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Forestland Values

Future Forestland Area: Impacts from Population Growth and Other Factors that Affect Land Values

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Shifting patterns of land use in the United States are associated with many of today's environmental concerns. Land-use shifts occur because of relative changes in land rents, which are determined in part by financial returns in commodity markets. In recent decades, more than 3 million ac shifted annually in or out of US forest use. Gross amounts of land-use change are an order of magnitude larger than net changes. Between 1982 and 1997, a net amount of 3.6 million ac was added to the US nonfederal forest land base. Area of developed uses is projected to increase by about 70 million ac by 2030, with the largest percentage diverted from forests. All regions show substantial increases in developed area, with increases in population and personal income as key drivers. Forest area is projected to decline in two key timber supply regions, the South (−6.0 million ac) and the Pacific Northwest Westside (−1.9 million ac). Other regions having projected losses in forest area include the Northeast (−3.0 million ac), the Lake States (−1.2 million ac), and the Pacific Southwest (−0.6 million ac). Conditions in land markets reflect increased rents from residential and other uses of developed land, such that forests and forestland values will increasingly be influenced by development and its location.

Keywords: land-use projections; land markets; development; land-use shifts

America's 747 million ac of forestland span many forest types, site qualities, locations, age structures, and other attributes. US forests also produce a wide variety of goods and services, both market-based and nonmarket. Decisions about uses of public and private land are shaped by an array of economic and political factors. As a result, the patchwork that is land use and cover in the United States is a rapidly changing phenomenon. We will examine key factors that influence future forestland values and how they are related to changes in the allocation of the US nonfederal land base to different major uses. We provide projections of areas for forest and competing land uses for the next several decades. Such projections serve as indicators of the levels of goods and services provided by forests and other major uses of land.

We first look at historical trends in land use to understand past developments that can be of value in assessing future scenarios, as some of the key drivers such as population change are expected to persist. Both urban and rural populations have grown dramatically over the past two decades, causing some rural counties to triple their populations within that time span, with some significant impacts on nearby forested landscapes. At the same time, we need to consider what is happening in competing sectors, such as agriculture, including effects of government policies such as farm subsidies. Then, we provide projections of US nonfed-

