Proceedings

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Over 200 attendees from 20 countries contributed papers at the conference. Twenty-three of those papers and the keynote addresses delivered at the conference are included in a companion volume to this proceedings titled Forest Policy for Private Forestry: Global and Regional Challenges[1]. All presentations at the conference are represented here in the form of a paper or an abstract. Abstracts are provided for the articles included in the previously mentioned book. We would like to thank all contributors to the conference for helping to make it a truly exceptional event for everyone.

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[1] Teeter, L., B. Cashore and D. Zhang 2003. Forest Policy for Private Forestry: Global and Regional Challenges. CABI Publishing, Wallingford, UK, 307p.

Policy and Economics

The Role of Private Lands in Regional Economic Development - *Henry H. Webster and Daniel E. Chappelle*

University of Minnesota and Michigan State University

Introduction

This is a simple straightforward presentation covering an important topic, the role of private forestlands in regional economic development. This presentation is based primarily on matters in the Lake States region where the authors have had extensive jointly shared experience. Some of the points may also be reasonably applicable in other regions. Previous experience (among us) in three other parts of the country leads us to think that may be so.

We will discuss three primary related topics. First, forests in many different ownerships contribute to both environmental quality and economic development. Second, efforts have been made to diversify a once over concentrated economy in major parts of the Great Lakes region (and have succeeded in a useful way). Third, private forests have played a considerable role in these efforts. An important part of this third point is the fact that non-industrial private forests are the source (and a dependable source) of a very substantial share of timber supply.

Forests in Many Different Ownerships Contribute to environmental Quality and Economic Development

Both protection of environmental quality and economic growth and development are extremely important. Indeed they are mutually interdependent. Poverty is worldwide the leading cause of severe treatment of natural environment. Economic development helps to relieve poverty. Economic development also provides the basis for directly paying for relatively expensive environmental protection measures. Protection of environmental quality similarly contributes to economic development. Put simply, talented people and organizations are the under firming root of effective development. Neither is likely to remain for long in areas with truly severely degraded natural environment. This mutually interdependence is the central point cogently put by the Bruntland Commission in *Our Common Future* (UN World Commission on Environment and Development 1990).

It is quite apparent that forests in several different ownerships contribute to both environmental quality and economic development in the Lake States, as well as in other regions. Eighty percent of the approximately 50 million acres of forestland in the Lake States is held by a combination of industrial owners and several national forests (North Central Forest Experiment Station 1992).

These 50 million acres of forests together with attractive bodies of water are the natural bases for a sizeable resort sector in the Lake States region. Lake States topography and scenery is interesting if less spectacular than mountainous regions. It is notable interesting compared with more uniform heavily agricultural regions south and west. Forests and waters are the natural bases of this interesting topography and scenery. It has also been demonstrated that communities with substantial activities in both tourism and forest products sectors are better off than communities with only one of these resource sectors (Chapelle 1997; Webster and Chapelle 2001; Hacker and Anderson 1997).

These 50 million acres of forests are also the material base for a considerable expansion of forest products industries in the Lake States during the past two decades. Both building products industries, and pulp and paper, have expanded appreciably. In some cases existing plants have been enlarged (particularly in pulp and paper). In other cases wholly new plants have been established. In an overall sense these expansions have been shared about equally in Minnesota, Wisconsin, and Michigan.

Efforts have Been Made to Diversify an Over controlled Economy in Major Parts of the Great Lakes Region

These expansions are in part the result of natural competitive forces, particularly an expanding regional forest resource, some increases in transportation costs, and tightening of timber supplies in some other regions. These natural competitive forests are an important base but are certainly not the whole story. Let's consider the regional societal context, which lends vital point to some deliberate and rather major efforts.

Major parts of the industrial Midwest experienced some very heavy economic weather from the late 1970s through at least the 1980s. Areas heavily dependent on steel-heavy machinery-automobiles were most severely affected. Unemployment rose to extremely high levels. And a historically prosperous

region with above-average per capita income levels declined to the national average or a bit below. Primary causes of this substantial economic jolt were first high and then fluctuating energy costs and internationalization of many mass production industries.

This substantial economic jolt led to efforts to identify and deliberately foster sectors in which there was apparent potential for net state and regional economic growth. The governors in a fairly direct sense led these efforts in many cases. There also came about a considerably strengthened pattern of regional joint efforts linking adjacent states. Some parts of these efforts dealt with forest resources and industries (Webster and Chappelle 1997). Other parts dealt with some range of other industrial sectors. A considerable reshaping of the industrial economy of the Midwest resulted. This reshaping was sufficient to cause very competent economic analysts at University of Wisconsin to conclude that the Midwest would do better than national average in quite a number of industrial sectors other than automobiles (Bilek and Stier 1997).

Efforts specific to forest resources and industries can be readily illustrated for the state where both authors jointly served, named Michigan. Quite similar efforts were made in Minnesota and Wisconsin though program terminology differed and the overall economic situation was better in those two states.

The societal context was sharply put by three quantitative measures that appeared in Michigan at roughly the same time about two decades ago. The state unemployment rate rose to nearly 18 percent of the state labor force for a time. New forest inventory information showed forest growth to be three times harvest. And in-state consumption of paper and building products was determined to be somewhat more than three times in-state production. These three quantitative measures made it clear, and widely understood, that forest resources and industries was a sector with important potential for net state and regional economic growth.

Overall state efforts to foster sectors with such potential were termed the governor's target industry program. It initially consisted of three identified sectors: forest resources and industries, agricultural food processing, and certain especially high-value parts of the automobile industry. A quite specific program to foster each was drawn up, and the governor assigned primary responsibility for leadership of each. The programs for forest resources and industries and for agricultural processing were subsequently grouped (in a conceptual sense) with a newly developed tourism sector program as a "Renewable Resource Development Initiative." The tourism segment focused primarily on efforts to attract additional out of state visitors.

The specific target industry program for forest resources and industries consisted of 25 quite specific initiatives. These 25 can be grouped into three primary categories: efforts to improve the business climate for forest products industries, efforts to increase supply of increasingly useful and valuable timber, and efforts to have private and public sectors work in a unified manner concerning these resources and industries. A substantial commonsense of direction was achieved. Two strong, though informal, organizational links were notably important. One joined particular people in the business development and forest resource units of the state's Department of commerce and Department of Natural Resources. The other joined the state agencies to particular people in the universities who were the source of analytic help and related advice.

Results of all these efforts have been constructive. Overall the state unemployment rate has come down by states to a bit below the national unemployment rate. Significant expansions of forests products industries have occurred, as previously noted. The proportion of state consumption of paper and building products produced in-state rose from 30 to 40 percent.

People in the governor's office developed a particularly telling measure of overall effect in 1990 (people whose judgment and objectivity are to be trusted). They found that the state had become 25 percent less dependent on its most dominant industry (automobiles) than had been the case 10 to 15 years earlier. This was real process in getting at the root of the original serious economic jolt.

It is difficult to be sure exactly what part forest resources and industries played in this important overall effect. That this sector was one of several having beneficial effect is beyond reasonable question.

As mentioned previously, quite similar efforts were also married out in Minnesota and Wisconsin.

Private Forests Have Played a Considerable Role in these Efforts

Private forests have played a considerable role in these favorable developments. As previously noted, non-industrial private forests and state and county forests together constitute 80 percent of 50 million acres of forestland in the Lake States. State and county forests are a regionally distinctive feature. Nevertheless, non-industrial forests are the more extensive single ownership category. They constitute more than half of all forestland in Wisconsin and Michigan, specifically 64 percent and 53 percent,

respectively. Non-industrial private forests constitute slightly less than half Minnesota's forested acreage (specifically 44 percent). Minnesota has proportionally more public forestland than either of its regional neighbors. These proportional differences among Lake States primarily reflect the degree to which forestland originally passed into private ownership *and then succeeded in staying there*. Matters related to agricultural productivity over sizeable areas are at the root of these observed differences among the three Lake States.

Industrially owned forests further enlarge total privately owned forest area. Industrially owned forests constitute a bit less than 10 percent of all forestland in the Lake States (with Michigan having somewhat more industrially owned forest land than either Wisconsin or Minnesota). This less than one-tenth has two important characteristics, however. It is the one major ownership category that expanded to a degree from 1970s to 1990s; and industrially owned forest are reasonably thought to be the most intensively managed forests in the Lake States. Deliberate and targeted land acquisition by a number of firms, and relatively unified direction and relatively clear overall purposes of resource management, have contributed to these two important characteristics of industrially owned forest land.

Finally, non-industrial private forests are the source of a very substantial share of timber supply for industry-based economic development. For one specific example, two-thirds of timber harvest has historically occurred on the 53 percent of forestland held by non-industrial private forest owners in Michigan. Rather similar patterns are reasonably thought to also occur in Minnesota and Wisconsin although the specific numbers differ.

This pattern of non-industrial private forests being the source of a more than proportionate share of timber supply is important. This directly contradicts the idea that most non-industrial private owners are not interested in timber harvest. Rather it has been suggested that many owners are interested about a quarter of the time—when they actually have mature timber and are offered decent prices. This is a keen insight developed by an insightful Lake States observer several decades ago (and substantiated by experience since). Good data on stated intent and actual behavior of a sizeable sample of non-industrial private owners simply did not match. Concentrated thought led Bob Stone[1] to the insight just mentioned (Stone 1997). It seems likely that questions asked of landowners, and questions actually heard by landowners, often differ. If asked, "Are you interested in selling timber," a landowner who does not have any reasonably mature timber at the time may well interpret the question as simply nonsense and answer "No." Such answers have frequently been greatly over interpreted.

Conclusion

Both protection of environmental quality and economic growth and development are extremely important. Indeed they are mutually independent. Forests in many different ownerships contribute to both environmental quality and economic development. Deliberate efforts have been made to expand these contributions of forest resources to important societal goals in the Lake States, as well as other regions.

Private forests have played a considerable role in these developments. Industrially owned forests have expanded somewhat and are managed relatively more intensively than many other forests. Non-industrial forests are the region's most extensive single ownership category. They are also the source of a very substantial share of timber harvest for industry-based economic development.

It seems almost self-evident that private forests have public importance in addition to their direct importance to their individual and industrial owners. Private Forests and their owners deserve respect and appropriate forms of assistance in view of this public importance.

Points made in this paper have been developed and illustrated specifically for the Lake States region. There is reason to believe they apply in more general form in other regions as well.

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[1] *Robert Stone served at various times as a member of the USDA North Central and Southeastern Forest Experiment Stations, and most recently the Forest Products Laboratory. He developed the important insight noted while preparing his Ph.D. dissertation at University of Minnesota.*

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Price Elasticities in the Norwegian Private Non-Industrial Roundwood Supply: Sensitivity of Econometric Methods and Price Aggregation - *Torjus Folsland Bolkesjø and Birger Solberg*

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The major part of the timber harvest in Scandinavia is provided by non-industrial private forest (NIPF) owners, and many micro-level Roundwood supply analyses have been done to provide improved information for market participants and policy makers. Like econometric studies in general, the results of these studies depend upon (i) the economic behavior theory used, giving the variables to be included in the econometric model and their expected signs; (ii) the quality of empirical data available for these variables (both regarding relevance and number of observations); (iii) the choice of statistical method. Most of the previous published studies have concentrated on the first of these points, whereas the importance of the last two has been rather sparsely investigated. This paper focuses; first, on analyzing how the roundwood supply elasticities depend on choice of econometric method by comparing results from estimations based on pooled Tobit and fixed-effect Tobit models. Second, using gross stumpage price (i.e. price delivered road side) are compared with using net stumpage price, and finally, the importance of level of aggregation in price data are analyzed by comparing the results of using county level mean prices and municipality level prices.

A panel consisting of information on annual harvest, prices, income, wealth and forest property characteristics for 14,468 forest owners during the period 1989-1997 (except 1991), is used for the statistical testing.

The estimated net price elasticity decreased more than 100 percent when using the FE-Tobit model instead of the pooled Tobit model and municipal-level mean prices. Based on the log-likelihood values of the models, we regard the FE-Tobit model as more reliable than the pooled Tobit model. The signs and the significance of the coefficients of the FE-Tobit results were also more in line with the theory, though details are not reported here.

The gross price elasticity was higher than the net price elasticity. This was inline with our a priori expectations as the relative variation is higher in the net price series than the gross price series. However, the increase of the price elasticity of about 70 percent was surprisingly high. The estimated price elasticity was not that sensitive to the level of the aggregation of the price data. However, the estimates were 25 percent higher when using county-level mean prices instead of municipal-level mean prices and the FE-Tobit model.

The results demonstrate that the econometric method applied heavily affects the estimation results in micro-level roundwood supply analyses. And that the nature of the price data should be more carefully considered when comparing price elasticity estimates based on micro-level data. Although the case in this study is the Norwegian roundwood market, the results should be of interest as the problems investigated are present also when analysing other markets.

An Ecological-Economic Comparison of Longleaf Pine and Slash Pine on Private Lands in the U.S. South - *Janaki R.R. Alavalapati, George A. Stainback, and Douglas R. Carter*

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Introduction

Longleaf pine

The longleaf pine ecosystem was once the predominant forest community in the southeastern coastal plain of the United States (U.S.) before European settlement, covering over 36 million hectares (Lander et al., 1995). At present less than 1.2 million hectares of longleaf pine (*Pinus palustris*) remain and the total is still declining since most mature longleaf stands are not being adequately replaced by younger stands (Delly and Gechtold, 1990). Humans have had a significant impact on this ecosystem for several hundred years. During colonial times longleaf pine was harvested mostly for its valuable wood. However, large scale logging of longleaf pine forests occurred in the 19th and early 20th centuries. Longleaf pine forests were further reduced during the 1950s when timber and pulp and paper industries started to use faster growing loblolly and slash pine on land that used to support longleaf pine. Lack of reforestation and government policies that encouraged the exclusion of fire also contributed to the decline of longleaf pine. Finally, the conversion of cut over lands to agriculture use led to the further reduction in longleaf pine forests in the U.S. south. Today virgin longleaf stands exist only in a few isolated pockets (Abrahamson and Hartnett, 1990).

The longleaf pine ecosystem has a high degree of biodiversity, supporting hundreds of plant and animal species. The dramatic decline of this ecosystem has had significant negative environmental consequences. For example, over 30 plant and animal species that occur in this ecosystem are now threatened or endangered (Lander et al., 1995). The most notable example is the red-cockaded woodpecker (RCW, *Picoides borealis*), which was listed as endangered in 1970. The RCW needs mature pine, preferably longleaf pine at least 25 years old for foraging habitat and at least 60 years of age for nesting habitat (Wood and Kleinhofs, 1995). Because of its wide range and the high proportion of forestland in private ownership in the southeastern U.S., restoration on private lands is essential for the recovery of the RCW (Costa, 1995).

The replacement of old growth longleaf pine with agricultural crops, urban development and shorter rotation species may have reduced the amount of carbon stored in forest biomass (Birdsey 1992). With public concerns over the rapid rise in CO_2 levels, this represents the loss of a significant environmental benefit. In addition to environmental benefits, longleaf forests have unique characteristics that may translate into potential economic benefits to landowners. First, longleaf is much more resistant to fire than other commercial timber species such as loblolly or slash pine. In fact, regular occurrence of low intensity ground fires reduces competition from other plants and improves the biodiversity in the herbaceous ground cover (Dennington and Farrar, 1983). Second, it is more resistant to fusiform rust and bark beetle attacks than other pine species. Third, it produces higher valued lumber under long rotations compared to other pine species. The wood of longleaf pine is dense and its straight growth form makes it a choice species for the production of higher proportion of sawtimber relative to slash pine.

Challenges to restoring longleaf pine of private lands

Because of the above environmental and economic benefits associated with longleaf pine, there is a strong interest among forestry professionals and conservation groups in restoring this ecosystem. For instance, in Geneva County, Alabama, over 2000 hectares of marginal agricultural land were planted with longleaf pine through the Conservation Reserve Program. The Florida Division of Forestry has made it a top priority to restore longleaf pine on state forestlands. Non-governmental organ-izations such as The Longleaf Alliance and many government organizations including the USDA Forest Service have been providing forums to exchange information and conduct research on various issues related to longleaf pine restoration. For example, the Longleaf Alliance Regional Conferences allow landowners, researchers, government representatives, and policy makers to interact and exchange information about longleaf pine.

However, many landowners, although they prefer to see longleaf, are reluctant to grow longleaf pine on their land on a commercial basis. The main reason for this is that the economic returns from longleaf pine are usually less than those of loblolly or slash pine. However, these returns do not account for

environmental benefits such as carbon sequestration, biodiversity, and amenity benefits. In the absence of established markets for these services private forestland owners generally perceive them as public goods and do not consider them in their land-use decisions. However, developing markets for these services may increase the economic returns thereby stimulating landowners to restore longleaf pine on their land. If environmental benefits are internalized, it is quite possible that longleaf pine may become financially competitive with slash and loblolly pine. In the absence of such information, it is difficult to initiate policy development to promote longleaf pine on private land. This study is aimed at exploring economic strategies to restore longleaf in the U.S. South.

The specific objectives are:

Develop an economic model that incorporates timber and carbon sequestration benefits associated with longleaf pine and slash pine.

Estimate rotation age, land values and the amount of carbon stored under longleaf and slash pine production.

Determine annual payments, reflecting amenity benefits of longleaf pine relative to slash pine, that are required to influence landowners switch from slash pine to longleaf pine.

Rationale to include environmental benefits

There is a growing concern over the accumulation of "greenhouse gasses", particularly Carbon dioxide (CO_2), and associated global warming. In 1997, over 160 nations gathered in Kyoto to discuss strategies to limit greenhouse gas emissions and agreed to take steps toward achieving the stabilization of greenhouse gases in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system (IGBP, 1998).

Article 3.3 and 3.4 of the Kyoto Protocol recognizes that forests play an important role in the global carbon cycle through the conservation of existing carbon pools, through sequestration of carbon in new forests, through substitution of forest products for more energy-intensive materials and through substitution of biomass fuels for fossil fuels (Brand, 1998). Furthermore, preliminary research indicates that carbon sequestration through forestry practices can be cost effective. For example, Sedjo et al. (1995) noted that by creating plantations, carbon could be sequestered or conserved at less than $5 per ton. Dixon (1997) estimated that sequestration of carbon through silvicultural practices could cost between $2-56 per ton.

In this study we assume that public agencies will provide payments for net CO_2 assimilation and taxes are imposed on net CO_2 emission thereby generating a cash flow of positive net payments from regeneration to harvest followed by negative net payments at harvest from biomass decay (Hoen and Solberg, 1997). Internalizing the benefits of forest carbon sequestration through subsidies and taxes should have significant impacts on forest management. Van Kooten et al. (1995) and Hoen and Solberg (1997) found that inclusion of carbon benefits causes an increase in rotation age. Stainback and Alavalapati (1999) found that forestland values would increase by considering carbon benefits. More recently, Enzinger and Jeffs (2000) found similar results for eucalyptus in Australia.

As noted earlier, RCW prefers older pine stands, particularly longleaf pine stands. In our model a landowner is assumed to be compensated for producing a habitat for RCW. In particular, the amount paid will increase with stand age with benefits being small for young stands (i.e. stands younger than 30 years) but increasing to a plateau when the stand reaches approximately 60 years in age. In addition to carbon and RCW habitat benefits, we assume that amenity benefits associated with longleaf would be higher than those of slash pine. We model these benefits as annual payments to landowners who grow longleaf pine.

Model specification

Growth and Yield

Growth and yield of merchantable timber of slash and longleaf pine was modeled using the functions represented in Figure 1 (see at end of paper). These functions represent typical yields for slash and longleaf pine. Slash pine has a faster growth rate in the beginning relative to longleaf pine but longleaf pine catches up in later years and even surpasses the yields of slash pine. Thus slash pine is usually managed with short rotations of 20 to 30 years while longleaf is managed with longer rotations of 40 or more years. Following Pienaar and Rheney (1993) we modeled each forest stand to produce two products – sawtimber and pulpwood. The relative amount of sawtimber and pulpwood that is produced at harvest is considered a function of stand age.

Modeling carbon benefits

We follow van Kooten et al. (1995; 2000) in modeling forest carbon payments and taxes.[1] It is assumed that subsidies would be paid to the

[2]*See Stainback and Alavalapati (1999) for details about growth and yield and carbon sequestration modeling.*

landowner on a continuous basis, while the stand is growing, according to the amount of carbon sequestered in the biomass of the stand. Taxes are levied on the landowner as carbon is released as a result of harvest. The present value, pv_c, of carbon benefits in dollars per hectare is represented as:

$$(1) \quad pv_c = \int_0^t p_c \alpha v'(t) e^{-rt} dt - dec_{waste} - dec_{pulp} - dec_{saw}$$

Where P_c is the social value of sequestering carbon in dollars per metric ton, t is time in years, $v'(t)$ the volume increment with respect to t or the first derivative of the growth function and r is the interest rate. The term α is a conversion factor that converts wood volume to metric tons of carbon. Different tree species vary slightly in the amount of carbon in a unit of wood volume but the average is approximately 200 kg of carbon per cubic meter of wood (van Kooten et al. 1995). We use this figure to derive the value of α of 0.201 metric tons of carbon per cubic meter. In our model it is assumed that the amount of harvest that is left as waste at the sight decays immediately following harvest and that a portion of the products produced from the harvest decay over time and a portion is put into very long-lived products such as buildings and books or is buried in anaerobic conditions in landfills and does not decay (Skog and Nicholson 1998). The amount of sawtimber that does not decay is represented by β_s while the amount of pulpwood that does not decay is represented by β_p. Following Hoen and Solberg (1997) sawtimber is modeled to decay over 100 years and pulpwood products over 5 years.

The present value of the carbon emissions from the decay of sawtimber, pulp and waste is represented by dec_{saw}, dec_{pulp} and dec_{waste} respectively and were estimated using the following equations:

$$(2) \quad dec_{waste} = \frac{p_c \alpha (v - v_p - v_s)}{(1+r)^t}$$

$$(3) \quad dec_{pulp} = \left\{ \frac{1}{5} p_c \alpha (1-\beta_p) v_p \left[1 - (1+r)^{-(t+5)} \right] \right\} (1+r)^{-t}$$

$$(4) \quad dec_{saw} = \left\{ \frac{1}{100} p_c \alpha (1-\beta_s) v_s \left[1 - (1+r)^{-(t+100)} \right] \right\} (1+r)^{-t}$$

Where v is the total volume in cubic feet v_p is the volume of pulpwood and v_s is the volume of sawtimber. Following Enzinger and Jeffs (2000), β_s and β_p are assumed to be 0.80 and 0.35 respectively. Simple linear decay functions were used to make subsequent calculations in the model easier to use and understand.

Modeling RCW habitat benefits

There is very limited data on the value of longleaf pine in terms of RCW habitat on a per hectare basis. However, some studies have used contingent valuation method to assess individuals' willingness to pay for an increase in the chance of survival of the RCW into the future. In these studies the individual willingness to pay for an increase in the likelihood of survival ranges between 8 and 14 dollars (van Kooten and Bulte, 2000; Reave et al., 1995). Since, longleaf stands of 30 years and older provide foraging habitat for the RCW and stands 60 years and older provide foraging and nesting habitat we modeled RCW habitat benefits to increase with the age of the stand with smaller benefits occurring with stands less then 30 years of age increasing to a plateau of 14 dollars per hectare around 60 years of age (Wood and Kleinhofs, 1995). The present value of RCW habitat benefits pv_w in dollars per hectare can be represented as:

$$(5) \quad pv_w = \int_0^T w(t) e^{-rt} dt$$

Where $w(t)$ represents the value of RCW habitat in dollars per hectare as a function of t. Figure 2 shows $w(t)$ graphically.

Modeling other amenity benefits

To include the other amenity values for longleaf pine it is modeled that the landowner receives an identical payment every year for growing longleaf pine instead of slash pine. These amenity benefits may include restoring a native species (longleaf pine) to its range and aesthetics associated with longer rotations. This payment is similar to the payments under the Conservation Reserve Program where landowners receive annual payments from the government for, among other things, planting trees on marginal agriculture land to prevent soil erosion. We simulated the model to find the amount of amenity payment needed, after considering carbon and RCW habitat benefits, to make the returns from longleaf pine equal to those of slash pine. The resulting value indicates that amount of subsidy that would have to be paid to a landowner to induce him or her to grow longleaf instead of slash. The present value of amenity benefits PV_a are determined as:

$$(6) \quad pv_a = sub/r$$

Where sub is the annual subsidy paid to the landowner for growing longleaf pine.

Modeling timber benefits

Finally, the present value, pv_f, of timber benefits per hectare can be represented as:

$$(7) \quad pv_f = (p_p v_p(t) + p_s v_s(t) - g) e^{-rt}$$

Where p_s and p_p are the prices in dollars per cubic meter for sawtimber and pulpwood respectively, v_p and v_s are pulpwood and sawtimber volumes in cubic meters per hectare respectively and g is the generation cost of the stand in dollars per hectare.

Modeling land values and carbon sequestration

If the land is used to produce slash pine in perpetuity, land expectation value *lev* in dollars per hectare can be represented as:

$$(8) \quad lev = \frac{pv_c + pv_f + pv_w}{1 - e^{-rt}} + pv_a$$

Lev is maximized with respect to *t* to obtain the optimal rotation age, which represents the bare land value. The value of a unit of carbon is considered as the discounted cost of the damage caused by that unit of carbon over the time period that it remains in the atmosphere. We assume that the most probable value lies within the range of $0 to $50 per metric ton. The above model is used to estimate land values assuming that sawtimber and pulpwood are produced from the harvest. The price of pulpwood and sawtimber, respectively, are assumed to be $10.24 per cubic meter and $28.96 per cubic meter (Timber Mart-South 1998). Most economic literature dealing with southern pine use a range of interest rates from 3% to 6%. Therefore, we assume an intermediate interest rate of 5% in this analysis. As would be expected, running the model at higher interest rates decreases the competitiveness of longleaf pine relative to slash pine. Thus at higher interest rates a larger amenity benefit payment would be needed to induce landowners to switch to longleaf.

As the stand grows carbon accumulates in the form of biomass. At the time the stand is harvested, a small amount of the merchantable biomass is released into the atmosphere. The remainder of the biomass is put into pulpwood and sawtimber. The biomass that goes into pulpwood and sawtimber is divided up into two parts. One part consists of long-lived products such as building material for sawtimber and books for pulpwood and material buried in anaerobic conditions in landfills. The carbon in these pools decays very slowly if at all and is thus represented as a permanent. This portion makes up 80% of the sawtimber pool and 35% of the pulpwood pool. The rest of the biomass in these pools is modeled to decay over time - 5 years for pulpwood and 100 years for sawtimber. The proportion of biomass in the permanent carbon pool and the decay rate for sawtimber are different because greater proportion of sawtimber is put into long-lived products and its higher lignin composition causes it to decay at a slower rate (Skog and Nicholson 1998; Micales and Skog 1997). As soon as the stand is harvested replanting is done and the stand starts to accumulate carbon again. Each stand can be conceptualized as being divided up into a number of parts of identical size equal to the number of years in the rotation. One of the parts would be harvested each year with that part being replanted the same year, making the volume and thus the amount of carbon stored on the stump reach a steady state equilibrium. In addition the amount of sawtimber and pulpwood harvested each year would be equal. Because the decay functions are linear the pool of sawtimber and pulpwood that decays also will reach a steady state equilibrium. The carbon stored on the stump and in the steady state pools of decaying pulpwood and sawtimber is determined by equation (9).

$$(9) \quad seqa = \alpha\left[\left(\sum_{i=1}^{t}\frac{v_i}{t}\right) + \frac{5(1-\beta_p)v_p(t) + 100(1-\beta_s)v_s(t)}{t}\right]$$

Because some pulpwood and sawtimber never decay there is also a pool of permanently sequestered carbon that increase with each harvest by the same amount. This pool is represented by equation (10).

$$(10) \quad seqb = \alpha\left(\frac{\beta_p v_p + \beta_s v_s}{t}\right)$$

Results

Carbon payments and taxes

We determined the optimal rotation and land value (LEV) assuming that two products, sawtimber and pulpwood, are produced from the same harvest. As shown in figures 3 and 4 without any carbon subsidies or taxes the Faustmann rotation is 30 years and the LEV $613.66 per hectare for slash pine and 42 years and $358.36 per hectare for longleaf pine respectively.

As expected the rotation age increases when carbon subsidies and taxes are included in the analysis. For example, when the value of carbon is $50 the rotation age increases by 7 and 9 years for slash and longleaf pine respectively. This increase in rotation age not only implies that a greater volume will be produced when the stand is harvested but that a greater proportion of the harvest will be sold as sawtimber instead of pulpwood. Thus internalizing carbon sequestration would impact the supply of pulpwood and sawtimber differently. In addition to increasing the optimal rotation age, the results show that carbon subsidies and taxes substantially increase the LEV of forestland. For example, LEV increases to $1013.01 per hectare when the value of carbon is $50 per ton for slash pine and increases to $649.04 per hectare for longleaf pine. Although the LEV for longleaf pine increases at a faster rate with increasing carbon values than does slash pine, longleaf pine never becomes financially competitive with slash pine.

Red-cockaded woodpecker habitat and amenity benefits

Figure 3 also shows that including RCW habitat benefits do not significantly change the optimal rotation age. This result is due to the small value given to RCW habitat relative to timber and carbon. We expect that at higher values there would be more of an effect on the optimal rotation age. Internalizing the value of RCW habitat does produce a significant change in the land value as illustrated in figure 4. LEV increases slightly more than $300 for all values of carbon. However, this increase in LEV is not enough to make longleaf pine financially competitive with slash pine. Our simulation model indicate that an additional annual payment of $40 per hectare for longleaf pines' amenity benefits is needed to make longleaf financially competitive with slash pine. By comparison, without RCW habitat values included in the analysis $45 per hectare would be needed in annual amenity payments to make longleaf competitive with slash pine.

Carbon storage

We estimated the amount of carbon stored per hectare in a slash and longleaf pine forest. Figure 5 depicts that amount of carbon sequestered over one hundred years at a price of $30 per metric ton. The starting value at year zero is the amount of carbon sequestered in steady state represented by equation (9). The increase in the amount carbon sequestered in future time periods represents the amount of carbon sequestered in the permanent pool, represented by equation (10), plus the steady state pool. Figure 5 shows that the amount of carbon sequestered with longleaf pine is greater than with slash pine and the difference increases with time.

Therefore at a given price for carbon a landowner growing longleaf would supply a greater amount of carbon than a landowner growing slash pine.

Conclusions

In this study we investigated the impact of internalizing the public goods associated with carbon sequestration, RCW habitat and other amenity values associated with slash and longleaf pine on private forestlands. We found that a carbon subsidy and tax policy increases the optimal rotation age for both slash and longleaf pine and internalizing RCW habitat benefits increase LEV for longleaf pine but had a very small impact on the optimal rotation age. The greater value of private forestland could entice landowners to put a larger portion of their land into forest production thereby increasing the timber supply at the extensive margin. This increase in the value of forestland could also reduce forest conversion to other uses such as urban development. This could be a benefit in the southeastern U.S. where many view urban sprawl as a significant concern. From the landowners' perspective, longleaf pine is not competitive with slash pine when carbon and RCW habitat benefits are internalized. However with just a small subsidy for the other benefits of longleaf pine, in the range of $40 per hectare per year, longleaf pine does become financially competitive with slash pine. Thus a carbon subsidy and tax along with a longleaf subsidy could significantly alter forest management in Florida and induce landowners to plant more longleaf pine. The amount of sequestered carbon a landowner would supply at a given price of carbon is greater for longleaf pine then slash pine. If the supply of carbon at a cheaper price is a societal goal, our results indicate that longleaf has an advantage over slash pine.

There are several limitations to this study. First, rotation age is only one input in the production of forest products. We did not address other changes in forest management that could result from a carbon subsidy and tax policy. For instance, it is probable that carbon taxes and subsidies would have an impact on the amount of fertilizer, pesticides and stocking density used by landowners. These factors would not only impact the amount of carbon sequestered but other environmental aspects of forestry as well. Second, substantial uncertainty may be associated with the value of longleaf pine as RCW habitat on a per hectare basis. A significant increase in the value of RCW habitat would favor longer rotations and longleaf instead of slash pine. Third, the decay of sawtimber and pulpwood were modeled using simple linear functions. These formulae did not consider differences in product types, regions and technology. However, compromising between the objectives of simplicity and accuracy appears unavoidable. Finally, the change in timber supply caused by changes in the optimal rotation age and LEV will inevitably influence the market price of sawtimber and pulpwood. This price change will in turn influence forest management decisions. To more accurately predict the impact of a carbon subsidy and tax policy, price changes resulting from this policy would need to be considered in the model.

There are several possible ways to extend this study in the future. First, although the focus of this study was on slash pine and longleaf pine, the procedures can easily be extended to other species commonly grown in Florida such as loblolly pine or eucalyptus. Second including thinnings and other non-timber products such as pine straw could extend the model. Third, biomass from harvest could be sold

and utilized for biofuel production. Inclusion of biofuel in the analysis could significantly affect the carbon benefits associated with forestry. Fourth, the exact role and nature of the institutional arrangement needed to facilitate a carbon subsidy and tax policy needs to be examined. Institutions could facilitate exchanges of subsidies and taxes relating forest carbon sequestration and emissions and monitor contracts so that other groups cannot claim emissions reductions. For example, in this study we proposed that timber producer's claim subsides for carbon sequestration and pay taxes for carbon emissions depending upon the end products produced and their decay period. Claiming carbon credits by forest products manufacturers would result in double counting. Fifth, it is important to evaluate the cost effectiveness of other policy alternatives vis-à-vis the policy instrument that is analyzed in this study. For example, Senate Bill 1457 proposes to provide low interest loans to land owners to grow trees on their agricultural land. Finally, there could be other socioeconomic and institutional factors, such as lack of information, uncertainty and other forest management objectives, which may be limiting the planting of longleaf pine. Exploration of these issues may help formulate policies.

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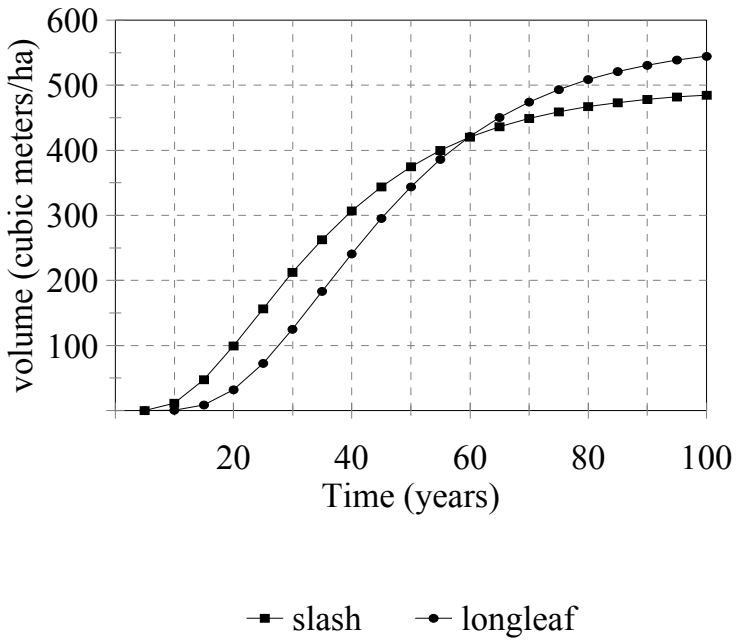

Figure 1. Relationship between merchantable volume and stand age for slash and longleaf pine.

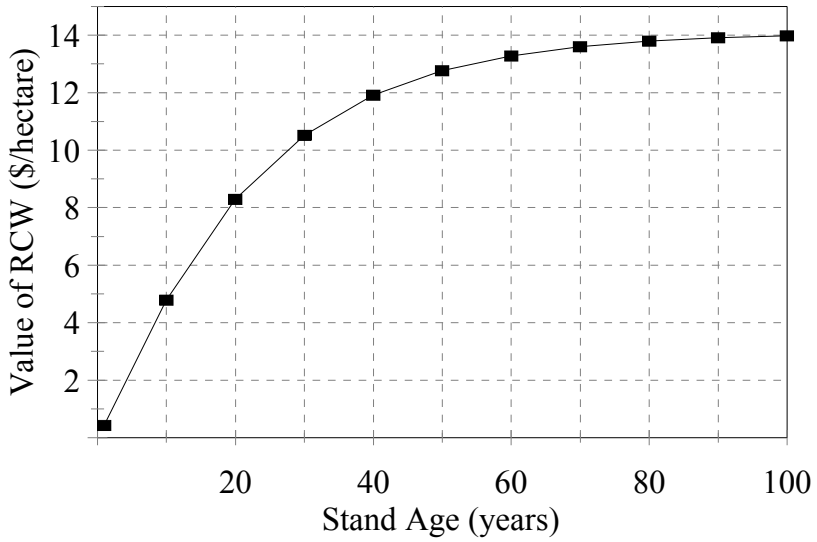

Figure 2. RCW habitat value as a function of stand age for longleaf pine.

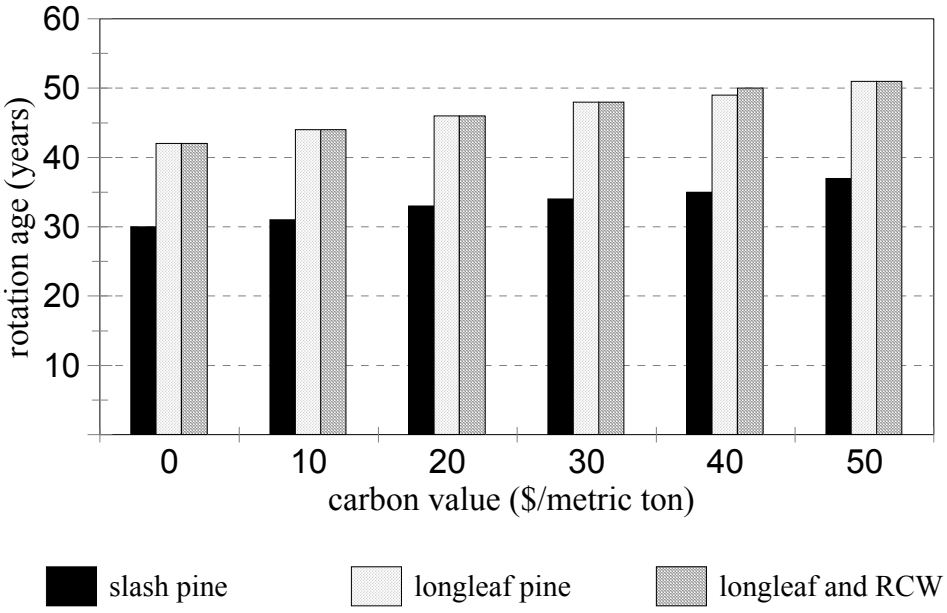

Figure 3. Rotation age as a function of carbon value for slash and longleaf pine.

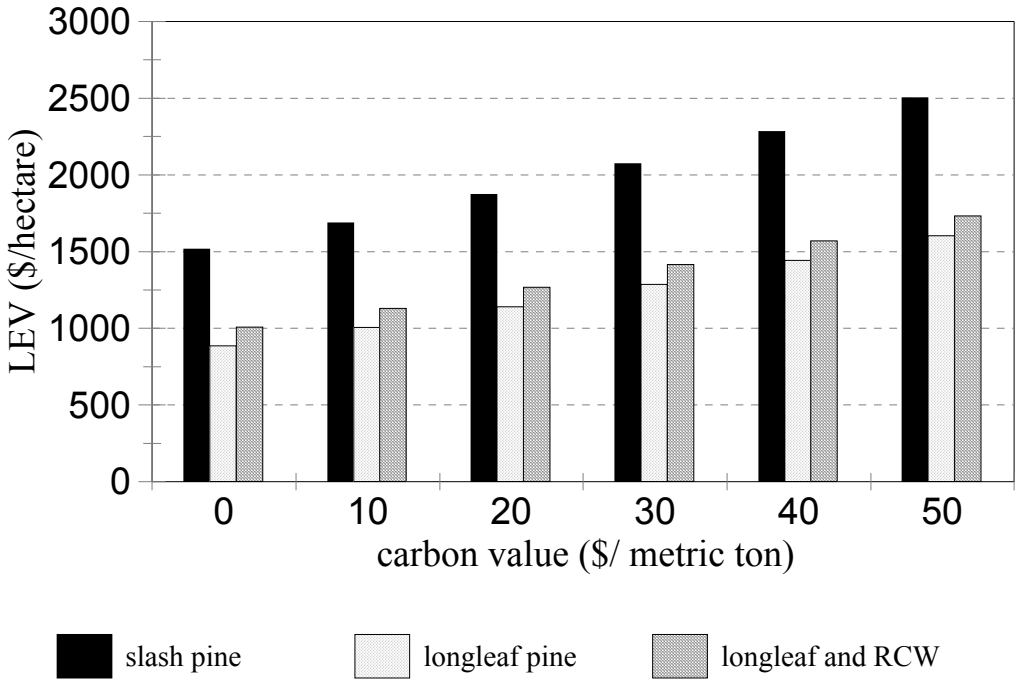

Figure 4. Land expectation value as a function of carbon value for slash and longleaf pine.

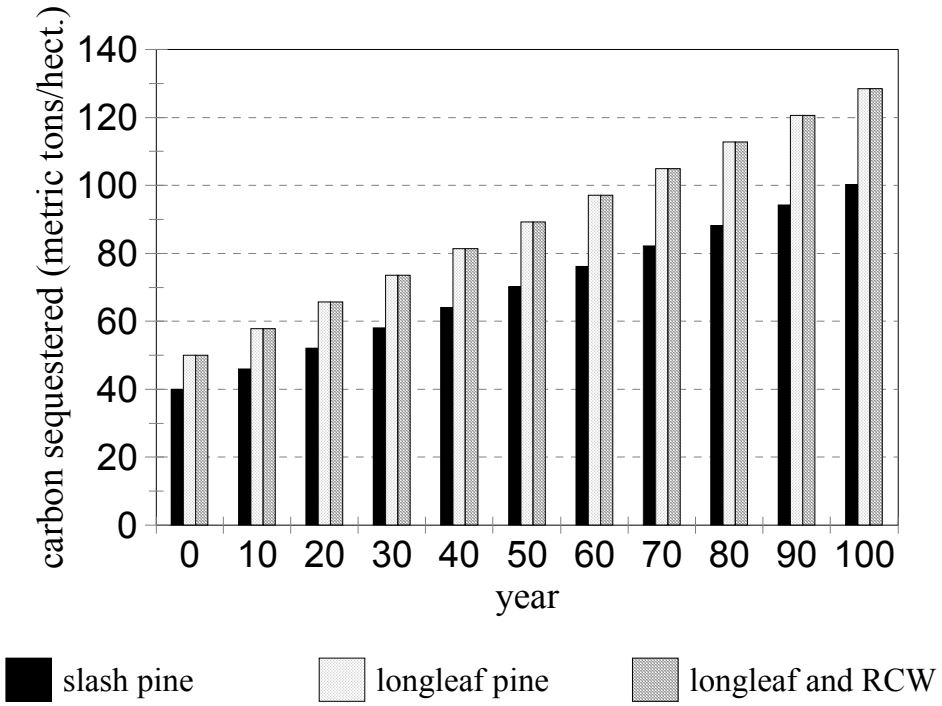

Figure 5. Carbon sequestered at a value of $30 per metric ton as a function of time.

The Effects of a Carbon Credit Market and Sequestration Policies on Private Forestry in the Southern United States - *Ching-Hsun Huang and Gary D. Kronrad*

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Introduction

Global Warming

The increase in carbon dioxide in the air and its greenhouse effect on global climate change has become one of today's major environmental issues (Brown *et al.* 1989). The ambient CO_2 concentration has increased from about 280 ppm (Neftel *et al.* 1991) to 360 ppm over the past 200 years (Valentine *et al.* 1998). Average surface temperatures have increased by 0.6 ± 0.2^0C globally over the 20th century (IPCC 2001). It is projected that the temperature will warm 1.4 to 5.8^0C by 2100 relative to 1990, and globally average sea level will rise 0.09 to 0.88 meters by 2100 (IPCC 2001). According to available observational evidence, regional changes in climate, particularly the warming, have already influenced a diverse set of physical and biological systems around the world (IPCC 2001). The effects of climate change would vary by region, and be accompanied by changes in precipitation, the variability of climate, and the frequency and intensity of some extreme climate phenomena (IPCC 2001).

Increased atmospheric CO_2 by itself has the potential to increase plant growth and the efficient water usage by trees (Valentine *et al.* 1998). The impact of an increase in CO_2 concentration on ecosystem metabolism includes stimulation of photosynthesis, depression of respiration and delay of senescence, as well as relief of water, nutrient and low light stresses. As a result, these effects prolong the growing season (IPCC 1990). However, conversely, if the rise in CO_2 is accompanied by a higher temperature at which respiration is often the more sensitive process than photosynthesis, global warming may result in a period of net carbon release from the land to the atmosphere with a magnitude that is still uncertain (IPCC 1990). The predicted principal damage to agriculture from global warming will come from heat stress and decreased soil moisture. Warmer temperatures will cause the growing cycle of plants to accelerate and, thus, allow less time for plant development before maturity. Analyses have shown that agricultural losses caused by global warming may exceed $14 billion in the U.S. (Adams *et al.* 1995).

Forests as Carbon Sinks

Using forest plantations to sequester atmospheric carbon to ease global warming is attractive due to forests' potential to sequester large amounts of carbon, the availability of the technology for establishing new forests, the environmental benefits generated by forests and the cost effectiveness of sequestration in forests (Sedjo 1996). Carbon can be stored efficiently and in great quantities in trees. Forests store carbon in the form of living trees, forest floor detritus, soil and wood products (Dewar 1991). Globally, 750 billion metric tons of carbon is held in the atmosphere. More than 92% of the world's terrestrial carbon is sequestered in forests, which store between 20 and 100 times more carbon per unit than agricultural lands (Andrasko 1990; Houghton 1990). Forests currently hold about 1,200 billion tons of carbon in their plants and soils out of 2,000 billion tons in all terrestrial vegetation and soils (IPCC 1990; Woodwell 1993; Dixon *et al.* 1994).

In the U.S., forest ecosystems store about 52 billion metric tons of carbon (Birdsey 1990), which accounts for 4% of all carbon locked in the world's forests (Atjay *et al.* 1979). Birdsey (1990) pointed out that 59% of all carbon stored in forest ecosystem is found in the soil, 31% in live and dead trees including coarse trees roots, 9% in other dead organic material above the soil surface and 1% in the understory vegetation. In live trees, merchantable bole portions contain about 51% and the roots hold about 17% of all carbon; the remainder is in other solid wood, small trees with diameters at breast height less than 12.5 cm and foliage (Bridsery 1990).

The monetary values of the forests' stabilizing function in the global climate system might be pictured by the following calculations. First, a "central" value of $10 might be placed on every short ton of carbon released that causes global-warming damage (Brown and Pearce 1994). If this figure is applied to tropical forests, the conversion of open forests and closed secondary forests to agriculture or pasture would cause roughly $300-$500 and $1,000-$1,500 of damage per hectare, respectively. The conversion of primary forests to agriculture will cause up to $2,000 of damage per hectare (Brown and Pearce 1994).

Depending on location, establishment costs for forest plantations range from $230 to slightly more than $1,000 per hectare with a mode around $400

(Sedjo 1983). Additionally, Sedjo (1989) predicted that the annual increase of atmospheric carbon is estimated to be 2.9 billion tons worldwide, and it would require 465 million hectares of plantations at a cost of $372 billion (temperate zone) or $186 billion (tropics) to sequester this amount of carbon.

The cost of establishing forests, which offset the greenhouse effect by sequestering carbon, represents real opportunities forgone due to sacrificing crops, livestock or other socially useful products. However, these forests are able to provide other social benefits in the form of wildlife habitat, recreation and erosion control (Sedjo 1989).

Carbon Sequestration through Silviculture

The growth and quality of the forest resource can be increased directly by employing silvicultural practices such as thinning, fertilization, improved harvesting and genetic tree improvement (Brown *et al.* 1996). Yet, increasing the growth rate by itself does not increase mean carbon storage. On the contrary, it may decrease carbon storage over a given area if the growth is a result of converting to a younger age-class distribution (Turner *et al.* 1995)

Soil carbon pools can be increased or at least stabilized by applying some silvicultural practices--thinning, extending rotation ages and maintaining high levels of coarse woody debris after harvesting (Brown *et al.* 1996). Consequently, these practices which help to maintain biodiversity and soil productivity (Swanson and Franklin 1992) will be able to store more carbon on forest stands as well (Brown *et al.* 1996).

The relationship between economics and increasing carbon sequestration by silvicultural practices has drawn public interest. A study conducted by Marland and Marland (1992) explained that the efficiency of carbon sequestration through silvicultural management could vary dramatically depending on site-dependent characteristics such as forest growth rate, site occupancy when silvicultural practices take place and the efficiency of utilizing forest products. Another study, which assessed the efficiency of various strategies to sequester carbon in biomass of Norwegian forests, was conducted by Hoen and Solberg (1994). The results indicate that by changing the management practices, the marginal costs (shadow prices) of net CO_2 fixed and carbon captured were about $21 per ton CO_2 and $79 per ton carbon, respectively. It was found that the optimal rotation ages for Norway Spruce increase substantially when a carbon dioxide tax is introduced; it was projected that a government subsidy/tax program might impact timber supply and timber market (Hoen 1994).

Options for Increasing Terrestrial Carbon Sequestration

There are two viable options for significantly increasing terrestrial carbon sequestration. Many acres that were once forested and now in agricultural, pasture, or rangeland uses are highly erodible or environmentally fragile (Trexler 1991). It has been estimated that approximately 310 million non-forested acres are suitable for tree growth (USDA 1990). About 120 million to almost 250 million acres of economically marginal or environmentally sensitive crop and pasture lands could physically support tree cover (Parks 1992). The first option is converting agricultural and pasture lands to conventionally managed forests.

Fully stocking and intensively managing existing forestlands is the second sound alternative for increasing carbon storage in terrestrial ecosystems. It has been shown that yield on many of the 481 million acres of U.S. timberlands are well below physical potential (Trexler 1991). Only about 80 tons of carbon per acre was stored in forest ecosystems nationally, contrasting with 220 tons of carbon that can be captured in an old-growth forest (Trexler 1991).

Carbon Credit Market

Nordhaus (1990) suggested that a tax of approximately $5 per ton of carbon (with equivalent taxes on other greenhouse gases) would be the most reasonable way to deal with global warming. A tax of this amount was estimated to reduce greenhouse gases by 13% and generate net benefits of about $12 billion per year (Tietenberg 2000). If storing carbon in forests is cheaper than paying a carbon tax, companies will either grow their own carbon storing forests or pay others to sequester carbon for them. Each ton of carbon sequestered is called a "carbon credit" and can be used to offset emissions, sold on the open market or traded by one company to another company. Sequestering carbon will allow companies to continue to use fossil fuels while CO_2 in the atmosphere is stabilized and then, over time, reduced. The establishment of a carbon credit market between utility companies and private forest landowners will benefit both companies and landowners.

It is anticipated that the trading of carbon credits will become one of the major industries of the 21st century, and this trading may create a global market with an annual demand of 1 billion tons of carbon (Totten 1999). Italy, Norway and Sweden, for example, are imposing emission taxes on carbon of $50 per ton or more (Totten 1999). Although the actual market prices for carbon credits are still uncertain, some utility companies are already using a shadow price of $17 for every ton of carbon they

emit (Totten 1999). Pizer (1999) suggested that, by the year 2010, any carbon emitted above a 1.2 gigaton ceiling will cost industry $100 per ton under a proposed comprehensive domestic CO_2 trading system in the United States. It is expected that the market value of a ton of carbon sequestered could range between $30 to $40 in the American market, and as high as $70 to $80 in European and Japanese markets (World Bank 1999). When the market is well established, estimates based on the size of the potential carbon trade in North America and Europe indicate that the carbon credit market could be worth $30 to $100 billion (Ellerman 1998).

This study was designed 1) to determine the financially optimal management regime for forestland given a range of values for carbon credits, and 2) to calculate the profitability of managing forests for the dual products of timber and carbon storage.

Methods

Dynamic Programming Approach

Forest landowners are rational and will manage their forests for timber production, or a combination of timber production and carbon sequestration, in a manner that will earn them maximum financial return. Maximum profit may be earned by practicing the optimal financial rotation regimes on their forestland. This is achieved by determining the optimal time to thin the stand, the number and intensity of the thinnings, and the optimal time to conduct the final harvest. This calculation is affected by the quality of the soil, the landowner's alternative rate of return and the value of the forest products.

A dynamic program was developed to simultaneously determine both the optimal rotation age, and the optimal timing and intensity of thinning(s) for loblolly pine (*Pinus taeda*); the most widely planted commercial species in the southern U.S. This program utilized PTAEDA2 (Burkhart *et al.* 1987), a forest stand simulator, to predict stand growth data on diameter, height and volume from establishment to final harvest. PTAEDA2 was linked to a financial program, which performed cash flow analyses and calculated net present worth (NPW) and soil expectation values (SEV). NPW is the present value of revenues minus the present value of costs for a given investment. It is the result of finding the present value of future discounted cash flows. SEV, the NPW of a perpetual series of equal forest rotations, is commonly used for comparing forestry investments, which have unequal rotation lengths.

Site indices 50, 70 and 90 (base age 25), the range of site indices most commonly observed, were used in these analyses. The maximum possible rotation length was limited to age sixty with a choice of number of thinnings (zero, one, two or three) during the rotation. The method for the first thinning would be a combination of low and row thinning; the method for the second and third thinning would be a low thinning only. The first thinning could not be conducted until the stand was at least 10 years of age. The minimum number of years between thinnings, or between a thinning and the final harvest, could not be less than 5. For all the dynamic computer simulations, a "thinning and final harvest" regime would be considered to be operable only if it passed the following two threshold constraints: 1) every thinning or final harvest had to yield a minimum of 15 cords per hectare of pulpwood and/or sawtimber; 2) the number of residual trees after each thinning had to be at least 198 per hectare. Four thinning intensities were employed: 20, 25, 30 or 35% of basal area removal. The same thinning intensities were used at all thinnings for a specific optimal solution regardless of the number of thinnings or age of thinning.

Due to the fact that non-industrial private forest landowners usually are paid only for complete half logs (8 feet) of merchantable sawlogs, the sawtimber volume for the economic analyses was based upon data from PTAEDA2, taper functions developed by Amateis and Burkhart (1987), and the Doyle log rule. A minimum of 10-inch diameter at breast height (dbh) and one 16-foot log were set as minimum sawlog requirements in this study. After the first 16-foot log, the minimum sawlog increment was assumed to be 8 feet. The merchantable height is the number of 8-foot logs that could be cut out of the tree up to a minimum top diameter of 6-inch inside bark. Pulpwood volume was measured in cords to a 4-inch outside bark top diameter for trees in the 5-, 6-, 7-, 8- and 9-inch dbh classes.

Economic Evaluation

Six alternative rates of return (ARR), which span the range of before-tax earning rates available for most landowners, were chosen for the economic analyses. They were 2.5, 5.0, 7.5, 10.0, 12.5 and 15.0% in real terms, meaning that inflation has been removed. The annual real rate of price increase for sawtimber and pulpwood were assumed to be 2.0% (Kronrad 1999) and 1.0% (Texas Forest Service 1984-1998), respectively. Labor costs were assumed to increase at a real rate of 1.1% per year (Council of Economic Advisers 1998). The price of sawtimber was assumed to be $450 per thousand board feet (Doyle) (Texas Forest Service 1997-1998), and pulpwood was priced at $35 per cord (Texas Forest Service 1998).

The analyses included all proper forest management activities. In general, management costs are incurred for establishing, maintaining and harvesting the stand. In this study, all the current management costs came from a survey of forest consultants. The property tax cost was not included because it was assumed that the revenue from a hunting lease would offset the cost of property taxes. Assumed management activities, frequency and labor costs for forestlands in Texas are presented in Table 1.

A Market for Carbon Credits

It was assumed that a market would be developed in which private companies would pay landowners for each additional ton of carbon that they sequester in their forests. Landowners would want to maximize the net revenue from the production of three products: sawtimber, pulpwood and tons of carbon. Sawtimber and pulpwood have market prices that are easily determined. Carbon, on the other hand, presently is not a tradable commodity with a market price. Therefore, in these analyses, the price (or value) of carbon was assumed to be $11, $55 or $110 (which is equal to $10, $50 or $100 per short ton) for each additional ton of carbon that landowners were able to sequester in their loblolly pine plantation. Economic analyses for timber production management only ($0 carbon value) were also conducted to produce baseline data. For the above ground tree biomass, only carbon stored in the useable portion of pulpwood or sawtimber qualified as carbon credits. Dry-weight equations developed by Baldwin (1987) were applied to pulpwood whose dbh was equal to 5, 6, 7, 8 or 9 inches to a 4-inch outside bark top diameter, or to sawtimber whose dbh was equal to or larger than 10 inches to a 6-inch top diameter. It was then assumed that the roots of loblolly pine account for 19% of the total (above plus below ground) tree biomass (Kinerson 1977). Because net amount of carbon in trees is estimated to be 50% of dry biomass (Dewar and Cannell 1992), the estimated amount of carbon was determined by multiplying the tree dry weight by 50%.

In these analyses it was assumed that as trees grew larger and stored more carbon, landowners would receive an annual payment based on the amount of carbon sequestered and the price of carbon. When a stand's mortality was greater than its growth, or a thinning or final harvest was conducted, landowners would have to repay the carbon credit buyers for the loss of tree biomass in which the carbon was stored. This repayment was calculated based on how many tons of carbon were lost from the stand and how much each ton of carbon was worth. No repayment was required for wood used to produce long-lived wood products since they continue to sequester carbon. The same carbon value was used for the repayment for the loss of carbon as was used for the sequestration of carbon. All financial gains and losses from carbon sequestration within the rotation were included in the discounted cash flow analyses.

Given a range of site indices, real ARRs, and carbon prices, discounted cash flow analyses were conducted to obtain net present worth for all the operable management regimes. The Faustmann formula was then applied to calculate soil expectation value (SEV). The management regime which had the highest SEV was chosen as the financially optimal "thinning and final harvest" schedule for each combination of site index and landowner's ARR.

Results

In order to determine the profitability and the financially optimal thinning and harvesting schedules of forest management, a total of 4,397,904 NPWs and SEVs were calculated for all the operable management regimes on site indices 50, 70 and 90 lands. The financially optimal thinning and final harvest schedules, which maximize soil expectation value, received from timber products and carbon credits for each combination of site index and ARR are listed on Table 2. Table 3 shows the SEVs with carbon value of $0, $11, $55 or $110 per ton. All monetary values are presented on a per hectare basis.

Low Site Quality--Site Index 50

Regardless the price of carbon, the financially optimal thinning and final harvest rotation for 2.5% ARR would be the one in which a thinning is conducted at stand age 33 (with 25% of the basal area removed) and a final harvest is performed at stand age 59 (Table 2). This best management regime would generate the maximum SEV of $4,159.14, $4,935.32, $8,040.04 or $11,920.89 per hectare when the per ton price of carbon is $0, $11, $55 and $110, respectively (Table 3).

The results indicate that, when the price of carbon is $0 and $11 per ton, forest management is profitable only for landowners whose real ARR is 2.5 or 5.0% on site index 50 land (Table 3). When the price of carbon is $55 per ton, management for timber and carbon storage is profitable for all the six real ARRs. If the price of carbon reaches $110 per ton, SEV is between $768.55 (for 15.0% ARR) and $11,920.89 (for 2.5% ARR) per hectare.

Medium Site Quality--Site Index 70

When carbon is priced at $11 per ton, the financially optimal management regime for 7.5% ARR would entail two thinnings, at stand ages 17 and

22 (with 25% of the basal area removed), and the final harvest at stand age 29. This best management regime would generate the maximum SEV of $1,237.21 per hectare.

For site index 70 lands, when carbon can be sold for $11 per ton, forest management is profitable for landowners who have real ARRs of 2.5, 5.0, 7.5, 10.0 or 12.5%. Instead of losing $205.35 per hectare from managing for timber production only, landowners whose ARR is 12.5% could earn $37.54 per hectare by managing for both timber production and carbon sequestration. Selling carbon for $11 per ton turns an unattractive endeavor into a profitable investment. If carbon can be sold for $55 or $110 per ton, managing for both timber production and carbon sequestration is always profitable.

High Site Quality--Site Index 90

When carbon is valued at $0 or $11 per ton, the financially optimal management regime for 12.5 and 15.0% ARR would require two thinnings, at stand ages 11 and 16 (with 30% of the basal area removed), and a final harvest at stand age 21. If carbon is worth $11 per ton, the best management regimes will generate maximum SEVs of $896.97 or $384.45 per hectare when ARR is equal to 12.5 or 15.0%, respectively.

Forest management is profitable on site index 90 land for all the six real ARRs with or without managing for carbon sequestration. However, a value of $11 per ton for carbon could increase landowners' profitability by $296.41 (for 15.0% ARR) to $2,051.08 (for 2.5% ARR) per hectare.

Discussion

In contrast with the command-and-control approach which provides no incentive for emitters to seek less expensive ways of reducing emissions, the proposed market-based approach for environmental regulations allows emitters to reduce emissions at lower marginal costs than would otherwise be possible. If the United States has well-established systems to monitor the amount of carbon that is sequestered, it can attract capital into forest management and utilize its forests to mitigate possible global warming effects. Properly utilizing forests can mitigate global warming by reducing greenhouse gas emissions while improving the economic efficiency, increasing rural employment and benefiting the environment.

The results of this study indicate that the effects of a carbon credit market and sequestration policies on the financially optimal management regime and the profitability of forest management are significant. As the price of carbon increases, the rotation length increases, the age of the first thinning is delayed, and thinning(s) frequency and intensity tend to decrease. This will decrease the supply of pulpwood and increase the supply of sawtimber. As a result, if demand remains constant, pulpwood prices may increase and sawtimber prices may decrease.

If forest landowners incorporate carbon sequestration into their forest management, the revenue from selling carbon credits will either turn forest management into a profitable business or increase the current financial returns for landowners. This study shows that forest landowners need to be aware of changes in carbon prices and adjust their management practices accordingly to maximize their revenue from the management of timber production and carbon credit.

Different from previous analyses of carbon dioxide subsidy and tax programs, this study was concerned with the trading of carbon credits solely between forest landowners (carbon credit sellers) and utility companies (carbon credit buyers) with no government intervention. The value of carbon credit prices will determine the development of the carbon credit market, and affect silvicultural practices and carbon sequestration rates.

The study of the impacts of fertilization and stand density on carbon sequestration were not included in this study but are underway. The emission effects of forestry activities such as site preparation, burning and fertilization may have indirect or direct effects on the emission of greenhouse gases. Further investigations regarding the application of silvicultural treatments, which result in carbon dioxide emission, will be investigated to complete the existing carbon budget.

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Table 1. Management activities, frequencies and labor costs for forestland.

Activity	Cost	Frequency	Start	End($/ha)
Boundary location	$49	Once only	Year 0	
Boundary maintenance	$5	Every 10 years	Year 10	Final harvest
Management plans (initial)	$12	Once only	Year 0	
Management plans (updates)	$25	Every 10 years	Year 10	Final harvest
Site preparation (chop)	$222	Once only	Year 0	
Site preparation (herbicide)	$210	Once only	Year 0	
Hand planting, labor	$111	Once only	Year 0	
Seedlings	$74	Once only	Year 0	
Burning	$99	Every 5 years	Year 10	Final harvest
Mark and administer Pulpwood/sawtimber sale (percentage of gross)	10%	-AS NECESSARY-		

Table 2. Financially optimal thinning and final harvest schedules which maximize soil expectation value for loblolly pine plantations by site index and real alternative rates of return.

	Real Alternative Rates of Return					
	2.5%	5.0%	7.5%	10.0%	12.5%	15.0%
Site Index 50						
Carbon Value						
$0/tonne	33-59* (25%)[+]	23-28-48 (30%)	<19-25-34>[++](35%)	<19-24-29>(35%)	<19>	<18>
$11/tonne	33-59 (25%)	24-30-44 (25%)	<19-25-34>(35%)	<20-25-32>(35%)	<19-24-29>(35%)	<19>
$55/tonne	33-59 (25%)	24-30-44 (25%)	24-30-42 (25%)	24-33 (25%)	24-29 (25%)	24-29 (25%)
$110/tonne	33-59 (25%)	24-30-44 (25%)	35-41 (30%)	31-36 (30%)	31-36 (30%)	31-36 (30%)
Site Index 70						
Carbon Value						
$0/tonne	25-36-43 (20%)	16-21-33 (30%)	13-18-29 (35%)	13-18-24 (35%)	<13-18-24>(35%)	<13-18-24>(35%)
$11/tonne	25-36-43 (20%)	16-21-35 (30%)	17-22-29 (25%)	13-18-24 (35%)	13-18-24 (35%)	<13-18-24>(35%)
$55/tonne	25-36-43 (20%)	25-34 (20%)	24-29 (20%)	24-29 (20%)	17-22-29 (25%)	16-23 (20%)
$110/tonne	25-36-43 (20%)	25-34 (20%)	25-34 (20%)	24-29 (20%)	24-29 (20%)	24-29 (20%)
Site Index 90						
Carbon Value						
$0/tonne	13-19-28-38 (25%)	14-22-27-32 (25%)	11-16-22-27 (30%)	11-16-22 (30%)	11-16-21 (30%)	11-16-21 (30%)
$11/tonne	27-34 (25%)	14-23-31 (25%)	19-27 (35%)	11-16-22 (30%)	11-16-21 (30%)	11-16-21 (30%)
$55/tonne	27-34 (25%)	29	27	24	18-24 (30%)	15-22 (20%)
$110/tonne	27-34 (25%)	29	29	26	24	24

*Bold type indicates the age of final harvest, and the number(s) to the left indicates age(s) at thinning(s).
[+]Number in parentheses indicates the percentage of basal area removed during thinning
[++] Brackets indicates a negative SEV. Schedules shown minimize losses.

Table 3. Soil expectation value of the financially optimal thinning and final harvest schedules for loblolly pine plantations by site index, real alternative rates of return and price of carbon.

	Real Alternative Rates of Return					
	2.5%	5.0%	7.5%	10.0%	12.5%	15.0%
Site index 50						
Carbon Value						
$0/tonne	$4,159.14	$406.02	-$277.13	-$501.50	-$590.19	-$629.60
$11/tonne	$4,935.32	$827.76	-$5.76	-$294.23	-$432.48	-$503.48
$55/tonne	$8,040.04	$2,544.70	$1,167.97	$577.31	$251.90	$46.85
$110/tonne	$11,920.89	$4,690.86	$2,684.63	$1,717.71	$1,145.06	$768.55
Site index 70						
Carbon Value						
$0/tonne	$10,735.00	$2,671.83	$796.27	$126.62	-$205.35	-$390.58
$11/tonne	$12,065.10	$3,329.16	$1,237.21	$432.91	$37.54	-$191.98
$55/tonne	$17,385.56	$6,218.18	$3,156.11	$1,811.83	$1,077.33	$642.43
$110/tonne	$24,036.15	$9,940.36	$5,682.65	$3,675.55	$2,530.32	$1,798.46
Site index 90						
Carbon Value						
$0/tonne	$23,244.37	$7,092.04	$2,888.27	$1,315.91	$531.48	$88.04
$11/tonne	$25,295.45	$8,179.31	$3,585.71	$1,787.81	$896.97	$384.45
$55/tonne	$33,947.05	$12,716.69	$6,554.29	$3,909.04	$2,491.10	$1,641.65
$110/tonne	$44,761.55	$18,527.81	$10,454.96	$6,715.95	$4,653.90	$3,360.10

Predicting Changes in Norwegian Pulpwood Prices: An Empirical Analysis Regarding the Effects of Causal Information and Deterministic Shifts in Economic Forecasting - *Anders Q. Nyrud*

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Introduction

The objective of this paper is to discuss the role of causal information in econometric modeling and economic forecasting. Econometric theory is illustrated through application of several forecasting models for domestic Norwegian pulpwood price.

Roundwood is traded globally on a world market. Such a market can be divided into sub-markets according to factors such as the commodity traded (i.e. tree species, assortments and grades) or sub-market area. Europe is commonly referred to as one such sub-market. The European sub-market can be further divided into even smaller segments (e.g. national markets), which are mutually linked within the bounds of the European – and global – roundwood market.

Norway is by European standards a medium sized producer of roundwood. The annual net increment is calculated to approximate 20-mill m^3/year (coniferous and broadleaved) (the Norwegian Institute of Land Inventory, Tomter 1996). Annual removals are approximately 9 million m^3/year (Figure 1). Norwegian roundwood is basically consumed by the domestic forest industry as raw material (sawmills (51%) of total harvest) and pulp & paper industry (42%), or used as firewood (Statistics Norway 1960-1997a)). In addition to domestic roundwood, the industry imports substantial amounts of pulpwood.

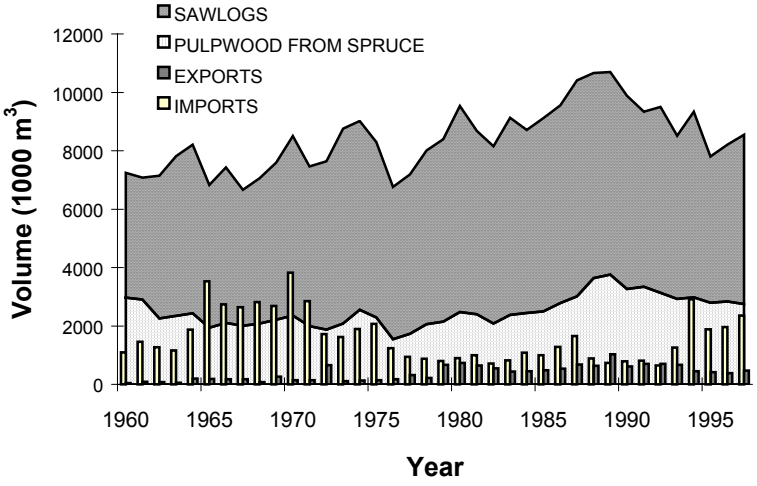


Figure 1. Key statistics on the Norwegian roundwood market, total harvest, pulpwood supply, imports and exports.

The forest sector (forestry and forest industries) has traditionally played and important role in the Norwegian economy. Due to several reasons (e.g. the exploitation of the off-shore oil resources the last thirty years, and declining real value of forest products (Figure) the economic importance of the forest sector has been reduced the last decades.

Forest products are traded both domestically and on the international market. The lion's share of the lumber produced is consumed domestically, while 90% of the Norwegian pulp & paper production is exported. The wood processing industry is the third largest exporter in the Norwegian economy.

The outline of the essay is as follows. In the second part, a brief description of the Norwegian industrial roundwood market is supplied, followed by a brief review of relevant theory. In the third part, the data used in this analysis is presented along with a brief introduction to methodology employed. Results

are presented in the fourth part of the essay. The essay concludes with a discussion of the results.

The Norwegian forest products markets related to competitive equilibriums

In Norway industrial roundwood is traded in a well- organized market. Since the early 1900s forest owner associations have dominated the supply side. Pulpwood is purchased by a few, large pulp & paper mills, while sawlogs are purchased by numerous sawmills of different size. The price of industrial roundwood was for many decades settled annually through central negotiations between the forest owner associations and the principal buyers. The Norwegian government would interfere through arbitration when the two parties did not reach a consensus on price. The sawlog market was decentralized during the 1980s, while for the pulpwood market central negotiations were abolished in 1995. Currently, the pulpwood price is settled through local, quarterly negotiations.

The impact of exogenous shocks on commodity prices is a well-studied phenomenon. For instance, the 1970s oil crises (OPEC I and OPEC II) influenced commodity prices all over the world, including Norwegian industrial wood prices. Throughout the last decade, liberalization of the Norwegian wood market has resulted in more rapid adjustments to external influences. The last decade the Baltic States' entry into the North-European wood market, and the Swedish devaluation in 1992 had a significant effect on the price of Norwegian industrial roundwood.

Walras (1873) introduced the issue of competitive markets more than 100 years ago. Inter-regional trade, and negligible or nonexistent trade barriers, induces linkages between markets. Thus, changes in the patterns of trade, or conditions within one market (segment), are likely to affect surrounding markets in which the same commodity is being traded – competitive markets influence one another. Given that wood is traded in a competitive world market, and that transaction costs are small compared to the price of industrial roundwood, a model consisting merely of wood prices should be sufficient for forecasting the price of pulpwood.

The concept of causality has been subject to extensive discussion within the philosophy of science, a unique definition has yet to be put forward. When dealing with forecasting and econometric modeling, the matter of causality is of great relevance. In econometric literature the concept of causality is usually in one way or the other connected to the definition supplied by Clive Granger in 1969 – commonly referred to as "(Wiener-) Granger causality". Granger causality is defined in terms of predictability, and therefore unacceptable for most philosophers of science (Geweke 1984). For economic forecasting on the other hand, the relation to predictability makes the concept of Granger-causality appealing. Knowledge of Granger-causality, i.e. predictability, is likely to impact on forecasts.

The main idea of Granger causality is that lagged values of an explanatory variable, say X, do (or do not) improve the explanation of dependent variable, Y, obtainable from only lagged values of X and itself. A F-test is applied to determine whether the lagged X's have statistically significant parameters. If the null hypothesis $\gamma_j = 0$, (j = 1, … K), in equation (1) is rejected, X is said to Granger-cause Y:

$$(1)\quad Y_t = \alpha + \sum_{j=1}^{K} \beta_j Y_{t-j} + \sum_{j=1}^{K} \gamma_j X_{t-j} + u_t$$

u_t is assumed to be a well-behaved white noise error term.

Hendry (2000) discusses the role of causal information in economic forecasting. He distinguishes between: (i) when the model coincides with the DGP mechanism; and (ii) when it does not coincide. In the first case, casual information is useful, and produces better forecasts than non-causal. Forecasting performance cannot be improved through adding further variables. Causally relevant information generally improves forecasts even when the model is mis-specified, provided the mechanism generates stationary data. It can be showed that adding non-causal variables yield conditionally unbiased forecasts, but these forecasts are inefficient. This result remains for both constant, and non-constant DGPs.

When DGP and model do not coincide, causally relevant information is unlikely to contribute to forecasting performance. The forecasting ability of a misspecified model of a non-constant mechanism is not improved through adding causal information. On the contrary, non-causal variables potentially can be more useful than causally relevant ones – as long as the model remains misspecified. Mis-specified, stationary models yield unconditionally unbiased forecasts, thus the forecasts can be improved through adding a stationary, linear combination of x_{t-1}, or differenced (and thus stationary) series.

Basing forecasts on causal information (i.e. including causal variables in a model) might be a meaningful ting to do – perhaps qualified by the need to estimate parameters from small samples of badly measured data. However, when a model is not the true DGP, and either non-stationary or its DGP is non-constant, the dominance of causal information over non-causal cannot be shown. On given forecast

criteria it can be formally shown that non-causal information dominates causal (c.f. Hendry 2000).

The matter of non-constant mechanisms should also be addressed. Deterministic shifts due to e.g. policy changes will affect models' forecasting abilities. Deterministic shifts cannot be predicted, and are therefore correspondingly hard to include in the modeling process. In such situations, it cannot be proved that adding causal information will improve, nor that dropping causal variables will worsen forecasts. In such cases simple models are likely to provide superior forecasts. This fact implies that choice of model should depend on for what purpose the forecast is made, i.e. models used for policy making might be different from models used purely to forecast a single variable.

Data and methods

Some work has recently been carried out on causality and forecasting within forest products markets (Toppinen 1997 and Reikikoski *et al*. 2000). Toppinen tested several price-series originating from the Finnish market for industrial roundwood with regard to Granger causality. She concluded that sawlog (stumpage) prices Granger caused pulpwood (stumpage) prices over the business cycles. Reikikoski *et al.* (2000) used three models (AR, single equation regression and VAR) to forecast Finnish SC-paper export quantity to German markets. The forecasting performance models were compared. They concluded that the AR model performed superiorly when comparing out-of-sample forecasts.

Data

All prices used in the study are from Statistics Norway's Forest statistics and External trade statistics (Statistics Norway 1960-1997a, 1960-1997b). The prices are annual averages, and span from 1960 to 1997. Almost all pulpwood consumed by the Norwegian pulp & paper industry is from Norway spruce (*Picea abies karst*.). Specific prices of pulpwood from Scots pine (*Pinus silvestris*) will not be used in this study, although the average price of industrial roundwood, PAVGDOM, includes prices for wood from pine. All prices are nominal, i.e. not deflated by a price index. Capital letters denote series in levels, whereas lowercase letters denote logarithmic transformed variables. The variables used in the empirical study are described in Table 1 below and Figure 2.

Table 1. Description of the variables used in the study

Acronym	Description
PPW_S	Price, domestic pulpwood from spruce
PAVGDOM	Average domestic price, industrial roundwood (spruce and pine)
PIMPPW_S	Price, imported pulpwood from spruce
PEXPPW_S	Price, exported pulpwood from spruce

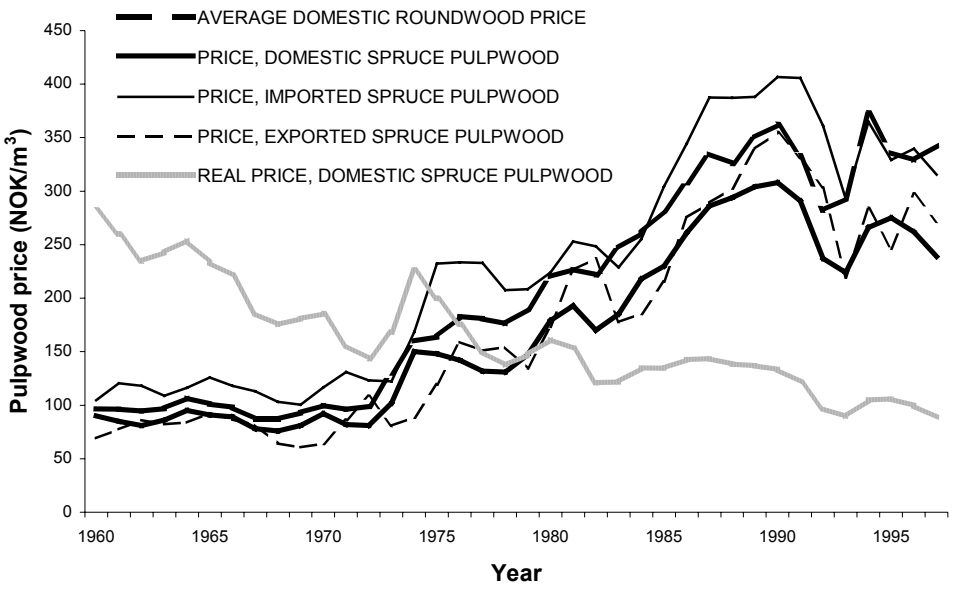


Figure 2. Price series used in the study.

Stationarity

Traditional econometric methods of modeling time series assume certain stochastic properties of the time series investigated. One of the assumptions is stationarity, implying that mean and variance of the series subject to analysis are constant over time. Economic variables often have unit roots, i.e. they are non-stationary, integrated processes. Non-stationarity makes interpretation of the modeling results difficult, since the conventional t and F statistics do not follow their standard distributions (e.g. Banerjee *et al*. 1993). Stationarity is commonly tested for using the (Augmented) Dickey Fuller ((A)DF) test. This test performs a test on the time series using the maintained hypothesis that a series contains a unit root (Dickey and Fuller 1979).

Causality

As described above, given a competitive world market and adequately low transaction costs, domestic prices are likely to be influenced (Granger caused) by the international price level. Granger causality is tested as outlined in equation (1); it only applies to stationary time series.

Models

Two models were used in this study, a p'th order AutoRegressive (AR(p)) and a Vector AutoRegressive (VAR(p)) model, p = 1, … P. When data series are non-stationary, differenced variables are used in the models, i.e. differenced models, dAR(p) and dVAR(p).

An AR(p) model can be written as:

(2)

$$x_t = m + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \cdots + \alpha_p x_{t-p} + u_t, \quad t = 1, \ldots, T, \; p = 1, \ldots, P, \; P \leq T$$

where m is a constant, u_t is a iid, white noise error term. In this case, the AR model used to forecast the pulpwood price will contain present and lagged values of ppw_s.

A VAR(p) model can be written as:

(3)

$$\mathbf{y}_t = \mathbf{m} + \mathbf{A}_1 \mathbf{y}_{t-1} + \mathbf{A}_2 \mathbf{y}_{t-2} + \cdots + \mathbf{A}_p \mathbf{y}_{t-p} + \mathbf{e}_t, \quad t = 1, \ldots, T, \; p = 1, \ldots, P, \; P \leq T$$

where y_t is a column vector of k variables (i.e. $\mathbf{y}_t = [y_{1t}, y_{2t}, \ldots, y_{kt}]'$), $\mathbf{A}_i$ are k × k matrices of coefficients, **m** is a k × 1 vector of constants and $\mathbf{e}_t$ an vector white noise process, with the properties:

(4) $E[e_t] = 0$ for all t $\qquad E[e_t e_s'] = \Omega I$

Several VAR models will be used in this essay, consisting of both two (k = 2, i.e. a bivariate VAR) and three (k = 3, i.e. a multivariate VAR) variables.

Results

An ADF-test was applied in order to test for unit-roots in the series. All level series contained a unit root. When differenced the null hypothesis was rejected. This indicates that all series were integrated of order one (I(1)), thus the remaining study is performed on differenced variables. Results from the stationarity tests are displayed in Table 2..

Table 2. Stationarity tests.

Levels	ADF test statistic	Differences	ADF test statistic
pavgdom	-2.0658	dpavgdom	-4.7119**
ppw_s	-1.2461	dppw_s	-5.7606**
pimppw_s	0.62208	dpimppw_s	-4.7206**
pexppw_s	-0.19508	dpexppw_s	-5.8928**

Critical values: 5% = -3.603 1% = -4.374; constant and trend included.

The test for Granger causality was carried out on differenced series. Results are reproduced in Table 3 below. At the 5% level of significance, the null hypothesis is not rejected for any of the tested relationships. However, the price of exported spruce pulpwood is very close to rejection and is therefore considered to Granger cause domestic pulpwood price.

Table 3. Causal relations (p-values reported in square brackets).

Dependent variable	Explanatory variable	Granger test, 6 lags
dppw_s	dpavgdom	0.74556 [0.6210]
	dpimppw_s	1.9117 [0.1371]
	dpexppw_s	2.6933 [0.0503]

Based on the results from the stationarity Granger tests the following forecasting models are suggested[1]:

(1) dAR : dppw_s – a so-called naïve prediction model. As discussed above, AR models do under certain circumstances have favorable forecasting abilities compared to more complex "policy models".

(2) dVAR : dppw_s, dpexppw_s – a bivariate model, contains price of exported pulpwood, the only variable that Granger caused domestic pulpwood price.

(3) dVAR : dppw_s, dpimppw_s – a bivariate model, contains the price of imported pulpwood, this price does not Granger cause domestic pulpwood price.

(4) dVAR : dppw_s, dpawgdom – a bivariate model, contains the average domestic price of industrial roundwood, the Granger test strongly rejected a causal relationship between this price and domestic pulpwood price.

(5) dVAR : dppw_s, dpexppw_s, dpimppw_s – a multivariate model, contains one series that Granger cause domestic pulpwood price and in addition to a third series that showed no direct relationship with the pulpwood price.

(6) dVAR : dppw_s, dpavgdom, dpexppw_s – a multivariate model, contains two series that does not Granger cause domestic pulpwood price.

Results from diagnostic tests, and one-step-ahead out-of-sample forecasts are reported in Table 4, Table 5, and Table 6 below. Two forecast horizons were used, four and six years. The length of the forecast horizons were chosen in order to perform forecasts before and after the Swedish 1992 devaluation, i.e. in order to investigate effects from deterministic shocks.

[1] The models proved to be quite robust with regard to lag structure. Four lags were used in all models.

Table 4. Diagnostic tests for the dAR-model (p-values in square brackets).

Diagnostic test	Model No. – out-of-sample forecast period	
	(1) – 6	(1) – 4
F test on parameters	[0.2735]	[0.2054]
AR 1-2 F	[0.9059]	[0.9031]
ARCH 1 F	[0.8725]	[0.6763]
Norm χ^2	[0.7595]	[0.8294]
Forecast χ^2	[0.1794]	[0.7810]
Chow F	[0.5154]	[0.8265]

Results for the dAR-model with two forecasting horizons are reported in Table 4. The F-tests on the parameters are not rejected, i.e. the null hypothesis of insignificant explanatory variables is maintained. Except from this, the dAR model show nice properties with regard to the diagnostic tests conducted. Neither the tests on residuals, nor the tests on forecast constancy were rejected.

Table 5 shows results from the bivariate dVAR-models. Model (2) was superior both when forecasting 6 and 4 years ahead, still the F-test on parameter significance was not rejected when forecasting 6 years ahead, and residual normality was close to being rejected when forecasting 4 years ahead. Even though containing non-causal variables, Models (3) and (4) had favorable results regarding parameter significance. Both, however, reject forecast constancy.

Table 5. Diagnostic tests for the bivariate dVAR-models (p-values in square brackets).

Diagnostic test	Model No. – out-of-sample forecast length					
	(2) – 6	(2) – 4	(3) – 6	(3) – 4	(4) – 6	(4) – 4
F test on parameters	[0.1332]	[0.0234] *	[0.0077] **	[0.0007] **	[0.0945]	[0.0865]
AR 1-3 F	[0.4841]	[0.6504]	[0.8965]	[0.8463]	[0.3185]	[0.7108]
Norm χ^2	[0.2965]	[0.0536]	[0.6496]	[0.4825]	[0.1108]	[0.4858]
Forecast χ^2	[0.3856]	[0.1712]	[0.0004]**	[0.0000]**	[0.0005]**	[0.0042]**
Forecast F	[0.4672]	[0.2720]	[0.0479]*	[0.0084]**	[0.0502]	[0.0527]

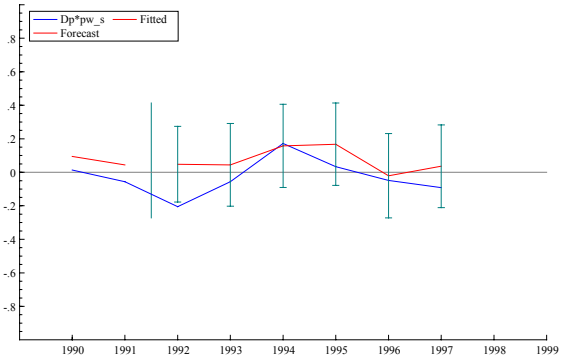
The multivariate models show favorable test scores when it comes to model specification (**Table 6**). Regressor insignificance is rejected for all models, except for Model (6) – 6. However, forecast constancy is rejected for all models.

