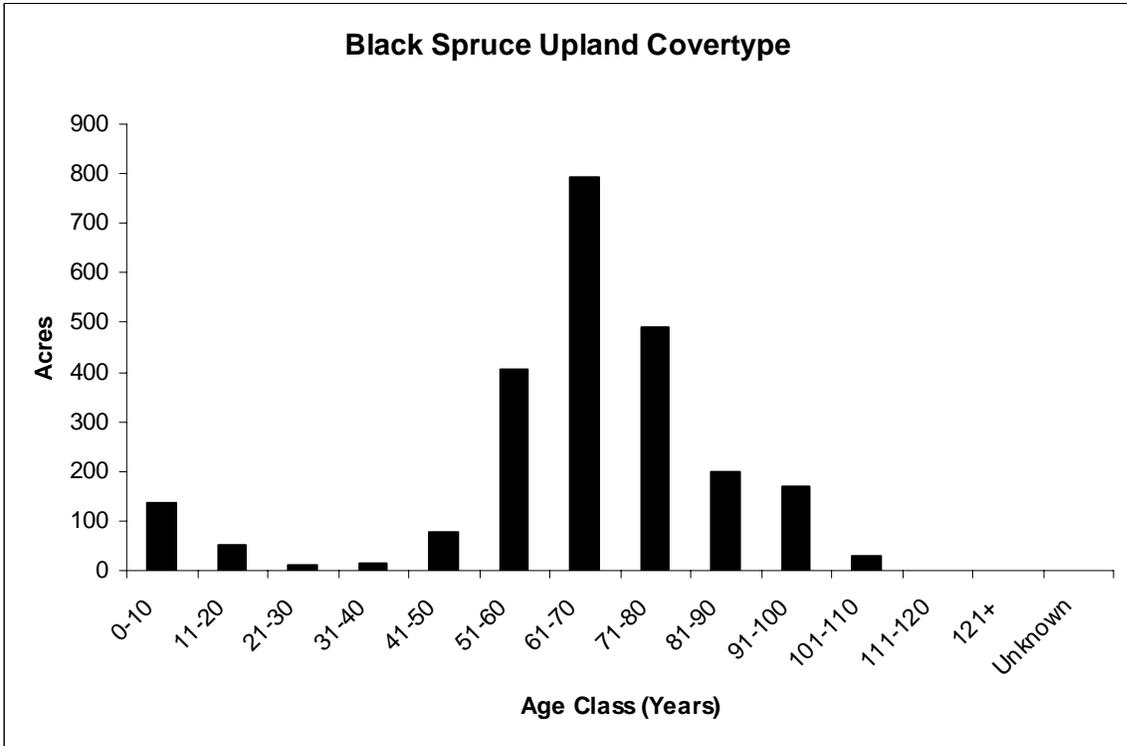


Figure A.7. Area of black spruce upland covertypes by age class.

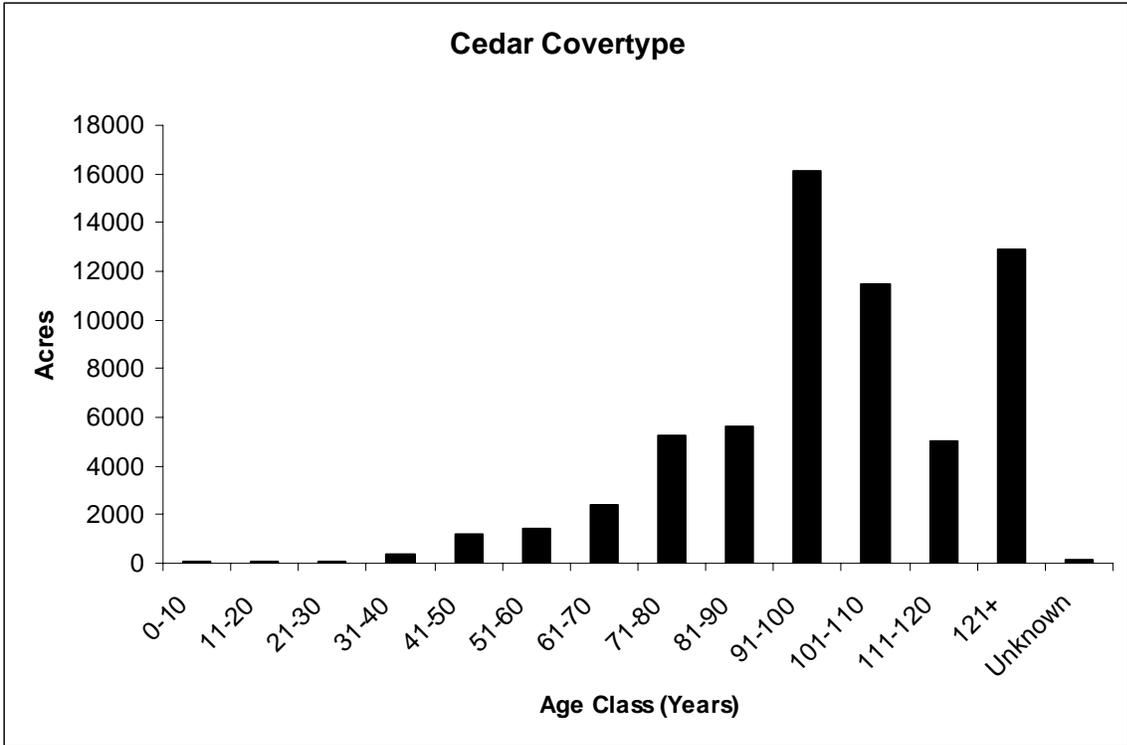


Figure A.8. Area of cedar covertypes by age class.

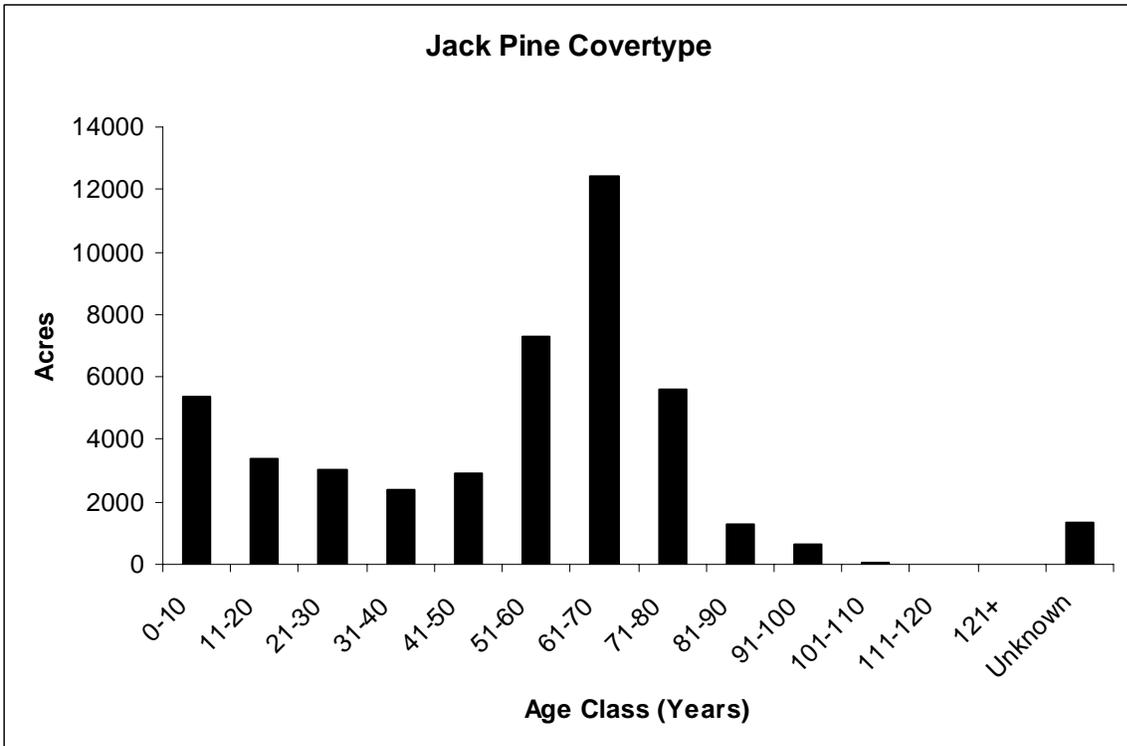


Figure A.9. Area of jack pine covertypes by age class.

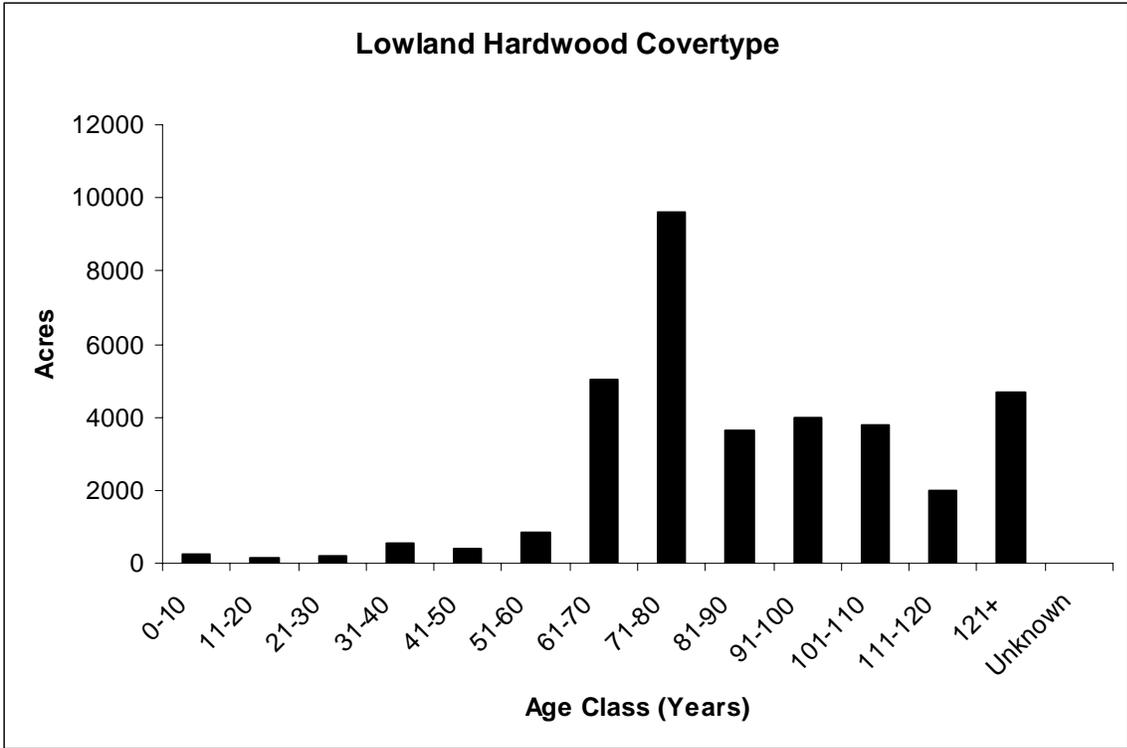


Figure A.10. Area of lowland hardwood covertypes by age class.

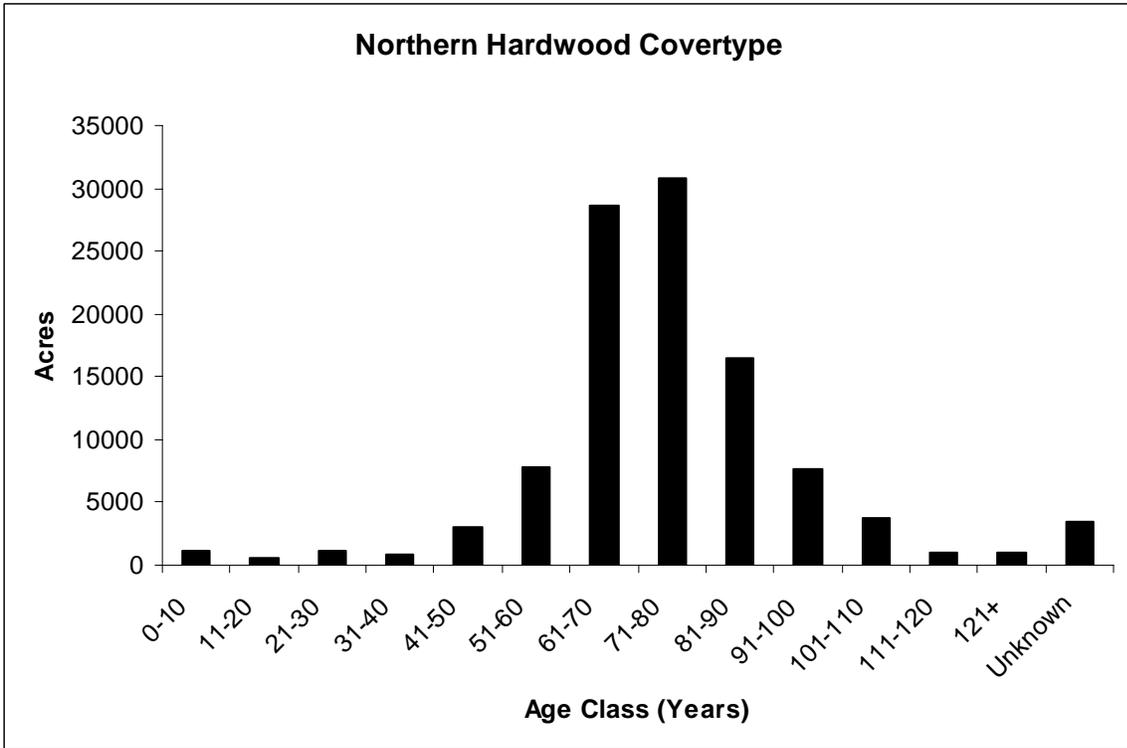


Figure A.11. Area of northern hardwood covertypes by age class.