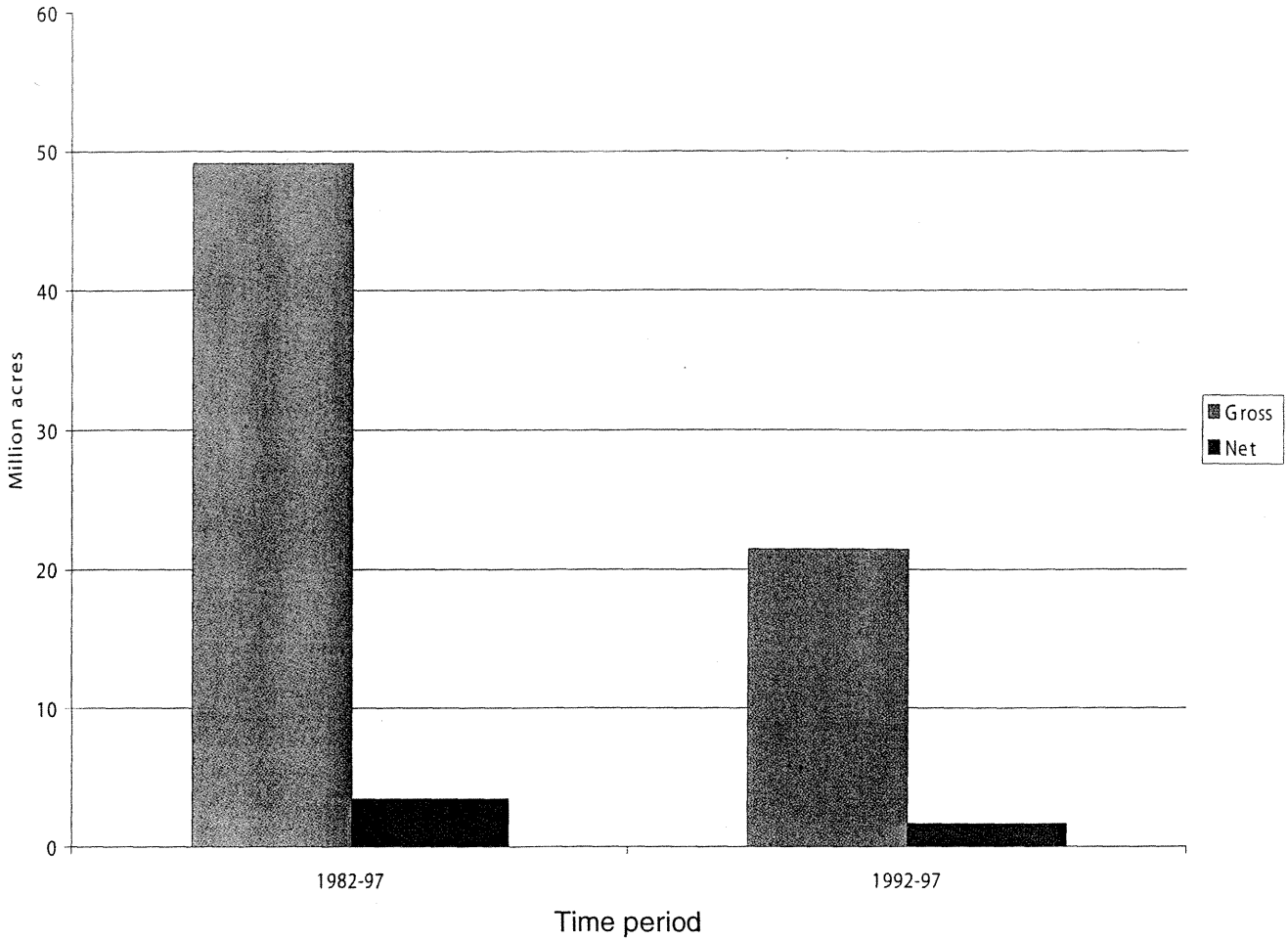

Figure 1. **Gross vs. net area changes involving US forestry. Source: USDA Natural Resources Conservation Service.**

eral forest area out to 2030, based on modeling that draws on historical relationships. We conclude with a discussion of implications of the projected area changes and what can be learned by examining trends in market valuation of competing land uses.

Historical Trends

In 1997, the United States had 747 million ac of forestland (Smith et al. 2001), covering about one-third of the land area. Two-thirds or 504 million ac were timberland (defined as forestland that can produce 20 ft3 of industrial wood per acre per year and is not withdrawn from timber production or reserved for other uses such as wilderness). Fifty-eight percent of US forestland is privately owned. Previous economic research finds that land-use shifts are determined primarily by changes in the relative profitability of alternative uses. In theory, land values reflect the discounted value of the stream of rents from the highest and best land use. Land values may reflect that there is some anticipated future use—for example, development—that will be most profitable at some point in the future. This is consistent with the dynamic nature of the US land base. In recent decades, more than 3 million ac shifted annually in or out of US nonfederal forest use (USDA Natural Resources Conservation Service 2001). These gross changes in land use are an order of magnitude larger than net changes (Figure 1). While close to 50 million ac shifted in or out of forest use in total between 1982 and 1997, a net amount of 3.6 million ac was added to the nonfederal US forest land base. Within the timberland base, there have also been shifts between different forest cover types. One of the largest changes has been an increase between 1952 and 1997 of more than 25 million ac of commercially valuable pine plantations in the South (Alig and Butler 2004).

National net area changes also mask much regional variation. This is illustrated in the South, where the trends for the two subregions differ. Forest