Table 6. Diagnostic tests for the multivariate dVAR-models (p-values in square brackets)

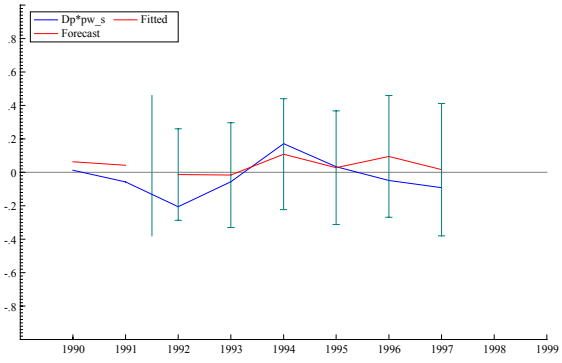
Diagnostic test	Model No. – out of sample forecast length			
	(4) – 6	(4) – 4	(5) – 6	(5) – 4
F test on parameters	[0.0095]**	[0.0008]**	[0.0108]*	[0.0129]*
AR 1-2 F	[0.1896]	[0.4604]	[0.0537]	[0.2318]
Norm χ^2	[0.4582]	[0.6123]	[0.0344] *	[0.2013]
Forecast χ^2	[0.0002]**	[0.0000]**	[0.0000]**	[0.0002]**
Forecast F	[0.0443]*	[0.0068]*	[0.0150]*	[0.0242]*

Except for the diagnostic forecast constancy test, out of sample forecasts are evaluated through visual inspection. The forecasts are plotted in Figure 3, Figure 4, Figure 5 and Figure 6. The impression given by Figure 3 and Figure 4 is that Models (1) and (2) (the dAR, and the dVAR containing causal variables) forecast superiorly, irrespective of out of sample forecast horizon. These models also performed well with regard to forecast constancy. Considering Models (3) and (4), the first shows large variation (supporting forecast constancy rejection), while the latter overestimates the actual price. These results might be explained by the market deregulation and exogenous shocks taking place in the early 1990s. Except for Model (2) all models predict higher results than the actual values, this being most striking for Model (4).

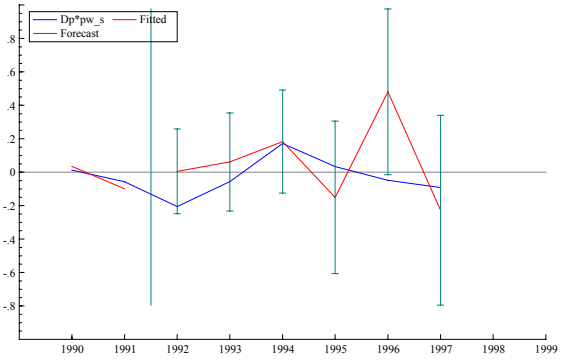
(1) dAR : dppw_s



(2)dVAR : dppw_s, dpexppw_s



(3)dVAR : dppw_s, dpimppw_s



(4) dVAR : dppw_s, davgdom

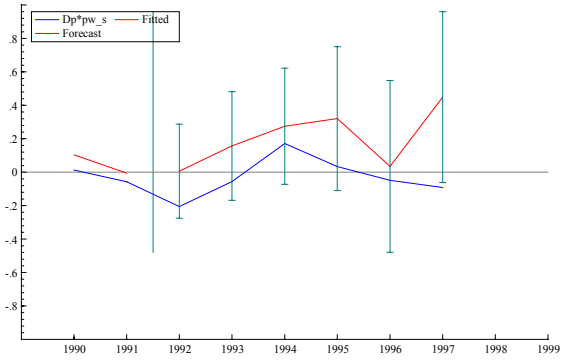
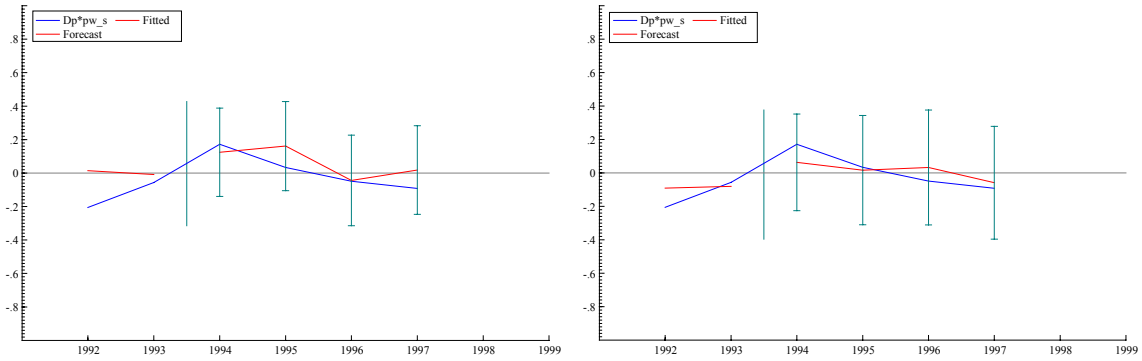


Figure 3. Six year out-of-sample forecasts for dAR- and bivariate dVAR-models.

From Figure 4, it is evident that Models (1), (2) and (3) did not change substantially when the forecasting period was shortened. However, Model (4) improved considerably, most likely because the forecast then started after the Swedish 1992-devalutaion. Even though forecasting performance improved, the latter two models are still outperformed by Models (1) and (2).

(1) dAR : dppw_s

(2) dVAR : dppw_s, dpexppw_s



(3) dVAR : dppw_s, dpimppw_s

(4) dVAR : dppw_s, davgdom

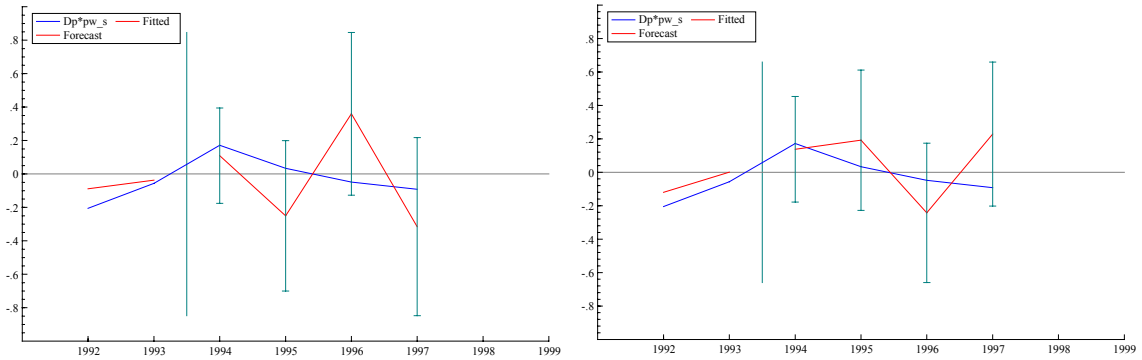


Figure 4. Four year out-of-sample forecasts for the dAR- and bivariate dVAR-models.

Results for the multivariate models are reported in Figure , note that the scale of the y-axis is different from the two previous figures. Model (5) does not distinguish itself from the non-causal Model (6) in terms of forecasting performance.

(5) dVAR : dppw_s, dpexppw_s, dpimppw_s (6) dVAR: dppw_s, dpimppw_s, dpavgdom

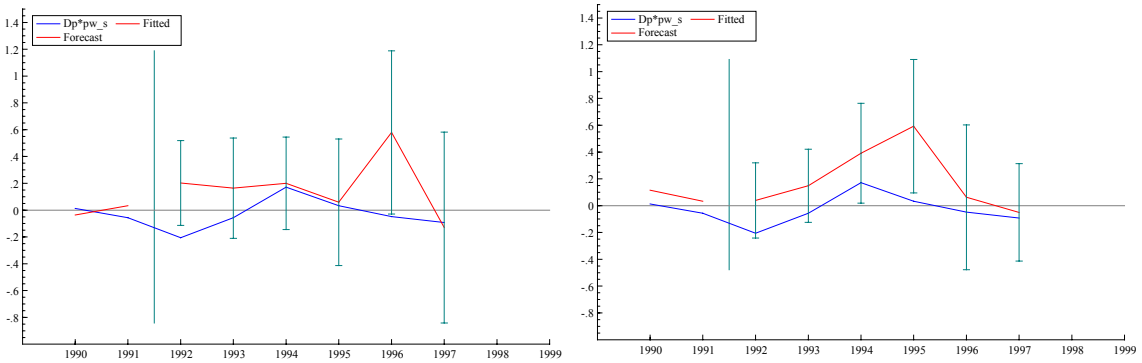
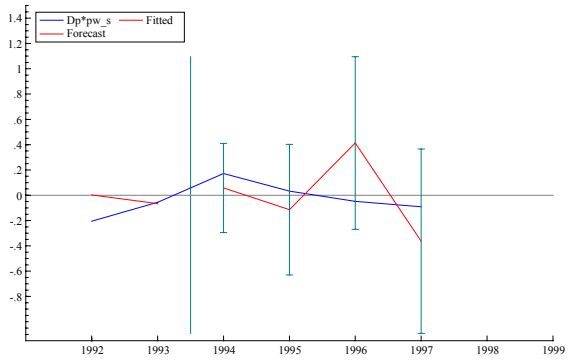


Figure 5. Six-year out-of-sample forecasts for the multivariate dVAR models.

(5) dVAR : dppw_s, dpexppw_s, dpimppw_s



(6) dVAR : dppw_s, dpimppw_s, dpavgdom

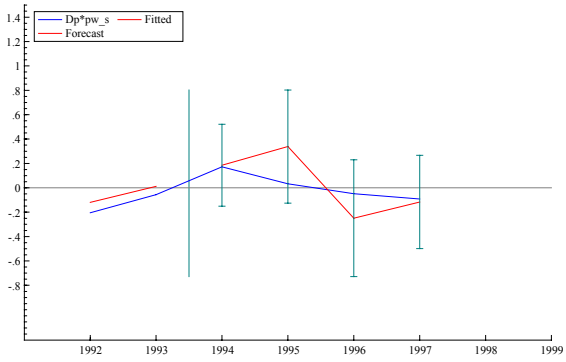


Figure 6. Four-year out-of-sample forecasts for the multivariate dVAR models.

Figure 6 displays the two remaining forecasts for the multivariate dVARs. Both forecasts have improved greatly. The models were difficult to distinguish from test results in Table 6; according to the forecasts Model (6) apparently outperforms Model (5) in the sense of fitting the actual series. Such a result is surprising because Model (5) contains a causal variable.

Conclusion

Some inference can be made from the results above. First, parsimonious models containing causal information mimic the DGP, thus yielding quite accurate forecasts. The results from this study imply that parsimonious, causal models will outperform analogous models containing non-causal variables, and even dAR-models. However, as more variables are being added to a dVAR, causal information is less likely to assure good forecasts.

The favorable forecasting abilities of dAR-models are common knowledge among econometric modelers. Often such a model is superior to any theory-based model. Still, this study shows that a causal dVAR-model can make better predictions. A disadvantage concerning dVAR-models is its sensitiveness with regard to deterministic shifts in the data. dAR-models have advantages in this respect because they, in contrast to more elaborated systems (small "policy models"), do not break down when exogenous shocks occur. Through the use of causal information (i.e. causal variables) in dVAR models, this type of problems can be overcome.

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Is Private Forestry in Germany Profitable? - Analyzing Results From an Operational Comparison Among Private Forest Ownerships in Northrhine-Westphalia - *Christian Wippermann and Bernhard Möhring*

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Introduction

Germany's total land area is about 30 million hectares whereof approx. 10 million hectares are forested. Private landowners own and manage about 47 % of all forested lands. Private forestland is traditionally part of private asset portfolios that consist of farmland, real estate, and financial assets. The economic importance of the timberland varies depending on the individual management objectives. Most often, the owners do not consider their forestland as an investment from a portfolio perspective. Rather, the forestland is a century-old family heritage managed passively as a hedge. This is for two reasons. The forestry taxation system allows for the accumulation of standing volume, which can be merchandized when needed. Furthermore, forestland as a form of real estate is considered to be an inflation hedge (Brabänder 1996, Möhring 1994). The experience of two severe inflations in the twentieth century makes Germans very much favorable of inflation safe investments.

During the last decade, actual and potential forestland owners have begun to evaluate their forestland differently. There are two main reasons for this. Firstly, the profitability of forestland has fallen due to an increase in labor cost accompanying stagnant or even falling revenues from timber sales. Additionally, a huge supply of forestland that was expropriated by the communist regime in eastern Germany is now available for sale. In eastern Germany more than 700,000 hectares of forestland have been and are currently marketed by a state agency. Therefore, potential owners want to know what to bid for forestland. Also, actual forestland owners are concerned with the economic perspectives for their timberland assets.

This paper presents an approach to evaluate the ex-post performance of a model timberland investment consisting of a management class of Norway spruce (*Picea abies L.*). The analysis covers the time period 1969-1994. This allows for integrating business cycles and the evolving economic environment of forestry in Germany (Wippermann 1999). The analysis builds on data from forest ownerships in North Rhine-Westphalia, which have been voluntarily participating in an operational comparison since 1969. The documented data set is very detailed. It contains cost and revenues, profits and information on standing volume and other characteristics of the surveyed ownerships. Currently fifty ownerships put data at disposal for the Institute of Forest Economics at the University of Göttingen. With an average size of approx. 1600 hectares the ownerships are classified as medium to large sized (Brabänder 1995).

Evaluation of the performance of the model investment

As mentioned before, in Germany forestland is traditionally not considered as an investment. Yearly transactions are low and the valuation of the forestland reflects the heterogeneity of the traded good (Moog 1994). Usually, the land is not only valued for its potential to grow timber and for the standing timber volume but also for other characteristics; hunting, the recreational value, non-timber forest products and the prestige of owning land in densely inhabited in Central Europe have to be taken into account. For many decades now there has been a discrepancy between the returns from forest management and the prices that are paid at actual transactions (Petri 1971). However, for all these implicit factors vary significantly for each traded piece of forestland and thus affect the individual landowner's utility, it is not considered worthwhile to generate official forestland value statistics. The following formula shall reflect this reasoning and is used to compute the performance of the model investment (equation [1]).

Equation 1: Annual Return on the Forestland Investment

$$p_{i,t} = \frac{(B_t + H_t) - (B_{t-1} + H_{t-1}) + (profits / losses)_t}{(B_t + H_t)}$$

B_t = soil value

H_t = stumpage value

$p_{i,t}$ = return on forestland

To generate a retrospective time series of forestland values the authors combined different statistics and data sets.

The soil value is computed using a price statistic for agricultural land from North-Rhine Westphalia. It is assumed that forestland is usually worth about two thirds less than a hectare of agricultural land (Blänker 1996). We also assume that the soil value reflects the other factors discussed above as affecting the forestland value. The average stumpage value was computed by using a management unit simulation program. (Möhring 1986). It is assumed that the average stumpage value is 0.56 of the value of the standing timber. In addition to the annual change of forestland value, the annual average profits from the management of the Norway spruce stands affect the total performance of the investment.

The results for this profitability analysis are as following: the geometric mean of the annual nominal returns on the model investment is 4.64 % over the time period 1969-1994. Thereof, 3.22 % can be contributed to the change in the market value and 1.42 % can be assigned to the annual returns from forestry itself. The latter is much less volatile than the former, which can be seen from table [1]. The returns on the market value can be split up into the change of the soil value and into the change of stumpage value. On average, the former is about one percent point higher than the latter. Both contribute equally to the overall change in the value of the forestland. Whilst the profits from management only become negative once, during the year following the severe hurricane of 1990 with its consequent market distortions, the returns on the soil value and on the stumpage value are more volatile. The change in soil value is negative six times and the return on the stumpage seven times. Looking at the partial returns it becomes obvious that the change in land value is very significant in the late 1970s when inflation was very high and much less during the following two decades. Figure [1] shows how both developed over the examined period. ***(See all tables and figures at end of paper.)***

Underlying effects are the change in land value for agricultural land due to overproduction within the European Community, the permanent transformation of agricultural land into other forms of land use, and for the stumpage value the weak development of timber prices in Germany.

Mean variance portfolio analysis

In a second step, we use the generated risk-return time series to compare our model investment with a financial asset for which we chose a stock market index. The used index was computed by the German federal statistical agency until 1994. This index is the predecessor of today's DAX. As can be seen in table [2], the return series are slightly negatively correlated (-0.13). Over the examined period, the stock index shows higher mean returns but also goes along with a higher volatility, *i.e.* a higher annual variance of the mean return. The plot of both time series underlines the slightly negative correlation (figure [2]). During the whole period, in particular during the first decade, both investments dominate alternately. Whilst the timberland performs well in the 1970s and early 1980s the picture changes after the mid-1980s. Since then, the stock market outperforms the timberland most of the time. The peak for timberland performance in 1990 coincides with a severe hurricane in the winter of 1990/91. For the remaining years, the market effects of the hurricane and the enlargement of the European timber markets led to a low performance. During the whole period the stock index is more volatile than are the forestland returns. In fifteen out of twenty-six periods the stock index outperforms the forestland investment.

Finally, we use the two time series to perform a mean-variance portfolio analysis based on Markowitz' portfolio optimization approach (Kruschwitz 1995). The two-asset portfolio consists of the forestland and the Frankfurt Stock Exchange Index for the time period 1969-1994. Figure [3] illustrates this result. On the efficient frontier, which closes the set of all possible combinations upwards, we indicated the efficient combinations of forestland and the stock index investment for ten percent steps, *i.e.* the combinations that show the highest return while the standard variation - as a measure for risk - is minimized. Due to the negative correlation, combinations lying on the upper half of the curve outperform the combinations on the lower part of the curve. The outperformed combinations are highlighted in table [3], which summarizes the characteristics of all ten percent step combinations presented in figure [3]. Depending on the risk preferences of the investor, forestland thus plays a significant part in the portfolio; *e.g.* for a risk averse investor it would be recommendable to invest eighty percent in forestland and twenty percent in stocks. With higher risk preference, this composition changes in favor of an investment into stocks. The

mean-variance portfolio analysis for the chosen time period shows that, depending on the risk-performance of the investor, forestland might be a worthwhile option for investors; although, a single forestry investment is not recommendable.

Discussion

As mentioned in the introduction, today landowners are much more concerned about the performance of their estates. Alternative investments can be found within their holdings or on the capital markets. As expected, the average nominal before tax return of 4.64 % for the model investments is low when compared to the performance of the stock index.

Despite the low returns on their lands, the majority of landowners do not intend to sell off their forests. Recently restructured holdings with timberland instead sold off several engagements in fields like brewing, or even agriculture, but continue to manage their forestland (Duffner 1999). A leaner management structure and the further mechanization of harvesting operations help to offset the effects of increasing labor cost and stagnant timber prices. It seems to be acknowledged by the landowners that forestland in the portfolio reduces overall risk, even if the returns are not comparable to the returns on timberland investments in North America or Chile or New Zealand (Binkley 1996, Redmond and Cubbage 1988).

The reported returns are nominal and before tax returns. We do not consider the effect of taxation. We expect a better understanding of landowner behavior when taxation is included in the analysis. Forestry enjoys several taxation rules that make forestland investment at least worthwhile for liquid investors who want to park money to protect it from taxation (v. Finckenstein 1997); volume accumulation does not fall under taxation as long as no harvesting happens. Furthermore, in the case of natural disturbances the actual tax rate on timber sales can be reduced. This depends on the amount of affected timber that exceeds the annual sustainable harvest level, which is approved by the taxation authorities every ten years. It seems to be that forestland owners trade off a low performance with - a compared to other investment types – significantly lower tax burden. The examined period includes business cycles and the market effects of several natural disturbances that affected the performance. It would be interesting to look at longer periods to better understand the possibilities of forestland as an inflation hedge and the systematic risk of this investment type due to natural disturbances. Finally, we did not deflate the returns because we doubted the applicability of existing deflators like the consumer price index to investments in a real asset.

On the other hand, landowners are concerned about the increasing influence of public policy measures upon their management regimes (Brabänder 1995). The discussion of certification and the consequent development of the Pan European Forestry Certificate (PEFC) very much reflect such economic and political concerns. So far, landowners were able to reduce overhead and variable cost. But in the long run, it might be difficult to compare with international cost levels. Nevertheless, depending on the individual's aversion to risk, forestland actually seems to be a worthwhile portfolio asset. As wrote Endres in 1923, "Forestland is recommended investment for anyone who prefers a good night's of sleep over a good meal".

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Table 1: Overall Return of the Forestland Investment and its Components

Time Period 1969-1994	Total Return	Returns Forest Management	Returns from Change in Forest land value	Return on the Soil Value	Return on Stumpage
Return (%)	**4,64**	**1,42**	**3,22**	**2,19**	**1,03**
Standard deviation	**6,93**	**0,81**	**7,58**	**4,21**	**4,48**
Variation coefficient	**1,43**	**0,57**	**2,20**	**1,80**	**3,96**
Periods with positive/ negative Returns	**20/6**	**25/1**	**20/6**	**20/6**	**19/7**

Table 2: Comparison of Returns: Forestland and Stock Index

Period 1969-1994		
Asset	Stock Index	Forestland
Average Return (%)	**8,90**	**4,64**
Standard deviation	**21,16**	**6,93**
Variation coefficient	**1,94**	**1,42**
Correlation coefficient	**-0,1397**	**1**
Periods with positive/ negative Returns	**18/8**	**20/6**

Table 3: Efficient Portfolios of the Forestland and the Stock Index

Share Forestland	Share Stock Index	Expected Return	Standard deviation
0	1	8,90	21,16
0,1	0,9	8,47	18,96
0,2	0,8	8,05	16,79
0,3	0,7	7,62	14,67
0,4	0,6	7,20	12,61
0,5	0,5	6,77	10,66
0,6	0,4	6,34	8,89
0,7	0,3	5,92	7,43
0,8	0,2	5,49	6,49
0,9	0,1	5,07	6,30
1	0	4,64	6,93

Figure 1: Development of the Soil Value and the Stumpage Value during the Examined Period

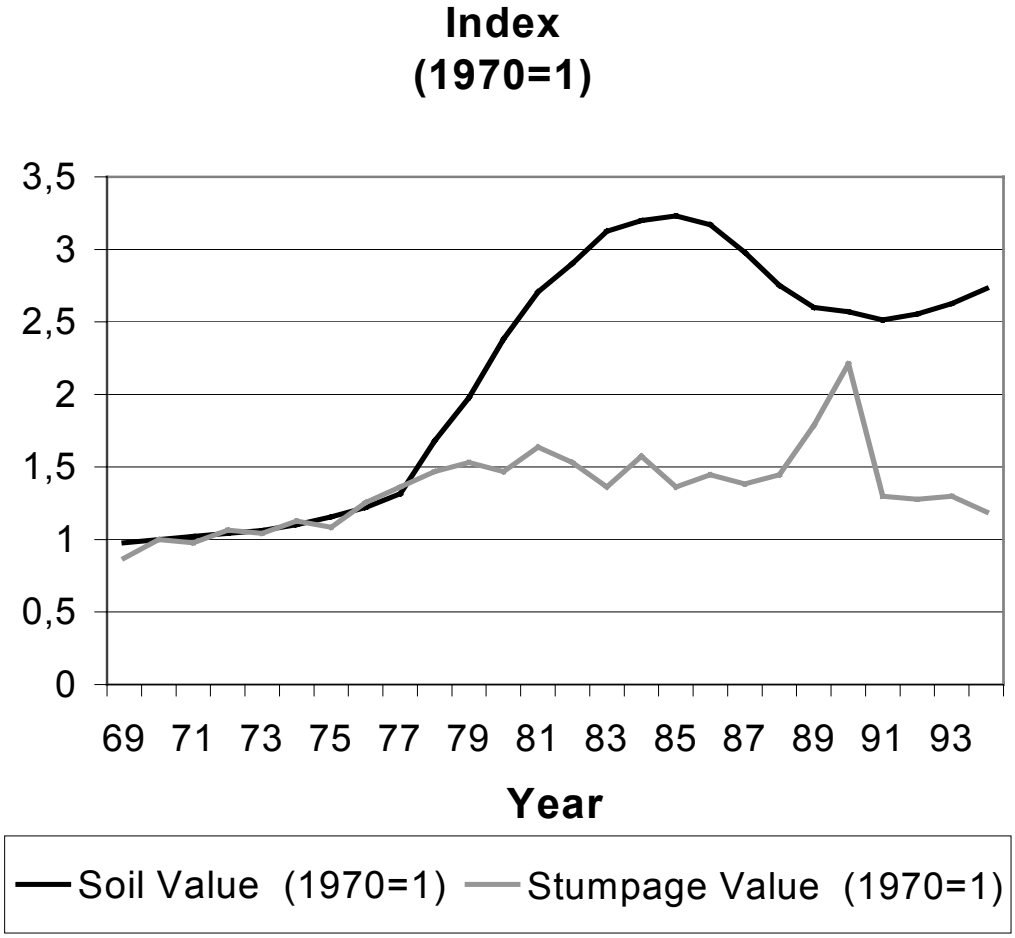


Figure 2: Returns Stock Index - Forestland

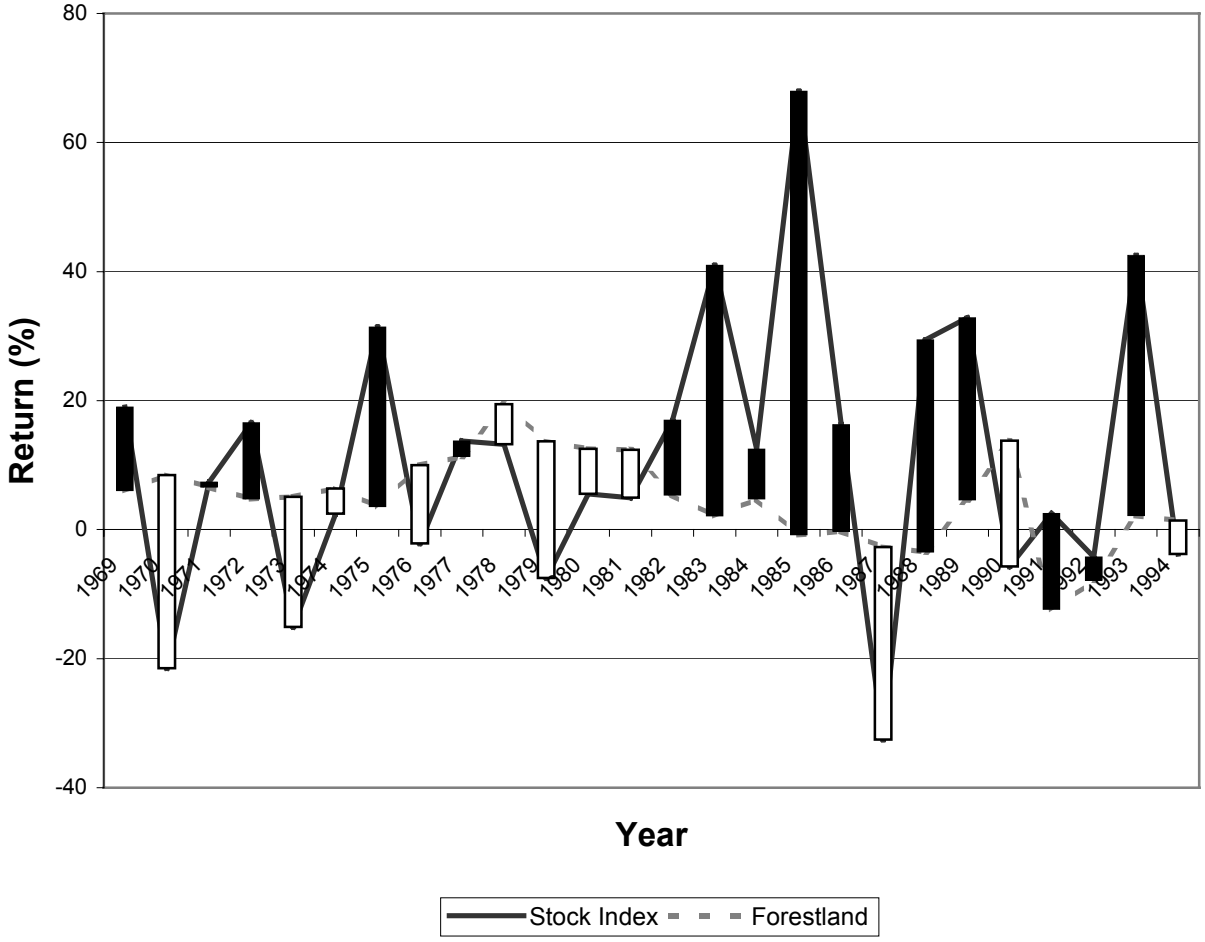
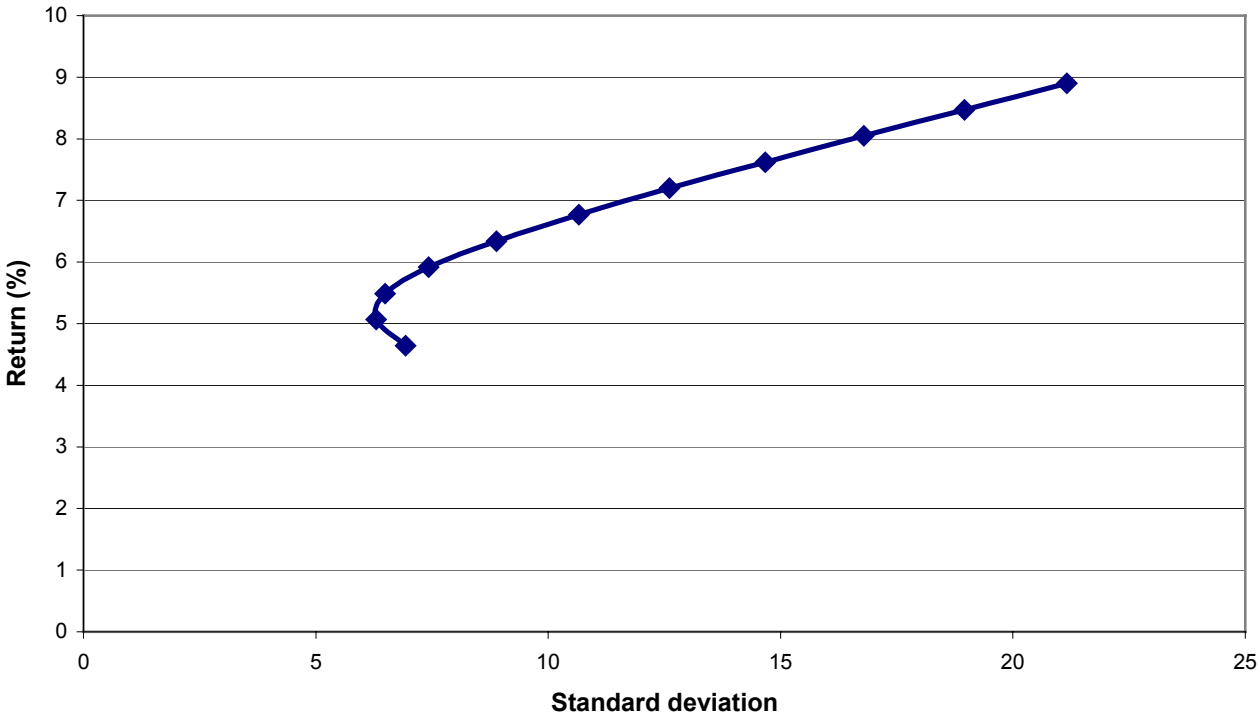


Figure 3: Combinations of Stock Index and Forestland



Forestry and Biotechnology: Sorting Out The Issues - *Dawn W. Parks*

ArborGen

Introduction

Today, biotechnology, the application of engineering and technology to the life sciences, is poised to make significant contributions to our quality of life. But like earlier technologies, biotech has its critics who question its impacts on both society and the environment.

Scientists are unlocking the mysteries of deoxyribonucleic acid (DNA) in both plants and animals, resulting in an understanding of these organisms at the most fundamental level. Out of this understanding will come opportunities to treat formerly incurable diseases, produce replacement organs for critically-ill patients, grow food to meet specific nutritional needs, and increase production of food and fiber to meet a growing world demand.

This last item is no small task. The world population currently stands at six billion, and it's expected to grow to nine billion by the year 2050. Demand for additional food, wood and paper products will be driven both by the increase in numbers, and by advancing standards of living around the world. For example, in the United States, every year, each American uses enough paper and wood products to equal a 100-foot tall tree, 16 inches in diameter or approximately 675 pounds of paper (Temperate Forest Foundation, 2001).

Biotechnology is not the single answer to the world's food and health problems, but it can be an important tool in addressing them. Some of the most significant advances to date have been in agriculture. Today, one-quarter of all U.S. cropland is planted with genetically engineered species, predominately corn, soybeans and cotton. While much of the early work has been geared toward increasing yields and fighting pests, biotechnology also holds potential for adding nutrients to foods, extending shelf life to reduce waste, and creating super seeds that will help poverty-stricken farmers create profitable crops (Council for Biotechnology Information, 2001).

Tree Improvement and Biotechnology

And of course, the possibilities for biotech extend to trees as well. Forest products companies, including ArborGen, see potential for biotechnology to help them meet the growing demand for wood and paper products. It's a demand that must be met on an ever-decreasing land base, as other lands are set aside for non-forest use.

Advances in forest biotechnology also offer opportunities to benefit society and the environment. The environment is expected to benefit because growing more wood on less land, some of it worn out or abandoned agricultural land, will mean less pressure on native forests. These fast growing plantations can help reduce green house gases through rapid uptake of carbon dioxide. Pest resistant and herbicide tolerant trees can significantly reduce the use of chemicals due to more efficient prescription applications. Biotechnology will also be a critical technology for keeping the pulp and paper industry competitive in a market being filled with a myriad of non-renewable wood substitutes being introduced in the market such as plastics and steel. Production traits that allow trees to grow more quickly with less in-woods management costs could significantly impact procurement costs. When reduced procurement costs are combined with traits such as lignin modification, overall production costs are reduced.

The American chestnut tree has dwindled in the United States due to the chestnut blight. Biotech could create a blight-resistant strain of American chestnut and help bring back this beautiful tree to North American forests. The concept of phytoremediation and land reclamation are gaining popularity as a process for utilizing trees to remove, transfer, stabilize, and/or destroy contaminants in the soil and groundwater (Center, 2001). Fast growing plantations have the potential to dramatically increase carbon uptake. These are a few examples of creative uses of the technology that demonstrates how biotech could work for the benefit of all mankind.

Perhaps the most important thing to remember is that the idea of genetic engineering is not new. Man has been genetically altering crops for thousands of years through sexual means. Agriculture, and more recently, forestry, has always created new varieties through hybridization, cross-breeding and selection processes that change the genetic makeup of plants. For example, today's corn plants bear little resemblance to the original corn plants until they were cultivated (Fink). Through hybridization and controlled pollination technologies, we've been able to develop trees that are more disease-resistant and grow straighter, faster and larger in shorter periods of

time. Plant breeding and genetic modification are both tools in the plant improvement toolbox.

One reason to use genetic modification for tree improvement is time. Breeding and crossbreeding to combine certain characteristics can be a “hit or miss” proposition, and in trees it is extremely time consuming; taking years from pollination until maturation. Genetic modification can move things along faster. It also offers precision in trait introduction, as well as access to a broader pool of desirable traits. Using biotechnology, scientists can identify the genes associated with specific characteristics or traits and then insert these improvements into the DNA of a different plant. The lengthiest parts of the biotech process are identifying which genes control which traits, and developing the processes to make the trait insertion successful.

Biotechnology Safety and Regulation

As biotechnology moves onto center stage, people are beginning to ask questions. "Is it safe?" "How does this affect the environment?" “What are the long-term effects?” The wise use of biotechnology is a critical issue, and all of these questions warrant review. The Institute of Forest Biotechnology has been created to research the answers to these very important questions. According to Director, Steven Burke, the think tank will promote the societal benefits of bio-engineered trees, fund research and assist addressing the concerns, which will affect the adoption of the technology across the industry.

An early concern voiced about biotech was that transferring DNA material between species is tinkering with nature. But tinkering with nature is producing some very positive results, such as the announcement last year of newly created “golden rice". The gold color comes from beta-carotene, the world’s most common source of vitamin A. Vitamin A is important in the prevention of blindness and other ailments. By adding it to the rice, nutritionists may have found an easy way to prevent deficiencies that can cause two million deaths each year among children under the age of five. The genes that made this super rice possible are two from the daffodil and one from a bacterium (Nash-Zurich, 2000).

Is biotechnology controlled and regulated? The answer is yes. It’s a heavily regulated field, with a great deal of government oversight. According to Val Giddings, Vice President of the Biotechnology Industry Organization (BIO), the fact is that "the products of biotechnology have been reviewed more in advance, in depth, in rigor than any other foods in the history of humanity. The regulatory review documents for the first tomato improved through biotech occupy six feet of shelf space. That's a standard that conventional breeders don't have to meet. So there is a vast amount of data that shows these products are safe and a huge amount of experience that demonstrates it as well." The safety of a particular product must be demonstrated and reviewed before a genetically altered plant can be sold.

There is a well-recognized regulatory process for notifying the appropriate authorities about genetically modified tree research and deployment. All field tests of biotech plants must be reported to USDA’s Animal Plant Health Inspection Service (APHIS) prior to planting. APHIS is responsible for "protecting American agriculture against pests and diseases." Specific information about each test is then published by APHIS in a public database. If the biotech product involves pesticide genes, the Environmental Protection Agency (EPA) becomes involved since it is responsible for the safety and safe use of pesticidal and herbicidal substances in the environment. APHIS and the EPA, while separate agencies, work together to ensure the safety of the environment. The agencies have all been instructed to review their existing regulations and strengthen them where appropriate. This process will receive considerable public input, ensuring that all stakeholders’ opinions are heard and evaluated in the review (Council for Biotechnology Information, 2001).

ArborGen encourages an atmosphere that promotes dialog leading to effective and cost efficient testing and evaluation. We will continue to participate in dialog regarding the appropriate regulation of this new technology as it relates to trees. As an example, ArborGen has been and will continue to be actively engaged in the development and implementation of the Cartegena Protocol. The purpose of the Protocol is “ensure an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms…specifically focused on transboundary movements” as outlined by the Convention on Biodiversity (Convention on Biodiversity, 2000). The Protocol is designed to be a template for assisting any government in creating or strengthening its regulations as it pertains to safety as many developing countries and countries in transition do not have appropriate, if any, regulations in place.

ArborGen became involved in the dialog for two reasons. Initially, the Protocol was written to include living modified organisms and all products thereof. That meant that all paper and wood products manufactured from any genetically modified trees would be regulated. The second reason, and more important, was that the risk assessment regulations in the Protocol required a life-cycle evaluation of all living modified organisms prior to commercialization. The impact of such a life-cycle

requirement would virtually preclude any opportunity to commercialize biotech-derived trees.

In addition to the EPA, USDA, FDA and the Protocol, there are over 35 intergovernmental organizations and workgroups that are deliberating over and creating biotech regulations and policy that have the potential to significantly impact biotech forestry (USCIB, 2000).

Biotechnology Challenges

A significant concern is "outcrossing" or the escape of genes to the wild where they could cross with, or out competes, native trees. To prevent outcrossing, researchers are investigating the feasibility of changing the flowering process in biotech trees, such as preventing the development of flowers or pollen. Other practices, such as harvesting the trees before they reach flowering age, could also be used.

Could insect pests develop resistance to the insect control proteins that are built into crops? It's certainly a possibility. Corn and cotton crops, which contain the Bt insect control protein, were commercialized with specific management practices aimed at reducing the development of insect resistance (Carpenter, 2001). Commercialization of biotech insect protected trees will likely require specific management practices as is common in other crops. For example, foresters could plant "refuges" of non-modified trees around the perimeters of genetically improved forests. The refuge would serve as a breeding factory that would keep up the numbers of non-resistant insects. This practice has been very effective in cotton production (Carpenter, 2001). Scientists are continuing to research how large a refuge needs to be to effectively slow or stop the development of resistant insects. An important point to remember is that biotech trees are not meant to replace native forests. They'll be grown in plantations dedicated to producing high volumes of fiber, leaving plenty of forests, where natural processes and native species will continue to predominate.

Trees can also be modified to resist herbicides. While some people have worried that herbicide-tolerant seedlings will mean an increase in the use of herbicides, just the opposite seems true. There has been a gradual reduction in the total use of herbicides for the control of weeds in fields in which glyphosate resistant soybean has been grown (Carpenter, 2001). Herbicide-tolerant trees will allow foresters to apply herbicides only when really needed, as opposed to applying a lot of product to prevent any potential problems. The result is expected to be a reduction in the amount of herbicide applied over the life of the plantation. In addition, a reduction in the need to control by cultivation in hardwood plantations will reduce the possibility of erosion, improve soil structure, and protect the surface roots of crop trees.

Commercialization

Biotechnology is both complex and expensive. Given the nature of research and development and intellectual property protections, many companies have found a business case for sharing their assets and expertise to achieve what no one company could achieve. As an example, ArborGen was established as a joint venture resulting from an agreement between Westvaco, International Paper, Fletcher Challenge Forests, and Genesis Research and Development Corporation, to explore the commercial opportunities in forest biotechnology. This new company is expected to be a world leader, bringing together unequalled expertise and unparalleled resources from the joint venture partners and serving as a magnet to attract developments from other independent laboratories, universities, and companies.

Through ArborGen, the partners will develop and sell bio-engineered forest trees. A research development phase of several years is expected before operational planting of genetically engineered trees will begin. When combined with the trees' growing cycle, this time span will afford ample opportunity to determine both the benefits and impacts of these trees.

Summary

The forestry biotech industry is, in many ways, still in its infancy. Forest products companies are still several years from producing commercial seedlings. The full potential of biotech has yet to be seen. Apart from obvious uses such as growing taller, stronger trees, there are dozens of possible societal benefits to applying biotech to trees.

Participation in dialog regarding the appropriate regulation of technology is ongoing and an important element of successful commercialization. As with any technology, there are challenges to address, but the people who are working on forestry biotechnology at ArborGen feel sure it's safe for them and their children. Geneticist Les Pearson, Biotechnology Section Leader at Westvaco (an ArborGen partner), and father of three, is committed to producing a product that is safe for the environment. According to Pearson, "as demand for paper and forest products grow, we need to find better ways to produce more fiber. These new technologies allow us to increase fiber production while at the same time reducing pressures on natural

forests, so that we can keep these for our kids and future generations to enjoy."

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Sustainable Forestry

Experiences of a Private Non-Industrial Forest Landowner - *Henry S. Kernan*

South Worcester, New York

This presentation will review and comment upon a 54-year ownership and management of about 1,200 acres of northern hardwood on the Allegheny Plateau of central New York. Even though highly urbanized and industrialized, New York is nearly two thirds under forest. The cities and industries are mostly along the Hudson River from New York City north to Albany and from there west to the Great Lakes. The 18.6 million forested acres include six million acres of Adirondack wilderness and another million acres of semi-wilderness in the Catskill Mountains almost within sight of Manhattan's tall buildings. These forests are vast but not isolated. The attitudes and values most critical to their present and future condition originate in wealthy cities and suburbs, form which centers of power they radiate out and into the forested countryside. They have brought about the withdrawal of nearly three million acres of forest from multiple use, far more than has any other state east of the Rocky Mountains.

My experiences are those of an owner of private forestland. In 1993 we private forest owners in New York numbered 425,000. We owned 13.1 million acres, 72 percent of the forest and 86 percent of the timberland. The remaining timberland is about equally industrial and public. Our wooded properties average 28 acres and frequently change owners. Farmers once owned almost all of those 13.1 million acres, but few of them own forestland now. Most of New York's forestlands were in farm use for a century or more before being abandoned to the re-growth of the forest. Farm use had at one point reduced the state's forest cover to one third of the pre-European level. The re-growth of the forest thus took place on woodlots long grazed by domestic livestock and heavily cut for firewood and other farm use, and advanced over pasture and cropland. The process, though slow in human terms, has by now brought more than half of New York's timberlands to a sawtimber condition.

The lands I have owned since 1947 had last been farmed in the 1920's. Those now long-gone farm days, horse-drawn and lamp-lighted, left behind them barn ramps and cellar holes, now deep in the forest, and miles of stonewalls collected from the fields nearby. From such a lowly start I now have an inventory of over two million board feet and over five thousand cords.

Nearly half the board footage is in the prime species, red oak, white ash, black cherry and hard maple. Their volume, quality and frequence are the concern of my silviculture, along with the diversity of forest products and functions in which the public shares: water wildlife, carbon storage and much else. These concerns have thus far kept most timber harvests to salvage and stand improvement. They bring out the best of what we can expect here of northern hardwoods, trees that are tall, straight and clear of lower branches, but that share space with the tardy, shade-loving beech and hemlock. Rather than use their gains each year for property taxes, I prefer to build up their quality and volume for estate levies.

My forest has 17 marketable species, five more infrequent, and six that lack size and quality. Present also are snags and den trees, logging slash, culls, and the rough, decaying debris of the forest floor. Areas reserved from the cutting cycle are steep slopes, streamsides, roadsides, old growth, the boggy environs of a lake, and some meadowlarks.

Such reserves and allowance for species and woody material of low or no marketable value lower the yield for financial gain. I believe they are parts of sustainable forest management. My forest has received tree farm awards and been tagged green by the National Forestry Association. Smartwood is about to do likewise. This certification is gratifying, but the full implications are still unclear.

According to one definition, sustainable forestry makes a profit for the owner. During my ownership, taxes have taken out $225,000 and timber sales have taken in $128,000. The difference would not have been as great if the markets for firewood and pulpwood had not been diminishing over the period of my ownership. The present inventory of timber is enough to wipe out that difference several times over. I have not done so for the same reason that collectors acquire and keep their fine paintings and works of art. The presence and possession of fine oak, ash, cherry and maple are their outdoor equivalent, worth any offer so far, even with black cherry at five dollars a board foot standing in a forest that pays taxes in full.

I pay those taxes on the assessed, not on the marketable value of my property. They are not the same and do not include the timber. I cannot lower my taxes by selling timber and I cannot get a higher price for my land by keeping the timber. Forest

owners, therefore, keep their timber until just before they sell their land. At other times many owners prefer not to have loggers in their woods. The state's ratio of growth to removals is three to one. Not 0.5 percent of the respondents to a Forest Service enquiry expected net income from their forest properties.

Taxes on forestland in New York are thought to be high relative to those in nearby states and to how much net revenue they generate for their owners. In New York the taxing authority is the town, not the county or state. Each sets its own assessments and rates, and the state has nearly one thousand. Officials consider them excellent, non-protesting sources of revenue that require few services and endanger few votes. Most of my forest is in Harpersfield, which has little else to tax but marginal farms, woods, and a general store. On my property taxes are nearly ten dollars, in nearby Schenevus they are five dollars, and in the Catskill town of Woodstock, over thirty. According to a study in the Adirondacks two dollars per acre per year are the most that an acre of forest can pay and make money for the owner. The assessments and taxes do not consider the environmental values of private forests as public assets.

Yet overtaxed or not, private forestlands in New York are doing well. They attract more owners each year; increase in capital value, and in timber volume by 400 million cubic feet a year. They could do with more cherry and oak and less red maple and aspen, fewer deer, and more outlets for low-grade wood. Given the typical stand structure of sawlogs; seedlings, saplings and poles are in short supply.

We owners in New York have to favor us more than the vigor and health of our forest trees. We are free to make what use of them we choose. I take what trees I want, where I want, when I want, without notice to a state official before or after, without paying a tax. Wind and ice storms do some damage, but we get by without lightning fires, housing problems for fussy spotted owls and woodpeckers, tree-huggers, and quarrels over clear-cutting and roadless areas on national forests. Our 9,000-acre Finger Lake National Forest is not a roadless area and never will be.

We forest owners find plenty of wild creatures in our woods and streams. Beaver, heron and trout are plentiful in and along my river. Wild turkey and coyotes have lately come in numbers. Deer are no longer a rarity but a threat. Last fall hunters removed 32 whitetails form my land, all nicely fattened on seedlings of ash and cherry.

Most of those who buy and pay taxes on forestland in New York are looking for recreation and aesthetic enjoyment. For what they are seeking, New York's forests fit in well. They are accessible, beautiful to look at, and pleasant to be in, most of the time anyway.

This passive, low profile forestry of recreation and aesthetic enjoyment receives a cautious tolerance from the citizenry and representatives in Albany. Behind the caution is a vague sense that private owners of forestland cannot be trusted to do well by the environment. New York City is buying large area of the Catskill watershed. Every piece of forestland newly acquired by the state is hailed by the press as having been "saved", presumably from private ownership.

Legislator's attitudes towards private forestry are cautious but also casual and off-hand. They have not passed an effective piece of forestry legislation since the Forest Management Act of 1946. They do not seem to realize that their state has 18.6 million acres of forest and some of the world's finest hardwoods.

At one point New York was the leading lumber state. At another, six million acres were abandoned, tax-delinquent farmland and rural slums. Their regrowth into productive forest is a powerful vindication of private forestry.

Strategic Policy and Technical Developments in the State of Oregon, Based on International Criteria and Indicators of Sustainable Forestry - *James E. Brown, David A. Morman, Gary Lettman, and Kevin R. Birch*

Oregon Department of Forestry

Introduction

The State of Oregon has embarked on new initiatives that have the potential to improve the management of Oregon's forests, to challenge existing forest management paradigms, and to incorporate international standards of sustainable forestry directly into state forest policy. These initiatives may help to begin resolution of a decades-old citizen debate about the present and future management of public and private forests in the state. If successful, the Oregon model may be useful for other states and nations to consider. The purpose of this paper is to summarize these initiatives and to report on Oregon's progress to date.

Oregon's Forest Resources

Oregon is a special place. It is blessed with a diverse landscape and climate and abundant natural resources. European settlement of the region began less than 200 years ago. Nearly every component of the native ecosystems present when Lewis and Clark floated down the Columbia River to the Pacific Ocean in 1805 remains today.

The state's forest resources are legendary. About 27.5 of Oregon's 62 million acres are forested. They range from coastal temperate rainforests of Douglas fir, hemlock and spruce to arid pine and mixed conifer forests east of the Cascade Mountains. Approximately 60 percent of Oregon's forestland is publicly owned. The federal government manages the vast majority of this public forestland. The remaining forestlands are privately held, almost evenly divided between corporate industrial owners and 45,000 non-industrial private landowners. (Oregon Department of Forestry, 1998) Oregon's forests are relied upon as a primary source of drinking water, diverse recreation opportunities, fish and wildlife habitat, scenic and spiritual values, and for both timber and non-timber commercial products.

Timber harvesting in Oregon began in earnest at the start of the 20th Century. Harvest levels reached their peak in 1952 when 9.8 billion board feet of timber were cut. Harvest rates declined throughout the 1970s and 80s and even more dramatically in the 1990s, primarily as a result of changes in federal land management policy. Private harvest rates have remained fairly stable during the past 30 years and are projected to remain so. Today, total harvest remains below 4 billion board feet per year. Despite the commercial harvesting of Oregon's forests over the past 100 years, successful forestation and reforestation efforts, combined with strong state laws regulating the conversion of forestland to other uses, have resulted in 92 percent of the native forest acreage that existed prior to European settlement still existing today. (Oregon Forests Resources Institute, 1999)

An Evolving Regulatory Framework

Over the last 90 years, the State of Oregon has vested the primary responsibility for articulating and implementing forest management policy into a citizen Board of Forestry appointed by the Governor and confirmed by the state senate. As currently configured, the Board consists of seven members, no more than three of which may have a direct financial interest in Oregon forestry. Historically, the Board has asserted its policy authority on all state, private, and federal forestlands in Oregon The Board directs the State Forester, who, in turn, leads the Oregon Department Forestry.

Like a number of other states, Oregon has historically used regulatory frameworks as the principal means of implementing natural resource policy. These frameworks have been developed through mechanisms such as the Oregon Conservation Act of 1941, the 1971 Oregon Forest Practices Act (the nation's first comprehensive program to directly regulate forest practices on private forestlands), state clean water and clean air standards, and land-use planning laws. In the early years of forest practice regulation, forest landowners saw the merits in establishing baseline performance standards in order to create a level playing field for timber producers. Initially, regulations were relatively easy to adopt and implement because the cause-effect-benefit relationships were clear to everyone.

Over the past 15 years, forest landowners have been asked to increase protection for more resources, as the public perceives those resources as being threatened by private commercial operations. In effect, the public appears to be demanding that forest landowners manage the entire portfolio of forest resource-based assets on their lands in a way that

protects/enhances each asset (air, water, fish, wildlife, recreation, scenery, timber, jobs) and the portfolio as a whole. However, the cause-effect-benefit relationship and the methods associated with protecting/enhancing many of these assets are not as well based in science. Landowners have become increasingly concerned that, through the existing regulatory programs, the public may be "taking" their private property without compensation for the public benefits they are being asked to provide.

In response to landowner concerns, the Oregon Legislature amended the Forest Practices Act in 1995 to place conditions on the Board of Forestry's authority to adopt new forest practice regulations. A 1998 ballot measure proposing a severe restriction on forest management was soundly defeated by an 81 percent "no" vote. In 1999, the Department of Forestry became immersed in three lawsuits involving property takings claims by forest landowners resulting from administration of the Board's existing forest practice rules. In 2000, Oregon voters passed a ballot measure (currently under legal challenge) that gives private landowners the right to pursue compensation when a government action can be shown to have reduced the value of their property. State government was being given repeated messages from a large proportion of its citizens that, while the desire for sound stewardship of Oregon's forests continued, alternatives to traditional regulatory approaches were needed.

Sustainability Emerges as a Concept in Oregon Forest Policy

Even as the policy debates were occurring on the future of Oregon's regulatory system for forest practices, a new conversation was beginning. Oregon's focus on sustainable forestry as a unifying forest policy concept began to solidify in 1989, when the Oregon Legislature created a nine-member Oregon Progress Board of citizen leaders and charged them to develop benchmarks to help the state strategically plan for Oregon's future (Oregon Progress Board, 1999). The initial set of Oregon Benchmarks included a broad array of social, economic and environmental health indicators; however, the indicators did not provide enough information to show whether Oregon would be able to sustain the current level of forest outputs into the future.

Then in 1991, the Legislature directed the State Forester to study the cumulative effects of forest practices. The study was to examine issues including timber harvest rates; effects on employment and community stability; forest rotation ages; effects of leverage buyouts; effectiveness of state forest practice rules; cumulative effects on soil, air, water, fish and wildlife; and appropriate clear-cut size limits. The first attempt to respond to this direction resulted in both an extensive and expensive literature review, but no clear strategy on how to use the information.

Concurrently, the Department of Forestry's Executive Staff was embarking on a new strategic management path. Their notion was that in order for the agency's polices to be better understood, accepted, and supported, improved coordination and communication was needed among various state and federal agencies, local communities, interest groups, and forest landowners. The concept of sustainability, based on the World Commission on Environment and Development ("Bruntland Commission") definition, began to emerge as a possible core theme of the agency's mission. The department's leaders then developed a model that showed the relationship among its mission, principles, systems, tools, culture, and results, and the connection to sustainability. This model proved very effective in communicating the department's mission and vision to all agency employees and in developing understandings and relationships with stakeholders and cooperators.

The Board of Forestry used the same principles to develop a 1995 update to its forest policies, which are summarized in the document, *Forestry Program for Oregon*. The *Forestry Program for Oregon* identifies issues that are problems or opportunities for constructive action, develops policies to address the issues, and outlines the program- specific actions needed to implement the policies. The Board and the department use this document as the foundation for discussions with the Governor, the Legislature, other policy makers and opinion leaders. The following are excerpts from the Board of Forestry's 1995 *Forestry Program for Oregon* mission and vision statements:

"The Board of Forestry will provide aggressive leadership in developing forest policy and programs that ensure the application of enlightened management to all public and private forest lands in Oregon. These polices and programs will:

1. Promote healthy diverse forest ecosystems throughout Oregon that provide abundant timber and other forest products, habitat to support healthy populations of native plants and animals, productive soil, clean air and water, open space, and recreational opportunities.
2. Use aggressive but careful management to minimize adverse effects from insects, disease and wildfire, and assure healthy ecosystems.
3. Recognize that Oregon's forests are diverse, dynamic, and resilient, and that most forest uses are compatible over time.

4. Recognize and build upon the wide range of management objectives across public and private forests.
5. Promote the use of incentives, the collection and sharing of information, and appropriate regulations to foster a climate for good stewardship.
6. Use the processes of ecosystem assessment to define resource goals, monitor our actions, and appropriately adjust our policies and actions . . ..

[I]f the *Forestry Program for Oregon* is implemented successfully Oregon will have:

1. Healthy forests providing a sustainable flow of goods, services, and values such as water, fish, air, wildlife and products [and]
2. Landowners willingly making investments to sustain healthy forests (public and private). . . " (Oregon Board of Forestry, 1995)

New Oregon Initiatives Take Root

With sustainability now a central, but still somewhat vague, Board of Forestry goal, other new forums emerged that reinforced the Board's mission and vision:

Forest stewardship incentives: The Board and the department began a public involvement process to craft new voluntary, initiative-based programs that would build on the existing regulatory foundation of the Oregon Forest Practices Act. Simultaneously, the State Director of the Defenders of Wildlife was working collaboratively with the forest industry and others to produce an atlas of Oregon's natural resources and did an outstanding job of summarizing incentives and land management approaches. (Oregon Biodiversity Project, 1998) These two processes proved to be complementary and started a new dialogue within the forestry community on how non-regulatory methods could be used to achieve desired resource protection goals.

The Oregon Plan for Salmon and Watersheds: The Board's policy discussions on non-regulatory concepts fed into a new process under the leadership of Oregon Governor John Kitzhaber. The Governor's vision was to bring together forest and agricultural landowners, the urban and industrial sectors, state and local governments, and citizen groups to craft a protection and restoration plan for depleted coastal salmon populations.

This new strategy relied extensively on voluntary efforts, established upon a regulatory base and coordinated at the watershed level. A 1998 federal magistrate's ruling prevented the "Oregon Plan for Salmon and Watersheds" from being deemed sufficient by the National Marine Fisheries Services to forestall federal Endangered Species Act listing of the Coho salmon. Oregon still argued strongly that The Oregon Plan could be used in place of federal Endangered Species Act enforcement actions and thus, more quickly leads to recovery of these salmon populations, particularly on private lands. The Governor, with the full cooperation of a broad cross section of Oregonian interests continued implementation of The Oregon Plan in spite of the magistrate's ruling.

With additional federal listings of threatened or endangered fish populations throughout the state, the Oregon Plan was expanded in 1999 to a statewide initiative. As a result of the Plan, a collaborative, three-year public involvement process was implemented to evaluate the effectiveness of Oregon forest practices to protect water quality and fish habitat. The process resulted in recommendations for regulatory and non-regulatory changes, now under Board of Forestry consideration, to address fish passage issues, forest roads, landslides, riparian functions, and landscape perspectives. (Oregon Department of Forestry, 2000d)

An extensive record of voluntary accomplishments by the forest landowner community to protect and restore aquatic habitat, improve forest roads and stream crossing structures, and to fund other efforts, has been documented. The contributions of forest landowners towards fish recovery and water quality protection, above what state regulations require, have been a key highlight of the Oregon Plan's accomplishments (Maleki and Riggers, 1999).

To date, the federal government has not seen the need to initiate enforcement actions on Oregon private forestlands, nor has it worked to void any of the Oregon Plan actions or measures.

Enlibra Principles: In 1999, the Western Governors' Association, through Governor Kitzhaber's leadership, adopted new principles for environmental management of the Western United States. These principles emerged from the identified need for western governors to " . . .find new ways to vest our citizens with policies that both protect the heritage and traditions in the West that are valued and advance the kind of development that will maintain the region's extraordinary quality of life." (Western Governors' Association, 1999) In summary, the "Enlibra" (a new word meaning balance and stewardship) principles are:

- National Standards, Neighborhood Solutions - *Assign Responsibilities at the Right Level*.
- Collaboration, Not Polarization - *Use Collaborative Processes to Break Down Barriers and Find Solutions*

- Reward Results, Not Programs - *Move to a Performance-Based System*
- Science For Facts, Process for Priorities - *Separate Subjective Choices from Objective Data Gathering*
- Markets Before Mandates - *Replace Command and Control with Economic Incentives Whenever Appropriate*
- Change A Heart, Change A Nation - *Environmental Understanding is Crucial*
- Recognition of Benefits and Costs - *Make Sure Environmental Decisions are Fully Informed*
- Solutions Transcend Political Boundaries - *Use Appropriate Geographic Boundaries for Environmental Problems* (Western Governors' Association, 1998)

A need for a common language

Despite the many developments and innovations occurring in Oregon's natural resource policy arena, a key piece was missing. True two-way communication between various forest policy viewpoints was still not occurring. As a result, policy debates over the direction of forest management on both public and private lands remained characterized by polarization, posturing, and sometimes violent confrontation. Oregon's forest policy framework was lacking a "common language" that any interested party could use when discussing the present condition of the state's forest resources and the future implications of both current and alternative forest management strategies.

Opinion polls show that people in Oregon and around the world want a full range of economic, social, and environmental goods and values produced from forests. Because of this broad-based sentiment, the United States committed to using our forests sustainably at the 1992 United Nations Conference on the Environment and Development and as a party to the 1995 Montreal Process Santiago Declaration. The Montreal Process established 67 indicators that describe the seven criteria or goals (conservation of biological diversity, maintenance of productive capacity, forest ecosystem health and vitality, conservation of soil and water resources, forest's contribution to global carbon cycles, socioeconomic benefits, and the legal and institutional framework) necessary for the conservation and sustainable management of temperate and boreal forests (The Montreal Process, 1999). The criteria and indicators encompassed the three "legs" of sustainability (social, economic, and environmental) and became the "Rosetta stone" for establishing a common language to discuss forest conditions and social responsibilities at international, national, and local scales. They also provided a framework to consider the components of forest sustainability holistically.

While the specific issues may differ from nation to nation or state to state, the larger concern addressed by the criteria and indicators is the same: how to satisfy the needs of the community-of-interest (those dispersed parties united by a concern for forest values) and the needs of the community-of-place (those parties united by a concern for forest values at the local level) within a framework of sustainable forest management.

This concept took on greater meaning for State Forester James E. Brown, when he attended the XI World Forestry Congress in Antalya, Turkey in 1997. While there, he attended a dinner hosted by Cote Ivory (Ivory Coast) and heard the story of how that nation's government responded to the problem of local villagers plundering new forest plantations for fuel wood. In response, the government negotiated an agreement with the village leaders. Under the agreement, the villagers were given fuelwood gathering rights for personal use and to sell to jobbers in the city as long as they tended the forest in a proper way. The agreement solved both the economic and social needs of the village and the environmental needs of the nation.

This fairly simple model of open dialogue between the community-of-interest and the community-of-place had relevance internationally. Many other examples can be found where it is the community-of-place that actually tends and manages the forests. If somehow the community-of-place becomes disenfranchised, the forests they once tended can deteriorate over time. Without support from the community-of-place, successful implementation of hoped-for environment improvements will likely not succeed. Likewise, the community-of-interest has an economic responsibility to help pay the costs of environmental improvements intended for public benefit.

State Forester Brown returned to Oregon with a new vision of how the Montreal Process Criteria and Indicators could be used to build upon the foundation already established by the Board of Forestry's *Forestry Program for Oregon* mission and vision statements. He immediately began a dialogue with other policy makers on how Oregon could better evaluate whether its forests were being managed sustainably and meeting society's objectives. In Oregon policy arenas, the social, economic, and environmental concepts imbedded in the criteria and indicators, immediately resonated with Oregon opinion leaders, interest groups, academia, and forest landowners as necessary to defining sustainable forestry. Consensus was soon reached that the Montreal Process indicators could be used by the

state as tools to measure progress towards sustainability and to guide future planning, assessment, and monitoring activities across all ownerships.

Incorporating the Montreal Process criteria and indicators into Oregon forest policy

Based on the Board of Forestry's *Forestry Program for Oregon* 1995 direction to conduct forest ecosystem assessments, the Department of Forestry's Forest Assessment Project was created and charged with building on the original 1991 cumulative effects study.

Today, the Forest Assessment Project has three major components:

- An integrated assessment of Oregon's forests
- Cooperation with Oregon State University and others to develop more advanced and integrated modeling tools for answering policy questions, and
- Publication of Oregon's "first approximation report."

The assessment project provides background information about the conditions and trends of Oregon's forests, in-depth analyses of significant policy questions, and analytical tools with which to examine scenarios of the future development of the state's forests under alternative forestry policies. The seven sustainability criteria are incorporated as organizing frameworks for guiding and prioritizing future research, assessment, and monitoring efforts. Integrating the needs and values of Oregonians into policy analyses has proven to be a vital component of these assessment projects.

To guide the Forest Assessment Project process, the department has established a multi-stakeholder Forest Policy Advisory Group that oversees the project and ensures that the goals and objectives of the assessment are met. The agency has also established working groups to ensure that policy issues and research needs are addressed and that processes are developed, consistent with the criteria and indicators, for describing, assessing and evaluating forest resources. (Oregon Department of Forestry, 2000c)

Technical assessments and policy discussions regarding forest sustainability converged in 2000 when Oregon became the first state in the nation to publish a "first approximation report." Nations had previously developed such reports to try to assess the status and trends of their forest resources measured against the criteria and indicators, but a U.S. state had never before attempted this ambitious effort. In *Oregon's First Approximation Report for Forest Sustainability*, the indicators are presented not as a set of thresholds that must be met to achieve sustainability, but rather as agreed upon data references to base forest policy dialogues. The report provides a snapshot of Oregon's forests today, and a starting point for discussions about future forest sustainability. It provides the state's citizens with a "report card" on the conditions of Oregon's forests and background information that policy makers can use as they try to chart the future course of Oregon's forests. (Oregon Department of Forestry, 2000b)

The Board of Forestry is preparing to again update its comprehensive policy document *Forestry Program for Oregon.* It has become clear to Board members that all the forest policy issues they face in Oregon fit nicely within the seven Montreal Process criteria. The criteria will therefore become the goals of the next *Forestry Program.*

The Department of Forestry believes the following concepts also must be incorporated into the *Forestry Program for Oregon* for it to achieve the Board's mission and vision:

- Sustainability must be defined in terms society can understand
- Policy decisions must recognize:
  - ⇒ Sustainability equals the sum of social, economic, and environmental factors;
  - ⇒ The need to reconcile differences between divergent public opinions (as voters and interest group supporters) and public behaviors (as consumers) by moving the public towards informed public judgments; (Force and Fizzell, 1999)
  - ⇒ In a democratic society, political stability requires meeting the needs of both the community-of-interest and community-of-place;
  - ⇒ Enlibra principles must guide the debate;
  - ⇒ The pathway to sustainability is both through the landowner (land management practices) and public (resource use and other behaviors);
  - ⇒ Different land ownerships can play different roles in sustainability (federal lands will tend to play the environmental conservation role, and private lands play the economic role, with state lands somewhere in the middle);
- Landowners must recognize they manage a portfolio of forest assets and that individual assets must be managed in a manner that enhances or maintains entire portfolio;
- The public must understand and accept its responsibility in terms of opinions, behaviors, and judgments;

- Further research is needed to better define the interactions and tradeoffs between resource extraction and quality of life.

Sustainability concepts in action

Today, the concept of sustainability, and the Montreal Process criteria and indicators of sustainable forest management are central to the mission and vision of the Board of Forestry and the work of the Department of Forestry. Future department program strategic plans, program effectiveness monitoring, forest assessment modeling and analysis, and public information efforts will address the seven criteria and the core sustainability indicators selected by the Board (see Page 10). Sustainability concepts are also strongly influencing a variety of other Oregon natural resource forums:

Forest Resource Trust: In 1993, the Oregon legislature voted unanimously to create the Forest Resource Trust to provide financial and technical assistance to family forestland owners for stand establishment and improved management of forestlands for timber, wildlife, water quality and other benefits. The trust pays up to 100 percent of the costs of stand establishment on underproducing lands in exchange for the landowner's commitment to ensure successful reforestation/afforestation and management of a healthy forest.

Financial assistance through the trust is well funded for the next several years with receipt in 1999 of $1.5 million of carbon dioxide emission offset monies from the Klamath Cogeneration Project in Klamath Falls, Oregon. The cogeneration project is a public-private partnership between the City of Klamath Falls and PacifiCorp Power Marketing. The monies provide enough financial assistance to fund conversion of underproducing lands for approximately 80 different landowners throughout western Oregon.

State of the Environment Report and Oregon Benchmarks: In 2000, Oregon published its first *Oregon State of the Environment Report*. The report provides " . . . scientifically reviewed information about current conditions and trends across the state and future risks to the environment." (Oregon Progress Board, 2000) The report examines not only forest ecosystems, but also aquatic, rangeland, agricultural, and urban ecosystem health. Not surprisingly to forest managers, the report confirms that the most pressing environmental problems facing the state are not on upland forestlands, but rather in the intensively developed lowland areas dominated by urban and agricultural uses. The report proposes a new set of state environmental benchmarks to the Oregon Progress Board to measure progress in meeting state goals for water quality and quantity; marine ecosystems and estuarine resources; freshwater wetlands, fish communities, and riparian systems, agricultural and urban areas, forest resources, and for the overall topic of biological diversity. The Department of Forestry is working with the Progress Board to ensure compatibility between the Oregon Benchmarks applicable to forestry and the core Montreal Process indicators used by the Board of Forestry and the agency.

Forest Certification: The international trend towards third-party certification of forest management and forest products has also become a growing trend in Oregon. The Board of Forestry has determined its role with respect to forest certification systems operating in Oregon will be to directly interact with those systems to influence and encourage them to operate on private and public lands consistent with Board policy. The Board has directed Department of Forestry staff to draft Oregon standards for the essential components for credible certification systems. The agency is examining the draft International Forest Industry Roundtable "Criteria and Indicators of Credible SFM [Sustainable Forest Management] Standards and Certification Systems" as the basis for developing Oregon standards. (Griffiths, 2000) The Board has also charged the agency to begin work on a variety of studies regarding forest certification to better inform both state government and the forestry community about this new tool for demonstrating and documenting forest management performance.

Sustainability Executive Order: In 2000, Governor Kitzhaber signed an Executive Order directing all agencies and employees to take actions to promote sustainable practices within state government. The Governor, for the first time, articulated a State of Oregon definition of sustainability:

"Sustainability means using, developing and protecting resources at a rate and in a manner that enables people to meet their current needs and also provides that future generations can meet their own needs. Sustainability requires simultaneously meeting environmental, economic and community needs." (Kitzhaber, 1998)

Among other elements in the order, the Oregon Department of Administrative Services (DAS) is charged with developing sustainable purchasing policies for each of the several categories, including paper products and building construction.

An example of how the Montreal Process criteria and indicators are being incorporated into Oregon forest policy

Criterion 2 of the Montreal Process calls for the "maintenance of the productive capacity of forest ecosystems." Oregon Department of Forestry staff has identified three primary policy issues in Oregon surrounding this criterion:

- Is Oregon maintaining the size and productivity of the forestland base? (Considering factors such as resource losses from fire, insects and disease; reforestation success with native species, and land development and use-conversion patterns)
- Are timber growth and harvest balanced at sustainable levels?
- Are growth and harvest of non-timber forest products balanced at sustainable levels?

The Montreal Process suggests five indicators to measure progress towards meeting this criterion:

a. Area of forest land and net area of forest land available for timber production;
b. Total growing stock of both merchantable and non-merchantable tree species on forest land available for timber production;
c. The area and growing stock of plantations of native and exotic species;
d. Annual removal of wood products compared to the volume determined to be sustainable;
e. Annual removal of non-timber forest products (e.g. fur bearers, berries, mushrooms, game), compared to the level determined to be sustainable.

Department staff has decided to consider indicator "c" as somewhat duplicative and therefore excluded from further state analysis. Indicator "e" was considered to be another useful indicator, but needing further development before meaningful data could be collected. Indicators "a," "b," and "d" were selected for immediate use as "core indicators" for assessing Oregon's performance in maintaining productive forest capacity.

Oregon's First Approximation Report for Forest Sustainability provided a first look at the available information for the selected core indicators. Staff then determined what additional information would be needed to provide the Board of Forestry with enough background to allow them to evaluate current and alternative policy directions in light of these indicators.

For indicator "a," staff decided to use geographic information system data layers from the USDA Forest Service Region 6 and Bureau of Land Management State Office showing federal land allocations. Land use information could be examined to estimate the amount of private forestland still used for timber production. The combination of all above data sets would allow accurate estimates of land available for timber production. For indicator "b," the federal databases cooperatively produced for the Renewable Resources Research Act would be used. For indicator "d," state timber harvest reports and sustainable timber harvest estimates from state analyses would be used, along with modeled estimates of non-declining even flow timber harvest levels generated for each ecoregion or other landscape scale.

Several state programs already have a direct effect on Oregon's performance in meeting Criterion 2. They include the fire suppression efforts, insect and disease management, reforestation regulations and incentives, and land-use planning requirements. In the past, these programs had been viewed and evaluated separately but now will be reexamined using the core indicators. Individual program policies, action plans, monitoring strategies, and performance measures will be revised to demonstrate progress towards maintaining the productive capacity of forest ecosystems. The information generated using the core indicators will become an adaptive management feedback mechanism to inform the Board on whether their programs are succeeding in meeting the Oregon Board of Forestry's *Forestry Program for Oregon* goals.

One dilemma facing DAS will be how to define sustainably produced wood products in a way that complements, rather than conflicts with Oregon's forest practice regulations.

The Department of Forestry is working with DAS to ensure that the state does not express in policy a blanket purchasing preference for third-party certified wood products. To do so might discriminate against Oregon forest landowners, who are in full compliance with Oregon's forest practices requirements, but who have chosen to not become certified.

The Department of Forestry believes forest certification is not a necessary prerequisite for sustainable forest management or for a well-managed forest. Ideally, forest certification should remain a voluntary, market-driven process involving willing producers and consumers. For private forest landowners, certification is only valuable when it meets their management objectives and there is a way for them to recover the investment required to participate in it. The State of Oregon should not consider landowners with well-managed forests, but who choose not to pursue voluntary forest certification, to be less competent or protective of forest resources than those landowners who obtain certification.

On a related note, the Oregon Economic and Community Development Department has fully embraced the Governor's sustainability initiative. The agency is looking for ways to weave several issues into one unified strategy, including: sustainable forest management, forest certification, ecosystem workforce training and employment, secondary wood products manufacturing, and the "Brand Oregon" commodity marketing concept. The agency's goal is to increase the amount of Oregon-grown, sustainably produced, value-added, secondary wood products that could be marketed internationally with "Brand Oregon" assistance. The agency believes encouraging a larger proportion of certified wood in secondary wood products manufacturing will further differentiate Oregon products in the marketplace. (Fleener, 2001)

State Forests Management Plans: In addition to its forest policy responsibilities, the Board of Forestry is also a forest landowner. In January of 2001, the Board completed the six-year process of revising the Northwest Oregon State Forests Management Plan, which provides management direction for more than 615,000 acres of state forestland in northwest Oregon, located in twelve counties. The new plan takes a more comprehensive, multi-resource approach to forest management than previous long-range plans for these state forestlands.

The sustainable management of all resources present on Northwest Oregon State Forests is at the heart of the plan. Its resource management goals and strategies are intended to achieve a balance among the resources and achieve the greatest permanent value for citizens of Oregon through a system of integrated management. This plan is based on an approach called "structure-based management." Structure-based management is designed to produce and maintain an array of forest stand structures across the landscape in a functional arrangement that provides social, economic and environmental benefits. These include sustainable timber and revenue, habitats for native species, a landscape that contributes to healthy aquatic systems and a forest that provides for diverse recreational opportunities.

A majority of the forestlands included in the management plan currently are covered by densely stocked, young Douglas fir, hemlock and spruce stands. Structure-based management is designed to mimic natural stand development patterns, but to transition today's forests into more diverse structures (including large trees, snags, down wood and gaps) in fewer years than would occur without active management. By anticipating patterns of forest development, foresters can design silvicultural prescriptions to influence development of stand structures, products and habitats.

Future State Forest timber harvests will be focused on moving these lands towards the following structure-based management goals:

5 to 15%	Regeneration
10 to 20%	Single closed canopy
15 to 35%	under story re-initiation
20 to 30%	Layered
20 to 30%	older forest structure

Once created, older forest structure stands will not necessarily be preserved, but instead harvested and regenerated when stands in other parts of the forest also become mature. (Oregon Department of Forestry, 2000a)

The new state forest plan is a bold new initiative, but it must be viewed as an experiment, and much work remains to be done for its implementation to be a success. Nevertheless, the resource strategies embedded in the plan are already challenging the paradigms of both industrial and federal forest management. It is hoped that the "Third Path" exhibited by the Northwest Oregon State Forests Management Plan will result in new knowledge and insights that can be applied to other forest ownerships.

Conclusion

The criteria and indicators of sustainability from the Montreal Process will be incorporated into Oregon statewide policies, such as the Oregon Benchmarks and the *Forestry Program for Oregon*. The indicators will be used to help us measure forest conditions, to monitor different aspects of forest production, to set measurable goals and targets to achieve policy objectives, and to articulate our findings more clearly to a wider public audience.

By basing Oregon forest policy on the Montreal Process criteria and indicators, the state will have the tools to reduce ideological bias in forest policy decisions because representatives from government, industry, and environmental groups have agreed upon the criteria and indicators internationally. Data from the indicators can create a common language used to discuss how forests are being managed. Using the indicators will provide the ability to incorporate consistent measures into planning, assessment, and monitoring activities across all ownerships, thereby making resource policy decisions more comprehensive and coherent.

Oregon has historically been a progressive leader in forest management, and by incorporating sustainability concepts and the Montreal Process criteria and indicators into state forest policies; it is well positioned to continue to be an example to other states and even to other nations. It is hoped that the common international language created by the criteria and indicators will improve communications between the community-of-interest and the community-of-place.

Oregon looks forward to working with other states and our federal partners, especially with Oregon's largest landowner the USDA Forest Service, to learn from other government's efforts to address sustainable forest management. We also need to collectively strive towards a national consensus on core indicators, and to work toward consistent indicator priorities, data collection methodologies, and reporting formats.

To date, state and national efforts to use the Montreal Process criteria and indicators have not been consistent and coordinated. The use of the criteria and indicators has not been integrated into planning polices for national forests. There is also no process in place to ensure consistent data collection methods and appropriate assessment scales for chosen indicators or to test and verify the validity of the indicators themselves. Looming over all of these unresolved issues is the charge to complete a national sustainable forestry report, based on the criteria and indicators, by 2003. (Salwasser, 2000) The Department of Forestry believes the National Association of State Foresters, in partnership with federal agencies, will need to assume a greater leadership role to ensure improved coordination occurs.

The incorporation of sustainability concepts into forest assessments will make that work more complex than ever, but that complexity more appropriately reflects the complexity of our forest ecosystems, now combined with the diverse perspectives, needs, and values of our social and economic systems. Getting a handle on biological diversity over both time and space is alone a very difficult task, but to do so while simultaneously considering six other major criteria of sustainable forests will be a monumental challenge.

In contrast, the same sustainability concepts may simplify and clarify future forest policy development in Oregon. The state will continue to strive to successfully use the tools provided by the criteria and indicators to engage landowners, interest groups, and the general public in a constructive dialogue that results in greater appreciation of the multiple values of Oregon's public and private forestlands. This conversation will then hopefully lead to a greater consensus on the future direction of Oregon forest policies. As a byproduct, society will hopefully also gain a greater understanding of what sustainability means and the role every citizen and consumer will need to play to achieve it.

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Forest Resource Sustainability—An Issue of Growing Concern

"We are drawing on the world's natural capital far more rapidly than it is regenerating. Rather than living on the 'interest' of the 'natural capital,' we are borrowing from poorer communities and from future generations."[1] Concern about sustainably managing our natural resources, including forests, has grown significantly in the past two decades. This concern is at both the national and international levels and the state and local levels.

The following are general areas of concern to the national and international community:

- How to conserve and sustainably manage forests to meet socioeconomic development needs in those developing and developed countries with extensive forest cover;

- How to meet the basic subsistence needs of expanding populations from a shrinking resource base, especially in many developing countries with limited forest cover;

- How to address the causes of forest degradation and deforestation and maintain the world's forests in a healthy state to meet the needs of present and future generations;

- How to protect the environmental role of forests in stabilizing global climate, in conserving biological diversity, and protecting critical watersheds, from national, transboundary, regional, and global perspectives;

- How to facilitate sustainable international trade in forest products and maximize benefits to producers while responding positively to "green consumerism."[2]

While sustainable forest resource concerns exist in most, if not all, state and local areas, the state of Minnesota provides a good illustration. During the 1980s, Minnesota experienced increases in timber harvesting. Responding to public concern about the long-term impacts associated with expanded timber harvesting, the state commissioned a generic environmental impact statement (GEIS) on timber harvesting and forest management. With a focus on cumulative impacts, the GEIS assessed the long-term affect timber harvesting has on a wide range of forest resource values and uses and identified mitigation measures.

Along with the concern arose debate over what is sustainable forest management. A recent *Journal of Forestry* devoted to forest sustainability states, "Defining sustainability and sustainable forestry is troublesome. Definitions abound but there is little consensus."[3] The article goes on to say that sustainable forestry is, arguably, a social construct. That is, the definitions will vary with the values of the beholder.

The National Roundtable on Sustainable Forests concluded, "that while there is no universally agreed upon definition of sustainable forest management, although the term is now widely used throughout the world. It is generally intended to imply a type of management that views the forest not as the source of any one economic product (e.g., timber, paper or mushrooms) or service (e.g., recreation of water supply), but as an integrated, ecological whole encompassing countless values, products, and services. More specifically, sustainable forest management is intended to respect the full range of environmental, social, and economic values of the forest, and to integrate the way those values are

[1] *Our Forests, Our Future, summary report of the World Commission on Sustainable Development, Winnipeg, Manitoba, Canada R3B 0Y4, 1999.*

[2] *World Commission on Forestry and Sustainable Development: Proposed Work Programme, August 1995, c/o Woods Hole Research Centre, Woods Hole, MA 02543.*

[3] *Floyd, D. W., Vonhof, S. L.,and Sayfang, H. E. (2001) Forest sustainability—a discussion guide for professional resource managers. Journal of Forestry 99, 8-16.*

managed to ensure that none are lost and that the forest remains healthy and vibrant into the future. Obviously, achieving this goal is a challenge, which is why there is still a lively debate about that sustainable forest management really is, how to measure it, and how to attain it."[4]

During the past decade there has been considerable interest and effort devoted to funding ways to monitor and measure or assess progress toward the complex goal of sustainable forest management.

Without an effective way to accurately monitor both forest conditions and the status of the values that people believe are part of sustainable forest management, it is difficult, if not impossible, to measure progress toward such a complex goal as sustainable forest management. Since our vision of forests and good forest management has now become broader, a set of assessment tools is required to match the vision. A comprehensive set of "Criteria and Indicators" provides just such a tool.

Criteria and indicators describe forest conditions, attributes, or functions; the benefits associated with environmental and socioeconomic goods and services that forests provide; and the overall policy framework, institutions, and processes that enable society's efforts to achieve sustainable forest management. They describe individual elements that need to be assessed in order to determine trends in forest conditions and management. The criteria and indicators are supported by a wide diversity of governmental and nongovernmental groups and are designed to be applied at the national level.

A number of international agreements and conferences have addressed sustainable forestry. Much of the work centered around establishing meaningful criteria and indicators of forest sustainability.

The Montreal Process Criteria and Indicators

At the 1992 Rio Earth Summit, world leaders recognized the importance of forests to sustainable development by adopting the Statement of Forest Principles and Agenda 21, the international sustainable development action plan. The governments of twelve nations on five continents, including the United States, joined to develop and eventually endorse the non-legally binding criteria and indicators for the conservation and sustainable management of temperate and boreal forests. The countries of Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America, and Uruguay, known as the Montreal Process member countries, developed and endorsed seven criteria and sixty-seven indicators to use in monitoring and assessing forest sustainability. The Montreal Process countries account for 90 percent of the worlds temperate and boreal forests, 60 percent of all forests on the globe, 35 percent of the world's population, and 45 percent of world trade in wood and wood products.[5]

Criteria 1 to 5 are biophysical and contain 28 indicators. They relate specifically to forest conditions, attributes or functions and to the environmental benefits associated with the forest. Criterion 6 relates to the socioeconomic values of the forest and contains 19 indicators. Criterion 7 is legal/institutional and contains 20 indicators. It relates to the overall policy framework of a country that can facilitate sustainable management of forests. A summarized version of the Montreal Process Criteria and Indicators is in appendix A.

Measurement challenges and data availability create problems in doing a comprehensive assessment of sustainable forest management using the criteria and indicators at the present time. The U.S. Roundtable on Sustainable Forests conducted a series of workshops on data availability and measurement challenges in 2000.[6] They classified the indicators according to data availability measurement challenge as follows: Value A = directly applicable at this time; Value B = directly applicable but of less than national coverage; Value C = probably applicable with improved algorithms and/or enhanced measurements; and Value D = not likely to be applicable. The table below summarizes the results.

	# of indicators	% of indicators
Value A	22	33
Value B	2	3
Value C	38	57
Value D	4	6
Total	66*	97*

- indicator 60 not applicable to classification.

[4] http://www.sustainableforests.net/what_we_do/q&a.htm

[5] *Forests for the Future, Montreal process Criteria and Indicators, December 1999.* http://www.mpci.org

[6] *Roundtable on Sustainable Forests, Criteria and Indicators Technical Workshop, Briefing Book, May 2-3, 2000, unpublished,* http://www.sustainableforets.net

The Minnesota Sustainable Forest Resources Act—A Case Example

Concern for sustainable forest management in Minnesota resulted in the call for and preparation of a generic environmental impact statement on timber harvesting and management and the passage of a Sustainable Forest Resources Act in 1995. While the terminology used and the specifics in the Minnesota situation are different from the Montreal Process Criteria and Indicators, the concepts, themes, and outcomes are quite similar. As such, it provides a good case example.

By the mid-1970s, Minnesota's forests had developed to a point where significant potential existed for forest industry expansion and development. With the increased fire protection provided beginning in the 1930s, the aspen and related cover types in particular had grown quite rapidly producing an attractive wood resource for the new manufacturing technology and increased consumer demand.

From 1975-1989, nearly $1.5 billion was invested in new, expanded, and modernized forest products manufacturing facilities. An additional $1.2 billion was expected to be invested between 1990 and 2000. Timber harvest increased from 2.0 million cords in 1975 to 3.38 million cords in 1989. With the new manufacturing capacity, harvest was expected to reach 4.7 million cords by the year 2000.

In July 1989, a citizen petition was brought before the Minnesota Environmental Quality Board (EQB). The petition cited a number of environmental and economic issues that could be directly impacted by the accelerated timber harvesting in Minnesota and requested the EQB to prepare a Generic Environmental Impact Statement (GEIS) to examine the cumulative effects resulting from timber harvesting and forest management activities.

The GEIS addressed nine technical areas identified in the scoping process: (1) maintaining productivity of the forest resource base, (2) forest wildlife, (3) water quality and fisheries, (4) economic and management issues, (5) recreation and aesthetic resources, (6) biodiversity, (7) forest health, (8) forest soils, and (9) unique historical and cultural resources. In addition, five background papers were prepared: (1) public forestry organizations and policies, (2) recycled fiber opportunities, (3) silvicultural systems, (4) harvesting systems, and (5) global atmospheric change.

The GEIS suggested four major strategic program responses: (1) a forest resource practices program which would address site level impacts, (2) a sustainable forest resources program which would address landscape level impacts, (3) a forest research program which would focus research efforts on key gaps identified in the study and during implementation, and (4) a Minnesota Board of Forest Resources to oversee the implementation of the three major policy initiatives.

With the completion of the GEIS came the likelihood of a number of legislative initiatives brought forward by various interest groups. The potential for the various legislative initiatives to be conflicting, creating chaos, was very high. Thus, the chair of the EQB and the commissioner of the Minnesota Department of Natural Resources appointed a 25-person roundtable to develop a strategy to implement the GEIS. The roundtable comprised the full spectrum of forest interests and stakeholders and included representatives from the interest groups which otherwise would be likely to develop legislative recommendations of their own.