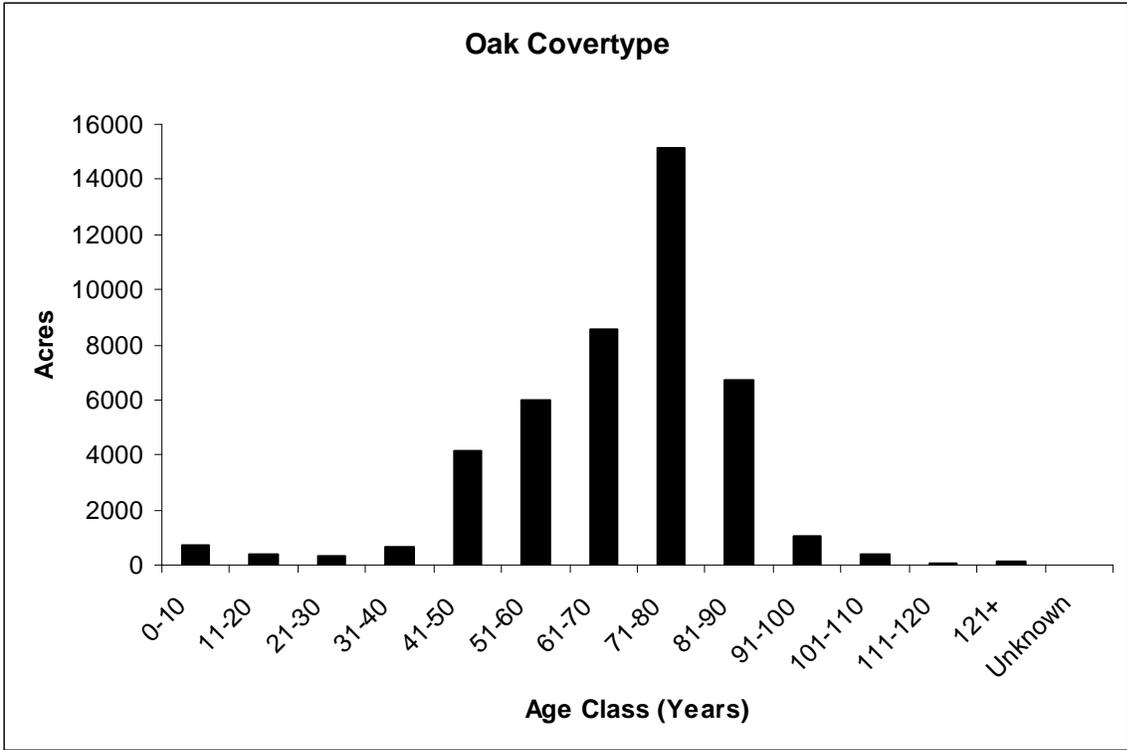


Figure A.12. Area of oak covertypes by age class.

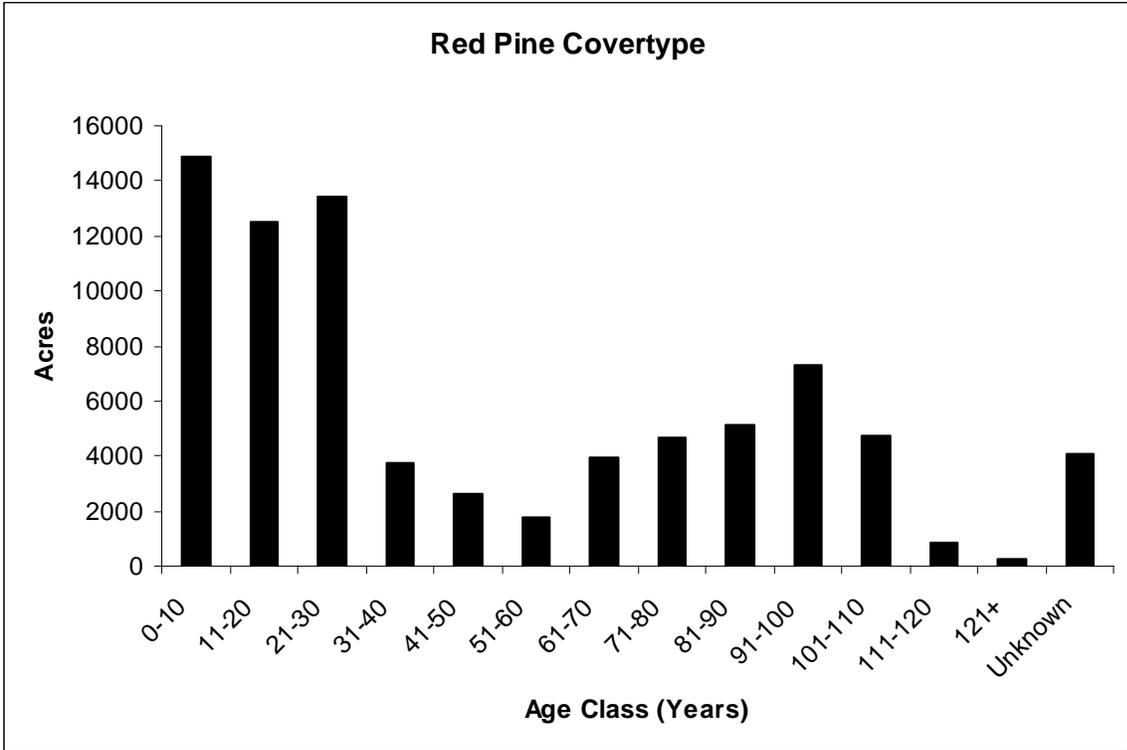


Figure A.13. Area of red pine covertypes by age class.

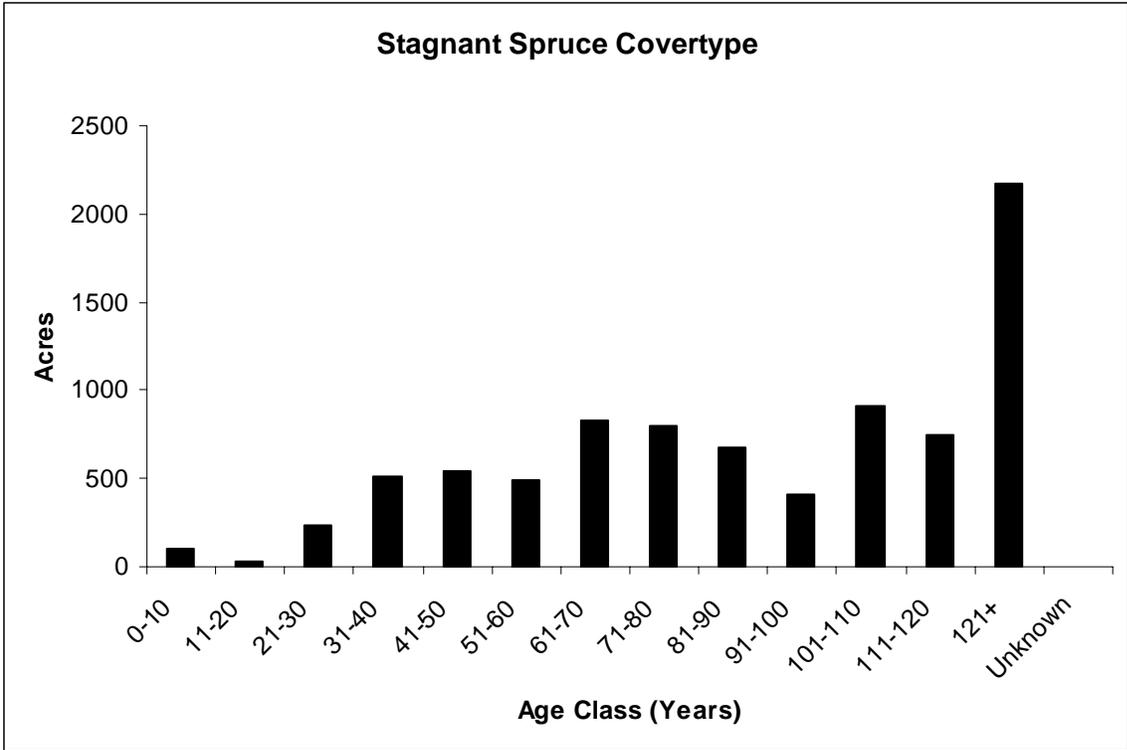


Figure A.14. Area of stagnant spruce covertypes by age class.

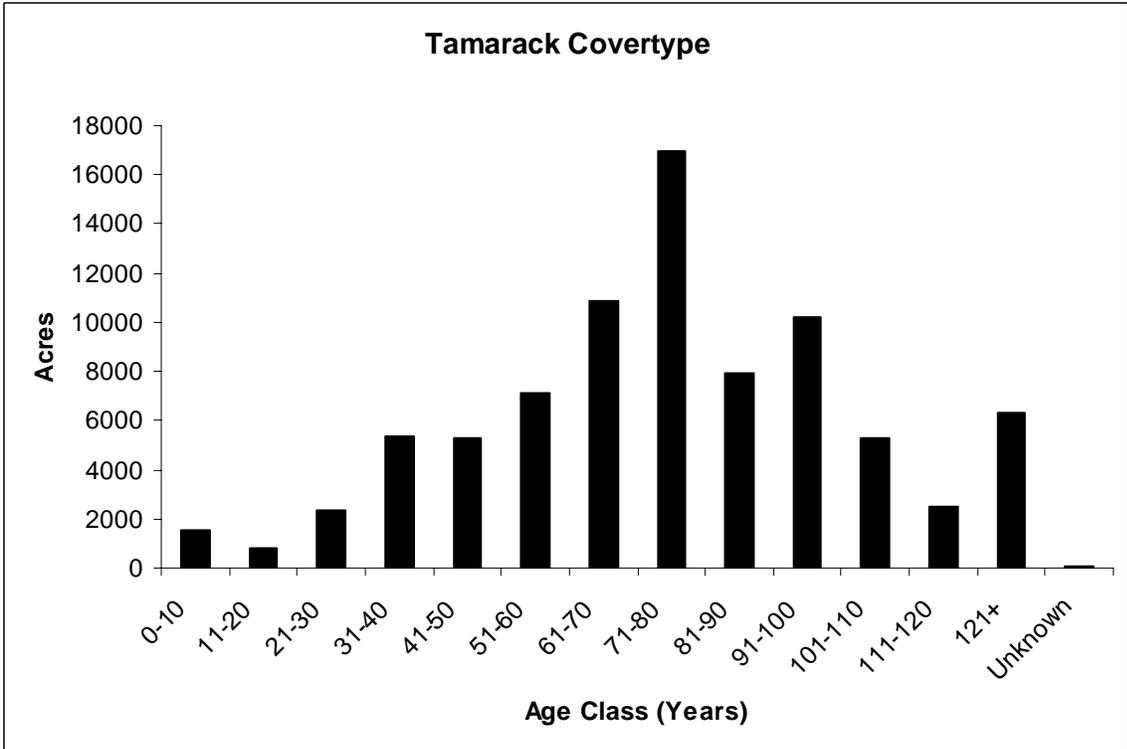


Figure A.15. Area of tamarack covertypes by age class.

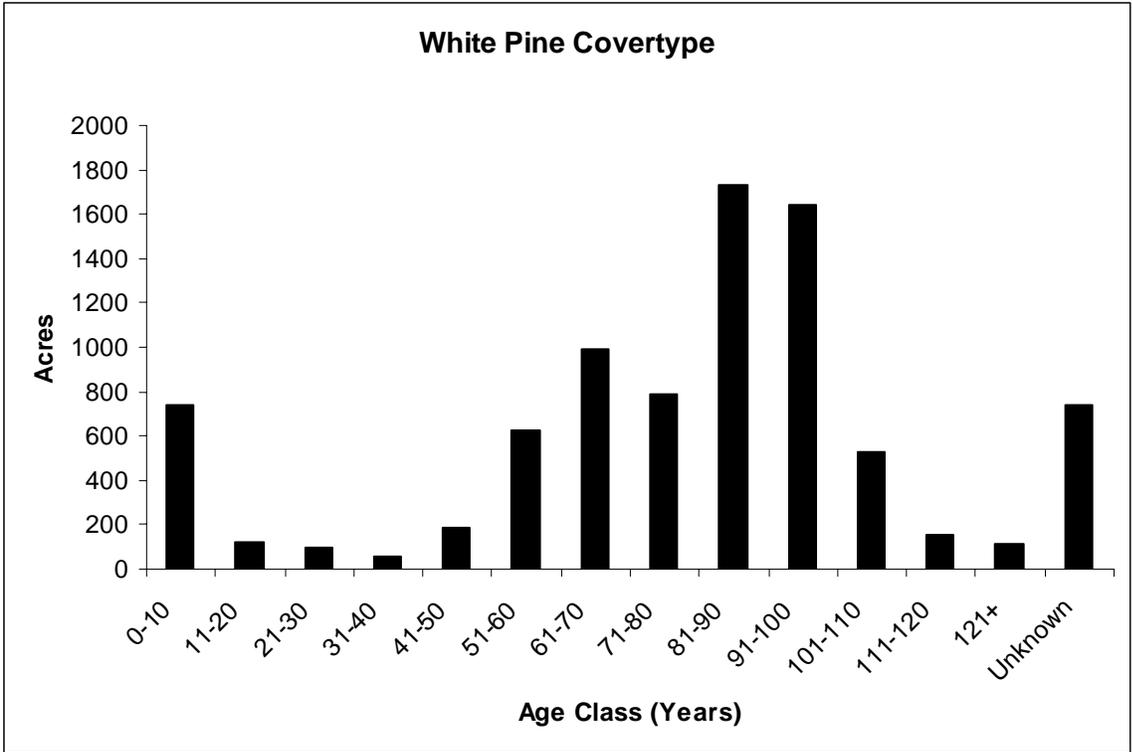


Figure A.16. Area of white pine coverture by age class.