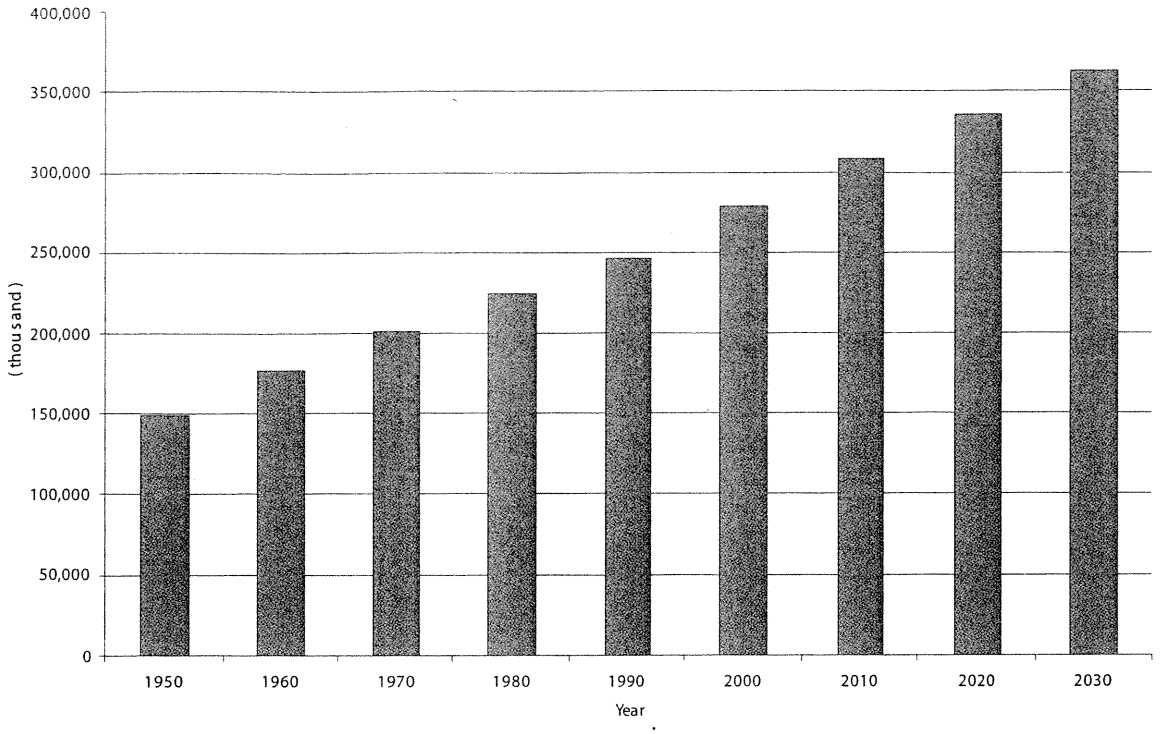

Figure 2. **US population: history and projections.**

area was reduced by about 2 million ac in the more populous Southeast (FL, GA, NC, SC, and VA), while it increased by 3 million ac in the more rural South Central subregion (AL, AR, KY, LA, MS, eastern OK, TN, and eastern TX). The South Central subregion had the largest increase in forest area of any region. The South Central region has a larger amount of marginal agricultural land suitable for conversion to forests and has less population pressure than the Southeast.

Western regions—the Pacific Northwest Westside (west of the crest of the Cascades mountain range in OR and WA), Pacific Southwest (CA), and Rocky Mountains—also had historical net reductions in forest area. Population growth has been above the national average in the West in recent decades. Many studies have found that forestry returns positively influence forest area but that they can be overwhelmed by returns to development. In many metropolitan areas, land in the surrounding rural area is developed to accommodate a city's growing population (Alig et al. 2004). Two key factors determining development of forestland are the distance to a city center and the changes in the city's population.

Forest area has historically been influenced by changes in the agricultural sector. Technological changes that significantly boosted agricultural productivity per acre allowed many forest acres to be spared from conversion and encouraged the reversion of marginal lands to forest. The average real value of US farmland rose by an average of 1.5% per year from 1987 to 1997, compared to an earlier decrease of 25% from 1982 to 1987. At the same time, agricultural area has declined every year since 1954, falling from 1.2 billion ac to 955 million ac in 1997.

Agricultural subsidies have prompted some forestland conversion, including forested wetlands containing hardwood bottomland ecosystems noted for their biodiversity. Agricultural subsidies are capitalized into land values (Plantinga and Miller 2001), with the total dollar amount of US farm subsidies greatly outweighing any for forestry. The national Freedom to Farm legislation proposed to reduce subsidies, but add-backs by Congress have led to record amounts of subsidies. Because prices for agricultural products have been artificially propped up, the playing field for forest use has not been level. It is likely that more forestland is converted to agricultural uses than would happen in an unfettered market environment.