The GEIS Implementation Strategy Roundtable submitted a consensus-based report, including recommendations for implementation, to the commissioner of the Minnesota Department of Natural Resources signed by 24 of the 25 roundtable members. The report and recommendations addressed the mitigation strategies with a particular focus on the four major program responses mentioned earlier.[7] The report and recommendations were developed into draft legislation for the 1995 legislative session.

With strong support from the diverse interests represented on the implementation strategy roundtable, the Minnesota Legislature passed the Sustainable Forest Resources Act of 1995,[8] with much discussion in various committees but very little debate. A potentially divisive issue had been turned into strongly supported legislation and a $1.7 million appropriation for implementation in a year when most state agency budgets were being cut. A win-win situation had been established by finding common ground through the process of collaboration.

The Provisions of the MNSFRA of 1995 are:

Policy - A broad statement indicating that it is the policy of the state to pursue sustainable management; balance economic, environmental, and social goals; encourage cooperation and collaboration; recognize

[7] *Report of the GEIS Implementation Strategy Roundtable submitted to the Commissioner, DNR, St. Paul, MN, November 16, 1994.*

[8] *1995 Minnesota Sustainable Forest Resources Act, Office of Statutes, State of Minnesota, St. Paul, MN 55155.*

the broad array of management, use, and protection perspectives; and establish mechanisms to incorporate these perspectives in the planning and management of the forest resources of the state.

Minnesota Forest Resources Council (FRC) - Established a 13-member FRC (amended to 17 members in 1999) appointed by the governor. The kinds of interests to be represented on the FRC are prescribed in law. The purpose of the FRC is to develop recommendations to the governor and to federal, state, county, and local governments with respect to forest resource policies and practices that result in the sustainable management, use, and protection of the forest resources of the state.

Minnesota Forest Resources Partnership (FRP) - Encourages forest landowners, forest managers, and loggers to establish a partnership in which the implementation of FRC recommendations can occur in a timely and coordinated manner across all ownerships.

Timber Harvesting and Management Guidelines - The FRC was charged with coordinating the development of comprehensive timber harvesting and forest management guidelines which address water, air, soil, biotic, recreational, and aesthetic resources found in forest ecosystems by focusing on those impacts commonly associated with applying site-level forestry practices. The guidelines were completed in December 1998. The timber harvesting and forest management guidelines are voluntary. The FRC was charged with establishing compliance goals. If information from monitoring indicates lack of compliance and adverse impacts, the FRC is to recommend additional measures to address those impacts.

Landscape-level Forest Resource Planning and Coordination - The FRC is directed to establish a framework what will enable long-range strategic planning and landscape coordination to occur to the extent possible across all forested regions of the state and across all ownerships. I will say more about this later in my paper.

Monitoring - The Minnesota Department of Natural Resources is charged to establish a program for monitoring (1) broad trends and conditions at statewide, landscape, and site levels; (2) silvicultural practices and application of the timber harvesting guidelines at statewide, landscape, and site levels; and (3) effectiveness of practices to mitigate impacts of timber harvesting and forest management on the state's forest resources. In addition, a process to accept and deal with comments from the public on negligent timber harvesting or forest management practices must be established. The benchmark monitoring for guideline application was completed in 2000. Details on monitoring are available in a paper, "Ensuring the Application of Sound Forest Practices on Private Forests: Challenges Facing the Design and Implementation of State Compliance Monitoring Programs," by Michael A. Kilgore, Executive Director, MFRC; Paul V. Ellefson, University of Minnesota; and Michael J. Phillips, MFRC, given at this conference.

Research Advisory Committee - The FRC appointed a forest resources research advisory committee including representatives of the major research institutions doing forest and related research within the state. The purpose of the advisory committee is to foster the identification and undertaking of priority forest resources research activity in a collaborative and cooperative fashion. It is also to conduct periodic assessments of status, needs, and priorities of forest resources research in the state.

Interagency Information Cooperative - The Minnesota Department of Natural Resources was charged with coordinating the establishment of an interagency information cooperative. Members of the cooperative are to include, at a minimum, the major forest management agencies and organizations within the state. The purpose of the cooperative is to coordinate the development of data standards and data, provide for sharing of the data by the public and private organizations, promote improvement in data reliability, expand the capacity and reliability of forest growth, succession, and other types of ecological models, and conduct a needs assessment for improving the quality and quantity of information systems. The information cooperative was established but currently lacks funding to function effectively.

Continuing Education and Certification - Timber harvesters and forest resource professionals are encouraged to establish voluntary certification and continuing education programs within their professions. In response, the Minnesota Logger Education Program and the Center for Continuing Education were established to deliver continuing education programs for loggers and natural resource managers, respectively.

In late 1997, the Minnesota Forest Resources Council (MFRC) developed the following common vision statement with significant involvement of stakeholders.

Common Vision for Minnesota's Forests

"Minnesota's forests are managed with primary consideration given to maintaining long-term ecosystem integrity and sustaining healthy economies and human communities. Forest resource policy and management decisions are based on credible science, community values, and broad-based citizen involvement. The public understands and appreciates

Minnesota's forest resources and is involved in and supports decisions regarding their use, management, and protection."

Major Goals for Achieving a Common Vision

Along with the vision, the MFRC identified eleven goals for achieving the vision.

1. **Minnesota's Forest Land Base is Enlarged and Protected.** No net loss of forestland occurs and some previously forested areas are returned to forest cover. The forestland base is protected from decreases and fragmentation caused by land-use changes.
2. **Forest Ecosystems are Healthy, Resilient, and Functioning.** Forests are composed of appropriate mixes of cover types and age classes required to maintain wildlife and biological diversity.
3. **Forests are Sustainably Managed.** Forests are managed to ensure economic, social, and ecological sustainability. Forest management activities enhance the diversity of the state's forests and support the long-term sustainability and growth of the many sectors that depend on them.
4. **Forest-based Economic and Recreational Opportunities are Large.** The role and contribution of forests to the state's economic and social well-being are acknowledged. Economic opportunities for Minnesota's forest-based industries, including tourism and wood-based businesses, are large, sustainable, and diverse.
5. **Forest Practices are Implemented in Effective and Efficient Ways.** Forest practices are implemented in ways that maximize their effectiveness while minimizing the costs of their administration. Guidelines suggesting appropriate practices are scientifically based, practical, easy to understand, their rationale clearly stated, and their application consistent where possible and appropriate.
6. **Forest Landscape-level Planning is Coordinated and Involves Collaboration.** Landscape-level planning is based on ecological landscapes and involves collaboration among landowners, users, stakeholders, and the public.
7. **Public and Private Rights and Responsibilities are Recognized.** Forest practices that achieve certain public benefits recognize and respect the inherent rights, responsibilities, interests, and financial limitations of public and private forest landowners.
8. **Forest Research Programs are Effective and Adaptive.** Effective and coordinated basic and applied research programs provide information. Forest practices and landscape planning/coordination activities are based on the best available information and technology and can be readily adapted to new information or changing resource conditions.
9. **Multi-resource Information Systems are Compatible and Comprehensive.** Landowners, managers, and stakeholders have access to information systems that are capable of providing comprehensive information about forest resources.
10. **Forest Policy Development is Effective and Supportable.** Policies and programs focused on forest resources are developed and supported by processes that collaboratively move forward to resolve issues and accommodate a wide-range of constituencies.
11. **Program Funding is Committed and Sustained.** Sustainable, adequate, and long-term funding is available to accomplish the vision and the goals for the state's forests.

Subsequent to developing its vision and identifying major goals, the MFRC identified several important forestry issues in need of attention. Of the twenty-two issues identified, the accuracy and availability of information on Minnesota's forest resources was identified a being the highest priority. Shortly thereafter, the MFRC created the Forest Resources Information Management Committee (IMC) and charged it with studying the availability and adequacy of the state's forest resources information. A two-phase review process was adopted.

Phase I Review Process[9]

The phase I review process entailed three major steps. First, questions by which progress toward achieving the goals can be measured were developed. These questions were called *baseline questions* in order to signify their importance.

Second, a review of several regional, national, and international Criteria and Indicator projects underway or recently completed was undertaken. A total of five Criteria and Indicator projects were reviewed. The review (1) provided the means to compare and contrast the goals with Criteria and Indicators developed by international, national, and regional forestry groups addressing sustainability, and (2) suggested additional information that might make the information review more comprehensive.

[9] *Review of the Availability and Accuracy of Information about Forests: Phase I Report, Minnesota Froest Resources Council, January 2000.*

Finally, indicators—quantitative or qualitative measures that provide information—were developed for each baseline question. Indicators reported are a select set of all possible indicators—those judged to be most effective at answering the question. Several questions, particularly those related to process-type goals, were such that quantifiable indicators were not readily discerned.

The baseline questions developed for each goal and the indicators for each baseline question are shown in appendix B.

Proposed Phase II Review Process

The second phase builds upon the first phase through the examination of the state's ability to provide the information necessary to answer the baseline questions and indicators. A sampling of questions addressed in the second phase includes:

Are programs in place to collect the information needed?

Where are the gaps between information needed and that which is available?

Is the information accurate?

Is the information collected at frequent enough intervals and at appropriate scales?

Is the information collected in a manner that allows the identification of trends?

Is the information comparable to historical data sources?

Is the information available to the policy makers, planners, managers, and citizens who may need the information?

The IMC initiated the second phase in February 2000. It will be completed in April 2001. A final report that synthesizes the findings from the Phase I and Phase II reviews will be presented to the MFRC in August 2001. It will identify priorities for further action and will recommend programmatic responses to be taken.

Application to Non-industrial Private Forests

The Minnesota Sustainable Forest Resources Act is framework legislation designed to enable stakeholders to join together and collaboratively work to implement provisions of the Act to achieve sustainable forest management. As such the Act is voluntary. However, there is a high level of involvement of landowners in its implementation. Intensive training is available for loggers and landowners on the application of sustainable forestry practices. Most of the state's loggers and many private forest landowners have participated in the training. Some were even involved in the development of the guidelines.

Our sincere belief is that we will take greater steps toward sustainable forest management sooner using this approach than if we went the regulatory route. Consequently, the compliance monitoring mentioned earlier becomes very critical in identifying performance training needs and any other steps that may be needed.

Conclusions

What We Have Learned

Implementation of the Minnesota Sustainable Forest Resources Act is progressing well. We have a comprehensive set of forest management guidelines, developed collaboratively, being implemented at the site level. Interest in training and implementation has been very positive. A statistically sound monitoring program is in place to monitor compliance. Research on guideline effectiveness is underway, albeit to a lesser level than needed due to funding constraints. The landscape level program is underway in four major landscapes. Stakeholders within the landscape, including major landowner groups, are working together to develop desired futures for the landscape and action plans to achieve the desired future.

The collaborative approach is messy and sometimes seems slow. However, it recognizes that foundational to sustainability is a system comprising three major components—the environment, the economy, and the community. Sustaining our forests requires a careful balance to assure a healthy environment, vibrant communities, and a viable economy. A healthy environment is necessary for productivity and survivability. A viable economy is essential to be able to afford programs that maintain a quality environment. Vibrant communities are needed to support policies, programs, and an infrastructure that maintain environmental quality and economic opportunity. If one part of the system is out of balance for long, the system will not be sustainable. Collaboration is an essential element of achieving this intricate balance and assuring a sustainable future.

While most stakeholders believe that development and implementation of sustainable management has progressed quite well, some interests believe greater progress should have been made sooner and have been pushing for a regulatory approach. Experience has shown that meaningful regulations are very difficult to get enacted, expensive to administer, and fall far short of comprehensive guidelines.

Based on the experiences of the Minnesota forestry community, we conclude with a few suggestions for organizations embarking on sustainable forestry initiatives:

Establish and maintain trust. Trust is tenuous, and misunderstandings occur frequently, often when least expected. Once a level of trust is established, it is important to maintain it (e.g., through consistent behavior, honesty, one-on-one communication).

Establish realistic expectations. Progress toward the goal of sustainable forestry is sometimes painstakingly slow, especially in situations where trust levels are low. It is important to be realistic about how much can be achieved at a given point in time. A high level of patience is critical.

Maintain open dialogue. Facilitating communication among important stakeholders, who are often in conflict, is essential. Bringing in a professional facilitator is often helpful.

Seek consensus. The influence of a broad-based consensus on legislative outcomes, and ultimately on implementation, is considerable. Reaching consensus is often laborious, painstaking work, but the results are usually worth the effort.

Strive for tangible products. The value of concrete outcomes is substantial. Tangible products provide group members with a sense of accomplishment, and enhance the external credibility of the initiative as well.

Use appropriate tools for the job. Recognize that technical information can be very helpful in resolving scientific debates, but that it has limited value in addressing political concerns or value differences. A roundtable is a far better means than a technical study for resolving the latter issues.

Appendix A

Montreal Criteria and Indicators (Shortland)

Criterion 1 Biological Diversity

1.1 Ecosystem Diversity

1.1.a(1) Area by forest type/total forest area
1.1.b(2) Area by forest type by age or succession
1.1.c(3) Protected area by forest type
1.1.d(4) Protected area by forest type by age or succession
1.1.e(5) Fragmentation

1.2 Species Diversity

1.2.a(6) Number of forest-dependent species
1.2.b(7) Species at risk

1.3 Genetic Diversity

1.3.a(8) Species with reduced range
1.3.b(9) Populations of representative species

Criterion 2 Productive Capacity of Forests

2.a(10)Area of forest land; area of timber land
2.b (11) Growing stock on timberland
2.c(12)Area and growing stock of plantations
2.d(13) Annual removal of wood products/sustainable volume
2.e (14) Annual removal of non-timber products/sustainable quantity

Criterion 3 Forest Health and Vitality

3.a (15) Area affected by insects, disease, exotics, fire, flood, etc.
3.b(16) Area affected by air pollutants
3.c(17)Area with diminished biological functioning

Criterion 4 Conservation of Soil and Water

4.a(18)Area with soil erosion
4.b(19) Area managed primarily to protect soil and water
4.c(20)Streams with altered flow and timing
4.d(21) Area with diminished soil organic matter or altered soil chemistry
4.e(22)Area with soil compaction
4.f(23) Water bodies with altered biological diversity
4.g(24) Water bodies with altered chemistry
4.h(25) Area of forest with accumulation of toxics

Criterion 5 Global Carbon Cycles

5.a(26)Total biomass and carbon pool
5.b(27) Forest absorption and release of carbon
5.c(28)Forest product contribution to carbon budget

Criterion 6 Socioeconomic Benefits

6.1 Production and Consumption

6.1.a(29) Value and volume of wood and wood products
6.1.b (30) Value and quantities of non-wood products
6.1.c(31) Supply and consumption of wood and wood products (per capita)
6.1.d(32) Value/GDP
6.1.e(33) Recycling
6.1.f (34) Supply and consumption of non-wood products

6.2 Recreation and Tourism

6.2.a (35) Area managed for recreation and tourism/total forestland
6.2.b(36) Facilities/population and area
6.2.c(37) Visitor days/population and area

6.3 Investment

6.3.a(38) Value of investment in forests
6.3.b(39) Expenditure on R&D and education
6.3.c(40) Extension and use of new technology
6.3.d(41) Rates of return on investment

6.4 Cultural, Social, Spiritual

6.4.a(42) Area managed to protect cultural, social, spiritual values
6.4.b (43) Non-consumptive use forest values

6.5 Employment and Community Needs

6.5.a(44) Employment in forest sector/total employment
6.5.b(45) Wage rates and injury rates
6.5.c(46) Viability and adaptability of forest-dependent communities
6.5.d(47) Area used for subsistence

Criterion 7 Legal, Institutional, and Economic Framework

7.1 Legal Framework

7.1.a(48) Property rights and land tenure
7.1.b(49) Planning, assessment, policy review
7.1.c(50) Public participation
7.1.d(51) Best practice codes
7.1.e(52) Conserving special values

7.2 Institutional Framework

7.2.a(53) Public involvement, education, awareness, and extension
7.2.b(54) Planning, assessment, policy review
7.2.c(55) Develop and maintain human resource skills
7.2.d(56) Develop and maintain physical infrastructure
7.2.e(57) Enforce laws, regulations, guidelines

7.3 Economic Framework

7.3.a(58) Investment, taxation, regulation
7.3.a(59) Nondiscriminatory trade policies

7.4 Capacity to Measure and Monitor

7.4.a(60) Data about the indicators
7.4.b(61) Inventories, assessments, monitoring
7.4.c(62) Compatibility with other countries

7.5 Capacity for R&D

7.5.a(63) Scientific understanding
7.5.b(64) Social costs and benefits and environmental accounting
7.5.c(65) New technologies and their consequences
7.5.d(66) Impacts of human interventions
7.5.e(67) Climate change

Appendix B: Baseline Questions

	FRC Goals	Baseline Questions	Indicators
Forest base	**Minnesota's Forest Land Base is Enlarged and Protected**	How much forestland is there?	Area of forestland, timberland, and total land area.
		How extensive are areas of continuous forest cover?	Extent, location, and spatial pattern of areas of continuous forest cover. Changes in ownership within areas of continuous forest cover.
		What laws, rules, administrative policies, land use plans, and local ordinances exist to protect the extent of existing forest?	Extent, location, and spatial pattern of forest land by landowner and administration category. Extent, location, and spatial pattern of forest land protected from conversion to non-forest uses by laws, rules, administrative policies, land use plans, and local ordinances.
		To what degree does land taxation influence the amount of forestland?	Listing of land taxes and the degree to which they impact the amount of forestland.
Ecosystem health	**Forest Ecosystems are Healthy, Resilient and Functioning**	What is the condition of the terrestrial habitat in forested areas?	Extent, location, and spatial pattern of natural plant communities. Extent, location, and spatial pattern of forest types, age classes, size classes, site index, basal area, and productivity classes. Status of state and federal endangered/threatened/special concern species. Listing of sensitive species that are monitored by agencies, institutions, and programs.
		What is the condition of the aquatic resources in forested areas?	Index of Biological Integrity. Status of state and federal endangered/threatened/special concern species. Listing of sensitive species that are monitored by agencies, institutions, and programs.
		How extensive are disturbances in forested areas?	The extent, location, and spatial pattern of disturbance by type and severity class.
		How are disturbed forests recovering?	Land use and cover class of disturbed areas. Composition and stocking of forest regeneration.
		How does tree growth compare to mortality and removals?	Growth, mortality, and removals by species.
		To what degree are forest land productivity levels in-line with potential productivity?	The extent of forest land with productivity levels below potential productivity.

	FRC Goals	Baseline Questions	Indicators
Economies and communities	**Forest-based Economic and Recreational Opportunities are Large**	What is the status and economic value of manufacturing of fiber and raw materials from Minnesota's forests?	Location, capacity, and products produced by facilities of Minnesota's wood-based industry. Economic value, number of employees, and wages paid in the primary manufacturing of Minnesota fiber and raw material. Economic value, number of employees, and wages paid in the secondary manufacturing of Minnesota fiber and raw material. Import and export levels of raw materials and products.
		What is the availability of recreational opportunities and their economic value?	Amount of forestland available for public use. Number and type of facilities available for recreation and tourism. Expenditures of individuals participating in forest recreation and tourism.
		What is the status and economic value of special products (non-timber) from Minnesota's forests?	List of special products produced. Gross sales of special products produced from Minnesota's forest resources.
Management	**Forest are Sustainably Managed**	Please see questions for (1) Forest Ecosystems are Healthy, Resilient, and Functioning, and (2) Forest-based Economic and Recreational Opportunities are Large.	
	Forest Practices are Implemented in Effective and Efficient Ways	Are guidelines (e.g., Best Management Practices, silviculture guides) that suggest appropriate practices to promote sustainability in place?	List of sources that provide guidance.
		To what extent are existing guidelines that promote sustainability implemented?	Forest area managed in accordance with guidelines. Number of loggers and forest managers who participate in guidelines education programs. Compliance monitoring results.
		How effective are existing guidelines that promote sustainability?	Effectiveness monitoring results.
		How efficient are guidelines that promote sustainability?	Compliance monitoring results.
		What costs are borne by loggers, managing agencies, and landowners for implementing guidelines?	Cost of guidelines for loggers, managing agencies, and landowner groups.
Management	**Forest Landscape-level Planning is Coordinated and Involves Collaboration**	What groups are dealing with forest resource issues that affect large areas and multiple landowners?	List of groups, their purpose, and geographic extent.
		To what extent are landowners coordinating forest planning and management activities?	Area of forest land where planning and management activities are influenced by landscape-level planning and coordination activities.

	FRC Goals	Baseline Questions	Indicators
		To what extent is strategic planning occurring?	Area of forest land that is part of strategic planning effort (assessment, issue identification, goals, and strategies).
	Public and Private Rights and Responsibilities are Recognized	Do existing laws, rules, administrative policies, local ordinances, land use plans, direction documents, and guidelines recognize public and private rights and responsibilities?	List of laws, rules, administrative policies, local ordinances, land use plans, and guidelines that affect private landowner's rights and responsibilities. List of laws, rules, administrative policies, local ordinances, land use plans, and direction documents that define public rights and responsibilities.
	Forest Policy Development is Effective and Supportable	Are processes in place to provide collaboration in forest policy development?	List of processes, their purpose and geographic extent.
Enabling conditions	**Forest Research Programs are Effective and Adaptive**	Are research programs responsive to the need of practitioners?	Researchers and practitioners perceptions as to the adequacy and applicability of research.
		Are mechanisms in place so researchers know what's needed?	Researchers and practitioners perceptions as to the transfer of information and needs between the communities.
	Multi-resource Information Systems are Compatible and Comprehensive	How comprehensive are the existing information resources in the state?	Periodic review of the availability and accuracy of information on forests in Minnesota.
		To what extent are information from multiple landowners compatible?	List of efforts and accomplishments to coordinate common data standards and information reporting.
	Program Funding is Committed and Sustained	What activities are missing or are performing	List of programs and their purpose.

Factors Affecting Mississippi's NIPF Landowners' Reforestation Decisions -

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Introduction

Non-industrial private forest (NIPF) landowners have played an increasingly important role in the nation's timber economy. Nearly 70% of the forestland in the South is owned by NIPF landowners (Powell et al., 1994). In Mississippi alone, these landowners control approximately 66% of the state's forestland base (Hartsell and London, 1995). Therefore, NIPF landowners are expected to provide a large portion of the state's supply of timber. However, whether they do so depends largely on how their timberlands are managed. Forest management decisions of NIPF landowners can impact future timber supply due to the magnitude of their collective ownership.

In the South, most forestry investment opportunities involve regenerating harvested timberlands with pine. Consequently, pine regeneration on private timberlands is an important factor affecting future timber supplies. While industrial owners have been active in regenerating their timberlands with pines, NIPF landowners have not always done so (Adams and Haynes, 1991). Softwood growth in most of the large softwood producing states in the South has been less than softwood removals (Powell et al., 1994). This is an indication that landowners have not always provided for pine regeneration after harvest. This shortfall in regeneration efforts is occurring despite the presence of a variety of government programs designed to assist NIPF landowners. A major concern, therefore, among the forestry community and policy makers is why some landowners regenerate after harvest while others don't. Identifying the specific reasons for regenerating and not regenerating is important in developing policies and programs that address the most important reforestation issues faced by NIPF landowners.

A number of studies have looked into the reforestation behavior of NIPF landowners (see Doolittle and Straka, 1987; Royer, 1987; Royer and Kaiser, 1983; Hyberg and Holthausen, 1989), but very few have examined the specific reasons why some landowners regenerate and others don't. This study explores the different reasons for landowners' reforestation decisions as well as the degree of importance of these reasons. Moreover, this study also looks into the different factors affecting landowners' reforestation decisions (e.g. socio-demographic characteristics) and identifies which types or groups of landowners are more likely to regenerate.

Methods and Procedures

A telephone survey of NIPF landowners in Mississippi was conducted from March 15 to May 30, 2000, to determine landowner characteristics and the reasons behind their reforestation decisions. Dilman's (1978) total design method for survey procedures was followed. The sampling frame consisted of all Mississippi landowners not living in "Delta counties" who owned at least 8 ha of uncultivated land, and who harvested timber between January 1, 1994 and December 31, 1998. The 8 ha threshold eliminates many non-forestry uses (e.g. home sites). Furthermore, NIPF landowners who own less than 8 ha account for only 8.5 percent of the state's uncultivated acreage (Doolittle, 1996).

From 62 counties with landowner records, a simple random sample of about 22 percent was drawn. Names and addresses were matched with telephone records to get telephone numbers. This resulted in about a 50 percent match or just fewer than 11,000 telephone numbers. From these telephone numbers, 7,392 respondents were contacted. Of the respondents contacted, 340 refused to be interviewed, 6,223 were screened but did not qualify for the interview, and 829 completed the interview (427 of these had reforested and 402 had not). This final sample size achieved the targeted five percent sampling error at the 95 percent confidence level. An interview schedule was constructed and used in collecting necessary information from the landowners during the telephone interview.

Survey results were summarized and analyzed using the Statistical Package for the Social Sciences (SPSS, Inc., 1999) and the Statistical Analysis System (SAS Institute, 1996). Specifically, relative frequencies were calculated to summarize the survey results. Moreover, chi-square tests were done to evaluate relationships between landowner characteristics and the decision to regenerate following harvest.

Results

Ownership Size

Size of ownership has long been considered an important factor in the forest management decisions of private landowners. Landowners in our study owned tracts of land ranging from 8 ha to more than 2,024 ha. Statistical analysis showed that ownership size was significantly related to landowners' reforestation decisions. Results indicate that landowners who own larger tracts of land were more likely to regenerate while those in the smaller ownership categories were more likely to be non-regenerators (Figure 1). Specifically, about 66.7% of the landowners who owned 8-20 ha did not regenerate nor did the 59.3% of the landowners who owned 21-40 ha. For larger ownerships, the majority of the landowners regenerated their timberlands with pine. For landowners who owned 41-100 ha, 101-202 ha, 203-404 ha, 405-2,023 ha and more than 2,024 ha, the percentage who regenerated was 57.6%, 66.0%, 68.6%, 76.7% and 80.8%, respectively. Thus, as ownership acreage increases, the percentage of regenerators also increases. **(See all figures at end of paper.)**

Demographic Characteristics

Information about landowners' demographic characteristics was also obtained to determine which of these characteristics are significantly related to landowners' reforestation decisions, as well as to identify landowner groups that are more likely to regenerate. The demographic characteristics examined in the study included: race, age, gender, and place of residence, education, occupation and income. Except for age, all of these variables have a statistically significant relationship with the decision to regenerate.

A slightly larger percentage (54.2%) of the whites were regenerators (Figure 2). On the other hand, a great majority (87.0%) of the blacks did not regenerate. Males were more likely to regenerate as compared to females (Figure 3). About 53.6% of the males were regenerators. In contrast, a larger percentage (55.2%) of the female gender were non-regenerators. Landowners who live in larger cities or towns were also more likely to regenerate than those who live in rural areas (Figure 4). For instance, most of the landowners who lived in farm/rural areas were non-regenerators (52.3%); while for those who lived in cities with population greater than 10,000, most were regenerators (64.6%).

Landowners who attained higher education were more likely to regenerate than landowners with lower educational attainment (Figure 5). Most of the landowners with only elementary/middle (66.7%) or high school (62.4%) education were non-regenerators. On the other hand, a larger percentage (60.4%) of the landowners with college or advanced degrees were regenerators. Most of the landowners who were professionals/businesspeople (57.1%), government workers (67.9%), self-employed (53.8%) and retired (52.4%) were regenerators (Figure 6). More affluent landowners were also more likely to regenerate (Figure 7). About 59.5% of the landowners who earned more than $50,000 annually regenerated their harvested timberlands with pine. In direct contrast, 56.2% of those who earned less than $50,000 did not regenerate.

Government Incentive and Educational Programs

Government incentive programs are important policy instruments used to encourage landowners to participate in forest management activities. Landowners in Mississippi were asked whether they were aware of the existence of different incentive programs designed to encourage reforestation. Landowners' awareness of the Conservation Reserve Program, Forestry Incentive Program and the Mississippi Forest Resource Development Program was significantly related to their reforestation decisions. In general, landowners who were aware of the programs were more likely to regenerate (Figures 8-9). About 59.6% of the landowners who were aware of the Conservation Reserve Program were regenerators, while for those who were not aware; a larger percentage did not regenerate (56.4%). Similarly, a larger percentage of the landowners who were aware of the Forestry Incentive Program were regenerators (68.1%), while for those who were not aware of the program, a larger proportion were non-regenerators (58.5%). The majority of the landowners who were aware of the Mississippi Forest Resource Development Program were also regenerators (71.4%). In contrast, most of the landowners who were not aware of the program were non-regenerators (Figure 10).

Landowners were also asked whether they had attended any educational programs designed specifically for NIPF landowners. Attendance in educational programs had a statistically significant relationship with landowners' reforestation decisions. The majority (76.1%) of the landowners who had attended these educational programs were regenerators; whereas for those who had not attended any of these educational programs, the majority (56.4%) were non-regenerators (Figure 11).

Reasons for Landowners' Reforestation Decisions

Landowners who regenerated were presented with a list of possible reasons for regenerating and were asked to rank these reasons by level of importance

(Table 1). In general, regenerators considered most of the different reasons presented to them as highly important for their regeneration decision. This includes both ecological and economic benefits of timber production. For instance, the three reasons that ranked the highest in terms of level of importance were: (1) the desire to keep the land in timber production; (2) the desire to be good stewards of the natural environment; and (3) an economic decision in anticipation of future profits from forest production. On the other hand, the availability of cost-sharing funds from public agencies did not have a large bearing on the decision of landowners to regenerate. Most of the regenerators considered the availability of cost shares to be of low importance or no importance relative to the other reasons.

Non-regenerators were also presented with a list of possible reasons for not regenerating and were also asked about the importance of each reason (Table 2). The majority of the non-regenerators considered each reason presented to them to be of low importance or no importance. Only a small percentage of the landowners considered these reasons to be of high or moderate importance in their decision not to regenerate. However, the belief that the land would reforest itself to pine naturally, the high cost of reforestation, and the lack of information on reforestation options were considered to be more important relative to the other reasons. On the other hand, the preference for growing hardwood on the tract and the belief that reforestation investment is too risky ranked the least in terms of level of importance.

Implications/Conclusions

Reforestation activities of NIPF landowners in the South continue to be a major concern of the forestry community and policy makers, especially with evidence of declining softwood inventories. It is particularly worrisome whether the South can continue to provide for softwood harvests to meet future softwood demands. Studying landowner characteristics and behavior is important in understanding which factors are most useful in predicting forest management activity or the lack thereof. This research study examined landowner characteristics and how they were related to landowner reforestation decisions. It provided information about the types or groups of landowners that are more likely to conduct reforestation activities.

Results indicate that demographic characteristics of landowners can be useful in predicting their management activities. Landowners who are more likely to regenerate are those who have larger ownerships, higher income levels and higher educational attainment. These landowners also tend to live in larger cities. Moreover, white males landowners are also more likely to regenerate. Policy instruments should focus on landowners who do not belong in these demographic categories, since they are the ones who are more likely to be inactive in pine regeneration.

There is also evidence that landowners who are aware of existing government incentive programs are more likely to participate in pine regeneration. Moreover, landowners who participate in educational programs are also more likely to be active in planting harvested timberlands. These findings highlight the role of incentive and educational programs in encouraging landowners to be active in forest management. Therefore, landowners should be made aware of the existence of incentive/assistance programs available. They should also be encouraged to attend educational programs so that they will be well informed about the different reforestation options available to them. Landowners in Mississippi consider both economic and ecological considerations highly important in their decision to regenerate pine following harvest. The desire to keep the land in timber production, the desire to be good stewards of the natural environment, and an economic decision in anticipation of future profits from forest production were considered to be the three most important reasons for regenerating. Although the majority of the landowners considered all of the reasons for not regenerating to be of low or no importance, the belief that the land would reforest itself to pine naturally, the high cost of reforestation, and the lack of information on reforestation options ranked the highest in importance. These findings are similar to the findings of previous studies (see Royer and Kaiser, 1983 and Palmer et al., 1985) on NIPF landowners in the South. This implies that landowners still face the same problems they did more than a decade ago. While efforts have been made to address these problems, our findings indicate that there is a need to re-evaluate existing policies to determine if new, expanded, or re-directed programs are needed to encourage landowners to regenerate following harvest.

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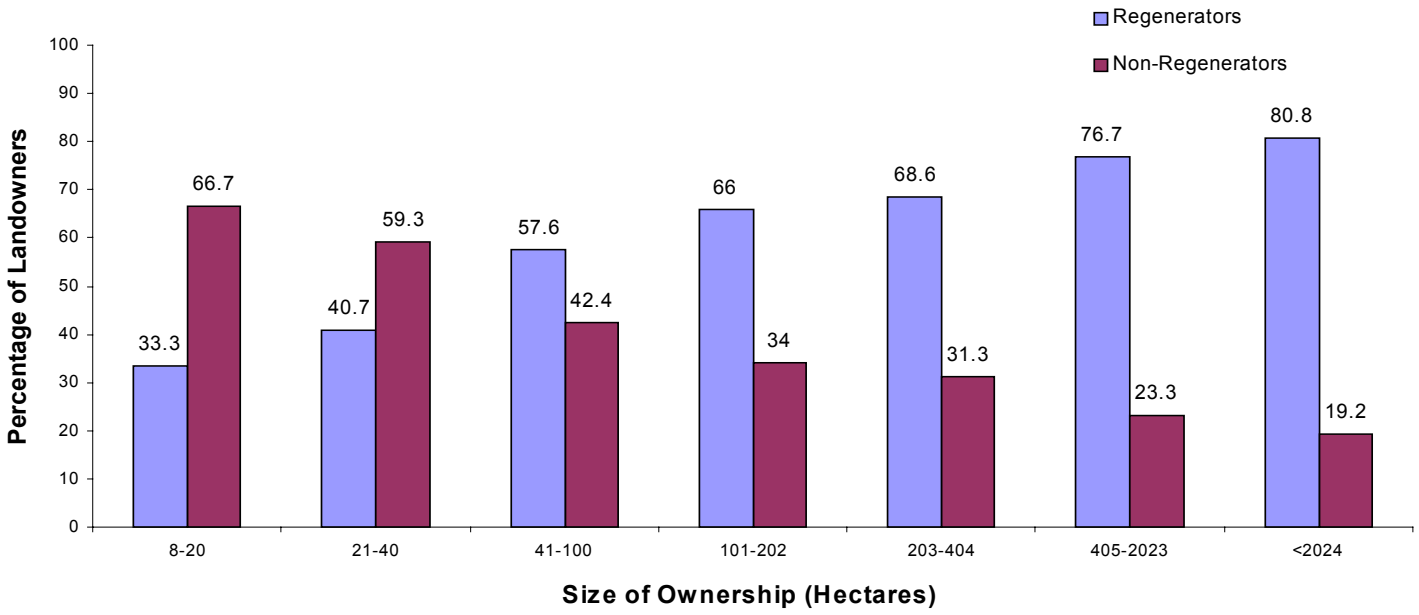

Figure 1. Distribution by ownership size of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

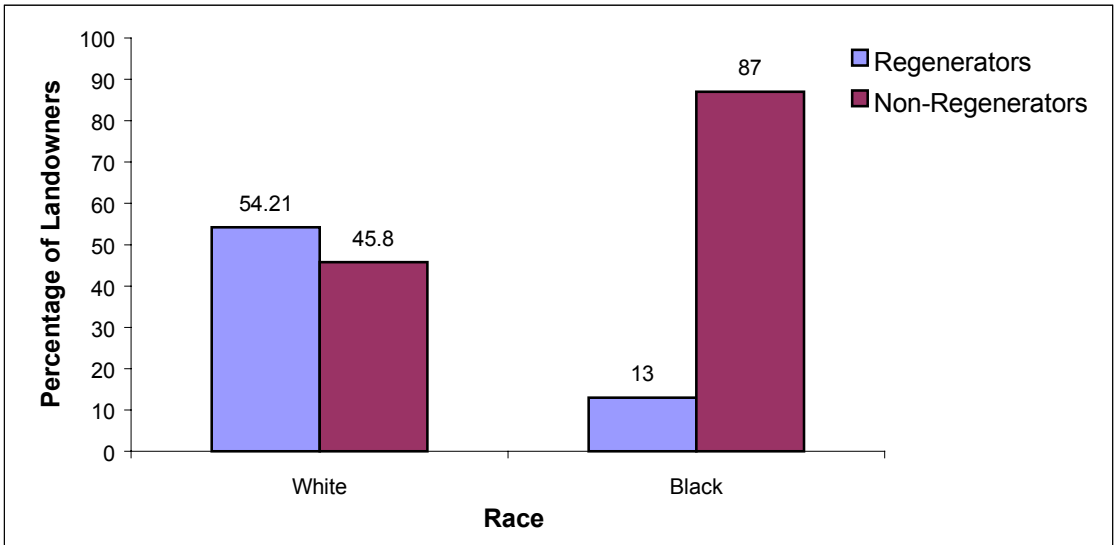

Figure 2. Distribution by race of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

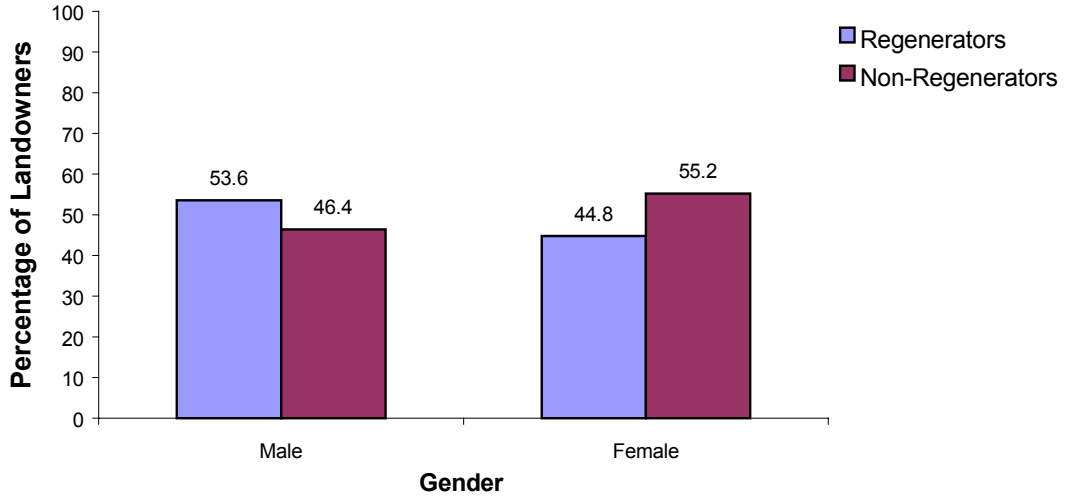

Figure 3. Distribution by gender of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

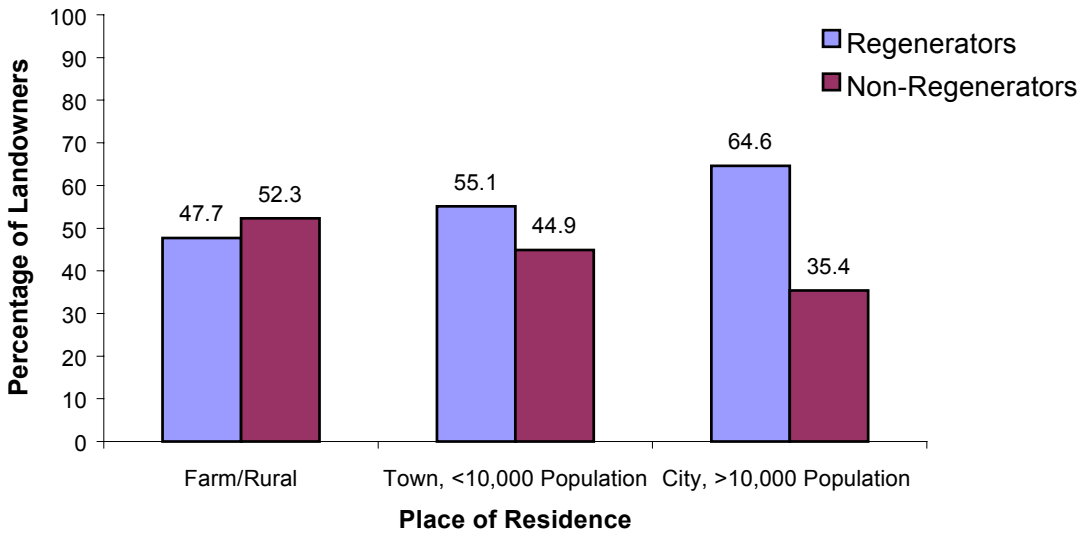

Figure 4.Distribution by place of residence of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

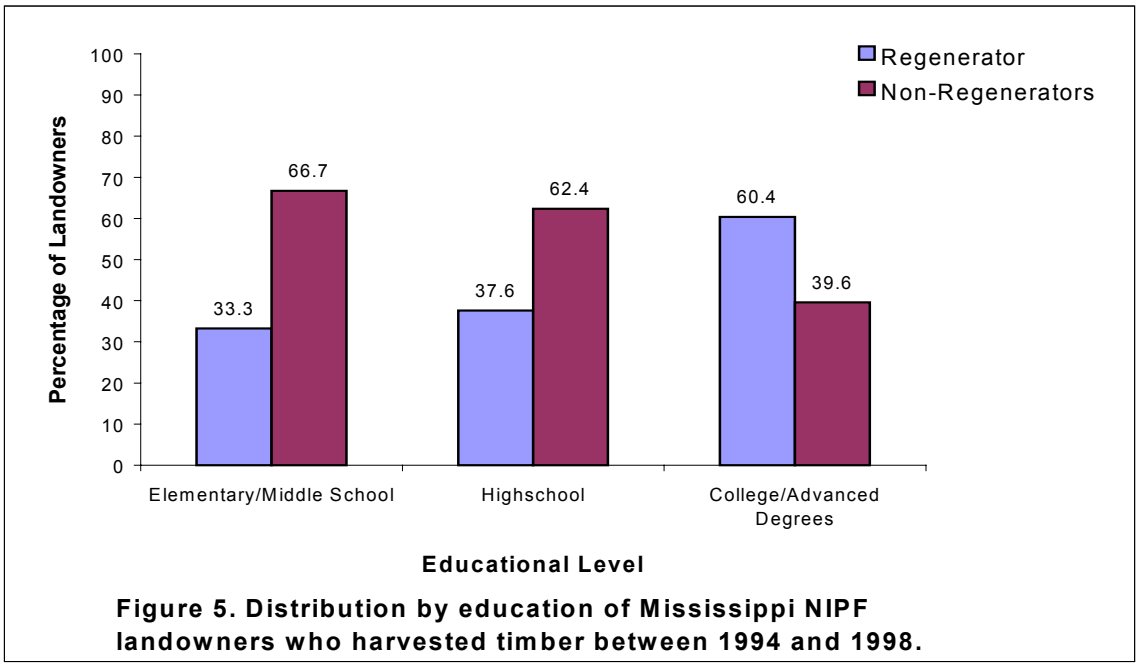

Figure 5. Distribution by education of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

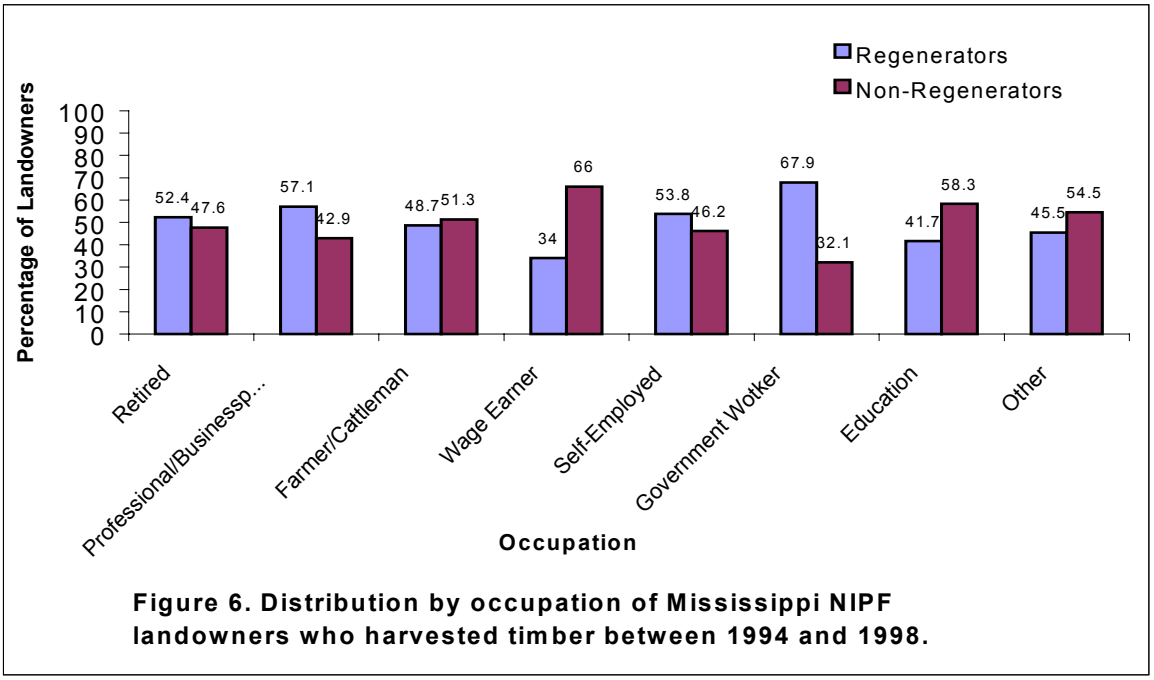

Figure 6. Distribution by occupation of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

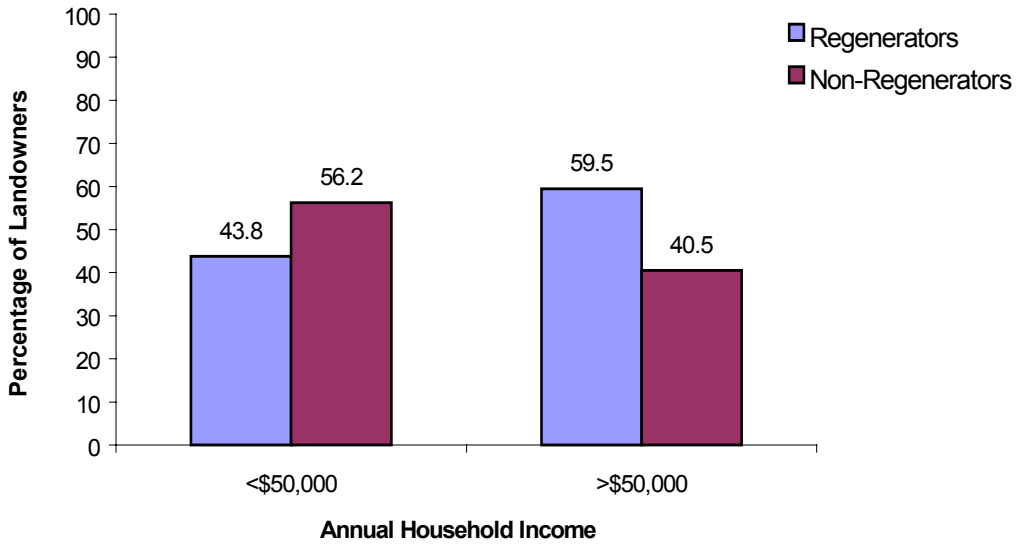

Figure 7. Distribution by income of Mississippi NIPF landowners who harvested timber between 1994 and 1998.

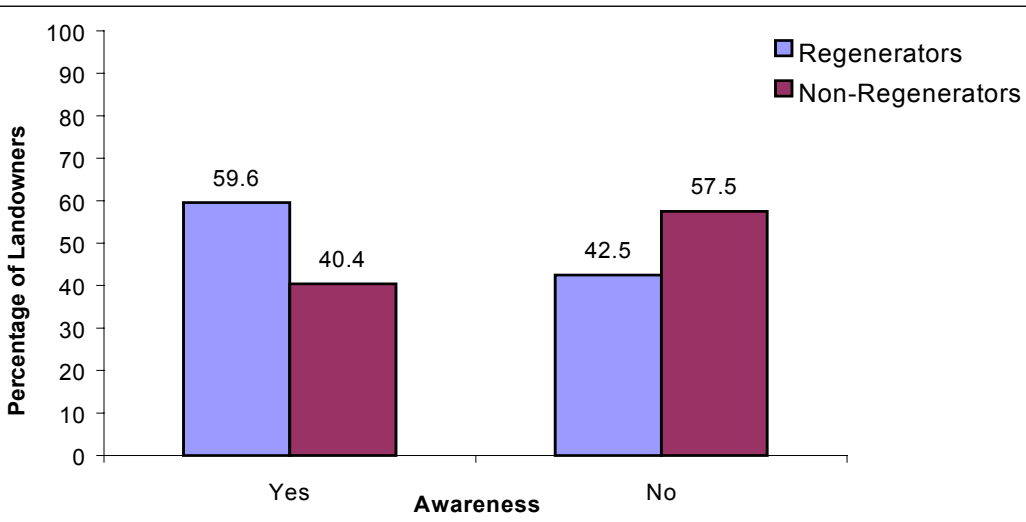

Figure 8. Awareness of the Conservation Reserve Program by Mississippi NIPF landowners who harvested timber between 1994 and 1998.

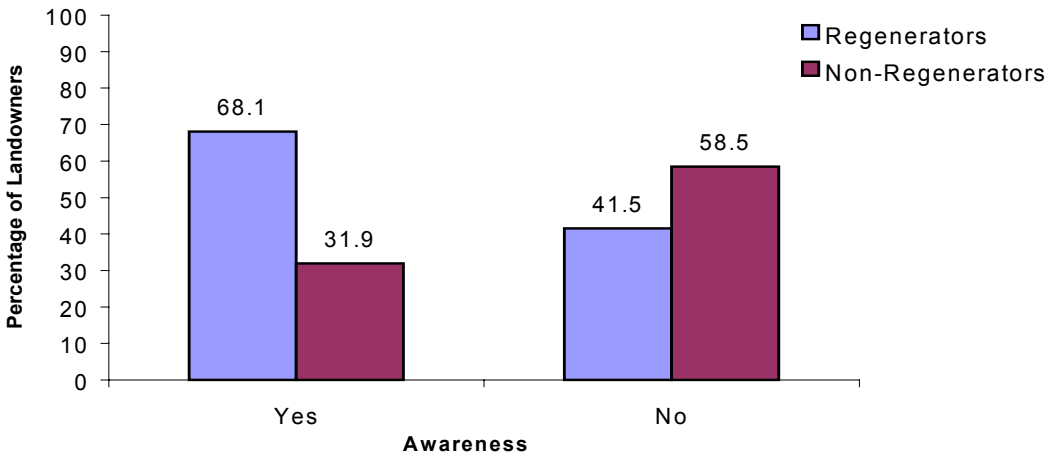

Figure 9. Awareness of the Forestry Incentive Program by Mississippi NIPF landowners who harvested timber between 1994 and 1998.

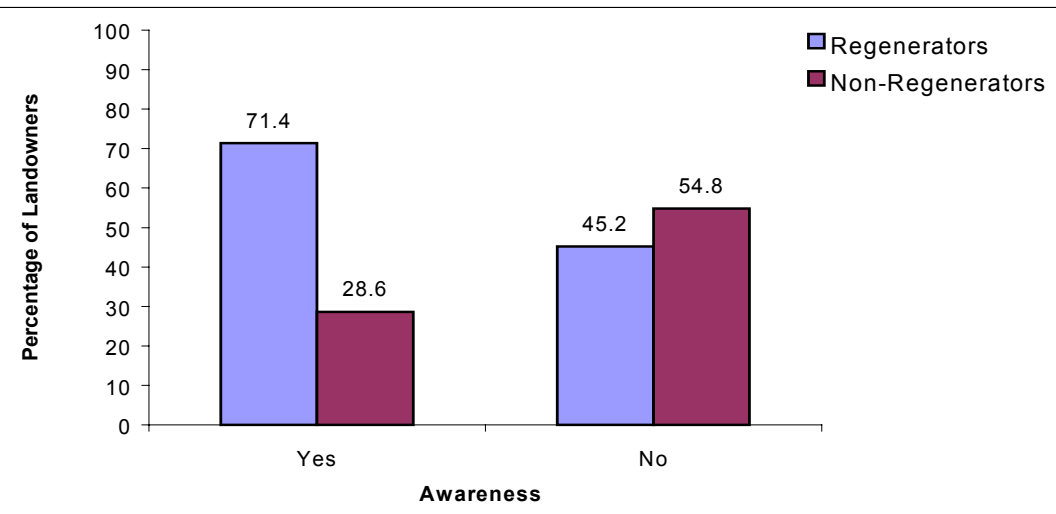

Figure 10. Awareness of the Mississippi Forest Resource Development Program by Mississippi NIPF landowners who harvested timber between 1994 and 1998.

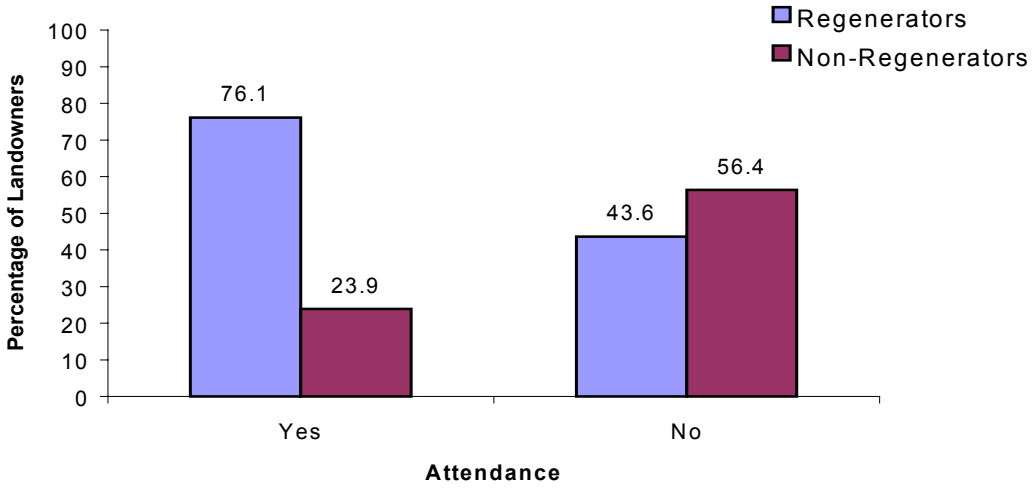

Figure 11. Attendance of educational programs by Mississippi NIPF landowners who harvested timber between 1994 and 1998.

Table 1. Reasons for regenerating and their importance to regenerators.

Reasons for Regenerating	**Importance**				
	High (%)	Moderate (%)	Low (%)	No Importance (%)	Not Sure/ Don't Know (%)
Had revenues from timber sale to finance reforestation	49.2	15.5	10.1	23.4	1.9
Availability of cost-sharing from public agencies	27.9	15.9	9.8	45.4	0.9
Economic decision in anticipation of future profits from forest production	72.8	11.2	6.3	8.4	1.2
Advice of professional forester	54.8	15.0	5.6	23.9	0.7
Availability of tax credits and tax deductions	33.5	17.1	12.4	32.8	4.2
Felt he land should be kept in timber production	90.2	5.9	1.9	2.1	0.0
Conserve the natural environment and provide for future generations	90.2	6.1	0.2	3.0	0.1

Table 2. Reasons for not regenerating and their importance to non-regenerators.

Reasons for not Regenerating	Importance				
	High (%)	Moderate (%)	Low (%)	No Importance (%)	Not Sure/ Don't Know (%)
1. Couldn't get the government cost-sharing	22.1	6.0	3.2	66.7	2.0
2. Couldn't borrow money to reforest at a reasonable interest rate	10.7	5.0	4.5	78.6	1.2
3. Land is not suitable for pine	16.4	4.5	4.0	73.9	0.2
4. It take too long to get the money back from a reforestation investment	13.7	9.7	4.7	67.9	4.0
5. Rate of return on reforestation investment is too low	12.4	7.7	5.0	70.1	4.7
6. Have not yet decided the future use of the land	21.9	10.0	2.5	62.7	3.0
7. Investment in reforestation is too risky	8.2	6.0	6.0	78.1	1.7
8. Had other uses for sale revenues	20.6	5.2	2.7	68.4	3.0
9. Reforestation costs too much	27.4	6.5	3.7	58.5	4.0
10. Too much red-tape in obtaining technical or cost-sharing assistance	22.1	5.5	2.7	63.7	6.0
11. Felt the site would reforest itself to pine naturally	31.8	14.9	9.7	41.0	2.5
12. Logging left site in such poor condition that it made reforestation with pine difficult	14.7	9.2	7.0	66.9	2.2
13. Wanted to grow hardwood on the tract	5.7	4.7	3.5	83.6	2.5
14. Adequate stocking of pine after harvest	14.4	8.0	8.2	64.2	5.2
15. Didn't have information on reforestation options	24.6	6.5	8.0	58.7	2.2

U.S. Implementation of the Montreal Process Criteria and Indicators- Implications for Non-Federal Forest Lands -

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Introduction

Criteria and Indicators

"Sustainable Development" emerged as a concept in the mid-1980s after years of dialogue about how to address vital global issues, and was defined in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (see sidebar). During the ensuing decade-and-a-half, the idea of sustainable forest management evolved as the widely accepted manifestation of sustainable development applied to the forest resource. Sustainable forest management has at its heart three elements: ecological health and resilience, economic vitality, and social value and equity. Each must be tended, so all can be considered. If one element fails, then sustainability fails in the long run.

Sidebar - Milestones in History of Sustainable Development and Sustainable Forest Management Dialogue

1968. International Conference for Rational Use and Conservation of the Biosphere
1972. Stockholm Conference (leads to United Nations Environment Program)
1983. Prime Minister of Norway (Gro Harlem Brundtland) asked to lead special commission of United Nations (referred to as Brundtland Commission)
1984. International Conference on Environment and Economics
1987. Our Common Future published by Brundtland Commission
1992. United Nations Conference on Environment and Development (held in Rio de Janeiro; also known as the Earth Summit)
1993. International Seminar of Experts on Sustainable Development of Boreal and Temperate Forests (held in Montreal; initiates Montreal Process)
1995. Santiago Declaration endorsed by Montreal Process countries
1997. First Approximation Reports published by Montreal Process countries
1999. Roundtable on Sustainable Forests is self-chartered in the United States
2000. Federal Memorandum of Understanding on Sustainable Forest Management Data in the United States is initially signed

(SOURCE: Consultation with Robert Hendricks, USDA-Forest Service International Programs).

Managing for each of these elements is a formidable challenge in its own right. How do we turn these concepts, collectively, into a management model that enables decisions and actions that move the management and use of forest resources in the direction of increasing sustainability? For temperate and boreal forests, the development of the Montreal Process Criteria and Indicators (C&I) for the Conservation and Sustainable Management of Temperate and Boreal Forests (Table 1) gives us a working hypothesis to address that question.
The C&I are neither fully tested technically nor perfect conceptually. They do, however, provide a practical (the key word is practical) framework and a common language with which to examine our understanding and measure the current state of the three elements of sustainable forest management. The practical application and testing of any new concept requires a place to start, and the C&I have emerged as a widely accepted starting point.

Table 1 - Montreal Process Criteria

Criterion 1 - Conservation of Biological Diversity (9 indicators)
Criterion 2 - Maintenance of Productive Capacity of Forest Ecosystems (5 indicators)
Criterion 3 - Maintenance of Forest Ecosystem Health and Vitality (3 indicators)
Criterion 4 - Conservation and Maintenance of Soil and Water Resources (8 indicators)
Criterion 5 - Maintenance of Forest Contribution to Global Carbon Cycles (3 indicators)
Criterion 6 - Maintenance and Enhancement of long-term Multiple Socio-Economic

Benefits to Meet the Needs of Societies

1. Production and consumption (6 indicators)
2. Recreation and tourism (3 indicators)
3. Investment in the forest sector (4 indicators)
4. Cultural, social, and spiritual needs and values (2 indicators)
5. Employment and community needs (4 indicators)

Criterion 7 Legal, Institutional, and Economic Framework for Forest Conservation and Sustainable Management

1. Legal framework (5 indicators)
2. Institutional framework (5 indicators)
3. Economic framework (2 indicators)
4. Capacity to measure and monitor changes (3 indicators)
5. Capacity to conduct and apply research and development (5 indicators)

The United States (U.S.) and 11 other nations, through the Santiago Declaration, have endorsed this starting point (Heiner, 1995). In 1999 a multi-stakeholder Roundtable on Sustainable Forests (see: http://www.sustainableforests.net) formed in the U.S. as a self-directed group of Federal and non-Federal organizations and individuals to better understand and use the C&I to enhance sustainable forest management in the U.S. A year later Federal agencies signed a Memorandum of Understanding, committing them to use the C&I framework to develop a national report in 2003 on the state of the nation's forests and progress towards sustainable forest management in the U.S. And now a new Sustainable Forest Data Working Group has been chartered under the auspices of the Federal Geographic Data Committee (see: http://www.fgdc.gov) in the U.S. to secure data for the 2003 national report and to improve the prospects for future quality data to report on forest conditions and other matters affecting the state of the nation's forests using the C&I. The commitment to testing the working hypothesis is growing deeper and wider.

A Framework for Sustainability

The Montreal Process C&I are in part a practical characterization of what sustainability means as applied to forests and in part a framework for a monitoring and evaluation system. The characterization will be tested through use, and monitoring the state of the various indicators is a key part of using and refining the C&I concept. Any monitoring system forms amid a dilemma. At the beginning, insufficient knowledge is available to perfectly define what needs to be measured (the indicators or elements thereof). Will the money committed to monitoring some things be spent on the right things? On the other hand, the only way to improve the knowledge to perfect the monitoring design is to begin to make measurements and to refine those measurements over time. Theory can only carry so far. Over time, it is the monitoring itself that tests and improves the concept. We are in the early stages of this process for the C&I. Over time a more robust system will evolve.

Having twelve nations using the same framework provides a very powerful test of the sustainable forest management idea. As the C&I become more broadly used and applied, we will learn where corrections are needed and where the strengths of the system are. We suggest that having a common framework to guide monitoring, discussion, and understanding is especially important in the U.S. where we do not have a unifying, established national policy on forests and forestry. Our forestland ownership in the U.S. is, and will continue to be, diverse and diffuse. A common framework and language can be the basis for turning this diversity into strength by enabling discussion of some important questions. Do we have a common understanding when we speak of sustainability? Are we on a trajectory of improving sustainability? In which elements, criteria, or indicators are we doing better or worse? Where can we concentrate energy to make the most needed changes? How do the different components of the landscape (ecosystems and ownerships) interact to produce the overall picture of sustainable forest management in the U.S.? These are all difficult questions. Without a common framework to guide our understanding, we submit that these become imponderable questions.

The basic theory behind using the C&I system is that better data will lead to better information, which in turn will lead to better decisions that result in the desired outcome of increasing sustainability. The starting point for achieving this desired goal is collecting a core set of the right data and understanding what the data tell us. Two key notions from this section bear repeating. First, the Montreal Process C&I provide a working hypothesis to help define the set of right data. Second, in the U.S., where there is no centrally established national policy on forests and forestry and where forestland ownership and management objectives are richly diverse and dynamic, the C&I provide a common

framework and language that is essential to a dialogue on sustainability.

The USDA-Forest Service reported in its 2000 RPA Assessment of Forest and Range Lands, that as of 1997, 63.3 percent of the forest land in the U.S. is privately owned, with 14.4 percent classed as forest industry and the remaining 54.2 percent as non-industrial. The balance is categorized as Federal (27.4 percent) and as other public (9.3 percent) including State and local units of government. Forestlands in the various ownership categories are not distributed evenly across the U.S. - 67 percent of the privately owned forestlands are located in the East and 84 percent of the publicly owned forest lands are in the West.

Varying Viewpoints on Sustainability

The C&I, as a common language and framework, help us grasp the basic idea of sustainable forest management and put it into practice by shaping our vision and policies as well as informing our planning and resource management activities. The implications for non-Federal forest landowners and managers are significant as they are for other citizens who make decisions every day that affect land use and development. In the U.S., non-Federal forest landowners include nearly 10 million non-industrial private individuals, families, and other owners plus Native Americans, forest corporations, other corporations, and state and local units of government.

In a presentation to the Association of Oregon Loggers earlier this year, Hal Salwasser, Dean of the College of Forestry at Oregon State University, stated that forests are part of an "ever shifting mosaic" of urban forests, multi-use forests, production forests, agro-forests, and reserve forests. Landowner objectives vary greatly, and they change with information and over time, as do society's expectations.

Sampson and DeCoster reported in 1997 that private landowner opinion and attitude surveys lead to two general conclusions: those who own forest land see it as an integral part of their lifestyle that contributes significantly to the quality of their lives; and managing for timber production is not the highest priority for the majority of non-industrial private landowners. However, in Pennsylvania, a state dominated (75 percent) by private ownership, most of the nearly 513,000 private forest owners will harvest their timber at some time during their ownership tenure. In a study reported in 1993, 55 percent of Pennsylvania private forest owners (accounting for 71 percent of private forest land) have harvested timber and 37 percent of owners (52 percent of acreage) intend to harvest timber (Birch and Stelter, 1993). As this may be true in other regions as well, such trends have important implications for sustainability.

In the February 2001 issue of the Journal of Forestry, members of the Society of American Foresters (SAF) have begun to more deeply and completely explore the concept of sustainability. Kent Connaughton of the USDA-Forest Service says that SAF's Committee on Forest Policy has concluded that sustainability can be viewed as:
A moral principle to guide individual behavior and societal policies

- An objective for taking action (e.g., the sustainable forest).
- A means to achieve the objective (e.g., sustainable forestry and indicators of sustainable forestry).

These views of sustainability can help us think more broadly about the implications of applying the C&I to non-Federal forestlands.

As a Moral Principle

Individual and societal values result in choices being made by individuals and society about rights and responsibilities as well as desired goals and investments. The C&I can help shape society's will and the long-term vision of individual landowners, neighbors, and communities. They can help us:

- Converge our shared interests in creating opportunities for people today while preserving choices for future generations.
- Improve the science about our environmental, economic, and social concerns, and develop more comprehensive understanding of sustainability for decision-making.
- Build partnerships among non-Federal and Federal forest landowners responsible for managing resources plus other citizens who affect and are affected by decisions.
- Organize and work with landowners and other stakeholders at the appropriate geographic scale to address landowner and societal concerns in integrated and coordinated ways.

As an Objective

The purpose for owning and managing forestland varies greatly among private landowners, as do society's goals for public as well as private lands. Regional differences also exist. The C&I give us:

- A framework to integrate data and develop information tools for landowner and community decision-making.
- A more holistic understanding about the potential benefits from different lands.
- A way to increase landowner and public awareness about current situations.
- A more comprehensive and systematic way for landowners, neighbors, and communities to organize thinking about natural resource management and related development options, and discuss possible solutions.
- An opportunity to engage the public and generate public support for a wider range of investment tools.

As a Means

There are many avenues or vehicles to help landowners make informed decisions and achieve desired objectives and benefits. The C&I can help enhance stewardship activities through:

- More complete assistance to non-Federal forest landowners via updated incentives and assistance programs that help individuals make desired investments.
- Establishing an evaluative framework for state forest practices.
- Improved coordination among government (e.g., Federal and State agencies, etc.) and non-government (e.g., watershed councils, consultants, etc.) assistance providers.
- Increased private capacity to address landowner objectives (e.g., sustainable forestry cooperatives)
- More coordinated natural resource and land use planning and decision-making processes at state and regional levels (e.g., State resource and development planning, local/regional green infrastructure planning, etc.).
- Better trained landowners, practitioners, and consultants via education and other processes (e.g., licensing, certifying, and registering).
- Standards setting, certification, and verification of forest management practices.

These three approaches are presented as a means of framing various perspectives on sustainability. They are not intended to be definitive or exclusive.

Analyzing Linkages Among Indicators

Before combining indicators or perhaps while seeking logical combinations, we need to assess whether we have picked indicators that are actually measurable, meaningful, and affordable. Once indicators clear this screen, it is important to understand how, when linked together, these indicators reveal something about sustainability.

Regardless of whether one considers the right approach to sustainability to be a moral principle, objective, or means, the practical challenge of how to move indicators from "data" to "useful tool" remains. The real value of the C&I rests in the potential for various indicators to be integrated to reveal causal relationships driving changes in forest conditions. The aforementioned Roundtable on Sustainable Forests has grappled with crosscutting issues in several technical workshops with experts on various indicators. Currently, efforts are focusing on collecting data within certain indicators, for example, Indicator #1-extent of area by forest type relative to total forest area; or, Indicator #33-degree of recycling of forest products. The future utilization of the C&I may lie in identifying ways to analyze whether indicators like #1 and #33 are related. Hypothetically, if a link can be established between two or more indicators, especially in a causal fashion, new truths will be revealed. For example, if it could be shown that increased recycling links directly to maintenance of a given forest type over time in the landscape, then the value of the C&I as a tool is truly revealed because policy and planning can respond to this revelation.

Several seemingly intractable challenges face forest managers in the new millennium. Among these are forest fragmentation, invasive and exotic species, heavy fuel accumulations and high fire risk, and the lack or insufficiency of models that capture the economic value of ecological services flowing from forests. Application of the C&I, in their framework context, may be useful in addressing these challenges. This requires, however, recognition that economic forces and social decisions that lie outside the traditional purview of forest managers (e.g. investment, land use decisions, pollution control, etc.) often drive forest conditions.

The Fragmentation Example

Indicator #5 speaks to issues surrounding the fragmentation of forest types. For many, this term applies not only to fragmentation within a contiguous forest block, but also to how forestlands are being

lost or converted to other uses. This contemporary use of the term "fragmentation" has become a buzzword for many concerned about the myriad impacts of forestland loss. A conference held in Annapolis, Maryland, in September 2000 highlighted the issue, and raised awareness of its magnitude. However, a quantitative analysis of forest fragmentation, while doable, reveals only the symptoms of the problem, i.e. rate of loss, loss of specific forest types, etc. A genuine understanding of trends flows from multi-sector analysis that casts forest loss in the context of macro-economic changes, land use trends, transportation policy, micro-economic variables, and other factors that show forest land values side-by-side with land values based on developed uses. Additionally, true understanding of the issue requires overlaying economic factors with policies such as zoning at local and state levels and more integrated planning at local and regional levels.

It is this kind of complex analysis that lends credence to the structure of the C&I, as one can identify indicators that can be brought to bear on the question. For example, if one looks at Indicator #38, which seeks to quantify forest investments, and considers this and other indicators alongside Indicator #5, one can begin to reveal real world links between investment and forest retention. The issue, as in many cross-indicator scenarios is one of scale and interpretation. This kind of analysis is difficult at the national level, and must be done with careful acknowledgement of the full array of variables. Forestland may be converted as a consequence of a lack of investment; hence an insidious trend is not revealed through a narrow interpretation of the investment indicator. Additionally, data on investment, calculated at a national scale, will not link easily to land use changes occurring at a localized scale, or tie easily to local land use codes. Another valuable indicator might be found in #41, which tabulates rates of return on investment. Again, the issue is one of scale, and breadth of interpretation. Once rates of return are calculated, how does one judge whether they are good or bad? In evaluating their impact on fragmentation, one would need to compare rates of return on neighboring land uses -data not automatically included in the indicator.

Advancing Indicator Interpretation

What this example reveals is that three areas of new work are emerging.

1. Scientists and practitioners must collaborate on developing cross-indicator models addressing specific issue areas.

Issues like fragmentation, or loss of soil productivity, require consideration of more than one indicator to fully understand. Yet, today's models remain focused on one indicator at a time.

2. C&I must be placed in a broader context than traditional "forest issues."

Criteria 6 and 7, for example, must be interpreted as the venue for consideration of factors that some may not initially suggest as relevant to forests, like transportation policy, community development and revitalization, innovations in forest products marketing, overseas investments in infrastructure (milling, etc.), and other policies and trends that impact forests at home.

3. C&I must be useful at local, applied levels to achieve broad-based acceptance.

This requires careful attention to data at sub-national levels. While the initial focus is national level reporting, work should be done to make the C&I useful at the forest management unit and other sub-national levels.

Gaps and Issues Related to C&I

It is important to recognize the potential and current advances in building and strengthening institutions engaged in the stewardship of forest resources in the U.S. Recent efforts of the Roundtable on Sustainable Forests and the past decade of collaboration within the forestry community and other arenas have challenged us to confirm the various roles and responsibilities of all stakeholders to achieve sustainable forest management.

Perhaps the most daunting task for C&I stakeholders to complete is the effective coordination of activities surrounding the C&I process. This requires long-term fulfillment of obligations, which capitalize on the resources and strengths of stakeholders. The coordination of "who collects specific data" and "how and when to report data" must be delineated clearly with allowances for modification as warranted. In some cases, new processes will be created which require coordination with existing data assessments. Current activities form the foundation for a desired integrated process of optimum use among efforts. Therefore, initial descriptions of data gaps should coalesce into the identification of processes essential to meet the goals of C&I implementation.

The outcomes of the past few years of stakeholder collaboration on the C&I have converged towards one particular priority, that of addressing the needs and gaps in U.S. capabilities to measure all 67 indicators of the C&I. Early attempts to understand exactly where we stand with respect to available data, studies, programs, and methods reflect the advances and the shortfalls of periodic evaluations of forest resources on national and sub-national levels. The complexities of developing a comprehensive approach to integrate useful information on sustainable forest management are reflected in the types of gaps and issues, which lie ahead, including:

- Insufficient data.
- Incomplete geographical coverage.
- Partial measure of indicator.
- Insufficient methods of measurement.
- Inappropriate algorithms or sampling design.
- Lack of consistent measurement.
- Periodic or single implementation of measurement.
- Inconsistent or evolving measurements within programs of data measurement.
- Inaccessible data.
- Cost prohibitive.
- Proprietary standards.
- Process limitations.
- Lack of priority in existing programs and resources to generate and maintain data.
- Lack of coordination among programs and institutions involved in data development and information management.

Capturing the extent of these limitations across indicators provides a basis for the "next steps" for the broad U.S. forestry community to maintain progress along the sustainable forest management pathway.
The current vast sum of information and knowledge relative to forest resources in the U.S. are paralleled in few places in the world. Nevertheless, the shifting political and social sentiments regarding forest resource use and stewardship demand accountability that reflects these changes. Established national level programs such as the Forest Rangeland and Renewable Resources Planning Act of 1974, known as the RPA, and sub-national level efforts of forest resources accounting (e.g., state resources inventories, private industry data, forestry extension programs, academic research programs, environmental resources monitoring, etc.) all depend upon segments of information and knowledge which partially complete a policy mosaic the U.S. The implementation of the Montreal Process C&I proposes a framework to optimize on the individual policy pieces of consistent, coordinated, and complementary capacity to monitor and assess achievements towards sustainable forest management.

The C&I process has surfaced the need to plan segments of retro-fitting and converting existing data and information management systems to include or reflect the measures of the C&I. Considerable costs will be involved in the conversions and these costs must be integrated into the continued developments of existing programs. An important dynamic in the efforts to complete the conversion process is to consider the data questions in relation to what steps are necessary to make it happen.

Through three Technical Workshops held by the Roundtable on Sustainable Forests in March through May 2000, data and process issues specifically related to the C&I were identified, including for instance the need for measures of and national level data on non-timber/non-wood forest products (NTFP) (see Table 2). Currently, data are regional and concentrated at state or local levels with varying degrees of detail, periodic reporting, and compatibility. There has been no national level effort to provide consistent, comprehensive assessments of growing resources and their condition, management, markets, and land use. Nevertheless, for the First Approximation Report for the U.S. published by the USDA-Forest Service in 1997, even incomplete estimates exceeding one billion dollars represent only a fraction of the production and use of NTFPs from forestlands in the U.S. As land use issues continue to intensify, competition for forest resources from commodities and uses other than timber and recreation will require more data, research, and knowledge.

Another area of known value to the implementation of the C&I is the need for improved understanding of the role of small wood lots in U.S. wood supply, local and regional economies, and landscape-level resource planning. In a country where timber harvests from non-industry "farm and other private ownerships" are projected to exceed 12 billion cubic feet by 2020, or 62 percent of total timber harvest nationwide (National Research Council, 1998), the impacts on and the decisions of small wood producers will be critical to the overall sustainability of U.S. forest resources.

Table 2 - Data Issues in the U.S. related to the Montreal Process Criteria and Indicators

1. Resolve database management, consistency, and integration.
2. Develop lists of indicator species.
3. Develop standards to measure biological diversity for each biological category.
4. Adopt the National Vegetation Classification and convert existing systems.
5. Implement Forest Health Monitoring Program nationally.
6. Enhance frequency and geographic coverage of Forest Inventory and Analysis.
7. Determine carbon budgets and potential changes resulting from disturbance.
8. Determine appropriate biotic and abiotic belowground sustainability metrics.
9. Resolve issues of data coverage and confidentiality on private land.
10. Assess fragmentation metrics on a national level.
11. Expand measures of non-timber forest products.
12. Compile representative statistics for socio-economic and institutional indicators.
13. Standardize definitions.
14. Improve and complete national coverage of Gap Analysis Program.
15. Develop national strategy for monitoring community and economic indicators.
16. Develop national strategy for cultural, social and spiritual indicators.
17. Plan for integration of geospatial databases with non-geo-referenced data.

(SOURCE: Federal Interagency Memorandum of Understanding on Sustainable Forest Management Data in the United States, as initially signed on October 16, 2000.)

These are just two examples of C&I-related issues that require considerable attention due to the lack of data in the U.S. Many other indicators require various levels of additional attention, resources, and institutional coordination. The lessons learned from dialogue among Roundtable participants and others reflect numerous challenges for U.S. stakeholders to achieve long-term conservation and sustainable forest management goals.

Conclusion

The basic premise guiding domestic implementation of the C&I and dialogue within the Roundtable on Sustainable Forests has been "better data leads to better information, which leads to better decision making." This will only come to fruition if we balance our natural instinct to simplify, with the undeniable reality that forest issues are complex. The C&I are not perfect, nor do we have a mutually agreed upon desired future condition for our forests. Sustainability is a journey, which may or may not in-fact have a definable destination. We may not know when we arrive, but we can find ways to understand whether or not we are getting closer. The C&I will continue to live in a dynamic global forest policy context that includes many other approaches ranging from regulation to certification. Natural changes and the laws of unintended consequences influence the environment. When improving conditions in one area, we may trade off another.

While an obvious first task is to identify data collected at national and sub-national levels that fulfill national reporting needs of the government using national level indicators, the longer term value in the C&I is at a sub-national level in an applied context. When combined appropriately, with an eye to the differences between linkages and causality, indicators can become useful predictive and management tools. Several tasks must be accomplished before this can become real.

1. Indicators must be analyzed in combination, not in isolation.
2. Balancing must occur with consideration given to whether an indicator is meaningful, measurable, and affordable.
3. Data must be made available real time for use on real issues at sub-national levels.
4. Analytical models for sub-national application must be developed and made available to forest managers and other stakeholders.
5. Multi-indicator scenarios should be pilot tested in real world sub-national scale situations.
6. Existing research funding programs should support the potential of the C&I as a planning and management tool.

As we face growing demands on the forest base and global-scale change including climate, we can hardly predict long-term outcomes. The C&I serve as a gauge on the dashboard of vehicle Earth. We must watch the road, watch our speed, and steer as best we can.

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Optimal Management of Forest Landscapes for Maximizing Biodiversity and Ecosystem Management: The Case For Laissez-Faire Private Ownership -

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Introduction

In addressing the subjects of biodiversity and ecosystem management some definitions are in order. However, in spite of the recent popularity of these two terms no simple definitions exist.

At least three levels, or scales, of biodiversity can be recognized. Genetic diversity (among individuals) is the critical biological base level but difficult to catalog and evaluate. Diversity of species and other taxonomic groups is more manageable, especially for legal, political, or administrative decision-making. Habitat diversity and scale--the ecosystem base for the finer levels of biodiversity-- generally is the most practical level for land management decision-making. However, habitat diversity in the landscape does not automatically translate to desired species diversity. A complicating factor is that biodiversity constituents counting only “native” biodiversity as desirable, and introduced or culturally enhanced diversity as an intrusion often insert an additional value judgment. In this paper, biodiversity is defined as biological diversity, meaning the variety of life in an area and the processes through which the biological parts of ecosystems are interconnected. (Salwasser et al., 1993)

An ecosystem, as first defined by Tauseley (Tauseley, 1935) and further elucidated by many other ecologists, is a system that includes biotic communities and their interrelated biotic and abiotic environment at whatever space and time scales and level of detail is appropriate for the concerns at hand. Complex concerns often require a hierarchy, or nesting, of ecosystem models at various scales. (O’Neil et al., 1986)

Ecosystem management is a recent, politically based term that appears to be only partially related to previous ecosystem concepts. Review of the articles on ecosystem management, for example the Journal of Forestry for August 1994, illustrates the vagaries and general lack of a clear definition of this term. A de facto definition that often emerges is that "ecosystem management" applied to forests is a broadening of traditional multiple-use concerns to accommodate additional constraints and their value concerns--especially biodiversity as an end-value in itself. Some authors conclude that "ecosystem management" is best viewed as not so concerned with specific forest management practices but in working with the forces that lead to change and adaptability of communities of plants, animals, and humans, often across ownerships (based on Irland, 1994).

Although ecosystems can be defined at various scales, "ecosystem management" generally implies broader considerations above forest stand and property management to at least landscape levels. It is often suggested that this broader view is more "holistic" but holism relates more to comprehensiveness than to scale per se. Therefore, it is most useful to consider a nesting of stand, forest, and property ecosystem views in landscape "ecosystem management."

Within the northeastern United States, at the landscape level, biodiversity is largely a result of physiographic factors (climate, geology, soil, topography) affecting biotic community composition, structure, and function, (Noss, 1990) acted on by various disturbance elements and recovery processes. These disturbance elements occur at different time and spatial scales and include "cultural" as well as "natural" ones.

The physical geography of the northeastern United States is characterized by variety. This variety is due to historical and ongoing physical forces. Geological uplifting and subsidence of plates and landmasses produced alternatively sea bottoms and mountain peaks. Across the region, glaciation with continual weathering and erosion are the more recent forces. For example, in New York State alone, there are many different land types ranging from mountains to rolling hills and glaciated valleys to level sand plains. At a more micro landscape level several different landform types interact: hills, valleys, plains, ridges. Soil type also varies and different physical structures and drainage classes can be found within almost any 5-kilometer block. The compartment-alization of forests also varies from extensive unbroken tracts to

mixed farm and forest to urban-suburban tree covered areas.

The socioeconomic geography of the Region is both varied and the result of historical forces. Settlement by Europeans began about 400 years ago and large, area-wide settlement occurred generally in the 1800's and early 1900's. However, within the last 200 years massive changes occurred in the landscapes of the Northeast.

The major forces for original settlement by Europeans, about 400 years ago, were desire to live free of cultural and religious ties of already settled cities, expansion from perceived crowded conditions in Europe, the promise of quick riches from productive farms in the New World, extraction of high quality raw materials from forests, and desire for strategic military outposts. (Much of the historical material is drawn from Thompson, 1966.)

The unbroken forest was a hindrance to settlement and was cleared, first for subsistence farms, and later for more specialized market-based agriculture. Farming was a major force shaping the early forest resource throughout the Northeast. For example, in New York State by 1920, only about 20 percent of the State remained in forest cover (Considine, 1984) and much of that had been repeatedly harvested for a wide variety of wood and other forest products. Similar situations occurred throughout the Northeast.

Agriculture continues, up to the present, to be a major force affecting the forest resource. The same forces, which lead to early agricultural expansion also, produced, from 1920 to the present, shifts in the type and extent of farming. Attendant to this has been a continual decrease in the area of land devoted to agriculture and a corresponding increase in the amount of forestland. Again, in New York State, today over 60 percent of the State is covered in forests (Alerich & Drake, 1995). The long term trend in northeast agriculture has been an initial clearing and fractionation of forests into smaller and smaller tracts, often separated from others, followed by a consolidation of individual areas into a heterogeneous almost random pattern of interconnected forest areas as former agricultural lands return to the natural forest cover.

Agriculture, while a major force affecting forest development in the Northeast has not been the only one. The demand for forest products, timber and non-timber, shifting over the last 200 years, and the interest in forest land as a consumption good, as opposed to an agent of production, have all had impacts on the Region.

The northeastern United States was one of the first regions on the North American continent where forests were harvested for wood products. Starting in the 1600's and accelerating through the 1700's and 1800's and into the 1900's a wide variety of wood products have been harvested. In the 1700's and 1800's timbers for buildings and ships and fuel wood were predominant. The lumber industry grew quickly, however, and the northeast was soon the leading lumber producing region of the country. For example, in 1850 New York State produced more lumber (predominantly softwood) than any other state in the country (Thompson, 1966). Most forest areas in the northeast, unless they are in a park, or other publicly restricted area, have had timber harvests at various intervals, some about every 30 to 50 years, others more frequently.

In the 1800's and into the early 1900's the charcoal and wood chemical industries flourished in many parts of the region. These industries, unlike others that tend to use large trees, existed on small trees. Often the forests were repeatedly clearcut on a 20 to 30 year cycle. The cessation of that industry saw a regrowth of forests on those lands (Kubik, 1989).

Forests in the northeastern United States are a very complex mix of over 100 tree species occurring in a variety of associations, or forest types. Attendant to these different types are certain other vegetative communities and particular associations of fauna. From a biodiversity viewpoint, within each broad type there are different species with different abilities to compete with other vegetation for the growth factors. Each species has different levels of tolerance for, and response to disturbance factors.

On a worldwide view, northeastern forest types have only moderate species diversity, but across landscapes containing elements of different forest types northeastern forests yield a very rich biodiversity. Today in almost any county one can find a relatively close association of different forest types. The close juxtaposition of a variety of tree and other vegetation species can lead, in turn, to a wide variety of animal species within a single county. This diversity, today, is largely the result of cultural, or human-caused disturbance factors acting in concert with the longer-term physical factors.

The forests of the northeastern United States are held by an incredibly diverse set of owners (Birch, 1982, 1983a, 1983b). Looked at from the viewpoint of the late 20th Century, this may be the most diverse set of owners anywhere in the world.

Non-industrial private forest owners predominate. Many studies have attempted to characterize and model these owners (Canham, 1971). Historically, farmers owned much of the present non-industrial private forest. Their orientation was often towards some financial profit or obtaining wood products for home use. Time and other resources were allocated among different farm activities according to the owners' perceived returns for their efforts. One owner might have harvested some wood products for a new barn, another might have waited many years before harvesting, using the timber as a cash crop to raise capital for other uses. Over the years the character of any one-forest tract changed from the neighboring one.

Today, farmers hold only 14 percent of the Region's forestland. In the Depression of the 1930's some areas of land being abandoned for agriculture were purchased by public agencies. However, even today, private ownership predominates across the Region. Public ownership is much less important than in the western United States, accounting for only 14 percent of all forestland. Forest industry holds 21 percent leaving the great bulk, 65 percent, in the hands of millions of individual holdings, each ranging in size from a few to several thousand acres (Remington & Sendak, 1989).

The present non-industrial forest owner's profile spans across age, income, occupation, family status, education, interest and knowledge level, and virtually any other socioeconomic characteristic one might seek to measure. One cannot say that most owners are either middle aged, or that they are middle to upper income, or that they are nonresident, etc. Furthermore, the lands are purchased for a wide variety of reasons and subsequently held for a wide diversity of perceived benefits and uses. What is particularly relevant to the argument for biodiversity is that within any given area there are likely to be a juxtaposition of owners with different objectives, income levels, and perceptions about their forest holdings.