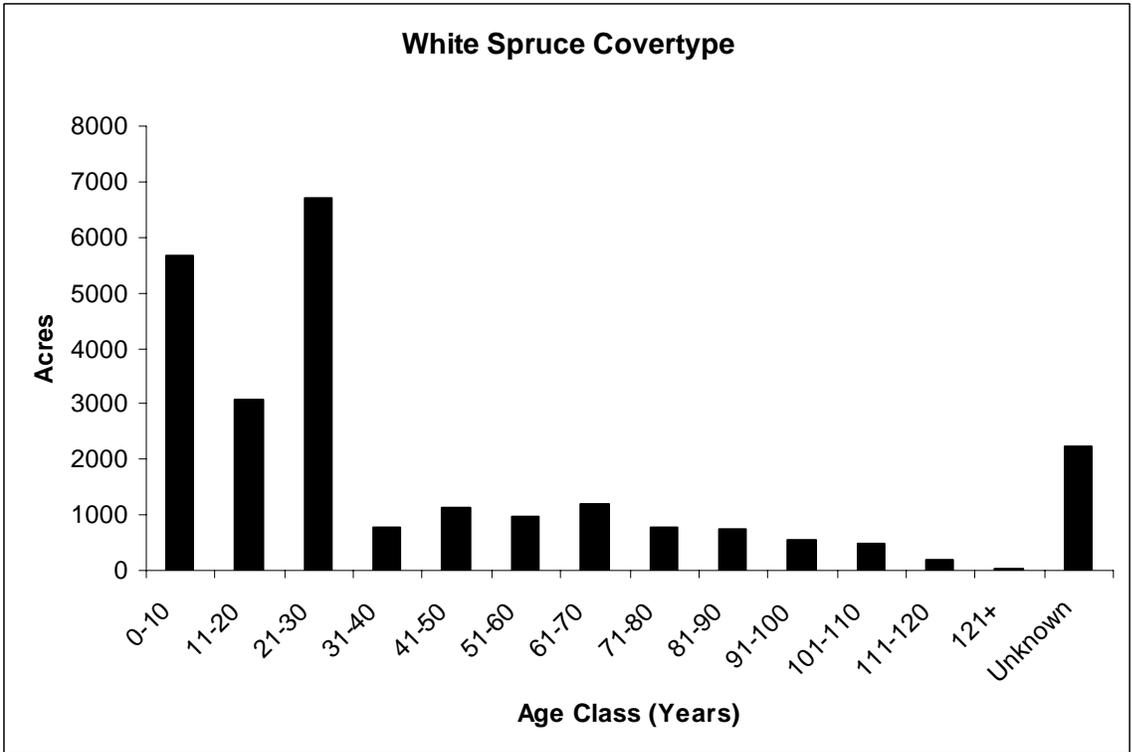


Figure A.17. Area of white spruce coverture by age class.

Appendix B: Distribution of TFFL by Covertypes and Site Index

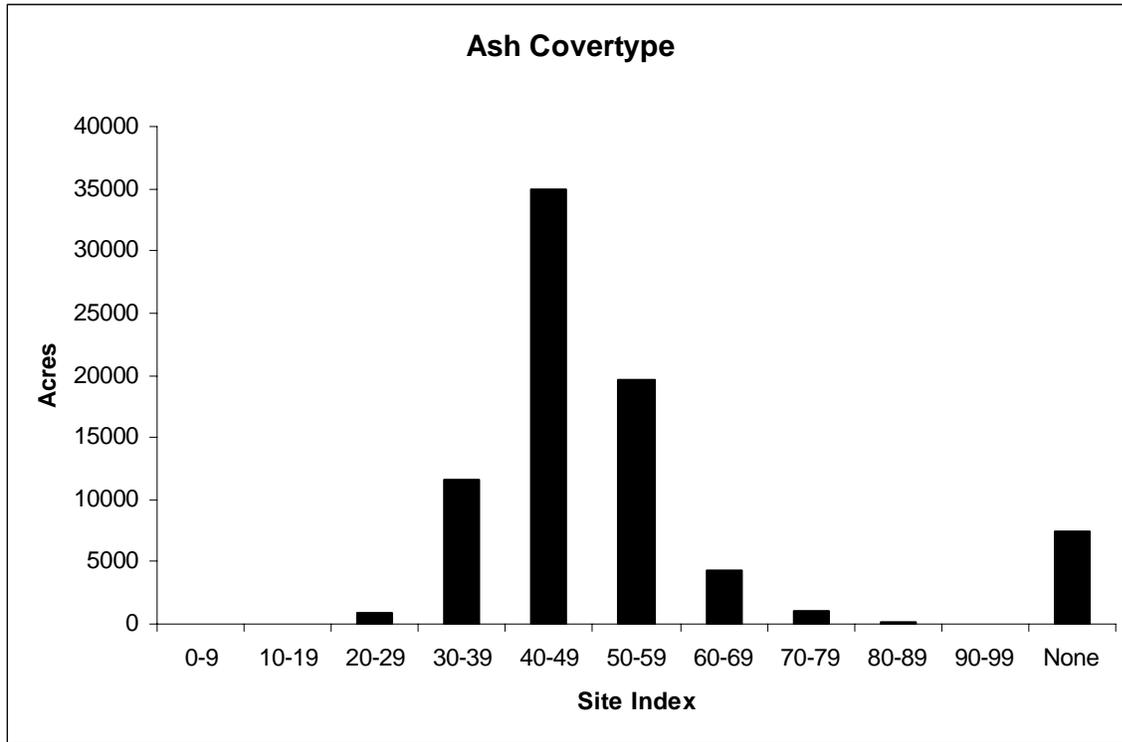


Figure B.1. Area of ash covertypes by site index.

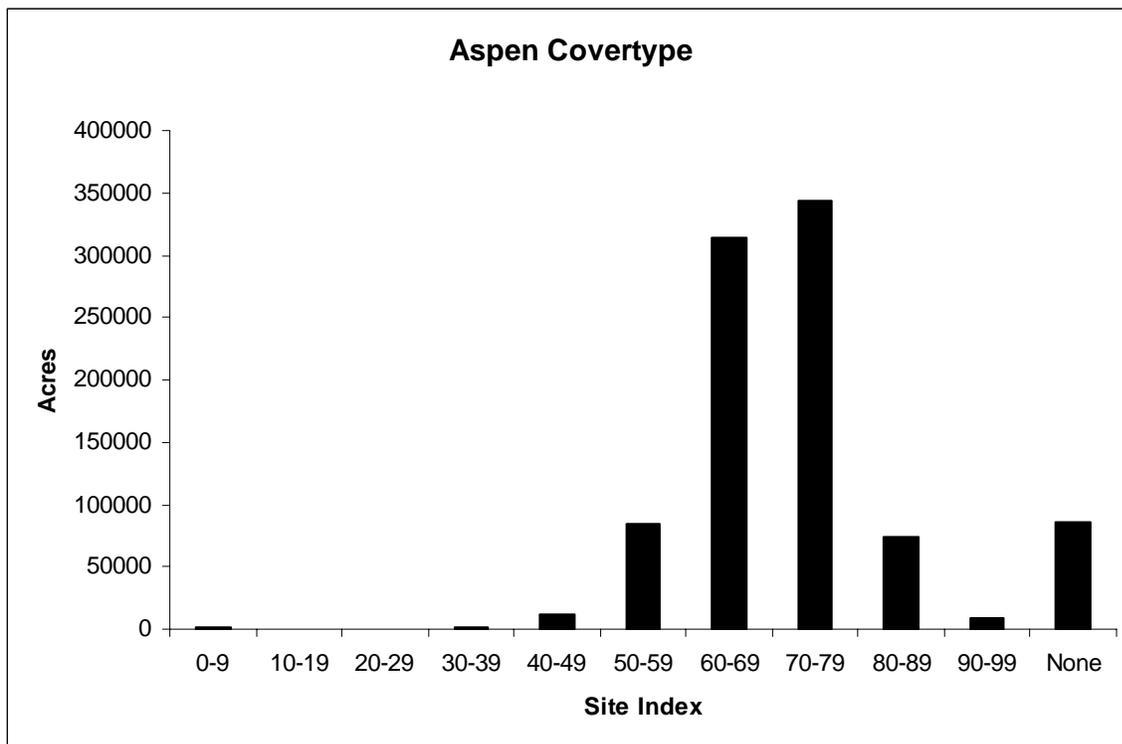


Figure B.2. Area of aspen covertypes by site index.

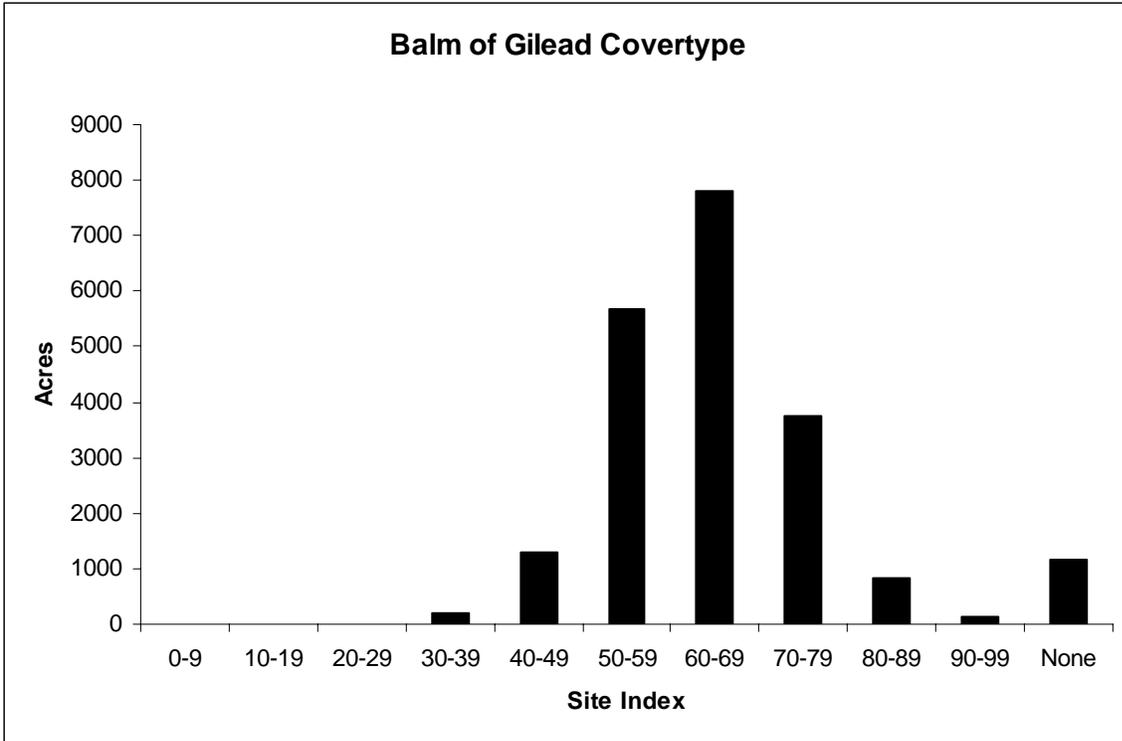


Figure B.3. Area of balm of gilead covertype by site index.

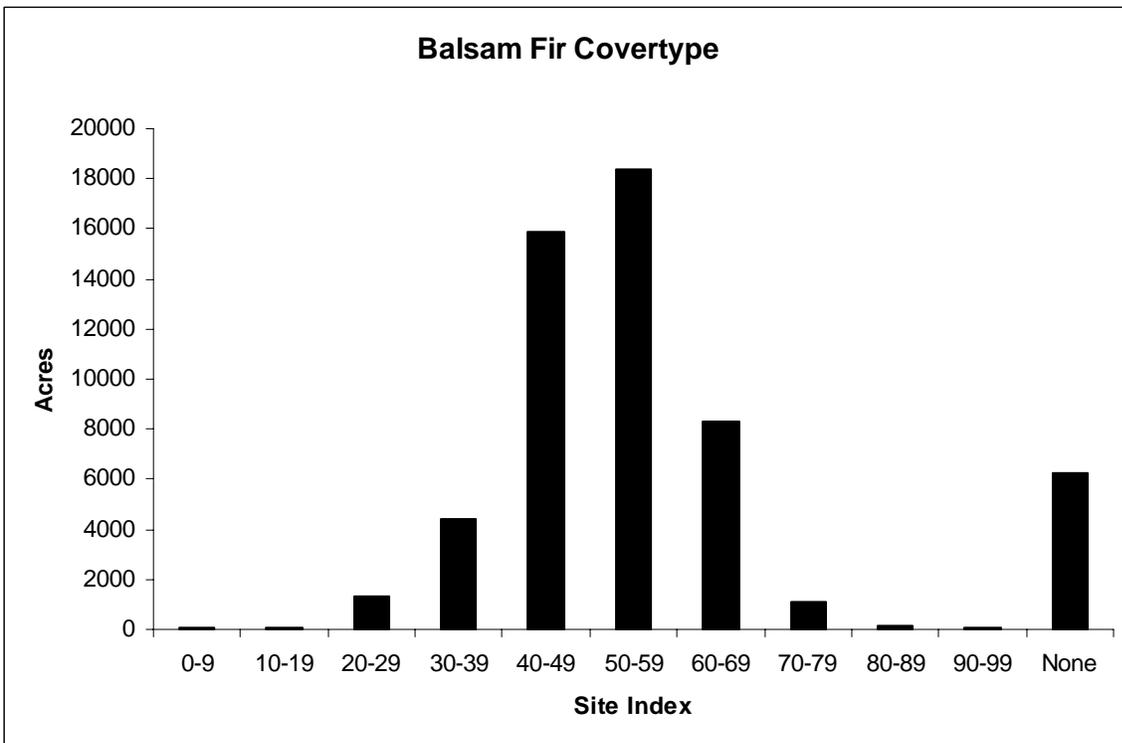


Figure B.4. Area of balsam fir covertype by site index.