Area Projections of Major Land Uses

The Resource Planning Act (RPA) assessments (e.g., Alig et al. 2003, Haynes 2003) provide large-scale analyses, looking across major land uses and sectors, to assess land-use changes and their complex interactions across the whole country. Land managers and policy analysts can use the information from the historical analysis and associated projections of forest area changes in planning for wildlife habitat, carbon sequestration to address global climate change, timber supply, and other benefits provided by forests. A key element of the RPA assessment is long-term projections of changes in land use, forest cover, and forest resources. In an earlier study,

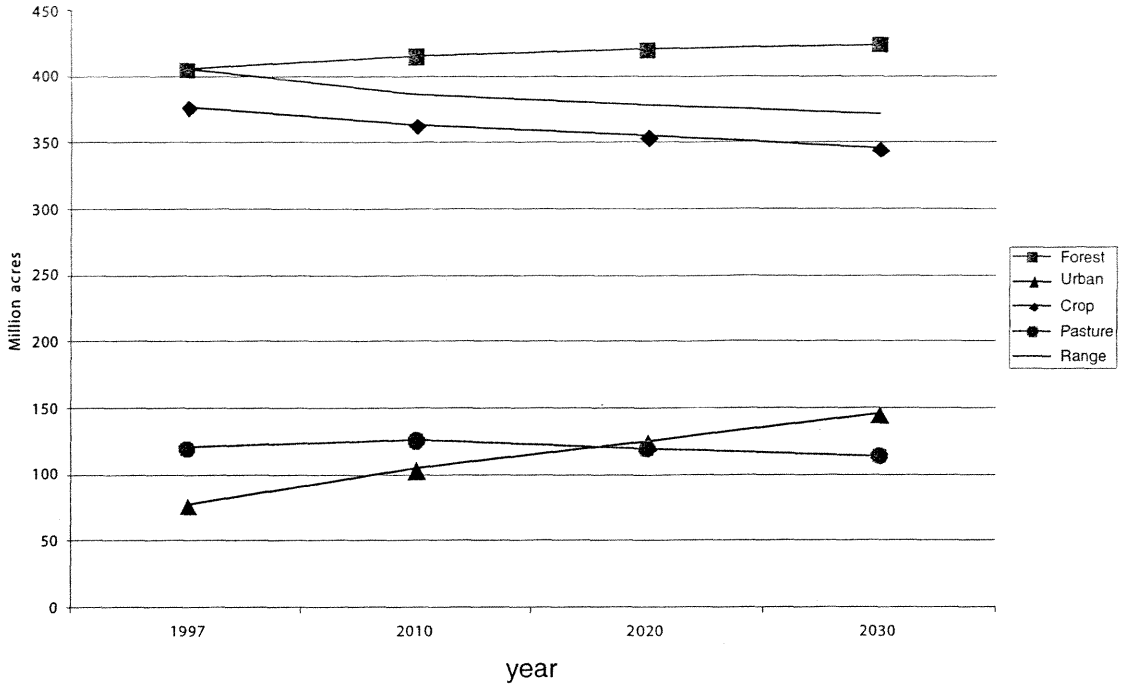

Figure 3. **Projected area changes for major land uses in the United States.**

Alig et al. (2002) projected 2050 timberland area to be about 3% smaller than today's due in part to increasing demands for urban and related land uses. In the South where notable changes were projected, an increasing area of southern-planted pine is accompanied by a reduction in the area of upland hardwoods (Alig and Butler 2004).

In the 2005 RPA Assessment Update, we updated those earlier projections by taking advantage of a recently developed national-level econometric land-use model (Lubowski et al. 2004). The model estimates the effects of key economic factors on transitions between major land-use categories over the 1992 to 1997 period. Land-use projections for forests, crop agriculture, pasture, range, urban/developed uses, and the Conservation Reserve Program reflect a continuation of trends observed during the 1992 to 1997 period. Between 1997 and 2030, nonfederal forest area is projected to decrease in about half of the 10 regions.