As a group the non-industrial private forest owners of the Northeast have an extremely diverse bundle of wants and objectives for their forests. Timber production for financial return is but one goal. It is the predominant one on only about 25 percent of the forestland. Most owners are interested in having some recreational use of the land, possibly an investment to sell in the future, seeing wildlife or other forest elements thrive, or just holding the land for its existence value and the desire to own land.

The mix of a bundle of ownership objectives complicates traditional forest management techniques and makes the job of the professional forester very different from earlier times. Silvicultural practices become more complex. No longer can it be assumed that production of large, clear logs of species with high financial market value for veneer and lumber are the end objective. For example, instead of favoring ash or sugar maple in a cultural improvement practice (thinning) it may be more important for the landowner to favor some paper birch, or to leave crooked white pine or rotten wildlife den trees. In addition, harvesting trees at culmination of mean annual increment is irrelevant. Much more important might be accelerating or delaying harvest until money is needed to pay for a child's college education or modifying a financial rate of return to meet some other goal. Maximizing long term financial returns might not be as important as having a periodic cash flow over the next 20 years to meet property taxes. Owners may, conversely, wish to incur very high financial opportunity costs to maintain a certain kind of forest cover on their land; a cover they "like" best.

Some owners have very high demands for cash; they demand a very high rate of return from their forests to continue the growing cycle. These owners are likely to sell all merchantable timber as soon as possible. This same group of owners has short tenures and to gain more immediate cash the owner is likely to sell the land.

At the other extreme are some forest owners who refuse to have any trees harvested on their property. These owners have the perception that timber harvests are "wrong" and that their other forest values will be lost if they cut trees. Consequently, their forests develop, possibly for long periods, without any human-based alteration. This same forest may eventually be sold to another owner more receptive to timber harvesting, and thus it can be considered in the long run wood supply (Canham, 1971).

Average tenure, or length of ownership of forestland is about 10 years. However, the length of ownership can vary immensely from tract to tract. Some forest areas have been in the same family for several generations with a more or less similar management philosophy, others do indeed change owner and possibly come under a wide swing in objectives at less than 10 year intervals whereas in other situations, management objectives might not change with ownership changes. Similar to other owner characteristics, different tenure situations occur in close juxtaposition.

Many forest owners are ignorant of the potential timber values in their forest holdings; however, they might consider a sale when presented an offer. Some forest owners will consult a forester for the timber sale; others will allow the timber harvester, the logger, to set the terms of harvest and sale.

Importantly, most of the non-industrial forest ownerships have been little impacted by professional foresters. Others, not foresters, make the management decisions on most of this land. The saving factor, however, is that these forests really do not require professional foresters in order to grow and produce diverse goods and services. Professional foresters can however, provide an essential role in maintaining the biodiversity, as will be shown below.

Markets for wood products are another factor when considering the system within which northeastern United States forests exist. The market value of different species is becoming quite dynamic. Only 30 years ago oak was considered a very low value wood species. It ranked along with beech and red maple as a so-called weed species. Sugar maple, black cherry, and white ash were the leading hardwood timber species. Large clear red spruce and white pine was also in high demand for lumber and spruce and fir were the major pulpwood species. Today, red oak standing timber (stumpage) commands a price equal to black cherry and higher than white ash. (See for example, NYS Dep't of Environmental Conservation, Stumpage Price Reports, issued every six months, or Sendak, 1994.) Sugar maple slipped to a medium value species and yet within the last year or two has increased again in value. These and other shifts in prices are primarily driven by changing demands for consumer products and changing technology.

In the mid 1950's a new process was developed that made it quite feasible to use hardwoods for paper production (Canham & Armstrong, 1968). Virtually overnight major paper companies shifted prices and altered forest management practices. In turn, other forest owners shifted silvicultural practices. Some owners who had removed, or otherwise eliminated hardwoods from spruce-fir stands, within one year were now removing spruce and fir and favoring hardwoods. The hardwood pulp market along with the more recent "rekindled" fuel wood market has greatly increased opportunities to harvest previously noncommercial trees. This, like all the other situations previously mentioned in the Northeast, contributes not only to biodiversity but also improves the economy of many rural communities. However, the market for small trees has also increased the possibility of cutting trees that would provide higher value timber if allowed to grow larger. Forest owners, ignorant of the alternatives and the relative tradeoff values, may be taking a route not in their best interest.

Technology has also had a major impact on wood supplies. For example, furniture manufacturing is a major end use of northeastern wood. Red maple, still a lower value species, is now being readily substituted for sugar maple in furniture construction. It is sometimes better suited to accepting finishes than its higher prices cousin, sugar maple. And as the formerly abandoned farmlands across the region naturally regenerate, red maple has been an aggressive natural invader. Consequently, a stock of higher quality red maple is becoming available and manufacturing is responding by developing newer technologies and attitudes to use this material (Canham and Smith, 1992).

A final example that stands out is the development of a thriving cabin log industry based on the expansive areas of red pine, and other softwood species, planted on abandoned farm lands from the 1930's to the 1950's and now largely in public ownership. There was relatively little thought given to precise markets or end uses when these trees were planted but, again, a use was found, based on consumer preferences and technology of private initiative.

All the previously cited conditions and situations, when combined, show the dynamic, heterogeneous forest management system in the northeastern United States in the late 20th Century.

The above picture has raised many concerns among professional foresters and others interested in long-term community stability and the quality of our forest resources. However, it appears that after 200 to 300 years of accidental, primarily free-enterprise (laissez-faire) forest management, the forests of the northeastern United States have sustained an impressive set of activities ranging from timber supply to watershed protection to wildlife habitat. Looked at from a landscape level of a township, county, or small watershed, the forests exhibit a very diverse, vigorous and dynamic system, one that is remarkable resilient, and one that has the potential, under certain conditions, to continue into the 21st Century. Looked at from a regional viewpoint the actions of forest owners are largely random; each owner operates within their own sphere of knowledge, interests, and resource characteristics.

Governmental action in a free market economy is, theoretically, to correct market failures. Five

functions of government can be identified: providing the legal foundation and social environment, maintaining competition, redistributing income and wealth, reallocating resources, stabilizing the economy (McConnell & Brue, 1993). The classic cases today are lack of a socially desirable level of output of certain "environmental amenities" or "public goods"; things the economist terms externalities. Today there are a plethora of laws, regulations, and government agencies set up to regulate private activities and to provide (produce at public expense) certain goods and services.

National defense, police protection, and education: these are the hallmark publicly produced goods and services in a free market economy such as the United States. Historically, in the United States, controls and regulation of private enterprise including land use were used in a limited manner until the 1970's. However, there has been an almost exponential growth of laws and regulations in recent decades. Many of these affect, either directly or indirectly, forestland management (Canham & Stegemann, 1988).

In addition to regulation, incentives have been attempted to induce forest owners to manage their forest resources in certain ways. Technical assistance has been rendered to owners through state and federal programs. Cost sharing of certain conservation practices has occurred in one form or another since the 1930's. In some cases there have been some program success, in other case only limited use has been made of programs and a minimal amount of the forest resource has been affected. A good example is subsidized tree planting which has only marginally improved forest areas and wood supplies. Indeed, a much greater impact of tree planting is the introduction of more diversity through the introduction of softwood species in the midst of a largely hardwood forest, an objective not even considered when the programs were conceived.

Four major public, or governmental activities will enhance both biodiversity and improve the contribution of forest resources to the Region's economy: (1) let private initiative operate, (2) guard against unidirectional forces that appear to be leading all forest owners in the same direction, or producing homogeneity, either in the forest conditions, or in the character of forest owner, (3) provide education to all parts of society, not just forest owners, (4) protection of adjoining neighbors' and community property rights.

Government regulation commonly is justified by anecdotal references to visibly non-conforming behaviors that are believed to require control, whereas regulations that have negative directional consequences for all forest resources and owners often are ignored.

The ecological concept of "incorporation" (O'Neil et al, 1986) is useful here. Either natural or cultural actions (e.g., tornado, hurricane swath, or clear-cut) that may appear disastrous at the local scale and present timeframe will be incorporated into normal, or acceptable, variation of the larger space and time continuum of a landscape or region. However, a relatively synchronized event over the landscape or region is likely to have significant landscape scale and longer-term impacts. For example, a forest owner commercially "stripping" or "highgrading" their forest holdings may devastate some values of that property for a short time but that is likely to be more temporary and be a welcome biodiversity impact at the landscape level. In contrast, the government-stimulated chemical wood industry, circa World War I, resulted in widespread clearcutting in southern New York and adjacent Pennsylvania, thereby producing a healthy regrown forest, but one which is very similar in age and species composition over a large area, with a resulting low level of biodiversity.

Taxation, including real property taxes, is a vehicle widely used throughout the world, to finance governmental activity. The property tax has long been used to finance local and county government, particularly in the northeastern United States. High property taxes are a definite major unidirectional force. Forestland is held, as previously stated, for many different reasons. However, if taxes rise there is increased pressure on the forest owner to liquidate timber earlier than desirable, to subdivide land, and to possibly ignore some other external benefits (such as free open land for hunting). Property taxes, in many areas of the Northeast, are well above the ability of the forest to provide revenue (Canham, 1992). This is not a new phenomenon and ways to modify the property tax have been developed since the 1930's in the United States, even earlier than that in Europe. Laws and programs granting forest owners partial exemption from taxes in return for a dedication of the forest to specified long-term timber management are in existence in many states. These have been somewhat successful but many owners resent the governmental control or "ownership" such programs often entail. Even more important such programs shift the tax burden to other types of property raising questions of equity, etc.

After looking at the problem from many different viewpoints, and over many years, it is concluded that the only long run solution is to eliminate the property tax as a form of local government financing. The property tax was developed when society was rural, land based. The theory was that land equaled wealth and ability to pay. More recently an added argument has been that the amount and value of land owned somehow related to public services demanded, hence a property tax approximated a socially desirable "price" (Davis, 1976). None of the above two contentions are true today. The property tax is unequitable; amount and value of land owned is a poor indicator of either wealth or ability to pay. Furthermore, land does not demand services, people do. Other arguments for the property tax are that it is very predictable and easy to administer, at the local level. Predictability of revenue is a virtue not to be denied.

However, in today's world most local governments look very much to state and federal aid and revenue sharing programs for much of their funds. These are less predictable, being based on sales and income taxes, but are a reality. Regarding the ease of administration, this is less true with each passing year. Nonresident owners, state mandates on local taxing jurisdictions to have up-to-date, full value, assessment roles, and an increasing number of tax parcels all drastically increase the cost of using the system. Finally, high property taxes are leading to more contesting of assessment and questioning of local government activities. These are not only headaches for local government, they can be very costly. All in all, the property tax has outlived its usefulness and should be eliminated for all property. Sales and income taxes are, in the end, much cheaper to administer (more efficient) and much more equitable as means of financing public actions.

Subdivision of forest parcels into smaller parcels with separate ownerships is a threat to the diversity and economic contribution of Northeast forests. Forest owners may choose to subdivide their lands for many reasons. However, government policies may have the unintended effect of inducing many owners to subdivide. For example, zoning ordinances or land use laws that either require costly septic systems on small tracts or that prevent subdivisions of under a certain size may easily lead to many subdivisions just before the law is enacted. Alternatively, many owners, faced with such a law and recognizing a potential loss in revenues from a possible taking, may subdivide their lands into many parcels, each just a fraction of an acre over the legal minimum. These actions have happened at least two states: New York and Vermont.

A third major unidirectional threat to Northeast forests (and elsewhere) is that timber harvesting is increasingly perceived as somehow socially undesirable and that loggers are inherently "bad". This perception may become increasingly widespread as more and more forest owners are urban, nonresident owners and as society becomes bombarded by spectacular statements about rainforests, old growth forests and loss of our precious resources.

Education may be the biggest role for the public sector to undertake to enhance private forest management. Economists recognize that a major imperfection in the neoclassical competitive, free market, capitalistic economy is lack of good information. Reducing the incorrect perceptions and beliefs about forests will do much to increase the social goals earlier mentioned. Professional foresters can serve in this capacity. However, there is a fine line between objective education and an evangelist approach to try to instill one single doctrine.

This latter approach, if followed, could detract from biodiversity as much as any other force. Maintaining the heterogeneous, diverse pattern of forest owner behavior is the key to successful ecosystem management. However, forest owners are only one of the groups requiring education. Elected public officials, regional planners, other governmental agency personnel, and the general public are all involved in setting and implementing public policy, often with the ill-fated implications raised above. Special educational programs should be designed for each group.

A laissez-faire approach is strongly advocated for the northeastern United States, and similar other regions around the world. However, protection of private property rights and providing for an orderly and equitable development is a legitimate function of government and is the fourth role. This usually manifests itself through zoning, a mechanism for obtaining compatible adjoining land uses, and the court system which arranges for compensation when the actions of one owner take away from the legitimate values previously enjoyed by another owner.

Licensing, or registration, or certification, of loggers has been discussed in many circles. Maybe its time has come. However, as with many other social problems, private market-driven initiative seems to be moving to solve the problem. Timber

harvesting associations are educating members about good logger-landowner relations, safe harvesting, and protecting soil and water resources. Individual timber harvesting firms are hiring foresters, and are readily giving landowners references to previously completed harvesting operations. Some have even developed a picture portfolio of their work to show prospective clients.

Other private organizations aimed at landowners (two, for example, in New York State are the New York Forest Owners Association, and the Catskill Forest Association) are developing a following, especially among the more affluent urbanites. The educational and technical assistance efforts of these groups are conducted largely without major government funding and function similarly to other private, market-driven systems.

In summary, if you want to get something done, appeal to the strong human emotions. Make it worthwhile. Altruism and regulations work but private initiative, aimed at what is in it for the individual is the fastest and most efficient way to get things done. Adam Smith's Invisible Guiding Hand can apply just as well to forests in the 21st Century as it did to pin manufacturing in his world.

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Recent USDA Forest Service Experience with Forestry Incentives; What have we achieved? - *Susan Stein*

Forest Stewardship Coordinator, USDA Forest Service

Introduction

The United States government has been providing various kinds of incentives to private forest owners since the late 1890's, when the Division of Forestry housed at the United States Department of Agriculture (USDA) in Washington, D.C. began to help private forest owners learn and implement better forest management. Since then, this role has grown tremendously and many Federal programs have been implemented, all with the same basic objective: to assure that our Nation's private forestlands are managed sustainably, for all of the benefits that these lands can provide to society.

This paper provides a quick overview of these programs and then focuses on the achievements of the two programs most recently implemented by the USDA Forest Service – the Forest Stewardship Program, which helps private landowners to plan for the sound use of their forests, and the Stewardship Incentives Program which, when it was funded, provided financial assistance to landowners to implement their Forest Stewardship plans.

It should be noted that there are several other Federal programs currently being implemented by other agencies of the United States government that can assist forest landowners. These include the Forestry Incentives Program (FIP), designed to cost-share forest improvement practices on private lands capable of producing a minimum of 3.5 cubic meters of timber per hectare annually as well as several programs focused on farmland that can be used for afforestation and agroforestry. This paper focuses on Forest Service programs.

The term "incentives" is used rather loosely here to include technical as well as financial incentives.

Importance of NIPF Lands

As of 1994, the 9.9 million owners of non-industrial private forest (NIPF) land in the United States owned 48% of the nation's forestland (Birch, 1996). These lands provide important public benefits such as special forest products (wild mushrooms, medicinal plants, floral greenery); quality soil, air and water resources; community vitality; recreation; and wildlife and fisheries habitat. They also represent 58% of total U.S. timberland and provide 60% of all forest products consumed in and exported from the United States (Haynes and Ince, 2001). NIPF lands account for 72% of the U.S. hardwood inventory and 30% of the U.S. softwood inventory (Haynes and Ince, 2001).

The term non-industrial private forest (NIPF) refers to private forest ownerships of 0.4 hectares or more that do not contain a wood processing facility. Owners of these lands typically do not depend upon timber as a primary source of income. Individuals, partnerships, and other legal entities own these lands. About 30 percent of NIPF owners have white-collar occupations; an additional 27 percent are retired; about 15 percent have blue-collar jobs; and the remaining 28 percent are farmers, homemakers, service workers, or gave no answer when surveyed (Birch, 1996). About half are more than 55 years of age. NIPF owners are found in all fifty of the United States.

Historical Role of Forest Service and other Federal Agencies in Private Land Management

The United States government's role in assisting owners of private forest land began in the late 1800's and is well described by Sampson and Decoster, 1997. A quick summary is provided here.

The Federal role began in the 1890's with the distribution of educational reports and pamphlets by a small Division of Forestry at USDA. In the 1920's, the government began to provide financial assistance, referred to in the United States as "cost-share" to State tree-seed and nursery programs and to fund State programs that provided educational assistance and technical advice to farm woodland owners. This Federal-State government partnership has grown since then and is a foundation for all of our landowner assistance programs.

During the 1930's the Federal forestry role was expanded to include other agencies, resulting in significant accomplishments. The Civilian Conservation Corps' planted 1.25 billion trees, the Prairie States Forestry Project planted over 29,927 kilometers of shelterbelts, and the Soil Conservation Service (SCS) began a long-term effort that, by 1992

resulted in the planting of 2.9 hectares of trees. By 1992 over 75% of the SCS acres remained in forest use.

In 1956 a USDA Soil Bank program began which resulted in the planting of 890,309 hectares in trees (80% of which remained in trees by 1992).

Congress authorized the Forestry Incentives Program (FIP) in the 1973 Farm Bill, to increase the nation's timber supply through tree planting and improved management of timber stands. As of 1992, 92% of FIP hectares planted in forest through cost sharing to private land owners were still in forest.

The Conservation Reserve Program created in the 1985 Farm Bill resulted in the conversion of 101,172 hectares of cropland to trees by 1992. Over 90% of this was in the South.

In 1990 Congress created the Forest Stewardship and Stewardship Incentive Programs.

The Forest Stewardship Program and the Stewardship Incentive Program – what have we achieved?

The Forest Stewardship Program (FSP) has been in existence for over a decade. Its primary purpose is to encourage the long-term stewardship of non-industrial private forest (NIPF) lands. Annual program funding has increased from 19.9 million dollars to over 30 million dollars since the program's inception. Most of these funds are distributed to the 50 States and U.S. Territories. The State forestry agencies utilize these funds to provide technical and educational assistance to private landowners. Much of this assistance has been provided in the form of long-term, multi-resource management plans called "Forest Stewardship Plans" which landowners receive at no cost.

As each plan is developed, participating landowners learn about the possible benefits and uses of their land and various options for its management. The plan provides recommendations on the most effective and sustainable ways to meet landowner objectives and the protection of all the resource values. While many landowners are interested in enhancing the timber values on their property, many are not. Timber does not have to be a primary interest in order for a landowner to participate in the program. Plans can also cover wildlife values, recreation, riparian habitat enhancement, fire prevention, invasive species and many other areas.

While program accomplishments have been impressive, they address only a small fraction of the need. As of October 2000, the program had resulted in the production of over 180,000 Forest Stewardship Plans covering some 8.8 million hectares of private forestland. This amounts to 6.2% of the non-industrial private forest acres nationwide and just under two (1.83) percent of the ownerships.

A recent study gives an indication of the program's importance to different NIPF ownership size categories (Esseks and Moulton, 2000). It is based on a survey of 1,200 NIPF owners with Forest Stewardship Plans conducted in 1998 and 1999. These owners had plans that were prepared in 1997 or prior years. It is doubtful that the results would be different for plans written since 1997.

The majority of ownerships enrolled in the program are mid-size ownerships ranging from 4 to 40 hectares. Close to 40% of the plans produced through 1997 covered ownerships that ranged from 20 to 81 hectares and close to 30% covered ownerships from 4 to 20 hectares (see Table 1 and Figure 1). These two size classes combined represent 65% of all plans. Larger-sized ownerships are often served by private, rather than State, forestry professionals. Smaller-sized ownerships (i.e. under 4 hectares) are, perhaps less commonly-served because their owners are less interested in management and/or because State forestry agencies get less "bang-for-the-buck" in serving smaller ownerships. **(See Figure 1 and Table 1)**

Figure 1: Percent of FSP participants in each size category

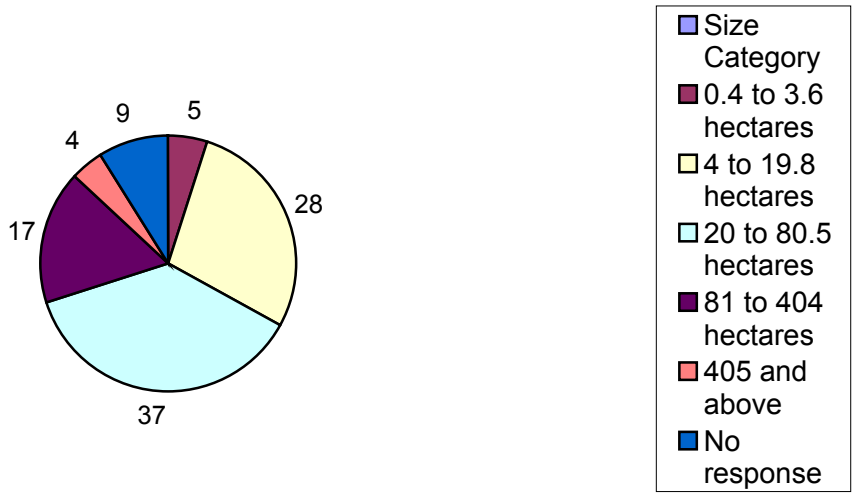


Table 1: Percentage of NIPF ownerships with Forest Stewardship Plans, by size category (FY 1999)

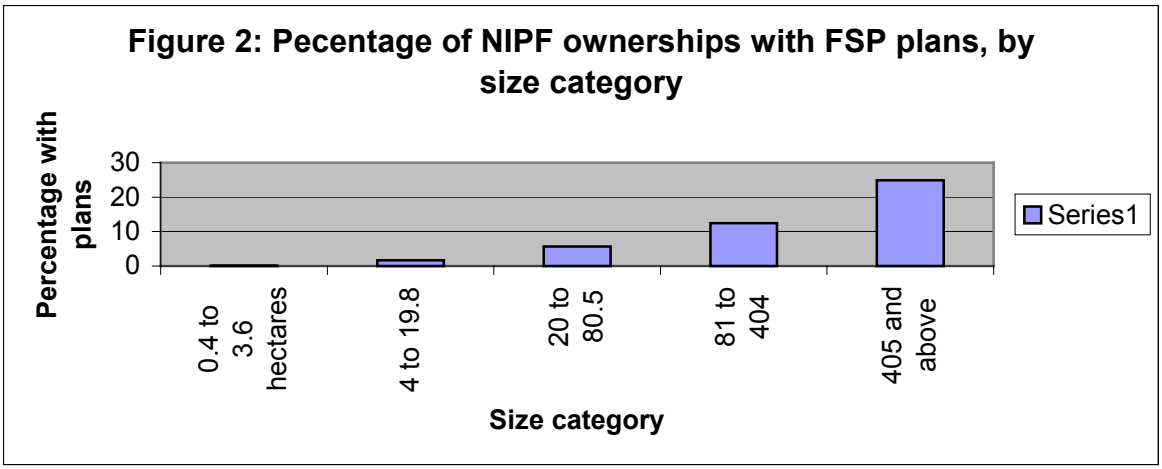
Size Category (hectares)	FSP participants per size category (percent)[1]	FSP Clients per size category	Ownerships per size category[2]	NIPF ownerships with FSP plans (percent)
0.4 to 3.6 hectares	5	8,363	5,795,300	0.1
4 to 19.8	28	46,830	2,762,100	1.7
20 to 80.5	37	61,883	1,088,300	5.7
81 to 404	17	28,432	229,100	12.4
405 and above	4	6690	26,900	24.9
No response	9	15,052	--	--
Total	100	167,250	9,901,700	--

Sources:

[1]J. Dixon Esseks and Robert R. Moulton, 2000. *Evaluating the Forest Stewardship Program Through a National Survey of Participating Forest Land Owners* (De Kalb, Il: Center for Governmental Studies, Northern Illinois University), p. 38.

[2]Thomas W. Birch, 1996. *Private Forestland Owners of the United States, 1994* (Radnor, PA: USDA Forest Service), p. 30.

As indicated in Figure 2, a significant percentage (almost 25%) of ownerships in the range of "405 hectares and above" have a plan. The percentage of ownerships with plans decreases as ownership size decreases. Just over 12% of NIPF ownerships 81 to 404 hectares in size have a plan, and less than 6% of the ownerships of 20 to 81 hectares have a plan. Only 0.1% of ownerships under 4 hectares have a Forest Stewardship Plan. There are still many ownerships in all categories that could potentially benefit from a Forest Stewardship Plan.



The survey indicates that the Forest Stewardship Program is having a strong positive impact on the way participating landowners manage their forests as well as their interest in multiple resource management. Esseks and Moulton found that over 80% of landowners with Forest Stewardship plans are implementing them. Over half (55%) of these landowners have begun to implement at least one management practice that is new to them and over 60% are implementing practices for two or more management purposes.

These and other results tell us that the program is, in many respects, serving its intended purpose. The Forest Stewardship Program encourages landowners to take a more active role in the management of their forests, to try new management techniques and to undertake multiple resource management.

The survey also indicates that the preparation of a management plan often represents a landowner's very first contact with a professional forester. For many landowners, a plan leads to continued contact with a professional forester, subscriptions to professional forestry journals, and other sources of technical information. Contact with professional foresters can act as a preventative measure, helping landowners avoid inappropriate management practices that can damage their land and its resource values.

A few more findings from the survey are presented below:

- Roughly 94% of survey respondents would strongly recommend the FSP to others;
- Growing trees was listed as the top management purpose overall; creating/preserving wildlife habitat was second.
- 63% of those receiving cost-share said they would not have accomplished the same plan implementation without the amount of cost-share they received.
- 60% of those that had received follow-up technical assistance said that they would not have implemented their plans to the same extent without this help.
- Forty-six percent of the surveyed landowners were more likely to improve wildlife habitat after getting their plan and 32% were more likely to improve water quality. Twenty-seven percent were more likely to harvest timber for sale.

More information about this study can be found on the web at http://www.srs.fs.fed.us/pubs/viewpub.jsp?index=913

It is interesting to contrast the results of the Esseks/Moulton survey, which indicates that landowners are highly satisfied with their plans, with the results of an assessment of 100 plans randomly selected from across the country. The plan assessment was conducted in 2000; by a team of Forest Service and State Forestry project managers drawing from the same sample that used by Esseks and Moulton. The assessment found that, while timber resources were adequately addressed, a broad range of technical areas, including cultural resource restoration, fisheries enhancement and recreation, were not adequately covered.

What these two studies combined tell us is that, while the program is very popular among participating landowners and is achieving many of its objectives, many plans are not addressing multiple resource objectives to the extent that the State and Federal FSP program managers on the review team feel they could or should be. While somewhat disappointing to the team, it is probably not unexpected. The program is still new enough that the mind-sets and training of the foresters who deliver it are still catching up with the concept of multiple resource management. In most cases, plans are prepared by professional foresters who may be highly trained in their field but may not have received adequate training to give advice on non-timber values. A number of States have been addressing this need by hiring part or full-time wildlife experts to assist with plan preparation. At the national level, we are addressing this perceived shortfall by preparing a Forest Stewardship Planning desk guide that provides advice on writing plans that address customer needs and especially non-timber values. We are also supporting the development of a website that can be used by plan preparers and landowners who desire information on managing forests for non-timber and timber values.

The Stewardship Incentive Program (SIP) was designed as a companion program to the Forest Stewardship Program. Its purpose was to provide cost-share assistance to landowners with Forest Stewardship Plans. Although Congress authorized for up to $100,000,000 to be spent each year, the program received far less funding, the most being about $20 million per year, down to about $6 million each during its last few years of existence. The program has not been funded since 1998. There are several reasons for the lack of funding. Perhaps the most relevant to this paper is that SIP did not have unanimous support among all fifty States, due to program characteristics that were perceived by some as weaknesses, which will be discussed further later.

In keeping with the Forest Stewardship Program, the SIP program allowed for the cost sharing of an impressive range of practices, grouped under the following practice types:

- Forest Stewardship Plan writing
- Reforestation and afforestation
- Forest improvement
- Agroforestry establishment, maintenance, and renovation
- Soil and water protection and improvement
- Riparian and wetland protection and improvement
- Fisheries habitat enhancement
- Wildlife habitat enhancement, and
- Forest recreation enhancement

As with the Forest Stewardship Program SIP was primarily implemented by each State forestry agency, with broad discretion provided to each State in determining which practices they would cost share and how the program was implemented. States could use SIP funds to cost-share up to 75% of a practice with a landowner. Many opted to provide a lower percentage of cost-share so that they could assist more landowners.

As indicated in Table 2 and Figure 3, certain practices were funded by State Forestry agencies more commonly than others. The three most commonly funded practices were "forest improvement", "wildlife habitat enhancement" and "reforestation and afforestation", funded by 88%, 86% and 84% of all States respectively (the term "States" here also includes the commonwealth of Puerto Rico). Agroforestry practices were funded by about 50% of all States. Riparian and wetland protection and improvement activities as well as forest recreation enhancement activities were each funded by about 40% of all States. Only six percent of States cost-shared "fisheries habitat enhancement" activities. Just over half of the States (51%) used some of their SIP dollars to cost-share Forest Stewardship Plans whereby the landowner typically paid 59% of the total cost (States had the option of supplementing their Forest Stewardship Program funds by cost-sharing plans). (See Table 2 and Figure 3).

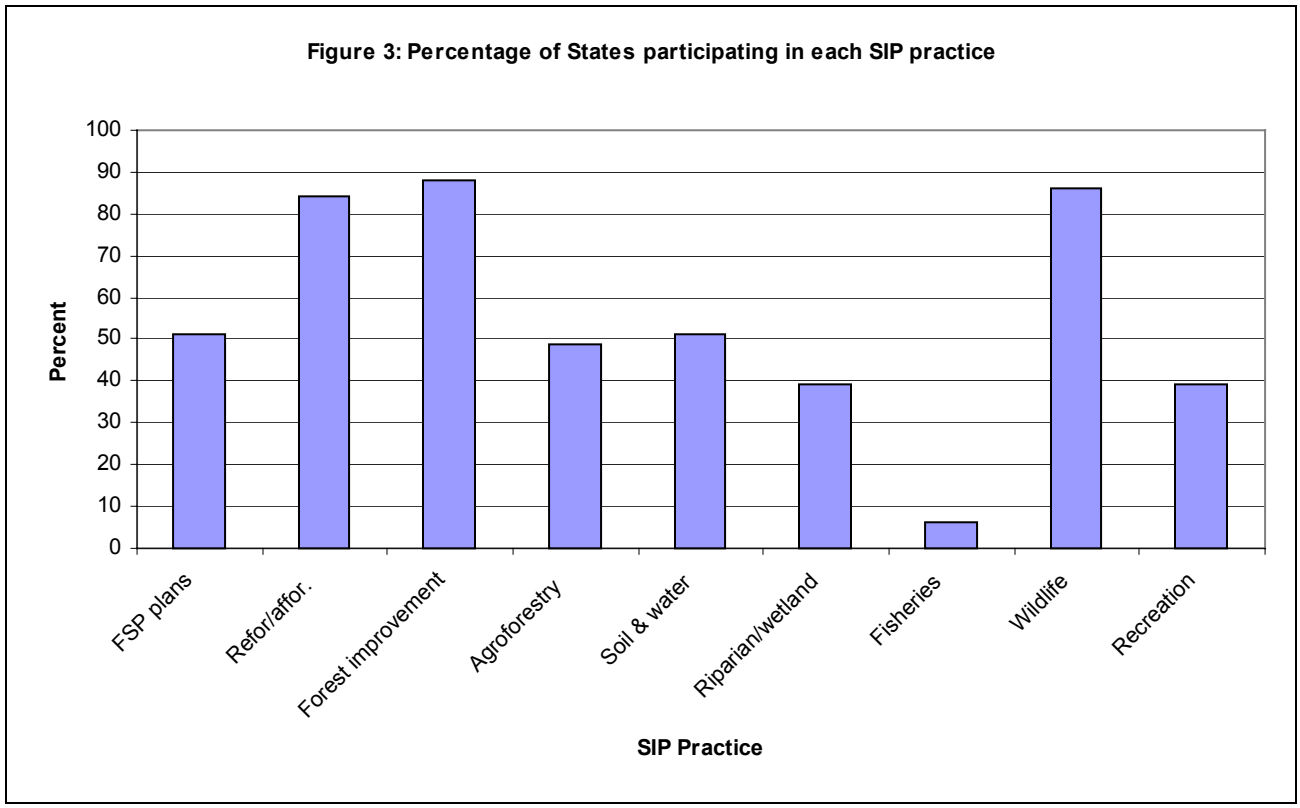


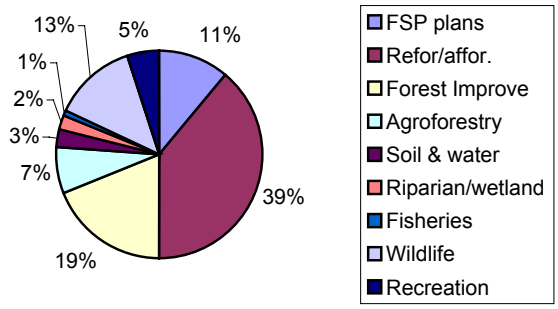
	Table 2: Percentage of States that Cost-Shared each SIP Practice	
		% of States practicing
	SIP Practices	
	Landowner Forest Stewardship plan development	51%
	Reforestation and afforestation	84%
	Forest Improvement	88%
	Agroforestry estab/main/renovate	49%
	Soil & water protection & improvement	51%
	Riparian & wetland protect & improve	39%
	Fisheries habitat enhancement	6%
	Wildlife habitat enhancement	86%
	Forest Recreation enhancement	39%

By the end of fiscal year 1999, approximately 60 million dollars had been expended to cost-share 526,092 hectares of Forest Stewardship Plans and 566,560 hectares of practices across the United States. Of the $60 million, close to $6.5 million was spent on plans, and the remaining $53.5 million on practices. As indicated in Figure 4, States opted to spend their SIP funds on certain practices more than others, the most important being "reforestation and afforestation" which accounted for about 40% of funds allocated by the end of Fiscal Year 1999. Nineteen percent of SIP funding was spent on forest improvement activities and 13% on wildlife habitat enhancement. Eleven percent of the funds were used

to cost-share Forest Stewardship plans and less than ten percent on each of the remaining practices.

Table 3 displays the number and percent of hectares covered under each practice-type (excluding plans). Close to half of the hectares covered by SIP practices (44%) involved forest improvement and 25% involved afforestation or reforestation. Eleven percent involved wildlife habitat enhancement and ten percent or less involved the remaining practices.

Figure 4: Percentage of SIP funds spent on each practice



Less than one percent involved fisheries habitat enhancement. (See Table 3)

Regional Highlights

A comparison of Forest Service Regions shows some variation in terms of practices implemented (see Table 4 for a list of States included in each Region). Agroforestry was the predominant practice in the Rocky Mountain, Southwestern, and Intermountain Regions (Regions 2,3,4), accounting for roughly 60% of the hectares implemented (see Table 5 and Figure 5). Wildlife was another important practice in the Intermountain Region, accounting for 26% of hectares improved.
(See Tables 4&5, and Figure 5 at the end of paper.)

Agroforestry also represented the most important practice for the Northern Region (Region 1 - covering Idaho, Montana, and North Dakota), accounting for 38% of practice hectares installed in that region. Wildlife habitat enhancement was also important, accounting for 26% of regional hectares implemented. Reforestation and afforestation, and forest improvement practices each accounted for about 15% of hectares achieved in this Region.
Forest improvement, riparian and wetland protection and improvement, and wildlife habitat enhancement each accounted for between 25 and 30% of practice hectares installed in the Pacific Southwest Region (Region 5). While for the Pacific Northwest Region (Region 6), forest improvement was by far the most important practice, accounting for 60% of all practice hectares installed. Reforestation/afforestation and wildlife habitat improvement respectively accounted for 16% and 18% of hectares installed.

In the Southern Region (Region 8), covering 13 southern States, SIP accomplishments focused predominantly on reforestation - afforestation, accomplishing 54% of all practice hectares under this category. Forest improvement and wildlife habitat enhancement accounted for 19% and 20% of all practice hectares implemented.

The Northeastern Area (NA), covering 22 northeastern states, also focused on reforestation/afforestation. Fifty-six percent of hectares installed fell under this category. “Soil and water protection and improvement” and recreation were also important in the northeast, accounting for 15% and 9% of hectares installed respectively.

Forest improvement practices accounted for 45% percent of the hectares installed in the Alaska Region, while recreational improve-ments accounted for 34%. Wildlife habitat enhancement accounted for 12% of all practices hectares achieved.

The International Institute for Tropical Forestry (IITF) split most of their accomplishments between forest improvement and agroforestry.

What We Have Learned

Experience in managing these two companion programs has been invaluable, both to the Forest Service and State forestry partners as well as the landowners that they have served. Some insights are presented here.

1) Technical and/or financial assistance has a positive long-term impact on landowner behavior. As the 1999 study by Esseks and Moulton found, 80% of landowners with Forest Stewardship plans are implementing them.

Table 3: Number and percentage of hectares under practices installed		
	Cumulative number of hectares	% of Total hectares
SIP Practices		
SIP 2 Reforestation and afforestation	140,631	25%
SIP 3 Forest Improvement	247,267	44%
SIP 4 Agroforestry estab/main/renovate	17,642	3%
SIP 5 Soil & water protection & improvement	56,682	10%
SIP 6 Riparian & wetland protect & improve	3,259	1%
SIP 7 Fisheries habitat enhancement	356	< 1%
SIP 8 Wildlife habitat enhancement	64,084	11%
SIP 9 Forest Recreation enhancement	36,391	6%
Total	**566,312**	**100%**

Many are managing their properties for wildlife, timber and/or other resource values that they would not have managed for prior to receiving their plans. For many, the plan represented a first, important contact with a professional forester, which led to continued contact as well as subscriptions to forestry journals and other forms of assistance.

2) Landowner input is essential. Discussions with Federal and State program managers have underscored the importance of landowner input. At the very least, a plan preparer must understand landowner objectives before attempting to prepare a plan. For landowners with very general objectives, it is important for the preparer to help refine those objectives. Plans that list "wildlife" or "timber" as primary objectives, for example, are not specific enough. What wildlife species does the landowner wish to attract? What are the landowner goals related to timber? The answers to these questions will shape the nature of a plan. A landowner's ability to implement a plan depends largely on the extent to which a plan meets his or her needs.

The State of Montana has experimented with "coached planning", where landowners are actually coached through the process of developing their own plans. Informal discussions with States have indicated mixed results. Some have found this to be too labor intensive and expensive a method. On the other hand, it appears that landowners who have written their own plans may follow them more closely than landowners whose plans are prepared for them.

3) Ensuring participation by a diversity of landowners may require special effort. The study by Esseks and Moulton (1999) and the Forest Service's annual reporting system indicate that participation by minority landowners in this program has been low. This has led some Forest Service and State agency offices to undertake special measures to inform minority landowners of the program and encourage them to participate. The Forest Service Southern Regional Office, for example, has held a series of special workshops and events to inform minority or underserved landowners of our programs, build greater trust, and increase participation in sustainable forest management activities. State caucus groups are being formed, through which landowners inform other landowners of the programs and their benefits. Initial results indicate that higher percentages of minority landowners are interacting with State forestry agencies, as a result of this effort. Some of our Western offices have hired Native American coordinators to work closely with Native American tribes interested in participating. These kinds of efforts should be replicated across the country. The Forest Service is preparing a handbook that advised program managers on how to conduct such outreach efforts. We hope to have it printed by August of this year.

A related issue has been that of land tenure. When the program was first designed, the term land "owner" was used quite literally, i.e. participants had to be fee simple owners of their land. Since then our interpretation of this term has been broadened to allow participation by some groups who may not own their land outright but who have long-term management rights and are quite capable of assuring that they can follow through on whatever commitments they might make. An example of this would be "landowners" in Hawaii with fifty-year leases from the government but do not own the land outright, or certain native American groups that also hold long-term leases.

4) Linking financial incentives to plans may have an undesirable effect. Landowners are required to have a Forest Stewardship Plan in order to participate in the Stewardship Incentive Program. Due to this requirement, in some areas, plans have been perceived only as a requirement to be met in order to be eligible for cost-share. This is reflected in the quality of some of the plans and in fact is one of the reasons why the Stewardship Incentive Program not been popular among some State forestry agencies. Some argue that by linking incentives to planning, the planning process is diluted.

5) A different, less intensive form of assistance may be required to reach smaller acreages. As mentioned above, few Forest Stewardship Plans have been written for properties under 10 acres in size. Considering that this size category constitutes 59% of all NIPF ownerships and that the amount of land under this category is increasing, it will be important to provide some type of technical assistance to these lands. While these lands may not be important in terms of timber supplies, their proper management can greatly reduce fire hazards. Some States, such as California are therefore producing Forest Stewardship plans for groups of small landowners to reduce fire threats.

6) While many landowners may not ask for timber-related assistance, it is likely that they will still benefit from it. Many landowners, who do not plan to manage for timber, are selling their timber when offered attractive prices. Not having had the benefit of professional forestry advice, these poorly informed "last-minute" arrangements often have negative consequences for the landowner and his or her property. In response, some regions of the country are including timber management advice in plans even when timber is not a landowner's as a primary or secondary objective.

7) In order for an incentive program to be successful in the United States, it must have strong political support**.** In the United States and likely in other countries, a program must not only achieve the desired objectives, but must also have strong political support in order to be sustained. The Stewardship Incentive Program resulted in the implementation of 526,092 hectares of Forest Stewardship Plans and 566,560 hectares of conservation practices on the ground. However, despite these accomplishments, it is no longer funded. Many of the State forestry agencies did not support its continuation. Some preferred not to link financial assistance to plans, for reasons discussed earlier. Some found the administrative requirements to be very burdensome and found that the cost of administering the program to outweigh the advantage of receiving federal funds.

Conclusion

In conclusion, the Forest Stewardship and Stewardship Incentives Programs have been directly responsible for improved management on close to 890,309 hectares of NIPF lands. There have also been many indirect benefits. The management of these programs has provided the USDA Forest Service and our State partners with a wealth of experience on managing landowner assistance programs. Many States have created similar State-funded programs. Program funds have also been used to support groups of landowners that reach out to other landowners to help them better manage their lands and, most important of all, many landowners have been exposed to the benefits of informed forest management.

Much work remains. Less than two percent of NIPF ownerships and less than seven percent of all NIPF lands have Forest Stewardship plans. Only 5% of NIPF lands are under any sort of management plan at all (Birch, 1996b). As we move to the future, we need to do more with the limited funds that we have. What else can we do to make these dollars count more? Some have suggested that, rather than spread our funds across the country or across each State; we focus them more, say on high priority watersheds, and pool them with funds from other programs to make a more noticeable impact. Some States and Forest Service Regions are doing just that and we will likely see more of this in the future. For some States this approach can be difficult politically – how can a State official justify spending funds in only a few watersheds when there are landowners in need of assistance across the entire State? Others have suggested that Forest Stewardship Plans are so labor

intensive that they prevent us from reaching many people. Instead, we should prepare more narrow, focused plans for more landowners – to plug them into the technical assistance arena. As we learned from the Esseks/Moulton survey, an FSP plan can represent the first of many contacts with professional's forestry assistance. Perhaps a less intensive plan would also have this effect. The flip side of course is that a narrower plan would be less likely to encourage landowners to adopt multi-resource management techniques.

The Alabama Forestry Commission has chosen to use some of its Forest Stewardship dollars to support the "Alabama Treasure Forest Association", a landowner association that encourages its members to reach out to other landowners and encourage them to participate in sustainable forest management. This is another way to spread our resources further. Another is to work more with non-profit organizations or other State and Federal agencies that have similar goals, and share resources. A number of States, for example are working with The Nature Conservancy, a non-profit organization that, among other things, assists landowners to manage working lands sustainably.

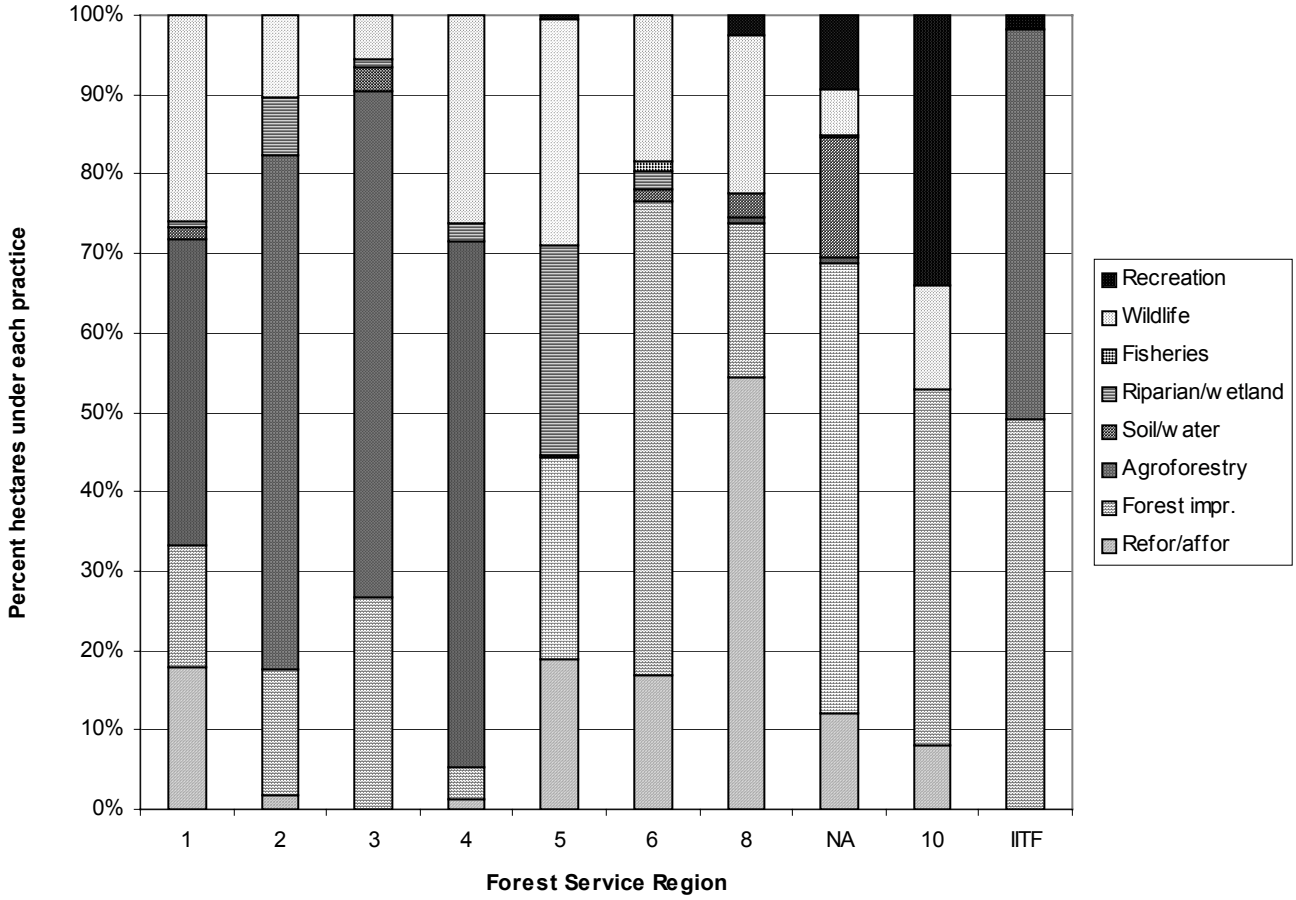
Of course another alternative is to provide greater funding to support sustainable management on private forestlands. In response to the lack of funding for the Stewardship Incentive Program, a number of groups, representing State forestry agencies, private landowners and counties, among others, are working to design a new incentives program – one that will receive broader political support than SIP. Current proposals are very similar; promoting a program that gives States maximum flexibility to spend funds according to State needs – on financial, technical, and/or educational assistance. They do not tie financial assistance to the preparation of Forest Stewardship plans.

Table 4: U.S. Forest Service Regions

Forest Service Region		**States Covered in Region**
Region 1	Northern Region	Idaho, Montana, North Dakota
Region 2	Rocky Mountain Region	Colorado, Kansas, Nebraska, South Dakota, Wyoming - partial
Region 3	Southwestern Region	Arizona, New Mexico
Region 4	Intermountain Region	Nevada, Utah, Wyoming - partial
Region 5	Pacific Southwest Region	California, Hawaii, Guam, American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Marshall Islands, Palau
Region 6	Pacific Northwest Region	Oregon, Washington
Region 8	Southern Region	Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia
Region 10	Alaska Region	Alaska
IITF	International Institute of Tropical Forestry	Puerto Rico, Virgin Islands
Northeastern Area		Connecticut, Delaware, Iowa, Illinois, Indiana, Massachusetts, Maryland, Maine, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Wisconsin, West Virginia

Table 5: Percentage of hectares under each SIP practice; regional comparison									
	Practice:								
Region	Refor/affor	Forest Improvement	Agroforestry	Soil & Water	Riparian & Wetland	Fisheries	Wildlife	Recreation	Total
1	18%	15%	38%	2%	1%	0%	26%	0%	100%
2	2%	16%	65%	0%	7%	0%	10%	0%	100%
3	0%	27%	64%	3%	1%	0%	5%	0%	100%
4	1%	4%	66%	0%	2%	0%	26%	0%	100%
5	19%	25%	0%	0%	26%	0%	29%	0%	100%
6	17%	60%	0%	1%	2%	1%	18%	0%	100%
8	54%	19%	1%	3%	0%	0%	20%	2%	100%
NA	12%	57%	1%	15%	0%	0%	6%	9%	100%
10	8%	45%	0%	0%	0%	0%	13%	34%	100%
IITF		49%	49%					2%	100%

Figuure 5: Percentage of hectares under each SIP practice; Regional comparison



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Capping the Cut: Preliminary Analysis of Alternative Mechanisms - *Lloyd C. Irland*

The Irland Group

Introduction

It is noteworthy that in the growing literature on "sustainability," the matter of timber flow sustainability is considered so marginal as to not warrant mention even in the index of many leading books. The speed with which this has occurred has been stunning. So, perhaps I can be forgiven for giving a moment's attention to this topic, while setting aside for the present the other more complex and apparently far more popular aspects of forest sustainability. Those issues require serious consideration but there is no time here for a book.

In US forest policy today there is a major disconnect between data and analytical technique and its application to the critical issue of sustained timber yields. We have never had more powerful computer models, and better in-place characterization of the forest resource. In many regions, analysts have a menu of competing models to choose from. We have never had better inventory data or better data on response to treatment. There have never been so many competent analysts capable of using these techniques. Our ability to conduct economic optimizations is unparalleled. Yet, the best applications of these capabilities have been conducted at two particular scales: individual management units such as company forests or National Forests, and the scale of entire nations and vast regions.

Important questions about Timber Sustained Yield (abbrev. TSY) are cropping up at *the intermediate geographic scale* -- states and regions of multi owner landscapes. In more and more areas, future timber sustainability is in question. In a few instances, cutting above current growth is currently occurring. Whether potential yield is being exceeded is usually debated. Arguably, we are really looking for a sustainable supply offered to the market, given some constraints for biodiversity. However we formulate those further conditions should not affect the discussion here on policy options.

If we are to ensure timber sustained yield (abbrev TSY) in multi-owner private landscapes, we will ultimately be compelled to find some way to cap the cut at a suitable level. This paper considers five broad options:

-- Let the market handle it
-- Jawboning
-- Log export bans
-- Controls on mill capacity
-- Controls on cut at landowner level

To implement these options, one could then consider a number of different mechanisms. These options, actors, and mechanisms then present a toolkit of possibilities, many of which may prove unwise or infeasible in particular circumstances.

> **Sustained yield** 1. The **yield** that a **forest** can produce continuously at a given intensity of management -–*note* sustained-yield management implies continuous production so planned as to achieve, at the earliest practical time, a balance between increment and cutting 2. The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various **renewable resources** without impairment of the productivity of the land –*see* **ecosystem management, long-term sustained yield (LTSY)**
> Source: Helms, 1998, p.181

Stylized Facts and Examples

Minnesota

Various ways of comparing the state's estimated growth and removals suggest a wide range of uncertainty in the net growth to cut balance (Fig. 1). The growth estimates have not been updated to fully account for recent management or for likely effects of a number of recent stresses, and estimates of removals have the usual uncertainties. A large decline in aspen inventories has long been expected (Gephart, et al., 1990; and Jaakko Pöyry, 1991). Around the Lake States, parcel fragmentation has been noted as an emerging concern for future supply.

New Hampshire

Responding to a concern over increased cutting, the State of New Hampshire conducted a special field survey and analyzed timber availability. The conclusion was that on plausible assumptions about availability, the 1995 levels of cutting might already have been excessive for several species (NH Forest Inventory Project Steering Committee, 1995, Sec. IV).

Maine

Maine exemplified the risks in interpreting "sustainability" in terms of current growth. Current

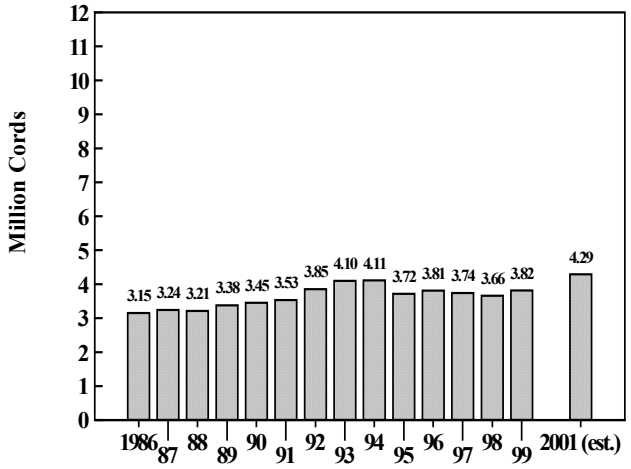
growth has fluctuated wildly in recent decades due to a variety of factors (Fig. 2). At no time did measured growth fall within a band defined by recent estimates of calculated sustainable yield.

Due to a lopsided age class distribution, a devastating spruce budworm outbreak, and associated heavy cutting, the Maine spruce-fir inventory has declined. According to a state study released in 1998 using 1995 inventory data, the state is cutting spruce-fir well above current growth. Growth of young stands, and effects of better management could bring this situation back into balance by the year 2040 (Fig. 3). Future risks to landbase and availability were not given extensive discussion in this report (Gadzik, Blanck, and Caldwell, 1998).

South – Sawtimber

It is recognized for some time that the South is cutting sawtimber at a rate exceeding current net growth. The debates concern to what degree management intensification will increase in response to rising prices and how future land use change affects supply (Siry, Cubbage and Malmquist, 2001). The Southwide Assessment currently underway is a massive effort to examine this question on a regional basis, using state of the art modeling, and setting the issue firmly into the context of current understanding of the links between timber management and sustainability of other forest resource values (Bechtold, n.d.; Cubbage, et al., 1995; deSteiguer, et al., 1989; and Wear, 1995).

Figure 1A



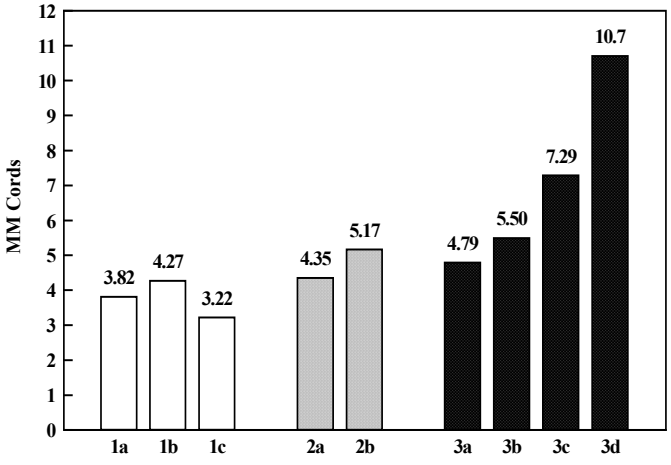
Actual & Projected Timber Harvest in Minnesota from MN Timberlands, All Ownerships, All Species

Source: DNR, Bureau of Forestry.

Harvest data compiled by NCFES and DNR.

*** 1995 adjustment due to decrease in fuelwood use since 1989/90.**

Figure 1B



Harvest Estimates and Alternate Productivity Measures

1. Harvest Data
- **a. Harvest 1999 (1)**
- **b. Projected Harvest 2001 (1)**
- **c. Harvest from Growing Stock (6)**

2. Past Growth
- **a. Average Annual Net 1977-1989 (2)**
- **b. Current Net Growth 1989 (2)**

3. Calculated "AAC's"
- **a. DNR "AAC" (3)**
- **b. GEIS "AAC" (4)**
- **c. 1989 Growth Plus Mortality (5)**
- **d. "Naive" Productivity (6)**

Sources:

(1) DNR, Bureau of Forestry, Oct. 2000.

(2) NC-158, p. 116, 128.

(3) DNR.

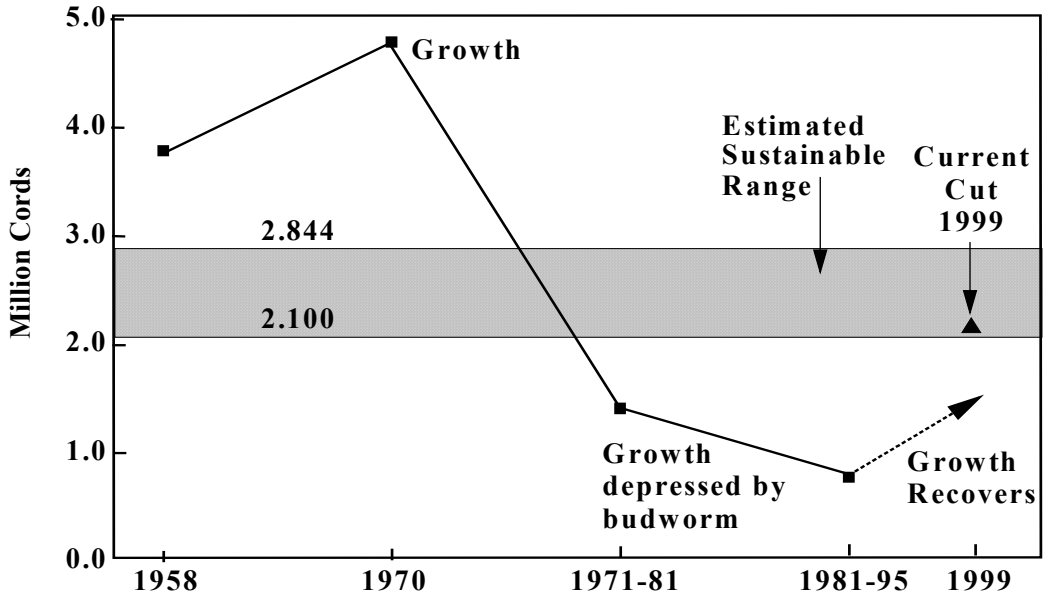
(4) GEIS Summary, 1994.

(5) NC-158, p. 121.

(6) NC-158, Table 8 below.

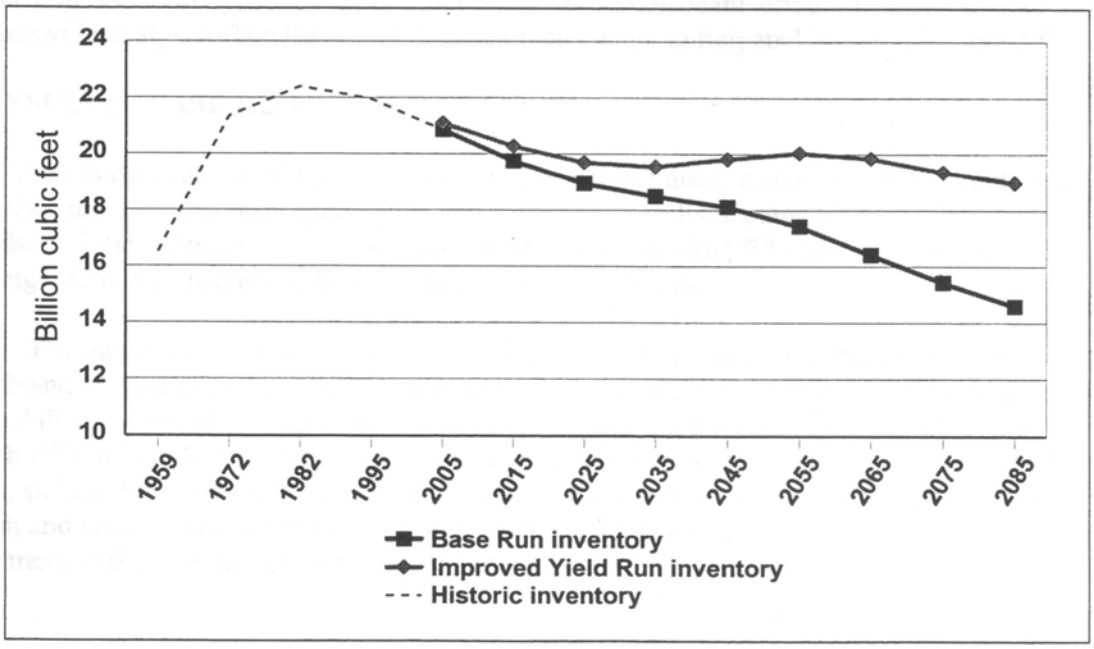
Figure 2

Average Annual Growth and Calculated Sustainable Yields, Maine Spruce-Fir Resource, 1958-1995



Source: Ferguson and Longwood, 1980, p. 47; NE-26, p. 57; NE-81, p. 37; NE-135, p. 35.
Converted to cords at 85 cu. ft.
Note: A number of technical differences in definitions affect interpretation of these numbers.
Range sustainable:
2,844 - Seymour and Lemin, 1989, p. 37.
2,100 - MFS, 1998, p. 17. Base run assuming intensive management investments cease after 2005 (as at p. 13 of source)

Figure 3



Projection of statewide inventory for Base Run and Improved Yield Run. (Data for 1959 to 1995 are from forest inventory reports. Data points after 1995 are based on ATLAS modeling projection.)

Source: Gadzik, Blanck, & Caldwell, 1998, p. 8.

North Carolina

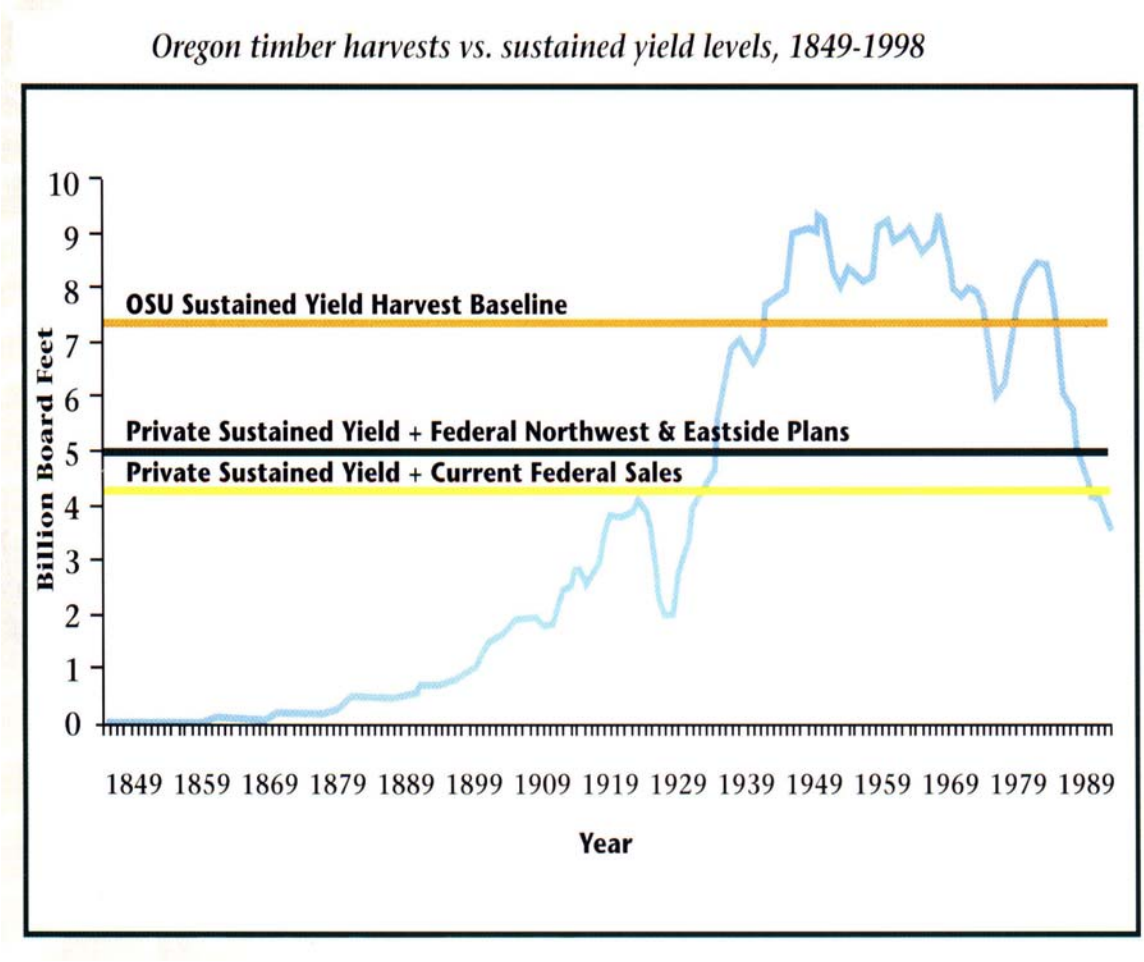
A North Carolina commission evaluated the state's resource position, using some of the research strategies previously developed for assessing availability. This group was led to some sobering conclusions. Depending on assumptions made concerning future land use change and availability, the state could already be in a deficit position. Future land use change was identified as a key variable (North Carolina Task Force on Forest Sustainability, 1996; Cubbage, et al., 2000).

U.S. West

In a number of National Forest regions in the West, a decade or more of contention over "even-flow" harvest schedules ended in a flash once it developed that those harvest schedules were not politically sustainable (Fig. 4). Massive declines in federal timber flows triggered rapid and dramatic changes in management plans, cutting levels, land and timber prices, industry competitiveness, and industry mix. Old assumptions that considered stable harvest flows from public lands as a kind of permanent entitlement were dashed. The very fall down in cut, for which the rapacity of private landowners was criticized by early Forest Service leaders (e.g. Timber, Mine or Crop?), was now occurring on federally managed lands. The issues and outlooks have been widely discussed (USDA Forest Service, 1969; Adams, et al., 1992; Adams, et al., 2000; US GAO, 1978; Gedney, Oswald, and Fight, 1975; McKillop, 1993; Sessions, 1990; and Oregon Dept. of Forestry, 2000).

"ICEBEMP" (Interior Columbia Basin Ecosystem Management Project) included a wide range of issues, and its methods deserve some note, but it applied solely to federal lands and so did not need to address the matter of capping the cut on private lands. It is probably fair to say, however, that the ICEBEMP was conducted in an intellectual atmosphere in which timber sustainability was considered at best a necessary evil, potentially in the way of more important things.

Figure 4



Source: Oregon Dept. of Forestry, 2000, p. 12.

National Overviews

Regularly, USFS National Assessments display charts confidently showing that on a national basis, sawtimber and growing stock inventories are rising and will continue doing so even when substantial increases in population, income, and wood products consumption are assumed (Haynes, et al., 2000). Yet, even recently, a team of resource experts offered the claim that timber sustainability cannot in fact be substantiated for the United States (Nilsson, et al., n.d.). Certainly, it can be said that a national focus allows the conditions in the states with rapidly growing inventories to obscure the local areas where the situation is closer to a balance or even negative.

Eastern Canada

At least in parts of each and every eastern province, there exist serious doubts as to timber sustainability under current management regimes, and unresolved issues of availability. Additional uncertainties are posed by widespread emerging support for greater allocations to Reserves (Auditor General, 2000; MacFarlane, 1997; Beyeler, 1999; Cameron, 2001; National Round Table on the Environment and the Economy, 1997; Natural Resources Canada, 1994; Natural Resources Canada, 2000; Reed, 1991; Reed, 1992; Runyon, 1991; and CFM, 2000).

British Columbia

In BC, there have been occasions when the annual harvest did exceed calculated allowable cut levels, during high points in the lumber market. Since, there have been additional allocations to reserves, and the adoption of the Forest Practices Code has affected availability and raised costs. A new cycle of

intensive planning has been underway. Activist groups have been attempting to gain a major reserve in the so-called "Great Bear Rainforest" on the coast, where old growth has been heavily cut. There is also intense controversy and legal battling over Native rights. Both of these issues cast a pall of uncertainty over future timber flows. At the same time, the BC Forest Service is arguing that in many forest types, future potential productivity has been underestimated.

Reductions in harvest levels have already occurred. Efforts to respond to resulting job losses by massive investment in intensive practices, and a program of incentives for increased value added production, have been underway for several years (Marchak, Aycock, and Herbert, 1999; Lonnstedt, Merkel, and Reed, 1990; and Pedersen, 1997).

The Role of Land Markets

The role of sprawl, fragmentation, and erosion of both the landbase and availability by these forces has been much discussed in recent years. In some regions, if retention of a forest landscape, some level of public access, and sustaining of timber flows is desired, it will have to be accomplished by immunizing large areas against subdivision and development. This is actually being done, on an ad hoc and unplanned basis, in the so-called "northern forest" today.

In most places, it will not be feasible to immunize more than tiny areas, and so the achievement of sustained timber flows will be impossible over any long period of time. Frequently, "investment" in timberland property is merely a holding period prior to subdividing for maximum gain on resale.

What Does Timber Sustainability Mean?

The public policy issue is simple. That is: *can we ensure that timber sustained yield is provided for over very large areas in the face of escalating future demand for wood?*

Typically, without even saying so, we think of sustained yield as a concept applicable to a management unit. On those occasions when we speak of wider geographic areas, we consider the problem to be more one of assessment than of planning and control, simply because there have been no readily available tools to control the cut at this scale.

It may be useful to think of a number of preconditions for understanding timber sustainability within some defined timbershed or region. With this audience these would probably not be especially controversial and they need no elaboration here (Table 1). Applying these to specific situations obviously will encounter data limitations. Applications will never be free of uncertainty and contention. In more than a few instances, a sound "harvest schedule" for the area may depart from "non-declining even flow." Explaining why may be a challenge, however. The forestry community must assume the difficult role of explaining to the public, the media, and legislatures the complexity of what timber sustainability means. This is best done in advance of a crisis.

Sustainability will usually not be simply a matter of masses of undifferentiated tons. It may be a matter of a major bread and butter species (e. g. spruce-fir in Maine) or a rare and valuable one (Mahogany, RCW nest trees). One can take this to extremes and wonder if a TSY for Birdseye maple should be imposed. There is considerable ambiguity in this area that deserves further consideration.

The existence of trade challenges any effort to impose local sustained yield. We would wish to avoid the "Taiwan Syndrome." In that scenario, a jurisdiction dramatically reduces harvests from its own forests, and then sustains its industry based on imports, thereby exporting the problem. In a way this is the opposite of achieving sustainability by log export bans. It is achieving sustainability of processing capacity by importing fiber, rather than by embargoing exports.

A serious question arises: who is to be charged with calculating the authoritative and binding "AAC"? Different jurisdictions would have their own preferences. The Canadian Royal Commission model has a great deal of appeal. A Royal Commission may have one or more members. It is empowered to provide objective, high-level advice on matters of high importance. Forest Economist Peter Pearce has served in this capacity in British Columbia.

Table 1
Preconditions for Timber Sustainability in Private, Multi-Owner Landscapes

Resources, landbase, management practices can support current/expected harvest levels, preferably with some safety margin, however small. Import/export balances are sustainable.

Explicit and well-supported assumptions are made concerning future intensive management and its effects.

Risks to future availability of management practices are known.

Sound and improving understanding exists of impacts of different harvest levels on non-timber resources, and extensive and credible monitoring is conducted.

Future technological change in growing, harvesting, and processing wood is accounted for.

Risks of dependence on public timber flows are minimized.

The relevant geographic area is recognized.

Assumptions concerning future global climate change are made.

Market imperfections are recognized and accounted for.

Assumptions concerning availability are clear and plausible:
land use change
owner intentions
public policies

All parties know what is going on:
volumes cut and movements
potential for "exporting the sustainability problem"
prices

Total fiber balances of the industry are known at relevant geographic scales.

A sense of range of possibilities in the supply/demand outlook is accepted.

Credible sources of analysis are available.

Some restraint is applied to the "fiduciary obligation" (to maximize $ by subdividing).

A stable, supportive political and policy environment for long-term ownership, investment, and management exists.

Evaluate Experiences Elsewhere

In a variety of political and social settings, experience may exist concerning how to "Cap the Cut" (CTC) in multi-owner, largely private landscapes. Nordic forestlands are regularly mentioned, though I am told informally that controls once in existence are no longer in effect. There is a need to conduct a worldwide scan on this issue and see what lessons have been learned elsewhere.

Five Options

These five options seem to provide an initial range of options for consideration --

1. Let the market handle it
2. Jawboning
3. Log export bans
4. Controls on mill capacity
5. Controls on cut at landowner level

1. Let the Market Handle It

This is usually the course of least resistance, and as a result has a lot of practical and political appeal. It can be buttressed by the familiar ideological arguments. It's the "American Way." It can also be supported by more or less formal forms of economic analysis that assume such things as perfect foresight and precise and immediate economic adaptation to the implications of such foresight. The theoretical appeal of "let the market handle it" hinges on this unspoken assumption of perfect markets. There are areas where a high degree of effective competition prevails, other areas where it is entirely absent, and there exist many intermediate cases. Timberland owners may willfully ignore the many externalities and market failures characteristic of land markets, but others won't ignore them.

Many examples could be cited illustrating that wood markets can adapt to emerging signals of scarcity. They re-adjust wood flows geographically, they shift use to more abundant species, with product mixes, they increase recovery ratios, use smaller sizes of wood, they recycle, and they turn to non-wood substitutes. End users find ways to use wood more efficiently or replace it with other materials. Landowners may even intensify management. Yet, we have yet to see an example of sustained timber flows being achieved over any wide area, and over any significant long time period as a result of private market forces alone, in situations of extreme demand pressure. Insightful local case studies on market adjustment could be very valuable.

2. Jawboning

One approach that might have appeal, especially in advance of a crisis, would be old-fashioned "Jawboning." This could consist of state or other leaders committing themselves to persuading high volume users of wood and landowners to behave as if they believe in timber sustainability. Of course, support from private industry and landowner leaders would be helpful. This approach might have to include criticizing private actions that are inconsistent with sustained yield -- "naming and shaming." For this approach to work, leadership must step forward, and be prepared to sustain the campaign for a long period. Considerable criticism and political inconvenience could result.

If accompanied by the right kind of leadership and supported by sound information, a jawboning strategy might be worth trying. The big problem is the widely held American attitude that land is just monopoly money, something to be grabbed and stripped for instant gains. So long as this idea is so firmly implanted in our culture, it can easily undo the work of many who do not feel that way.

3. Log Export Bans

In many areas, exports of logs or chips are important features of the local timber economy. This is a huge subject that has generated a large literature. This would be a fit subject for an entire conference. Export bans raise legal issues, concerns about administration and effectiveness, and perverse side effects. These convince me that relying on log export bans to achieve timber sustainability is not an appealing strategy (Irland, 2000).

In the end, overcutting is overcutting, whether the product is shipped out as a log or as a pack of lumber. Overcutting is overcutting whether the log goes to Ashland or St. Pamphile, to Kentucky or to Belgium, to Roseburg or to Seoul, to New Bern or to Yokahama.

4. Controls on Mill Capacity

In a given timbershed, mill capacity and net exports of logs/chips will determine the harvest of wood (setting aside land conversion, firewood, and minor sources of drain). So the idea is occasionally raised, if we seem to be at risk of overcutting, why not control mill capacity? Bills to require this have been introduced into the Maine legislature. Campaigns against chip plants are an application of this approach.

This idea seems very appealing on its face, but raises fearsome questions of law, administration, and

policy. Further, even in mature industrial regions, the "capacity creep" in existing plants is a huge source of increased fiber consumption over time. Whether this approach could be made to work in the real world is uncertain.

5. Caps on Cut at Landowner Level

Finally, we arrive at the landowner level. We understand that if all the landowners in a region were to regulate the cut on their individual properties according to sound analysis, the resulting AAC for the region would likely be sub-optimal. This is a serious objection to any effort to regulate regional TSY on a property-by-property basis. Also, the sheer number of properties involved would give one pause.

Caps on cut could take a variety of forms. They could be:

-- voluntarily assumed by landowners (self-policing)
-- voluntary with audit (trust but verify)
-- non-binding guidance
-- regulatory controls

Clearly, in the U.S. the institutional setting and political culture for this approach do not at present exist. In parts of Canada, the institutions may be said to exist, at least in embryo, but not the political culture.

Mechanisms to Implement the Options

It is one thing to have some interesting option to manage this problem. It is another to have a feasible mechanism for implementing it. Some of the options have a limited number of potential mechanisms, while others offer quite a range of design and implementation possibilities (Table 2). ***(See Table 2 on next page.)***

The option of "*let the market handle it*" could be seen as a "do-nothing" option, but it isn't. "Letting the market" do it presupposes ready availability of detailed information to all parties. It requires some means of assuring that market imperfections do not dominate outcomes. The objective is to ensure that the market really can potentially handle the situation. It requires attention to stability of the policy environment. This may take some hard work.

A "*Jawboning*" approach would require that those doing the jawboning have access to credible information on the situation and the outlook, and the necessary informational tools to make that widely known. The key constraint on this approach, however, is political will.

Implementing *log export bans* would require suitable legal tools based on national and state/provincial constitutional provisions, plus the administrative capacity to enforce the resulting rules. That capacity cannot be assumed to exist, even in the U.S. and Canada. For specific species, quarantine (log shipments spreading gypsy moth or hemlock wooly adelgid), ESA (Endangered Species Act), or CITES (Convention on International Trade in Endangered Species) considerations could enter.

Controls on mill capacity can be employed when the mills are supplied by leaseholds on public lands, as in Canada, but there is no suitable existing mechanism in the USA. A determined effort could undoubtedly find legal mechanisms. In Minnesota, for example, environmentalists have attempted to use environmental permitting processes to introduce evidence concerning alleged overcutting in emissions permitting proceedings for paper mills. Similar efforts have been used by chip plant opponents, at times with success (TVA). Such approaches may prove attractive to these groups more widely. Considering the formidable treasuries and legal skills at the disposal of these groups, we would ignore at our peril the potential for Capping the Cut to be attempted through wholly unanticipated legal avenues.

In limited instances (a few power plants in Maine, Vermont) regulatory agencies have imposed *burdens on plant owners* to certify that forest practices used in harvesting their feedstock are sound and are forester-supervised. An approach of this kind could represent a mild bow to CTC objectives even if not strictly meeting them. Whether and how these have actually worked should be evaluated.

Self-policing would seem to have more appeal than is commonly granted, even though it lacks credibility with many people. The leading program in North America is the AFPA's SFI effort, which has a provincial-level analogue in Alberta (ForestCare). The original SFI approach of first party verification has lost credibility even with its inventors. The SFI system is embracing a wider and more public range of second and third party approaches. So far, these approaches seem to satisfy industry's volume customers, but not the environmental groups. The general public and legislatures remain skeptical. It remains to be seen whether the companies are prepared to do what it takes to turn SFI into a truly effective program for

improving public confidence. It looks as if a few of them are.

Green certification has been discussed and debated -- far, far more than it has actually been used. As a veteran of several major certifications, I am probably too close to this issue to evaluate it objectively. For areas where the concern is immediate, it does not seem likely that certification could spread fast enough to be a policy bulwark of much strength. The problem would remain of how to account for the many landowners that would remain uncertified, which would then have a free ride on supply assured at someone else's cost. The option of requiring certification by law is unpalatable, as this would create an effective monopoly on policy in an unelected body outside of a nation's borders, and would destroy the basic concept of certification as a voluntary effort.

Table 2 - Mechanisms to Implement the Options

Option	Mechanism
1. Let the market handle it	Provide information on woodflows, prices, antitrust policies, etc.
2. Jawboning	Improved assessment, monitoring, and outlook research. High Level "Bully Pulpit" Work
3. Log export bans	Federal action under commerce clauses or delegation to states/provinces.
4. Controls on mill capacity	Permits with usage limits and audits. Legal responsibility on large users for how wood is cut. Self-Policing (SFI) Certification
5. Control cut at landowner level	Regulatory requirements. Immunize land against subdividing. Certification. Self-Policing.
6. Tax Incentives	Who Knows?

There is abundant literature on certification (Alberta Forest Products Association, 1998; Barker, 1998; Dykstra and Heinrich, 1994; Ingram, 1998; O'Hara, et al., 1994; Potter-Witter, 1995; Sedjo, Goetzl, and Moffatt, 1998; Stevens, Ahmad, and Ruddell, 1998; Viana, et al., 1996; and Vogt, et al., 1999).

Controlling the cut at the landowner level raises similar problems to controlling the usage of mills, with the additional problems posed by sheer numbers. The risk is that effective TSY could be achieved on public and large private properties, but then the overcutting is concentrated on small private ownerships that are exempted from the rules. Examples of this are occurring now.

At the landowner level, the approach of immunizing areas against subdividing has appeal, but it is a long-term and costly solution, as it will require immense amounts of public and nonprofit capital, as in the extensive easements in the northeast. Whether the approaches being pioneered now in the Northeast will spread to other regions it is too early to tell, but clearly many areas of private timberland lack the wilderness appeal of some of the northeastern areas, and these approaches are too costly to apply to highly parcellized landscapes.

The same considerations apply to using self-policing and certification at the landowner level as at the mills.

Economists are prone to believe that properly structured *tax incentives/disincentives* can induce private actors to behave in desired ways – to conduct more research, plant trees, drill for more oil, emit less carbon (carbon tax), invest in more plant and equipment (ITC). They also regularly analyze disincentive effects of various taxes. Is there some kind of tax regime that would induce mills and landowners to behave in ways that would ensure that sustained yield is not violated?

Any effort to cap the harvest level by controlling mills or landowners would have to deal with a large number of legal, administrative, and economic issues, and unintended consequences (see, e.g., Irland, 1996). There are serious "free rider" problems and difficult questions of how markets would adapt to the constraints imposed. Regulatory approaches to achieving a Capped Cut, then, should be a last choice option for when others are exhausted. Yet, the fear of regulation may be a necessary incentive for refractory or greedy private parties to do what is right.

Finally, if the forestry community chooses to ignore these difficulties, other groups out there will not. There are 11 states with citizen initiated referendum provisions. In Maine the approach has been used ostensibly for precisely the purpose of ensuring sustainability (but there is usually more to the story).

We now turn from the question of what options are available, to who should implement them.

Who Should Implement the Options?

Implementing any of these options depends on having a suitable institutional mechanism to implement it. The list of possibilities is not long.

Federal Government

Federal forest regulation has a long history of contention in this country. It seems to have been decisively rejected. There are probably even more objections to federal regulation as a method of CTC today than there were in 1950. There is probably little use in considering the federal level of government any further. In the several instances in which unrelated regulatory or other authorities have been employed to address alleged timber sustainability issues, the decisions have not been well supported by facts or logic.

State Governments

States have developed a wide variety of approaches to forest policy, and varying levels of capability for assessment and planning. To date, regulatory efforts have focused on forest practices and not on timber sustainability. Even so, there are scattered examples of state regulatory bodies (often PUC's) imposing burdens related to sustainability on large-scale wood users.

A serious weakness of relying on state governments is that many states are too small relative to timbersheds to have meaningful effects. In much of the country, an astonishing volume of wood crosses a state line before it is processed (see, e.g., Irland Group, 1999). Getting more than one state to address an acknowledged problem could be impossible. It is too easy to export this problem.

States can play extensive roles in better monitoring, in local assessments, and in the "jawboning process," assuming effective leadership emerges. At present, many states have become battlegrounds in the disputes over whether chip plants are a threat to sustainability. Like it or not, at least in those states, they are in the fight. Regulatory tools totally unrelated to timber issues, may have application.

Some states do a commendable job at tracking drain, while others ignore this issue entirely. Those states that ignore tracking drain should not be allowed to pretend that they are concerned about sustainability.

Local and Regional Agencies

It would seem unwise to grant counties or substate units any authority over allowable cut policies. For substate regulatory bodies with extensive jurisdictions, such as the Adirondack Park Authority, or Maine's Land Use Regulation Commission, however, the notion may deserve further consideration.

Self-Policing by Mills/Landowners

There would be two approaches to self-policing, one would be simply to rely on private declarations of conformance to the requirements of TSY. This approach would lack public credibility in many areas today. Another approach might be self-policing

backed by third party audit and by selective and objective public monitoring. It might be interesting to give this a try someplace.

Reflections: Directions for the Future

The "Capping" Issue Deserves Higher Priority

Some people seem to have reached a considered conclusion that timber sustainability is no longer meaningful. I haven't. I believe the issue of capping the cut ought to be a priority for further policy evaluation, analysis, and debate within our own and allied professions. If we as foresters do not pursue this agenda, other groups will. It's happening now. We may not like their ideas very much. But they have more clout, money, media access, and staying power than we do.

Is CTC Feasible? Cannot Say

At present, this review does not suggest that in the US we are in a position to immediately adopt policy that will effectively lead to CTC without unacceptable side effects. I suspect this also applies to Canada.

The Law of Unintended Consequences

.... has not been repealed. Any and all ideas considered for CTC must be subjected to intense scrutiny. We know the Law of the Second Best. Incomplete, ill-considered, or batched efforts to CTC will be worse than inaction. The far simpler topic of log export bans offers multiple examples.

Examine What Has Already Been Done

Identify the examples, and review them with care. Has it been working? What are the lessons?

Acting Sooner Always Beats Acting Later

The worst question in the world for a matter like this is: "Is there a crisis?" The idea is to prevent a crisis, not wait until it occurs. But acting early, when the social costs are least, is contrary to our political culture.

We May Have Only Bad Options

We may be unable to invent any policies that are "better" than the worst ones in our inventory -- such crude instruments as log export bans. If this is where we end up, we will be forced to balance the goals of achieving sustained timber flows against the costs of misallocations and contention associated with second-best policies for capping the cut. *If we forswear the CTC Option*, we should be honest with the industry and the public about the likely consequences.

The proper standard of comparison may not be perfectly functioning, theoretically ideal markets, nor is it even a good "second-best" policy. The question in some jurisdictions will be, can we devise a policy that beats a demographically promoted, third-best, extreme policy?

Improved Assessment of Condition and Outlook

Some good models for the types of assessment we need to be doing are out there. The Lake States Forest Assessment was a good example of a regional assessment. Considering the positive growth/removals balances in those states at the time, there was no need to explicitly consider the policy issue of CTC, or to engage in detailed supply assessment.

The Minnesota Generic Environmental Impact Statement (GEIS) was motivated in large part by a concern on the part of some groups that escalating timber cuts could lead to overcutting. Hence, the project devoted extensive attention to both timber sustainability and to biodiversity issues. The Northern Forest Lands Study and Northern Forest Lands Council conducted extensive assessments of regional context and trends, focusing on land availability. Explicit modeling of timber sustainability was not conducted, since over much of the region growth/cut balances were positive. The current Southwide Assessment will be available very soon and promises to advance the debate. The recent region wide outbreak of state-level "chip plant" assessments (e.g., Cubbage, et al., 2000) will also enrich the discussion.