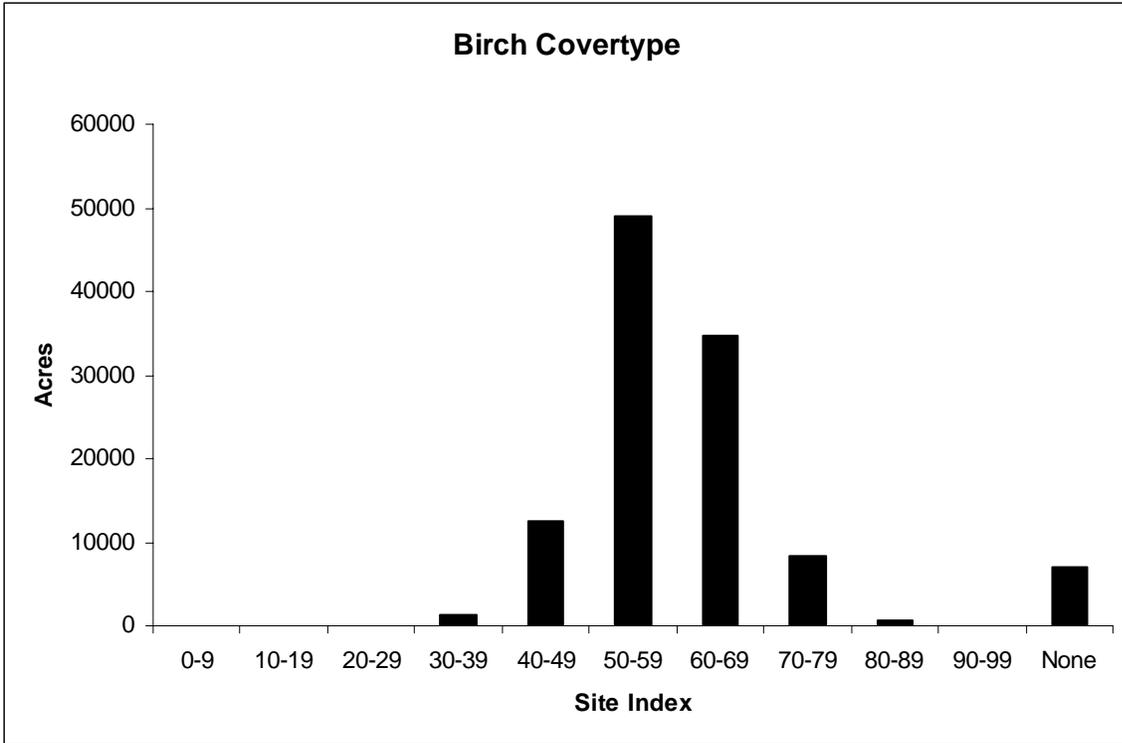


Figure B.5. Area of birch coverture by site index.

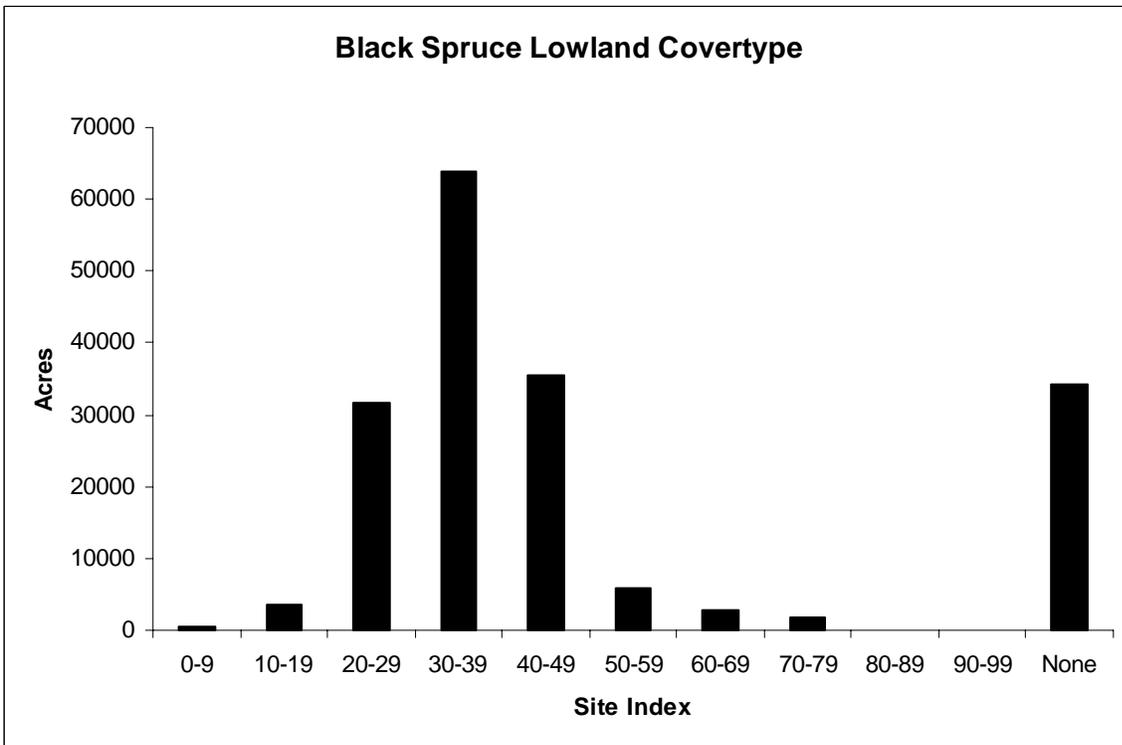


Figure B.6. Area of black spruce lowland coverture by site index.

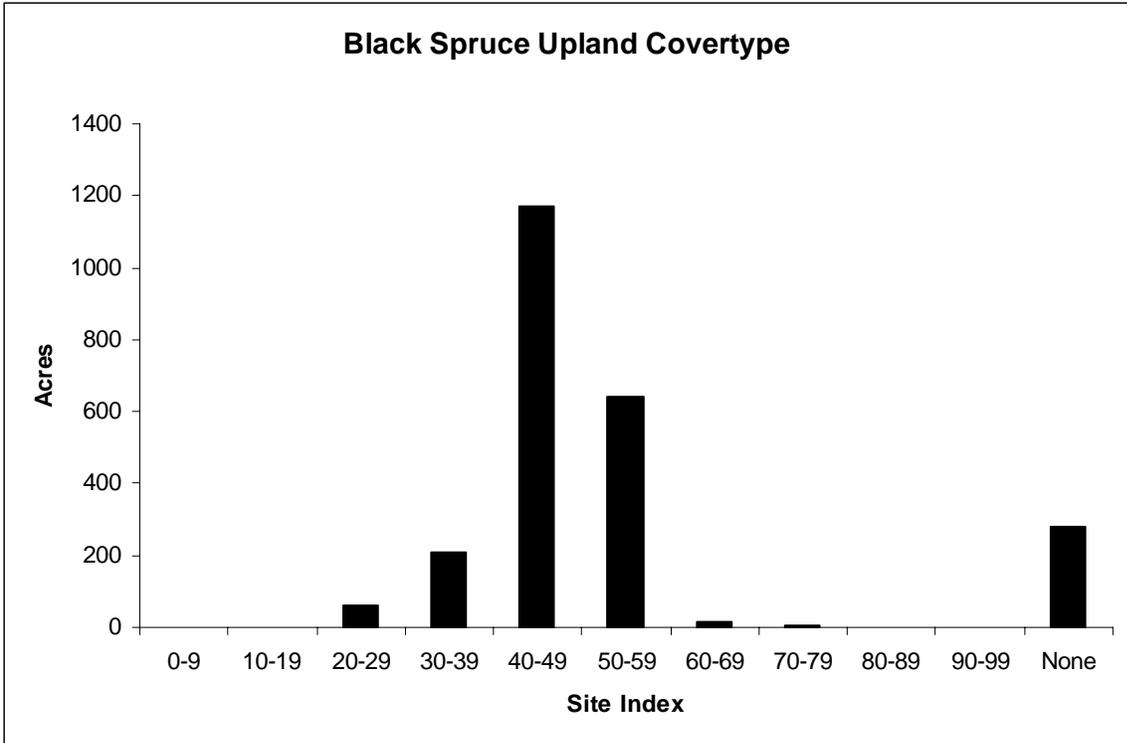


Figure B.7. Area of black spruce upland coverture by site index.

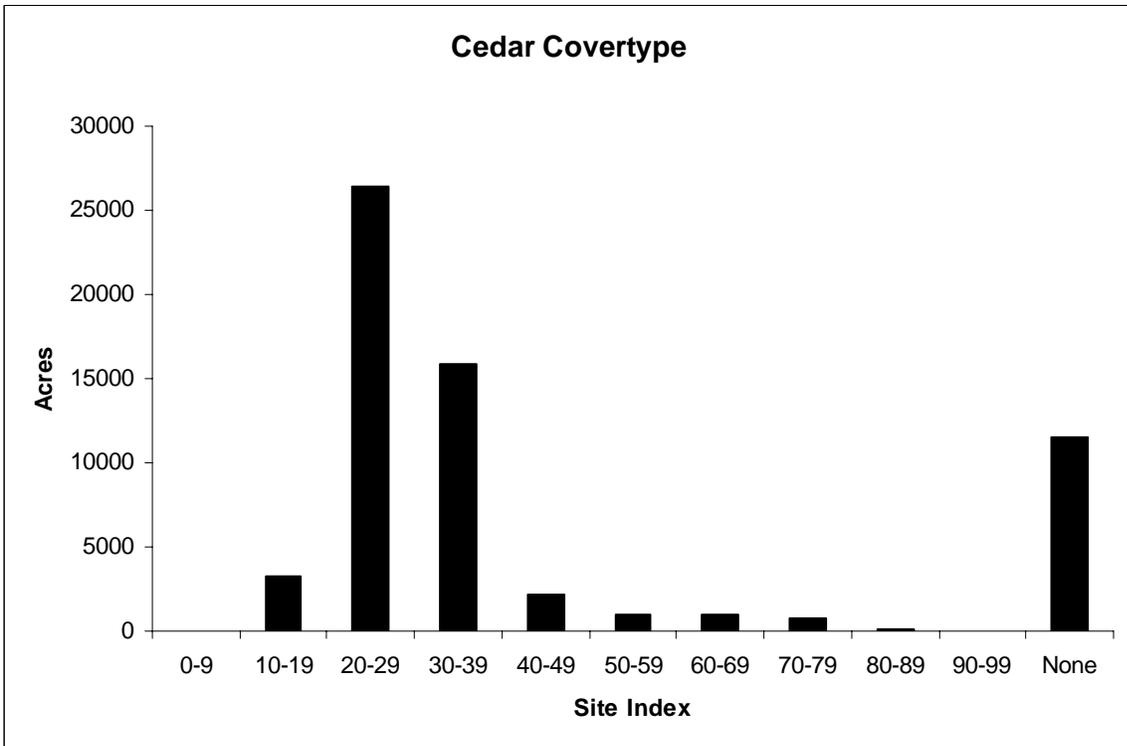


Figure B.8. Area of cedar coverture by site index.

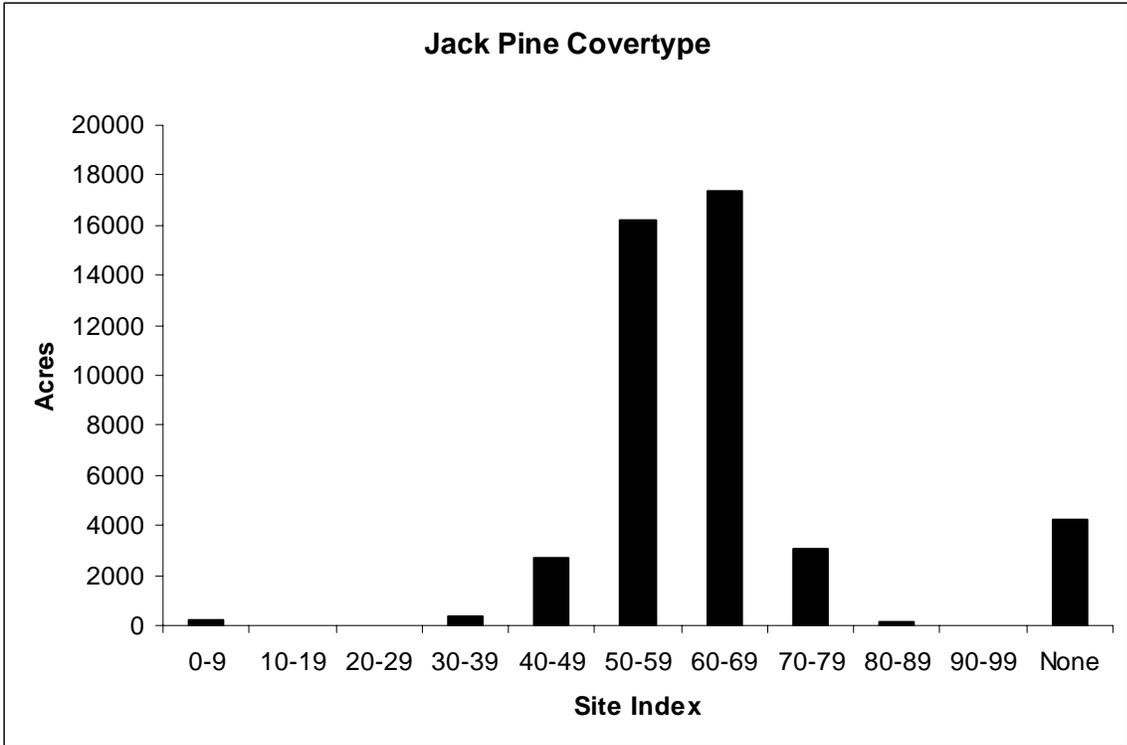


Figure B.9. Area of jack pine coverture by site index.