The largest losses of forest area are to urban and developed uses, in the face of a projected 30% increase in US population by 2030 (Figure 2). Overall, the area of urban and developed uses is projected to increase almost 90% by 2030, growing from 76 million to 144 million ac (Figure 3). Forests are projected to lose 26 million ac to urban and developed uses by 2030. A large part of those converted acres are in the South (10 million ac), which has a relatively large projected increase in population, and the Pacific Northwest (2 million ac), prime forest regions.

Among major land uses, forests have historically been the largest source of land for developed uses, and this holds as well for the projections. All regions show substantial increases in developed area. Other studies indicate that population and personal income are key drivers of increases in developed area (e.g., Alig and Healy 1987, Alig et al. 2004).

Forest area is projected to decline in net in two key timber supply regions, the South (–6.0 million ac) and the Pacific Northwest Westside (–1.9 million ac). Other regions having projected losses in forest area include the Northeast (–3.0 million ac), the Lake States (–1.2 million ac), and the Pacific Southwest (–0.6 million ac).

The regions with the largest projected gains in forest area are the Rocky Mountains and Corn Belt. This is largely due to a net land exchange with agriculture, with forests gaining area from crops, pasture, and range.

As is true historically, the gross area of projected land transfers is close to an order of magnitude higher than the net amount. Thus, many more acres of land change use than is suggested by net change statistics. This is important when considering changes in the state and condition of forest resources. Many acres entering the forestland base are early successional or planted stands, while a significant number of exiting acres have older forest characteristics.

Land Values

Conceptually, land has a current market value equal to the net present value of expected future rents, which are benefits from the land in excess of costs. Given the infinite time horizon, our lack of perfect knowledge and foresight complicates the determination of future rents. Over time, changes in supply and demand for land affect relative land rents. Increased demand for residential and other uses of developed

land in some areas have outweighed those for timberland use in recent decades. The expected flow of rents associated with different land uses provides incentives for investments in existing and future land developments. This could mean that forest use is pushed more toward hinterlands at an increasing distance from metro areas.

The projected shifts in land use reflect economic and soil quality conditions in the case of forest and agriculture, while conversion of forestland to development is influenced significantly in many cases by location. Increases in population and the demand for land can give rise to incentives to bring less fertile lands into use. For example, with expanded development, growing scarcity of forestland acts to raise timber prices. If timber prices and associated timber-related incomes rise enough, it may be profitable for some owners to intensify timber management on some lands and also afforest additional land. At the same time, changes in transportation costs may affect the extent of the area within which forest products can be profitably produced. Such changes affect land values in forestry.

Forestland values reflect current as well as anticipated uses of land. For example, forestland prices anticipate future development close to urbanizing areas (see Wear and Newman 2004 for southern examples). Urban and developed uses typically sit on top of the economic hierarchy of land uses, with rents often at least an order of magnitude higher than those for forestland. Such higher rents mean that determinants of land-use transitions in many cases are demand-side factors pertaining to developed uses, such as population and income.

We compared the relative size of urban versus forestry net returns for the Southeast and Pacific Northwest Westside to provide broad indicators of relative rankings of land use within an economic hierarchy of land use. Urban returns were estimated as the median value of a recently developed 1-ac parcel used for a single-family home, less the value of structures (Lubowski et al. 2004). Net returns per acre from forestry were estimated by the net present value of a weighted average of sawtimber revenues from different forest types, where a series of sawtimber harvests occur at the economically optimal (Faustman) rotation for a 5% interest rate. For 473 counties in the Southeast, the weighted average land value in forest use was $415, compared to a value in urban use of $36,216. For 38 counties in the Pacific Northwest Westside, the corresponding average values are $1,483 in forest use and $165,947 in urban use.

The ratio of average value of land in urban use compared to forest use is approximately 87 in the Southeast and 111 in the Pacific Northwest Westside. The highest forest values on a county basis in the Pacific Northwest Westside are about 25 times less than the lowest urban values and 141 times less than the highest urban value. The ratios in the Southeast are roughly similar; however, overall, the Pacific Northwest Westside has much larger land values in forest use and urban use. The Pacific Northwest Westside has 14 counties with land values at least $200,000 per acre in urban use and $2,000 in forest use, while the Southeast has none. Thus, in interface areas such as metro or urbanizing locations, the economic hierarchy of land uses suggests that in land markets development-related land-use factors tend to strongly dominate forestry-related ones.