Seek a Stable Policy Environment for Long-Term Management

If states are to "grow their way out" of supply crunches through intensive management, a stable policy environment for ownership, investment, and management is an essential condition. Perfect stability is unattainable, and perhaps not desirable. But when instability is excessive, capital markets know it when they see it.

Conclusion

In places where the current cut and projected AAC's are close together if not in deficit now, the forestry, landowner, and forest industry communities face a major challenge. Problem denial will not work for long. Accepting the realities and explaining what is being done about it has a chance, but it is not being very widely tried. If we as a community cannot come up with credible ways to ensure the public that sustained timber yields are provided for, we leave the door open to demagogues who will do it for us.

The research community has a lot of homework to do to develop a sound practical understanding of all the many issues noted in this paper, before we are even close to designing something that deserves to be called a policy for Capping the Cut.

At a minimum, however, areas where TSY is already an issue should be attending to a vigorous package of actions to maximize the ability of markets to adjust, to support intensive management, and to engage in vigorous jawboning against perverse or short-sighted actors.

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Private Forest Management in Urbanizing Landscapes - *Jeffrey D. Kline*

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Introduction

Private forestlands face increasing pressures from growing human populations, resulting in the increasing encroachment of urban uses onto forested landscapes. Previous research suggests that increasing population densities can lead to reduced management and harvest among private forest owners. In this way, urban encroachment can adversely affect the future supply of timber produced by private forests as well as alter habitat for terrestrial and aquatic species. Both outcomes are of particular interest in the United States where increasing public concern for ecological protection has led to reduced timber harvesting on public lands and greater reliance on private forestlands for future timber supplies. Meanwhile, socioeconomic change accompany-ying population growth and urbanization also can influence forestry activities by reshaping the political environment in which forestry takes place, with resulting changes in regulations and laws affecting forestry. In this paper, we examine the potential impacts of population growth, urban encroachment, and socioeconomic change on private forest management.

Population Growth, Urban Encroachment, and Forest Management

An increasingly important factor in forestry policy is the potentially significant impact population growth and resulting land use change will have on forests as they are converted to residential, commercial, and industrial uses. Encroachment of these developed uses into forested landscapes can cause the forestland base to become more fragmented with resulting ecological and economic impacts. Conversion of forestland to developed uses essentially is a permanent change leading to permanent fragmentation of the landscape, in contrast to forest cutting and fire where re-growth and succession may overcome temporary fragmentation. Ecological impacts from forestland conversion to developed uses can include direct loss of habitat or diminished habitat quality. Economic impacts can include less intensive forest management for commercial timber resulting in reduced economic output on private lands.

Much of this change occurs along the forest/urban interface, characterized by relatively low density residential and other development expanding out from existing urban centers into traditionally forested areas. Both Barlow et al. (1998) and Wear et al. (1999) find that private forest owners tend to harvest or manage their forestlands less intensively in locations where population densities are higher than in locations with relatively low population densities. While empirical research regarding the specific causes of these relationships are lacking, previous research does suggest several hypotheses regarding the likely impacts of urban encroachment on forestlands.

For example, forestlands located in urbanizing areas may become more fragmented into smaller and smaller management units. Previous studies suggest that the intensity of private forest management tends to decline with size of landowners' forest holdings (Row 1978; Thompson et al. 1981; Dennis 1990; Cleaves and Bennett 1995). New forest owners in increasingly urban areas may manage their forest parcels with less interest in the production of timber and greater interest in recreation, aesthetics, and other forest amenities. For example, Kline et al. (2000) find that 40% of non-industrial private forest owners in western Oregon and western Washington possess primarily recreation or passive forest ownership objectives rather than timber production objectives. These forest owners tend to own smaller parcels and are less likely to harvest timber. Also, Kline and Alig (1999) find that non-industrial private forest owners in western Oregon and western Washington tend to be more likely to develop their forestland to non-forest urban uses than are industrial owners.

Finally, many forestry analysts worry that urban encroachment results in greater likelihood of conflicts associated with the continuation of forestry activities in increasingly residential areas. Related to conflicts in particular, is the potentially increasing fire danger posed by greater numbers of houses in forested areas. Many forestry analysts feel that increasing numbers of residences located in forested landscapes are leading to increasing costs due to wildfire and overburdening firefighting resources that are re-directed to save homes instead of containing fires (Milloy 2000).

Socioeconomic Change

A potential secondary impact of urban encroachment is overall change in people's values

and attitudes toward forestry. Many social scientists believe the nation is experiencing rapid and significant change in forest values (Bengston 1994) and attitudes concerning forest management (Davis et al. 1991; Schindler et al. 1993). Egan and Luloff (2000) note that in many places of the United States, urban people are migrating to rural areas to improve their quality of life. These in-migrants are bringing with them different attitudes, needs, and values than those of long-term rural residents. Egan and Luloff call it the "exurbanization" of America's forests. The process leads to changing attitudes regarding the use and management of forests, and a push for forestry policies and practices that reflect changing forest values (Egan and Luloff 2000).

It is conceivable that such socioeconomic change will lead to continued changes in public attitudes and increased political activism regarding forestry. Residents in California, Maine, and Oregon all faced forestry-related ballot initiatives in recent years seeking to place certain restrictions of forestry activities in their states. For example, Oregon's Measure 64 in 1998 proposed to outlaw several forestry activities including the use of chemical herbicides and pesticides, on-site slash burning, and harvest of any tree greater than 30" in diameter. Additionally, Measure 64 would have banned clearcutting – defined as a harvest leaving less than 70 trees per acre with a minimum of 11" diameter in western Oregon and less than 60 trees per acre in eastern Oregon (Elections Division 1998a).

Oregon is a state with a growing population, expanding urban areas, and increasing numbers of workers employed in non-forest-related sectors. Analysis of county-level voting data in Oregon show that support for Measure 64 was positively correlated with population density, household income, education, and the proportion of county voters who are registered Democrats. Support for Measure 64 was negatively correlated with the proportion of workers in each county that are employed in the forest industry and the proportion of residents that are native-born Oregonian (Kline and Armstrong 2001).

These results in Oregon are consistent with previous research suggesting that public support for restricting forestry activities tends to be stronger among more urban, more educated, more politically liberal individuals (Schindler et al. 1993; Steel et al. 1994; Steel et al. 1998). It is conceivable that as populations become more urban, more educated, wealthier, and less affiliated with harvesting timber and other natural resources, they will possess less and less empathy toward timber industries and exert greater demands for outdoor recreation and the protection of forest amenities and wildlife. Such socioeconomic change accompanying population growth and land use change has the potential to transform the political climate of forestry for years to come.

Future Research Needs

Two significant factors affecting the future forest policy environment in the future will be population growth and resulting land use changes as forestlands are converted to developed uses. Conversion of forestlands to urban and developed uses can include direct loss of habitat or diminished habitat quality. Economic impacts could include less intensive forest management for commercial timber resulting in reduced economic output on private lands. Accompanying these changes in forest management are broader socioeconomic changes that have the potential to alter the demand and provision of multiple goods and services produced on remaining private forests. All of these changes will shape the socioeconomic context in which forest management will take place.

Integrated socioeconomic and ecological research increasingly will need information and analyses describing where humans are located on the forest landscape, how they are managing the portion of the forest landscape they occupy, and what they collectively demand and produce from the forest landscape in terms of forest products and non-timber outputs, such as recreation, aesthetics, and ecological protection. Researchers will be challenged to describe how human populations change over time and the degree to which population growth results in land use change, changes in forest management, changes in the demands people place on forests, and changes in the political environment in which forest policy and management will be shaped.

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Trends in Regeneration Policy on Public and Private Lands (Gifford Pinchot National Forest and Weyerhaeuser Company Example) - *Anna Tikina and John Gordon*

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Introduction

Humans tend to think about planting trees with some tenderness, viewing it as a concern about the future and as a provision for sustainability. This is one of the reasons why regeneration is an important stage in forest management, and explains its heavy regulation and monitoring. This study considers twenty years of regeneration efforts and was done to investigate how regeneration is performed and how the trees look like with respect to land ownership. One site was publicly owned and the other was private.

Adjacent lands in Washington State were chosen to minimize the major differences in natural conditions including climatic conditions, soil type, aspect, slope and elevation. The two sites were the Weyerhaeuser Yacolt division (WY), and the Gifford Pinchot National Forest (GPNF) in the Mt. Saint Helen's Ranger District and Mt. Adams Ranger District.

The hypothesis tested is that there is a difference in forest policy on private and public lands that influence regeneration success. The objectives of the study were: (1) to explain differences in regeneration policy over the last twenty years, (2) to define what the current condition of reforested lands is for the trees planted zero to five and fifteen to twenty years ago on both public and private types of land, and (3) to suggest whether regeneration differences exists and if so why.

Methods

The methodology of the study includes retrospective analysis, comparative analysis and gathered field data. A lot of attention was given to three sets of comparisons, which differed in time, i.e. how public and private regeneration policies have changed during the last twenty years, how they currently differ from each other, and how tree conditions differ.

Interviews with silviculture and regeneration specialists, and officials in the public and private sector comprised a valuable source of information. Information search and analysis included database work (for example, the Gifford Pinchot Vegetation Layer database), and work with GIS applications.

Numerical data for the study came from eight stands of each age class (0-5 and 15-20 years old) from GPNF and from six older and three younger stands from Weyerhaeuser. The stands chosen exhibited a wide range of conditions: an elevation range of 340 – 1025 m, a slope range from two to fifty-four per cent, different aspects, and productivity classes three to five in GPNF classification. In order to balance the conditions, the lower elevation stands from GPNF and the higher elevation ones from WY were chosen. The following criteria were selected for comparisons: (a) mean heights of the trees, (b) mean diameter (mean caliper for younger stands) and (c) the number of trees per hectare. The total woody biomass volume was chosen as a final measure in the comparison as calculated by the formulas suggested by Bruce and DeMars (1974).

The data was obtained by simple random sampling without replacement. Given time limitations the number of plots per stand was at fifteen irrespectively of the stand size. The sampling density averaged 5.5% across all sites. The diameters, heights and the number of trees per hectare were measured on square plots 4.5 x 4.5 m (20.9 m^2 or 0.076 ha). On older stands only trees above DBH (1.4 m) were counted. The following requirements also served as a basis of comparison: objectives for the land, nursery practices, planting, and post-planting operations.

1. Objectives for the Land

Public and private landowners have the same basic regeneration objectives. They want vigorous planting stock, and they want most of the trees to survive. On the other hand, the two take different actions to provide for survival of the planted stock, and they pursue different overall goals by regenerating the lands. The private companies ensure survival of their small number of high quality seedlings by utilizing chemical site preparation and weed control. The public lands instead overplant their seedlings to ensure survival.

The history of forestry practices development shows that the 1980s to 1990s brought changes to

forest management on both public and private lands in Washington State. The forest sector encountered more than one change in their policy and public relations. In the 1980s their practices were influenced by changes in water regulations, and in 1994 the President's Northwest Forest Plan was developed in response to endangerment of the spotted owl, and as a result modifications in silviculture activities were introduced. Requirements for the land and, therefore, their objectives have changed dramatically. On GPNF only 30% are designated to actively managed 'matrix' areas, while on 55% of the National Forest (Congressional Reserves and Late Successional Reserves) timber management has stopped almost completely (USDA FS, 1994). In 2000 the general goal of both sides remains vigorous regeneration of cut areas. However, dissimilarities in their objectives are becoming more distinct (USDA FS, 1997).

In the 1970s and early 1980s GPNF planted significant numbers of seedlings and because the growing stock was of low quality it was the only way to ensure stocking. This is why quantity prevailed over quality, such as using narrow spacing of approximately two meters by two meters (six feet by six feet). The limited growing space created difficulty for normal development of the seedlings, because the number of trees per hectare was too high, and the increment in diameter was marginal.

Late 1980s to 1990s methods changed towards higher quality of growing stock. For example GPNF planted mostly 2-0, but then moved to using transplants 1-1, 2-1, which are genetically improved and have a balanced root/shoot ratio and also planted at wider spacing (2.5 x 2.5, 2.7 x 2.7, 3 x 3, 3.5 x 3.5 m). However, there was also a push to regenerate the areas more difficult to regenerate on higher elevation land with steeper slopes, as lack of resource and equipment performance shifted cutting to the areas, unavailable for harvest before. This is why difficulties with terrain also influence regeneration success.

Another difference in regeneration is that harvesting methods also have changed. Instead of clear-cuts silviculturists prescribed shelter woods with different percentages of retention (up to 60 per cent). Besides, there is a dependence on natural regeneration – sites are planted only if stock seeded in the first one to two years is not enough for full stocking of the area. On sites with shelter wood-harvesting GPNF uses 4.8 x 4.8 m spacing for planting to ensure full stocking with required retention (R. Pankratz, Washington, 2000, personal communication).

Private forest owners in Washington follow state regulations, most importantly the Washington State Forest Practices Act, which in certain respects requires more specific and stringent measures and practices than the laws, which affect public land practices. For example, the stocking level required by law is lower on federal lands three hundred and twelve trees per hectare (125 trees per acre) while in Washington state the required stocking level is four hundred and fifty trees per hectare (180 trees per acre) (Washington State DNR, 2000). The public sector prefer to plant a number of trees that is much higher than the required stocking level, so that even if some seedlings die the desired stocking level will still be achieved. However, the trend to overplant has decreased because of the lack of funds for seedling purchases (K. Titus, Washington, 2000, personal communication). The private sector also plants at approximately 1000 – 1250 trees per hectare, levels higher than the legally required minimums, to ensure full occupancy of the site.

A summary of the regeneration objectives is presented in Table 1.

Table 1. Regeneration Objectives on Private and Public Lands

Public	**Private**
Maximizing survival	Maximizing survival
Tree vigor	Tree vigor
Economic benefits	Maximizing economic benefits
Sustainable ecological cycles	Provision for sustainable money flow
Wildlife	Compliance with wildlife, aesthetic, and environmental regulation
Slope stabilization	
Aesthetics	

2. Changes in Nursery Practices

1. Weyerhaeuser

WY plants most of their own seedlings from the company's nurseries. There are three nurseries in the region. They also sell their seedlings to other companies. The WY Yacolt Division buys seedlings from their own nursery. Usually they plant 1-1 growing stock. Very few 2-0 and plugs are planted. The 2-0s and plugs constitute only about 10% of the planting (D. Ford, Washington, 2000, personal communication). Seedlings are obtained from the company's seed orchards, and all of them are genetically improved.

WY seedlings are larger seedlings, with wider caliper, better development and survival, as they have more funds for regeneration. The public sector lags behind as they lack funding and innovative approaches (D. Haase, Washington, 2000, personal communication). The national forests have to be cautious because the public watches them more closely. The private companies follow the law, as the public constitutes a smaller concern for the private side. On the other hand, they try to do everything possible to establish and maintain good relations with the public by protecting the environment through compliance with regulations and voluntary efforts, and allowing hunting and other recreational opportunities on their land (C. Phillips, Washington, 2000, personal communication).

WY tends to experiment more with the planting stock and methods of growing. For example, lately they use fertilizer mix applied directly to the containers. This method has had promising results, though there has not been a long-term scientific study yet. The public cannot afford to experiment freely, because they may be accused of 'wasting the tax-payers' money', and they tend to wait until a method is scientifically proven. They would adopt the method only then, while the private sector has gone far ahead in experimentation (D. Haase, Washington, 2000, personal communication).

2. Gifford Pinchot National Forest

Major changes have happened in GPNF nursery practices, and the major one is the change from their own nursery (Wind River Nursery) to contractors' services for growing stock production. The policy of seedling production has also changed. In the 1980s all growing stock planted by GPNF were bare-root seedlings (mostly 2-0). In the middle and late 1990s the National Forest often planted plugs, such as plug-1, which, though more expensive, have a better survival rate compared to bare-root stock, or transplants, such as 1-1 or 2-1. These have better results than 2-0s. The seedlings have been obtained from private nurseries as plug-1, which means that the seedlings grow in one nursery as plugs and are transplanted to another nursery for the second year. The roots are pruned before transplanting (G. Buchard, Washington, 2000, personal communication).

The plugs come from different nurseries in California, Washington or Oregon, while the bare-root seedlings are purchased mainly from the neighboring nursery (Hood River). With the decreased demand for seedlings and higher public expectations for the national forests, the change may be economically beneficial, because even as the growing stock has become more expensive, the total cost of seedling production (such as maintaining a nursery) has decreased (USDA FS, 1999).

The trend from bare-root to containerized seedlings has also been observed on private lands. The difference however is that private companies favor containerized seedlings and plug-1 seedlings (D. Haase, Washington, 2000, personal communication). Even if the federal side buys containerized seedlings, they are not planted on the operational level. They are used only on the sites where regeneration is a must to achieve such as on steep slopes with low productivity. Their up-front cost is too high, and therefore, these seedlings appear to be too expensive for the public sector (R. Pankratz, Washington, 2000, personal communication).

Before the ban on herbicides in public lands in 1984 most of the weeds were killed through fumigation, herbicides and hand and mechanical weeding. Since 1984 the public sector has only been able to apply chemicals under limited circumstances, e.g. if the regeneration success is dramatically in danger due to pest or disease outbreak. As the public sector does not apply chemicals on planted sites (no chemical site preparation or brush control) or nurseries, this factor in conjunction with planting of bare-root seedlings of lower quality deteriorated the survival (USDA FS, 1992). After the ban it became difficult to grow healthy and vigorous stock, and this was another cause for changing to private contractors (D. Haase, Washington, 2000, personal communication).

Nursery techniques advanced dramatically, and general changes for both sectors include:

- Experimenting with animal control,
- Monitoring chemical water composition such as pH and electrical conductivity (for example, Microseed Nursery in Ridgefield, WA),
- Mixing fertilizers with plug medium,
- Producing more containerized nursery material,
- Inoculating stock with mycorrhizas (for example, Douglas-fir, noble fir or western red cedar) (G. Bouchard, D. Haase, B. Rickert, Washington, 2000, personal communication; USDA FS, USDA BLM, 1996).

Detailed information on trends and changes in nursery practices are presented in Table 2.

Table 2. Trends and Changes in the Nursery Practices on Public and Private Lands

	Public 1980s	Public now	Private 1980s	Private now
Contracting	Wind River Nursery	J.H. Stone Nursery, OR, Microseed Nursery (Ridgefield, WA)	WY Mima Forest Nursery	WY Mima Forest Nursery
Fertilization	Y	Y	Y	Y
Pesticides	Y	N	Y	Y
Genetically improved	Some	Y	Y	Y
Mycorryzal Inoculations	N/A	Y	Y	Y
Growing stock	Bare-root: 2-0, 2-1; containerized in critical cases	Bare-root: 2-0, 1-1, 2-1; containerized not on operational level	Bare-root: 2-1, 1-1, some containerized	Bare-root: 1-1, 2-1 and containerized
Root pruning	Y	Y	Y	Y
Monitoring Chemical Water Composition	N/A	**Y**	Y	Y

3. Planting

Planting on federal lands is done by sealed bid competition. Low bids are often achieved with migrant labor competition, so GPNF usually hires 'selected 12' companies that are known for good business practices. This also implies that they do not use illegal labor. The companies perform self-policing among themselves, as a consequence of competition, and any legal violations are reported. Being reported puts a company on to a 'black list', which means that their chances of getting a good planting job become negligible (R. Pankratz, Washington, 2000, personal communication).

Specifications for planting are carefully described in every contract, and include planting equipment, suitable spots for planting, tree storage and transportation, with an emphasis on correct root positioning (Nicholson, 1984). The terms of federal contracts and specifications have had only minor revisions over the last two decades (G. Bouchard, Washington, 2000, personal communication).

WY also contracts planting, but they do not do sealed bid contracting, but have a number of selected contractors who have worked for them for decades. In the same year as the stands are planted, a survey is conducted, which defines the quality of the planting. It is done by transect and one hundred trees are surveyed. The number of the dead or poor-conditioned seedlings defines the percent deducted from the contracted sum (B. Rickert, Washington, 2000, personal communication).

While differences in planting spacing still exist, narrower on public land, a trend to increase spacing is found on both public and private lands. The quality of the seedlings is going up everywhere, but private companies tend to invest more for the higher quality planting stock.

4. Post-planting Operations and Regeneration Success

Federal and private sides measure regeneration success differently. The USFS has a measure that is called one-treatment success. It means that the seedlings are not overtopped, survived browsing, and an acceptable stocking level (minimum 312 trees per hectare) has been attained on the sites in a five year period without any additional treatment.

It is measured in spite of the fact that the actual survival is not 100% or even 85% for each species. It is possible to measure success this way because if 100% survive, the site would be overstocked, and a

release treatment would be necessary. For example, if a thousand trees per hectare are planted with the required stocking of three hundred and twelve trees per hectare, then 100% survival is not necessary. However, if five hundred trees per hectare are planted, then the low survival percentage may become a problem. Sites are measured on year one and three and after they reach the age of five years. Regeneration specialists do not track them after five years. The data is then sent to the stand improvement personnel (F. Zensen, Washington, 2000, personal communication).

WY does not have a definition of one-treatment success, because they apply more than one treatment for regeneration purposes (brush control, both physical and chemical, and animal control). Regeneration success is defined by State regulation when the seedlings are 'free to grow': they are not overtopped, survived browsing as the terminal has developed some woody tissue, and an acceptable stocking level is achieved (minimum 450 trees per hectare). There still can be some side browsing, but it does not affect the general growth. However, the 'free to grow' state also means that the seedlings have reached about breast height. According to State regulations, the sooner the stands are classified as 'free to grow', the sooner the company will be able to cut on adjacent sites (Washington State DNR, 2000).

The company does not have a definite age when the sites are transferred from the regeneration specialists to stand improvement personnel, but usually it is when the stands are four or five years old. However, it depends upon the condition of the stand and the decision of the forester (B. Rickert, Washington, 2000, personal communication).

Deer and especially elk browsing constitute one of the biggest regeneration problems of the region, as no repellent is effective against them. WY puts netting on heavily browsed sites, and takes them off after several years to let the seedlings grow freely. GPNF applies netting to planted seedlings, especially on the sites where regeneration is essential. Eventually, the trees outgrow the nets, and the USFS nets are left to decompose. Sometimes, though, both GPNF and WY have problems with netting as the trees become deformed in the nets and lose vigor. Browsing problems still persist, because animals tend to rip off the netting to reach the tender young growth (G. Bouchard, B. Rickert, Washington, 2000, personal communication). One of the possible cures for the problem lies in over planting, which achieves the desired stocking level in spite of the heavy browsing.

Table 3 below summarizes the general trends in regeneration practices on private and public lands (including pre-planting operations) over the last twenty years. The table demonstrates the differences in techniques and methods based on the differences in objectives for the land.

These differences, as well as changes in forest policy, including the shift of objectives from timber extraction to multiple forest products, explain differences in stand development, which are described in greater detail below.

5. Present State of the 15-20 Year-old Stands

Though regeneration criteria (height, diameter and number of trees per hectare) do not differ for young seedlings (0-5 years old) between the private and public sides, older stands (15-20 years old) show substantial variability, as depicted in Figure 1. The WY stands are numbered #4 - #9, and the names refer to the GPNF stands.

The bigger tree per hectare numbers on the right side of Figure 1 belongs to GPNF. All of the WY stands were thinned, yielding average trees per hectare of about 450 as seen in Figure 1. Figure 2 shows that there is a reasonable correlation between trees per hectare and average diameter. While height is insensitive to stand density, DBH is sensitive to density after crown closure. In other words, diameter growth undergoes a significant decrease with respect to the lack of growing space as compared to height changes.

The number of trees per hectare in the GPNF stands is much greater than on WY land. The GPNF stands are currently waiting pre-commercial thinning, and although planned, this has not been done yet. Thinning influences growth and the diameters of the trees, because the stands are close to stagnating. This can be explained by the changes in forest policy over the last 20 years. Development of the Northwest Forest Plan of 1994 created a crucial change in management objectives as timber ceased being the main aim on the public lands in the region. This led to a decrease in funding, and therefore, stands, planted to be managed intensively, have been left without the planned management (B. Obedzinski, Washington, 2000, personal communication).

The average volumes were calculated using formulas, developed for small diameter Douglas fir by Bruce and DeMars (1974). One formula was used for trees less than 5.5 m in height, and another formula for trees bigger than 5.5 m. The present state of the fifteen to twenty year old stands differs greatly in terms of woody biomass in cubic meters. Table 4 shows average volumes for individual trees for trees as well as definite trees per hectare values and the volume per hectare (Volume, m^3 ha^{-1}). The average volume of a

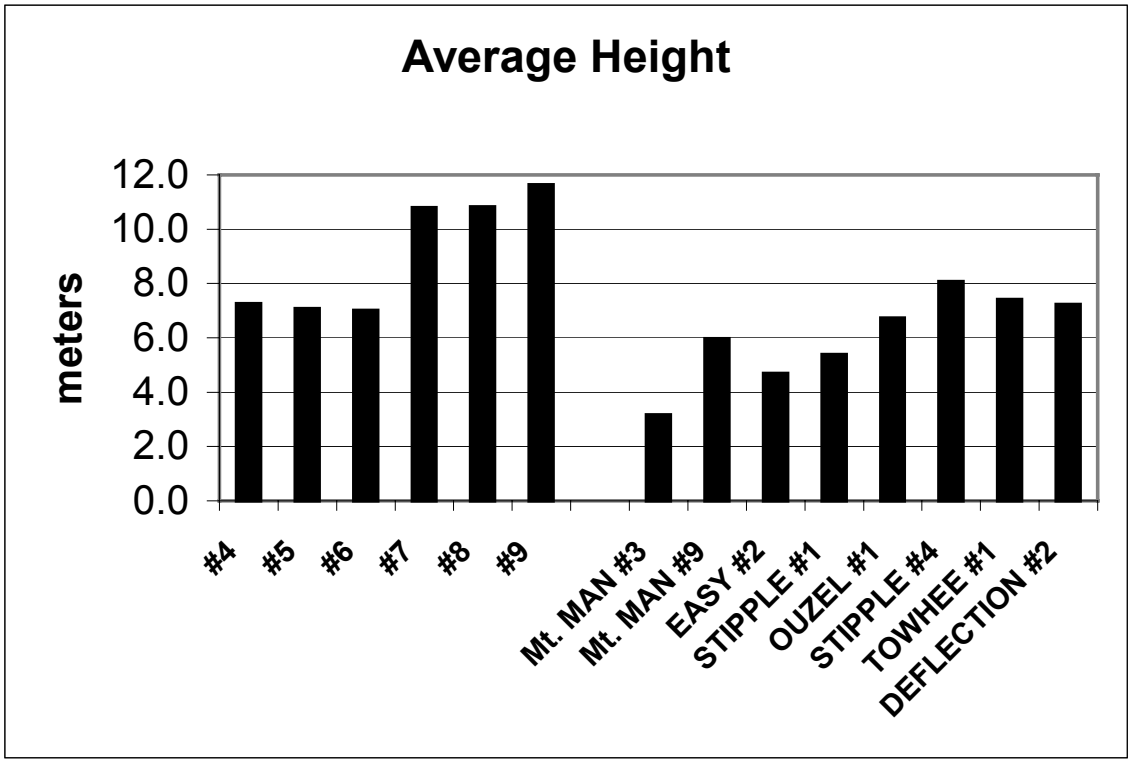
single tree found on the WY stands is almost threefold greater than that of a tree on public land. It is clear that trees grow better on the private lands.

The tree age and stand sites were chosen for this comparison study to minimize the differences caused by local geographical and environmental variations, though some variation could not be eliminated which caused the study to be less definitive. However, there still exist major dissimilarities in regeneration provisions and practices between the public and private sides. These major historical management differences served a basis for the differences in the tree volumes above. A number of policy implications can be inferred by the observations and data discussed in this study.

Table 3. Regeneration Trends on Public and Private Lands over Twenty Years

	Public 1980s	**Public now**	**Private 1980s**	**Private now**
Contracting	Sealed bid	'Selected 12'	Constant contractors + sealed bid	Constant contractors + sealed bid
Harvesting method	Clear-cutting	Partial cut and some clear-cutting	**utting**	Clear-cutting
Site preparation	Broadcast and pile burning	Pile Burning or No treatment	Broadcast and pile burning, scarification	Pile burning, scarification, and very little broadcast burning
Regeneration monitoring, years	3-5	3-5	3-4	3-4
Satisfactory survival, %	80%	85%	N/A	Desired stocking level
Hand-planting	Y	Y	Y	Y
Spacing, m	1.8 x 1.8, 2 x 2	2.7 x 2.7, 3 x 3, 4.8 x 4.8	2.5 x 2.5	2.7 x 2.7, 3 x 3
Survival survey	Semi-permanent plots 1/50 ac; 1st and 3rd growing seasons	Semi-permanent plots 1/50 ac; 1st and 3rd growing seasons	N/A	Transects; 1st and 3rd growing seasons
Legal minimum stocking level, trees per hectare	312	312	N/A	450
Animal control	Netting	Netting	Netting, repellents	Netting, repellents
Brush control	Site preparation	Site preparation (often none)	**Herbicide**	Herbicide; 2nd growing season
Fertilization	**N**	N	After crown closure	After crown closure
Regeneration success	'One-treatment success', seedling quantity	'One-treatment success', seedling quantity	'Free to grow', seedling quality	'Free to grow', seedling quality

Figure 1. Average Height in Stands 15-20 Years Old on Private and Public Lands.



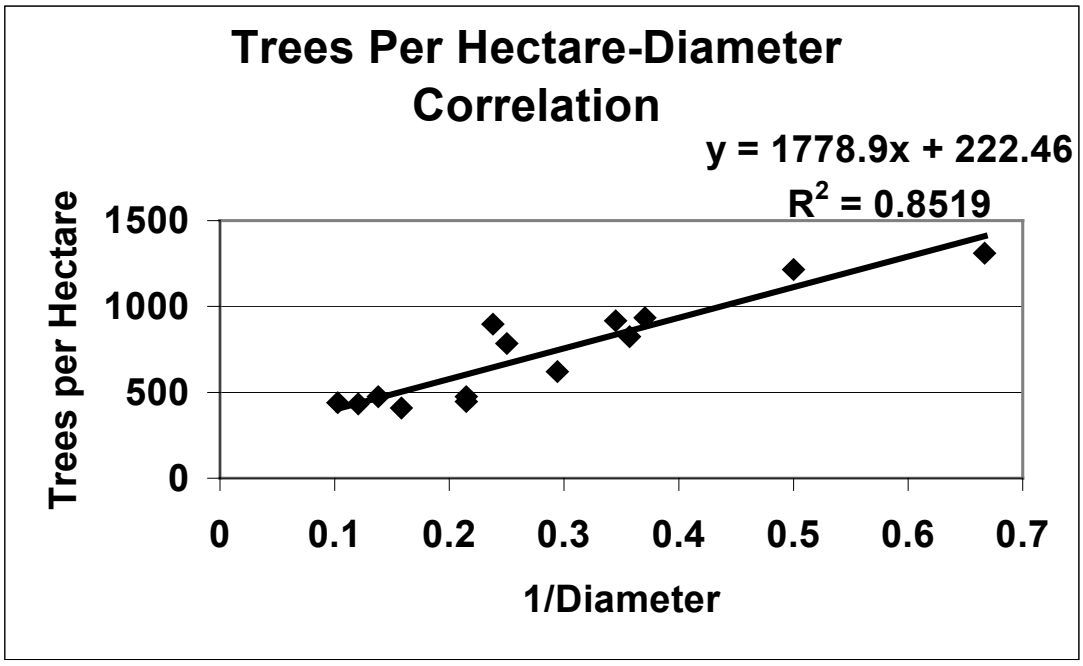


Figure 2. Trees per Hectare - DBH Distribution in Stands 15-20 Years Old On Private and Public Lands.

Table 4. Average Volumes of Individual Trees and per Hectare for Stands 15-20 Years Old

Stand	Hectares	Trees per ctare	Tree ume, m^3	Volume, ha^{-1}
GPNF				
Mt. MAN #3	0.9	3273	0.0056	18.4
Mt. MAN #9	0.5	2338	0.0476	111.2
STIPPLE #1	18.9	2289	0.0273	62.5
STIPPLE #4	6.7	3039	0.0504	153.2
DEFLECTION #2	11.9	2244	0.0533	119.7
TOWHEE #1	23.2	1962	0.0417	81.9
OUZEL #1	44.5	1550	0.0182	28.2
EASY #2	13.0	2058	0.0147	30.3
		average	**0.0324**	**75.7**
WY				
#4	3.9	1023	0.0556	56.9
#5	1.7	1118	0.0330	36.9
#6	1.4	1185	0.0327	38.7
#7	6.3	1185	0.1148	136.1
#8	16.6	1083	0.1444	156.3
#9	46.7	1098	0.2067	226.9
		average	**0.0979**	**108.6**

6. Policy Implications

One of the major conclusions is that managing for a great many objectives (USDA FS, 1990) does not necessarily lead to fulfilling all of them, given the limited and still decreasing funds of the National Forest system. At present timber management appears to be losing resources in an average ranger district, while more resources are dedicated to other activities such as archeology, wildlife, or recreation.

Of the many changes that have happened in GPNF nursery practices, the major one is the change from their own nursery to contractors' services for growing stock production. This appears to be a trend connected with low funding of the National Forest, and especially the absence of economic benefits from the nursery. The President's Forest Plan of 1994, which ceased timber cutting in newly created Late-Successional Reserves, has also lowered the demand for seedlings (USDA FS, 1994).

As the stands remained untouched, there has not been any possibility of planting under the canopy. Therefore, the stands, which had been planned to be cut and regenerated, were left without regeneration. And therefore, the need to produce seedlings for those stands has disappeared. Over the course of time GPNF ceased to need the number of seedlings produced by the Wind River Nursery. It embraced the change from maintaining a nursery, owned by the USFS, to competitive contractors, who offer service to more than one institution.

There is a necessity to pre-commercially thin the stands reaching the age of 15 years on the public lands. It is shown that overstocked, especially single-species stands tend to lose vigor, are more susceptible to pest and disease, and present a greater fire danger (Oliver and Larson, 1996). With the decrease in funding, silviculturists and regeneration specialists in the National Forests face significant problems in locating funds to release the stagnating stands (B. Obedzinski, R. Pankratz, Washington, 2000, personal communication).

Conclusion

From this research, it is possible to conclude that there is a significant difference in approaches to regeneration on public and private lands, and as a result, regenerated stands differ greatly between public and private sector. These differences are mainly inferred by the dissimilarity of the objectives for the land: multiple objectives on the federal land and a more-focused revenue-maximizing goal on the private land. The second difference is the distinction

between state (State of Washington in this example) and federal regulations: federal rules are less stringent in some matters then state ones (for example, for stocking level) but may be more severe in other cases (ban on pesticides on public lands).

The amount of funding and other resources given for regeneration constitutes another difference, as much more attention is given to regeneration on private land. This dictates conditions under which regeneration activities are performed. To ensure successful regeneration, emphasis is laid on the quantity of the seedlings on the public lands and on the quality of the planting stock on the private lands. The excessive number of trees per hectare reveals the necessity for pre-commercial thinning. This can be performed with the objectives of enhancing the forest health and of reducing forest fire hazard, rather than providing future timber supply. Unfortunately, the public is less responsive to timber management at the present time.

Regeneration practices have changed on both public and private land during the last 20 years. They both are trying to achieve the maximum result for their individual objectives. This dissimilarity may be another reason why there is a trend in forest management to move in two different directions: intensification (private plantations) and conservation (federal reserves). However, either significant changes in management need to be made on the public lands, preceded by an increase in funding to cover multiple objectives, or the USFS should seriously reconsider their management goals.

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Values and Attitudes of the Mississippi Department of Wildlife, Fisheries & Parks Relative to the Forest Industry in Mississippi - *Marcus K. Measells, Stephen C. Grado, Louis M. Capella*

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Introduction

Forestry, in the broadest sense, is a product of the social environment surrounding it. Forest practices are constantly being assessed, considered, and shaped by public opinion. These public assessments and expectations change as society evolves. These changes will be efficient and effective only if forestry professionals and practitioners are fully involved with affected communities and constituency groups. This involvement carries with it a responsibility to explain the objectives of their forest-based activities, management practices employed, and contributions of forestry to society, in a way that can be understood and accepted. For the most part, the benefits and merits inherent in forestry and the presence of forest industry at the corporate level are not being effectively communicated to the public and various interest groups. Properly communicating these benefits and shaping explanations requires an understanding of the background, values, attitudes, and perceptions of others participating in this process.

Forestry and forest industry currently face many difficult challenges ranging from concerns over harvesting practices, construction of roads, water-related issues, and the implications of forest management on wildlife. For instance, harvesting practices have been halted and, in some instances, completely eliminated in some regions of the United States. The continued success of forestry and forest industry as a leading economic entity in Mississippi depends, in part, on communication and educational activities developed and supported by forest industry. Mississippi's forest industry has realized, in light of market pressures and events in other regions of the country, that they need to be proactive in their communication and educational activities to prevent the regulated control or reduction of forestry activities within the state. This is a time to explore new partnerships for forest industry that may affect future business decisions.

Mississippi Forestry Association's (MFA) Sustainable Forestry Initiative (SFI) State Implementation Committee (SIC) and the Communication and Education Committee realized that the awareness, values, attitudes, and perceptions of Mississippi's citizens and special interests groups toward forestry and forest industry were not completely known. The SIC wanted to determine these and improve public views of forestry and forest industry in Mississippi. The SIC also wanted to reach constituency groups in the state who contact or influence large numbers of citizens in Mississippi or who have an influence on forest policies in the state. These key constituency groups include teachers, public agencies, loggers, private non-industrial forest landowners, conservation/environmental groups, bankers, and legislators. The focus of this paper is on a key public agency in the state, the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP).

The MDWFP is an important and influential constituency group in Mississippi. The MDWFP's mission is to conserve and enhance Mississippi's natural resources, provide recreational opportunities, maintain ecological integrity and aesthetic quality of the resources, and to ensure socio-demographic and educational opportunities for its citizens (MDWFP, 2001). MDWFP employees are highly respected individuals in their communities and throughout the state. Citizens often turn to this agency for technical information. For instance, the technical staff (i.e., wildlife biologists) provides landowners and hunting clubs information pertaining to wildlife management on their lands. Agency administrators are influential in the political end of wildlife and forestry issues. Therefore, forest industry needs to effectively communicate and educate MDWFP personnel on the importance of forestry and forest industry to society, Mississippi's economy, the environment, and their agency. Currently, the values, attitudes, and perceptions of the MDWFP relative to Mississippi's forest industry are largely unknown. Also, a number of individuals who work for the forest industry believe current communication and education activities targeted towards MDWFP personnel are not wide enough in scope or effectiveness.

This paper provides a baseline insight into MDWFP personnel values, attitudes, and perceptions towards forestry and forest industry through the use of focus groups and a mail questionnaire. Forest industry representatives, at the corporate level, will have a better understanding of the forestry-related issues that concern this constituency group. This paper also attempts to determine the communication

methods and media topics MDWFP personnel prefer when communicating or receiving information pertaining to forestry or forest industry. Forest industry may then be able to effectively reinforce and/or change existing values, attitudes, and perceptions as well as enhance the forestry education levels of MDWFP personnel for each job type in the agency.

Literature Review

Several studies and programs examined specific forestry or forest industry constituency groups, which included teachers, public agencies, loggers, landowners, environmental groups, and legislators. Few studies focused on the values and attitudes of constituency groups relative to forestry and forest industry particular to Mississippi.

Constituency Groups

A number of studies and programs have examined specific forestry or forest industry constituency groups that included public agencies and political officials. However, few studies have specifically targeted leading wildlife resource agencies in their state.

Research conducted nationwide in 1992 showed a significant difference between industry personnel and other interest groups in their perception of forest industry (Heissenbuttel, 1996). For instance, industry attributed a lack of public knowledge to a communication problem while other interest groups believed industry had a behavioral problem (Heissenbuttel, 1996). Heissenbuttel (1996) noted that the American Forest and Paper Association (AF&PA) sought views from state officials, leading forestry school professors, conservation groups, loggers, and small landowners. The Sustainable Forestry Initiative (SFI) was developed after discussions with these groups. Yarrow and Guynn (1995) focused their ecosystem management study on subscribers to the *Urban Forests* magazine, members of The Society of American Foresters (SAF), members of The Wildlife Society, state senators and representatives, and forest stewardship landowner participants from Virginia, North Carolina, South Carolina, Kentucky, Georgia, Florida, Tennessee, Alabama, and Mississippi. Conkling (1995) identified the five target audiences of the United States Forest Service Forest Health Monitoring Program as: 1) political – politicians or staffers, 2) cooperators – participating agencies, states, landowners, universities, and certain conservation groups, 3) scientific – research community and others reached by journals, symposia, meetings, and program reviews, 4) general public – non-technical, informed, and uninformed, and 5) special interests groups – environmental groups, forest industry, and other industry groups. Hubbard (1995) indicated that professionals attending a natural resource management workshop identified a broad range of relevant constituency groups. These groups ranged from NIPF landowners, urban dwellers, loggers, farmers, Christmas tree growers, policy makers, agency members, the "general public," industry personnel, educators, ethnic groups, K-12 school children, scouts, and summer campers. The Georgia Forestry Association's (GFA) Public Relations Program focused on committee legislators, the environmental community, the media, forest products industry personnel, metropolitan general publics, GFA members, and elementary school-age children (GFA, 1998). The Wisconsin Paper Council also included news media, legislators, and the public as key constituencies (Schmidt, 1998).

Forestry Attitudes and Media

Heissenbuttel (1996) reported that constituency groups believed the forest industry performed highly in replanting trees, protecting air quality, and recycling paper. However, industry was rated poorly in protecting wildlife habitat, protecting wilderness and other special areas, and protecting lakes and streams (Heissenbuttel, 1996).

Yarrow and Guynn (1995) completed a study of constituency groups in nine southern U.S. states to determine attitudes, perceptions, and underlying interests regarding ecosystem management. Respondents indicated that they received information on the management of their forests from college or state specialists (56%), extension brochures or leaflets (47%), and newspaper or magazine ads (37%). Respondents preferred receiving information primarily from a forester (57%), brochures, booklets, and fact sheets (46%), and workshops or classes (40%). Only 9% of respondents indicated a preference for information via radio or television.

The GFA's Public Relations Program tactics included an Okefenokee Swamp exhibit, GFA merchandise, media tours, a GFA source book, issue papers, and possibly a forestry license plate (GFA, 1998). They also developed a program called Georgia Forests Forever. During the 1999 National Forest Products Week, the GFA had speakers on television and radio shows and published articles in newspapers.

Focus Groups

General use

Focus groups are methods of collecting qualitative data using moderated group discussion generally

requiring 6 to 12 individuals from the population of interest (Betts *et al.*, 1996; Minnis *et al.*, 1997). Originally used as a technique in group therapy, the focus group has been adapted for use in marketing and has, over the past decade, been recognized as a valuable tool for investigating natural resource-related topics (Duda, 1992; Bissell and Duda, 1993). The increased popularity of focus groups may be due to the usefulness of the qualitative data produced (Betts *et al.*, 1996). Another purpose for using focus groups is to collect the necessary data needed in the development of high quality, quantitative instruments such as questionnaires (Morgan, 1993; Betts *et al.*, 1996).

The number of focus groups conducted is determined by research goals (Morgan, 1997). Fewer groups are needed when the research is exploratory in nature or when trying to understand group perspectives. Additionally, fewer groups are needed if the study population is more homogeneous in terms of background (Morgan, 1997). In general, three or four focus groups should be conducted at a minimum, with an upper limit of six to eight (Morgan, 1997). The exact number can also vary in relation to a number of other factors. A lower number can be used if a moderator is employed who will impose a level of structure on each group. This must be balanced with the need for more groups if statewide insights are wanted (Krueger and Casey, 2000).

Focus group analysis varies according to the amount of detail desired. A technique used by Marilyn J. Rausch is to read the transcriptions then annotate and highlight key findings (Krueger, 1998). Computer software such as The Ethnograph can also be used in analysis (Krueger, 1998).

Use in natural resources

Focus groups have been used to gain a deeper understanding of the interests and motivations of retired West Virginia forest landowners (Kingsley *et al.*, 1988). Miles *et al.* (1995) indicated that the Florida Division of Forestry used internal as well as external focus groups to develop survey questions to determine public perceptions. The external focus group consisted of representatives from forest industry as well as environmentalists. Representatives of both groups agreed that environmental education could help increase the public's understanding of forestry. The CFPC (1998) used focus groups as well as telephone surveys of California voting citizens, ages 18 to 49, prior to the campaign to determine the public affinity for forest products and to help develop media messages. Bowyer (2000) conducted three focus group sessions with elementary through high school teachers in Minneapolis/St. Paul, Minnesota to determine materials used in the classroom to discuss tropical forestry.

Surveys

Surveys have been used extensively in the natural resource field to gather information on various issues (Absher and Anderson, 1984; Shindler *et al.*, 1993; Manning *et al.*, 1996). Surveys can be conducted through telephone, mail questionnaires, person to person, or over the Internet. Surveys are used to collect both qualitative and quantitative data. Mail surveys generally consist of a cover letter, survey instrument, and a self-addressed stamped return envelope. A reminder postcard (sent one week later) and one follow-up mailing (sent two weeks after the postcard) are used to help increase the survey response rates (Dillman, 1978).

Methods

The genesis of this study came from an idea that forest industry needs to be proactive in its promotion of production forestry and why it benefits society. A methodology was followed to determine the values, attitudes, and perceptions of the MDWFP toward the forest industry. Additionally, communication methods preferred by MDWFP employees were determined on a personal and professional level. The study design consisted of the following steps:

Step 1: A literature review of environmental and forestry value and attitude research findings.
Step 2: Conduct focus group sessions.
Step 3: Develop a measurement instrument (e.g., mail survey) using focus group information.
Step 4: Pilot test the measurement instrument prior to the mail-out.
Step 5: Data collection, organization, and analysis.
Step 6: Develop conclusions from focus group sessions and the mail survey instrument information.
Step 7: Develop recommendations by job type for reinforcing and/or changing existing values, attitudes, and perceptions of MDWFP personnel.

Focus Groups

The focus group studies followed a standard methodology. The researchers prior to the focus group sessions developed a set of 16 open-ended questions. Leaders in the MDWFP were contacted and asked to invite individuals to participate in each focus group session. Three focus groups were conducted for this agency. The focus groups consisted of administrators, technical staff (i.e., wildlife biologists), and conservation officers (i.e., law enforcement officials). The request was for at least six individuals per session but no more than 12.

Refreshments were provided. However, no cash incentives were offered as state employees are prohibited from this activity. An independent, professional moderator was paid to lead each focus group session. The moderator asked participants to respond at random or, in some cases, to respond one at a time to each question. Each session was audio recorded with two cassette recorders to facilitate the transcribing of session discussions. Once each session was over, two researchers independently reviewed and transcribed the audiotapes. Content analysis, the process of reviewing the transcriptions and reporting the prominent topics or issues of the session, was used to develop the mail survey instrument. Responses to each question during focus group sessions, coupled with professional judgment on the part of the research team, provided the researcher with the content material to be included in the mail questionnaire.

Survey Instrument

Incorporating responses gathered during the three focus group sessions created a mail survey of the MDWFP. David Godwin, a MDWFP employee in charge of the agency's research programs, was asked to review the questionnaire and suggest changes. The MDWFP provided a mailing list consisting of all administrators, technical staff, and conservation officers.

The total design method for mail surveys (Dillman, 1978) was used in all phases of survey implementation. The questionnaire, a cover letter, and a self-addressed, stamped business reply envelope were sent to each individual in November 2000. Individuals were assured of the confidentiality of their responses and that their name would never be associated with the questionnaire. The return envelopes were individually coded for mail processing purposes. Individuals were given two and a half weeks to complete and return the survey. As surveys were returned, individual names were removed from the mailing list to avoid future mailings and maintain confidentiality. One week after the initial mailing, a thank you/reminder postcard was sent. Three weeks after mailing the original survey, a second letter, questionnaire, and self-addressed, stamped business reply envelope were sent to non-respondents.

Analysis

Focus group information underwent content analysis. The key issues for each focus group session question were determined and reported by the researchers. These key issues also were used to develop the mail survey.

Mail survey responses were entered into SPSS for Windows, Release 10.0.5. The majority of data collected was nominal in origin. Therefore, simple frequencies were used for each question. Non-response bias was accounted for by comparing the first 50 surveys returned with the last 50 returned. Items compared were age, ethnic background, and attitudes toward forestry and forest industry. Significance testing was conducted using the chi-square statistic.

Due to the homogenous nature of this agency, cross-tabulations on gender and ethnic background were limited. Therefore, cross-tabulations were used for key issues to determine agency relationships. Job descriptions were measured against individual attitudes and awareness of SFI. Additionally, forest-based activities and environmental problems individuals associated with forest industry were tested against personnel attitudes toward forestry and forest industry by job descriptions.

Results

Focus Groups

Focus group sessions were conducted for each major job description in the agency: administrators, technical staff (i.e., wildlife biologists), and conservation officers. The three focus group sessions had eight, eight, and 11 participants, respectively.

Administrators expressed mixed feelings toward forest industry during the focus group session. Individuals indicated that industry does well in replanting and repairing roads. However, they were concerned with wildlife management, riparian zone protection, chemical usage, and hardwood management. Four of the eight focus group participants were aware of SFI. However, administrators felt they were not knowledgeable enough about SFI to have a clear understanding of the SFI goals. Administrators also believed it would be beneficial if forest industry communicated with the agency, particularly with the technical staff and conservation officers. Administrators would be willing to participate in industrial tours relating to forest industry.

The technical staff voiced negative attitudes toward forest industry. They believed that industry did not care about wildlife and was only concerned with monetary issues. Streamside Management Zones, habitat diversity, wildlife management, and hardwood management were forest-based activities the technical staff felt industry needed to improve upon. Environmental problems associated with forest industry included water quality, erosion, and the loss of floral and faunal diversity. Each individual in this

session was aware of SFI. However, they did not believe industry was complying with the goals of SFI. The technical staff did not believe it would be beneficial for forest industry to communicate with them to improve relations. They felt industry now needed to implement activities on the ground to improve technical staff members' views toward forest industry. They had very negative attitudes toward past radio and television advertisements used by forest industry. The technical staff also reported a lack of interest in industrial or field tours.

Conservation officers had mixed attitudes toward forest industry. They believed industry did a good job of harvesting, replanting, and road maintenance. Erosion, hardwood management, and chemical use were areas of concern they believed forest industry needed to address. These also were the primary environmental problems associated with industry by this group. None of the individuals in this focus group session were aware of SFI. Conservation officers believed it would be beneficial for forest industry to communicate with them. They prefer to receive information in person from an industry representative and also in receiving information from videos and industrial or field tours.

Mail Survey

Survey response rates

A total of 382 questionnaires were sent to MDWFP personnel in November 2000. Two surveys were returned as undeliverable. Of the remaining 380 questionnaires, 236 were returned for a response rate of 62%.

Non-response bias was accounted for by comparing key issues from the first 50 mail surveys returned with the last 50 mail surveys returned. At the 95% confidence level, there was no significant difference in age between the first and last 50 surveys returned (P = 0.208). The average age was 42.6 years for the first 50 surveys returned and 46.1 for the last 50 returned. At the 95% confidence level, there was no significant difference in ethnic background between the first and last 50 surveys returned (P = 0.057). The majority of respondents for both the first and last 50 surveys returned were Caucasian. Two African Americans returned the survey in the last batch as compared to seven during the first 50. At the 95% confidence level, there was a significant difference in attitudes toward forest industry between the first and last 50 surveys returned (P = 0.037). However, attitudes for the first 50 returned surveys were positive (15), somewhat positive (8), neutral (13), somewhat negative (11), negative (2), and one no response. The attitudes in the last 50 surveys returned positive (10), somewhat positive (13), neutral (17), somewhat negative (6), and negative (4). The attitudes of the last 50 surveys centered on the neutral category.

Respondent characteristics

The question requesting age was answered by 214 individuals (91%). Ages ranged from 23 to 64 years old. Twenty-two personnel (9%) did not respond to this question. The average age was 43.8 years with a median of 44 years.

Two hundred sixteen individuals (92%) responded to the question about ethnicity. Of the 216 responses, 15 (7%) were Native American, one (< 1%) was Asian or Pacific Islander, 16 (7%) were African American, 183 (85%) were Caucasian, and one (< 1%) responded as "other." Twenty individuals (8%) did not respond.

Two hundred eighteen individuals (92%) reported their gender. Of these, 4 (2%) were female while the remaining 214 (98%) were male. Eighteen individuals (8%) did not respond.

Two hundred thirty-five individuals (99%) reported their job description. Fifteen (6%) were administrators, 40 (17%) technical staff, and 180 (77%) were conservation officers. Two hundred thirty-five individuals (99%) provided the number of years in employment with MDWFP. Employment years ranged from less than one year to 39 years. The average was 13.0 years with a median of 12 years and a mode of 15 years.

Perceptions

Two hundred thirty-three individuals (99%) expressed their personal attitude toward forest industry. Most individuals, 64 (27%), had a positive attitude toward forest industry. Sixty individuals (26%) had a somewhat positive attitude toward forest industry. Fifty-nine (25%) individuals reported a neutral attitude toward forest industry. Somewhat negative attitudes were reported by 34 (15%) individuals. The remaining 16 (7%) had negative attitudes toward forest industry. Three individuals (1%) did not provide a response. Table 1 contains MDWFP attitudes by job description.

The term Sustainable Forestry Initiative was recognized by 63 (27%) individuals. Thirty-four (19%) of 180 conservation officers were aware of SFI while 23 (59%) of 40 technical staff and six (40%) of 15 administrators were aware. The remaining 162 (69%) were not aware of SFI. Of the 63 individuals that were aware of SFI, 19 (30%) believed the industry was currently meeting the SFI goals while one (2%) felt industry was somewhat meeting the goals. Thirty-eight (60%) felt the industry was not meeting the goals. Of those 38, 18 (43%) were technical staff, 17 (45%) were

conservation officers, and three (8%) were administrators. Five (8%) individuals did not respond to this question.

All 236 individuals reported on forest-based activities they believed forest industry does well. The top three activities included replanting/regeneration, 163 (69%); harvesting, 146 (62%); and timber management, 143 (61%). Fifteen individuals (6%) did not provide a response.

All 236 respondents reported forest-based activities that they felt forest industry needed to improve upon. The top six activities included hardwood management, 177 (75%); wildlife management, 153 (65%); erosion, 151 (64%); Streamside Management Zones, 147 (62%); habitat degradation, 141 (60%); and tree species diversity, 136 (58%). Three individuals (1%) did not provide a response.

All 236 individuals reported environmental problems associated with forest industry. The top four included erosion, 167 (71%); habitat degradation, 163 (69%); species diversity reduction, 116 (49%); and water pollution/quality, 100 (42%). Thirteen individuals (6%) did not provide a response.

Table 1. Attitudes toward forest industry by job description as reported in the November 2000 survey.

Job Description	Positive	Somewhat Positive	Neutral	Somewhat Negative	Negative	No Response	Total
Administration	3	1	7	1	2	1	15
Tech. Staff	7	4	9	13	5	2	40
Cons. Officer	54	54	43	20	9	0	180
No Response	0	1	0	0	0	0	1
Total	64	60	59	34	16	3	236

Communication Methods and Messages

Of the 236 respondents, 219 (93%) felt it would be beneficial for forest industry to communicate their timber and wildlife management practices to the MDWFP. All 15 administrators reported it would be beneficial while 37 (95%) of the technical staff felt it would be beneficial and 166 (92%) conservation officers believed it would be beneficial.

Individuals indicated industry should use communication methods and activities such as educational programs/materials, 130 (55%); partnerships with the MDWFP, 129 (55%); and workshops, 126 (53%) to communicate with the MDWFP in general. Table 2 contains these general communication methods by job description.

Respondents also identified their personal preferences for receiving information pertaining to forestry and forest industry. The top six methods included workshops, 101 (43%); meetings, 99 (42%); presentations, 94 (40%); newsletters/other mail, 90 (38%); demonstrations, 88 (37%); and industrial tours/field trips, 87 (37%). Table 3 identifies the personal communication preferences by job description.

Respondents indicated the topics they believe forest industry should incorporate into education and communication activities. The top media topics recommended by MDWFP personnel were wildlife habitat, 220 (93%); wildlife, 190 (81%); and the environment, 132 (56%). Table 4 contains the top media topics by job description.

Individuals reported organizations or agencies, which they felt, were credible sources of information pertaining to forestry or forest industry. Twenty-one (9%) respondents indicated the Mississippi Forestry Commission was a credible source. The United States Forest Service was reported by 17 (7%) individuals followed by county agents, 14 (6%); Mississippi State University, 12 (5%); and forest industry companies, 12 (5%). The Mississippi Forestry Commission was cited the most credible source by administrators (4) and conservation officers (16). The technical staff (6) stated the U.S. Forest Service as their top credible source. The majority of individuals, 147 (62%) did not provide a response to this question.

Table 2. General communication methods by job description as reported in the November 2000 survey.

Job Description	Educational Programs	MDWFP Partnerships	Workshops	Presentations
Administration	7	7	6	5
Technical Staff	18	25	17	14
Cons. Officer	104	96	103	75
No Response	1	1	0	0

Table 3. Personal communication preferences by job description as reported in the November 2000 survey.

Job Description	Workshops	Meetings	Presentations	Newsletters/ Other mail
Administration	4	5	4	5
Technical Staff	19	20	22	15
Cons. Officer	77	74	68	70
No Response	1	0	0	0

Table 4. Media topics recommended by job description as reported in the November 2000 survey.

	Wildlife Habitat	Wildlife	Erosion
Administration	15	13	8
Technical Staff	37	27	26
Cons. Officer	168	149	97
No Response	0	1	1

Discussion and Conclusions

The thoughts, values, attitudes, and perceptions of MDWFP personnel pertaining to Mississippi's forest industry were captured in three focus group sessions and a mail survey with a response rate of 62%. In the mail survey, 65% of administrators, 100% of technical staff, and 56% of conservation officers in the agency responded. An interpretation of the study results was based on their values, attitudes, and perceptions. Testing for non-response was done by comparing attitudes from the first 50 and last 50 surveys returned. Twenty-three individuals reported positive and somewhat positive attitudes in each period. The number of individuals with negative or somewhat negative attitudes (13) was greater for the first 50 surveys returned compared to ten for the last 50 surveys.

Attitudes and opinions expressed in the focus group sessions were verified in the mail survey results. The administrators reported mixed feelings in both venues. The technical staff members were more negative toward industry in the focus group session as well as the mail survey. The conservation officers reported more positive attitudes toward forest industry in the survey results whereas they had mixed attitudes as reported in the focus group session. One major difference between the focus group results and the mail survey results was that in the focus group session the technical staff did not believe it would be beneficial for forest industry to communicate with

them. However, the mail survey indicated that the majority of technical staff members (95%) felt it would be beneficial for forest industry to communicate with the agency. This illustrates the benefit of quantifying through a mail survey attitudes and opinions expressed by individuals in the focus groups. Mail survey results more adequately represent the attitudes and opinions of all personnel in the agency.

Agency members reported few activities they believed the industry did well. In the mail survey, they felt industry did well in replanting, harvesting, and timber management. However, focus group participants had stated that these activities were done well for pine trees but not hardwoods.

MDWFP personnel voiced many areas of concern with forest industry's management practices. These areas of concern were expressed both in the focus group sessions and the mail survey. As expected, they were concerned over activities that have direct and indirect impacts on wildlife. The key areas of concern for the agency were hardwood management, wildlife management, erosion, Streamside Management Zones, habitat degradation, and tree species diversity. It is important for forest industry to consider these areas if relations with this agency are to improve.

MDWFP personnel were discouraged by past radio and television advertisements used by forest industry. Focus group participants expressed that such advertisements were unbelievable. For example, they doubted the wildlife-related activities that forest industry promotes. Agency members believe that future advertisements should include messages on wildlife habitat and wildlife that are more truthful and meaningful.

The SFI Program is an example of where the relationship between forest industry and the agency has been inadequate at best. It is apparent that forest industry has not effectively been communicating with the MDWFP regarding the SFI Program and industry's willingness to voluntarily implement it. The focus group sessions indicated that few MDWFP personnel were aware of SFI. Half the administrator focus group participants were aware of SFI. However, they were not knowledgeable of the goals of SFI. All technical staff members participating in the focus group were aware of SFI but did not believe industry was meeting the SFI goals. The conservation officers were unaware of SFI. The mail survey revealed that 63 (27%) MDWFP personnel were aware of the SFI. Six (40%) administrators, 23 (59%) technical staff members, and 34 (19%) conservation officers were aware of SFI. Of these, the majority (60%) did not believe the industry was currently meeting what they felt were the SFI goals. Based on these results, it appears that forest industry needs to more effectively communicate the goals and principles of SFI with this agency.

The MDWFP is an influential force in the political arena in Mississippi. The administrators, though few in number, are key influences in Mississippi politics especially in the areas of wildlife and wildlife management. They have direct ties to the governor and the legislature. This in turn may affect the management practices of other natural resources such as timber. One administrator, in the focus group session stated, "The administrators are the decision-makers that affect how MDWFP programs go on and how our programs might affect and relate to what forest industry is doing." Currently, the MDWFP has implemented the Scenic Streams Stewardship Program. This program depends on a relationship of cooperation between private forest landowners and the agency.

In conclusion, the agency is willing to work with forest industry on areas relating to wildlife issues that affect forest management activities. Forest industry needs to communicate and work with the MDWFP to improve their relationship. This could potentially involve both a change in forest-based activities that affect wildlife and communicating and educating MDWFP personnel to address the perceptions that industry is a negative force for wildlife in the forest.

This paper has provided a baseline of information on MDWFP personnel values and attitudes toward forestry and forest industry. For example, this data set can be used to determine differences that may occur between the values and attitudes by job description along with corresponding preferred communication methods and messages. If the results of this study are implemented, then follow-up is needed. Future studies should be conducted periodically after initial communication efforts have been implemented. These studies will determine the effectiveness of communication and education activities for improving attitudes toward forestry and forest industry. These studies will allow industry to constantly tailor their communication and education activities to meet the needs and wants of MDWFP personnel. Future surveys can query MDWFP personnel on information relating to forest industry to provide a better understanding of their knowledge levels. This will permit a comparison between what is perceived relative to reality.

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Perspectives on Certification

Certification as a Buyers' Cartel: Economic and Legal Implications - *David Laband*

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Introduction

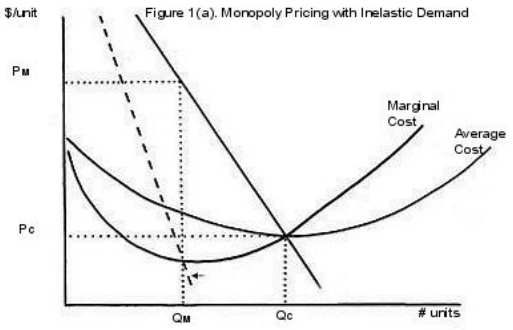
Private landowners increasingly are voicing reservations about certification, based on their perception that it may be a vehicle for buyer cartelization. In this paper I explore the economic and legal ramifications of a *de facto* buyers' cartel. Specifically, I: (1) analyze the ability of a buyers' cartel to act as a monopsonist by lowering prices paid to timber suppliers, and (2) discuss the applicability of U.S. antitrust law to such a practice. The mere fact that a cartel is organized tells us nothing about the impact of the cartel. I will identify and discuss considerations that influence the ability of a cartel to affect price(s), with specific focus on the case of certification creating a buyers' cartel in the forest products industry. This leads naturally to a discussion of the circumstances under which timber suppliers would be granted standing to sue for protection under U.S. antitrust law.

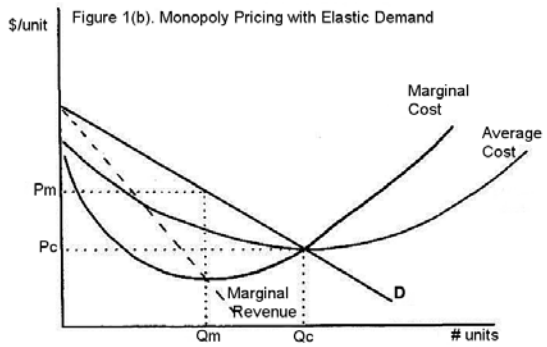
The Economics of Monopoly and Monopsony

Most people have a pretty good idea of what a monopoly is - - a single seller of a product. The fact that a single seller 'controls' all sales of a certain item is not *per se* objectionable from an economic perspective. IF there is cause for concern, such cause results from the fact that a monopolist is a price-setter, whereas in competitive markets firms are price-takers. The issue of concern to economists is the extent to which a monopolist can raise price above marginal cost of production. The ability to do so is known as market power; the Lerner Index measures market power:

$$L = (P - MC)/P.$$

The ability of a monopolist to price above marginal cost depends on consumers' elasticity of demand for the product it sells.[1] This dependency is depicted in Figures 1(a) and (b). In figure 1(a), the monopolist sells a product characterized by inelastic demand. In this market, the monopolist can raise price substantially above marginal cost (it has relatively significant market power), without driving lots of consumers away from the product. Specifically, the monopolist determines the optimal quantity to produce (Q_M^*) by equating marginal revenue with marginal cost; (s)he then charges as much per unit as customers in the market are willing to pay (P_M^*). In the aggregate, consumer welfare is reduced by the trapezoidal area ABCD, which consists of higher prices paid to the monopolist for each unit sold plus the fact that some consumers who purchase the item at the relatively low competitive price do not do so at the higher monopoly price. The former is merely a wealth transfer from consumers to the monopolist; the latter is a real social loss.





In figure 1(b), however, consumer demand is

[1] Mathematically, this dependence can be derived by setting the firm's marginal revenue (MR) equal to marginal cost (MC). Since total revenue (TR) equal the number of units sold (Q) times the price per unit (P), then $MR = \partial TR/\partial Q = \partial(PQ)/\partial Q = P + Q(dP/dQ) = P(1 + 1/\varepsilon_d)$. Setting MR = MC yields: $MC = P(1 + 1/\varepsilon_d)$, rearranging terms gives us $(P\text{-}MC)/P = -(1/\varepsilon_d)$. As elasticity of demand gets larger, the gap between price and marginal cost falls, and vice versa.

relatively elastic - - small changes in price elicit large changes in consumer purchase behavior. Consequently, even though cost conditions are identical in both markets, the monopolist depicted in figure 1(b) charges a lower price per unit than the monopolist depicted in figure 1(a). The reason why is straightforward: if the monopolist tries to raise price very much above cost of production, prospective customers desert him in droves. Because consumers' willingness to abandon the monopolist constrains his ability to raise price, the social welfare loss from monopoly in a market characterized by elastic demand is relatively small.

Monopsony is the flip side of monopoly - - it refers to a single buyer rather than a single seller. For example, if WalMart buys all of the personalized greeting cards produced by a small firm in Auburn, Alabama, it is regarded as being a monopsonist relative to the small firm. As with monopoly, there is no reason to be concerned *per se* about the fact of monopsony. The critical issue is how much lower the monopsonist can set the price paid for the input than would prevail in a competitive input market. In the case of monopsony, however, the firm's market power depends completely on the elasticity of supply. This dependency is depicted in figures 2(a) and (b). Inelastic supply (figure 2a) permits the gap between the price paid to an input supplier in a competitive market and the price paid in a market characterized by monopsony to be large; this gap narrows as elasticity of supply increases (figure 2b).

A Buyers' Cartel in Forestry

A cartel is a group of firms that acts cooperatively in an attempt to effectively monopolize or monopsonize a market. In the case of forestry, a buyers' cartel might consist of Lowe's, Home Depot, Hechingers, 84 lumber, True Value, and other large buyers of wood and wood products. Acting independently as competitors they pay some market-clearing price (P* in figures 2a,b) for lumber and wood products that they purchase from suppliers; acting in concert, they are in a position to pay a lower price (P_C) than would prevail in a competitive input market.

Figure 2(a). Monopsony Pricing with Inelastic Supply

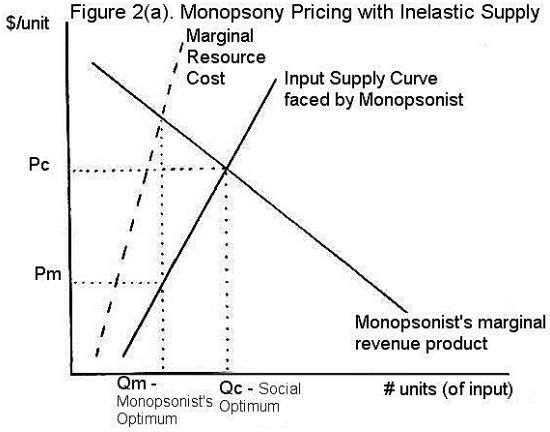
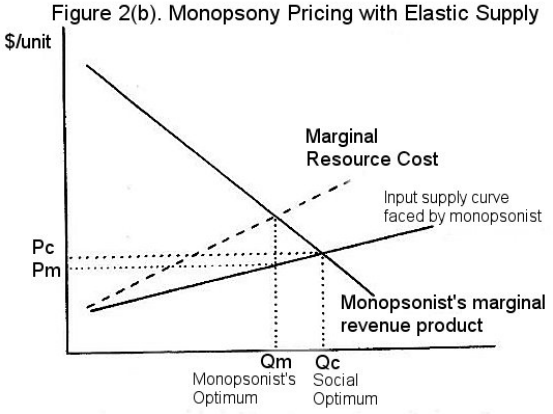


Figure 2(b). Monopsony Pricing with Elastic Supply



In general, economists pay little heed to cartels, because their very success increases the likelihood that the cartel will self-destruct. That is to say, the more successful a cartel is with respect to raising output price (monopoly) or reducing input price (monopsony), the greater is the financial incentive created for each of the member firms to cheat on the cartel by lowering (raising) output (input) prices just slightly. By doing so, each member of the cartel can increase his own profits, at the expense of the other members of the cartel. And, of course, once one member of the cartel cheats, they all have an incentive to cheat, and output (input) prices spiral back down (up) to the level that would exist in a competitive market.[2] So, left to their own devices, cartels are inherently unstable and almost never survive in the long run.

However, it is possible for would-be cartel participants to overcome this instability problem created by the financial incentive for each member to cheat. One way is for the firms in an industry with

[2] This is exactly why the per barrel price of oil plummeted in the 1980s and 1990s relative to the high prices orchestrated by the OPEC cartel in the late 1970s.

cartel potential to seek third party enforcement. The most powerful and enduring entity for accomplishing this result is the government. Local, state and/or federal agencies can issue regulations that control the behavior of firms in an industry. For example, it is well known (by economists at least) that in many, if not most, localities in the U.S. the municipal governments grant monopoly privileges to individual cable television companies. Regulations that are backed by force of law prevent cable companies from competing against each other. Consequently, cable rates in towns without competing cable companies are substantially higher than cable rates in towns with competing cable companies. The benefit to local governments from imposing monopoly on the citizenry comes in the form of revenues generated from a monopoly franchise fee imposed on the cable company and passed on to customers - - a not-so-subtle form of indirect taxation.

However, government enforcement is not essential to cartel survival; enforcement can be provided by any third-party capable of imposing meaningful sanctions on individual producers. For example, in the so-called 'dominant firm' model of cartel behavior, one of the member firms in a cartel is sufficiently large relative to the others that it can 'discipline' any of the smaller firms that may act contrary to the expressed or implied wishes of the other members of the cartel.[3] An industry or trade association can be used for cartelization purposes. Occupational licensure is a case in point - - licensure restricts the supply of practitioners, which inevitably raises the prices charged by those who are licensed. The licensure is, of course, couched in terms of public interest rhetoric (e.g., the public health or safety), but the end result is restriction of competition.

In terms of both the public interest rhetoric wrapped around the rationale and, more importantly, the economic consequences, certification is analogous to occupational licensure. Major purchasers of timber pledge publicly not to buy timber that is not 'certified' by a specified agency or organization such as the Forest Stewardship Council (FSC). In order to be certified, a timber owner must grow his/her trees the 'right' way. That is, (s)he must agree to behave the way the certifying authority dictates.

With respect to the relationship between certification and cartelization in the timber industry, there are at least two, not mutually exclusive scenarios: The so-called 'big-box' purchasers of timber try to use certification as a means of pressuring timber suppliers to lower their prices by agreeing to purchase non-certified lumber only at a discount relative to certified lumber, and the large industrial timber companies privately embrace certification as a means to disproportionately raise production costs for small, non-industrial timber growers in order to reduce competition in the supply of timber and, ultimately, raise timber prices.

This story proceeds as follows. Certification is costly. However, as a percent of unit production costs, certification is relatively more costly for small NIPF landowners than for large industrial companies. On the margin, the former will be driven out of the market by this cost disadvantage, leaving the latter with increased market share.

A Buyers' Cartel Legal Remedies

(a) The Law

Cartelization on either side of a market is subject to the Sherman Act of 1890. The relevant sections are:

Section 1. Every contract, combination in the form of a trust or otherwise, or conspiracy, in restraint of trade or commerce among the several states, or with foreign nations, is hereby declared to be illegal. Every person who shall make any such contract or engage in any such combination or conspiracy shall be deemed guilty of a misdemeanor....

Section 2. Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several states, or with foreign nations, shall be deemed guilty of a misdemeanor....

(b) Judicial Application of the Sherman Act

In historical context, judicial application of sections 1 and 2 has evolved from a narrow (i.e. literal) interpretation to a broad, effects-based interpretation (notwithstanding the unconventional prosecution of Microsoft). The strict interpretation, followed in the late 1800s and early 1900s, is that sections 1 and 2 forbid ***all*** monopolies and attempts to monopolize, period. The question is, what constitutes a monopoly or monopolized market? Early on, monopolization was defined in structural terms - - a company's share of the market. Antitrust enforcers adopted what came to be known as the 30-60-90 guideline: a 30 percent market share was not regarded as monopoly, a 90 percent market share was

[3] Such discipline might take the form of the dominant firm flooding the market with product at very low prices, as a signal to one or more other firms that cheating on the cartel by lowering price will have dramatic price and output consequences for the cheaters.

regarded as definitely monopoly, with 60 percent market share reflecting substantial monopolization.

Defendants in antitrust cases frequently argued that even if they met the bureaucratic structural guideline that defined monopoly, their monopoly position actually benefited consumers, a position substantiated by highly respected members of the economics community. Certain industries are characterized by substantial economies of scale over large ranges of production. In such industries, efficient (cost-minimizing) production may imply a single producer or a small number of producers. Even if the existing producer(s) acts as a monopolist by raising price above marginal cost, a low-cost-of-production monopolist may better serve consumers than high-cost-of-production competitive firms. Indeed, competitive firms operating in an industry characterized by strong economies of scale, have powerful financial incentives to merge to achieve cost savings. That is, monopoly may be the natural state of the industry; competition is an unstable state.

In effect, then, one challenge to a narrow interpretation of the Sherman Act is that by disallowing all monopolies, the law ends up hurting consumers rather than helping them. This challenge reflects an appreciation for the possibility that there may be "good" monopolies and "bad" monopolies; the antitrust authorities for prosecution should not target monopolies that result from consumer-friendly intent.

A second challenge to narrow interpretation of the Sherman Act is based on the distinction between defining monopoly strictly in terms of market structure and defining monopoly in terms of effects on consumers. As noted previously, from an economic perspective, monopoly is not *per se* harmful. Social welfare is harmed only to the extent the monopolist is able consistently to price significantly above marginal cost of production. This depends completely on the elasticity of demand for the monopolist's product. A monopolist that operates in a market where consumers react with great sensitivity to even small changes in price cannot raise price significantly above marginal cost without driving most of his customers away. In effect, he prices himself out of business. Demand might be elastic because the item is not very important to consumers and/or there may be substitute products readily available. In either case, the exercise of market power by the monopolist does not significantly impair social welfare, because there simply is not much market power to be exercised. However, if demand for the monopolist's product is inelastic (because it is important to consumers and substitutes are not readily available), the monopolist is able to price significantly above marginal cost.

Judicial appreciation of these economics-based challenges to a narrow interpretation of the Sherman Act led to development of what has come to be known as the Rule of Reason doctrine, which has, for the most part, dominated the antitrust landscape for the past 90 years. Under this doctrine, monopolies may be shielded from antitrust penalties by virtue of imposing limited harm or, indeed, improving consumer welfare.[4]

(c) Application of the Sherman Act to a Buyer's Cartel Created by Certification

This review sets the stage for an analysis of the application of the Sherman Act to a buyer's cartel created through the certification process. The first point to note is that under the Rule of Reason, the fact that a buyer's cartel exists, by itself, provides insufficient cause for action under the Sherman Act. Second, and relatedly, the cartel will be judged on the basis of its actions and thereby inferred intent. Let's revisit the two scenarios described previously.

In the first case, the 'big-box' purchasers of timber attempt to use certification as a means of pressuring timber suppliers to lower their prices by agreeing to purchase non-certified lumber only at a discount relative to certified lumber. That is, timber growers are squeezed for price concessions. A winnable case requires demonstration that: prices for uncertified timber dropped substantially below the prices that existed prior to certification, and the drop in input prices is caused by the certification process, not by recently-instituted production efficiencies, supply conditions that are unrelated to certification, or by demand conditions that are related to certification.

With respect to the first burden of proof, there must be a historical pattern of prices that is consistent with an interpretation of monopsony. This could be taken as evidence of harmful effect. The critical question, however, is whether such a history of input price movements ***would*** be interpreted as harmful effect traceable to certification-based monopsony. The answer to this question hinges on the second burden of proof. If, for example, one can document a significantly higher demand for certified wood and wood products relative to uncertified wood and wood products, this would support a decline in the relative price of uncertified wood and a resulting decline in the prices paid for uncertified wood. In this circumstance, the intent that reasonably could be inferred from the historical record of input prices

[4] For a comprehensive review of the antitrust laws and the development of antitrust policy see Shepherd and Wilcox (1979).

paid by the 'big-box' purchasers would be that they reflected responsiveness to market demand conditions, not that they were deliberately squeezing input suppliers. Nor would the absence of a documented demand-side justification for a decline in the relative price of uncertified wood be sufficient proof of harmful, anticompetitive practices by the 'big-box' companies. Factors unrelated to certification might have affected the supply of uncertified timber, driving down the relative price of uncertified wood.

In the second case, large industrial timber companies privately embrace certification as a means to disproportionately raise production costs for small, non-industrial timber growers in order to reduce competition in the supply of timber. If final consumers are willing to pay higher prices that fully compensate growers for the added costs imposed by the certification process, growers will not be pushed out of business. However, the only condition under which an increase in production costs can be fully passed on to final consumers is that demand is perfectly inelastic. The fact that timber demand is not perfectly inelastic implies that certification will, in fact, drive marginal producers (likely small landowners) out of production, by raising their cost of production by more than the increased prices paid for certified wood.

Cartelization of timber supply that results in the threat of sizable numbers of producers being driven from the market could attract the attention of the antitrust authorities. Under what conditions will this occur? If consumers are unwilling to pay higher prices for wood and wood products that are certified than they were willing to pay for uncertified wood and wood products. That is, if the elasticity of demand by final consumers with respect to price increases resulting from certification is great. In this case, certification can reasonably be inferred as not a necessary cost of doing business (since it is not supported by the demand side of the market). Consequently, certification that is imposed serves only to drive up producers' costs, some more so than others. In principle, the antitrust laws generally should promote competition, not competitors. Competitors may be harmed as a by-product of actions that promote competition. However, competitors may not be harmed as a direct result of actions that fail to promote competition. Indeed, judicial application is appropriate not only when the effect of actions taken is to harm existing competitors (timber suppliers) but also when potential competitors (timber suppliers) would be adversely affected.

The final difficulty in terms of bringing an action under the Sherman Act is that barring indication of explicit communication among the large industrial timber suppliers that reveals intent to support certification as a means of driving out NIPF landowners out of business, it is virtually impossible to prove 'conspiracy' in restraint of trade. Likewise, without some indication of explicit communication among the 'big box' companies to the effect that they all could profit by working together to support certification as a means of pressuring suppliers of non-certified timber to reduce prices, it will be difficult to successfully prove conspiracy in restraint of trade.

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Green Certification and the Future of Family Forests - *J.P. Caulfield, R.G. Chambers and C.T. Fields*

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Introduction

It is difficult to pick up a forestry publication without reading about the issue of certification. Usually certification is viewed in a positive light. Many writers apparently believe that America's forests "need" certification, and the issue is discussed with little or no debate. This is cause for concern because it is a monumental assumption. We also believe it to be wrong.

Forest certification was the theme of the February 1999, *Journal of Forestry,* which contained five articles on the subject. Not one considered whether certification is environmentally or economically justified or serves any useful function.

Organizations promoting certification see its need as self-evident. The Forest Stewardship Council (FSC), for example, markets certifications with statements like: *"There is huge public concern about the destruction of the world's forests. More and more people demand products that come from well-managed forests.* (Forest Stewardship Council 2001).

Such generalizations almost always lack supporting documentation. In fact, the literature contains evidence suggesting exactly the opposite: that the public at large does not "demand" products from well-managed forests if they cost more than what they are buying now.

One study asked consumers to rank the importance of forest product certified status against ten other product attributes (Forsyth et al. 1999). Certification ranked ninth of eleven attributes considered well below quality, price, appearance and strength. Knot location ranked fifth. Less than half the consumers surveyed who described themselves as "extremely environmentally conscious" were prepared to pay 10% more for certified, versus non-certified wood products. A small minority of the general population was prepared to pay that much. And as the authors correctly pointed out, "stated" willingness to pay is usually far higher than "actual" willingness to pay.

Simply put, a real debate on certification is a precondition for a rational discussion of this subject. To date, that debate has not occurred.

The assumption that America's forests need certification should concern foresters, landowners and society at large because no compelling evidence exists to suggest that America's forests are in danger. In fact, available evidence suggests precisely the opposite: that US forests are healthy, diverse and productive.

Also, some certification models arguably represent a base infringement on individual property rights. Moreover, broad acceptance of such models would likely have precisely the opposite results proponents claim to want. They would promote poor forest management, create economically non-viable forests, and raise income disparities between urban and rural areas.

Certification's greatest impact would fall on family forests, which is the nation's largest category of timber producer and a group systematically excluded from the process that gave rise to the new "certification industry." Most private landowners are unfamiliar with the certification issue and what is in store for them if it is widely adopted.

We begin by considering the importance of private timberlands in the US forest economy, then address the issue of whether America' s forests "need" certification. Three certification models are considered. Finally, we briefly examine the potential effects of widespread adoption of certification.

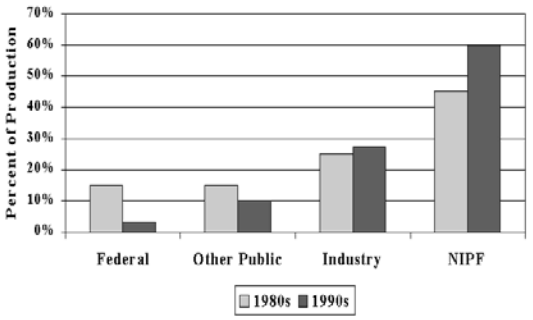
The Importance of Family Forests

The importance of private forestland in the US is hard to overstate. Seventy-one percent of America's 504 million acres of commercial timberland area are in private hands, owned either by non-industrial private forestland owners (NIPFs) or forest industry (USDA Forest Service 2000).

NIPFs consist overwhelmingly of family forests, the largest single private owner category. There are some 9.9 million NIPF landowners (versus 2 million farmers) (Sedjo 1999), who own 57% of the commercial timberland acreage. Industrial owners account for the remaining 13% of private ownership.

Private forests are also the nation's most important timber supply source, providing 88% of domestic industrial wood, and 26% of world production. Non-industrial lands account for 60% of US & 16% of the world wood production totals, respectively (Figure 1).

Figure 1. NIPF Lands Provide 60% of US and 16% of World Timber Production, and the Share is Growing



Source: Sedjo, 1999

Moreover, the role of US federal public forests as a timber supply source has declined since 1990 (Figure 1), because of the application of forest policies like the Endangered Species Act. Sedjo (1999) estimates that in the 1980s federal forests lands provided about 15% of US timber supplies and other public lands another 15%. Forest industry and NIPFs accounted for 25% for forest industry and 45% of the timber supply respectively. By 1998, however, the federal share fell to 3%, and timber from other public lands fell to 10%. Industry's share rose to 27% while the NIPF share climbed to 60%.

Compared to public lands, family forests consist primarily of young, vigorous forests. This is fortuitous because given the rising importance of private lands as a timber source; the ability to grow trees quickly is becomes more important. But there are other reasons as well. For one thing, young forests are more efficient carbon sinks than the slow-growing old growth forests typical to public lands. A mixture of younger age classes also provides a greater degree of wildlife habitat diversity than large unbroken areas of old-growth timber.

Simply put, family forests are a crucial component of global timber supply, biodiversity and national wealth.

"Sustainable" Forestry and the "Need" for Certification

Little debate exists to suggest whether America' s forests actually require certification. Proponents argue that forests should be managed to be "sustainable."

This is hard to dispute. Fortunately, is not a point that needs to be argued, because foresters have always advocated sustainable forestry. In the clamor for certification it is all but forgotten that creating and managing sustainable forests is the *raison d'etre* for the forestry profession in the first place.

Interestingly, certification proponents usually avoid defining "sustainability." As Sedjo et al. (1998) diplomatically state, *"The concept of what constitutes sustainable forestry is dynamic and evolving*." This is both an accurate statement and cuts to the heart of the certification issue: the more ambiguously and vaguely "sustainability" is defined, the greater the opportunity for the certification industry to view it as a blank check. This allows the imposition of standards that are biologically unsound, economically unjustified, and inconsistent with a capitalist system.

The notion that American forests "need" certification presumes they are poorly managed and in decline. Poor forest management can lead to a "non-sustainable" forest condition, where total forest area, productivity and biodiversity are reduced, thereby putting the nation's resources at risk. But is this happening?

It depends on how we define the word "sustainable." Lacking a consensus definition, and since the certification industry provides limited guidance, we return to our forestry roots and define *a sustainable forest as one capable of providing a continuous supply of forest outputs on a long-term basis*. It is not the only possible definition, but it does possess the virtue of simplicity and is relatively unambiguous.

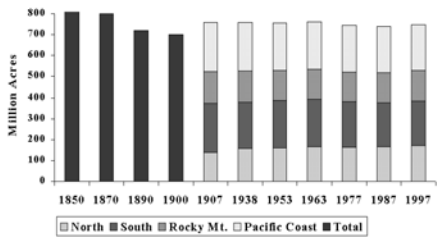
More important, our definition allows us to apply quantitative measures to judge whether America's forests are being sustainably managed, degraded or improving. This cannot be done when sustainability is vaguely defined.

The list is not exhaustive, and additional measures could be added. But our purpose is to frame a debate, not serve as the final word on certification. Consider the following questions:

1. Is America's forest area increasing or declining?
2. Is total forest growing stock volume increasing or declining?
3. Is per-acre productivity increasing or decreasing?
4. Are forests regenerated adequately and in a timely manner?
5. Is the volume in large diameter trees increasing or decreasing?
6. How does the area of plantation-grown forests compare to that of natural forest?

Figure 2 shows total US forestland acreage since the mid 1800s (USDA Forest Service 2000). Forest area declined from the mid 1800s to the start of the 20th century in response to the rapid increase in clearing for agriculture. But since the first decade of the 20th century, the forest area is essentially unchanged. Despite a rapidly growing population and a period of industrialization unprecedented in the history of mankind, the US forestland base actually increased since 1900. This hints at a sustainable forest condition.