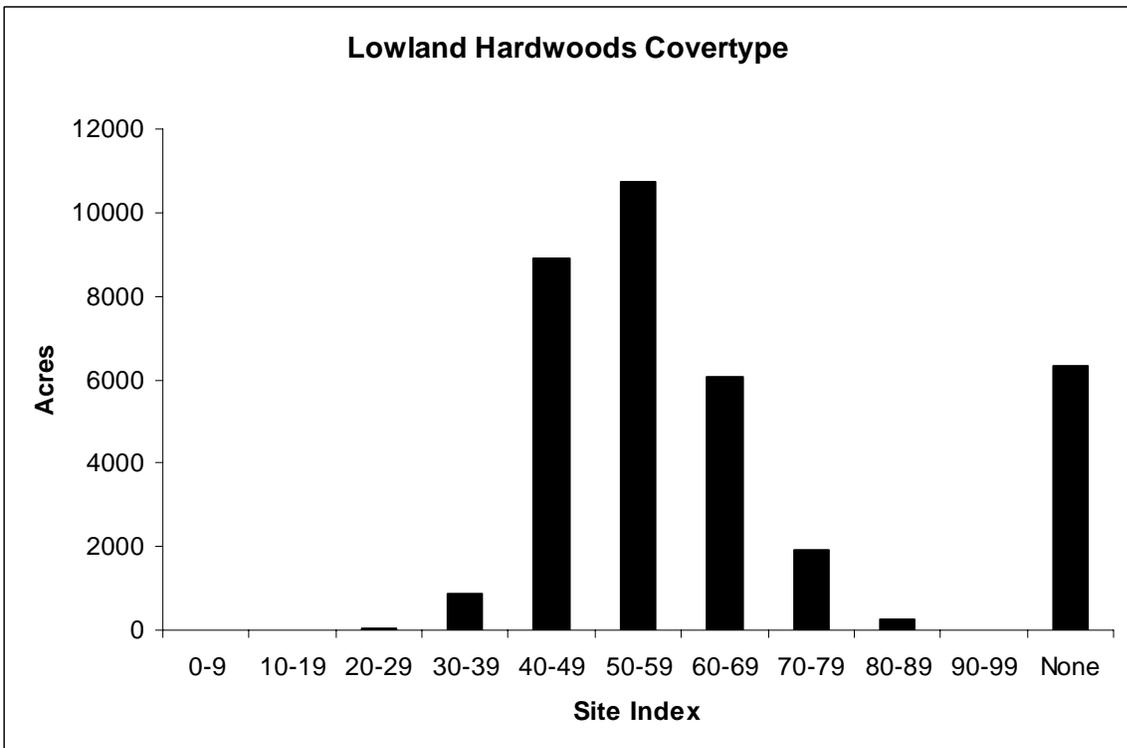


Figure B.10. Area of lowland hardwood coverture by site index.

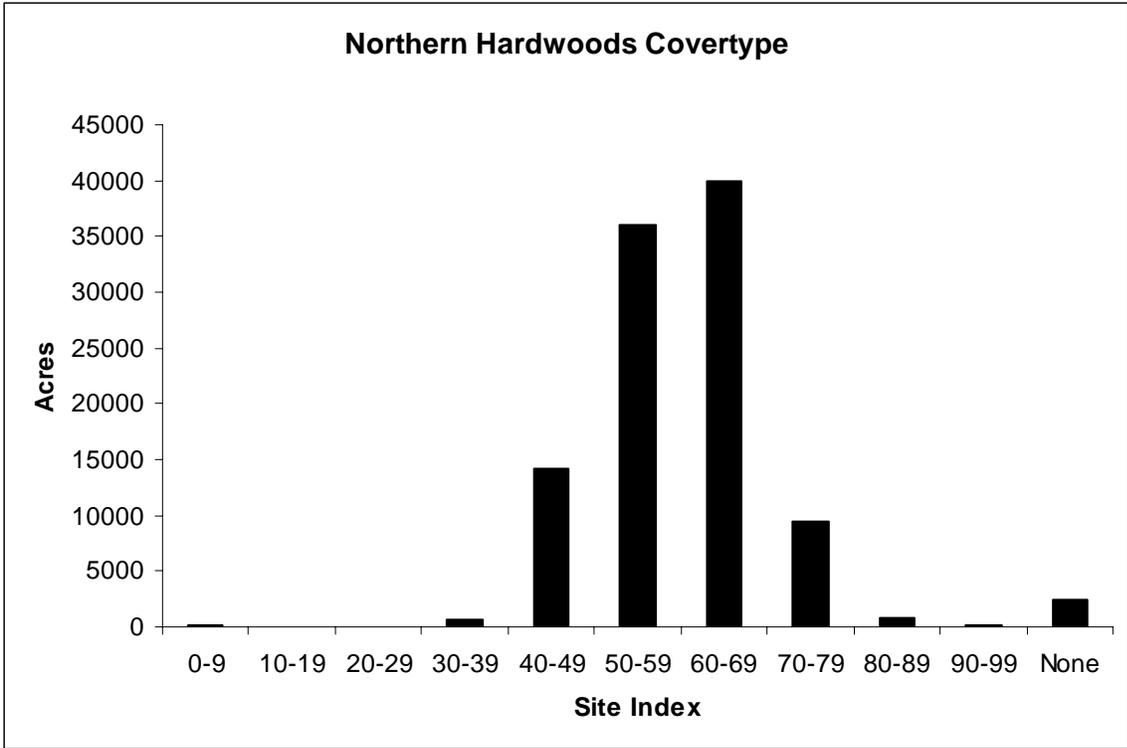


Figure B.11. Area of northern hardwood coverture by site index.

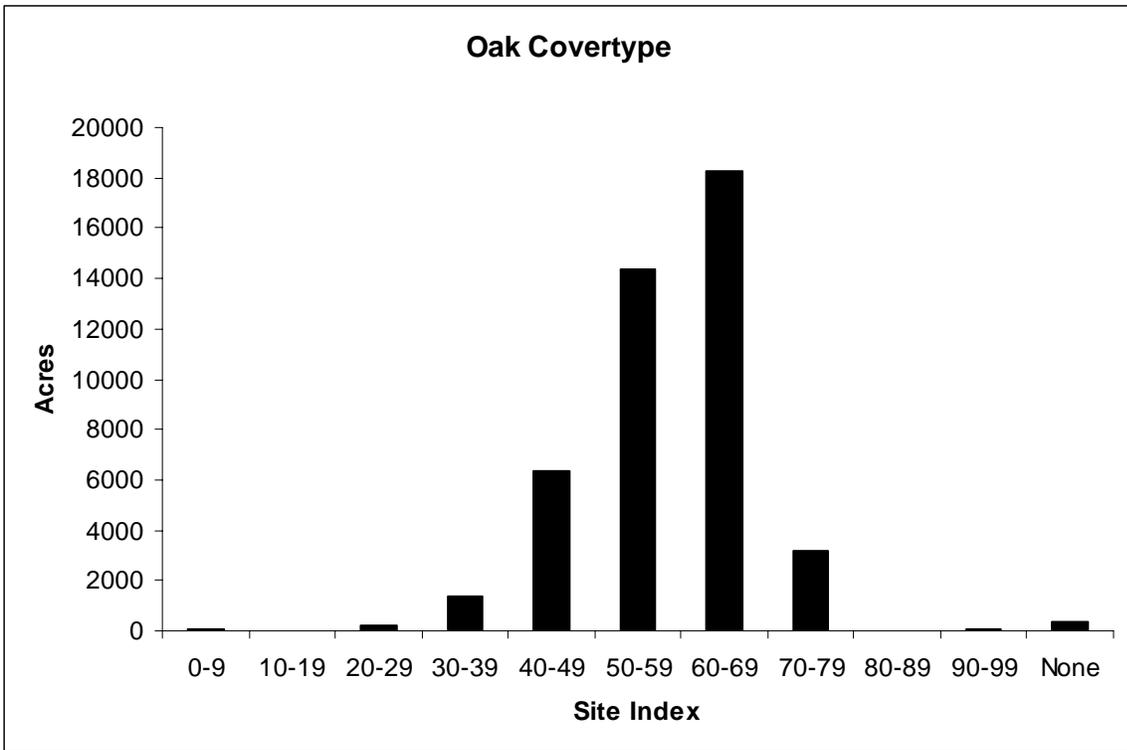


Figure B.12. Area of oak coverture by site index.

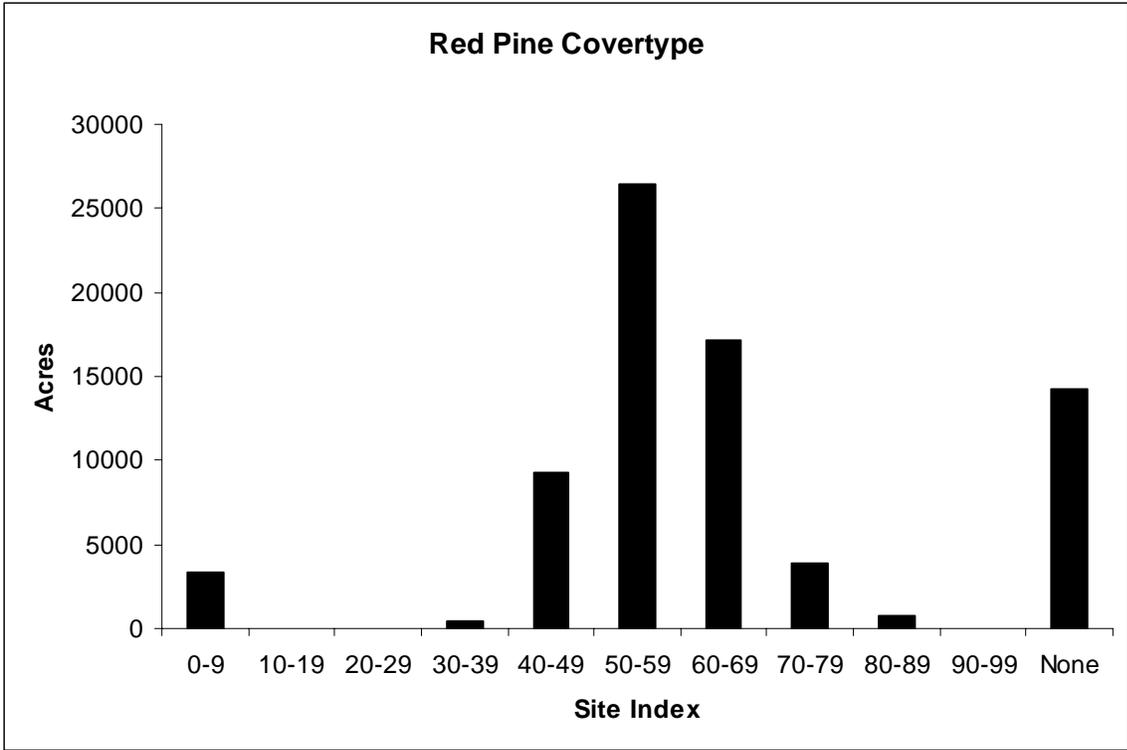


Figure B.13. Area of red pine coverture by site index.

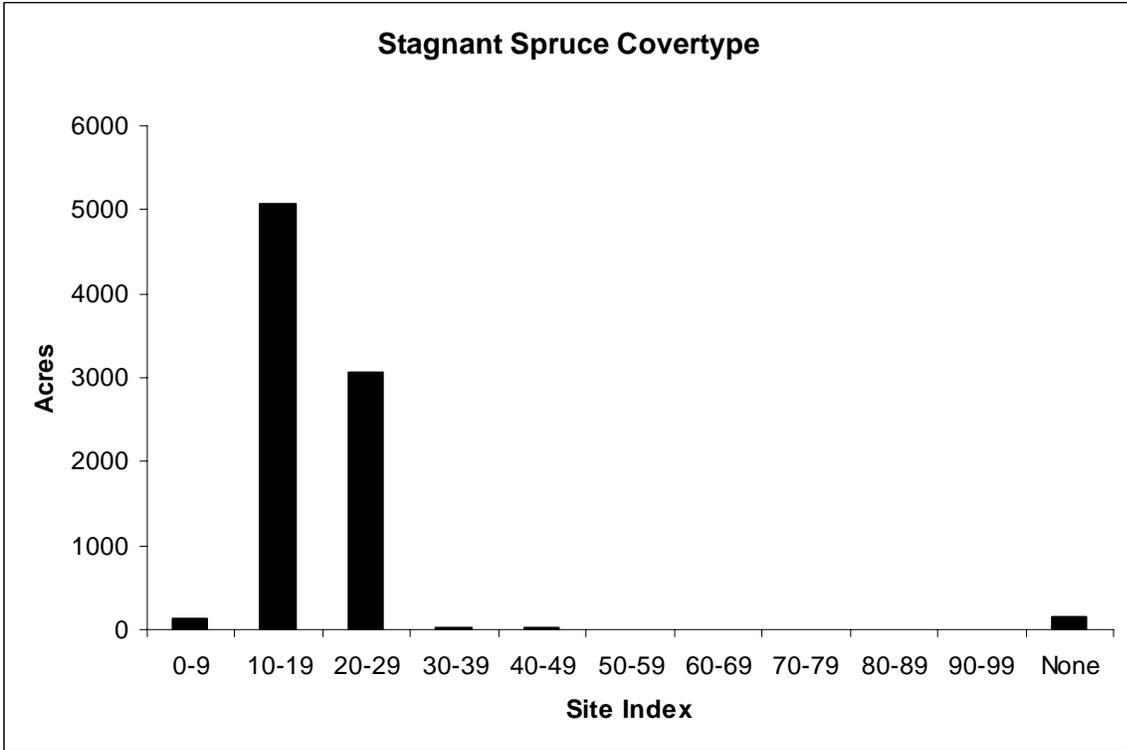


Figure B.14. Area of stagnant spruce coverture by site index.