Forestland values are affected by land-price volatility (e.g., boom and bust in value of agricultural assets), and forestland is sometimes used as a hedge against inflation. Forest asset markets as discussed by Aronow et al. (2004) have increased in activity. Some adjustments in timberland holdings include divestitures of industrial timberland, which can present both opportunities and challenges for forestland conservation. Large industrial forest properties are concentrated in the South and Pacific Northwest Westside and have decreased most significantly in the North (e.g., Maine has seen a decline of 10% in large ownerships since 1993). A growing number of "financial owners" of forestland (e.g., Timberland Investment Management Organizations) is also complicating the ownership picture.

Implications and Conclusions

Forestland in the United States is subject to a wide range of forces, both market and nonmarket in nature. Use of land for forestry competes with other major land uses, including urbanization pressure that is driven by substantial population and personal income increases. The rate of urban development increased in the 1990s, with a 50% increase over the previous measurement period; substantial population growth is expected to continue. Effects can vary regionally, due to differences in land values by type, location, productivity potential, and other factors. As the human population increases, competition among forest, agricultural, urban, and other developed uses for a fixed land base will intensify. Land-use projections for the 2005 RPA Assessment Update portray a future where more developed land is accompanied by reductions in forestland in some regions. Implications of the more than doubling of developed area is that forests and forestland values will increasingly be influenced by development and its location (Wear and Newman 2004).

In the future, rising land rents for development could result in more forestland fragmentation. Given that people need a place to live, society will need to increasingly examine economic and ecological compatibility issues in recognition of the goods and services provided by our forests. We focus in this article on discrete land-use changes, but those involved in forestry will recognize that other effects of population growth can include impacts on timber management, fire management, vandalism and littering, and other undesirable effects. As more people occupy the national landscape, expanding and blurring the lines between urban, rural, and wildlands, the nature of human impacts on the forest landscape is changing in fundamental ways.

More people on the American landscape will also affect the availability and proximity of amenities provided by forests. Amenities provided by relatively undeveloped land, including forestlands, are consistently shown to be a positive factor contributing to migration to urban and rural areas. For

example, many value proximity to public forestlands. The value of land for development can derive in part from scenic views or proximity to a recreational site. Amenity characteristics can, in turn, affect quality of life.

Policy instruments are used to address market failures involving land use, such as existence of public goods that represent nonmarket values that contribute to the welfare of individuals as members of society, or provide adequate incentives to achieve other land-use objectives of governments or communities. Such instruments affect land-use outcomes and include conservation easements and current use tax assessment (Kline et al. 2004). In making choices about how to manage the country's wealth of forestland, stakeholders—including the US taxpayer—have a large number of choices, with ripple effects that can extend far beyond the immediate stands of trees and can have cross-sectoral impacts. How do we take all these factors into account as we make sustainable natural resource management decisions?

Past studies have tended to view only subsets of the suite of biophysical, ecological, and socioeconomic factors that combine to influence the areas of forest cover types and their spatial distribution factors. They have tended to examine changes in land use at relatively small scales and focus on single sectors, with outcomes over large geographic areas not as closely monitored. Crossing sectors means crossing time horizons: forestry might look at a minimum of three to six decades' rotation time, whereas agriculture may only involve one season. The dynamics of human development guarantee changing cycles, with components such as trade-offs between sectors, less land for growing trees, an increasing need for fire planning in the urban-wildland zone, a pressing call to revisit land-use planning laws, and an investigation of how private markets can help in natural resource management issues.

Reallocation of land among uses is often a feasible option in the United States compared to some other countries that do not have such a wealth of land. How do we want to live on the land and how might values for major land uses change in the future? With the backdrop of dynamic supply and demand for renewable resources, uncertain national and international timber market shifts, unknown climate change potentials, and social values demanding a sustainable future, how can we know what choices to make? Coupled with population increases and income growth, the challenges will increase to make prudent decisions about use of our country's wealth of land and associated resources.

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