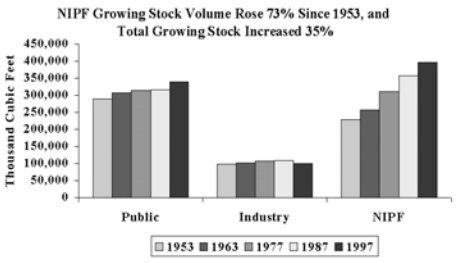
Figure 2. Total US Forest Area Increased Over the 20th Century



Source: USDA Forest Service, 1993 and 2000

It could be argued that the growth in forest area has grown might include a high proportion of poorly stocked, cutover forests with declining productivity. If true, this would suggest forests were not being managed sustainably. Figure 3 shows changes in forest growing stock volume since 1953 (USDA Forest Service 2000). Volumes on NIPF lands rose 73%, and 35% for all ownerships. Since the number of forested acres was essentially unchanged over the period, it means the per-acre productivity of America's forests rose.

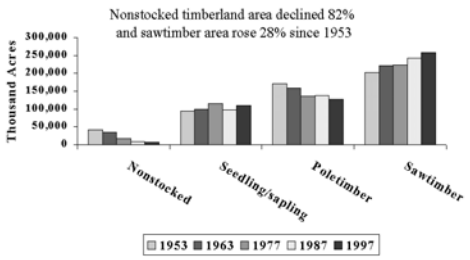
Figure 3. Total Growing Stock Volume by Ownership and Year



Source: USDA Forest Service, 2000

If forest management practices are sustainable, harvested acres should be quickly and efficiently regenerated, meaning the area of non-stocked forestland should be low. Moreover, non-stocked acres should decline through time. Figure 4 shows that 1.5% of the area of US timberland was non-stocked in 1997 (USDA Forest Service 2000). Also, the area of unproductive timberland declined dramatically – over 82% – over the last half-century. Moreover, the area of larger, sawtimber-size trees has risen, which is further evidence of sustainable forestry.

Figure 4. Area of US Timberland by Stand-Size Class and Year



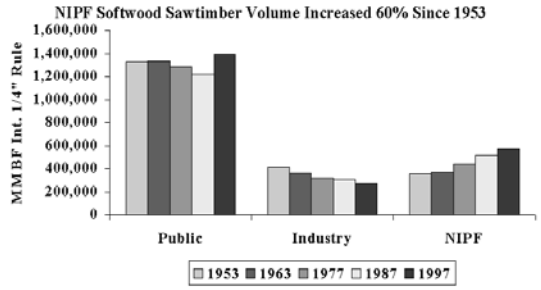
Source: USDA Forest Service, 2000

The increase in sawtimber acres is worth examining in detail. Certification advocates opine that big trees are preferable to small trees, because they are better indicators of biodiversity and more closely reflect the forest conditions that existed in a less industrialized and populated era.

Figure 5 shows softwood sawtimber volume, by year and ownership category (USDA Forest Service 2000). Volumes rose steadily on NIPF lands, increasing 60% since 1953. Volume also rose on public lands. Only industrial timberlands witnessed a decline in sawtimber volume over time. Figure 6 shows that hardwood sawtimber more than doubled on NIPF lands since 1953 (USDA Forest Service 2000). Hardwood sawtimber volumes also increased on both public and industry holdings.

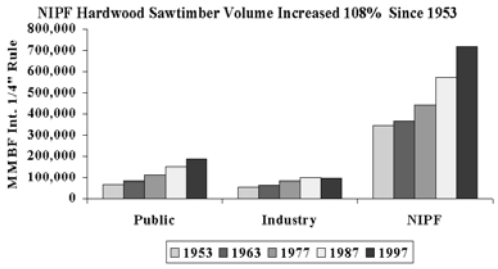
Also, Figure 7 shows total growing stock volume rose in virtually all diameter classes (USDA Forest Service 2000). So not only is growing stock sawtimber volume increasing, in most diameter classes it is in larger trees. The one exception is the very largest size classes, (+29" size) category. But even in this category the volume rose over the past decade. And as Figures 8 and 9 show, the diameter increases have occurred both for softwoods and hardwoods (USDA Forest Service 2000). For hardwoods, the proportion of growing stock has risen in all diameter classes, and volume had doubled in each size class from 11-13" upward

Figure 5. Softwood Sawtimber Volume by Ownership and Year



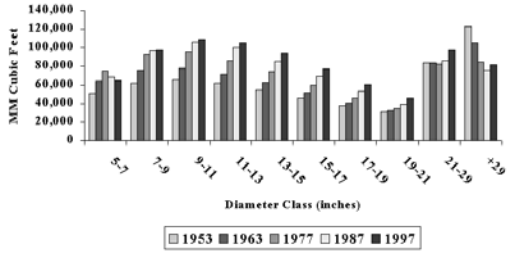
Source: USDA Forest Service, 2000

Figure 6. Hardwood Sawtimber Volume by Ownership and Year



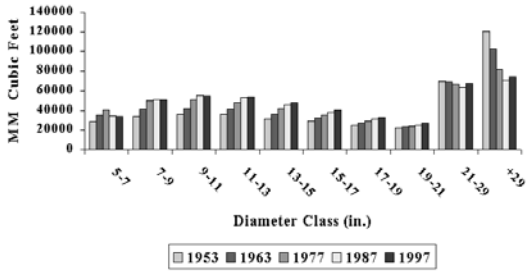
Source: USDA Forest Service, 2000

Figure 7. Volume of Growing Stock by Diameter Class and Year



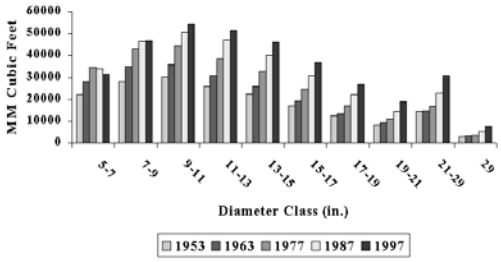
Source: USDA Forest Service, 2000

Figure 8. Net Volume of Softwood Growing Stock by Diameter Class and Year



Source: USDA Forest Service, 2000

Figure 9. Net Volume of Hardwood Growing Stock by Diameter Class and Year



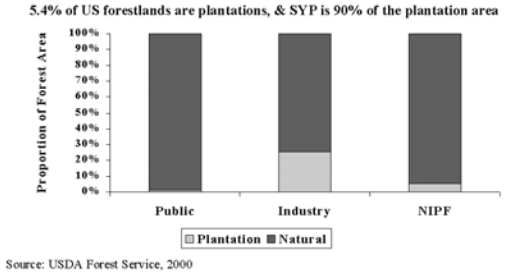
Source: USDA Forest Service, 2000

Far from being non-sustainable, America's forests have grown steadily in area, productivity and average tree size during the last half-century. And the greatest gains occurred on family forests.

Some would argue that our picture is biased because it overlooks the impact of forest plantations. Some in the certification industry dislike plantations, at least in a US context. The purported concern is that plantations are rapidly replacing natural forest areas.

In fact, plantations account for 5.4% of total US forest area Figure 10. The vast majority is held by forest industry, which has planted 25% of its timberland area. Just 5.3% of NIPF lands are in plantations, and 1.2% of public lands are planted

Figure 10. US Forest Area is Overwhelmingly in Natural Forests

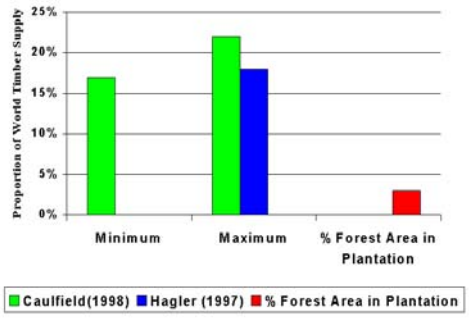


Source: USDA Forest Service, 2000

On a global scale, the importance of plantations is better seen in Figure 11, which summarizes results of two different studies (Caulfield 1998; Hagler 1997). Each estimated the proportion of world industrial wood produced from plantations. One study bracketed this at between 17 and 22%. The other estimated it at 18% of total supply.

Plantations account for 3.2% of the world's forest area, meaning global industrial wood production is far out of proportion to the area planted. Because intensively managed plantations grow far faster than natural forests, every plantation acre results in a disproportionately large reduction in the timber supply burden on natural forests. A small number of intensively managed forest acres frees natural forest acres for non-consumptive uses.

Figure 11. World Plantation Timber Production is Disproportionate to Area Planted



The above suggests that no compelling case exists for imposing certification on US forests generally, and family forests specifically. America's forests, in terms of total area, productivity, tree-size distribution and proportion of natural versus man-made forest area, are thriving.

Nonetheless, there is increased interest in certification, and the industry continues to grow. Does any certification model truly promote sustainable forestry? Numerous models exist and a complete discussion is beyond this paper. Instead, we examine the three models best known within the US, which also represent the widest spectrum of views of what certifying bodies expect of participants.

Certification Models: The Good The Sad and the Ugly

With apologies to Clint Eastwood, we refer to the three-certification models as "The Good, the Sad and the Ugly." The American Forestry Foundation's American Tree Farm System, the AF&PA's Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC) certification represent these respectively.

The Good: The American Tree Farm System

The objective of the American Tree Farm System is *"…to provide conservation education to private forestland owners in the United States…. The Tree Farm system goal is to reach out to these landowners and assist them in managing their forests sustainably"* (American Tree Farm System 2001). The System dates to 1941, and includes over 70,000 US certified tree farms.

Certification is conducted through the American Forestry Foundation, the oldest and largest voluntary third party verification group in the United States. The objective is to "*…recognize the practice of excellent forestry on private forest lands. This certification is intended to raise the visibility of the practitioners in their respective communities and inspire and motivate other surrounding non-managing forest landowners to practice sustainable forestry*" (American Tree Farm System 2001).

Like all certification systems, the Tree Farm System advocates good forestry. But three features set it apart from the other systems considered.

First, since certification occurs at the individual ownership level it focuses on factors a forest owner can actually control, and in which he has a vested interest. Unlike FSC certification, Tree Farm avoids issues beyond the landowner's control, like indigenous people's rights, or which they may not be interested in, like the social well being of local communities.

Tree Farm is the most inclusive of the certification systems considered. Membership is voluntary and open to any interested timberland owner, but non-members are not discriminated against by the organization.

Members are expected among other things, to write a management plan, regenerate harvested areas promptly, maintain water quality and protect and enhance wildlife habitat. But in advocating these

practices, the System imposes relatively few hard and fast rules about precisely how landowners must perform them.

When a property is certified, it is done through an independent third-party forester. The service is provided on a volunteer basis, so the certifier operates with no economic conflict of interest.

Tree Farm certification recognizes that management objectives vary among owners. It is understood that some individuals prefer to grow pine plantations while others may manage for wildlife. Tree Farm avoids value judgments about who is doing the "right" thing, and correctly leaves these decisions to the owner. Simply put, the Tree Farm System values diversity.

Tree Farm certification thus embodies a positive worldview because it recognizes first, that landowners are rational, and second, want to manage their property to achieve desirable personal and social goals. This view is consistent with a free enterprise system that rewards entrepreneurship and benefits both owners and society at large.

The same worldview is observed in the way Tree Farm System is organized. It is run at a state level, with Tree Farm committees in all but two states. The benefit here is the recognition that forest management systems are inherently local. Tree Farm views itself as an educational organization, not a regulatory bureaucracy or a "watchdog." While landowners are assumed to be rational, it is recognized that they may not initially possess the forestry expertise needed to effectively manage their properties. The organization therefore provides educational opportunities to overcome this obstacle, so landowners can make well-informed decisions that promote good forestry. In addition to 8,000 volunteer foresters who assist landowners, the Tree Farm system provides various publications, workshops field days and meetings to aid landowners in making informed judgments about their property.

The Sad: The Sustainable Forestry Initiative

The Sustainable Forestry Initiative was established by the American Forest & Paper Association (AF&PA) in 1994, in response to accusations of poor management in forest industry lands from extremist preservationist organizations, and to more extreme certification models proposed by organizations like FSC. The AF&PA states that SFI is *"…. an exacting standard of environmental principles, objectives and performance measures that integrates the perpetual growing and harvesting of trees with the protection of wildlife, plants, soil and water quality and a wide range of other conservation goals."* (AF&PA 1999).

The SFI Principles and Objectives, like those of the Tree Farm System, advocate forestry that is "sustainable," although SFI views the term vaguely. Operationally, the SFI also promotes forestry that is environmentally responsible and straightforward. It include practices such as (1) promptly regenerating harvested areas, (2) protecting water quality, (3) conserving biodiversity and fish and wildlife habitat (4) minimizing visual impacts of harvesting, (5) protecting places of historical, ecological and biological significance and (6) improving wood utilization and resource recovery rates.

Nonetheless, the SFI is "The Sad" for several reasons. First, it is reactive. The largest US forest products companies, representing a majority of AF&PA members, have promoted scientifically sound forestry for decades. But by suddenly advocating the "need" for SFI certification, these same members have repudiated the good stewardship industrial foresters have afforded their lands for over fifty years.

The largest firm's investments in research – tree improvement programs being just one example – have tremendously improved forest management on both industry and family forests. Moreover, some AF&PA members have landowner programs to assist non-industrial landowners manage their properties. The SFI, by ignoring these very real accomplishments, provides a public impression of an industry that has something to hide.

For example, AF&PA President W.H. Moore has stated that the SFI, on reaching its fifth anniversary had reached *"…an important reference point for many of the original goals we set when we first began this ambitious campaign to transform the forest products industry"* (AF&PA 1999). It is unclear what the industry is being transformed *from*. It is one thing to strive for improvement, which an appropriate goal for any industry. But the AF&PA gives the impression that the forest products industry pre-1994 is the same industry that existed pre-1894.

The SFI is exclusionary. As industry's umbrella organization, AF&PA makes SFI compliance a mandatory condition for membership. SFI was initially marketed by going to the CEOs of the major corporations. When these firms bought into SFI, by virtue of their market dominance they essentially forced the issue with the rest of the industry. This contrasts sharply to the inclusive view advocated by Tree Farm.

This approach works against the industry's long-term interests. The SFI suggests to the public that in past years the industry managed its lands irresponsibly and against society's best interests. AF&PA appears to be trying to give the impression

to outside observers that its purpose is as an industry regulating body, rather than an industry association.

In fact, the AF&PA actually brags that: "*Sixteen member companies have been expelled from the Association for failure to uphold the standard set by the SFI program."* (AF&PA 1999). Leading by edict is a poor substitute for leading by example, and AF&PA has alienated numerous firms.

Until recently, AF&PA only tried to impose its standards on industry players, and firms are free to maintain their membership or leave. More ominously, having successfully bludgeoned forest industry into compliance, AF&PA has become more ambitious, and is attempting to press SFI certification on both US family forests and foreign timber growers: *"We are revolutionizing industrial forestry in America, and we are beginning to expand the practice of sustainable forestry beyond our own forests to public and privately owned forestland, and even to other countries"* (AF&PA 1999).

A generous interpretation of the above statement is that AF&PA wants to offer landowners assistance in managing their properties. But considering the cavalier treatment it has afforded its own members, this view is probably optimistic. Although it is too early to tell precisely, AF&PA may be looking for ways to pressure landowners to follow the industry's lead in certification.

The Ugly: The Forest Stewardship Council

The FSC was established in 1993, and claims that: *"The Forest Stewardship Council is an independent, non-profit organization that promotes responsible forestry. A standards-setting body for a forest certification system, the FSC, through its Principles and Criteria for Forest Management, has established the highest standards for environmentally, economically and socially responsible forestry"* (FSC 2001).

Certification is based on 10 "principles" intended to be applied to all forests worldwide, regardless of silvicultural characteristics and whether publicly or privately owned. Certification standards are developed at a regional level by the FSC, in conjunction with regional committees.

FSC certification is all encompassing, with numerous social goals bundled into the process. Consequently, their principles and standards are ambiguous, arbitrary and conflicting. It is best described as a social engineering approach to certification.

That the principles apply equally to public and private lands says much about FSC's underlying philosophical foundation. Public and private timberlands are considered one and the same. Simply put, all forests are viewed as public goods, except that private landowners are obliged to pay their own bills and shoulder the risks for those lands. On public lands, these costs are borne by taxpayers.

FSC certification standards are still being developed for most regions. So we limit ourselves to the draft forest certification standards for the southeastern US (FSC 1999). Space does not allow a complete discussion, since the 10 "principles," accompanying "criteria," "indicators" and "verifiers" run 37 single-spaced pages. But some examples demonstrating FSC's views are instructive.

Principle 3 addresses Indigenous Peoples, which in part (section 3.2) states that: "*Forest management shall not threaten or diminish, either directly or indirectly, the resources or tenure rights of indigenous people."* (FSC 1999).

The FSC does not count as "indigenous" a family, which has managed and inhabited a property for the last 150 years. Even a mediocre lawyer could argue that Principle 3 implies either that a landowner's property should be returned to whatever indigenous group formerly claimed to occupy the land, or alternatively, that any proposed management on that land must be approved by any indigenous people who live in the area.

Principle 4 concerns community relations and worker's rights: (4.1) *"The communities within, or adjacent to, the forest management area should be given opportunities for employment, training and other services"* (FSC 1999).

The extent to which the owner of a 500-acre forest is responsible for employing and training the local labor force is not made clear. Must he be prepared to send them to college? What if the landowner knows the local wood dealer is dishonest? The principle says the landowner should deal with these people. Most important, what does this principle have to do with a well-managed forest?

Section 4.4 states: *"Management planning and operations shall incorporate the results of evaluations of social impact. Consultations shall be maintained with people and groups directly affected by management operations"* (FSC 1999).
Landowners are expected to consider local sensibilities about aesthetics, cultural sites, access, employment and landscape level impacts. Stated differently, any transitory whim of individuals with no connection to a forest property are placed above the goals of the landowner who pays all costs and bears all risks. The market is replaced by local politics.

Principle 5 concerns forest benefits: (5.1) *" Forest management should strive toward economic viability, while taking into account the full environmental, social and operational costs of production, and ensuring the investments necessary*

to maintain the ecological productivity of the forest" (FSC 1999).

It is not clear whether FSC considers a 1% or a 10% return economically viable. It does not suggest whether "economic viability" is the same for all landowners. How do the certifiers make an objective determination? They cannot, since the principle is arbitrary.

Section 5.1.2 *states, "The landowner's resources should be sufficient to financially support post-harvest management activities such as road maintenance, silvicultural treatments long-term forest health and management, and monitoring."* (FSC 1999).

The certifiers decide who is sufficiently wealthy to be allowed to grow certified trees. This also means certifiers require an intimate knowledge of the landowner's financial situation. This is naked elitism.

Principle 6 states*: "Forest management shall conserve biological diversity and its associated values, water resources, soils and unique and fragile ecosystems and landscapes, and by doing so, maintain the ecological functions and integrity of the forest."* (FSC 1999).

What happens when this principle conflicts with economic viability, as it easily could? There is no answer. There really can be no answer, since the criteria are undefined.

Principle 10 presents the FSC view on plantations. Plantations are regarded with suspicion, and the plantation management regimes FSC "allows" would create less productive forests than existing technology permits. Genetically modified trees (principle 6.8) are prohibited outright, a technology expected to exhibit its greatest potential in plantations. Intensive management practices such as fertilization ***may*** be allowed if the landowner submits sufficient scientific proof to the certifiers (sec. 10.6.4). Pests ***will*** be controlled using integrated pest management relying primarily on biological control methods rather than chemical pesticides and fertilizers (10.7). Costs are irrelevant, which could conflict with "economic viability."

FSC certification principles describe a static forest system characterized by minimal change. The intent is to push landowners towards creating and maintaining naturally regenerated, slow-growing "primary" and "secondary," forests, and away from managing productive, fast-growing plantations. In sharp contrast to Tree Farm, FSC places no value on diversity of either forest condition or management objectives.

The FSC is elitist and espouses a negative worldview. It presumes the world's forests are public goods. Landowners are assumed to lack the enlightened guidance provided by FSC bureaucrats, and would otherwise make the "wrong" decisions about how best to manage their property. FSC does not attempt to educate, inform or enlighten, but to control. Their model is completely at odds with a free enterprise system.

FSC's organizational structure and process for establishing certification standards also sheds light on their methods. Membership guidelines are a textbook case of political correctness: *"To ensure FSC's independence and adherence to its objectives, it is essential that members support FSC's principles and aims. That is why the FSC Statutes lay down strict conditions for all applicants."* (FSC 2001).

FSC membership is thus contingent on unquestioned support. How can any group claim "independence" if it does not allow dissent among its members? Additional evidence is provided by the way the FSC controls the process for establishing certification standards. They claim*"FSC aims to clear up the confusion (*about well managed forests*) by providing a truly independent, international and credible labeling scheme on timber and timber products."* (FSC 2001).

There were 18 members of the Working Group (WG) that developed the draft set of standards for the US southeastern states. It consisted of 5 academics, 5 consultants, 1 professional certifier, 4 NGO members, 1 public agency member and 2 landowners. Family forests, which own 70% of southern timberlands, and the group with the largest economic stake in forest certification constituted 11% of the committee. Moreover, at least one-third of the WG consisted of financially interested parties, in the form of consultants and certifiers. These individuals had direct conflicts of interest in developing objective, transparent standards. The same was potentially true for the academic members, because academics increasingly are employed as certifiers on a consulting basis. Also, at least one NGO member worked as a consultant part-time. So 1/3, and possibly over 2/3 of the WG members had direct financial conflicts of interest in serving on the committee.

Initially there was a third landowner representative on the WG, who resigned in protest because she became convinced that: (1) financial conflicts of interest existed among WG members (2) it was never the FSC's intent for the interests of family forests to be adequately represented, (3) since FSC had the final veto authority on the standards, it viewed the regional WG as a rubber stamp (Lynda Beame 2001, personal communication).

In short, the FSC process excludes dissenting views, is riddled with conflicts of interest, and represents a base infringement on private property

rights. The FSC certification scheme is neither independent nor credible.

The FSC would argue that these claims are overblown by pointing out that certification is "voluntary," which is a disingenuous argument. A stated FSC goal is to establish a "chain of custody," process – outlined in their Principle 8 – for certified forests, whereby the source of a timber product is verified. For products to carry an FSC trademark, they have to come from "independently" certified forests.

But the FSC intends eventually to make it impossible to sell wood products in the US or abroad it they do not bear the FSC seal of approval (Carlton 2000). Their means of establishing market power is through front groups like the Rainforest Action Network (RAN), which intimidates forest products retailers and attempt to force them to adopt FSC certification standards. Over the past few years, in the US alone, RAN has organized harassment campaigns against Home Depot, Wickes', Lowe's and Staples.

Along with activities such as the theft of forest products from retailers, which is illegal on its face (Anonymous 2001), RAN's strategy is to send lists of demands to corporations, threatening to make their lives difficult if they are not met. FSC condones, but does not claim credit for this activity. But this gives the lie to so-called "voluntary" certification. If FSC truly intended for certification to be "voluntary," it would publicly condemn RAN and related organizations.

The family forest owner who resigned from the southeastern certification standards committee eloquently summarized the FSC's intent:

"*Standards are written to meet a market that does not exist while efforts are underway at the same time to create a market that requires the standards that are being written. The producer will suffer the financial burden of meeting the standards while the consumer suffers the financial burden of buying a certified product. Meanwhile, all the money lands in the lap of a self aggrandized entity who is self empowered to not only set the standards but also to certify the certifiers"* (Beame 1998).

Forest Certification Outcomes

What might happen if the FSC certification model was widely adopted? We limit the discussion to FSC because it represents the most radical departure from the way US forests have been historically managed. Tree Farm has existed for 60 years, and industrial forestry about as long. As shown earlier, the kind of forestry practiced in the US for the past half-century or more has resulted in healthy, productive and diverse forests. Tree Farm and SFI advocate environmentally sound, forestry, and their certification models, if widely adopted, would not lead to significant changes.

Widespread FSC-style certification adoption, however, would mean first, that forest productivity would fall. Fewer acres would be in plantations and existing plantations would be less intensively managed, meaning that part of the harvest would have to shift to slower growing natural forests. Per-acre growth would decline and harvesting would by necessity occur on more acres.

Assume a pulp mill uses 500,000 cords of wood per year, and its timbershed, grows 2 cords/acre/year on average. If growth equals cut, 250,000 acres are entered for harvest each year. If productivity declined to 1.5 cds/ac/yr post-certification, the harvest would be spread to 333,333 acres. If certification allowed only 2/3 of annual growth to be harvested (1 cd/acre/year), 500,000 acres would be needed.

There are corollary impacts. Harvesting more acres means more miles of forest roads are required. Although erosion is a minor problem in most US forests, erosion that does occur is usually concentrated around roadbeds.

Since certification favors selection cuts over clearcutting, each acre will be entered more often. In short, certification would result in more frequent levels of human activity on each acre.

A larger harvest area means longer haul distances, which would raise timber price volatility. As timbershed areas expand, more fossil fuels would be consumed in transporting timber, meaning prices would be more heavily influenced by exogenous energy prices. Timber harvesting would be more labor intensive because as more acres are entered for harvesting, less volume would come off each acre, adding to volatility. Rising volatility, in turn, means the risk-adjusted return for timberland investments would decline, decreasing economic viability (contrary to FSC Principle 5).

Growing trees would become less profitable for other reasons. Aside from the initial cost of certification, the FSC requires annual auditing, which increases overhead. Because management intensity would decline, trees will grow more slowly, rotation lengths would increase and investment returns would decline.

Ironically, certification would limit opportunities to promote good forest management. For example, clearcutting of low-quality hardwoods for chips in the Appalachian highlands is economically worthwhile and silviculturally desirable. Many of these acres suffered from high grading early in the century. Over

time, this resulted in a situation where deformed and low-value species were left to occupy sites.

On such areas clearcutting would improve forests by removing low quality trees, allowing economically valuable species to become established. For many owners, selling otherwise non-merchantable timber to a chip mill is an opportunity to benefit financially and increase the productivity of their property. But this would not be allowed under FSC certification.

Certification would increase income disparities between urban and rural areas. In Washington State, 1979 per-capita income in timber-dependent counties was 5% below the national average. By 1997, however, the gap had widened to 29%. Researchers attribute the drop to the dramatic harvest reductions on publicly owned lands combined with regulatory constraints (CINTRAFOR 1998). The harvest decline and increasingly restrictive regulatory environment is a proxy for the outcome of FSC style certification. Ironically, this is directly contrary to FSC principle 4 on community relations and worker's rights*: "Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities." (FSC 1999).*

More generally, it is interesting to note that FSC has never negatively commented on the dramatic forestry job losses that have occurred in Washington and other western states during the last decade.

The above impacts of certification are, of course, preconditioned on a forest industry that continues to operate at existing levels of capacity. In reality, of course, increased overhead and production costs from adoption of FSC-style certification would increase the comparative advantage of offshore timber producers. This would result in a decline in US forest products processing capacity and the accelerated migration of domestic industry offshore. But perhaps that is what the FSC had in mind all along.

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Resource Manager Certification: Obstacles and Opportunities on Non-Industrial Private Forests - *Mary Chapman*

Director, Forest Stewards Guild

Introduction

There are several obstacles to a more robust trade in certified forest products in the US. One of these is the relatively low acreage of land currently third party independently certified as producing forest products using ecologically sustainable methods. Those looking to enlarge the pool of third party independently certified forest land have generally targeted larger tracts with relatively few owners such as non-federal public lands, tribal lands, and individual, family or organizational ownerships. Though this approach can return a big bang for the buck, 61 percent (240,378,000 acres) of US forestland is owned by 9.3 million non-industrial private owners with less than 1000 acres (Birch 1996). As is to be expected, the variation in reasons for ownership and management goals increases with their numbers. Providing these forest landowners with forest management information at the time they are looking for it can be problematic. The time needed to implement successive sustainable forest management practices may exceed the length of an owner's tenure, especially as the size of the average tract of forestland continues to decrease. These factors have prevented most organizations from trying to directly reach individual non-industrial private forestland owners of smaller tracts with certification information.

Certification Challenges and Solutions

With these conditions, the challenges to certification of non-industrial private forestland include:

1. Cost of certifying small tracts of non-industrial forestland.

Certification costs on tracts smaller than 1000 acres have been prohibitive for most forestland owners. These costs, coupled with the large number of people who own these smaller tracts, have been obstacles to significant or sustained efforts to encourage landowners to pursue Forest Stewardship Council-compliant forest practices on their land.

2. Suspicion of certifiers' motives.

Some landowners are concerned that third party independent certification of their forest management practices is a first step towards additional oversight and eventual regulation of these practices by a certifier or governmental agency. People with this perspective have described certification as an infringement on their private property rights.

Several methods are emerging to address these challenges:

1. **Group certification.**

In some parts of the country grassroots efforts have emerged among landowners to cooperate on forest management within a watershed or other landscape feature. Some of these coalitions are working toward, or have achieved, group certification of the forestland that landowners wish to designate within a specified area. Increasing the acreage of forestland to be audited for certification in one area decreases the assessment cost per acre for landowners.

2. **Resource manager certification.**

Hiring a forester indicates that landowners are interested in harvesting timber, whether as a primary ownership objective or incidental to other management goals. Either way, a consulting forester practicing ecologically responsible forestry has already attracted a pool of landowners interested in managing their land accordingly. On average, Guild members manage 15,000-20,000 acres of forestland. Landowners already know and work with their forester, which can decrease the uncertainty about the impact pursuing certification might have on their available management options. The consulting forester's confidence in certification can be reassuring to the landowner and can help decrease their concerns about the motives of those supporting certification.

If a landowner hires a certified resource manager to plan and implement land management practices that meet the Forest Stewardship Council principles and criteria, then the land itself does not need to be certified. The certified resource manager can bear the cost of certification, rather than the individual landowners. In addition, forest products harvested from their land have earned a place in the certified market.

As you might imagine, resource managers have expressed their own concerns about certification.

1. **Undergoing close review by ones peers can be uncomfortable.**

Even though resource managers often have many years of experience and are confident of the quality of their work when they consider becoming certified, having other professionals closely review ones work can be disconcerting.

2. **Certification is a multi-step process requiring good documentation.**

As business people, resource managers do keep records of financial transactions as well as forest management and harvest plans. However, going into the process they often wonder whether those records will be adequate to document the quality of their management and how they do business.

3. **Cost of certification.**

Some resource managers look at the cost of certification as a cost of continuing to do business. Still, they wonder whether voluntarily seeking out third party independent certification will attract additional clients for their services.

Solutions to these concerns raised by resource managers are emerging:

1. Provide a good description of the resource manager certification process.

The Forest Stewards Guild has developed a handbook for resource managers considering pursuing third party independent certification. The Resource Managers Handbook describes what the certification process is conducted on the ground, through articles and interviews with resource managers who have completed the certification process. These certified resources managers also suggest ways for their colleagues to be better prepared to go through the certification process, and ways to improve it.

2. Certify a portion of the land under a resource manager's care.

Some resource managers choose to include just a portion of the land they manage in the pool to be considered for certification. In this way they can try out the process and determine the impact of certification on their business with less expense than if they chose to include all of their lands in their initial certification pool.

3. Seek outside funding sources.

In some cases, sawmills or other wood processors have buyers for certified wood. They may be willing to help pay the cost of resource manager certification to expand their certified wood supply. Land trusts and other organizations supporting sustainable forestry such as landowner cooperatives may also be willing to share the cost of certification so that they can be assured of the quality of forest management planned and implemented by their resource manager, and have access to certified wood markets. The Forest Stewards Guild offers a competitive fellowship program for resource managers becoming certified. Since 1999, the Guild has awarded 22 fellowships to resource managers for $32,200 covering 93670 acres of land across the US. Though limited to $3000 each, the actual average fellowship was $1465. This amount covered about 1/3 of the resource manager's certification assessment cost, which averaged $.99/acre. Cost savings resulting from mgmt improvements.

4. Identify the benefits of becoming a certified resource manager.

Since becoming certified, resource managers have reported increased morale among their staff, increased confidence among clients in the forester's management practices, and in some cases having additional market access for their wood. Some resource managers have also said that they have realized cost savings from forest and business management improvements identified through the certification process, and that they now do a better job of tracking the results of forest management practices.

5. Provide continuing education and training for resource managers:

Earning and maintaining forestland certification depends upon the quality of forest management planned and implemented on the ground. Thus, it is essential to have a thriving cadre of qualified resource managers. Access to sound technical information is key to ensuring that these managers are well equipped to practice the most responsible forestry. Continuing education and training are critical for these resource managers to maintain their certification, as they are subject to an annual audit and a re-certification evaluation after 5 years. The Guild offers continuing education workshops and training session that help meet these requirements and add to technical expertise. Resource managers do not have to be certified to participate in these sessions.

Marketing Certified Forest Products

One of the biggest concerns about third party independent certification is the level of demand for forest products produced as a result of implementing forest management according to the standards and guidelines, and matching this demand with appropriate supply.

At this time something less than 10% of logs that leave forests as certified end up available to consumers as wood products branded with the Forest Stewardship Council trademark as certified. There

are a couple of reasons for this. First, due to weather conditions and the perishable nature of wood there is often not much time to properly investigate certified markets when a harvest is conducted. This is particularly true when markets are not well developed and the research needed is time consuming. Second, it is challenging to sell the often-narrow range of wood species and grades in the limited quantities that are produced, particularly when the forestland is not directly integrated with wood processing and marketing mechanisms. The result is that buyers are reluctant to develop products, which depend upon this inconsistent wood supply. Some resource managers are working with local manufacturers to address this concern, mostly at a small scale.

One step in resolving the challenges presented by the small, dispersed amounts of certified wood of varying species and grades now being produced is to coordinate management on large blocks of certified land and/or to form networks of certified resource managers. In both of these cases relationships have already been formed with landowners sharing a willingness to harvest forest products from their land. Their land management plans prescribe the timing of harvests, subject to landowner approval. Before harvesting, the resource manager collects information on the quality and quantity of wood that will be produced. A group of resource managers whose clients are not associated, or resource managers with cooperating landowners, could pool this information to develop a larger quantity and wider variety of products available on a more consistent basis to form a more reliable supply of certified forest products. Having this information over time would enable buyers to be more confident, and for manufacturers to develop products based on this supply of certified wood.

Even if more certified wood were available, there are many other segments of the chain of custody that need to be in place to bring the wood to market in a certified products. Links in the chain include log concentration yards as well as primary and secondary processing facilities. Experience has shown that having a broker or matchmaker who is known, trusted and credible with industry peers and has a track record working within the wood products value chain and manufacturing processes is critical to keeping people from backing out and overcoming some of the inevitable hurdles that will arise in trying something new. Their knowledge in coordinating supply with demand, and in developing new markets based on the information available through the forest management plans is key to developing and implementing successful market-building activities.

Summary and Conclusion

Third party independent certification, and resource manager certification in particular, is one way for foresters to step up to meet people's desire to gain assurance of the quality of at least some of the forest management they see going on around them. It's a trade off: a path to maintain the social license to practice forestry in exchange for additional transparency and public access to management information. Clearly it's not for everyone. But it has created opportunities for defining some of what constitutes good forestry – not just what doesn't.

The Continuing Journey of Certification: Road Maps, Traffic Jams, and Defensive Driving - *C. Denise Ingram*

USDA FS International Programs

Introduction

The common theme that underlies recent developments in forest certification systems is the goal to provide wood products to domestic and global markets in a way that does not contribute to the degradation or destruction of the world's forests. One result of these developments is, however, that the decision to certify for a variety of landowners, producers and forest stewards has become somewhat complicated. In some ways, it is akin to mapping a long, familiar journey for your family, while under pressure to choose from several new sets of directions. It may be analogous to embarking upon a journey that is entirely new with added costs and uncertain impacts.

Like most travels, the certification journey includes uncertainty and conflicting messages along the way. And in a practical sense, defensive driving will be required to navigate with the least capital outlays for the strategies chosen. For many forest owners, understanding the alternative strategies for participating in the certification arena requires close attention to the driving factors behind its development.

In the context of public policies and private forests, certification has its niche among a variety of sustainable forest management (SFM) tools. Understanding that niche will aid decision-makers to plan for the stewardship of all forest areas. Other appropriate policies and programs, such as criteria and indicators, national and local assessments, private sector initiatives, forestry extension to small landowners and institutional investments into sustainable forest management and conservation are additional tools that can be used to achieve SFM goals.

The following paper will review the certification journey to-date with a discussion of the expansion of certification systems, issues of supply and demand and the complexity of reading signals from the factors that influence the adoption of certification. The summary will attempt to present a set of lessons learned and identify lingering questions that reflect how certification continues to progress as a choice for public and private forest stakeholders.

Road Maps: The Expansion of Certification Systems

The choices of alternative routes to SFM through certification are numerous. Certification systems range from standards for traditional tree farmer networks to principles set by international governing bodies of accreditation to national and international mutual recognition of standards. The progression of certification worldwide varies from the point of view of industry, non-industrial landowners, forest communities, environmental nongovernmental organizations, intergovern-mental organizations, and national governments (IWPA, 2001). Many of the systems placed under the certification umbrella include activities that address SFM goals, but are not certification systems, per se. And although it is difficult to suggest a definitive list of certification systems, a subset commonly recognized systems are listed, for the purposes of this discussion, in Table 1.

The expansion of certification systems reflects positively on the diversity of forest resources, national political and economic structures, and the capacity of stakeholders to cooperate in SFM activities. On the other hand, the focus of human and financial resources on certification has shifted the emphasis from the primary goal of effectively implementing SFM on the ground to one of protecting market participation for wood products suppliers, with SFM as a highly valued, but none-the-less assumed by-product.

The complexities and variations of what constitutes "good" or "sustainable" forest management suggests that no one system fits all. Many areas are already, and have been for some time, practicing sustainable forest management. The demand for independent, impartial evaluations of forest management practices in order to gain a stamp of approval reflects political and social influences more so than the technical or scientific perspective of managing forests. Therefore, forest areas are receiving certification under a variety of approaches.

Certification has been embraced primarily in the temperate and boreal forests of industrialized nations. Although the Forest Stewardship Council (FSC) and the International Organizations for Standardization (ISO) evaluations are available throughout the world, only 3 of the 11 systems listed in Table 1 originate in tropical regions. Further, these three represent

national certification systems, which are still in various stages of development.

A brief look at the data suggests that there is a very long journey ahead in terms of achieving SFM through certification in most forest areas around the world. The total area of forests certified is approximately 92 million ha (Figure 1) worldwide based on figures for the systems listed in Table 1. Certified areas under these systems account for approximately 4% of the total area of forests. In addition, the proposed areas to be certified under some systems over the next few years suggest impressive potential in certification. Examples of future developments include 92 million ha under ISO 14001 and 37 million ha under the Canadian Standards Association (CSA) in Canada by 2003 (Sustainable Forestry Certification Coalition, 2000) and 27 million ha under the Pan European Forest Certification (PEFC) mutual recognition scheme (PEFC, 2000).

So, what does this trend imply in terms of the actual impacts of certification on forest resources and forest management worldwide? Rarely has the question been asked, "Do all forests need to be certified?" Is it necessary only to certify those forests that supply the demands of major buyers who wish to provide "green" products for their consumers? And if all forests do not require certification, which forests should be certified, and who decides? Clearly the answer to the latter question would seem to be that the landowner (individual, industrial, public, or community) should decide. But in the case of certification, a "created" market demand is the driving influence.

No one has suggested that all forest areas need to be certified; however, it is helpful to understand how much forest area is relevant to potential certification. Total world forest areas include protected forests, forestland that will be converted to other land uses, forests that are geographically inaccessible for exploitation and forests that are available for wood production. If we subtract areas that are not likely to be placed under long-term management for wood production, potential certification achievements rest primarily in areas available for exploitation (Figure 2).

On a global scale, it is difficult to quantify the area of forests that fall into these categories. In fact, there could be considerable debate on how to separate total forest areas into potentially managed areas. However, no matter how the areas are divided, the proportion of forests to be certified, relative to total forests, potentially represents only a small fraction of the total forest resource base. And the remaining forest areas still require stakeholders' attention in the face of competing land uses, illegal activities, fire, pests, diseases and development. Ironically, current certification levels (Figure 1) indicate that forest areas with the highest need for implementing SFM are less likely to be certified.

It may be argued that using a variable such as the area of certified forests is a somewhat limiting way to measure the impact of certification. In a broad sense, that is true. However, if the original and underlying intent of certification is to ultimately encourage and maintain the sustainable management of forest resources worldwide, there must be some measure of success on the ground. Documentation of certified forests does not in itself prove significant changes have occurred in forest resources management. It does serve, however, to reflect the suggested "success" of certification implementation, if there is some qualitative benefit attached to it. The measure of certified forest area is somewhat of an odometer for the journey. The quality of the experience will be reflected in the ultimate quality of management and condition of forest resources after certification is established, something that will be dependent upon the certification scheme adopted.

A satisfactory journey with recognizable mileposts must provide sufficient supply of added value at reasonable costs and, most importantly, the assurance that one will make it to the final destination. In the context of certification, one might restate this to say that the supply of certified wood in the eyes of forest owners, producers, and managers will be driven primarily by the availability of certification systems which deliver the added-value of some premium (e.g., market shares or price), the assurance that their lands will be certified at reasonable cost and that their product will be accepted in the market place. Meanwhile, the "created" demand for certified wood products must send recognizable signals through the markets, which indicate the required balance of product flows. Currently, significant gaps appear to exist between the demand for and supply of certified wood products. In the absence of price premiums and widespread consumer demand, there is little evidence to suggest that market shares alone will sufficiently attract rational, profit-maximizing producers to certify forestlands.

Traffic Jams: Demand Side Issues

One element contributing to the traffic jam characteristic of certification developments is the uncertainty of true demand for certified wood. Traditional approaches are less useful to estimate demand in the absence of critical market signals such as price and consumption quantities. Estimates of

demand drawn from descriptive surveys and studies of manufacturers and buyers of wood products suggest strong interest in and support for certification (Ozanne and Vloskey, 1997; Stevens, Ahmad and Ruddell, 1998). However, a stronger sense of future demand is based primarily on corporate procurement policies of buyers of wood product with considerable market influence.

Large national and multi-national, do-it-yourself outlets, retailers and wholesalers which sell annually millions of cubic meters of wood products worldwide constitute a significant proportion of the demand for certified wood. At least four of the leading U.S.-based wood products retailers have made public statements of their intentions regarding wood supplies from "endangered" forests (Table 2).

An assessment of environmental marketing messages related to procurement policies reflects common commitments not to contribute to further degradation and destruction of world forests through the selling of uncertified wood products from environmentally sensitive forest regions. These commitments represent significant progress in the promotion of certification in the U.S. and related global forest products markets. Of particular importance is the translation of this demand out to the forests and what it will mean to forest owners and managers who must supply certified wood to the markets. Certification will provide additional information to consumers about the products that they use, but it will not likely change the demand patterns or levels of demand by consumers for their overall wood product needs.

Traffic Jams: Supply Side Issues

The potential areas of certified forestlands are perhaps easier to identify than the demand for certified wood products. Areas of certified forestlands are continually updated by the different systems. Converting yields from those forests into volumes of chain-of-custody certified wood products is, however, more challenging. The decision to certify forest management, therefore, plays the central role to initiate the flow of raw material into processing for certified markets.

The key to assuring adequate future supplies of certified wood to meet demand is the elimination of market entry barriers for a diversity of producers. The growing trends in certified areas currently reflect the rational expectations and decision-making of forest owners and managers in response to the perceived developments in wood markets. Those producers who are likely to implement certification first are those who face fewer barriers to entry into the certified marketplace. In other words, early entrants are primarily owners of forestland who face the least marginal cost to change (e.g., change in management practices), who have sufficient factors of production (capital, labor and technology), and which have participated in the development or acceptance of a certification system that they are willing to apply to their own lands. Subsequent entrants into the certification marketplace are comprised of those entities that face higher costs of entry or high costs of non-conformance. Non-participants in certification may face combinations of market and non-market related reasons for staying out of certified markets.

The mechanisms that have surfaced to address these and other potential barriers to enter certified wood markets are critical to increasing participation by forest owners and managers. Initiatives for group certification, mutual recognition, and links between certification and other tools to support SFM goals are available to public, private and non-governmental groups.

Group Certification

Certification efforts had initially the potential to be impractical and cost prohibitive to small, individual landowners. Some certification systems, such as the FSC and SFI, responded early to the capabilities of small landowners to adopt certification in groups, but not on an individual basis. Group certification provisions are an important element for the potential expansion of supplies of certified wood in countries like the United States and in Europe.

The United States has fewer than 10 million non-industrial private forest landowners or NIPFs (National Research Council, 1998). In 1994, more than 93% of the owners held tracts of less than 41 ha each. More than 97 million ha were owned in tracts of 400 ha or less. Landowner objectives vary considerably, adding some complexity to the estimation of potential certified wood supplies. Only 27% of U.S. NIPF landowners listed timber production as the primary reason for owning forestland in 1994 (National Research Council, 1998). Other wood producing countries have similar ownership characteristics such as Finland with more than 440,000 individual non-industry private landowners operating under established forest owner associations (FFCS, 2001). Several countries in Europe have also substantial numbers of individual non-industrial forest owners with varying degrees of objectives, resources and potential to be active in certified markets (PEFC, 2000).

Mutual Recognition

Mutual recognition is another critical element that affects the supply side of certification. The supporters

of certification have found that in order for current certified wood demand targets to be met, forest areas must be certified sooner rather than later. Chain of custody must be established on a widespread basis to continue the flow of certified wood products through the market to the consumer. Although the FSC system has been the most documented and globally recognizable system, many other certification systems reflect the diverse forest conditions and needs of different regions throughout the world. One question is, "How can a certification system become implemented under a mutually-recognized framework and deliver the same market acceptance as the leading systems deliver individually?" In other words, how does a certification system remain competitive without giving up the critical elements of appropriate forest management deemed important for its particular region and constituency?

The Pan-European Forest Certification (PEFC) is one of the leading efforts globally facilitating the mutual recognition of forest certification systems in 12 European countries (PEFC, 2000). The predominantly NIPF ownerships in these countries represent about 100 million ha of forests that produce annually 280 million cubic meters of wood harvests. Another international effort in the industrial forestry community, the International Forest Industry Roundtable (IFIR) is a "global network" of members representing national forestry associations and international forest products companies (IFIR, 2001). Under the initiative of the Roundtable, it is proposed that a mutual recognition framework link diverse systems of SFM certification that are credible and that meet criteria established by the governing board of representatives. These processes reflect the high stakes of potential trade impacts dependent upon the ability to supply market acceptable certified wood.

Some challenges will be a deterrent to all-encompassing mutual recognition based upon the theory that such movements reduce the validity of, and consumer confidence in, environmental marketing and green labeling. Nevertheless, the potential supply of certified wood is dependent upon the recognition of the diverse routes that can lead to SFM. The work of the PEFC and the IFIR encourages the recognition of certification systems as providers of dependable environ-mental quality information to consumers.

Investment Opportunities for SFM

A significant gap in the supply of certified wood is the lack of products that originate from forest rich tropical countries. The potential for certification adoption in tropical and low-income countries is increased with a willingness to invest in certified forest management by a variety of sources. Most low-income countries have received a plethora of technical, scientific, and administrative assistance with their forestry sectors over the last several decades. Yet, many countries remain unable to institute long-term improvements in the management of their forest resources. The global availability and acceptance of certification may provide an additional tool to more effectively bring together the support and investment of all stakeholders to achieve SFM.

The results of investments in forestry development are difficult to quantify or defend through on-the-ground achievements in better-managed or sustainably managed forests. One key-missing element is the ability to track or monitor whether the intentions of the investments have achieved their desired ends. Through certification and the voice of the market, the producers and managers of forests are expected to implement improved management practices or risk the loss of markets, profits, and revenues. Donors that heretofore have avoided investment in forestry activities in some countries may feel assured that certification systems will ensure that quality, transparent, and unbiased forest management guidelines have been met and that their investment will have the desired payoffs - SFM and environmental protection.

In fact, the forest resources trends that have occurred during the rise of certification developments in many tropical countries indicate that the opposite has occurred. The implications of these trends raise serious questions about the potential to improve the demand-supply imbalance of certified wood markets for tropical wood products.

Defensive Driving

So what drives the motivation of decision-makers to consider certification of forestlands? Practically speaking, the traditional factors that influence forest land use or forest management decisions apply also to decisions regarding certification. The characteristics of forest ownership, the importance of forestry in the country's economic portfolio (especially true for countries where forest ownership is primarily a public responsibility), the structure of a country's wood products markets and trade, the extent of forest industry infrastructure and the capability to monitor and regulate forestry activities are all factors which influence the potential for certification to take hold in a particular country. A few examples of countries which differ greatly in these characteristics and which reflect the varied landscape of potential adoption are presented in this section.

This brief analysis looks at six countries around the world that are significant forest products contributors in their own regions as well as through global trade, yet currently exhibit varying degrees of participation in certification. Data for Brazil, Canada, Ghana, Indonesia, South Africa and the United States are used to demonstrate the complexity and mixed signals of certain influencing factors in the adoption of certification. Not all of our traditional assumptions are upheld.

First, let's look at economic factors. The relative economic importance of forestry and forest products industries in a country is expected to influence the decision to participate in certification activities. In other words, countries whose forestry sectors contribute significantly to their economies are presumably more inclined to respond to international market demand for certified products. By not responding, producers risk the reduction or loss of valuable market share and revenues. Subsequently, countries risk the loss of foreign exchange earnings.

One common measure of economic importance is a sector's percentage contribution to Gross Domestic Product (GDP). Although, on a world average, forestry contributes only 2-3% to national economies (FAO, 2001), some countries depend heavily upon forest industries. In the sample countries, Ghana's forestry and forest products sector contributes 11% to its GDP (Figure 3). With Indonesia at 10% and Canada at 5%, one would assume that these countries are likely to have high certification potential. Indeed, all of these countries have some certified forest areas, but only Canada reflects significant participation in certification with more than 25 million ha (Figure 4). A country such as the United States with relatively small forest sector contribution to GDP (approximately 2%) has more than 20 million ha of certified forests with the potential to more than double that amount over the next few years. Clearly this variable does not correlate strongly with the expected potential for certification related to the importance of the forestry sector in a country.

Another economic factor influencing potential certification in a country is the level of forest products trade as a proportion of total trade (Figure 3). Here again, the countries with the highest proportion of forest products trade as a percentage of all trade do not have significant areas of forests certified, except for Canada. These two economic factors combined indicate that there are other more influential factors that may determine the potential for certification in a country. Even if we look at different wood product categories, the economic and international market structures of a country do not guarantee consistent indication of certification potential. Only Canada, with high levels of sawn wood and plywood exports, and the U.S., with significant roundwood and sawn wood exports, have substantial areas of certified forests. On the other hand, the lack of certified forest areas has not currently affected exports of wood products from countries such as Indonesia and Ghana where exports represented more than 50% of production for sawn wood and plywood in 1998 (Figure 5). Overall, international trade and forestry and forest products contributions to economic production do not provide consistent indications of a country's potential to certify forestland.

There must be other factors that contribute to the potential for certification adoption in a particular country or region. The most consistent correlation with the area of certified forests in a country seems to be with the state of its forest resources and forest management. The extent to which forest management is already at high acceptable levels of SFM, or is well managed, is most consistent with high certification levels. Countries in regions whose forests, for the most part, are not considered endangered would find certification costs to be lower and fewer changes required of existing practices in order to achieve SFM goals. Countries such as Canada and the United States have had positive changes in forests area over time and have the highest levels of certified areas. Less developed tropical countries such as Brazil, Ghana and Indonesia have few areas of certified forests (Figure 4), yet significant negative annual changes in forest area (Figure 6).

Countries that urgently need the adoption of SFM (and could use certification as one of the tools to achieve it) face more barriers to entry into certified markets. Some of these barriers include costs to certify and maintain certification, a lack of human capacity and expertise, a lack of infrastructure, and a lack of monitoring capabilities. And there are other factors, which create a more complex picture of certification decision-making, such as the corporate, will of the forest industry, domestic consumer "green" preferences, corporate sensitivity to stakeholder input, and political receptivity to stakeholder input. These elements are more difficult to measure for comparisons purposes, yet they are influential in the decision-making context of forest owners and producers.

Summary

Certification developments have surfaced critical issues of accountability and responsibility in forest management which heretofore have been nestled away comfortably under the commons of public resource management and individual private choices.

Yet, it is still unclear to what extent certification will contribute to better management of forest resources globally.

A colleague recently stated emphatically, "Certification is here to stay!" There is little argument that the statement is most likely true. What we learn along the way on this journey, however, will hopefully help us to be better stewards and caretakers of the valuable resources of our forestlands. Public and private responsibilities will continue to be important elements in successful implementation of certification. The complexities of diverse forest resources and management objectives reflect opportunities for landowners and managers to use a variety of SFM tools, including certification.

Lessons Learned

- The diversity of certification systems reflects the diversity of forest resources and management approaches throughout the world; thus, no one system fits all forests.
- The actual demand for certified wood products is yet undetermined after almost ten years of certification developments.
- Group certification and mutual recognition are key factors in influencing increased supplies of certified forests.
- There is still little participation in certification in areas where forest resources are most threatened. Future certification in these regions will be dependent heavily upon national prioritization, and capacity building and investments in a number of SFM tools. Certification is but one tool that can be used to achieve SFM.

Lingering Questions

- What are the legal, political, environmental, and socio-economic implications of certification?
- Will the widespread environmental marketing pressures in temperate industrial regions trickle down and influence tropical forest area owners and managers to certify? If so, when and who will bear the cost?
- What is the true marginal difference in management and forest conditions since the advent of certification?
- What are the projected quantities of demand and supply of certified wood products?
- How can certification be used as an effective tool for private landowners to achieve SFM goals?

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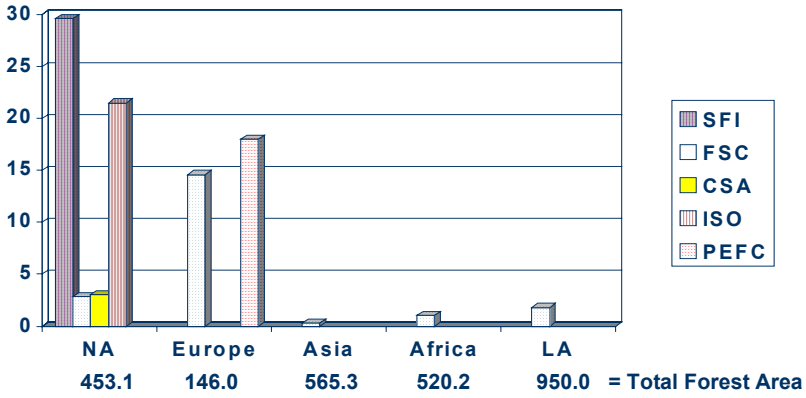
Table 1 – Major certification systems.

- Forest Stewardship Council (FSC)
- International Organization of Standardization 14001 EMS (ISO)
- Sustainable Forestry Initiative (SFI)
- Canadian Standards Association (CSA)
- Pan European Forest Certification (PEFC)
- Brazil CERFLOR
- Indonesia Eco-labeling Institute (LEI)
- Malaysia National Timber Certification Council

Table 2 - Environmental Marketing and Procurement Statements

Home Depot (Environmental News Service, 1999)	***"By the end of 2002, we will eliminate from our stores wood from endangered areas …. and give preference to 'certified' wood".***
Lowes, Inc. (Wall Street Journal, 2000)	***"… stop selling lumber and other wood from endangered forests "***
Wickes Lumber, Inc. (Wickes, Inc., 2000)	***" …. will reduce and by the end of 2001 eliminate its purchase of wood fiber from endangered forest regions around the world."***
84 Lumber Company (84 Lumber Company, 2000)	***" … intends to phase out sales of products from endangered forests by the end of 2003."***

Figure 1 - Forest areas certified, by region and system (million ha).



Source: FSC, 2000; PEFC, 2000; EFI, 2000.

Figure 2 – Schematic of potential areas for certification.

Need SFM

most ⟷ *least*

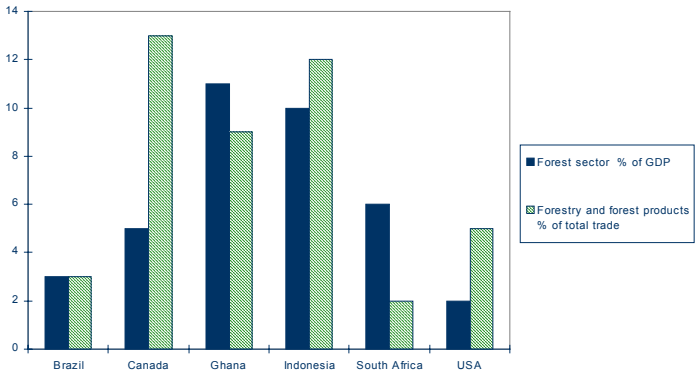
Forests not likely to be managed for wood production

Areas forests with high rates of deforest-ation and degrada-tion	**Areas of well-managed or sustain-ably-managed forests**	*Planned areas for conversion to other uses*	*Inaccessible forests for exploitation due to geographical location*	*Protected areas*

low ⟷ *high*

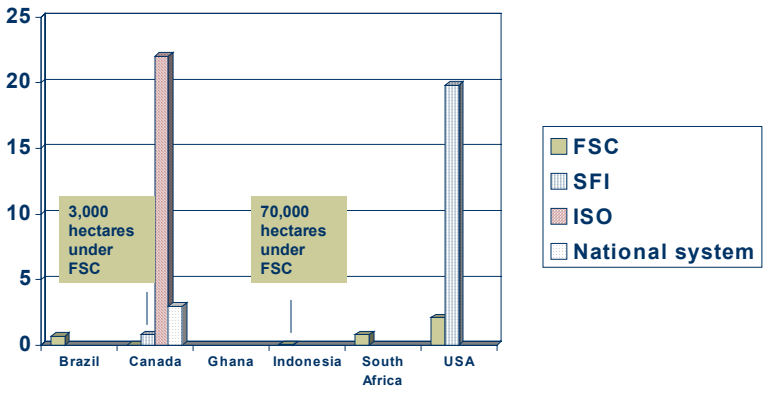
Certification potential

Figure 3 - Economic factors in selected countries.



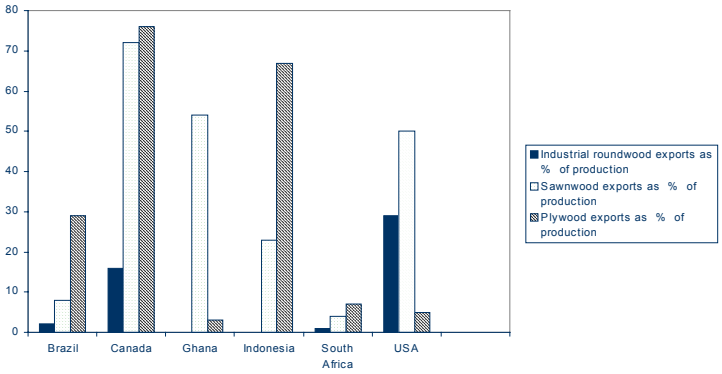
Source: FAO, 2001.

Figure 4 - Forest areas certified in selected countries (million ha).



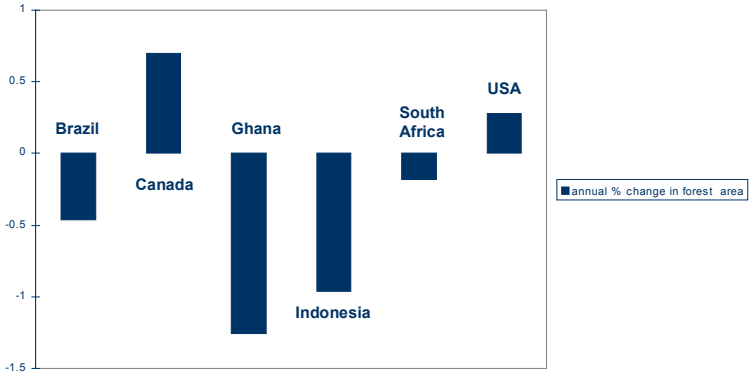
Source: FSC, 2000; Sustainable Forestry Certification Coalition, 2000; AF&PA, personal communication.

Figure 5 - Importance of international trade in selected countries.



Source: FAO, 2001.

Figure 6 – Annual percentage change in forest area in selected countries, 1990-1995.



Source: WRI, 2001.

International Case Studies

Private Forest Management Improvement Experiment and Forestry Policy in Taiwan - *Chin-shien Wu*

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Introduction

Agriculture has been used to support other industries, leading to the development of these sectors and resulting in Taiwan's economic miracle. However, agriculture's non-economic functions, such as ensuring the safety of the food supply, promoting an open and comfortable living space, greening and protecting the environment and promoting a balanced ecosystem, cannot be replaced by other industries.

Forestry developed vigorously during the 50s and 60s, and large-scale forest exploitation was carried out for timber production. Timber production made up about 90 percent of total forestry output value. Starting in the 70s, forestry policy gradually shifted from timber production toward resource conservation. Current forestry policy has emphasized nature conservation, sustainable management, multiple-use management, and ecosystem management. Wood demand in Taiwan reached the historical peak at 8.36 million cubic meters in 1992, and then leveled off and declined to 4.96 million cubic meters in 1998. As a result, forestry production on the whole exhibited a negative growth. Since 1990, no cuttings were allowed for natural cypress stands within national forests. Since 1991, all the cuttings were prohibited in nature forests. In recent years, although the economic production ratio of forestry is very low, public welfare of forest is very high, including the function of ensuring the safety of the economic infrastructure and of residents' lives and property.

Forest Description and Forestry Policy

Since Taiwan is located in both the tropical and subtropical regions, its climate is hot and humid. Taiwan's heavily variable geography has created a variety of different sites suited to the existence of a variety of wild flora and fauna. Such an environment breeds more than 4,000 species of higher vascular plants, with 25 percent of them being endemic species. There are 18,368 recorded species of wildlife, with endemic species comprising 60 percent of the total animal population, including 157 species of freshwater fish, 113 species of reptiles, 428 species of birds, 61 species of mammals and 17,609 species of insects, making Taiwan essentially a natural museum. With such abundant flora and fauna resources, and a high percentage of endemic species, Taiwan is very important to both academic research and resource conservation. Population pressures and rapid economic development have resulted in serious damage to Taiwan's environment, making conservation a must.

Taiwan is located in an area where there is a high incidence of typhoons. Typhoons regularly hit the island during the summer, necessitating dense forest cover to prevent soil erosion, mitigate extreme temperature fluctuations, and ensure the safety of people. In 1996, Typhoon Herb visited Taiwan and inundated most of Taiwan with torrential rains, causing the island's worst flooding and resulting in the greatest damage to agriculture in decades. Because some people lack the concept of protecting the environment and natural resources, many mountainous areas have been illegally developed and utilized, resulting in deterioration of water and soil resources in the forests. Since the ROC's citizens have gradually begun to place increasing importance on quality of life, environmental protection, and natural resource conservation, the agricultural sector must, beside following the market's lead and adjust its production structure, place greater emphasis on promoting environmental quality. Therefore, enforcing reforestation, improving forest management, and prohibiting illegal cultivation, to name a few, are some of the most important forestry practices in the future.

Taiwan is also known for highly rugged terrain, with 75 percent of hilly land and half of the land above 1,000 meters. Overall, 200 peaks are above 3,000 meters. According to the third survey of forest resources and land utilization, there are about 2.102 million hectares of forested land in Taiwan, comprising 59 percent of the national territory, increasing from 52 percent in 1990. At present, national forests make up 71.1 percent of the total, with public and private forests and aboriginal reserves comprising the remaining 28.9 percent. Most forests are natural forests (86.56 percent of total forest volume and 72.7 percent of total forest area). Taiwan forest contains growing stock of 358.7 million cubic meters, with the net annual growth of

about 5 cubic meters per hectare. The average volume per hectare is 171 cubic meters.

In 1975, the government approved the Taiwan Forestry Management Reformation Act. Since then, the practice of forest management has been derived from timber production to protect forest resources. Base on current Forest Law, the major objective of forest management in Taiwan is long-term profit of national land protection. Timber cutting is no longer the income of forest management. According to Taiwan Forest Management and Administration Act, which was sanctioned in 1990 and revised in 1991, the conservation of natural resource and ecology are the objectives of forest management. In addition, cutting has been totally prohibited in nature forests, protective forests of reservoir watershed, ecological protective zones, nature reserves, national parks, and the forests of unable reforesting areas. Furthermore, clear cutting area is limited to less than 5 hectares that would increase management costs and difficulties.

Other related laws and regulations regard forestland uses include Water and Soil Conservation Law, Slope Land Conservation and Utilization Regulation, Non-Urban Land Use Control Regulation, Wildlife Conservation Law, and Environmental Impact Assessment Law. Moreover, some relevant laws have great impact on forest management. For example, since the enactment of the National Park Act in 1972, six national parks have been set throughout the island. The total area of national parks is 322,845 hectares, which account for 9 percent of national territory. Meanwhile, 95 percent of national parks territories are in national forests. In addition, based on Culture Heritage Preservation Act, passed in 1982, eighteen nature reserves, with a total area of 63,279 hectares, have been established.

Taiwan's timber industry has now been heavily relying upon imported timber. Over 99 percent of timber supply comes from foreign countries. For the purpose of supporting a prosperous forest industry, Taiwan needs not only to diversify its timber purchasing but also to maintain its own sustainable supply. For decades, timber production has played an important role in supporting Taiwan's economic development. However, in 1999, agriculture only comprised 2.61 percent of Gross Domestic Product, and forest product value comprised 0.2 percent of agriculture product value. Although the economic value ratio of forestry is very low, non-market value of forest, social welfare of national land protection and environmental protection, is huge. Forestry is a kind of social welfare, economic and sustained career.

Since Typhoon Herb in 1996, the Council of Agriculture has pushed the "National Reforestation Campaign" in Taiwan. In order to promote incentive of reforestation, subsidy of reforestation has greatly been increased. The total amount of subsidy in the first six years is 250,000 NT dollars (US $7,686) per hectare. From the seventh year to twentieth year, the subsidy of reforestation management is 20,000 NT dollars (US $615) per year per hectare. The total amount of subsidy in twenty years is 530,000 NT dollars (US $16,295) per hectare.

Private Forest Management Improvement Experiment

Because of the increase in population and the need for food in Taiwan, the government has tried to develop agricultural production vigorously. Crops have been cultivated in higher elevation areas. Many tree farmers have started to cultivated agricultural crops on private forestland, leased national forestland, or aboriginal reservation forestland despite of high elevation or steep slope condition in these lands.

There are 186,000 hectares of private forest, making up only 8.8 percent of the total forestlands. However, the area of privately managed forests, including private forestlands, aboriginal preserved lands, released land in the national forests, protected forests, public lands, or national wilderness, which are similar to Non-Industrial Private Forest (NIPF) in the States, is about 600,000 hectares, far more than the 280,000 hectares of commercial forests in the national forests. Therefore, the privately managed forests are very important in Taiwan. Moreover, because these forests occur in the middle and lower elevation areas and are closer to the cities, its timber harvest costs could be lower there. However, due to some disadvantageous factors among private forests, such as the small scale and dispersed land, lack of capital, low timber price, and high labor cost, the commercial forest management activities have almost stopped. Compared to other agricultural production, the revenue from commercial plantation is relatively low. Landowner's interest in reforestation has been lost and local economies have been depressed.

Due to the limited land and highly populated in Taiwan, communities in the mountain areas have been formed. Because timber price has been low for many years, tree farmers in the mountain areas have grown non-timber high economic crops in their private forestland or leased land for earning the living, which is an inappropriate use or overuse, or even violation of the regulations. For example, betel nut palm (*Areca catechu*) on the sloping land areas has become a serious problem in agroforestry, because the betel nut palm is a kind of shallow-rooted tree and may cause soil erosion. In addition, in the trend of rapid economic development,

industrialization, and urbanization recently in Taiwan, however, the economies of communities in suburb regions or mountain areas are worse than metropolitan areas.

In order to solve dilemmas of privately managed forestry and problems of depression and harsh living in the mountain areas, the Council of Agriculture has supported Taiwan Provincial Government's pilot project of private forest management improvement experiment since 1992. The major points of the project were to draw up the improvement methods and management models that the tree farmers were willing to accept. In accessing the appropriate alternative experiment areas, three regions have been selected, which are Da-San-Bay and Shang-Ping regions in Hsin-Chu County, Shau-Ban-Tan region in Nan-Tou County, and Shyr-Jwo region in Chia-Yi County. The preliminary effect of the project is good and response from tree farmers is positive.

The project included the experimental methods to grow commercial trees, such as Taiwan incense cedar (*Calocedrus formosana*), camphor tree (*Cinnamomum camphora*), white fruit (*Ginkgo biloba*), among the tea plantings and betel nut palms, which is a kind of agroforestry, in order to find the balance between water and soil conservation and farmers' benefits. Now part of trees mixed in betel nut palms have grown up and are higher than betel nut palms, however, the farmers' benefits have not been decreased. Moreover, some farmers expressed that due to appropriate shading of trees, the quality of tea has been improved, and the price of tea has increased by about 300 NT dollars (US $9.2) per kilogram. This is an obvious effect of agroforestry implemented in Taiwan. The accomplishment of this project in the first stage of six years (1992~1997) includes completing the draft for improving management practices for the private forests, and the program of improving management for the private forests in three experimental areas. Also, 622 hectares of reforestation, 82 hectares of thinning and pruning, 140 hectares of fertilizing plantation, 28,927 meters of road widening, 1,936 meters of constructing green shower roads, 5,218 meters of improving streamside recreation sites, and 25,181 square meters of subsidizing agricultural management equipment have been completed. Besides, 260 hectares of tending and regenerating bamboo stands and 780 hectares of improving management for bamboo stands have been performed. In addition, a silvicultural practice team has been established, and a bamboo shoot processing plant and a forestry exhibition hall have been constructed. Furthermore, different kinds of flowers have been planted and native fry of fish, and firefly have been released as well, in order to improve the natural ecosystem, quality of living, and reforestation willingness of farmers in the area. The second stage of the project (1998~2001) has also been underway. Two other experimental areas will be included in this project in the coming year.

Conclusion and Discussion

According to the investigation by Agricultural and Forestry Aerial Survey Institute, the total area of over-used land is 58,000 hectares and this situation has resulted in a negative impact on our environment. Large scale cultivated areas of pure tea planting for years among the slope lands in Taiwan has faced the problems of low productivity and degraded quality. It will be a good way to help farmers adopt the management model of combining tree and tea. In addition, the production condition will be improved; meanwhile, soil erosion will be reduced.

If the tea planting is in over-used forestland, deep-rooted tree species should be planted forcibly, in order to achieve the objectives of water and soil conservation and caring of the living of people in mountain areas. The products from agroforestry are diverse, but the small economy scale of production and less competition on the market are the disadvantages. As to the current situation of economic development and environmental protection, prosperity of mountain villages still depends on agroforestry. Moreover, basic infrastructures should be promoted in mountain villages, including the necessary marketing, transportation, facilities of medical treatment, sanitation, education, recreation, water and soil conservation, and greening.

The implementation of agroforestry in mountain areas should be limited in inappropriate cultivated forestland, instead of encouraging the tree farmers to increase crop areas there. Soil and water conservation will be the major concern in future agroforestry. We still believe the best method of forestland conservation is forest management. The private forest management improvement experiment area is a good start for demonstration. The government will enlarge and extend the management model of agroforestry that suits nature environment and conditions in Taiwan, in order to obtain a win-win among agriculture and forestry, and government and farmers.

In the near future, Taiwan will be a member of the World Trade Organization. We expect our agriculture production will face great impact very soon. High labor cost and land cost will threaten agriculture and agroforestry production. Many privately managed forestlands will have to quit economic crop farming. The opportunity cost of planting trees will become

low and it will be a good chance to enforce agroforestry. Although the current forestry policy emphasizes nature conservation and forest protection, it is not necessary to set aside all the forests and stop regular forest management. A sound forest management is the guarantee of sound resource conservation. Private forest management is an important part in Taiwan forest management.

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”Se Vende Madera!” “Vende-se Madeira!” An Analysis of the Potential Impacts a Growing Housing Market in the Southern Cone of South America Will Have on Private Forest Owners in the Region - *Richard W. Hall*

Buckhead Resources, Atlanta, GA

Introduction

The demand for housing in the Southern Cone region of South America is expected to increase significantly over the next few decades. Currently, there is a major deficit of sufficient housing in the region, but certain factors in the region are now contributing to an improving environment for the financing and construction of new housing. These factors include increasing political and economic stability, growth in per capita income, and greater access to financing by individuals.

One effective way to evaluate potential impacts this increased demand for housing will have on private forest owners in the region is to compare the region with a more developed market such as the U.S. where statistical and historic data is more readily available. Historically, increases in demand for housing, especially in the U.S. as well as other developed regions of the world, have resulted in a greater demand for lumber and other solid wood products. This in turn has created a significant demand for timber from available forest resources and enhanced returns for investments in timberland opportunities.

Because of major differences between the housing markets in the Southern Cone region of South America and the U.S. housing markets, there is a much less significant relationship between the growth in the housing markets in the Southern Cone with the demand for lumber and other materials derived from forest resources. Therefore, the degree of economic benefit derived by forest owners in the region from a growing housing market is much lower than in the U.S. markets.

Significant forest policy measures are needed in the region to increase the demand for sustainable forest products to help overcome the significant housing deficit within the Southern Cone region. Such measures include the following:

* Greater incentives for home ownership;
* Increased funding for housing, particularly low-income housing that could be efficiently constructed from solid wood products:
    - Increased resources allocated to the research and development of new solid wood products derived from the high-yield forest plantations in the region.
    - Increased focus on marketing forest products as a viable source of building materials for homes in the region; and

* Decreased reliance on construction materials from natural, unmanaged forest ecosystems, particularly in the Amazon basin, and increased reliance on materials from sustainable plantation forest resources.

These policy considerations relate to a broad range of entities including government organizations, NGO’s, private industries and individual landowners. There is tremendous potential for sustainable forestry to meet the considerable social and economic needs associated with the housing deficit within the region.

The Southern Cone

Overview

The Southern Cone region of South America is becoming a more important area for the forest products industry. For the purposes of this paper, the Southern Cone refers to southern Brazil, Uruguay, Argentina and Chile. Where feasible, all statistics in this paper will include only southern Brazil. All other statistics that include all of Brazil will be clearly noted. Other geographic definitions of the Southern Cone may also include Paraguay and Bolivia, especially when discussing the MERCOSUR trade block.

Geographic Advantages

The Southern Cone region of South America is unique in that it is the only region of the South American continent that has areas with temperate climates. This has had a dramatic influence on the development of this region compared to other areas of South America. Throughout the world, wealth and economic output are concentrated along the seacoasts and sea-navigable waterways of the world’s temperate zones. The world’s temperate zones only account for 39.2% of the land area, but they account for more than 67% of the world’s GNP. If one looked only at temperate zones within 100 kilometers of a seacoast or sea-navigable waterway, such areas would account for only 8.4% of the world’s land area

but 52.9% of its GNP. (Sachs et al., 2001) (See Table 1)

The temperate zone within the Southern Cone of South America follows this pattern as well. It accounts for more than 65% of the total GDP of South America.[1] This temperate zone includes major economic centers including Rio de Janeiro, Sao Paulo, Curitba, Porto Alegre, Montevideo, Buenos Aires and Santiago. (World Bank, 2001)

Table 1 – The Wealth of Regions.

	Climate Zone (% of World Total)	% Near Coast	% Far from Coast
Tropical			
Land Area	19.90%	5.50%	14.40%
Population	40.30%	21.80%	18.50%
GNP	17.40%	10.50%	6.90%
Desert			
Land Area	29.60%	3%	26.60%
Population	18%	4.40%	13.60%
GNP	10.10%	3.20%	6.80%
Highland			
Land Area	7.30%	0.40%	6.90%
Population	6.80%	0.90%	5.90%
GNP	5.30%	0.90%	4.40%
Temperate			
Land Area	39.20%	8.40%	30.90%
Population	34.90%	22.80%	12.10%
GNP	67.20%	52.90%	14.30%

Source: Sachs et al. (2001)

This concentration of wealth within the temperate, coastal zones of South America demonstrates the importance of geography in understanding the economic development of various regions. In the *Wealth of Nations*, Adam Smith referred to the importance of geography in a country's ability to create wealth. Economies benefit from their ability to transfer goods, people and ideas. Because sea trade has historically been less expensive than land-based trade, areas lying near the coast have a significant economic advantage over hinterland economies.

Geography can also influence the level of disease and poor health within a region. Tropical areas are much more prone to disease than milder temperate zones. Cold weather tends to be a natural control over the spread of disease. Temperate zones also provide a better environment for the production of food and other renewable resources derived from agriculture and forestry. In tropical areas, warm weather tends to mineralize the organic material within the soil, and the abundant rainfall leeches it out of the soil. Pests can also be more of a problem for farmers in the tropical regions. As people in temperate zones have a healthier and more fruitful environment in which to live, they can devote more time to activities that create more wealth for a society than simple subsistence farming. (Sachs et al., 2001)

The incredible richness and ideal climates throughout the temperate regions of South America create an ideal environment for the cultivation and production of renewable resources such as agricultural goods and forest products. Unlike other well-recognized, productive regions throughout the world, particularly in the Southern Hemisphere, the temperate region of South America has a tremendous internal market that can be targeted in addition to export markets of the developed regions of the world such as the U.S., Japan and Europe.

Political and Economic Development

In his *Wealth of Nations*, Adam Smith also emphasized the importance of little to no government interference with the markets. In spite of the abundant natural wealth of the Southern Cone region, the development of the area has been hindered by excessive government influence and often misguided economic policies. For much of the twentieth century, Brazil, Argentina and Chile have been under military rule or been heavily influenced by socialist doctrines. However, over the last twenty years, the reigns of economic oppression have been broken, and these economies are poised for significant growth as the governments release control over various sectors of their economies and rely more on market forces.

As the world becomes more of a global economy, business transactions and practices are becoming more transparent and harmonious. This creates greater market efficiencies and leads to less corruption. Such influences can be seen throughout the Southern Cone region. For example, Chile's open markets and free trade pacts with countries throughout the world attest to its commitment to free and open trade. In an effort to eliminate the crippling effects of hyperinflation, Argentina has initiated a 1 to 1 currency peg to the U.S. dollar. It is interesting to note that the people of Argentina appear to be willing to endure a severe economic recession in order to continue to adhere to this policy and avoid a return to the days of hyperinflation. Brazil's opening

[1] *It should be noted that there is also a tremendous difference between the southern regions of Brazil and the rest of the country. The southern states of Espirito Santo, Rio de Janeiro, Sao Paulo, Minas Gerais, Parana, Santa Catarina and Rio Grande do Sul account for approximately 74% of Brazil's GDP. (Brazilian Embassy, 1999)*

of its economy and transition from an import substitution economic model demonstrates that country's willingness to embrace free market economics.

The most significant example of the region's growing commitment to open and free trade is the MERCOSUR trade block. Currently, Brazil, Argentina, Paraguay and Uruguay are full members. Bolivia and Chile are associate members and are expected to become full members in the near future. Unfortunately, the region has had difficulty in implementing truly free trade under MERCOSUR. One humorous anecdote relating to MERCOSUR is, "The only time MERCOSUR actually works is when Argentina sends a cold front to Brazil." In spite of its problems, there continues to be a relatively strong commitment among the member nations to work through their differences and make the pact work. Another development taking place is the creation of the Free Trade Area of the Americas. There appears to be strong support among the Southern Cone nations for this extensive trade agreement that would benefit the region tremendously.

General Factors Influencing Housing Markets

Economic Factors

Various factors can affect the level of demand for housing within a country or region including economic growth, interest rates, inflation, availability of financing, and government incentives. Generally, a strong economy creates a healthy demand for housing. As an economy grows, an individual's ability to afford new housing increases. Economic growth generally results in higher employment rates and consumer confidence. These are positive factors for the housing markets in that not only are individuals able to afford the purchase of a home, they are confident in their ability to pay for and maintain their home over time.

Interest rates are a significant factor affecting the housing markets because of their impact on an individual's ability to borrow the necessary capital to purchase a home. The lower the interest rates, the lower the cost of a home for homebuyers who borrow to pay for their home. Lower interest rates mean that the minimum income needed to afford a home is lower. For example, the minimum income needed in the U.S. to support a loan of $150,000 with a mortgage rate of 7.5% is $49,673. The minimum income needed to support the same loan with a mortgage rate of 7.0% is $47,678, a difference of $1,995. This reduction in interest rates increases the number of households who are able to afford such a home in the U.S. by as much as 1.9 million households. (NAHB, 2001) Inflation is another important factor influencing an individual's ability to afford a home. High inflation reduces an individual's purchasing power and decreases his ability to accumulate sufficient capital to buy a home. (CME)

For most people, a home will be the largest and most significant personal investment of their life. It is a near impossibility for most people to afford the significant capital costs of purchasing a new home without sufficient financing. Sophisticated financial instruments have been developed to increase the amount of capital available to homebuyers throughout the world. As more people gain access to capital for the purchase of a home, the demand for new housing increases.

Government Influence

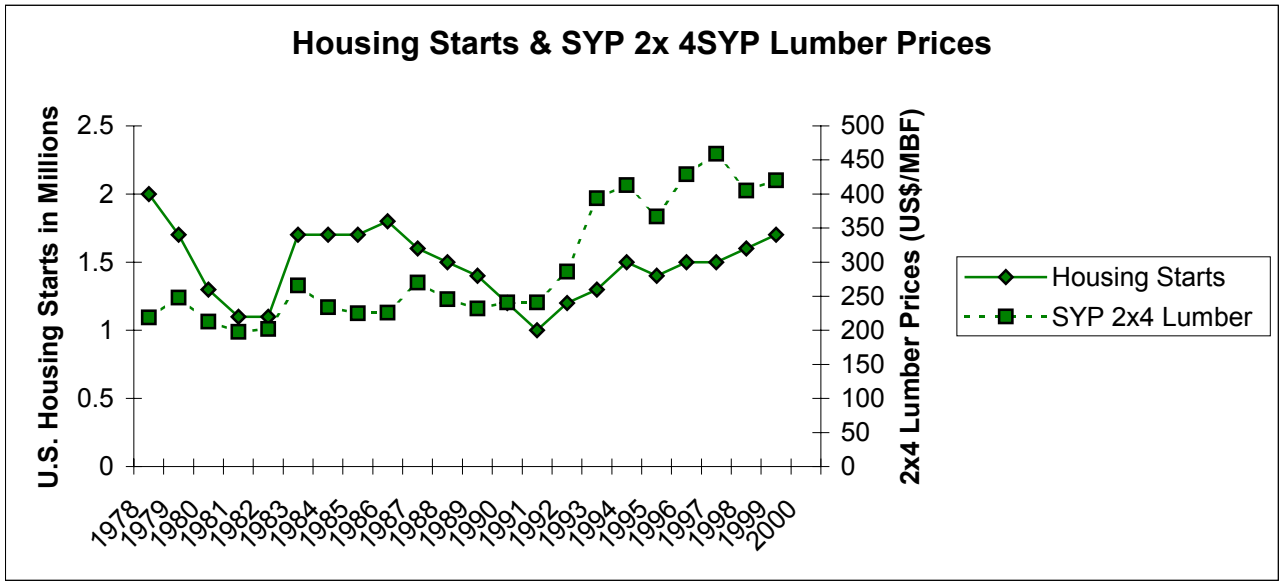
Government policies can also have a significant impact on the housing markets. For example, government subsidized housing will have a direct impact on the markets by creating demand for new housing to meet the basic needs of lower income households. Government can also have an indirect impact through other policies such as tax advantages associated with homeownership.

In the U.S. such tax advantages include the ability to deduct mortgage interest, property taxes, and moving expenses from one's income taxes. There are also significant advantages associated with capital gains generated from the sale of a home. U.S. homeowners are also able to receive benefits from secondary home equity loans. Such government support for home ownership is based on the recognition that homeownership provides significant value to an economy or society by supporting industry and the flow of capital, promoting good work habits and productivity, and encouraging stronger families and cleaner, safer neighborhoods. (Breckner, Robinson, 2000)

Historic Relationship Between Housing Markets and Timber Prices

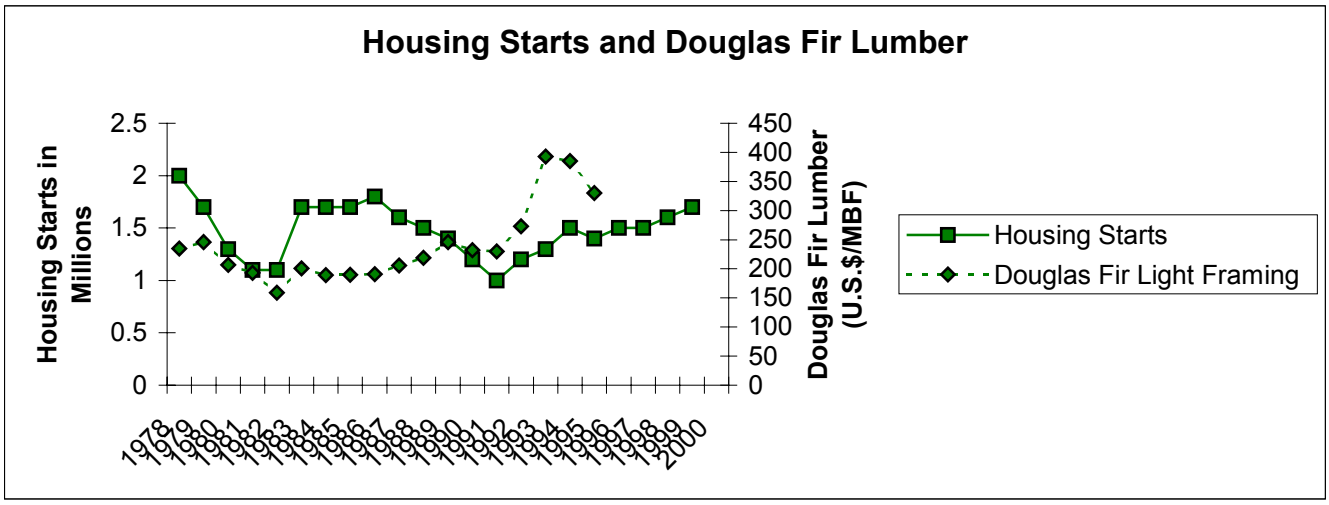
In the U.S. as well as other developed regions around the world, it is well established that there is a strong link between the housing markets and the demand for forest products. In general, solid economic conditions lead to a strong housing market. A strong housing market creates strong demand for lumber and other forest products. The demand for lumber and other forest products creates a demand for timber from available forest resources. (See Figures 1 – 4)

Figure 1 – Housing Starts and Southern Yellow Pine Lumber.