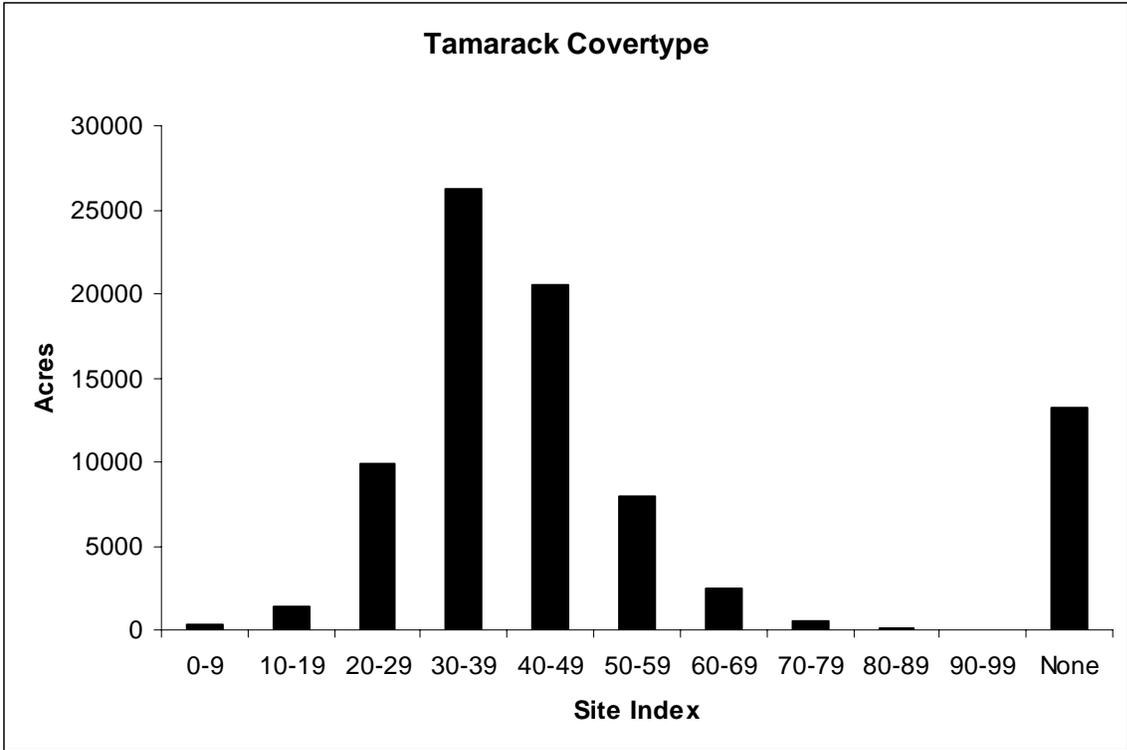


Figure B.15. Area of tamarack covertypes by site index.

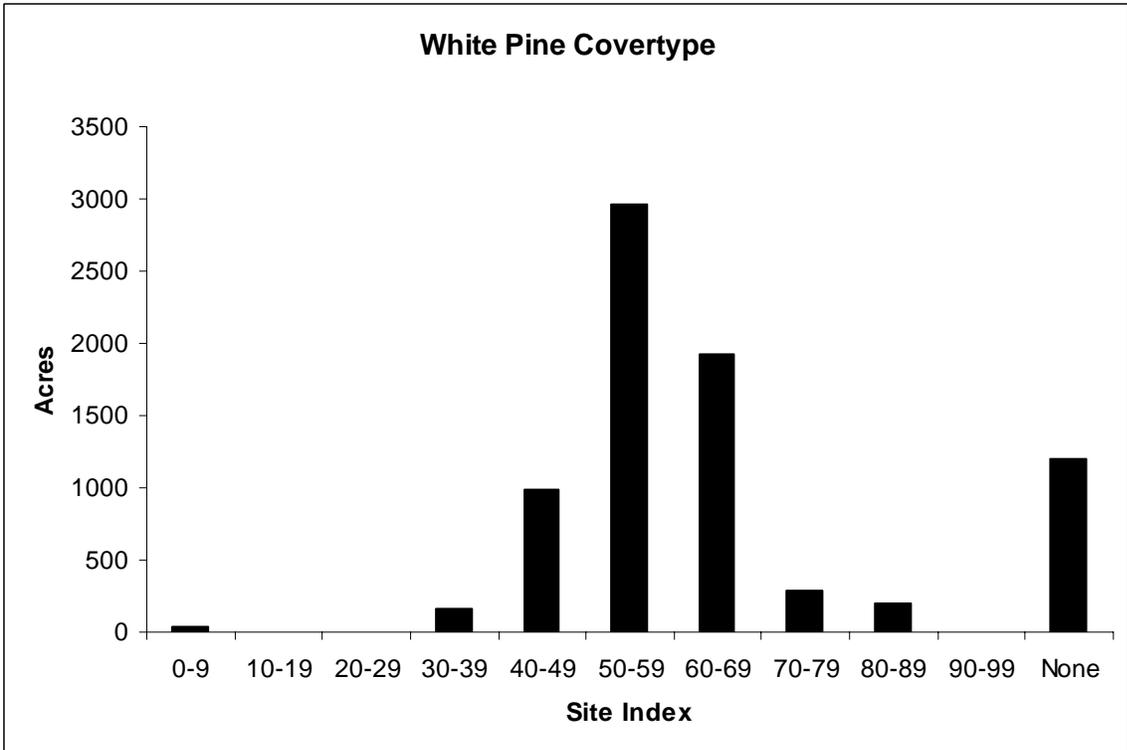


Figure B.16. Area of white pine covertypes by site index.

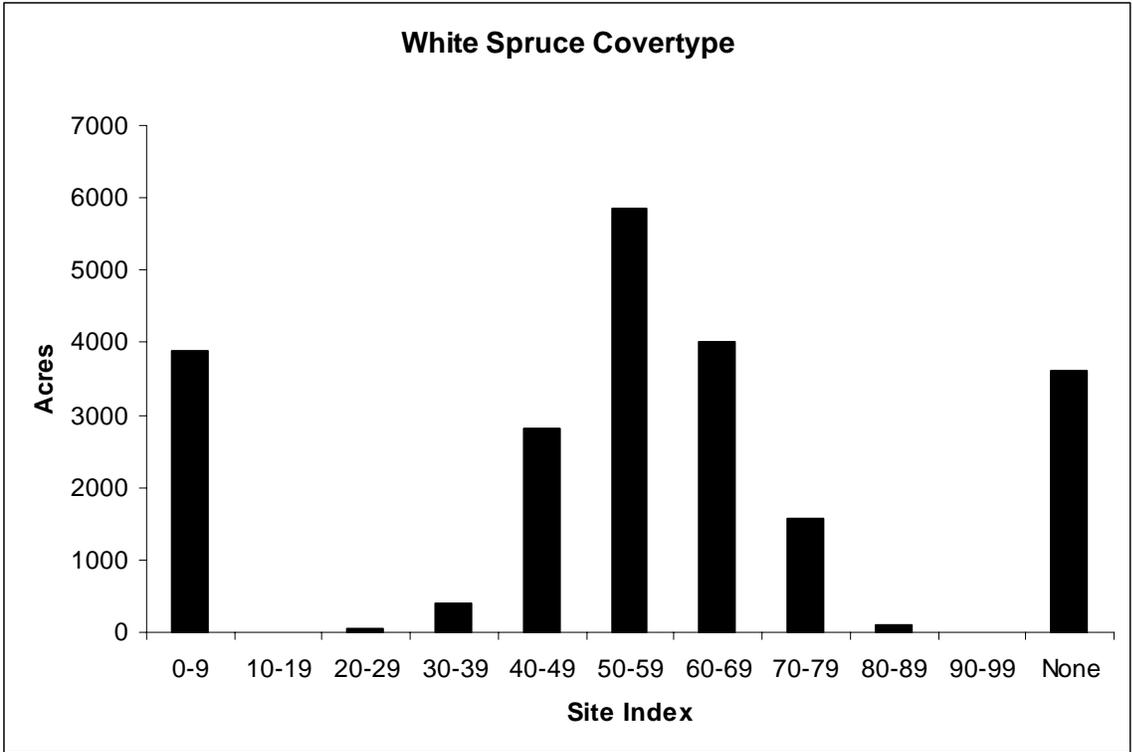


Figure B.17. Area of white spruce covertype by site index.

Appendix C. Landowner Survey

Former County Forest Land: A Survey of Current Owners



Location of Parcel:

You acquired this parcel sometime between 1995 and 2005.

Note: If the above acreage figure for this parcel of forest land is incorrect, please cross out the number and write in the correct number of acres. If you no longer own this property, please indicate this on the cover of the survey and return the survey to us so that we can remove your name from the study mailing list.

Please answer the following questions about the specific parcel of forest land identified on the front of the survey.

The term “forest land” used throughout the survey refers to the entire parcel not just the portion of the property with trees.

SECTION I. REASONS FOR OWNING FOREST LAND

We would like you to describe the importance of different reasons for purchasing and owning forest land.

1. How important to you are the following reasons for owning your forest land?
Please circle one number for each reason listed below

<i>Reasons:</i>	Not at all		Very	
	important			important	
A. Real estate investment	1	2	3	4	5
B. Produce timber for income	1	2	3	4	5
C. Use as a permanent residence	1	2	3	4	5
D. Use as a seasonal residence (e.g., cabin or summer home)	1	2	3	4	5
E. Place to hunt	1	2	3	4	5
F. Place to enjoy other forms of recreation (e.g., cross-country skiing, camping)	1	2	3	4	5
G. Place to watch birds and other non- game wildlife	1	2	3	4	5
H. Close to areas of personal interest (e.g., near favorite lake, family, friends)	1	2	3	4	5
I. Place to enjoy solitude or privacy	1	2	3	4	5
J. Want to pass land on to family/friends	1	2	3	4	5
K. Other. Please specify: _____	1	2	3	4	5

2. Thinking back to the time when you purchased your forest land, what was the SINGLE MOST IMPORTANT REASON for purchasing the land?

please check only one

- Real estate investment
- Produce timber income
- Use as a permanent residence
- Use as a seasonal residence
- Place to hunt
- Place to enjoy other forms of recreation
- Place to watch birds and other non-game wildlife
- Close to areas of personal interest
- Place to enjoy solitude
- Want to pass land on to family/friends in the future
- Other. Please specify _____

3. Today, what is the SINGLE MOST IMPORTANT REASON you own your forest land?

please check only one

- Real estate investment
- Produce timber income

- Use as a permanent residence
- Use as a seasonal residence
- Place to hunt
- Place to enjoy other forms of recreation
- Place to watch birds and other non-game wildlife
- Close to areas of personal interest
- Place to enjoy solitude
- Want to pass land on to family/friends in the future
- Other. Please specify _____

SECTION II. HISTORY OF FOREST MANAGEMENT

We would like you to tell us the types of forest management activities you have undertaken since acquiring the land.

4. Have you harvested trees (other than for firewood) on the property since purchasing your forest land?

please check only one

- Yes → *CONTINUE TO QUESTION 4b*
- No → *CONTINUE TO QUESTION 4a*

4a. If you answered NO to Question 4, indicate your primary reason for not harvesting timber.

please check only one

- The timber is not large enough to sell
- I don't know who to contact to harvest timber
- I don't want to alter the way the forest looks
- I am worried about destroying wildlife habitat
- Ethically, I don't think cutting trees is appropriate
- Other. Please specify: _____

4b. If you answered YES to Question 4, indicate when you most recently harvested timber.

please check only one

- 0-3 years ago
- 4-6 years ago
- 7-9 years ago
- more than 9 years ago

5. Indicate which of the following management activities have been undertaken on your forest land since you purchased the land.

please check all that apply

- Wildlife habitat improvement projects (*e.g., food plots*)
- Commercial timber harvest
- Timber stand improvement (*e.g., tree thinning, pruning*)
- Tree planting
- Other. Please specify: _____

6. Since purchasing your forest land, have you sought advice from or been contacted by a professional forester?

please check only one

- Yes
- No

7. Do you have a written forest management plan prepared by a professional forester or natural resource manager for your forest land?

please check only one

- Yes
 No

SECTION III. USES OF AND IMPROVEMENTS TO YOUR FOREST LAND

We would like you to help us understand how you have changed and improved your forest land since you purchased it.

8. Describe the road access to your forest land at the time you purchased the property.

please check only one

- An all-weather road was directly adjacent to my forest land
 An all-weather road was less than 1/4 mile away from my land
 An all-weather road was between 1/4 and 1 mile away from my land
 An all-weather road was more than 1 mile away from my land

9. Describe the road access to your forest land today.

please check only one

- An all-weather road is directly adjacent to my forest land
 An all-weather road is less than 1/4 mile away from my forest land
 An all-weather road is between 1/4 and 1 mile away from my land
 An all-weather road is more than 1 mile away from my land

10. Indicate the following improvements or structures that have been made to your forest land since the time you purchased it.

please check all that apply

- Built a cabin
 Built a seasonal or permanent home
 Built a storage shed
 Built one or more permanent roads
 Built recreation trails
 Built livestock fences
 Attached utilities (e.g., water, electricity)
 Other: Please specify _____

11. Answer the following questions about public access to your forest land.

please check one response for each question

<u>Ye</u>	<u>No</u>	<u>Not</u>
<u>s</u>		<u>Sure</u>

Have you previously posted your forest land against trespass?

Is your forest land currently posted against trespass?

Do you plan to post your forest land against trespass in the future?

12. If hunters asked, would you give them permission to hunt on your forest land?

please check only one

- Yes
- No
- Maybe, under the following conditions: _____

13. Have you ever leased your forest land to someone else for hunting or other recreation activities?

please check only one

- Yes → CONTINUE TO QUESTION 14
- No

13a. If you answered NO to Question 13, do you intend to lease your forest land for hunting or other recreation activities in the future?

please check only one

- Yes
- No
- Not sure

14. How would you describe the hunting opportunity on your forest land?

please check only one

- My forest provides excellent hunting opportunity
- My forest provides good hunting opportunity
- My forest provides average hunting opportunity
- My forest provides poor hunting opportunity
- My forest provides very poor hunting opportunity
- Don't know

15. Have you ever subdivided and sold any part of your forest land?

please check only one

- No → CONTINUE TO QUESTION 16
- Yes

15a. If you answered YES to Question 15, indicate the number of parcels you have sold from your original tract of forest land.

please check only one

- 1 parcel
- 2 parcels
- 3 parcels
- 4 or more parcels

SECTION IV. FUTURE INTENTIONS FOR YOUR FOREST LAND

We are interested in your intentions for the forest land in the future. Remember, your responses are kept completely confidential.

16. Which of the following forest management activities do you intend to do on your land in the next five years?

please check all that apply

- Obtain a written forest management plan
- Wildlife habitat improvement projects (*e.g. food plots*)
- Harvest timber (*excluding for firewood*)
- Timber stand improvement (*tree thinning, pruning*)
- Tree planting
- Other: Please specify _____

17. Which of the following improvements or structures do you intend to make on your land in the next five years?

please check all that apply

- Build a cabin
- Build a seasonal or permanent home
- Build a storage shed
- Build one or more permanent roads
- Build recreational trails
- Build livestock fences
- Attach utilities
- Other: Please specify _____

18. Which of the following best describes your ownership intentions regarding your forest land?

please check only one

- I have no intention of selling any of my land
- I plan to sell the entire parcel intact
- I plan to subdivide and sell some of the forest land, but keep part of it for myself
- I plan to subdivide and sell the entire parcel of forest land in smaller tracts
- I plan to donate the land to a non-profit organization
- Other: Please specify _____

SECTION V. SURROUNDING FOREST LAND CHARACTERISTICS

We would like you to help describe some characteristics of surrounding forest lands.

19. Considering all of the surrounding private forest land within 1 mile of your forest land, which of the following best describes how land is being used?

please check only one

- Most (more than 75%) of the surrounding private forest lands have houses/cabins on the property
- Much (50-79%) of the surrounding private forest lands (50%-75%) have houses/cabins on the property
- Some (25-49%) of the surrounding private forest lands have houses/cabins on the property
- Little (less than 25%) of the surrounding private forest lands have houses/cabins on the property
- No other private forest land exists within 1 mile of my forest land
- Don't know

20. Considering all surrounding private forest lands within 1 mile of your forest land, which of the following best describes public access to the land?

please check only one

- Most (more than 75%) of the surrounding private forest land is posted against trespass
- Much (50-75%) of the surrounding private forest land is posted against trespass
- Some (25-49%) of the surrounding private forest land is posted against trespass
- Little (less than 25%) of the surrounding private forest land is posted against trespass
- No other private forest land exists within 1 mile of my forest land
- Don't know

SECTION VI. LANDOWNER INFORMATION

Finally, we would like to ask you some questions about yourself and how you acquired the land.

21. How long have you owned this parcel of forest land?

please check only one

- 0-3 years
- 4-6 years
- 7-9 years
- more than 9 years

22. How did you acquire this parcel of forest land?

please check only one

- I bought the land from the county
- I acquired the land in a land exchange with the county
- I bought the land from someone other than the county
- I inherited the land from a relative
- Other: Please specify _____

23. Approximately how many miles is your permanent residence from the forest land?

If you live on or directly adjacent to the forest land please enter "0".

_____ Miles

24. Which of the following best describes where you live?

please check only one

- Rural area
- Small town (*less than 5,000 people*)
- Large town (*5,000 people or more*)
- Suburb of a metropolitan area
- Metropolitan area

25. What is your age?

_____ Years old

26. Approximately how many total acres of forest land do you own in Minnesota?

_____ Acres

27. Indicate the number of parcels of forest land you own in Minnesota.

_____ Parcels

28. Please use the space below to provide additional comments.

Thank you for taking time to complete this survey!

If you are interested in an internet link to the survey results please check here:

Please return the questionnaire in the enclosed postage-paid envelope to:

**University of Minnesota, Department of Forest Resources
Attn: Ross Brown
1530 Cleveland Avenue N., St. Paul MN 55108**

Please feel free to contact us if you have any questions about the survey. You can reach us at:

Michael Kilgore
Associate Professor
612-624-6298
mkilgore@umn.edu

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612-624-4280
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Appendix D. Assessing the Financial Impacts Associated With Policies for Retaining Versus Selling MN TFFL

A. Introduction

Financial analysis is an analytic tool that provides information on the financial performance associated with a policy or project. In this report, a financial analysis provides information on the financial performance associated with a policy that retains TFFL in public ownership versus a policy in which this forest land is sold. The perspective from which the financial analysis is prepared is that of the local taxing districts (county, municipal, township, school district). County-administered TFFL is viewed as a financial asset to local taxing districts and discounting techniques are used to assess the overall financial returns associated with policies for retaining and managing versus disposing of this forest land base.

B. Data

Data used to conduct a financial analysis of TFFL retention versus disposal options comes from the following sources:

- All 2002-2005 county revenue and expense data were collected and submitted by the 12 county land departments participating in this study. A more detailed description of this data is in Section II.
- The estimated market value (EMV) of all county-administered TFFL was obtained from the County Assessor's office in each of the 12 counties. Additional land market data used to describe the Minnesota forest land market comes from computerized Certificates of Real Estate Value (CRV) records provided by the Minnesota Department of Revenue for forest land sold in Minnesota from 1989 to 2005. Details about the forest land transactions are described in Kilgore and MacKay (2007).

C. Project Description and Expected Physical Results

The two alternative policies for TFFL are the same as described in Section IV: (1) county retention of all current county-administered TFFL (i.e., the "Without" condition) or (2) county disposal of approximately 2.7 million acres of county-managed TFFL (i.e., the "With" condition).

D. Assumptions Used in Conducting the Financial Analysis

The following assumptions were essential in conducting the baseline financial benefit-cost analysis of competing policies to retain or sell TFFL. All of these assumptions were also used for the economic analysis in Section IV.

- *Social Discount Rate = 3%*
- *County TFFL Management Will Not Change*
- *10 Year Disposal Period*

- *Stumpage Prices and Net Income Will Increase at the Rate Of Inflation*
- *Market Value of TFFL = \$800, But Highly Variable*

The study assumes that the EMV of TFFL will appreciate at the rate of inflation. County assessors estimated the average market value of TFFL in 2005 was \$817 per acre. Due to the large influence forest land prices have on the financial efficiency of a TFFL disposal policy and the associated uncertainty surrounding most estimates of market value, this report performs financial benefit-cost analysis under a wide range of forest land prices. Whenever not specified, the land price is assumed to be \$800 per acre.⁸⁵ However, most analyses include scenarios where the average forest land prices are \$1200, \$1000, \$600, \$400, and \$200 per acre. Further, an assumed sale of TFFL during the first ten years under the disposal policy alternative would undoubtedly have a significant downward effect on the market price of forest land. Consequently, presenting a gradient in forest land price assumptions will aid in interpreting the financial impact findings, knowing the sale of large acreage of TFFL will have a significant, yet unknown, effect on forest land prices.

It is important to note that forest land price appreciation does not, in of itself, increase the net income available to local taxing districts. The goal of the financial analysis is to assess whether disposal or retention of TFFL will generate more net income to the local taxing districts. Because forest land appreciation is assumed to be an unrealized gain (by definition under the policy option of retaining and managing TFFL), increases in forest land prices over time, per se, will not impact the financial performance associated with a policy of forest land retention and management.

- *Local Tax Levy is Independent of Property Values*

E. Financial Assessment of Land Retention

Under the previously stated assumptions, retaining all county-managed TFFL would result in a perpetual flow of annual income equal to the average annual net income generated between 2002 and 2005. The nominal four-year average annual net income resulting from the management of TFFL was approximately \$14 million (Table D.1).

Table D.1. Total revenue, costs, and net income from TFFL management 2002-2005.

	2002	2003	2004	2005	Annual average
Total revenue	\$22,066,046	\$25,371,757	\$30,439,943	\$36,481,527	\$28,589,818
Total costs	\$12,985,325	\$14,405,725	\$15,315,009	\$15,668,218	\$14,593,569
Total net income	\$9,080,721	\$10,966,032	\$15,124,934	\$20,813,309	\$13,996,249
(% change)		(+21%)	(+38%)	(+38%)	(+32%)

Because the study uses inflation-adjusted benefits, costs, and discount rates, the 2002-2005 average annual net income associated with the management of TFFL needs to be adjusted to account for the small inflationary changes that occurred over this period. The 2002-2005 annual

⁸⁵ This analysis ignores the transaction costs counties incur when they sell tax-forfeited land because, relative to the sale price, the costs of selling the land are very small. Ellefson and MacKay (1996) estimated costs of selling TFFL to be \$3-8 per acre. Even when adjusted for inflation, this cost represents a very small fraction of today's price of Minnesota forest land (~\$1200/acre).

inflation rate of 2.8% is used to adjust net income from 2002, 2003, and 2004 to express all net income in terms of 2005 dollars.⁸⁶ Adjusting for inflation, the average 2002-2005 real annual net income generated from county-administered TFFL is nearly \$14.45 million (\$5.31/acre) (Table D.2).

Table D.2. Net income from TFFL management in current and constant dollars.

	2002	2003	2004	2005	Average annual net income
Current dollars	\$9,080,721	\$10,966,032	\$15,124,934	\$20,813,309	\$13,996,249
Constant year 2005 dollars⁸⁷	\$9,865,059	\$11,588,727	\$15,548,432	\$20,813,309	\$14,453,882

Assuming counties continue to generate \$14.45 million annually (in real terms) and a 3% real discount rate, the NPV of perpetual net income resulting from retaining and managing TFFL is \$481,796,059 (\$177/acre).

F. Financial Assessment of Land Disposal

The study assumes that, in the case of a disposal policy, TFFL will be sold equally over a 10-year period and that the annual net income per acre (\$5.31) will remain the same for all TFFL under county management until it is sold. Therefore, net income associated with a TFFL disposal policy would come from two sources: (1) the sale of 272,300 acres of land each year; and (2) net income generated from continued management of TFFL that has not been sold yet. Land sales would be, by far, the larger of the two revenue sources.

Table D.3 shows the NPV of TFFL disposal, given a variety of forest land prices and a 3% discount rate. If all county-administered TFFL was sold at an average price of \$800 per acre, the NPV of all income during the 10-year disposal period would be approximately \$1.92 billion. Alternatively, at an assumed per acre sale price of \$200, the NPV associated with the sale of TFFL would be \$523 million.

Table D.3. NPV of TFFL disposal for various land prices.

Land Prices (per acre)	NPV of Disposal
\$1,200	\$2,845,835,109
\$1,000	\$2,381,280,262
\$800	\$1,916,725,416
\$600	\$1,452,170,569
\$400	\$987,615,723
\$200	\$523,060,876

⁸⁶ Based on CPI data from US Bureau of Labor Statistics.

⁸⁷ The following equation is used to adjust current dollars (D) to constant dollars (C) between t years at an annual inflation rate of i: $C = D \cdot (1+i)^t$.

G. Financial Efficiency of TFFL Retention Versus Disposal

The financial efficiency of a TFFL disposal policy is determined by comparing the NPV of this policy to the NPV associated with a policy of retaining TFFL under county management. Assuming TFFL would sell for an average price of \$800 per acre, the financial NPV of selling all TFFL would be \$1.92 billion. The financial NPV of retaining TFFL in county management status would be \$482 million. These data suggest the financial gain to local taxing districts would be approximately \$1.44 billion (in present value terms) if TFFL is sold to private owners (Table D.4). Land retention would only become a financially efficient policy alternative if the price of forest land falls below \$182 per acre.

Table D.4. NPV of TFFL retention and disposal for various forest land prices.

Land sale price/acre	NPV of TFFL disposal	NPV of TFFL retention	Financial gain with TFFL disposal
\$1,200	\$2.85 billion	\$482 million	\$2.36 billion
\$1,000	\$2.38 billion	\$482 million	\$1.90 billion
\$800	\$1.92 billion	\$482 million	\$1.44 billion
\$600	\$1.45 billion	\$482 million	\$970 million
\$400	\$988 million	\$482 million	\$506 million
\$200	\$523 million	\$482 million	\$41 million
\$182	\$482 million	\$482 million	\$0

H. Sensitivity of Analysis to Modified Assumptions

The financial benefit-cost analysis relies on a variety of important assumptions. Sensitivity analysis is often used to test the reliability of these assumptions and convey how sensitive the baseline conclusions are when the assumptions change (Boardman et al. 2001). To address this uncertainty and test the robustness of the baseline financial benefit-cost analysis, the financial efficiency of alternative TFFL retention and disposal policies were reassessed using a different set of assumptions. More specifically, the sensitivity analysis tests the effects different discount rates, stumpage prices, TFFL estimated market values, and disposal periods have on the financial efficiency of TFFL disposal versus retention policies. Analysis results that do not change under a range of study assumptions suggest greater confidence in the baseline analysis (Boardman et al. 2001).