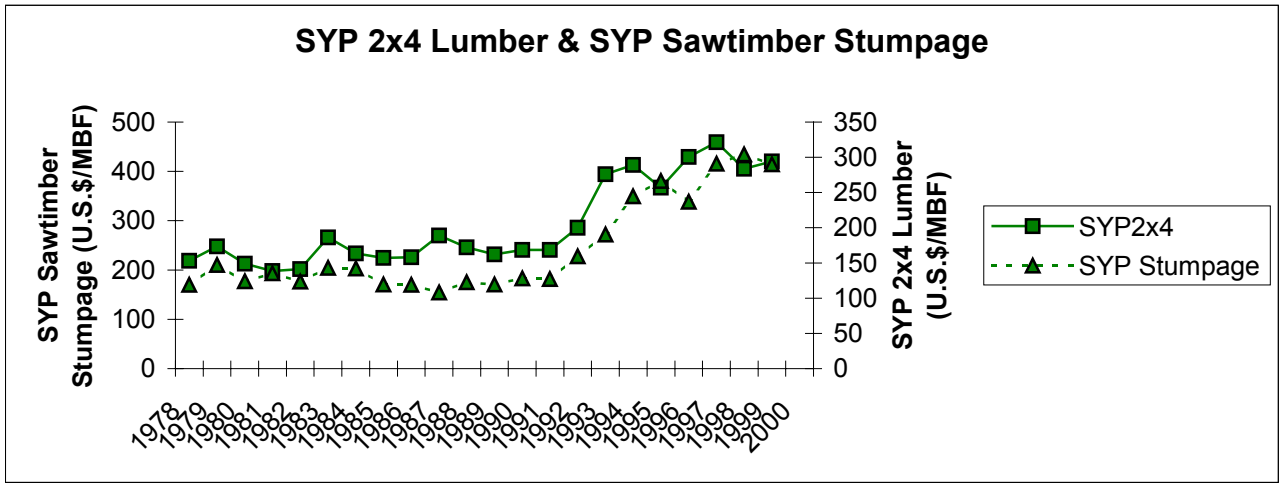
Source: Random Lengths, NAHB

Figure 2 – Housing Starts and Douglas Fir Light Framing Lumber.



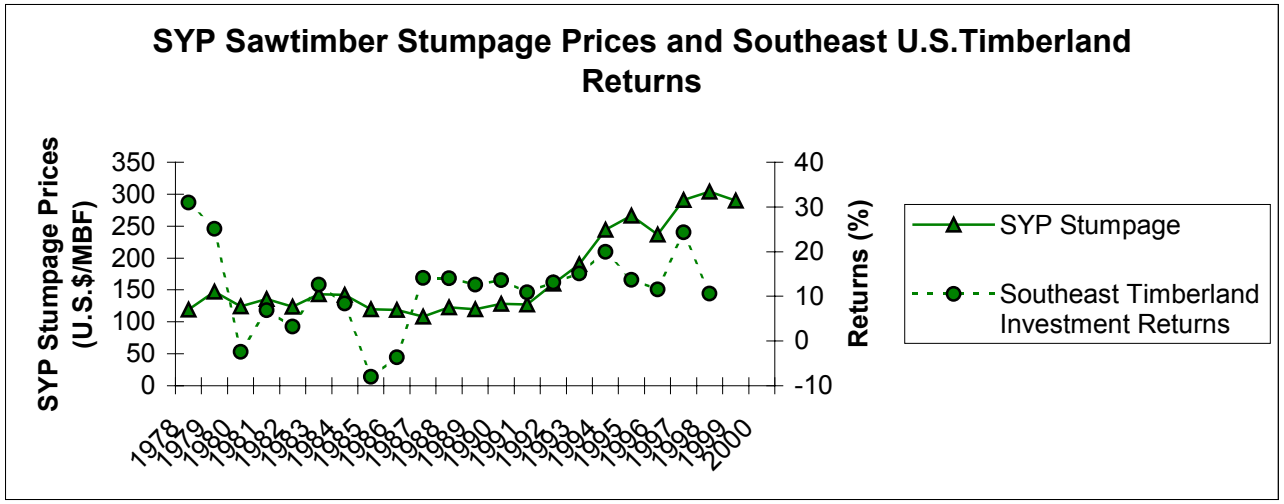
Source: NAHB, USFS

Figure 3 – Southern Yellow Pine Lumber and Southern Yellow Pine Stumpage.



Source: TimberMart South, Random Lengths

Figure 4 – Housing Starts and Southern Yellow Pine Stumpage.



Source: TimberMart South, HTRG

These relationships are apparent when comparing the prices for lumber and timber with U.S. housing starts. Though there are other influences that may impact the price of timber from available forest resources such as environmental restrictions, supply issues or climatic and other localized conditions, the housing markets continue to be a key determinant of demand and pricing for forest products in the U.S. markets.

Comparison of U.S. and Southern Cone Housing Markets

Macroeconomic Comparison

To make a useful comparison between the housing markets of the U.S. and the Southern Cone of South America, it is useful to first compare basic macroeconomic factors. The U.S. population of approximately 280 million individuals is approximately 88% greater than the Southern Cone population of approximately 149

million individuals. The population increases to approximately 219 million individuals if one included the rest of Brazil. (U.S. Census 2001) (See Figure 5) GDP, one of the most basic economic indicators, provides useful insight into the relative scope of these respective markets. The U.S. has the largest GDP in the world amounting to US$8.7 trillion. The economies of the Southern Cone region of South America amount to only 9.3% of the U.S. economy. The GDP of the Southern Cone of South America is approximately US$935 billion. If one were to include the rest of Brazil, that amount would rise to approximately US$1.1 trillion. (See Figures 6 and 7)

Figure 5 – Population *Source: World Bank (2001)*

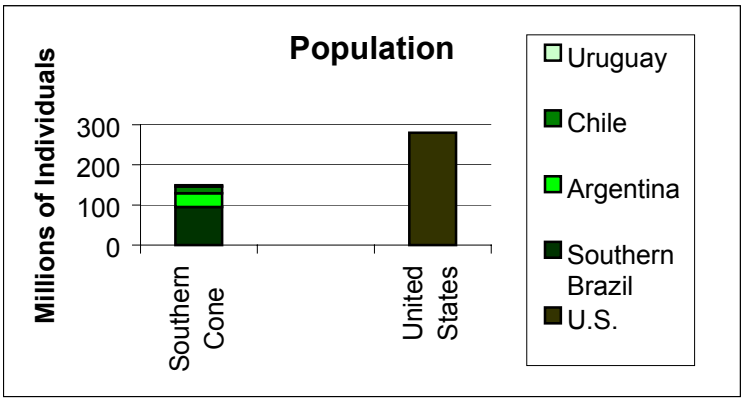
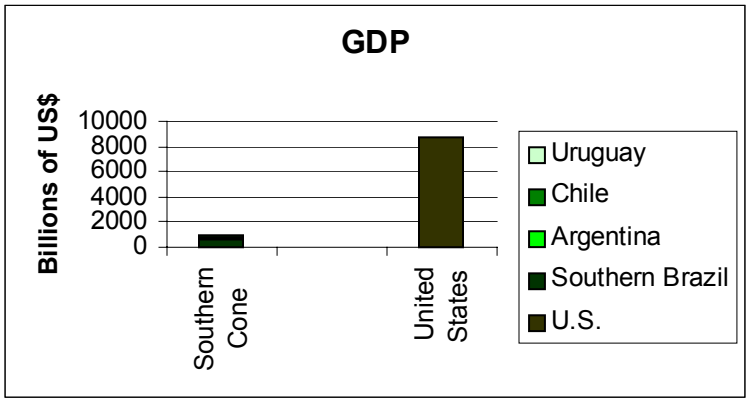
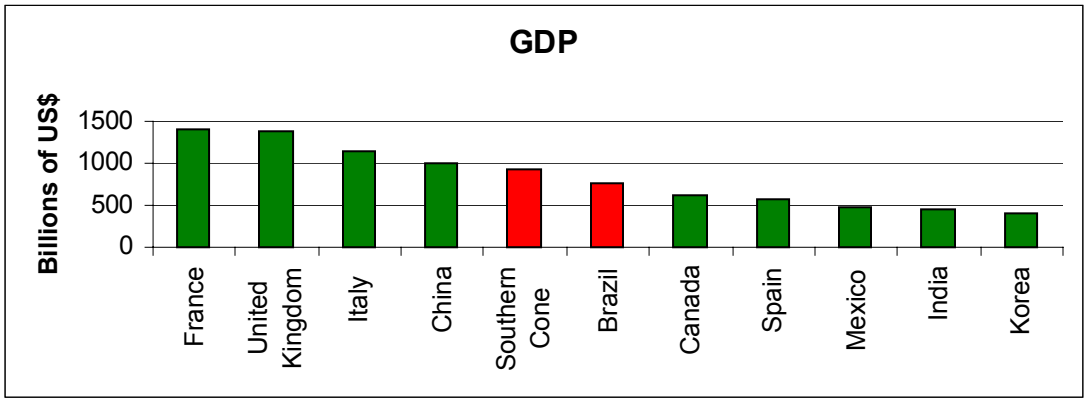


Figure 6 – GDP



Source: World Bank (2001)

Figure 7 – GDP



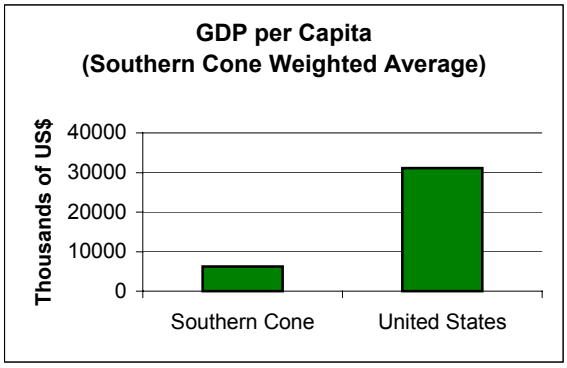
Source: World Bank (2001)

To put the Southern Cone economy into another perspective, it is interesting to compare it to other diverse economies around the world. For example, the Southern Cone economy is only slightly smaller than those of France, the United Kingdom, Italy and China. It is actually larger than the economies of Canada, Spain, Mexico, India and Korea. (World Bank, 2001)

GDP per capita provides a useful indicator of the level of wealth held by individual households. The U.S. GDP per capita is approximately US$31,103. The weighted average per capita income of the Southern Cone region is US$6,275,[1] approximately 20% of the GDP per capita of U.S. households. One major factor to consider when evaluating GDP per capita is the tremendous disparity between rich and poor throughout South America. Unfortunately, this phenomenon is apparent in the Southern Cone as well as the other regions. However, the growth in investment within the region, particularly foreign direct investment in various industries, is stimulating the development of a middle class with greater purchasing power. (World Bank, 2001; Brazilian Embassy, 1999) (See Figure 8)

As mentioned earlier, interest rates are a key determinant of an individual's ability to finance a home. There are significant differences among interest rates throughout the Southern Cone. Interest rates (Bank Deposit Rate) in Brazil are as high as 16.2%. Interest rates (Bank Deposit Rate) in Uruguay are as high as 11.9%. In Chile, interest rates (Bank Deposit Rate) are currently approximately 8.3%.

Figure 8 – GDP per Capita



Source: World Bank (2001)

Argentina has a unique interest rate environment because of that country's currency peg to the dollar. Interest rates (Bank Deposit Rate) in Argentina are approximately 7.9%. However, mortgage rates can vary depending on the expectation that the government may change its policy of pegging the peso to the dollar. Generally, loans in dollars carry a lower interest rate than loans in pesos. (PaineWebber, 2001) In Argentina, an overwhelming majority of homeowners take out dollar-denominated loans with general interest rates ranging from 10% for a five-year loan to 11% for a loan greater than 5 years. Peso-denominated loans are available, but interest rates are higher, ranging from 12.5% to 14% depending on the length of the loan. As a matter of comparison, the current discount rate in the U.S. is 4.5% while the prime rate is currently hovering around 8.0%. (Latin Trade, 2001; AJC, 2001)

Over the last ten years, inflation has become less of a factor in individual's ability to purchase a home in the Southern Cone. More stable economic policies such as the Real Plan in Brazil and the currency peg in Argentina have helped reduce the threat of hyperinflation. Currently, the inflation rate is 7.9% in Argentina, 7.8% in Brazil, 4.2% in Chile and 5.3% in Uruguay. This is quite a departure from the days of hyperinflation in the late 80's and early 90's when inflation rates could exceed 2000% in countries such as Argentina and Brazil. (Latin Trade, 2001)

Housing Markets

Because of the tremendous differences in the relative size of the general economies, one should not be surprised at the relative difference between the housing markets. A good barometer of the relative size of the housing markets is to compare the relative amount of home mortgages outstanding. In the U.S., there are approximately US$4.5 trillion of mortgage loans outstanding. The total amount of mortgages outstanding throughout the Southern Cone is only US$14.1 billion. (Barthell, Fischler, 2001; Fannie Mae, 2001) This figure represents approximately 0.003% of the U.S. mortgages outstanding. Given that the Southern Cone economy equals approximately 10% of the U.S. economy, one can see a tremendous disparity between homeownership patterns.

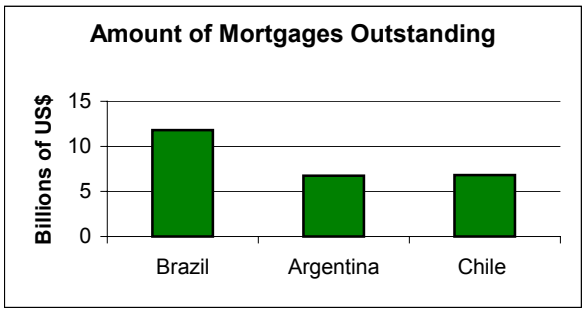
To put this in another perspective, one can look at the amount of mortgages outstanding as a percent of GDP. The ratio of U.S. mortgage loans as a percent of 1999 GDP is approximately 51%. On the other hand, that same ratio is 2.4% in Brazil,[2] 2.1% in

[1] *It is interesting to note that the GDP per capita in the southern regions of Brazil is approximately US$5,916 compared to US$2,829 for the rest of Brazil, a difference of approximately 48%. (Brazilian Embassy, 1999)*

[2] *This Brazilian ratio takes into account all of Brazil, not just the southern portion.*

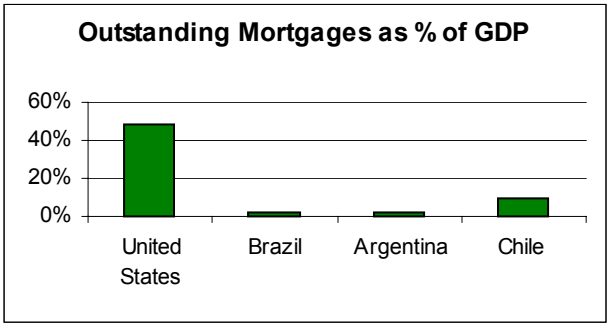
Argentina and 9.5% in Chile.[3] These ratios indicate that Chile has the most developed mortgage market and financial infrastructure of all of the Southern Cone nations.[4] (Barthell, Fischler, 2001) (**Figures 9 and 10)**

Figure 9 – Outstanding Mortgages



Source: Latin CEO, World Bank

Figure 10 – Outstanding Mortgages as a % of GDP



Source: Latin CEO

The average price for a new single-family home in the U.S. in 1999 was US$206,000. The average price of an existing home was US$168,000. (NAHB, 2001) Based on these statistics, the average price of a new home in the U.S. is approximately 6.6 times the U.S. GDP per capita. However, it should be noted that when using a basic mortgage payment program, a family in the U.S. earning US$31,103 per year could afford a home worth US$132,468 or 4.26 times GDP per capita. Assuming someone in the Southern Cone could afford a home worth 6.6 times their GDP per capita, one can estimate that the an individual household in the Southern Cone could possibly afford a home worth about US$41,415. Using the same mortgage calculator as another estimate, an individual earning US$6,275 per year could afford a house worth US$26,729.[5]

However, these estimates assume that individuals in the Southern Cone would have the same access to capital as individuals in the U.S. This is certainly not the case. The lack of available financing is one of the greatest impediments to a growing housing market in the Southern Cone. The lack of available capital, relatively high interest rates and inflation make it much more difficult for the average individual to purchase a home in the Southern Cone. Someone in the Southern Cone must be in a position to pay a substantial amount of cash up front when purchasing a home. If one is able to obtain financing, the length of the loan is generally much shorter than in the U.S. There are also no significant government incentives or tax benefits associated with purchasing a home in the Southern Cone. (Barthell, Fischler, 2001)

There are currently efforts to remedy this lack of financing in the region. The most effective way to make more capital available to individual homebuyers is to create a secondary mortgage market. This type of mortgage market provides large pools of capital from which homeowners can borrow funds in order to buy a home. The pool of capital is supported by many types of investors who seek stable yet profitable returns from the mortgage payments paid back to the investors. FannieMae is a corporation originally created by the U.S. government. It is the largest issuer and guarantor of mortgaged–backed securities in the U.S. Other groups contributing to this market include companies like GinnieMae and other banks and financial companies. Fannie Mae alone had over US$1 trillion of mortgage loans on its books as of 1998, close to 25% of the entire U.S. mortgage market. These large institutions have made it possible for millions of U.S. homebuyers to finance the purchase of a home at affordable rates. (Fannie Mae, 2001)

Chile has made a great deal of progress in creating this secondary mortgage market. The primary investors in Chile's secondary mortgage market are Chilean pension funds and insurance companies. Banco Hipotecario S.A. of Argentina is working with the International Finance Corporation (IFC) to package Argentine mortgages for the international secondary mortgage market. The IFC, a subsidiary

[3] *Estimates vary regarding the percent of mortgages outstanding as a percent of GDP. PaineWebber estimates the ratio for the U.S. to be 57%, the ratio for Argentina to be 4% and the ratio for Chile to be 17%. These differences in estimates can vary as a result of such factors as changes in macroeconomic data, currency fluctuations and lack of access to data in developing markets. Regardless of which source is used. It is apparent that there is a tremendous disparity between the U.S. ratio and the Southern Cone ratio.*

[4] *Chile is the only country in South America to have an investment grade rating by Standard and Poor's.*

[5] *This calculation assumes a thirty-year, 8% mortgage with 10% down.*

of the World Bank is making a US$150 million investment in this venture, the largest investment it has ever made in any single venture. Brazil, however, is behind Argentina and Chile in developing its secondary mortgage market. (PaineWebber, 2001)

The combination of poor economic conditions, high interest rates, high inflation and lack of financing have contributed to creating a significant housing deficit throughout the Southern Cone. One way to understand potential demand for housing in the region is to focus on the current and projected housing deficits and the resources needed to overcome those deficits. By 2020, there will be a housing deficit of approximately 43 million housing units.[6] To alleviate this deficit, between US$1.8 trillion and US$2 trillion will need to be spent on new construction and renovation of existing buildings. (CEPAL) (See Figures 11 – 15 on next two pages.)

Wood Utilization

The construction and renovation of this many homes over the next twenty years will require a significant amount of building materials. Because of the current differences in the housing markets in the Southern Cone, one should not expect the same increases in demand for lumber and wood products as would be expected in the U.S. markets under similar demand profiles. This is due to the lack of wood utilized in housing construction in the region

New residential construction accounts for more than 35% of U.S. lumber demand. This demand is quite volatile and has proven to be the single greatest influence on lumber price swings. The cost for lumber accounts for approximately one third of the cost of materials for a new home. A typical 2,000 square foot home in the U.S. will use approximately 16,000 BF of lumber and 6,000 BF of panel. The cost of lumber and panels for this size home is close to US$10,000. (NAHB, 2001) Given that approximately 900,000 new homes were built in 1999, one can calculate the market for lumber and wood products used in new construction to be approximately US$9 billion per year. Repair and remodeling has become a more important factor, as it now represents approximately 30% of the demand for solid wood products in the U.S. This US$7.5 billion market is much more stable and has less of an impact on lumber prices. (TimberMartSouth, 2001) Other sources of demand for solid wood products include nonresidential construction, manufacturing activities, energy and packaging and shipping. (Adams et al., 2000)

Assuming that buyers in the Southern Cone are able to purchase homes sized in proportion to their GDP per capita, One could assume that lumber costs per home would be about 20% of what they are in the U.S. as the homebuyers would have approximately 20% of the purchasing power. Assuming a simple 400 square foot dwelling, lumber costs would be approximately US$1,953. For the sake of comparison, a 1,000 square foot dwelling would have approximately US$4,882 worth of lumber. It should be noted that lumber prices are volatile and may fluctuate. (NAHB, 2001)

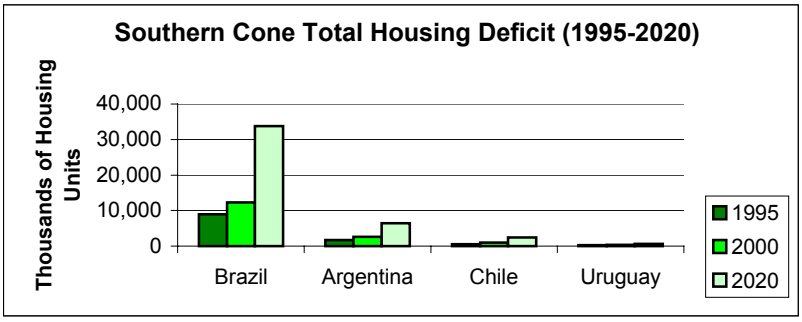
Given a market demand for 43 million houses over the next 20 years in the Southern Cone, the market for lumber and forest products used in construction would be approximately US$84 billion assuming an average 400 square foot dwelling and could be as high as US$200 billion assuming a 1,000 square foot home. These figures assume that homes are built in the Southern Cone using the same proportion of wood as in the United States. However, this is currently not the case, and the demand figures for lumber could actually be much lower in spite of the growing housing market.

Cultural preferences for housing design are more oriented to brick and cement construction in the Southern Cone. For example, 94% of the new homes in Uruguay are constructed using brick or cement walls. (Uruguay, 2000) This preference has a historical origin in that many people in the region are of Mediterranean descent and have a historic association with these types of homes.[7] There is also a cultural bias against wooden homes in that many people in the region associate wood homes with poverty and low class. Wood is not a symbol of strength and longevity in the housing markets and many homeowners prefer to avoid the stigma associated with wood homes.

[6] *This figure includes all of Brazil.*

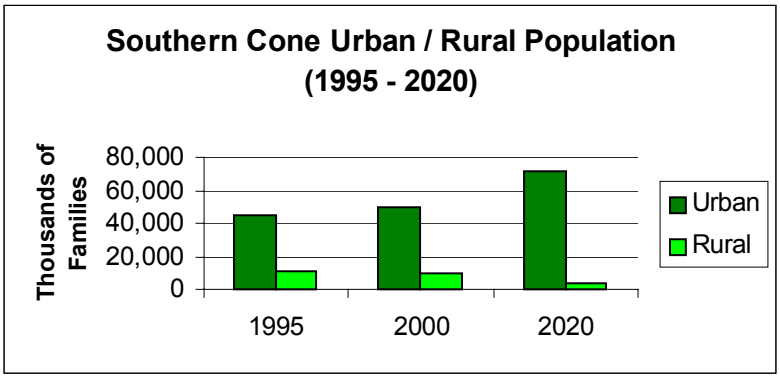
[7] *Home Depot has adapted its stores in the region to the different tastes of homeowners. For example, in Atlanta, Home Depot sells roofing tiles by the dozen. In Chile and Argentina, roofing tiles are sold by the crate.*

Figure 11 – Housing Deficit



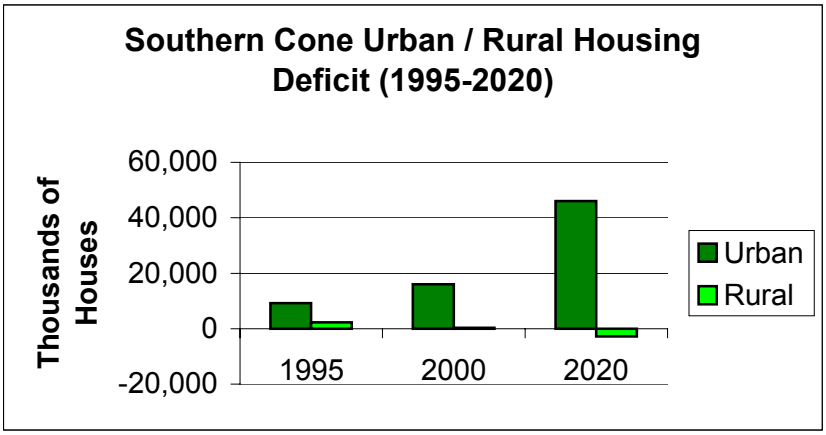
Source: CEPAL

Figure 12 – Urban/Rural Population



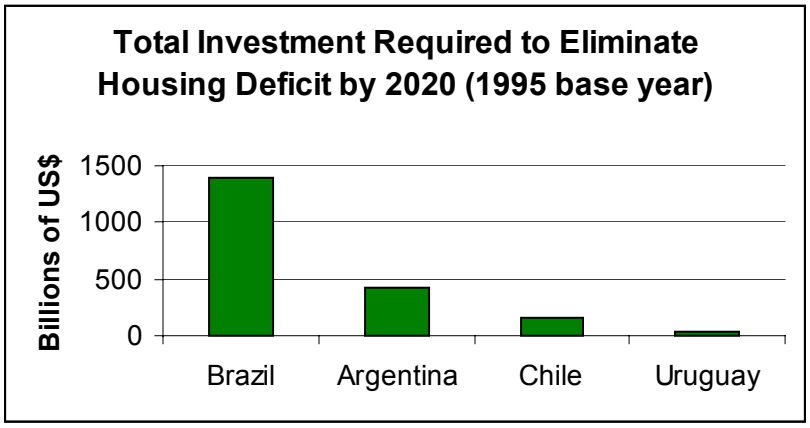
Source:CEPAL

Figure 13 – Urban / Rural Housing Deficit



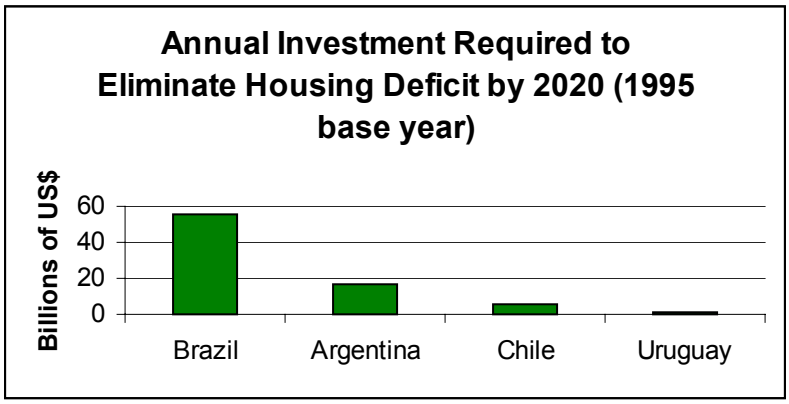
Source: CEPAL

Figure 14 – Total Investment Needed to Overcome Deficit



Source: CEPAL

Figure 15 – Annual Investment Needed to Overcome Deficit



Source: CEPAL

This preference can also be attributed to the wood stock available for construction. Throughout the Southern Cone, renewable forest plantations have such high growth rates that the strength of the wood tends to be lower because of its lower density. This is not good for construction. In most cases, the only portion of home construction with a significant wood component is the roof and associated trusses. Because of the strength required for the construction of roofs, this portion of the homes are usually built with lumber from natural forests, either araucaria or some form of tropical hardwood. It is interesting to note that more than 80% of the tropical hardwood harvested from the Brazilian rainforests is utilized within the Brazilian markets. (Lele,2000)

Wood as a percent of total building materials depends on the size of the home being constructed. The bigger the home, the less wood is utilized as a percent of overall construction. Clearly, the relationship that exists between the housing, lumber and stumpage markets in the U.S. is not prevalent in the Southern Cone. Of course furniture and interior designs can incorporate more wood after the house is constructed, but not nearly at the same scale as during the construction process.

Policy Implications

In summary, there are significant current and projected housing deficits throughout the Southern Cone of South America. There are significant forest policy implications associated with this social and economic phenomenon. The most significant policy issue is actually much broader than forest policy. Efforts should be made to help the region increase its standard of living and quality of life through the encouragement and facilitation of home ownership. In particular, resources should be directed to lower

income families that are most in need of housing and would stand to benefit the most from wooden construction materials as a low cost alternative.

If there is a commitment to utilize more forest products in home construction throughout the region, there should also be more of a commitment to utilize resources from sustainable, high yield forest plantations. Such plantations would be able to take more pressure off of natural forests as the need for forest products grows. In order to utilize the resources from such high-yield plantations, more resources are needed to research and develop products that would meet the strength requirements for construction.

Relative to the hardwood markets, various types of eucalyptus offer promise as a source of solid wood. However, the milling and kilning process for eucalyptus is quite challenging and can be prohibitively expensive relative to other natural hardwood species, especially for higher-grade applications. Relative to the softwood markets, overcoming the challenges associated with the lack of strength due to the low density of the wood from pine plantations should be a priority.

Engineered wood products such as different grades of OSB, MDF and particle board as well as laminated beams, LVL and I-joists would enable significant amounts of wood fiber from the region's high-yield plantations to be used in more significant construction applications in addition to other current uses.

More resources should be allocated to marketing wood products as a viable material for the construction of durable homes throughout the region. The current cultural preferences and biases against wooden homes should be overcome through the marketing and distribution of quality products that meet basic strength and durability standards.

By increasing the dependence on sustainable forest plantations, the Southern Cone reduces its dependency on natural forests. Policies should aim to make these plantations an economically viable alternative to natural forests.

Conclusion

The Southern Cone region of South America is home to some of the most productive forest plantations in the world. There is no reason why these valuable forest resources could not be effectively utilized to help overcome the significant shortage of housing throughout the region. Through the implementation of these various forest policies by government organizations, NGO's, private industry and individual landowners, people throughout the region would be in a much better position to enjoy a higher quality of life that would be sustainable long into the future.

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Policy without Values: Forest Management in Guyana - *Rory Fraser*

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Introduction

Guyana is a resource rich country that remains an underdeveloped, open export-oriented, agricultural raw material-based economy after more than eight decades of development (Dyett, 1994). A symptom of this conundrum is the situation in the forestry sector. The "back-of-the envelope calculations" of a world re-known forestry expert (Sizer, 1996) estimated that Guyana's 14 million hectares of forest could generate US$ 10 to US$ 20 billion worth of raw logs that would be worth up to $US 50 billion after processing. Yet, the forestry sector only contributes about 4% to 5% of GDP according to a Guyana National Development Strategy (NDS) estimate (National Development Strategy, 1996). Government income from logging activities in 1995 totaled less than $US 1 million, total revenues from non-timber products were also less than $US 1 million and fewer than 5,000 foreign "nature tourists' visited Guyana (Sizer, 1996). As another international forestry specialist (Palmer, 1996), opined "if not unique, Guyana must be the rare case of a country having large areas of forest but deriving no general revenue from them".

Explanations for the continuing situation in Guyana have focused on public sector efficiency issues such as - the absence of a land-use plan, the lack of clear management, an inadequate regulatory capacity, the government's intrusion into private markets, and the lack of transportation, power and social services - identified in Chapter 30: Forest Management of the NDS (National Development Strategy, 1996). Inefficiencies were also identified in the private sector – inappropriate harvesting practices; low levels of efficiency in the utilization of equipment; waste of forest resources after they have been harvested; critical shortages of skilled human resources; and inadequacy of available capital – in the National Forest Policy (1998).

However, these problems go beyond mere efficiency. For example, Guyana's Presidential Advisor on Science and the Environment wrote in his justification for offering exploratory forestry leases of 750,000 acres each to four foreign investors "it is a crime against humanity to lock away resources and not use them to provide a comfortable life for a long deprived people" (Chandarpal, 1997). Yet, today, five years later, headline news reports such as "The Guyana Ministry of Housing and Works has reported the removal and demolition of fifty structures put up by squatters in the Ogle burial ground and aerodrome area" (Stabroek News, 3/10/01) and "the Region Ten Forest Producers Association picketed the Guyana Forestry Commission demanding the right to legally operate in Region Ten" (Stabroek News, 12/02/00) are frequent items in the local newspaper. The obvious inequities that lead to these situations were ignored in the most recent election and the current spate of civil unrest that greeted the election results. As one Josiah Thomas wrote in a letter to the Stabroek News entitled "Time for Guyana to look Inland seriously"

"Dear Editor,
While visiting Guyana recently with my family, I was struck by the absolutely astonishing absurdity of Guyanese people being seemingly trapped on the thin coast while the interior with its immeasurable abundance lies idle. Amazingly, Guyana where on average there are about four people per square kilometer, exhibits a land scarcity similar to that of other countries with population densities of two hundred and fifty or more. This scarcity is reflected in high real estate prices, houses with no yard, cramped together on 40x80 lots, so close that if you sneeze you may disturb, never mind infect, your neighbor, people exerting themselves to capture a piece of swamp all along the coast. The recent crop of monstrous high-rise buildings in Georgetown shows not only abominable taste but is another sign of land scarcity. One is reminded of the saying: 'while the grass growing, the horse starving'"

In this paper, anomalies of resource wealth, small population, high literacy and high poverty are examined in the context of what can (should) and cannot (should not) be done in or with Guyana's forests. The case is made that Guyana's relatively unique political, social and economic history explains why the nation's forest is exclusively publicly owned and economically "unproductive". Understanding this history may result in plans and policies that are appropriate and implementable.

Background

Guyana is a country the size of Idaho, with an area of 214,970 sq. km. (82,980 sq. mi.), and sits on the northeastern shoulder of the South American continent bordered: to the east by Venezuela, to the west by Suriname, to the South by Brazil and to the North by the Atlantic Ocean. The terrain has four cover-types: a narrow coastal mangrove swamp forest, two distinct areas of savannah and scrub forest, a vast tropical high forest and relatively small area cleared for agriculture, mining and settlement Table 1.

Land classification	Area (Sq. km)	Area (Sq. miles)	% of Total
Tropical high forest	168,350	65,000	78
Coastal mangrove forest	805	310	0
Savannah and scrub	35,800	13,825	17
Cultivation, settlement, areas deforested by mining	10,015	3,865	5
TOTAL	214,970	83,000	100

Note 1: km2=100ha, 1 ha= 2.47 acres
Table 1. Land Area Classification in Guyana (Source: NDS, 1996)

The population was estimated at 842,000 people in 1995 (UNDP, 2000). Most of the population live on a narrow (approximately 5 to 25 mile wide) coastal strip and are located in three major population centers: Georgetown (248,000), Linden (27,000) and New Amsterdam (18,000). The majority (51%) of the people are the descendents of Indians brought to Guyana as indentured servants. People of African descent, brought to Guyana as slaves or indentured servants, are estimated at 29% of the population. The rest of the population is: Indigenous people (called Amerindians) 4%, European or Chinese 2%, and Mixed race 14%. English is the official language but a Guyanese Creole and Amerindian dialects are commonly used. There is a very high level (98%) of literacy in the 15 years and older population because education is compulsory between the ages 5 to 14 years. However, the per capita income was $3,403 in 1998 and the poverty rate is estimated at 43%. Approximately 33% of the working population is in Agriculture, 45% are in Industry and Commerce, and 21% are in the Service sector. Many are under-employed so official labor statistics only reflect an 11% unemployment rate. Resources in health care are relatively sparse and life expectancy at birth is 65 years because of high infant morality rate (50/1,000), epidemic levels of transmittable diseases such as malaria, and very low availability of affordable drugs and/or health care specialists. When compared to similar countries in the Caribbean region (Table 2), Guyana is by far the lowest ranked, 96th, on the United Nation's Human Development Index, despite a 98% literacy rate.

Forest Ownership and Control

The state owns 92% of the forests in Guyana. Amerindians own almost all of the other forests, as communal property, through a settlement in 1975 with the Guyana Government, as part of the conditions established by the British Government prior to the Declaration of Independence in 1966. The Guyana Forestry Commission, a semi-autonomous agency established under a 1979 Act of Parliament, controls half of the forest. The remainder of the public forest falls under the jurisdiction of the Department of Lands and Survey in the Ministry of Agriculture (Table 2).

Almost all (96%) of Guyana's forests are under some type of timber production regimes. Under prevailing regulations, an entrepreneur may obtain one of four types of forest concessions: a State Forest Permission (SFP), a Wood Cutting Lease (WCL), or a Timber Sales Agreement (TSA).

Table 2. Forestland Ownership Patterns in Guyana (Source: Guyana Natural Resources Agency/ Guyana Forestry Commission, 1996)

Ownership	Jurisdiction	Area (Sq. km)	Area (Sq. miles)	% of total forest area
Publicly owned				
State forests owned by the Government of Guyana	Guyana Forestry Commission	84,200	32,500	50
Forests on state lands owned by the Government	Dept. of Lands & Survey (Min. of Ag.)	70,800	27,100	42
Communally owned				
Forests on Amerindian lands	Village Councils	14,000	5,400	8
Privately owned	Individuals or corporate entities	Negligible	Negligible	0
ALL FORESTS		169,000	65,000	100

Table 3. Forestry and Socio-economic data for Guyana and some of the larger Caribbean islands and coastal states. (Merillio, Fraser & King, 2000)

Forest Data	Units	Guyana	Suriname	Belize	Jamaica	Trinidad&Tobago	Bahamas
Forest Area	(hectares)	18,756	15,094	2,117	652	235	186
Forest as % Land	(%)	94	95	88	23	33	19
Forest Per Capita	(ha/person)	18	37	11	0	0	1
Socio-Economic Data							
Population	thousands	842	410	216	2,525	1,305	279
Adjusted real PPP*	$/person	2,948	4,862	5,623	3,801	6,107	6,191
Pop. in poverty	(%)	43	39	35	34	21	5
Unemployment rate	(%)	11	16	11	16	16	15
Life expectancy at birth	(years)	65	70	75	75	74	74
Adult literacy rate	(% age 15+)	98	93	93	86	93	96
GDP per capita	(PPP US$)	3,403	5,161	4,566	3,389	7,485	14,614
Life expectancy index		0.66	0.76	0.83	0.83	0.82	0.82
Education index		0.88	0.89	0.86	0.78	0.84	0.88
GDP index		0.59	0.66	0.64	0.59	0.72	0.83
Human development index	(HDI) value	0.71	0.77	0.78	0.73	0.79	0.84
HDI rank		96	67	58	83	50	33

(a) **State Forest Permissions (SFPs)** are issued for areas less than 20,000 acres (8,100 hectares) and are issued for one calendar year only, with an option of renewal. SFPs do not necessarily grant exclusive rights to an area.

(b) **Wood Cutting Leases (WCLs)** are issued for areas between 20,000 and 60,000 acres (8,100 ha. to 24,200 ha.) for periods ranging from 3 to 10 years with an option of renewal. Holders of Wood Cutting Leases are expected to undertake management level and operational level forest inventories and to submit

management plans. Holders of Wood Cutting Leases also pay annual acreage fees.

(c) **Timber Sales Agreements (TSAs)** are issued for areas greater than 60,000 acres (24,200 ha.) for periods of 10 to 25 years with a right of renewal. TSA holders are required to undertake management and operational level inventories, and submit management plans. Annual acreage fees are also charged.

(d) **Exploratory Leases (ELs)** is similar to the prospecting license in mining. It is intended for applications for very large (750,000 acres) concessions as a preliminary step to the granting of a Timber Sales Agreement.

At the same time, timber production is possible on most of the other forests. Timber production from Amerindian lands, Exploratory Leases and the Iwokrama Rain Forest Reserve are permitted. However, royalties or other fees are only payable on timber from Exploratory Lease lands.

Table 4. Area of State Forests Allocated in Guyana (Source: Guyana Forestry Commission Concessions Data, 1996)

Categories of tenure	Number. Of concessions	Approximate area in thousands of (acre)	(ha)	% of state forests
State forest permission	486	4.1	1.7	19.0
Wood cutting lease	9	3.1	1.2	14.1
Timber sales agreement	17	8.9	3.6	40.9
Exploratory Leases	4	3.0	1.2	13.0
Amerindian lands	30 villages	1.0	0.4	4.6
Iwokrama Rain Forest Reserve	1	0.9	0.4	4.1
Unallocated	-	0.8	0.3	3.8
TOTAL		21.8	8.8	100.0

Table 4 - The forest concession data indicate that harvesting is acceptable on over 96% of the forests in Guyana. That there has only been a very small amount of deforestation is truly amazing and begs the questions "Is this true?" "Is this good?", and "Is this something other countries may learn from?". Let us examine the first question. While deforestation may not be evident there is every reason to believe that there is significant degradation of harvested areas. The NDS (1996) alludes to the degradation of the Wallaba (Epurea fallcata)-forest type and the high grading of the Greenheart (Ocotea rodaei)- forest types and seeks to address inefficient harvesting and manufacturing processes. The Tropenbos Foundation (1997) researchers have found the harvests in these areas are unsustainable. Diameter-limit cuts, long rotation, lack of adequate silvicultural information and damage to the residual trees are all contributing to forest stands that have been radically altered. The answer to the second question is value-laden. That is, while the forests have been altered they are still a teeming mass of biologically diversity and the trade-offs between an intact forest and an ecologically degraded forest are subject to the owners' preferences. Which leaves the last question, to be addresses in the rest of the paper.

Guyana's Intact Forest

There are three major reasons why Guyana has an intact forest: economic inaccessibility, exclusionary policies, and benign neglect. Mention of Guyana has, and still continues to, cause people to conjure-up images of El Dorado, that alluring mythical place of unbelievable wealth, that awaits one at the end of a dangerous and arduous journey. The Europeans came in search of gold and left with letterwood (Piratenera Guianensis), which was worth more than its weight in gold (Welch, 1975). They cleared land and planted cotton, coffee and then sugar, which they sold for gold. But, Guyana was unlike most tropical forests they had previously encountered. Not only was its forest more highly diverse but also there was very little population and a relatively unsophisticated production and marketing system. This presented a dilemma because there were very low incidences of highly valuable (to European) endemic species as found in Africa and Asia. There was a very limited workforce to draw from and the traditional methods of agricultural, from which the European colonist

learnt so much in Africa and Asia, was not as evident in the new world. In addition, the roads, trails and canals that linked communities in Africa and Asia were not evident in Guyana. The result, the wide scale European colonial exploitation visited on African and Asian colonies was precluded in Guyana because the economic cost of extracting timber or other crops in the forest far exceeded their value in the market. Unless the product was letterwood which had a high price to weight ratio. This constrained European settlement to the development of agricultural systems along the coast and the estuarine sections of the river.

Agricultural practices in Guyana required the labor intensive, empoldering of extensive areas of the alluvial rich coastal plain (Daly, 1976). In the absence of a significant local population, European, African, and Asian indentured servants and slaves were imported at great cost. Maintaining this labor force in the agricultural sector meant denying them access to or the opportunity to migrate and establish settlements in interior locations (Lancaster, 1994). At the same time, the fierce competition for labor from other plantations in the Caribbean region lead to skirmishes which had international significance in Europe and lead to restricted movement across the spatial, linguistic and cultural barriers created by the European colonists. Guyana, therefore, became the only English speaking country in South America and was managed as if it were a British Caribbean island. Today, Guyanese inhabit a narrow coastal strip with the same insular mentality of people in the British Isles. Whereas, the sea isolates the islands, Guyana is isolated by a linguistic sea, floats on the shoulder of a continent and is disembodied from its forested hinterland.

Distancing the population from the forests was not exclusively the by-product of a colonial history and unique political geography but a manifestation of the benign neglect resulting from the entrenched agrarian, state capitalist mode of development in the post-independence era. Since independence an inordinate amount of domestic and borrowed resources have gone into the maintenance of the physical infrastructure under-pinning coastal agricultural sectors and relatively little have gone into developing alternative modes of production. Sea walls, coastal roads and bridges, housing, manufacturing facilities, agricultural development schemes, drainage and irrigation systems have dominated capital investment since independence. At the same time, the relatively small public investment in interior locations appear to be token attempts to diversify the economy, establish national patronage and fend off incursions by covetous neighbors. Clive Thomas (2000) contends the reality of the post-independence government never matched its vision and it sought to circumvent the population's wishes and desires instead of responding to them. This kept Guyana mired in the classic colonial mode – large scale dependence on natural resources intensive activities, foreign investment and imports for satisfying production and consumption needs, along with low incomes, poverty, and poor social conditions. Or, as Harry Dyett (1994) concluded,

"... After more than eight decades, Guyana's production structure has, in essence, remained unchanged – an underdeveloped, open export-oriented, agricultural raw material-based economy. Without doubt, services have improved and become more widespread – where there were once dirt tracks, there are now paved roads, and other means of communication are in place. Production is still confined, almost exclusively, to a narrow coastal front, leaving a vast interior largely unexplored and underdeveloped."

The Current Situation

The current disposition of the government to the forest is - industrial exploitation, foreign control, disjointed decision-making, and continued public ownership. The government of Guyana has displayed a willingness to cede significant areas of forest to foreign industrial capital. This was made evident in the granting of exploratory leases to the four foreign owned companies. At the same time, they have ignored the pleas for private landownership and the demands of small forest operators. The situations reported above are typical of the bitter complaint about the incentives provided foreign nationals and the disincentives meted out to citizens and local businessmen.

Disjointed decision-making is product of the number of agencies with overlapping and conflicting responsibilities for natural resources. For example, the Minister of Forestry is not legally responsible for the operation of the Forestry Commission. That responsibility devolves to the Chairman of the Guyana Natural Resources Agency who reports directly to the President. The latter, in turn, has been given tacit authority to his(her) Advisor on Science and the Environment. At the same time, the Environmental Protection Agency exercises oversight over Forestry Environmental Issues and has direct responsibility for the Wildlife Department. The Department of Lands and Survey has responsibility for 42% of the nations forest but they do not issue timber-operating licenses, permissions or leases. Most of the exploratory and actual mining operations occur on State Forest lands but the GFC does not issue mining concessions. This is further complicated

by a relatively new (established in 1970's) system of regional government that are not legally responsible for these areas but are becoming increasingly more political involved in the decision-making. The situation in forestry administration is best captured by the management consultant (Hawthorne, 1997) who mused as he discussed the organization of data at the GFC:

"The structure of parts of the GFC is indeed already reminiscent of the Marie Celeste, a crewless ghost-ship with the appearance of functionality but in fact lacking it, maybe a 'lost city' with ancient marble pillars standing amongst so much rubble, where restoration work has just started…. There is little advantage rebuilding the temple of *Athens, without a context to the new structure and someone to use it"*

The Government of Guyana owns 92% of the land and in no public document, be it the National Development Strategy, the Privatization Program or the National Forest Policy is any consideration given to relinquishing control. Private forestland ownership is not an option.

Why Does This Situation Persist?

Ultimately, the problem is one of political accountability. In Guyana, the national forests are almost solely managed at the discretion of the political party in power. Since independence in 1966, two political parties, the Peoples Progressive Party (PPP) and the Peoples National Congress (PNC) have dominated the electoral process, garnering 95% of the votes cast in any election. Each party has had a significant term in office. The PNC from 1966 to 1992 and the PPP from 1993 to the present. The Government is selected on the basis of Proportional Representation. That is, the proportion of the electorate voting for that party dictates the number of seats allocated to a party. If a party gets 10% of the votes it wins 5 of the 50 seats and the top 5 candidates on that party's list are assigned a seat in Parliament. This system of Government, which was foisted on Guyana by the British as a condition of Independence, has brought 35 years of governance without accountability. As Clive Thomas (2000) puts it

"The fundamental flaw lay in its design. Over the years, perhaps the single most important impediment to economic advancement has been the amount of human resources that are absorbed in racial/political struggles for power and control over society. It is a matter of great regret therefore, that no development plan, no IMF/World Bank medium-term program, no government budget has as yet directly addressed this issue in its economic program."

The political problem is exacerbated by race. Ralph Premdas (1992) argues that an "ethnic nuclear bomb" has devastated Guyana because the economic cost of ethnic rivalry has reverberated in every tangible area of life. That this situation persists today is evidenced by the recently conclude elections, as Vyhfius (Stabroek News, 3/25/01) pointed out, almost all of the Indians vote for the PPP so they get about 53% of the votes, almost all the African and Mixed raced people vote for the PNC so they got 42% of the vote and the 4% Amerindians vote for a third party.

The unfortunate consequence is that while National Development Strategies and Forest Policies are promulgated but not implemented, the perpetrators are not held accountable. Colchester (1995) in discussing the arrival of Asian logging firms in Guyana captures this scenario very well. He contends that the influx of foreign capital has brought a new form of colonialism in which the environmentally destructive, clientelistic political economies of the Asian economies are being replicated in Guyana. That these southern businessmen like their western counterparts are unaccountable to the people within their home and host countries and unaccountable for their welfare. More importantly he suggests a certain type of ethnic chauvinism underlie the ties that bring these businessmen and politicians together.

Amerindians suffer the brunt of the social, political and economic wasting in Guyana. As Canterbury (1993) showed in his study, Amerindians are the "poorest of the poor". Forte (1993) endorses those sentiments when she reminded us of "the historic inequities in the distribution of wealth of the country, the lack of democracy for most of our history, the crushing burden of past and present corruption…" and the fact that "Barama (an Asian owned company) secured twice as much land in its contract with government than held in freehold title by all Amerindian villages combined".

The worst of it is the

"Opening up of the Guyana interior to extractive industries, bringing in its wake a migratory population, coupled with a rudimentary health care service often lacking in medicines, has also exposed Amerindians communities to an upsurge in disease, malaria and tuberculosis in particular."

Guyana is under a state of siege. The first invaders were the G*arimpieros*, miners, from Brazil and Venezuela who have been working Guyana's gold and diamond fields for over two decades. Much of their production leaves Guyana without official knowledge or approval. These mine workers have been identified with environmentally destruction, the spread of malaria and HIV-AIDS and discharge mercury and/or cyanide loaded water into the rivers systems. Two recent examples of this situation are the discovery, by a private citizen, of a 25-mile long road built from the Brazilian border into Guyana and a recent armed assault on a local police station by Brazilian miners.

Following in the wake of the miners, are the drug traffickers. Most of Guyana's borders and interior locations are un-patrolled and have become havens for drug trafficking. There are almost daily reports of arrests of "drug-mules" (people who attempt to smuggle drugs on or in their bodies) at the Cheddie B. Jagan International Airport. There has been an upsurge of American gangster-style executions by people using high-powered weapons that out-gun the local police or army.

There have been public accusations of official corruption among the ranks of politicians, bureaucrats in the land-management agencies, police and the military. Most of these accusations have gone un-examined or subject to inconsequential review.

Solutions

No natural resource policy, law or regulation can flourish in a society racked by the diseased social and political systems in Guyana today. This rather bleak situation in Guyana cannot be reversed unless there is a radical change in the political landscape. Kaimowitz (2000) has seen situations, similar to those in Guyana, in other tropical forest regions. He found that most primary forest exists because they are: 'economically protected' - too inaccessible, distant, or poor quality to log or farm; and keeping areas economically protected can be an efficient - though unpopular - way to maintain primary forest. He also found that governments lack presence in forest areas and government agencies are poorly motivated. He concluded that deforestation or forest degradation would probably get worse, especially in protected areas and forest concessions.

Should the current social and political malaise in Guyana be corrected there are forest policies that may be effective.

Sizer (1996) drawing on the his organizations experiences in Southeast Asia and Africa proposed a seven-part policy framework –

1. Make land available for a wide variety of uses
2. Maintain the ecological integrity of the forestlands
3. Maximize forest revenue consistent with diversity and ecological integrity
4. Delineate rights and responsibilities to land and resources
5. More efficient administration of land and resources
6. Greater public participation in the policy process
7. Attract and encourage responsible investment

Kaimowitz (2000) cautions, that who owns forest affects its use. He suggests that indigenous people, small farmers, and Non-Timber Forest Product (NTFP) users may use forests more sustainably because they lack capital and labor to do major damage, and they have diversified production systems. However, cultural factors and common property systems discourages investment. He also suggests that sustainable is not always optimal, whereas, clearing forests & depleting timber resources can be a socially optimal strategy, particularly in the Amazon. Whether it is optimal or inevitable, equity issues become very important. If producers are to receive rents, preferably they should be small producers.

If the desired outcomes are timber, biodiversity, carbon sequestration, erosion control, game, etc. large primary forests may not be optimal. Kaimowitz (2000), therefore, advocates a land use mosaic consisting of agroforests, plantations, and other options since these may be profitable even if sustainable natural forest management is not.

These experiences gleaned from other tropical forest regions can be of great benefit to Guyana. However, there are at least a dozen fundamental questions Guyanese have to ask of their Government:

1) How do coastal citizens become systematically involved in changing the forested interior and what mechanisms exist for them to benefit from these changes?
2) What is the role of the private ownership of land in Guyana's interior?
3) What is being done to promote and develop a non-timber products sector?
4) What is being done to involve Indigenous people and protect their

rights to own and operate their lands as they see fit?

5) What is being done to rationalize taxes, fees etc to generate funds for forest planning and forest management activities?
6) What mechanisms exist to ensure accountability of agencies such as the GFC?
7) What is being done to prepare organizationally and nationally for evolving international forest products markets?
8) What is the role of local and regional government in the development and implementation of forest management plans?
9) What is happening to the national land-use plan?
10) What is being done to reorganize the natural resources agencies to reduce redundancy and increase efficiency?
11) What is the meaning of sustainability in the Guyanese context?
12) What sanctions and incentives can be used to foster desired outcomes?

Answers to these questions can inform policy and provide some basis for the development of forest management strategies. In the process we may see the evolution of alternative strategies such as public participation, divestment of public lands, multi-functional resource agencies, micro-enterprise development, and domestic control which are more likely to result in net social and economic benefits while minimizing environmental degradation. That is strategies in which each Guyanese see some personal benefit from their forest and as a nation seek to embrace, enact and enforce the national forest policy.

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A Framework For Regional Private Native Forest Inventory in Australia -

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Introduction

A national workshop in December 2000 brought together forest inventory experts, private native forest managers, and State and Commonwealth government officers to consider the significance of private native forests, the information requirements of various agencies, industries and growers, and the need to develop a framework to assess regional priorities and inventory methods.

The paper discusses the significance of Australia's private native forests and steps being taken to develop a regional private native forest inventory framework to provide timely, relevant information for sustainable forest management and reporting.

Private Native Forests

Australia has 157 million hectares of forest (Table 1, Figure 1) representing 20 per cent of the continent. Approximately 71 percent of these forests are woodland (20-50% crown cover); 25 per cent are open wet and dry sclerophyll forest (51-80% crown cover); and 3 per cent are closed forest (81-100% crown cover) consisting of 80 per cent rainforest and 20 per cent mangroves. While ownership is 73 per cent public and 27 per cent private, about 42 per cent of the public native forest is leased by the private sector, mainly for pastoral use. Consequently almost 70 per cent of all forested land is managed by the private sector. This compares with approximately nine per cent under public multiple-use forest management.

Table 1: Forest types and areas by tenure ('000 ha)

Forest type	private	leasehold	Public and other tenures	% private and leasehold	Total Area ('000 ha)
Eucalypt	33,178	50,681	40,604	67.4	124,463
tall	*1,372*	*583*	*4,588*	*29.9*	*6,543*
medium	*28,640*	*35,121*	*27,689*	*69.7*	*91,450*
low	*988*	*12,056*	*1,656*	*88.7*	*14,700*
mallee	*2,174*	*2,920*	*6,670*	*43.3*	*11,764*
unknown	*5*	*<1*	*<1*		*6*
Acacia	2,784	8,525	989	92.0	12,298
Melaleuca	949	2,560	584	85.7	4,093
Rainforest	1,017	414	2,152	39.9	3,583
Casuarina	81	919	52	95.1	1,052
Mangrove	422	118	505	51.7	1,045
Callitris	197	300	370	57.3	867
Other	3,390	2,586	2,459	70.8	8,435
Subtotal	42,018	66,103	47,714	69.4	155,835

Source: Australia's National Forest Inventory 1998

The majority of commercial native forests under private ownership are in the states of Queensland, NSW, and Tasmania with smaller areas in Victoria and Western Australia. The areas of private native forest in South Australia and the Northern Territory used for commercial purposes are negligible.

In 1997/98, 455 sawmills relied entirely on the national private forest timber resource; a further 397 sawmills sourced timber from both public and private forests (ABARE 2000). An annual average of 3.9 million cubic meters per year of sawlogs and six million cubic meters per year of pulpwood were removed from Australia's native forests in the period 1994/95-1999/2000. Of this, 720,000 cubic meters per year sawlog and two million cubic meters per year pulpwood came from private forest (Table 2).

Table 2: Annual average sawlog and pulpwood volumes harvested between 1994/95 and 1999/2000

State	Sawlog Public m^3	Sawlog Private m^3	Pulpwood Public m^3	Pulpwood Private m^3
NSW	879,006	191,257	663,405	66,639
ACT	-	-	-	-
VIC	1,059,281	65,106	992,763	125,848
QLD	197,273	253,640	53,189	-
SA	-	-	-	-
WA	631,828	12,949	598,163	60,938
TAS	388,765	197,438	1,716,361	1,728,133
Total	3,156,152	720,390	4,023,881	1,981,558

Source ABARE 2000

Forest Policy Context

Under the Australian Constitution, forest use and management is the primary responsibility of the six State and two Territory governments. However, the Commonwealth has authority over exports and obligations under various international conventions, such as those protecting endangered species and biological diversity. In 1992 the Commonwealth, State and Territory Governments (Tasmania in 1995) agreed to a National Forest Policy Statement, which provides broad objectives for the future use of Australia's public and private forests, and aims to balance the competing demands of conservation and industry concerns. To this end, the policy established a Comprehensive Regional Assessment process to consider resource, economic, social, conservation and heritage values as a basis for Regional Forests Agreements between the Commonwealth and State Governments (Commonwealth of Australia, 1992). Although public native forests were the major focus of these agreements, the program highlighted the need for better information on private forests to improve the quality of planning and management to meet industry and conservation objectives.

Regional Forest Agreement Program

Australia's Regional Forest Agreement (RFA) program (Commonwealth of Australia 1995) was a national initiative to plan forest use in key timber production regions for the next 20 years. It represents the largest undertaking of its kind in Australia, covering 12 regions in five States with a total area of 45 million hectares. It started in 1995 and the final RFA is expected to be signed early 2001. The RFA regions represent approximately six per cent of the Australian land area, 16 per cent of the total forest estate and the majority of native forests managed for commercial timber production (Commonwealth of Australia 1997).

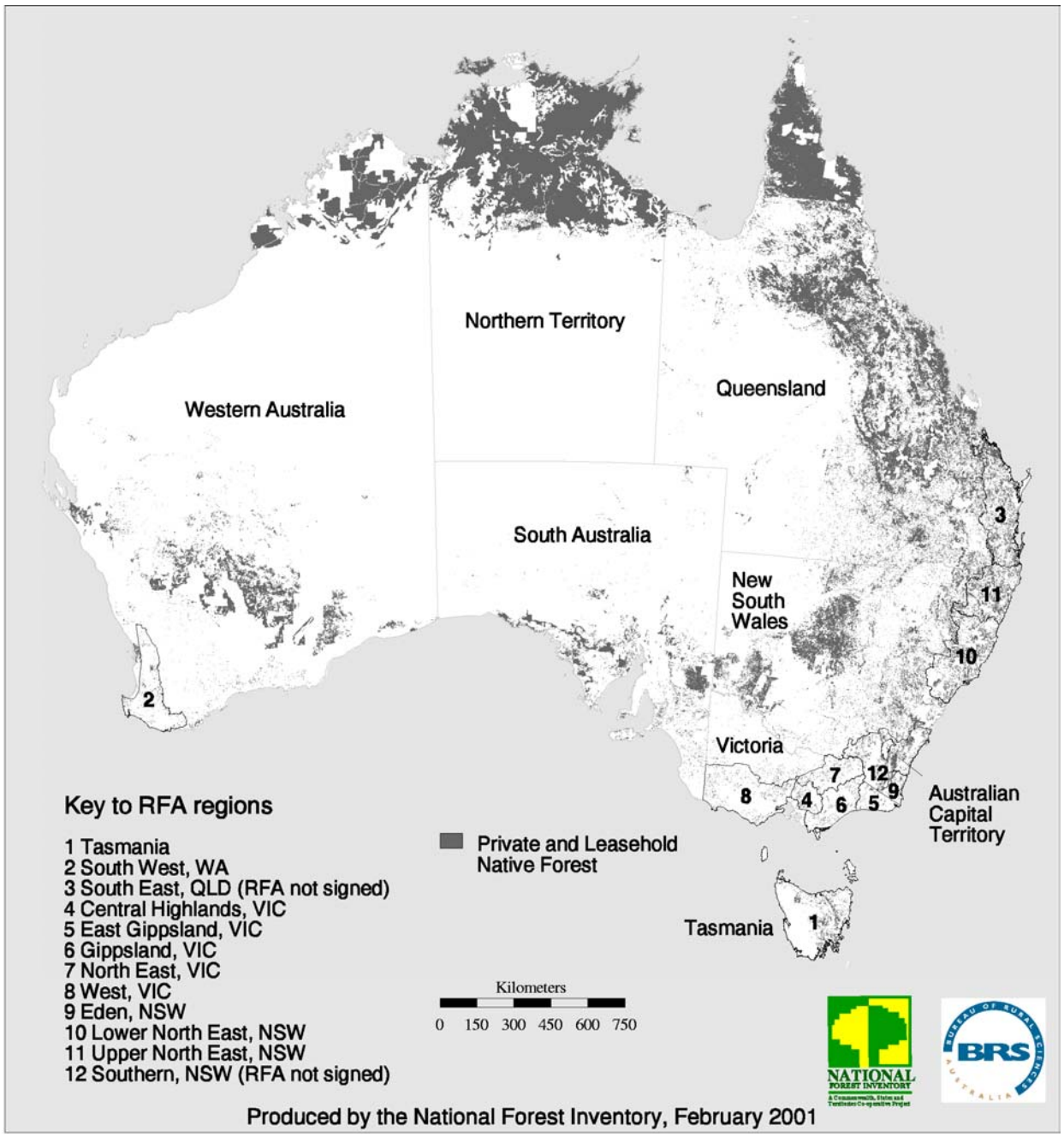
The RFA process aimed to achieve a comprehensive, adequate and representative (CAR) forest reserve system; ecologically sustainable forest management in the forests designated for wood production; and the development of an efficient, internationally competitive timber industry based on secure rights to produce timber from these forests (Commonwealth of Australia 1995).

Implementing this program required, interalia, agreed criteria – the JANIS[1] criteria – for establishing a national system of forest conservation reserves (Commonwealth of Australia 1997). The JANIS criteria defined principles of comprehensiveness, adequacy and representativeness as a basis for developing a forest reserve system on public land, to be achieved through dedicated reserves, informal reserves, and management prescriptions for forests to be managed for wood production. Protection measures could also be negotiated for private forests. JANIS guidelines provided targets based on the current areas of native forest ecosystems, old growth and wilderness, relative to their pre-European distributions.

Although 40 per cent of the native forest in regions covered by CRAs is in private ownership, the process focused on publicly managed native forests. The regional assessments provided some information on the status, condition and use of private forests, although much of this information was collected to establish regional conservation targets for forest ecosystems, with limited attention to the long-term sustainable management and development of the private native forest resources.

[1] JANIS is the Joint Australian and New Zealand Environment Conservation Council and Ministerial Council on Forestry, Fisheries and Aquaculture National Implementation Subcommittee.

Figure 1: RFA Regions and PNF distribution in Australia



Across the RFA regions, approximately 25 per cent of sawlogs are sourced from private freehold forest, while in some regions such as northern NSW and South East Queensland; the production from private forests exceeds that from multiple-use public forests (Table 3).

Private native forests in the RFA regions are also important for their conservation values as highlighted in Table 3 with 45 per cent of native forest ecosystems occurring on private land being identified as priorities for conservation.

Table 3: Significance of private native forests for timber and conservation as represented by area, sawlog volumes harvested and ecosystems listed as priorities for conservation by RFA region

CRA/RFA region	Private native forest (PNF) (ha)	Public native forest (ha)	Pre-RFA private timber harvest (m^3 yr^{-1})	Post-RFA public timber agreed supply (m^3 yr^{-1})	PNF ecosystems (number)	PNF priority conservation ecosystems (number)
NE Victoria	175,000	1,051,000	<1000	68,000	41	15
E. Gippsland	63,000	966,000	negligible	250,000	17	3
C. Highlands	107,000	585,000	10,000	345,000[1]	22	10
Gippsland	178,000	1,235,000	6,000	115,000	46	21[2]
W. Victoria	245,000	714,000	24,000	77,900	144	94[2]
Eden	125,000	408,000	3,000	25,000	52	7
UNE NSW	1,193,000	972,000	79,000	109,000	146	56
LNE NSW	1,435,000	1,739,000	206,000	160,000	179	85
S. NSW[3]	832,000	1,649,000	19,000	96,500[3]	81[3]	34[3]
Tasmania	943,000	2,262,000	251,000	310,000[4]	44	24
W. Australia	303,000	1,932,000	69,000	544,000[5]	21	5
SE Q'land	1,191,000	1,047,000	210,000	109,000	N/A	N/A

[1] This represents the current supply commitments. Legislated sustainable yield is 415,000 m^3 yr^{-1}.

[2] Only includes ecosystems identified as rare, endangered or threatened.

[3] Preliminary figures awaiting finalisation of regional forest agreement.

[4] Includes 10,000 m^3 yr^{-1} *Acacia melanoxylon* (Blackwood) and 300,000 m^3 yr^{-1} eucalypt sawlog/veneer

[5] Includes 464,000 m^3 yr^{-1} *Eucalyptus marginata* (Jarrah) and *E. diversicolor* (Karri) first and second grade sawlogs, and 80,000 m^3 yr^{-1} *Corymbia calophylla* (Marri) sawlogs.

Management of Australia's private native forests

Management of Australia's private native forest is mainly subject to State and Local government controls, with Commonwealth government jurisdiction covering export licensing and obligations under various international conventions, such as those protecting endangered species and biological diversity.

Each state has its own legislative requirements and facilitation arrangements for management of private native forest ranging from a relatively non-interventionist approach in Queensland through to substantial agency involvement in Tasmania, Victoria and New South Wales. Additional complications arise with the level of approvals required for private native forest management compared with other agricultural activities in addition to the substantial public good values that private land owners are expected to consider in the management of their land. Complicating factors are the number of private native forest owners and the respective variety of management intent, the varying range of forest management expertise, and the fragmented area and condition of these forests.

In addition to the public forest/land management agency involvement in private forests, Regional Plantation Committees have been established through the Commonwealth Department of Agriculture, Fisheries and Forestry to facilitate plantation establishment and advise on private native forest management. They provide an important mechanism for facilitating private native forest networks for information dissemination and communication. Through the Natural Heritage Trust, the Commonwealth government has also provided support for a wide range of local, regional and national initiatives contributing to the management and understanding of the private native forest resource.

Private Native Forest Inventory

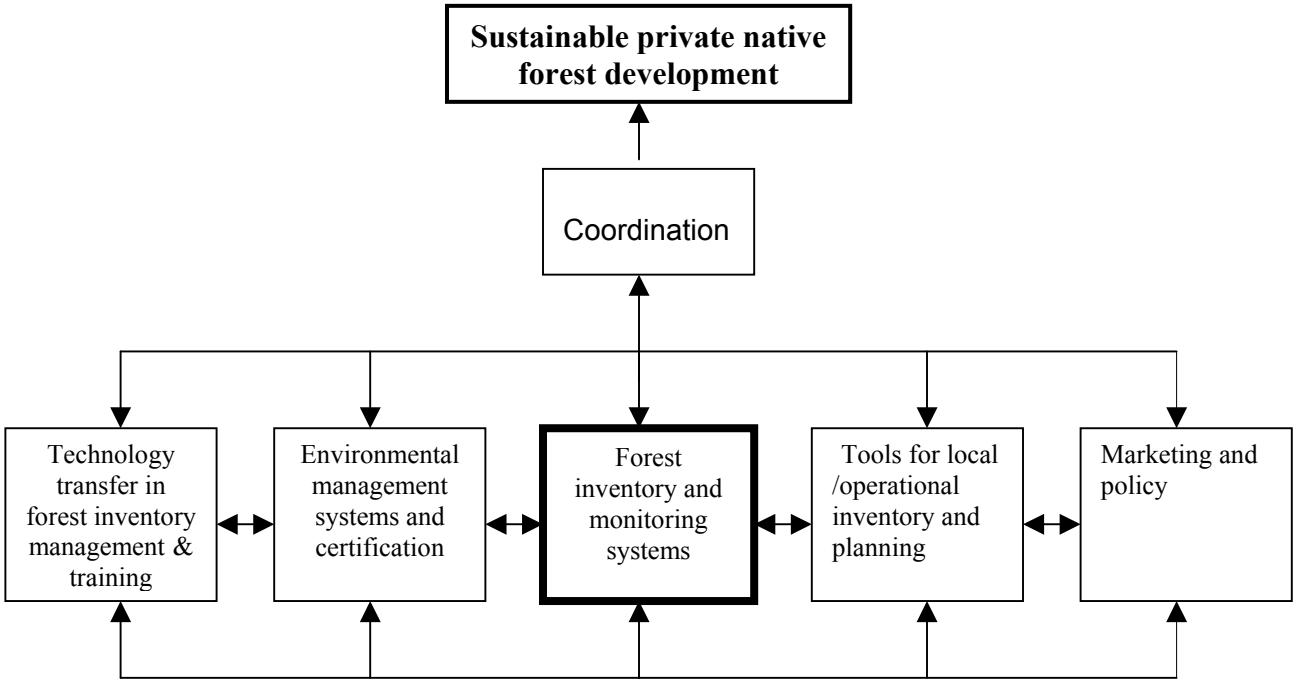
Need for private native forest inventory

A fundamental requirement for sustainable management of any natural resource, for both production and conservation purposes, is the need to quantify the landscape components. An adequate knowledge of the area and condition of the forest estate is a prerequisite for land-use planning, determining sustainable levels of production, or creating conservation reserves as part of a permanent forest estate (Ferguson, 1996). Successful forest industries have direct and indirect links with many regional, national and international Indus-tries,

including resource supply, processing, transportation, marketing, and building industries. Successful forest growers depend on investment and integration with these industries.

Reliable current information about the forest resource, especially at the regional wood catchment scale is required for strategic and operational planning and decision-making in this integrated chain (Howell and Donaldson, 1998). This in turn requires responsive, flexible, forest inventory methods and processes to provide reliable current forest information. Without strategic regional inventory information, it is not possible to determine requirements for sustainable forest management, nor is it possible for regions to attract longterm strategic investment. This applies particularly to regions where harvesting is undertaken in a vacuum of strategic regional information. Key relationships between inventory and dependent activities for sustainable private forestry development are illustrated in Figure 2.

Figure 2: Key elements to sustainable private forestry development



Developing a framework for regional private native forest inventory

Since its establishment in 1988, Australia's National Forest Inventory (NFI) has employed a 'bottom-up' approach using data, largely in the form of mapping, supplied by the States and Territories. The majority of the NFI's available funding has been expended filling gaps in mapping and "normalising" data collected using different methods, scales and standards (Tickle, 1996). This approach has successfully mapped the type, extent and ownership of Australia's forests across the entire continent at scales ranging from 1:25,000 to 1:1,000,000 in addition to completing regional mapping in priority areas and identifying information gaps. It has also demonstrated that it is not economically feasible for the NFI to meet many of its reporting requirements in a timely manner through continued rolling-up of traditional forest mapping and shown that many of the required attributes for forest planning and management cannot be obtained from satellite information.

This contrasts with a 'top down' approach, such as the USA national forest inventory, that uses a national grid of aerial photo samples, followed by ground measurements on a sub sample of permanent ground plots (Spencer and Czaplewski 1997). This provides a very flexible system, allowing for redefinition of stratum boundaries as new questions arise. However, even though such a system has been in place for more than 70 years, only recently has it been able to produce maps of forest type and extent at resolutions finer than the grid spacing through the

use of 1km resolution satellite data (Hershey and Reese 1999).

Australia's NFI is now pursuing the development of a Continental Forest Sampling Framework to provide a top-down approach to produce data for a suite of parameters that encompass both industry and conservation needs at national and sub-national levels and to provide links to bottom-up approaches. Two key objectives of the Framework are to provide a responsive, flexible, efficient system to provide authoritative national-level data for all forests; and establish a standardized and repeatable system to conduct successive inventories and make statements about change, relevant for 5-yearly reporting (National Forest Inventory, 2001). Importantly, it will establish a sampling design that allows for integration between the different levels of assessment. This should provide for scaling up of sample data collected by high resolution remote sensing and/or ground assessment methods, and intensification of sampling in areas where more details are required, such as regions, municipalities, neighborhoods, or properties. This will provide a framework for implementing timely, cost effective, regional private native forest inventories to minimize duplication and maximize economies of scale by combining top-down and bottom-up approaches as illustrated in Figure 3.

There is wide consensus, confirmed at the national workshop in December 2000 that the initial focus for regional private forests should be on strategic inventories to provide estimates of acceptable precision for whole regions. However, these should be designed within the context of information needs at other scales, such as more detailed information on smaller local or operational areas requiring additional sampling, and national information requiring aggregated regional data. As it is neither practicable nor necessary to address all levels over all areas at the same time, an inventory framework is required that will facilitate data integration across various levels. Indicative information types for three levels of inventory (Table 4) show that in many cases similar types of information are required at different scales.

The common data elements between the three tiers (national, regional and local), and the capacity to pursue hierarchical sampling intensities, reveals significant capacity to implement data collection processes, which meet multiple stakeholder needs.

These requirements could be met with a mapping and sampling framework using multiple stage assessments (e.g. multi stage, multi phase), possibly including:

- Wall-to-wall mapping with Landsat imagery to get national and regional vegetative cover and change information (Barson et al 2000), or systematic point sampling using Landsat or IKONOS imagery for quick, repeatable estimates.
- Systematic or random sampling within satellite mapping units using small to medium scale aerial photographs to determine characteristics such as forest type, structure, disturbance, and land use (Anon 1999).
- Sampling within the photo-interpreted strata using large scale aerial photo and/or laser systems to measure and interpret stand and individual trees parameters (e.g. Biggs and Spencer 1990, Spencer 1992, Means *et al* 2000, Lefsky *et al* 1999, Tickle *et al* 1998, Witte *et al* 2000).
- Ground assessments, possibly on double samples, to obtain quantitative/qualitative data (e.g. species, stem volumes) to correlate with remote sensing data.

Figure 3: National framework for native forest inventory and monitoring

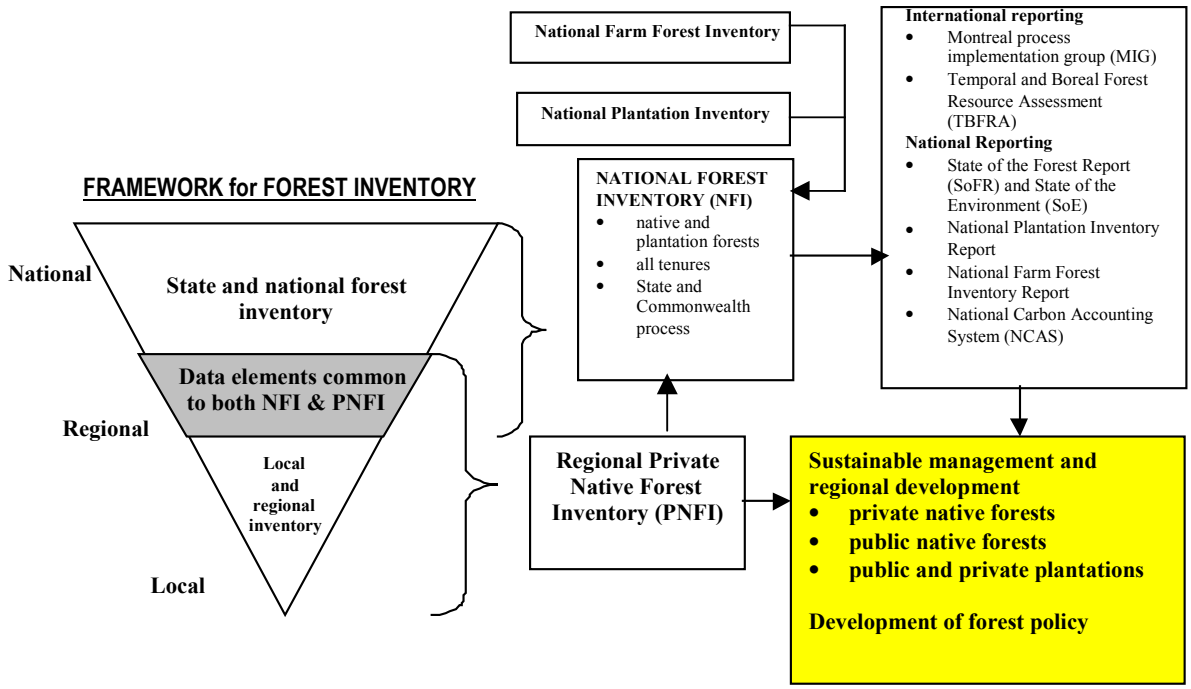


Figure 3 illustrates how a continental sampling framework could provide a framework for regional private native forest inventory, linking into the national forest inventory to meet a variety of State, national and international reporting requirements. It is important to recognize that regardless of the framework design, to achieve a specified level of precision for a particular variable over a specific area (e.g. forest stand, catchment, region), the sampling requirements for individual strata at each level are similar (e.g. national, regional, local, property). The number of samples required increases exponentially as the number of strata and level of spatial detail increases. The aim of the proposed framework is to arrange data collection within a hierarchy whereby each level has a subset of common data. A final regional design should be developed in concert with methods currently being developed for all forests through the National Forest Inventory Continental Forest Sampling Framework.

In addition to the technical aspects of inventory design, it will be crucial to gain landowner co-operation to engender broad support for private forest inventory and gain access to properties for ground sampling. All owners should be informed of the benefits of better information leading to better policies, the value of contextual information for business planning, and site specific information to assist planning on individual properties. This information should be directed to all property owners, not just supportive owners interested in timber values. Coordination will also be required between government agencies, both State and local, grower cooperatives and networks

.

Table 4: Key information types for three inventory levels

Capacity to feed assessed criteria up ↑

Level of inventory	Stakeholder/client	Information types and scale
National/State	Government agencies, policymakers, domestic & international clients, decision-makers e.g. NFI, National Vegetation Information System (NVIS) , Montreal Process requirements, Commonwealth Action Agenda	Broad forest communities, structure, volume/biomass, disturbance, conservation significance, tenure. Mapping scales: National/State (e.g. 1:100,000 – 1:250,000) Sampling intensity fit for data analysis at Interim Biogeographic Regionalisation of Australia (IBRA) region equivalents, whole of RFA regions, major river basins etc.
Regional	Regional development groups, State governments, industry, local government, cooperatives, large forest landholders	Detailed forest communities, structure, volume/biomass, products, disturbance, conservation significance, tenure. Mapping scales: local-regional (e.g. 1:25,000 – 1:100,000) Sampling intensity appropriate for sub-regional data analysis for catchments, wood allocation zones, Ecological Vegetation Communities, Local Gov^{t} Areas, etc.
Local/Farm	Landowner, cooperatives, small-scale operators, approval authorities	Detailed forest type, species, stand structure, merchantable volumes, products, regional/local conservation significance, specific rare endangered species, net harvestable area. Mapping scales: local/property (e.g. 1:5,000 – 1:25,000) Sampling intensity appropriate for data analysis at the stand and property levels

↓ Increasing level of spatial detail and intensity

Steps required to progress regional private forest inventory

Based on outcomes from the December 2000 workshop, the following steps were identified to progress a regional inventory program focused on private native forests:

- Collate existing information on private forests from State agencies.
- Determine what assessment information is required, including a minimum acceptable set of reporting statistics for private forests nationally which will address landowner needs and concerns, in addition to national level reporting requirements.
- Identify priority regions requiring assessment.
- Determine sampling design
- Determine appropriate tools and methodologies to implement sampling design.
- Develop and implement a program to engage and coordinate landholders and grower networks.
- Test and apply methods.
- Seek support for an ongoing national program for private forest inventory.

Conclusion

Federal initiatives commencing in 1988 provided a foundation for improved cooperation between the States and Commonwealth for the preparation of a National Forest Inventory. However there has been no mechanism to secure ongoing funding or to target

forests where forest inventory has traditionally not occurred (viz. privately managed native forests). The system to integrate public forest data into the national system is a bottom up approach that integrates data from State inventory programs. Over time, improved methods have evolved to integrate State data obtained by a variety of methods and standards to meet each State's objectives.

New requirements for national/international reporting and pressures on regional forests for sustainable forest planning covering all forests require more effective methods for obtaining information. These should combine top down and bottom up approaches that complement existing State programs, utilize combinations of state-of-the-art remote sensing and ground assessment methods, and have sound consultation mechanisms for regional stakeholders and forest growers. The challenge is to identify and implement 'best practices' to efficiently collect consistent, appropriate data for all of Australia's forests.

Acknowledgements

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Private Forestry Development with Agroforestry in the Developing Countries: A South-Asian Perspective - *Suraj Prasad Shrestha*

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Background

Agroforestry:

The International Center for Research in Agroforestry (ICRAF) defines "agroforestry as a dynamic, ecologically based, natural resources management system that, through the integration of tree on farm and in the agricultural landscape, diversifies and sustains production in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels"(ICRAF, 2001). The Association for Temperate Agroforestry (AFTA) defines "agroforestry as an intensive land management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock" (Merwin, 1997).

Population:

The world's population, which was below 2 billion in 1900 became 3.0 billion in 1960, increased to 5.7 billion in 1995 and now surpasses six billion has been a leading reason for cutting down forest because of the demand for forest products and for the expansion of land for agriculture, industries, settlements, roads, irrigation canals and many other uses. The accelerated loss of the world's forest cover presents one of the major environmental challenges (Gardner-outlaw and Engelman, 1999 and United Nations, 2001).

Forests:

Forests and wooded vegetation cover 3.45 billion hectares of the earth's surface (Gardner-outlaw and Engelman 1999, 1995, FAO 1999, and Sharma et. al. 1992). It is estimated that Asia, Africa, and Latin America, which contain 80 percent of the world's population, comprise only 55 percent of the world's forests. Developed countries with 20 percent of the world's population have the other 45 percent of the world's forests. However, the area of forest for wood supply in the world is only 1,563 million hectares (FAO, 1999, and Gardner-outlaw and Engelman 1999).

Per capita forests in the world have decreased from 1.2 hectares in 1960 to 0.6 hectares in 1995 and are projected to be 0.4 hectare by 2025. In 1965 industrial wood consumption per capita per year was 0.34 cubic meters, and was reduced to 0.26 cubic meters in 1995. In the same period, fuel wood consumption per capita was reduced from 0.33 to 0.32 cubic meters per year. There has been a net increase of forest cover to 20 million hectares in developed countries, while on the other hand there has been a decrease of 200 million hectares in developing countries between 1980 and 1995 giving a net loss of 180 million hectares (FAO 1999, Gardner-outlaw and Engelman 1999). With the shrinking trend of forest cover and the increasing demand of wood products, agroforestry is one of the land use practices that will reduce the gap between demand and supply of wood products, making it a people's movement (Patnaik, 1996).

South Asia:

South Asian Association for Regional Cooperation (SAARC) was established in December 1985 by the heads of the state or by heads of governments of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka to accelerate the process of economic and social development in member states (SAARC Secretariat, 2001). This region comprises about 22 percent of the world's population with fragile Himalayan ecosystem, the highest mountain system in the world. This region has demand for over 90 percent of all wood production as fuel wood and charcoal, three-quarters of which is consumed in India alone (FAO, 1999). There is lack of any institutional framework in this region for agroforestry programs. So far very little work has been done to promote agroforestry in this region, where subsistence agriculture is the main source of livelihood.

Objective

One objective is to investigate the current forestry and agroforestry situation of SAARC region and explore institutional development in order to accelerate agroforestry systems in private sectors which will increase the productivity of land resources by supplying wood resources and nutrition to rural people and improve watersheds of this region.

Method

Based on available literature and information, the current situation on agroforestry was investigated specifically for SAARC region. An attempt is made to visualize the need for a strong institutional framework to accelerate agro-forestry practices in private sectors of this region.

SOUTH ASIAN NATIONS AND FORESTRY

The population for SAARC countries (Figure 1) was 1.269 billion in 1997 and contains only 2 percent of the Earth's forest area, amounting to 18.7 percent of total land area of this region being under forest cover (FAO, 1999). The SAARC region is one of the most densely populated regions in the world with an average of 307.3 people per square kilometer (Table 1) compared to 2.4 in Australia, 241.7 in United Kingdom, 29.7 in the United States, 19.3 in Brazil, 333.6 in Japan, and 133.2 in China. Although the annual growth of gross domestic product was over 4 percent during 1990-1995, income per capita still remained below $500.00 per year in most of SAARC nations (Table 1).

The internal migration of population from rural to urban areas in SAARC countries is continuing as in the past, but the rural population remained more than 70 percent of the total population in 1997 (Table 1 and Figure 2). In most rural areas, fuel wood is the main sources of energy for domestic cooking and many cottage industries (FAO, 1999)

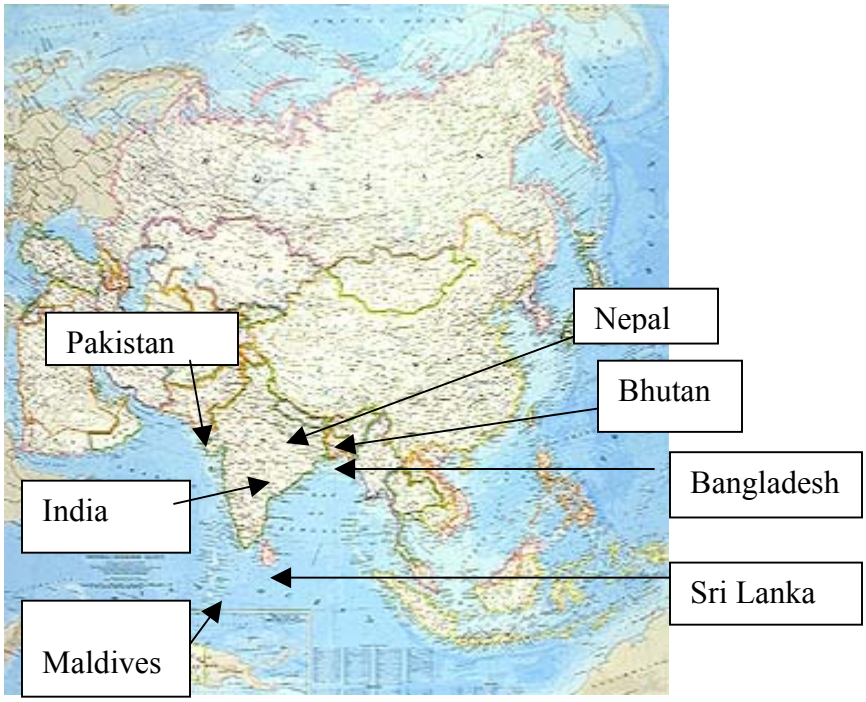

Figure 1. SAARC

Table 1. Population, gross national product and gross domestic product for SAARC nations

Countries	Population				GNP per Capita 1995 (US$)	Annual growth Rare of GDP 1990-1995
	1997 (Million)	Density 1997 (Per Km^2)	Annual rate of change 1995-2000 (%)	Rural population percent in 1997		
Bangladesh	122.0	937.2	1.6	81	240	4.1
Bhutan	1.9	40.4	2.8	93	420	n.a
India	960.2	323.0	1.6	73	340	4.6
Maldives	0.3	1000.0	3.4	73	990	n.a.
Nepal	22.6	158.0	2.5	89	200	5.1
Pakistan	143.8	186.5	2.7	65	460	4.6
Sri Lanka	18.2	281.6	1.0	77	700	4.8
Overall	1269.0	307.3	-	73	-	-

Source. State of World's Forests, 1999. FAO/Rome

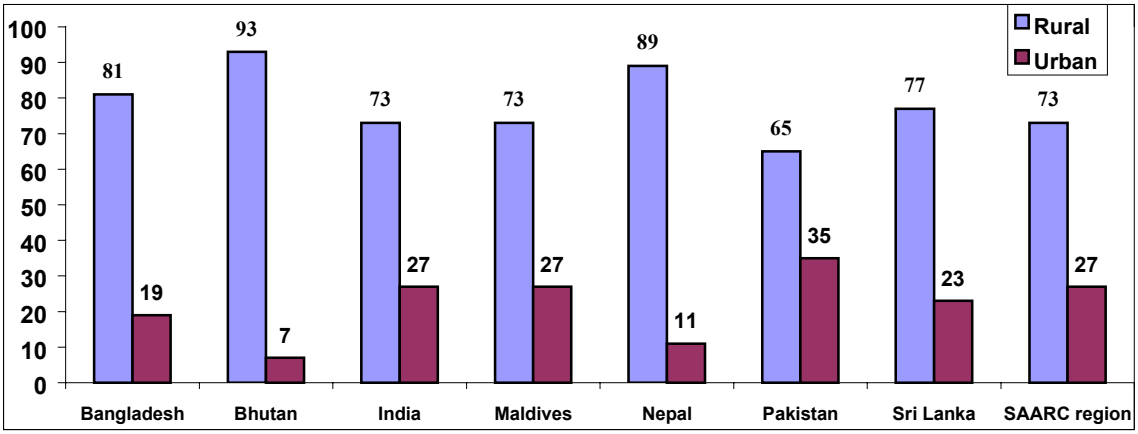

Figure 2. Percent of rural and urban population in SAARC nations in 1997

Director-General Jacques Diouf of the Food and Agricultural Organization (FAO), expressed on World Food Day that the world produced enough food globally in 1999 to feed six billion inhabitants, but that significant steps need to be taken to improve global and national food supplies to combat hunger (FAO, 1999). Compared to many African nations, SAARC nations are better at supplying food to their population. But compared to the global 26.6 percent land area of forests, the SAARC region has only 18.7 percent of land area comprised of forests (FAO, 1999). Though there was a slight increase in forest cover in the SAARC region between 1980 and 1990 due to an increase in forest cover in India, forest decreased in this region by 0.2 percent every year between 1990 and 1995 (Table 2).