Varying Estimated Market Value—Land Sale Prices

The single most important factor in determining the financial efficiency of a TFFL disposal policy is the market price of forest land. Minnesota’s forest land market has experienced a dramatic price increase over the past 20-25 years (Kilgore and Mackay 2007). Not surprisingly, estimates of the market value of TFFL vary greatly. In 2005, county land assessors estimated that the market value of all TFFL in the 12 counties was \$2.2 billion, or \$817 per acre. Alternatively, according to data on forest land sales, the average price of Minnesota forest land in 2005 was \$1,226 per acre, with a large difference between the per acre price of large parcels and small parcels (Table D.5). Parcels that were more than 200 acres sold for less than half the price of 20-40 acre parcels.

Table D.5. 2005 MN forest land prices by parcel size.

Parcel size	Median price/acre
200+ acres	\$623
101-200 acres	\$857
41-100 acres	\$1,200
20-40 acres	\$1,405
All	\$1,226

Source: Computerized Records of MN Forest Land Sales⁸⁸

The baseline financial benefit-cost analysis uses the county assessors' EMV—\$800 per acre. However, two major factors could cause the total land sale revenue to be higher or lower than \$800. First, the difference in price between large and small parcels could have a significant impact on revenue generated from the sale of TFFL. For example, based on the data in Table D.5, if 25% of the total TFFL area is sold as 20-40 acre parcels, 25% as 41-100 acre parcels, 25% as 101-200 acre parcels, and 25% as 200+ acre parcels the average revenue from TFFL sales would be \$1,021 per acre (Table D.6). Alternatively, if TFFL is primarily sold as large parcels (200+ acres) the average income per acre would be considerably less.

Table D.6. Estimated average income from TFFL sales under different parcel size class distributions.

Distribution of TFFL parcels	Average income per acre
25% 200+ acres	\$1,021
25% 101-200 acres	
25% 41-100 acres	
25% 20-40 acres	
50% 200+ acres	\$918
10% 101-200 acres	
20% 41-80 acres	
20% 20-40 acres	
50% 200+ acres	\$829
30% 101-200 acres	
10% 41-100 acres	
10% 20-40 acres	
75% 200+ acres	\$726
15% 101-200 acres	
5% 41-100 acres	
5% 20-40 acres	

The other factor to consider when estimating revenue from a TFFL disposal policy is how a major increase in forest land supply would affect the price of Minnesota forest land. In 2005, approximately 50,000 acres of forest land sold in Minnesota. Under a 10-year disposal policy, an additional 272,000 acres would be sold each year. Economic theory suggests that such a large increase in the supply of forest land on the market would likely result in a substantial decrease in

⁸⁸ This data was obtained from computerized records of information on Minnesota's Certificate of Real Estate Value (CRV). Transactions included in this data set must have been arm's length sales of undeveloped forest land that were less than 20 acres.

the sale price of forest land. There is no data available to indicate how much the price of forest land would decrease.

Neither the distribution of TFFL parcel size nor the effect of a large increase in supply on price is known. Due to the uncertainty surrounding the price of forest land under a TFFL disposal policy, a range of average forest land prices is used in the financial benefit-cost analyses. To provide more clarity and make the analyses more useful for practical purposes, a *break-even* price is also presented to indicate the average forest land price that would make TFFL retention and disposal financially equivalent. If the average price is greater than the break-even price, then a TFFL disposal policy is a financially efficient strategy; if it is less, then a policy of retaining TFFL is financially efficient.

Discount Rates

A 3% discount rate was used in the baseline financial benefit-cost analysis and was based on a review of the literature and discount rates used by other public agencies. However, a reasonable argument can be made for discount rates that are higher or lower than 3%. To examine the impact of using alternative discount rates, financial analyses were performed using 1% and 5% discount rates.

Table D.7 and Table D.8 illustrate that changing the discount rate does not affect the baseline financial benefit-cost analysis conclusions. Even when discounting future benefits and costs at 1%, a TFFL disposal policy is the financially superior policy under most assumed forest land sale prices. TFFL retention would only generate greater financial returns if the price of forest land drops below \$536 per acre.

Table D.7. NPV of \$14.5 million in perpetual annual income under various real discount rates.

	1% Discount rate	3% Discount rate	5% Discount rate
NPV of retention	\$1,445,388,176	\$481,796,059	\$289,077,635
NPV per acre	\$531	\$177	\$106

Table D.8. NPV of TFFL disposal minus NPV of TFFL retention.

Land price per acre	Discount rate		
	1%	3%	5%
\$1,200	\$1,712,205,376	\$2,364,039,050	\$2,288,794,975
\$1,000	\$1,196,398,131	\$1,899,484,204	\$1,868,269,291
\$800	\$680,590,886	\$1,434,929,357	\$1,447,743,607
\$600	\$164,783,642	\$970,374,511	\$1,027,217,922
\$400	(\$351,023,603)	\$505,819,664	\$606,692,238
\$200	(\$866,830,848)	\$41,264,818	\$186,166,554
Break-even price	\$536	\$182	\$112

Stumpage Prices

The assumption that long-run stumpage prices will increase at the rate of inflation is reasonable, but tenuous. A sensitivity analysis can describe how future changes in stumpage prices (and net income) can influence the financial efficiency associated with retaining or disposing of TFFL.

According to projections in the USDA-Forest Service’s Resource Planning Act (RPA) Assessment,⁸⁹ from 1997 and 2050 softwood sawtimber prices in the northern US are projected to increase by 0.4% ; hardwood sawtimber prices increase by 0.2%; softwood pulpwood prices increase by 0.7%; and hardwood pulpwood prices decrease by 1% (Haynes 2003). Based on these projections, it could be argued that real stumpage prices will increase over the long run. Therefore, a sensitivity analysis will examine the effect a 0.2% and 0.4% overall annual stumpage price increase would have on the financial efficiency of alternative TFFL retention versus disposal policies.⁹⁰

Table D.9 shows the net benefits associated with a TFFL policy under different stumpage price projections. If TFFL is sold at \$800 per acre and stumpage prices are expected to increase by 0.2% annually, the NPV of selling TFFL is still \$1.36 billion dollars greater than the NPV associated with keeping the forest land under county management.

Table D.9. NPV of financial gain associated with TFFL disposal given various stumpage price changes

Land price per acre	Average annual increase in stumpage prices		
	No change	0.2%	0.4%
\$1,200	\$2,364,039,050	\$2,286,279,076	\$2,213,233,585
\$1,000	\$1,899,484,204	\$1,821,724,229	\$1,748,678,738
\$800	\$1,434,929,357	\$1,357,169,383	\$1,284,123,892
\$600	\$970,374,511	\$892,614,537	\$819,569,045
\$400	\$505,819,664	\$428,059,690	\$355,014,199
\$200	\$41,264,818	(\$36,495,156)	(\$109,540,648)
Break-even sale price	\$182	\$216	\$247

A TFFL disposal policy appears to be the financially efficient strategy regardless of changes in the underlying assumptions about future real stumpage prices. If stumpage prices increase 0.4% annually, the average price of forest land would have to fall below \$250 for retention to be financially superior policy alternative.

Disposal Period

Another assumption used in the baseline financial analysis is that if the TFFL were divested, all land would be sold equally over a 10-year period. This 10-year period was chosen arbitrarily as a reasonable time period for completing the sale of virtually all TFFL currently managed by the 12 counties. However, disposal of such a large land base could very likely take much longer to

⁸⁹ We did not find any timber price projections specific to Minnesota.

⁹⁰ Annual harvests are assumed to remain the same, but prices will increase. If harvests remain the same, revenue from timber sales will increase by the same percentage as in stumpage prices (0.2% and 0.4%).

complete. Accordingly, Table D.10 shows how longer disposal periods (20 and 30 years) would affect financial efficiency of TFFL retention and disposal policies.

Table D.10. NPV of financial gain associated with TFFL disposal given various disposal periods.

Land price per acre	Disposal period		
	10 years	20 years	30 years
\$1,200	\$2,364,039,050	\$2,061,575,445	\$1,810,713,358
\$1,000	\$1,899,484,204	\$1,656,461,805	\$1,454,900,013
\$800	\$1,434,929,357	\$1,251,348,164	\$1,099,086,668
\$600	\$970,374,511	\$846,234,524	\$743,273,322
\$400	\$505,819,664	\$441,120,883	\$387,459,977
\$200	\$41,264,818	\$36,007,243	\$31,646,632
Break-even price	\$182	\$182	\$182

A longer disposal period would have almost no effect on the baseline financial gain associated with selling TFFL. Forest land prices would have to fall to below \$182 for a TFFL retention policy to be a financially superior policy option.

Change in Multiple Assumptions

The goal of the sensitivity analysis was to relay how responsive the baseline financial benefit-cost analysis is to the underlying study assumptions. It considered how different assumptions about future forest land prices, discount rates, future timber prices, and disposal periods altered the baseline financial benefit-cost analysis results. These additional analyses concluded that variations in these baseline assumptions, by themselves, have very little effect on the initial conclusion that TFFL disposal is the financially preferable policy when compared to a policy of retaining TFFL under county management.

To further test how changes in the baseline assumptions affect the baseline results, more than one key assumption was varied simultaneously. Table D.11 shows the financial gain in NPV associated with selling TFFL under different combinations of discount rates, land prices, and future stumpage prices.

Once again, a policy of selling TFFL would be the financially superior policy alternative to the local taxing districts under most circumstances. However, the analysis begins to change when a 1% discount rate is used and future real stumpage price increases are projected. Assuming a 1% discount rate and a 0.2% annual increase in stumpage prices, the break-even sale price would be \$794 per acre. If real stumpage prices increase at a rate of 0.4% per year over the long term, TFFL retention would almost certainly be the optimal policy. This is a very specific scenario, but if local taxing districts believe it to be the most likely one, TFFL retention may be the financially optimal policy.

Table D.11. NPV of financial impact of TFFL disposal under various market conditions.

<i>Discount rate = 1%</i>			
	Average annual increase in stumpage prices		
Land price per acre	No change	0.2%	0.4%
\$1,200	\$1,712,205,376	\$1,046,086,629	(\$38,004,675)
\$1,000	\$1,196,398,131	\$530,279,384	(\$553,811,920)
\$800	\$680,590,886	\$14,472,140	(\$1,069,619,165)
\$600	\$164,783,642	(\$501,335,105)	(\$1,585,426,409)
\$400	(\$351,023,603)	(\$1,017,142,350)	(\$2,101,233,654)
\$200	(\$866,830,848)	(\$1,532,949,594)	(\$2,617,040,899)
Break-even price	\$536	\$794	\$1,215

<i>Discount rate = 3%</i>			
	Average annual increase in stumpage prices		
Land price per acre	No change	0.2%	0.4%
\$1,200	\$2,364,039,050	\$2,286,279,076	\$2,213,233,585
\$1,000	\$1,899,484,204	\$1,821,724,229	\$1,748,678,738
\$800	\$1,434,929,357	\$1,357,169,383	\$1,284,123,892
\$600	\$970,374,511	\$892,614,537	\$819,569,045
\$400	\$505,819,664	\$428,059,690	\$355,014,199
\$200	\$41,264,818	(\$36,495,156)	(\$109,540,648)
Break-even price	\$182	\$216	\$247

<i>Discount rate = 5%</i>			
	Average annual increase in stumpage prices		
Land price per acre	No change	0.2%	0.4%
\$1,200	\$2,288,794,975	\$2,251,753,725	\$2,227,202,239
\$1,000	\$1,868,269,291	\$1,831,228,041	\$1,806,676,554
\$800	\$1,447,743,607	\$1,410,702,357	\$1,386,150,870
\$600	\$1,027,217,922	\$990,176,673	\$965,625,186
\$400	\$606,692,238	\$569,650,988	\$545,099,502
\$200	\$186,166,554	\$149,125,304	\$124,573,817
Break-even price	\$112	\$129	\$141

I. Summary of Financial Analysis Results

The financial benefit-cost analysis examined the financial impacts of retaining versus disposing of county-managed TFFL from the perspective of the local taxing districts. The retention of TFFL implies counties would continue to generate annual income from the management of these lands, primarily through revenue generated from timber sales. Alternatively, a TFFL disposal policy would entail selling approximately 2.7 million acres of forest land currently managed by 12 county land departments. The NPV of discounted cash flows of both policy options was used to assess the financial feasibility of each. When conducting the baseline financial benefit-cost analysis, the following assumptions were made:

- Future benefits and costs are discounted using 3% discount rate.
- No changes in the use or management of county TFFL from current uses and management.
- Net income increases at the rate of inflation—ignoring possible future forest product and service markets.
- TFFL sells for an average price of \$800 per acre.
- A 10-year period for disposal TFFL.
- The sale of TFFL has no impact on property tax revenue or public service costs.

Under these assumptions and from purely a financial perspective, a policy of selling TFFL is the financially efficient alternative when compared to a policy that keeps TFFL under county management. The NPV of a TFFL disposal policy is \$1.92 million, whereas the NPV of a TFFL retention policy is \$482 million. The net financial gain associated with selling TFFL is approximately \$1.44 billion. The sale price of TFFL would have to drop below \$182 per acre in order for the retention policy to be more financially attractive.

A sensitivity analysis showed that, in general, changes to the stated assumptions regarding discount rates, stumpage prices, and disposal periods have very little effect on the baseline financial benefit-cost analysis results (Table D.11). The only circumstances that are likely to make the policy of TFFL retention more financially attractive than a policy of selling TFFL are when future benefits and costs are discounted to present value terms using a low discount rate (1%) and real timber prices are assumed to increase (0.2% or 0.4% annually).

Forest land prices appear to be the biggest determinant of whether local units of government would benefit financially from selling or retaining TFFL. Unfortunately, future forest land prices, particularly under a scenario where considerable acreage is placed on the market over a relatively short period of time, are very difficult to estimate. Without information on how this increase in the supply of forest land will impact forest land sale prices, it is difficult to state with certainty what the financially superior TFFL policy would be. However, the financial analysis shows that under a range of reasonable assumptions and barring any dramatic changes in forest land prices and timber prices, a policy of selling TFFL would produce greater financial returns to local units of government than a policy that retains these lands under county management.