The SAARC nations, which account for more than a fifth of the global population, produce only 20 percent of fuel wood and charcoal, 2 percent of industrial round wood, 4 percent of sawn wood, a negligible amount of wood panels, 1 percent of pulp and paper, and 1 percent of paper and paperboard demanded in the region (Table 3). In 1996, this region had a trade deficit of about 700 million US dollars in forest products (Table 3), which might have exceeded over one billion US dollar every year by 2000. There is no well documented data available for the area under private forestry in most of the SAARC region, but the areas of natural forests and plantations indicates that less than 20 percent of the forest area in this region is under private holdings (Figure 3).

Table 2. Forest cover in SAARC countries

Countries	Total Land area ('000 ha.)	Forest area ('000 ha.) with year				Annual Change in forest area, 1990-1995 ('000 ha.) and % in parenthesis	Forest area in 1995 In '000 hectares		
		1980	1990	1995			Natural	Plantations	
					(%)				% to total
Bangladesh	13017	1258	1054	1010	7.8	-9.0 (-0.8)	700	310	30.7
Bhutan	4700	2975	2803	2756	58.6	-9.0 (-0.3)	2748	8	0.3
India	297319	58259	64969	65005	21.9	7.0 (n.s.)	50385	14620	22.5
Maldives	30	n.a.	n.a	n.a	n.a	n.a	n.a.	n.a	n.a.
Nepal	14300	5580	5096	4822	33.7	-5.5 (-1.1)	4766	56	1.2
Pakistan	77088	2749	2023	1748	2.3	-5.5 (-2.9)	1580	168	9.6
Sri Lanka	6463	2094	1897	1796	27.8	-20.0 (-1.1)	1657	139	7.7
Overall	412917	72915	77842	77137	18.7	-141 (-0.2)	61863	15301	19.8

Source. State of World's Forests, 1999. FAO/Rome and Gardner-Outlaw and Engelman, 1999.
n.s – not significant, n.a. – not applicable

Table 3. Production of wood-based products (1996) in SAARC countries

Product	Quantity	% of world total	Export		Import		Trade deficit in thousand US$
			Quantity	Thousand US$	Quantity	Thousand US$	
Fuelwood and charcoal	370889[a]	20	8[a]	447	72[a]	1582	1135
Industrial roundwood	29036[a]	2	24[a]	2212	477[a]	69644	67432
Sawnwood	19453[a]	4	28[a]	6602	95[a]	16698	10096
Wood panels	494[a]	n.s	20[a]	10185	54[a]	23283	13098
Pulp and paper	2173[b]	1	2[b]	1896	360[b]	167640	165744
Paper and paperboard	3559[b]	1	7[b]	4839	748[b]	445002	440163
Total							697668

Source. State of World's Forests, 1999. FAO/Rome. [a]Thousend m^3 and [b]Thousend tones

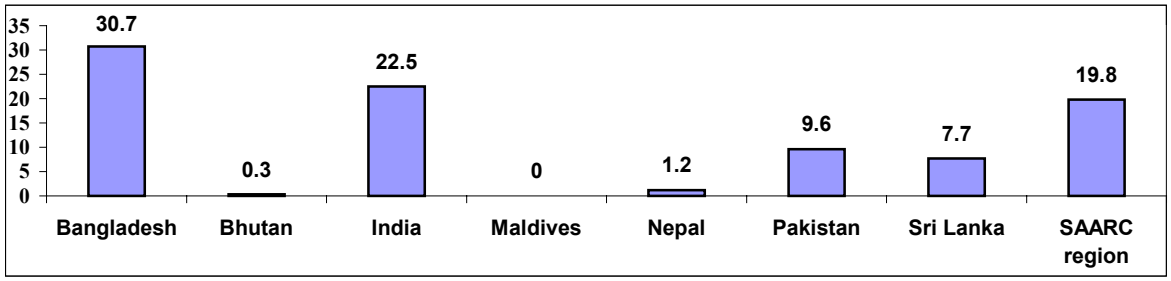

Figure 3. Percent of private and state plantations compared to total forest area in SAARC nations in 1995

Increasing human population and decreasing forest cover in the SAARC region has led to the reduction of per capita forest area every year (Table 4 and Figure 4). If this trend is not reversed, there will be almost

negligible per capita forest cover in Pakistan and Bangladesh by 2025. In this situation, Pakistan will be the first SAARC nation to be designated as a country with forest and freshwater scarcity (Gardner-Outlaw and Engelman, 1999)

Table 4. Forest area per capita in hectares for SAARC nations in hectares from 1980 to 2025

Nations	1980	1995	2025
Bangladesh	0.01	0.01	0.00
Bhutan	2.26	1.49	0.64
India	0.08	0.07	0.05
Maldives	n.a.	n.a.	n.a.
Nepal	0.38	0.23	0.09
Pakistan	0.03	0.01	0.00
Sri Lanka	0.14	0.10	0.05

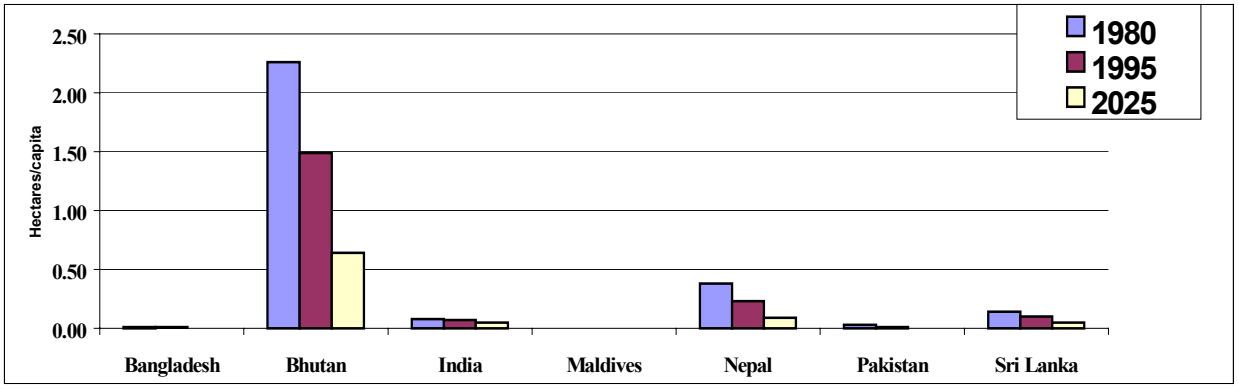

Figure 4. Per capita forest in hectares for SAARC nations

Agroforestry in The SAARC Region

The Nairobi, Kenya-based world leading institution for agroforestry, ICRAF, has Southeast Asian Regional Program office at Bogor, Indonesia, but not in the SAARC region, and ICRAF has a very limited agroforestry program in this region. To some extent governmental and non-governmental organizations in the member countries of the SAARC nations are initiating some agroforestry activities. Kishwan (1995) mentions that India, Nepal, Thailand, Kenya, China and Bangladesh do not have well designed agroforestry policies. However, Bangladesh had initiated a Five Year Agroforestry Plan (FYAF) prepared by the National Agroforestry Working Group (NAFWG). Myers (1986) mentions an urgent need for multi-purpose farm forestry (agroforestry) and reforestation of wastelands and degraded agricultural lands in the Himalayan region (most of SAARC nations). On-farm research in Bangladesh has developed a more structured approach, using farm workshops as a way of identifying farming innovations (Raintree, 1994). In Bangladesh, homestead gardens are the major supply of wood products. With a lack of an institutional framework in agroforestry, the SAARC nations are still far away from reaping the benefits from agroforestry.

Narain et. al. in 1998 found that in western Himalayan valley in India, alley cropping systems paired with tree-rows were almost covered by undergrowth, weeds and regenerated leucaena, which acted as a filter strip. This effect was more observed with closely planted agroforestry hedgerows. Positive factors associated with agroforestry were found to be reduction in temperature of air and soil, efficient utilization of solar radiation, suppression of weed growth, conservation of moisture, maintenance or increase of organic matter, protection of soil from erosion, nitrogen fixation, and reduction in wind speed to the crop. But, the competition for light, moisture and nutrients, between tree and agriculture crops may be considered negative factors (Basavaraju and Gururaja, 2000).

Technical know-how and the specific plant material to develop forest resources on private lands are considered to be crucial factor in Himancha Pradesh in India (Singh, 1996). An agronomy aspect of the discipline is very effective for involving farming systems for maximum success and profit from agroforestry systems along with other disciplines (Vandenbeldt, 1992). Crops growing in agroforestry save their own moisture because the protection by trees cuts down their rate of evapotranspiration. Especially legumes provide residues which are returned to soil resulting in the addition of nutrients to the soils. (ICRAF, 2001).

Benefit-cost studies carried on in agroforestry by Rana et. al. (2000) in Upper- Swan Catchment in the Una district of Himanchal in India concluded that the highest benefit-cost ratio found was 2.59 and the lowest was 1.97. They also found that all four plantations in agroforestry were profitable. Agroforestry professionals must raise the level of awareness of gender perspective among decision makers for equitable participation of women (Montes, 1999).

Conclusion and Recommendation

India and Bangladesh have initiated some agroforestry programs in the SAARC region, where private ownership of forest is already higher than in the rest of the SAARC countries. The current forestry situation of this region indicates that the population's demand of forest products from natural forests can be supplied only at the cost of environmental degradation. In this context, production of wood products in private sectors is the best alternative, and will work as a supplement to the demand of forest products from natural forests. Under the limitations of land resources of this region, pure forestry in private lands may take over some agricultural production. However, it is over due for the SAARC nations and international organizations to initiate agroforestry in private sectors for long-term supply of wood products with the production of agricultural crops. There is an urgent need for a speedy development of environmentally sound and economically viable agroforestry practices in this region. This may only be possible from a strong institutional framework for agroforestry by initiation of SAARC nations and international organizations along with research and development, economic and marketing studies, education and training, information and technological development, and active participation of rural people.

Worldwide institutions, agencies and conventions involved in forest development are: Asian Development Bank (ADB), Central American Commission on Environment and Development (CCAD), Center for International Forestry Research (CIFOR), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Biological Diversity (COB), Food and Agricultural Organization (FAO), FAO's Committee on Forestry (COFO), Forestry Advisers Group (FAG), Forestry Research Support Programme for Asia and Pacific (FORSPA), Forest Resources Assessment (FRA), Global Forest Information System (GFIS), International Centre for Research in

Agroforestry (ICRAF), Intergovernmental Forum on Forests (IFF), Intergovernmental Panel on Forests (IPF), Inter-Agency Task Force on Forests (ITFF), International Tropical Timber Council (ITTC), International Tropical Timber Organization (ITTO), International Union for Conservation of Nature and Natural Resources (World Conservation Union) (IUCN), International Union of Forestry Research Organization (IUFRO), National Forest Program (NFP), United Nations Conservation on Environment and Development (UNCED), United Nations Environment Programme (UNEP), World Commission on Forests and Sustainable Development (WCFSD), World Bank (WB), World Resources Institute (WRI), and World Wide Fund for Nature (WWF). It is ironic that in the presence of so many organizations involved in forest development as mentioned above, the SAARC region, which constitutes more than one billion people in population, is not well considered for the initiation of agroforestry practices.

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Evaluations Regarding Forest Management and Forest Ownership in Turkey

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Introduction

About 26.6 percent of Turkey's entire land area (20.7 million hectares) is occupied by forests. Of which 48% of total area are productive forest and the remaining is unproductive forest (Konukçu 1998) and about 0.33 ha forest area is shared per person over the country.

The first legal regulation concerning the utilization from forests in Turkey is "Forest Regulations" developed in 1870, the Ottoman Empire period (Özdönmez et al. 1996), Since that time, in Turkish forestry, which has been subject to various regulations and applications; at present, about 99.9 percent of the forest area is owned by the State and the remaining 0.1 percent is owned and managed by the private sector (SPO 2001).

The administration of almost all forest area in Turkey and management activities on these forest areas have been carried out by the Ministry of Forestry. Since 1937, forest management activities have been realized by the 241 State Forest Enterprises (SFE) spread over the country. The General Directorate of Forests under the Ministry of Forestry subordinates these enterprises. Because the ownership of nearly all forest areas belongs to the State, the forests are managed by State.

A wood raw material based production perception that is not taking into consideration multi-dimension benefits of forestry and demand of society has been dominated in the management plans prepared at the level of SFEs. As a result of this trend, in all management plans, prepared all over Turkey, to provide raw wood material based production at the maximum amount is mostly a priority objective and all inventories done in the forests is to realize this purpose.

Although the share of private forest ownership and management activities is very low according to official figures, the private forestry activities exist in practice on the state forests. Legal, economic, technical, social and cultural factors, which affect the present forest ownership and management activities, are available in the Turkish forestry, but not available in other countries. Especially, forest villagers, which are 11 percent of total population and directly or indirectly related to forests and live inside and next to forests, are main factors that affect the forest ownership and management activities in the country.

In this paper, it is aimed that the legislative, economic, social, technical and cultural factors mentioned above which affect the forest ownership and forest management activities in the Turkish forestry will be reviewed in detail. With this purpose, firstly, it will be focused on the historical developments of forest ownership and forest management activities, and then general information concerning the Turkish forest resources; forestry and forest sector will be given briefly. Lastly, the factors, which have influence on the forest ownership and forest management activities in Turkish forestry at the macro and micro levels, will be discussed.

Historical Development of Turkish Forest Management and Ownership

In spite of increasing the population and necessities, as a result of that the forests are haphazardly destroyed, the forests have been owned by the state and other various estate owners almost in every country, a pair of measures has been taken with regard to arranging the conservation of forests and utilization from forests (Özdönmez et al. 1996).

First regulations about this topic in Turkey had begun with the political reforms made in the Ottoman State in 1839. Because of the Ottoman State had financial crisis, an Forest General Directorate was established in order to collect the taxes which would be collected from wood, timber and coal with the aim of providing an income for the national treasure from the forest resources of the country and also Forest Directors were appointed to the regions of the country (Bingöl 1990). First legal regulation concerning the forest management and forest ownership is the Forest Regulation (Orman

Nizamnamesi), which was come into force in 1870. This regulation is a first and most important written document, which gave a direction to the Turkish forestry and determined the forest policy devoted to the protection and management of forests. According to this regulation, the forests were divided into four categories with regard to the ownership. These are (Özdönmez et al. 1996):

1. Forests directly belonging to the State,
2. Forests belonging to the foundations (Charities),
3. Forests belonging to the small town and villages,
4. Forests belong to the persons.

The Forest Regulation foreseen that the forests are managed by way of obligation and privilege, and the sales are done as the standing tree sale. In this way, the state preferred to realize the protection of its forests with its own organization, but left the management of its forests to the private person and companies under its control and supervision (Özdönmez et al. 1996).

A law about the management technique of forests was enacted in 1917 and according to this law, that the state forests are managed according to management plans was obligated. In this way, the period of the unplanned and non-managed forestry was ended and passed through technical forestry period. But, the results of Balkan and World War I occurred in this period obstructed to be realized the applications of technical forestry on a large scale (Özdönmez et al. 1996).

Afterwards, Law No: 3116 enacted in 1937 with the assertion of constituting the contemporary forestry comprehension first time in Turkey, exactly adopted to the ownership types of Forest Regulation agreed in 1870 (Özdönmez et al. 1996). However, the forests were accepted as an important source of the national economy with this law, and all state forests must be protected, expanded and managed by the State for the benefits of society according to the plans.

The state ownership and management approach brought by Law No: 3116 (Forest Law) has been developed in the following years. The approach that the forests are owned and managed by the state was truly considered as important with regard to the benefit of society. In the direction of this approach, it was aimed to ensure that all forests, with a few minor exceptions, were nationalized, under Law No. 4785 enacted in 1945. However, because of the reactions appeared in the application of this Law, it was foreseen that a part of the forests previously brought under state control are re-given the estate owners under some conditions with the Law No: 5658 enacted in 1950. Lastly, Law No: 6831, Forest Law that is currently being in force was enacted in 1956.
The forests were divided into three categories with regard to the ownership according to this Law. These are:

1. State owned forests
2. The forests owned by the public organizations
3. Privately owned forests

In addition to other previous laws, the national park concept aiming that the forests should be used with regard to the benefits of social and cultural aspects was brought. Thus, besides the protection forests, the national parks had a part in this Law (Özdönmez et al. 1996).

The forests have been accepted as natural wealth like water and air and left open for the utilization of everybody desultorily. A considerable part of the state forests belonged to the persons, foundations, villages and small towns, which were left out of the forests, were counted as a benefit obtainable resource without paying any price (cibâli mubaha) and a wide liberty was given to the society about the utilization from these forests (Özdönmez et al. 1996).

As a result of these understanding and applications, the Turkish forests were subjected to substantial destruction regarding both quality and quantity. Therefore, it was an obligation to place too much legal regulation, some of them mentioned above, related to the ownership and utilization of forests.

The Characteristics of Turkish Forest Resources and Forestry Sector

Some information in order to give a general idea about physical, managerial, social and economic characteristics of Turkish forests and forestry sector will be given in this section.
The forest area in Turkey occupies 26.6 % of total land area or 20 763 247 ha of 78 million ha land area in Turkey is covered with forests. (MoF, 2000). But, based on the average, the proportion of average forest area to the general land area is 32 % overall the world (Özdönmez et al. 1996). It is seen that the rate of forest area in Turkey remains under the world average in terms of the quality and effectiveness of

its functions when taken into consideration 48 % of Turkish forests to be productive and the remaining 52 % to be in the unproductive (degraded) characteristic of forests (MoF 2000). On the other hand, about 91,6 % of Turkish forests are naturally growing forests, and the remaining 8,4 % is the plantation forests mostly planted on the degraded areas and open spaces of existing forests (Konukçu 1999).

Approximately 99.9 % of Turkish forest area (20 744 765 ha) is owned by the state, the remaining 0.1 % (18 492 ha) is owned and managed by private owners (MoF, 2000). In the European Union Countries, the rate of public forest ownership and private sector ownership are respectively 29.8 % and 70.2 %. Furthermore, 72.1 % of forest resources in the developed northern American countries are in the public ownership, 26.7 % in the private ownership, and the remaining 1.2 % is owned by indigenous or tribal peoples (United Nations 2000).

The other important point is that, while the average productive forest area per person is 0.64 ha in the world, this ratio is only 0.16 ha in Turkey (Konukçu, 1999). In another word, the productive forest area ratio in Turkey is one fourth (1/4) of the world average.

Because of the forest ownership, the forest management activities related to the state forests have been undertaken by the central and province organizations that are coordinated by the Ministry of Forestry. The management activities regarding the privately owned forests are under the control and supervision of the State.

The administration of almost all forest areas in Turkey and management activities on these forest areas have been carried out by the Ministry of Forestry. The Ministry of Forestry is headed by a Cabinet Minister, Under-Secretaries. The Ministry has six ancillary units dealing with legal, administrative and research activities, but majority of the staff are employed in four general Directorates (Muthoo 1997): Forests, National Parks and Hunting-Wildlife, Afforestation and Erosion Control, and Forest and Rural Affairs. The Three latter General Directorates operate as administrations with direct budget funding but reporting to the Under secretariat The General Directorate of Forests, which is responsible for the overall economic management of state forests, has financial autonomy and reports directly to the Minister of Forestry.

Public (state) forests divided by regional, district and sub-district administration basis such as Regional Forest Directorates (RFD), State Forest Enterprises (SFE) and Forest Administration Chief Offices (FACO). The average sizes of FACO vary between 10-100 thousands hectares, one SFE may covers 3-15 FACO. There are 27 RFD and each of these is divided into 9 SFE as an average (total number of SFE is 241 in 2000). As SFEs are fundamental units in which forest management activities are realized technically, economically and financially (EFI 2001).

Economic management activities realized in the forestry sector, which take part among the main production sectors in Turkish economy are carried out by 241 SFEs especially under the General Directorate of Forests subordinated by the Turkish Ministry of Forestry.

The contribution of the Ministry of Forestry into the national income is about 0.05 % as much as reflected in the balance sheets prepared by SIS for 1990. The share of forestry sector will reach to 1.76 % of the national income, when illegal fuel wood consumption not reflected in the forestry sector balance sheets, private sector's wood production and subventions made by forestry sector are taken into consideration (Türker 1999a).

Approximately 7 million people live in about 19 000 forest villages overall the Turkey. These people are directly or indirectly connected to the forests and their life standards are under the bottom limit of poverty (SPO 2001; Geray 1993). These create substantial pressures on forest resources around the villages.

The wood based products obtained from the forests in Turkey cannot meet the internal demand. It is believed that this situation will continue for a long time. The supply deficit has been met by importing the forest products from other countries. Consequently, the forestry sector is not an import sector for Turkey.

The forestry in Turkey is in a sector position that its backward linkage rate is low but forward linkage is high, and it gives input to many other sectors. Consequently, this sector is in a strategic sector position.

Social, Economic, Historical and Cultural Factors Affecting the Turkish Forest Management and Forest Ownership

The principle of the State management has been dominated in the Turkish forestry since 1937 and it has been accepted that the forestry services are undertaken by the SFEs. The main reason of accepting this principle is that all society are interested in forests. And private ownership may accelerate destruction of forests. Furthermore, because of many justifications such that occupying generally derives the private forest ownership the state forests in Turkey, and cause ownership claim on the state forests etc. (Ayanoglu, 1997). As a result, state domination has been established in both forest ownership and forest management activities.

The objectives of the protection or preventing the destruction of forest resources take part in the basis of establishing the state domination in the forest ownership and forest management in Turkey. Consequently, the factors, which are the cause of destruction of forest resources in Turkey, are at the same time, directly or indirectly effective in the forest ownership and forest management activities.

The forest villagers, who are directly or indirectly in interaction with the forests and forestry activities and are economically insufficient, take part among the main factors that play an important role in the destruction of forest resources in Turkey. About 7 million forest villagers who live in 19000 forest villages of Turkey destroy the forests which is a natural resource to meet their needs for the agricultural, forestry and livestock activities by cutting down trees, grazing, unplanned harvesting. Because the forest villages are located as disorganized quarters and are far from the cities and even the towns. Therefore, it is impossible to transfer various social services to the villages. The compatriots that live in the forest villages spent a big part of year as out of work, and they have an occasion to destroy the forests (Türker 1997).

The forest villagers cannot provide the revenue, which is required for their minimum life conditions because of the following reasons;

- The shared income per household is at low level,
- Insufficiency of their possessions or capital accumulations,
- The scarcity of their share in the public investments,
- Mostly living in the conditions of closed economy,
- The production made for the market is at low level,
- Lack of productivity in the agricultural and livestock activities done by the primitive techniques on the area exposed to erosion.

With these reasons, the forest villages that could not provide revenue by normal ways, cause the destruction of forest resources by way of smuggling, clear cutting for arable field, settling in forest, grazing their animals, causing forest fires for clearance to make arable field to continue their life at the minimum conditions (Türker 1997).

One of the most important reasons of the forest destruction in Turkey is the excessive use of forest resources by legal or illegal way. Furthermore, the forest resources have also been destroyed by illegal ways. Especially, such a destruction are arisen from the actions devoted to distribution of forest area to the people in villages and cities by violating the constitution and laws, misinterpreting the relevant articles to gather the votes of people (Geray and Türker 1997). The following reasons can be stated for the legal reasons of forest destruction in Turkey (Türker 1997);

- The use permission of forest areas degraded by various ways are given for non-forestry purposes in the constitution and forest law,
- Land appropriations done from forest areas for the public benefit,
- Insufficiency of discursive effects of punishments,
- Lawsuits related to forest crimes are not finished in a short time.

About 55 % of the forest degradation occurred in between 1950 and 1989 was arisen from the constitutional and legal regulations (Caglar 1992).

The cadastral works of approximately 70 % of 20.7 million ha forest area in Turkey have been just completed until 1997. Consequently, this situation causes to occur the ownership disagreements and the illegal activities of the people related to the forests, and thus, play a provocative role for the individuals to commit various crimes in the forests (Türker 1997).

Especially, as forest cadastral works have not been completed, the customs of traditional land ownership and utilization from the forests are the causes of the important problems between SFEs and forest villagers devoted to the forest management activities in the state forests. Because of the social pressures, the management activities might be obstructed particularly in close to forest villages of state forests, which have been planned, with the aim of production. According to the results of a research done by Türker to determine the amount of forest areas which cannot be managed because of the social pressures and the dimensions of the production decrease resulted from this in the MACKA SFE located in the East Black Sea Region of Turkey, the forest management activities cannot be realized in 4634 ha area of the enterprise, in another word, in 12 % of MACKA SFE's total forest area. Thus, the potential of raw wood material production, which is out of production, is about 28 % of the enterprise's total annual production. In this way, the forest areas that might be taken a considerable amount of products are left out of application. This is a cause of negative results that occurred in meeting society's needs and success of the forest enterprises (Türker 1998a).

The lack of the forestry organization in the administration and management activities is an important factor in the destruction of Turkish forests. Therefore, the widespread forests over the country cannot sufficiently be protected. In the administrative organization, about 155000 ha forest area is under the responsibility of a Forest Enterprise Chief, and these forests are dispersed on the area and located far from each other. Consequently, the protection of forests is quite difficult (Türker 1997).

The Problems faced in Turkish Forestry Sector

Besides the problems devoted to the forest destruction mentioned previously, the other problems faced by the forestry sector at the macro and micro bases have also influence on the ownership and management activities in Turkish forestry.

It is possible to find the objectives of Turkish forestry at the macro level in the Five Year Development Plans (FYDP) and Forestry Main Plans (FMP). The objectives of Turkish forestry in VIII.FYDP prepared for 2000-2005 period were expressed as follow (SPO, 2001):

Forests will be managed, protected and developed by taking into consideration the facts of site region conditions, inter-sectors dependence, the yield power and carrying capacity, forest health and landscape, eco-tourism, the productivity, pollution, fire-insect-land slide, snow, avalanche-torrent-frost and drought, and economic factors, in the coverage of ecosystem sensitivity, in the direction of continuity, multiple use, participation, specialize, biodiversity and the protection of wild life and water, the improvement of social principles .

The objective was stated in the FMP as follow;

It is aimed to make necessary connection between the national plan targets and detailed projects devoted to the these targets to be reached to the sectoral development determined by the national plans by dealing with organizing the internal activities of sector, to become a united whole in itself and with this perception.

In the scope of the national forestry objectives determined at the macro level in respect of FYDPs and FMP mentioned above, the strategies and policies of the forestry sector at the national level should be clarified and revised continuously. But, the national forestry strategies are not determined according to the new national forestry objectives periodically stated in the national plans. Consequently, the objectives of the national forestry policies, which should be developed according to the national forestry strategies, cannot also be reached to the desired dynamic structure (Türker 1999b).

However, Turkish forestry sector and the national economy face with the effects of international economic integration, social and cultural acts and agreements in a short, middle and long period. The production and marketing of the goods and services provided by forestry sector are planned according to economical and management principles. There are some new approaches in the international forestry bodies related to organizing the production and marketing of forest goods and services according to the forestry objectives, strategies and policies which are changeable over time (Türker 1999b).

As a matter of fact, various international platforms such as Rio Summit, Helsinki and Montreal Agreements and Antalya Declaration etc. that the world forestry strategies and policies were put on the agenda, and universal developments related to forestry forced the Turkish forestry sector to make some changes in its objectives, strategies and policies at the macro level. Some changes such as removing

the custom tax and funds currently applied for trade of forest products appeared as a result of development of coastal and boundary trade, customs unity with European Union in Turkey and with the developments occurred at the universal scale (Türker 1999b).

With the integration of international policies and strategies, the monopoly structure in the forestry sector has changed, but the conditions necessary for free market haven't been fully completed yet mainly due to state ownership of forest lands. Having difficulties to adopt free market conditions, SFEs had a bottleneck and started questioning their management strategies mainly focused on wood based production. At this point, the discussions have began about the objectives of forestry sector, the central and provinces organizations of forestry sector and the management of forests with more functions of them according to multiple use principle and the improvement of the public participation in the forestry sector etc. (Türker, 1999b).

One of the main problems of forestry sector is the continuous application of traditional forest practices in spite of newly developed applications (SPO 2001). Most of the forestry practices depend on supply and demand. With this type of applications, Turkish forestry has similarities with XIX. and XX. Century Middle and West European Forestry. These similarities of Turkish forestry with the Central and West Europe arise from the influences of German and French forest scientists in the Turkish forestry education. These countries still use similar system in forestry practices. In these countries, forests are perceived as an esthetic, recreational, ecological wealth. Because they have many possibilities to meet their forest products necessities from out of their countries. They don't have problems like forest villages, integration of the forest sector with other sectors, grazing, rangeland management, and intensive plantation (Geray 1989).

Because of the domination of the classic perception in the Turkish forestry mentioned above, there is no any multi-dimensional consistent structure, which will provide reflection of the objectives from macroeconomic level (National development Plans) to sectoral level (Forestry Main Plan), then to forest enterprise level (Management Plans) and lower levels (Geray 1993).

As a result of being completely free from this perception, there is a management plan and objectives determined by authorities for each of the SFEs, which constitute the frame of Turkish forestry sector. These enterprises have various socio-economic, cultural, sociological and geographical conditions and became widespread over the country with 241 enterprises. The management plans which display how much and from where the products will be harvested according to production technique and rotation period with one alternative. These management plans don't include the work, investment, and personnel plans. Therefore, it is impossible to develop a proper strategy at the forest enterprise level according to these plans (Türker 1999b). In addition, as the objectives of SFEs cannot also be determined for each enterprise due to time and place, the strategic management problems have occurred in the SFEs. Thus, there is no plan regarding the afforestation and erosion control, national park and wildlife activities, forest villages etc. in Turkish forestry or existing plans are not sufficient and actual plans.

One another problem faced in the Turkish forest management activities is about afforestation. Sufficient financial support cannot be allocated to afforestation works and local people might impede sometimes afforestation works done by providing financial grant. Because these works are a contradiction with the traditional utilization customs from forests, and other handicap is arisen from the uncompleted cadastral works, which cause some ownership conflicts (Türker 1998b).

Discussion

As known, a national economy is consisting of enterprises that work in various sectors. A large portion of economical activities (realized) in the Turkish forestry sector is occurred in SFEs. The main objectives of Turkish forestry sector can be summarized as follow (TÜRKER, 1998c);

- Protection and expansion of forest lands,
- To be managed the forests by taking into account the technical, social and economic with the multiple use principle,
- Providing continuously forest products and services demanded by the society
- Taking necessary measurements to minimize the social pressures of forest villagers.

Turkish forestry sector has some problems such as not defining and evaluating the success, not

appreciating and invalid profession, lack of motivation, gathering a large number of staff in certain places, lack of competition, costly organized structure, managing the enterprises by directions and regulations of central administration and not discussing the alternative methods. Because of all these problems, the objectives stated above cannot be effectively realized (Geray 1989).

As a result, SFEs are closing their operation period with loss due to not effectively and productively realizing administration, staff, purchasing, production, marketing, financing, accounting, research and development and public relations. For example, 38 % of total SFEs or 94 SFEs of 244 SFEs located over all the country are always closing their balance with loss. The Turkish forestry sector has to take care of social problems and conditions. Because this sector allocates forest products with lower than market prices to the forest villagers and some public organizations using wood and wood based products. Therefore, revenues from the sales of forestry sector are increasingly decreasing

For this reason, more attention should be given to decrease the costs instead of searching new methods or ways to increase the revenues in the SFEs. However, SFEs cannot control their costs effectively, because of political issues and excessive staff payment. Finally, the contribution of the forestry sector to the national economy is only 0.05 %.

Since 1937, at which legal state forest management activities began, it is impossible to imply that the forests have been sufficiently protected, expanded and productively managed. But, the elimination of state forest management may not solve all of these issues.

Forest villagers who are suffering from low economic income are expected to get more benefits from Turkish forest resources and management activities. Although officially 99.9 % of total forest area belongs to the State, in reality, forest villagers who live in and around the forests are the other owners of the forests. When considering the forest villagers fact, these people carry out private forestry activities.

In conclusion, it is more important to determine how the forest resources are effectively and productively managed than by who is owned. The particular conditions of Turkish forestry should be taken into consideration and the priorities should be given to solve the problems mentioned above so that activities of SFEs become effective and productive.

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Attitudes of High School Students in Miyazaki About Future Employment in the Forestry Sector - *Iwao Noda and Hiromitsu Kitazono*

Introduction

The ownership of the forests in Japan and Miyazaki is shown in Table 1. The majority of forests are privately owned. The rates of ownership in Japan are the same as Miyazaki, Japan 58% and Miyazaki 57%, respectively. A large amount of log production is derived mainly from the private forests (74%) in Japan (Figure 1). The most important species are s*ugi* (*Cryptmeria japonica*) and *hinoki* (*Chamaecyparis obtusa*), which occupy 44% and 24% of the man-made forest area. These represent 41% and 12% of Japanese produced log volume, respectively and followed by hardwood 21%, Pine 8%, other softwoods 18%.

Miyazaki prefecture is famous for timber production in this country. Especially, the volume of timber production of *sugi* has held the first place consecutively since 1991(Figure 2). However in this prefecture as well as in other areas in Japan, the forestry sector has problems with forestry workers aging and lacking in successors, although the private forests are becoming mature and the demand for forest labors are increasing (Noda & Kitazono, 1998).

Table 1. Ownership of the forests in Miyazaki and Japan

Unit: 1000ha

	Ownership	Miyazaki pref.		Japan	
Private F.	Individuals etc.	336	57%	14,572	58%
	Prefectural organizations	72	12%	2,730	11%
National F.	Forestry Agency	178	30%	7,647	30%
	Other government agencies	4	1%	197	1%
Total		590	100%	25,146	100%

Note) The Prefectural organizations consist of local governments, cities, communities, villages. The Individuals etc. consists of individuals/ companies/ shrines and temples.

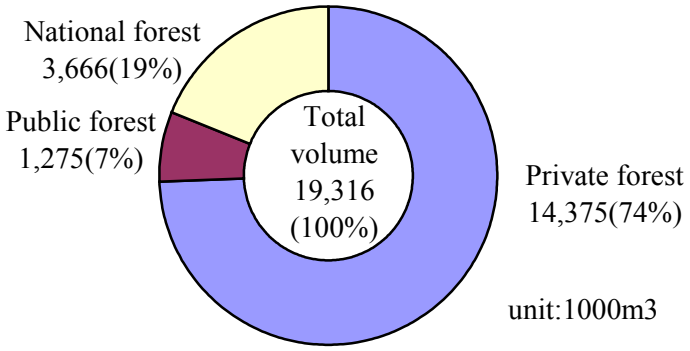

Figure 1. Produced log volume in 1998, Japan
Source: Forestry Agency 1999. Forestry White Paper for Fiscal Year 1998.

Figure 3 shows that number of forest workers is on the decrease in Japan, the number in 1995 is one third of 1965 in 30 years. Moreover the rate of old workers is on the rapid increase compared with all industry average: the rate of over 65year-old workers in forestry sector is 4%(1965), 19%(1995). Also even in Miyazaki the same comes out.

These become serious issues against sustainable forest management. So we carried out the research survey with a questionnaire for forestry workers in order to make clear the conditions of employment and the problems in Miyazaki in 1997. According to the results, forest workers claimed that the most necessitated factors in need of improvement were 1) wage / salary, 2) social security system (Noda & Kitazono, 1998). It is necessary to design forest policies to make clear causes and attract new workers against the serious problems. We carried out another research survey on the high school students in Miyazaki prefecture to make clear the students' awareness of the forestry sector and finding future work. This report is based on the findings.

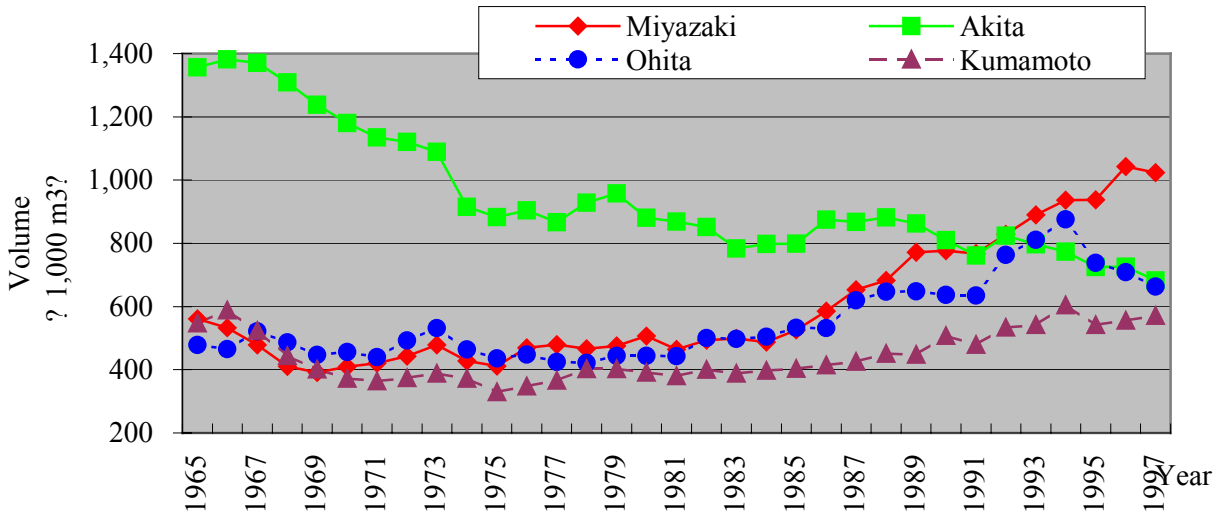

Figure 2. Volume of timber products of *Cryptmeria japonica* .
Notes: This shows data of the ranking 4 prefectures in 1997.

Materials and Method

We designed a questionnaire and carried out the research survey on the 2nd grade students at 18 public high schools in Miyazaki on Nov. 1998. The survey was conducted in cooperated with schools. Students filled in the questionnaire in the school.

The questionnaire consists of four items (13 questions); 1) Study of forest / forestry, 2) Key points of finding works, 3) Thinking of the forestry sector, 4) Recognition of the forestry sector.

The high schools are divided into three types by major courses; general course, agricultural course, and technical course. The agricultural course includes the forestry/forest science course. 18 high schools (every six schools each course) were extracted from the school list of Miyazaki prefecture. Every 40 questionnaires, which is equal to a class (40 students), were handed to every school and 720 sheets were delivered to the schools. As a result, the respondents were 635 students, 88% of 720 students (Table 2).

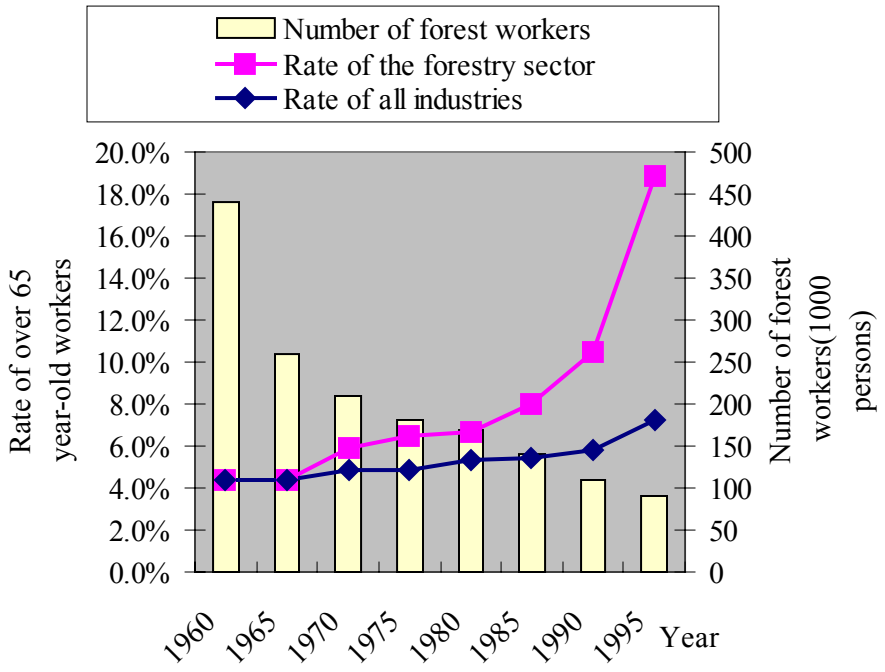

Figure 3. Number of workers and aging in the Japanese forestry sectors
Source: Forestry Agency 2000. Forestry White Paper for Fiscal Year 1999.

Table 2. Respondents by major courses

Unit:person

	Course						Total	
	General C.		Agricultural C.		Technical C.			
Male	121	49%	148	89%	190	85%	459	72%
Female	124	51%	19	11%	33	15%	176	28%
Total	245	100%	167	100%	223	100%	635	100%
Rate	39%		26%		35%		100%	

Results

Working conditions: Key points for finding a work

What are the criteria for the students to find their work? According to this survey, the best two points were favorable / desirable work and the wage / salary, which respectively amounted to 84%, 70% of all respondents (Table 3). These were followed by the working hours / holidays 49% and the stable future 38%. The above result was almost the same as each course. Our previous survey showed that forestry workers claimed 1) wage / salary problem, 2) the social security system as the most necessitated factors in need of improvement (Noda & Kitazono, 1998). These results show the wage / salary system is the most important in attracting new workers.

Table 3. Key points for finding work?

Unit:person

Answer	Course						Total	
	Gen.C.		Agri.C.		Tech.C.			
Favorite/desirable work	210	86%	137	82%	189	85%	536	84%
Wage/salary	165	67%	107	64%	175	78%	447	70%
Working hours/holidays	103	42%	87	52%	118	53%	308	49%
Stable future	94	38%	75	45%	75	34%	244	38%
Social security(annuity,insurance, retirement allowance,etc.)	49	20%	30	18%	31	14%	110	17%
Working place	28	11%	21	13%	37	17%	86	14%
Social evaluations	25	10%	16	10%	12	5%	53	8%
Young staffs existence	4	2%	14	8%	11	5%	29	5%
Others	12	5%	0	0%	8	4%	20	3%
Number of respondents	245		167		223		635	

Note) Duplicate choices. % means the joining rate, which is the rate to the number of respondents. The others shows relationship/challenging work etc.

Images of the forestry sector

The most three activities, among the choices of activities listed on the sheet (Table 4). which the high school students associated with the forestry sector, were

1) Cutting trees, 76% of all respondents who voted,
2) Planting 71%,
3) Raising 62%

There were no big differences among the three major courses. In the same question, we asked the respondents to describe freely in the column if they had other images than all choices. The described images were, for example, “overcutting”, “hard labor”, “forestry=environmental destruction”, “planting trees to produce useful woods”, etc. They were divided into three groups; negative image group, positive image group and indifferent group, but the negative image group was major.

Table 4. What do you associate with the forestry sector?

Unit:person

Answer	Course						Total	
	Gen.C.		Agri.C.		Tech.C.			
Cutting trees to produce timber	181	74%	128	77%	173	78%	482	76%
Planting trees	167	68%	130	78%	157	70%	454	71%
Raising trees	147	60%	117	70%	132	59%	396	62%
Sawing timber for boards, posts	95	39%	51	31%	89	40%	235	37%
Forest management with producing and selling forest products	61	25%	34	20%	57	26%	152	24%
Selling wood products	34	14%	29	17%	31	14%	94	15%
Others	3	1%	2	1%	3	1%	8	1%
Number of respondents	245		167		223		635	

Note) Duplicate choices. % means the joining rate, which is the rate to the number of respondents.

Work finding in the forestry sector

We asked them whether to find work in the forestry sector. Of all respondents, only 8% stated to find work in the forestry sector. Even students of the agricultural course were less than 20%, a few more than others (Table 5). Table 6 shows that the strong three reason were

1) To work outdoors 65%,
2) To contribute environment / land conservation 59%,
3) To do the interesting / worthwhile work 57%.

The above three reasons got a majority and those who responded to find work in the forestry sector had awareness of nature-conservation and environmental issues. But we could find a bit of difference among the major courses. The respondents of the agricultural course had a reason that forestry was a worthwhile work more than other courses. In case of the general course and the technical course, concerns of nature and environmental issues caused them to respond to find work in the forestry rather than the “worthwhile work”.

Table 5. Do you find work in the forestry sector?

Unit:person

Course	Yes		No		NA	Number of respondents
General C.	16	7%	221	90%	7	245
Agricultural C.	26	16%	136	81%	4	167
Technical C.	9	4%	212	95%	2	223
Total	51	8%	569	90%	13	635

Note) % means the response rate of finding work in the forestry or not. Chi-square=18.9, $p<0.001$

Table 6. Why do you find work in the forestry sector?

Answer	Respondents	Rate
Working in nature	33	65%
To contribute environment/land conservation issue	30	59%
Interesting/worthwhile work	29	57%
To become a technical expert of forest/forestry	14	27%
Progressed mechanization	13	25%
Forest/forestry job having a bright future	8	16%
To succeed one's father in the family business	5	10%
Others	8	16%
Total number of respondents finding work in the forestry sector	51	

Note) Duplicate choices. % means the rate to total number of respondents.

Table 7. Why do not you find work in the forestry sector?

Answer	Respondents	Rate
Lacking information of the companies in the forestry sector	275	48%
Insecure future of the sector	206	36%
Dangerous works	186	33%
Physical strength needed for forest works	173	30%
Worse income	150	26%
Irregular working hours/holidays	142	25%
Vagueness	116	20%
Few young fellows in villages	85	15%
Unsatisfactory living environments(transportations, medical treatment, educations etc.)	59	10%
Unsatisfactory facilities(sports, culture activities)	29	5%
Others	97	17%
Total number of respondents not finding work in the forestry sector	569	

Note) Duplicate choices. % means the rate to total number of respondents.

On the other hand, Table 7 shows that the strong four reasons not to find work in the forestry sector were

1) Lack of guidance information 48%,
2) Insecure future 36%,
3) Danger 33%,
4) Hard labor 30%.

The wage problem was only 26%, although forestry workers pointed out the most to be improved on our previous survey.

Guidance information- Interest in forests

We classified the respondents into two groups with the answer whether to have a think of finding work in the forestry for the analysis. One is the group of students who gave an affirmative answer to the question and is named as the “applicants”. Another is the group of students who gave a negative answer and is named as the “non-applicants”(Table 8). Of the applicants, 78% are interested in forest / nature more than the non-applicants. Of the applicants, 57% gave an affirmative answer to the question whether to want to study of forest / forestry, but 22% in case of the non-applicants (Table 9). The applicants have interests in the forestry sector and the students who are interested in nature and environment protection or forests may be attracted to work in the forestry.

Table 8 Are you interested in forest/nature?

Unit:person

Answer	Applicants		Non-applicants		Total	
Yes	40	78%	252	44%	292	47%
No	3	6%	100	18%	103	17%
Vagueness	8	16%	216	38%	224	36%
Total	51	100%	568	100%	619	100%

Note) The applicants are the group of respondents who answered in the affirmative to the question of finding a work in the forestry sector. There was 1 unavailable answer. Chi-square= 21.8, $p<0.001$

Table 9 Do you want to study forest/forestry?

Unit:person

Answer	Applicants		Non-applicants		Total	
Yes	29	57%	126	22%	155	25%
No	5	10%	161	28%	166	27%
Vagueness	17	33%	278	49%	295	48%
Total	51	100%	565	100%	616	100%

Note) There were 4 unavailable answers. Chi-square= 30.7, $p<0.001$

Demand of information

One-half (48%) of the applicants want such information as general knowledge of forest / forestry, existing companies etc. (Table 10). Of even the non-applicants, 15% indicated the necessity. In fact, one half of the non-applicants cited unawareness of employment opportunities in the forestry because of lacked information. On top of that, 54% of even the applicants of the agricultural course indicated the necessity. These results show being lacking in guidance information of the forestry sector.

Table 10. Do you want any informtation of the forestry sector?

Unit:person

Answer	Applicants		Non-applicants		Total	
Yes	24	48%	86	15%	110	18%
No	12	24%	246	43%	258	42%
Vagueness	14	28%	234	41%	248	40%
Total	50	100%	566	100%	616	100%

Note) The Applicants are the group of respondents who answered finding work in the forestry sector. Chi-square= 33.9, $p<0.001$

Conclusion

We conducted the survey on the 2nd high school students and made clear their images of the forestry sector and their ideas of finding work. It is not too much to say that they are potential labor for the future forestry sector. So we discuss measures or forest policies as to attract new workers with based on the results of this survey.

Improvement of working conditions

It became clear that the criteria for the high school students to find work were mainly 1) favorable / desirable work and 2) wage / salary from this survey. Besides, forest workers claimed the wage / salary problem, the social security system as the most necessitated factors in need of improvement. Therefore, we conclude that the following four items are the most important factors in need of improvement in current working conditions in terms of attracting new forest workers.

1) Wage / salary increase,
2) Improvement of working hours / holiday,
3) Stable future of work,
4) Improvement of social security.

The wage / salary increase is the most important of them. The 4th item, the improvement of social security is significant and picked up to make workers engage in the forestry sector on a long-term basis.

Spreading guidance information

The strong four reasons why the non-applicants gave a negative answer to the question of finding work in the forestry sector were 1) lack of guidance information, 2) insecure future, 3) danger, 4) hard labor and supported by one-third of respondents except the lack of information. Especially the lack of information was the strongest reason and supported by one half of respondents. Of the applicants, one half claimed guidance information. And even the applicants of the agricultural course amounted to one half. These indicate that the publicity information activities have not been enough in the forestry sector and the guidance information have not been spread and was demanded. Therefore, we should take a measure to give students correct images and attract new workers and it is firstly necessary to improve the school education system for introducing the guidance information, including activities of the forestry sector.

Acknowledgements

We would like to thank Prof. K. Yukutake, Univ. of Miyazaki, Miyazaki, for his helpful advice on this investigation.

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NGO's, Private Forest Management, and FSC Certification - *Philip Guillery, Kathryn Fernholz*

Community Forestry Resource Center (CFRC) of the Institute for Agriculture and Trade Policy (IATP)

Non-industrial private forest landowners (NIPF'S) control the management of close to half of the forests found in the eastern part of the United States (Sampson and DeCoster 2000). In the Lake States, private lands constitute over 60% of the forested acres. These landowners and many other owners worldwide have diverse objectives for their ownership and many have reservations regarding the types of forest management they have experienced and observed. A growing percentage are looking for ways to manage their land that include playing an increased role in decision-making and management activities. These same owners express interest in understanding the ecological as well as the economic potential of their property and being part of developing that potential.

One emerging opportunity to develop more palatable management for private landowners that provides ecological and economic benefits is through the formation of sustainable forestry owner groups that unite landowners, organize educational opportunities, and assure forest management through independent third-party certification. Forest owner groups are developing throughout the Lake States that have the goals of maximizing the long-term ecological and economic benefits of forests, increasing landowners control over forest management, and certifying forests under Forest Stewardship Council standards (FSC 2000). Similar efforts are taking place in the northeastern United States and there is growing interest from landowners in other regions and countries.

These forest owner groups have taken on many different forms. Some groups are organized as non-profits and focus on educational services. Other groups are forming cooperative businesses to manage members' lands and increase income for their membership. These types of forest owner groups vary in how they accomplish these objectives. A number of cooperatives are concentrating solely on log sales while others are developing into full value-added cooperatives. The full value-added cooperatives follow two alternatives for processing and marketing finished forest products for their members. A number of cooperatives have the goal of owning and controlling all aspects of the forest product business while others follow a strategy of partnering with existing forest products companies to produce value-added products.

The commonality between these groups is their commitment to ecology-based forest management. A common method for these groups to demonstrate and assure that commitment is through Forest Stewardship Council (FSC) certification of their forest management systems and the products they market.

Most of the forest owner groups have adopted FSC Certification to help them define what "good forestry" means and to provide a level of consistency among their membership. Primarily the interest is in using the certification system to assure strong ecological standards are enforced in the management of lands such that landowners can be assured the forest will be continue to be a high quality resource and habitat for many generations to come. In addition, the strong economic and social principles of FSC certification assure rural landowners that the economic benefits associated with wood product processing and marketing will stay local and benefit their communities and neighbors. Lastly, many of the landowner groups are gaining market advantages by being able to differentiate their product through the FSC eco-labeling and marketing system.

The role of the Community Forestry Resource Center (CFRC), a non-profit organization, is to support these local groups by providing technical assistance. The CFRC assists with forest management planning, Geographic Information System (GIS) development, access to FSC certification, and other aspects of developing and operating forestry cooperatives and forest owner groups. The CFRC focuses its efforts in the Lake States but collaborates with groups in other parts of the United States as well as in Canada and Central America.

An important opportunity in these efforts to help landowners organize is the role of other institutions. Government service providers, non-profit organizations, land trusts, forest products businesses and others groups involved in forestry issues and policy collaborate with forest owner groups. Often this is to the mutual benefit of the forest owner group and participating organization. For example, from involvement in forest owner groups, many landowners have learned about the potential to protect their forests land-term through conservation easements. This has led to a number of partnerships between land trusts and the forest owner groups. Moreover, forest products businesses committed to

producing FSC certified products have developed partnerships with the forest owner groups because of the groups' commitment to certification.

The landowners have identified goals regarding the type of management they want and the importance of the forest owner in forest management. However, they have also expressed the need and interest for the involvement of organizations and individuals with common interests in forest sustainability and rural economic development to assist these groups in meeting these goals.

There are nearly 10 million private forest landowners in the United State (Sampson and DeCoster 2000). With the large number of private forests in the United States, it is possible for cooperative efforts of forest owners to be applied broadly and with significant impact. Although the formal design and structure of the forest owner associations vary from group to group, the commitment to sustainable forestry management, third-party certification, and maximizing income can produce similar benefits for forest resources and the communities they support in many different regions.

With the increasing severity and diversity of economic, aesthetic, recreation, and habitat decisions facing forest owners (Baughman *et. al.* 1993), there is a need to find creative initiatives that offer beneficial solutions with the ability to meet the needs of the landowners without compromising the needs of the forest. By forming forest owner groups and cooperatives, forest owners are better able to face these diverse challenges.

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Abstracts of Additional Papers Presented at the Conference

Projecting The US Timber Supply With a Spatial Look at Private Timber Resources: Assumptions and Projections From the 2000 RPA Timber Assessment - *John Mills and Xiaoping Zhou*

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Projection results from the 2000 Renewable Resources Planning Act Assessment indicate private forestlands will provide an increasing share of U.S. timber supplies while operating from a smaller land base. Southern forests will continue to play a dominant role in domestic fiber production, contributing roughly two-thirds of the total U.S. fiber output. Investment in forest management in the South will allow private owners to expand fiber output by nearly 50-percent in the next 50 years, in spite of an 8-percent reduction in area available for timber production. This increase in efficiency, however, is accompanied by a 25-percent expansion of the area treated annually with harvest, perhaps raising questions about what happens beyond 50 years. A modified version of the Aggregate Timberland Assessment System allows us to look at these regional results in finer detail. The model simulates the results of same forest inventory, growth, management, removals, and area change assumptions that were part of a regional solution, but does so at the county level. Projections are presented in maps, providing a spatial look at private ownership patterns, the distribution of forest resources, and the potential patterns of harvest activity for the next 50 years.

Comparative Analysis of Incentives for Non-Industrial Private Forest Management in Michigan - *Karen Potter-Witter*

Department of Forestry, Michigan State University, East Lansing, MI 48824

Property tax, cost-share and financial incentive programs for non-industrial private landowners in Michigan are being evaluated for their effectiveness in encouraging forest management activities. This paper reports on selected results of a comparative analysis of program enrollment, landowner characteristics and management accomplishments. The analysis is based on data from a survey of 2,200 private-non-industrial forestland owners who were members of the Michigan Forest Association (MFA) or were enrolled in the Commercial Forest Program (CF), the Forest Stewardship Program (FSP), or the Two-Hearted Watershed (THW) landowner program in 2000. With a 55% overall response rate, landowners reported on present and past management activities and program enrollment, as well as on their opinions of the current provisions of and proposed changes to the Commercial Forest program. The survey of CF, THW and MFA enrollees and members was administered in cooperation with the Michigan Department of Natural Resources, Forest Management Division. The sampling of the SFP enrollees was conducted in cooperation with Mel Baughman, University of Minnesota College of Forestry as part of his examination of the effectiveness of Forest Stewardship plans in the north central region. The comparative analysis tests the hypothesis that the level of forest management reported by landowners does not significantly differ among incentive programs. Landowner program enrollment is compared to tree planting, timber harvesting, wildlife habitat improvement, riparian zone management, fencing and other forest management activities. Explanatory demographic and geographic variables are also tested.

"Non-Joiner" NIPFs: Factors Which Drive Them to Fragment and Convert U.S. Family Forest Lands - *Catherine Mater*

Mater Engineering, Ltd., Corvallis, Oregon and Senior Fellow - The Pinchot Institute for Conservation

In 1999, Mater Engineering undertook preliminary baseline research interviewing a sample number NIPF owners across to US to determine factors, which drive NIPF landowners to fragment and/or to convert their family forests to non-forest uses. The NIPF interview results were matched with interview results from state agency personnel and forestry consultants in the same study regions when asked the same questions. State agency personnel listed NIPF lack of good forest practices knowledge (100%), real estate development pressures (85%), and property and inheritance taxes (70%) as the key forest fragmentation and conversion drivers. Consulting foresters listed property and inheritance taxes (62%), poor image of forestry as a profession (46%), and lack of money for proper management (38%) as the key drivers. In contrast, NIPFs listed lack of offspring interest in maintaining the family farm as their central issue (almost 50%). Increase in property taxes was referenced as a key driver by only 22% of NIPFs interviewed, and only 8% of NIPFs referenced inheritance taxes as a key driver. Expanding this initial research effort, WERC provided major grant dollars to undertake over 200 additional in-depth interviews with "non-joiner" NIPFs, state agency personnel, and consulting foresters is currently being conducted. "Non-joiner" NIPFs are those forestland owners who are not affiliated with forestry or woodlot owner associations and likely to be most susceptible to fragmentation and conversion.

This paper will detail the research results of the 200 follow-on interviews conducted this year, advancing a better understanding of this issue. Based on research results, the paper will also discuss potential private forestland owner national program and policy changes likely to be considered.

Price Reporting and Forest Management - *Barry N. Rosen[1] and H. Fred Kaiser[2]*

[1]Baruch College, The City University of New York
[2]USDA Forest Service

Price reporting has been proposed to make more information available to the non-industrial private forest landowners (NIPF). Proponents say reporting stimulates owners' participation in the timber economy by increasing their awareness of potential returns and they're negotiating and forest investment confidence.

For buyers and sellers of timber, the motive behind price, or more broadly, market reporting is to assist NIPF landowners and other market participants in gauging the proper price, place and timing of market entry. Despite the need for their harvested material, most NIPF owners do not participate in timber markets. A variety of reasons contribute including perceived conflicting uses, fractured holdings, short ownership tenure expectations, non-dependence of owners on forestry activities for income and notably, lack of knowledge of how forest products markets work plus fear of negative outcomes from forestry activities. Professional foresters can work with owners to overcome these negative perceptions and develop forest management plans that are compatible with ownership goals. Separately, price reporting along with associated market information and guidance would also help to improve the quality of NIPF owner decisions and encourage their participation. Anything less might mean that this increase in NIPF output over the years will come at the cost of production and economic efficiency.

Growing Certification of Public Forestlands in the US and the Impacts to Private Forestland Managers - *Catherine Mater*

Mater Engineering, Ltd., Corvallis, Oregon and Senior Fellow - The Pinchot Institute for Conservation

Third party, performance-based certification on public forestlands is a growing phenomena in the US today. Over 50% of all certified forestlands in the US under the Forest Stewardship Council (FSC) regime are owned and managed by public entities, and a growing volume of public forestlands are electing to undergo Sustainable Forestry Initiative (SFI) third-party assessment:

- Currently, three states in the US, Pennsylvania, Minnesota, and New York, have all or some of their state-owned forests certified
- Four other states across the US have just initiated dual certification assessments (FSC and SFI) on all of their state-managed forests (Tennessee, North Carolina, Maine, and California)
- The State of Washington is just completing an FSC assessment on 1.2 million acres of state-managed Westside forests; and
- The National Park Service in Vermont has placed the March-Billings-Rockefeller National Historic Park under dual certification assessments (FSC and SFI).

This paper will examine why public forestlands have become so visible in certification efforts across the U.S., and will specifically examine both the intended and unintended impacts on private forestland owners (both corporate and non-industrial) as evidenced through case study analysis. Intended results discussion will include reduced-risk learning for private forestland owners; increased legislative dollar support for NIPF outreach; forest management policy stabilization and reciprocal regulation check-offs for private forestland owners; and impacts on domestic and international market demand for certified products - especially market shifts to include lower-grade commodity products. Unintended results discussion will include increased pressure on NIPFs who lack access to affordable certification options; increased division and tension within the environmental communities impacting forest policy decisions on private lands; and increased offshore private forestland investment to meet certified wood flow demand.

Changing Landowner Preferences, Forest Fragmentation, and Absenteeism: Results From Virginia - *Gregory S. Amacher, M. Christine Conway, and Jay Sullivan*

Virginia Polytechnic Institute and State University, Blacksburg, VA

Landowner surveys have been administered over the last 3 years in Virginia to revisit several questions about non-industrial and industrial landowner behavior. The overall goal has been to assess how increasing absenteeism and fragmentation of forest parcels affect landowner behavior, specifically willingness to participate in forest markets. Landowners in a range of cover types have been sampled, including mountain, coastal plane, and piedmont regions, as well as landowners holding pine plantations, hardwood, and mixed pine-hardwood stands. Non-industrial behavior considered includes harvesting, reforestation, propensity to not harvest and leave timber as bequests for future generations, the relationship between debt and forest market participation, and the propensity to shift land into or out of forestry-related uses. Recently, the work has been extended to studying prices non-industrial landowners would have to receive before participating in markets, as a way of predicting the market response to changing prices and harvest access. This work identifies a "reservation price," unique to each type of landowner, that can be compared with market prices to gauge how close or far groups of landowners are from harvesting timber. Several broad conclusions emerge from this work: forest fragmentation and absenteeism are interrelated issues, failure to examine all landowner decisions will yield an incomplete picture of landowner behavior, reservation prices are sensitive to both landowner preferences and characteristics of the forest market, such as parcelization, absenteeism, and debt positions, and the competitiveness of bids and timber sale prices are very sensitive to indicators of fragmentation, but in surprising ways. By and large, our work shows that two types of margins are developing as a result of fragmentation.

Efficiency and Potential Merger Gains in the Danish Forest Extension Service - *Peter Bogetoft, Niels Strange, and Bo Jellesmark Thorsen*

Royal Veterinary and Agricultural University, Denmark

In Denmark, many small-scale forest owners are associated local district offices of the Danish Forestry Extension Service. Increasing economic pressure has caused a search for more efficiency in the Extension Service, including potential reorganization. In this paper the efficiency of the different districts are evaluated using Data Envelopment Analysis (DEA) to approximate the production technology of the districts. Furthermore, recent theoretical development in DEA-analysis is used to assess the gains from a number of potential mergers, and to decompose this gain into gains arising from pure technological inefficiency, harmony effects and scale effects. It is found, that technological inefficiency is the major source of inefficiency, whereas mergers are only favored through harmony gains, as the scale effect seems absent or even negative.

Educational Application of Sustainable Forestry and Certification Programs—A Case Study for Clemson University - *Patricia A. Layton[1], Allen Dunn[2], and Rick Cantrell[3]*

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Clemson University's 17,000-acre experimental forest is used for teaching, research and demonstration, while remaining a working forest that pays all management costs from forest-generated revenue. Clemson University enrolled its' experimental forest in the Sustainable Forestry Initiative Program (SFI)^{SM} in August 2000 for several important reasons. First of all, the university wanted to ensure that markets continue to be available for forest products produced on the forest. The second was to provide a learning experience for students and as a demonstration for non-industrial private landowners who may be considering certification for their forestlands. Application of sustainable forest management systems and certification is a growing trend globally. Through direct participation in the SFI program, students are gaining valuable experience in applying forest management standards and in record keeping and auditing practices required for independent certification. Finally, outreach and continuing education programs for non-industrial landowners, loggers and foresters is an important component of the SFI program and is a core function of the University's mission. Through teaching, research and demonstration, Clemson University is ensuring that graduating foresters are well trained to deal with current forest management issues and that South Carolina's forest landowners, foresters and loggers are equipped with new technologies and the most current information on market trends.

Wisconsin NIPF Owners Discussing Participation in Forest Management Programs - *Mark Rickenbach[1], Ray Guries[1], Dan Schmoldt[2], and Mary Sisock[1]*

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Like most states, Wisconsin has many non-industrial private forest (NIPF) owners (230,000) and acres (11 million acres). While accounting for 64% of all timber harvests in the state, fewer than 20% of owners have written management plans. In addition, we estimate that fewer than 10% participate in owner organizations like the Wisconsin Woodland Owners Association (WWOA, a statewide association). However, new organizations have emerged for owners to become involved in forest stewardship activities. By the end of 2000, five forestry cooperatives will be located throughout the state. During the next year, Wisconsin Family Forests (WFF, a geographic-based owner association for information sharing) will expand to four more townships. Understanding how and why owners choose between different opportunities to participate is a constant question for these organizations, state agencies, and extension professionals.

We will discuss results from a series of focus groups that targeted members of WWOA, two cooperatives, WFF, and the state's Managed Forest Law program (property tax incentives) to understand:

*their concepts of forest stewardship and management,
*their reasons for participation, and
*the benefits and limitations of participation.

Through thematic analysis of their guided conversations, we will describe the underlying motivations and perceptions that provide the basis for their participation. While not a representative sample, their insights are instructive in understanding how and why landowners choose between alternatives. This analysis and the survey that will follow later this year will be useful for informing the efforts of those who promoteprograms targeted at owners in Wisconsin and elsewhere.

Private Forestry in Alabama: History as a Guide For Policy - *Warren A. Flick*

Warnell School of Forest Resources and Center for Forest Business, University of Georgia, Athens, GA 30602-2152

Private forestry, especially in Alabama and the Southern U.S., has a rich and deep history. It contains many successes and many problems. Its successes include rapid development in response to demand, responsiveness to public policy, great variety in resource use and management, and innovation in contracting for resource development. Its problems include rapid generation of public resource externalities, and relentless pressure on unorganized, low income workers to keep costs low. This paper will present original research about the historical development of Alabama's forest industry in relation to the preceding characteristics. An appraisal of private forestry development in a state well known for its lack of public regulation of private forestry will help frame any discussion of policy alternatives for the future.

Big Carrot, Little Stick – Substantive Tax Incentives Stimulate Economic Development and Environmental Protection on Privately-Owned Lands in Argentina - *Timothy M. Cooney*

Bush & Cooney, LLC, Charlotte, NC 28226

The establishment of planted forests on private lands can provide both economic and environmental benefits to society in addition to direct financial benefits to private investors. Argentine Law N^{br} 25.080 enacted in January 1999, and the supporting regulatory Decree 133/89 enacted in February 1999, were established to provide a framework for enticing private investors into establishing forests that will provide both economic and environmental benefits for Argentina. The "carrot" provided in the law gives substantive tax benefits at both the Provincial and National levels, including 30-year tax stability, exemption from assets taxes, extremely accelerated depreciation of capital investments, payback of a value-added tax, exemption from miscellaneous transaction taxes, and reimbursement of planting costs. The "stick" provided in the law requires development of a 10-year forest management plan, to be approved by Provincial regulators and reviewed annually, which details the economic benefits and environmental impact of the proposed project. Failing to abide by the regulations can result in penalties equal to 30% of the investment.

UBS Timber Investors, a global timber investment management organization with over US$1.0 billion of assets under management world-wide, established the first private forestry fund in Argentina in February 1999 with investments solely derived from Argentine pension funds. The benefits of law 25.080 contributed to the feasibility of this investment. Using this investment as an operational example, this paper provides details on the requirements of the law, and expected benefits to the investors and people of Argentina.

A Profile of Timber Markets in the U.S. Southeast - *Runsheng Yin and Jon P. Caulfield*

Department of Forestry, Michigan State University, East Lansing, Michigan
TimberVest, Atlanta, Georgia

This paper examines some of the fundamental intra- and inter-market relationships using data from Timber Mart-South. Based on comparing the two key parameters of growth rate and volatility of a price series, it is shown that markets in the Southeast vary widely across areas, products, and species. It is also shown that these markets can be characterized by two development stages. Prior to the late 1980s and/or early 1990s, most markets saw real price declines. Since that time, a majority of markets have witnessed a strong real price appreciation, while at the same time they have become more volatile. The relationships between delivered wood and stumpage prices, stumpage prices in Pacific Northwest and the Southeast, and forest products and stumpage prices are also analyzed. The study has implications for timberland investors, procurement managers, supply modelers, and others involved in the forest sector.

Assessing the Impact of Property Taxes on Private Forestry - *Sun Joseph Chang*

School of Forestry, Wildlife, and Fisheries, Louisiana State University

Forest property taxation in the United States can be classified into four general categories: the flat property tax, the site value tax, the forest productivity tax, and the ad valorem property tax. In this paper the Impact of the above mentioned property tax systems is analyzed in terms of fiscal neutrality, tax burden, revenue stability, and administrative simplicity.

Testing Integration of Some European Roundwood Markets - *Ritva Toivonen[1], Anne Toppinen[2] and Tapio Tilli[1]*

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Roundwood markets in European countries have had their national characteristics, and quantities of roundwood traded between countries have been small. However, the ongoing European economic integration (EMU) may facilitate better circumstances for European wide, competitive roundwood markets. Consequently, shocks in one region force prices to move accordingly also in the other regions.

This study was conducted to statistically analyze the degree of roundwood market integration of the most forested EU-countries: Austria, Finland and Sweden. A major share of forest industry products are exported on the common EU markets from each country. Coniferous species are dominant, and a majority of forests is owned by NIPF-owners in each country. Co-movement of annual roundwood prices of 4 coniferous assortments was analyzed from 1980 to 1997.

The results of testing for the "law of one price", i.e. equalisation of prices when measured in common currency in distinct countries, indicates that wood prices co-move in Finland and Sweden. Instead, the results were more vague regarding the comparison of Austrian prices and prices in the two Scandinavian countries. We conclude that roundwood markets between Finland and Sweden have not behaved independently from each other, and there are some linkages also between the Austrian and Scandinavian wood markets. Thus, large trade volumes may not be necessary for co-movement of roundwood prices between distinct countries, and it is possible that the close connection can be also formed by the common markets for forest industry products. Integration of markets should be further compared with additional countries in Europe or regions in the USA.

The Economic Costs of Increasing Forest Conservation in Finland - *Jussi Leppäänen[1], Mika Linden[2], Jussi Uusivuori[3], Mikko Toropainen[4], and Heikki Pajuoja[5]*

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In many European Union member countries the existing land conservation levels imposed by the national and the EU level legislation and regulations have been found insufficient from the viewpoint of biodiversity management and species protection. Ideally, political decisions on appropriate levels of nature conservation should be based on accurate information on both the biological and economic benefits and costs of increased conservation. In this study we investigate the economic costs of proposed increasing forest conservation using Finnish data. To shed light on this complex issue, we employ a three-level methodology. First, we present estimates for the conservation-induced changes in the net present values of privately held forestland. Second, we calculate the national economy-wide impacts of conservation using an input-output analysis. Third, we estimate a dynamic reduced-form econometric model to derive the dynamic impacts of forest conservation on the Finnish timber markets and forest sector. The results show that a conservation program setting aside three percent of the total forestland area in Southern Finland would amount to one billion euro worth of compensations to private landowners. The economy-wide impacts of conservation seem to depend heavily on the extent of which imported timber can serve as a substitute to domestic timber; if there is no imported timber substitution on the domestic markets, the reduction in the annual gross national product will be almost four times larger compared to the case in which reductions in domestic timber harvests are replaced by increased timber imports. Finally, the results of the dynamic analysis of the forest sector indicate that more intensified timber management in the remaining commercial forests will replace some of the lost harvests, while the increase in timber imports may remain limited.

The Proposed Mississippi Reforestation Investment Program - *John E. Gunter[1], Joshua O. Idassi[2], and James E. Granskog[3]*

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Lack of reforestation after harvest by non-industrial, private forest (NIPF) landowners threatens the sustainability of Mississippi's $11.4 billion forestry and forest products industry and the 130,000 jobs it generates. One reason NIPF landowners do not reforest is the absence of available credit to finance reforestation investments. The Mississippi Reforestation Investment Program (MRIP) is designed to address this credit market failure. An inspiration of the Mississippi Special Task Force for Economic Development Planning, the program was developed in part and refined by the authors from the input received in statewide focus group meetings with key decision makers and NIPF landowners. Unique features of MRIP include: 1) 100 % debt financing of the total cost of reforestation, 2) competitive rate of interest, 3) repayment provisions tied to timber harvests, 4) 35-year loan maturity, 5) insurance coverage of most downside risks, 6) linkage to Mississippi's new 50 % investment tax credit, and 6) the collateral employed to secure the loan. Marginal analyses of cash flows from an MRIP-financed reforestation investment versus doing nothing reveal the program to be most attractive to qualifying NIPF landowners.

Does Size Matter? Analyzing the Efficiency of Norwegian Sawmilling - *Anders Q. Nyrud[1] and Even Berseng[2]*

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[2]Telemark Research Institute

Norwegian commercial sawmilling consists of approximately 200 independent mills (5 employees or more). In this paper the efficiency of Norwegian sawmilling is investigated using Data Envelopment Analysis. The analysis is carried out on an extensive panel data set, ranging from 1974 to 1991, consisting of more than 3000 individual observations. The performance of the units is examined through estimating efficiency scores for each mill throughout the period studied. The mills are further divided with regard to output volume, enabling us to reveal differences in productivity among size classes. Efficiency is also evaluated for the industry as a whole, through estimation of structural and industrial efficiency scores.

The Case For Choice: Preserving Landowner Options Among Multiple Certification Systems - *Bob Simpson*

American Tree Farm System, Washington, DC

The American Tree Farm System (ATFS) has been certifying privately owned forestland since 1941. In tandem with the current forest certification movement, the ATFS has earned recognition as a credible verifier of sustainable forest management. Tree Farm has strengthened its standards and established performance measures comparable to other certification systems, and enjoys mutual recognition status with the Sustainable Forestry Initiative as well as official observed status as a US landowner certification body by the Pan European Forest Certification Council.

Beyond its role as a certification body, the American Tree Farm System is an education and advocacy organization, and the 67,000 landowners currently included in the system represent a powerful collective voice on issues relevant to their interests as private forest owners. With the growing globalization of forest product markets, and the increasing pressure on private lands to satisfy world demand, the ATFS has proactively engaged comparable European landowner organizations in dialogue on issues of common interest B including forest certification.

The 1st International Forest Owners' Symposium on Certifying Non-Industrial Private Forests, cosponsored by ATFS in 1999, provided for a systematic assessment of US and European landowner options and opinions relative to certification. The conclusions drawn from this symposium and other joint discussions on certification indicate that landowners not only want, but need choices if they are to be expected to participate in the certification movement. The case will be presented for global mutual recognition of forest certification programs such that landowners can choose the approach that works best for their situation.

Green Tag Forestry - *Keith A. Argow*

President, National Woodland Owners Association

Green Tag Forestry was developed in the mid. 1990s out of an concern expressed by the National Woodland Owners Association (NWOA) than small independent private landowners could find it difficult to access the developing market for "green certified" forest products. The Forest Stewardship Council (FSC) had arrived with its Smartwood and SCS forest certification programs in the U.S. after having success with certification in Europe. Several mid-sized forest products companies had their lands certified at it appeared it was a coming trend. At the same time the forest industry launched their ambitious Sustainable Forestry Initiative (SFI) and subsequently exchanged mutual recognition with the American Tree Farm System.

FSC and SFI did not proceed with mutual recognition because the programs are quite different in terms of the depth of forestry activities probed. An independent review of the four major forest certification systems by the Sustainable Forestry Partnership (published by Oregon State University in July, 2000) evaluated each on 27 points. Both Green Tag and FSC received scores of 25 each (but not identical ratings), SFI scored 18 and Tree Farm received 11. Only FSC and Green Tag offered "chain of custody." Many, if not most, small private landowners find the SFI/Tree Farm certification to be more appealing, especially since it is free. An important question yet unanswered is "which of the four major certification programs offers the better benefits to NIPF." Beside the benefit of being able to show the world that one is honestly practicing a certain level of forestry, the most obvious measure of worth is a market price premium on the stumpage prices received by landowners. So far the experience has been: "not much."

Given this background one can reasonably ask: "Why was Green Tag Forestry" developed at all? The answer is the same today as it was six years ago: to keep options and markets open to private landowners by certifying the highest standards of forestry practice while avoiding the relatively high expense and management limitations associated with FSC certification.

Developed jointly by the National Woodland Owners Association and individual members of the Association of Consulting Foresters (ACF), a Green Tag evaluation uses ten Criteria and 63 Indicators. After its creation, the program was transferred to the National Forestry Association (NFA) for administration and continuing development. Professional foresters already participating in NFA's 400 member National Forestry Network (private landowner referrals--a NWOA member benefit), became the core of Green Tag certifiers, giving the program a third party certification structure. All receive Green Tag training, all are members of the Society of American Foresters, and most are members of ACF. A Green Tag--Canada is in development.

As of February, 2001 some 30 woodlands in nine states totaling 48,194 acres had been Green Tag certified, not much when compared to the millions of acres enrolled on the other three programs. Yet Green Tag stands apart as arguably the most intensive forestry evaluation. This alone can offer benefits to landowners committed to sustainable forestry. The program is much less expensive than FSC for individual landowners (although FSC foundation scholarships are sometimes available), but certainly more than the Tree Farm alternative. As the advent of forest certification evolves both in the woods and in the marketplace, it is apparent there are really two winners: the forest and the future.

Developing and Implementing Forest Certification on Non-industrial Private Forestlands in the South: A Case Study of Forests and Foresters in North Carolina - *Frederick Cubbage, Warren Boyette, Daniel Richter, William Gardner, Judd Edeburn, Larry Jervis, and Susan Moore*

The Southern Center for Sustainable Forests
North Carolina State University
Duke University
The North Carolina Department of Natural Resources

Forest certification is a promising new means to enhance forest management and protection, yet generate adequate financial returns from working forests to ensure that they are retained. The practicality, costs, benefits, and ultimate acceptance of forest product certification programs in the South need to be examined. A national project on forest certification has begun in selected states, and North Carolina is participating in this effort through the Southern Center for Sustainable Forests (SCSF), a partnership among Duke University, North Carolina State University, and the North Carolina Department of Environment and Natural Resources, Division of Forest Resources. The cooperating partners of the Southern Center for Sustainable Forests are performing a forest certification assessment project for North Carolina on their forestlands, which is assessing the merits and practicality of obtaining certification for southern forests and the training needed for foresters to be qualified certifiers or sustainable forest management (SFM) auditors.

The cooperating organizations are: (1) performing the steps necessary to seek certification for our qualifying forest lands of the three SCSF partners from the largest certifying bodies; (2) conducting a reverse assessment of the process of applying for certification, the merits of the forest audit procedures undertaken in the project, and the criteria selected by the assessors in examining our forests; and (3) developing and implementing an effective standards and outreach efforts for professional foresters (private and public) and non-industrial private forest (NIPF) land owners in North Carolina and the South centered on disseminating lessons learned during the certification pilot project, including preliminary training for selected foresters on certification approaches and SFM audits. This paper will review the status of this pilot project, and the prospects for widespread applications of certification for non-industrial private forestlands in the South. This project will provide a practical educational assessment of forest certification for forest products retailers, foresters, and NIPF owners regarding the potential, benefits, and costs of certification.

Willingness to Pay for Certified Wooden Furniture: A Market Segment Analysis - *Knut Veisten and Birger Solberg*

Agricultural University of Norway (NLH), Department of Forest Sciences

This paper reports on a market segment analysis of extra willingness to pay (WTP) for certified wooden furniture. Representative samples of the British and Norwegian population were surveyed by telephone and asked to choose between two profiles of wooden furniture, where one of the profiles was eco-labelled and more expensive. The price differential between the eco-labelled and unlabelled was varied between sub-samples to allow estimation of extra WTP for eco-labelled furniture using a logit model.

Market segments were identified using an approach combining economic theory of choice and psychological theory of attitudes. Segmenting within environmental marketing has been based on both demographic variables and attitudinal or other psychosocial variables. In addition to this, the data allowed for segmenting based on simple empirical and logit model estimates of WTP. The statistical method to identify the segments was cluster analysis.

The hypothetical choice between two furniture profiles may be viewed as a behavioural intention that is a better predictor of real behaviour than attitudinal statements and demographic characteristics. Further, the choice variable was adjusted to improve its predictability. By the estimated WTP from the choice variable, the segmentation analysis can be improved. More than identifying a group of "very positive toward the product" with their specific demographic characteristics, it allows for a more thorough segmentation based on the combination of WTP, attitudes and demographics.

Consumers' Perception on Forest Products in South Korea: With Special Reference to Environmental Concerns - *Yeo-Chang Youn and Mi-Hyeon Seol*

Department of Forest Resources, Seoul National University

Environmental concerns have been growing in the Republic of Korea while it experiences rapid industrialization and urbanization. More consumers are willing to pay for food considered safe while less consumers pay attention to wood products produced in an environmentally sound way. Consumers are asked about their attitudes for environmental issues and willingness-to-pay for environmentally sound products such as recycled paper, reconstituted wood panels and natural food products from forests. They are more interested in natural food products than industrial forest products as far as environmental issues are concerned. This is also manifested by the difference in their willingness-to-pay and intention of continuous consumption of these products. The survey also revealed that the more consumers have experienced with nature and, the more concerned about environmental issues when they make decisions of consuming forest products. It is shown that the wealthier consumers, the more concerned with environmental issues.

Agrarian Household Behavior and Land Use in Tropical Forests: Empirical Analysis in the Brazilian Amazon - *Jeannette Espinoza*

Department of Forestry, North Carolina State University

Agricultural household models combine household decisions with respect to production, consumption, and labor supply. This type of model allows understanding household behaviour regarding to land use. These models can be classified either as separable or non-separable depending on market characteristics. Separability condition holds if outputs and inputs are traded in perfect markets, with exogenous prices for outputs and inputs, including labor. Several factors could violate the separability assumption, especially in developing countries, where is likely to face incomplete markets. The determinants of forest clearing by agrarian households can be modelled in the household production framework. This paper evaluates the implications of market failures for this modelling approach and presents an empirical example of a non-separable model of household behaviour in the Tapajós National Forest. The non-separable model is found more appropriate in this case because markets for key inputs and outputs are incomplete. In this case, household decisions are guided by shadow prices rather than market prices. Determination of shadow prices (including wage) is an important feature of this model. Forest clearing is modelled as a function of household characteristics including number of children, age, and number of adults in household, using primary data from a survey of households in the Tapajós National Forest in the Brazilian Amazon. This study contributes to understanding of household decision making, thereby informing land use policy in tropical forest regions in the context of forestry and economic development.

Poster Abstracts

The Rural Technology Initiative: Increasing Technology Transfer to Rural Forest Communities - *Kernen Lien*

Washington State University Cooperative Extension, Lewis County

The increasing complexity of managing forests to satisfy new riparian regulations and other environmental goals is contributing to the Increasing disparity of incomes between rural forest resource-based and urban communities. At the request of rural forest communities a pilot regional network and service system, The Rural Technology Initiative (RTI) has been created by CFR UW & WSU Cooperative Extension to increase technology transfer to rural forestry communities. The objective is to empower the existing infrastructure to use better technology in rural areas for managing forests for increased product and environmental values in support of local communities.

Low Impact Harvesting Techniques - *Mary Chapman*

Forest Stewards Guild, Santa Fe NM

Forest Stewards Guild members are pioneering innovative low-impact harvesting approaches on lands they manage. New techniques and equipment are facilitating important silvicultural work long precluded by limited funds, skills and machinery. In North Carolina, modified forwarding equipment is enabling economically viable timber stand improvement projects focused on lower quality trees. In Maine, imported harvesting equipment is drastically reducing damage to residual stands while facilitating low thinnings. Demonstration projects are providing new skills to loggers and promoting a range of silvicultural options that provide a greater level of long-term protection to forest resources.

The Landscape Management System: Technology For Tomorrow's Forests Today - *Kevin Ceder*

College of Forest Resources, University of Washington

The Landscape Management System (LMS) software developed at UW CFR assists land managers in developing forest plans while meeting regulatory requirements with detailed analytic, graphic and visual aids. The system accommodates various growth models, allowing the manager to simulate future conditions under prescribed treatment options for landscape scale planning units. The manager can access the value of management strategies from many perspectives, e.g. economic, harvest flow, habitat suitability, aesthetics, carbon sequestration, fire risk and more at several scales.

Who Owns the Private Forests of the United States? A Summary of Past Findings and Future Objectives of the National Woodland Owner Survey - *Brett J. Butler*

USDA Forest Service, Northeastern Forest Research Station, Newtown Square, PA

Increasing environmental and economic demands on forest resources are increasing the need for effective forest policies to enhance the benefits that society receives from forests. The link between a forest policy and the land is the forest landowner and to create effective policies it is imperative to know who owns the forests, why they own forests, and what their expectations are for these forests. Beginning in 1978, the U.S. Forest Service has conducted periodic surveys to answer these questions for private forestlands in the U.S. The individual surveys provide us with snapshot answers to these questions and we are beginning to amass enough data to look at trends. These surveys collected information on landowner demographics, management objectives, and reactions to various policies. For example, these surveys have told us that there were 7.6 million private woodland owners in 1978 and 9.9 million in 1994, who owned 333 million acres and 393 million acres, respectively.

Beginning in 2001, the Forest Service will begin its next periodic survey of private forest landowners in the U.S. Some of the goals of this survey are to continue the long-term data series, convert the survey to an annual basis, connect landowner attributes to field measurements of the forests that they own, and design a survey that is flexible enough to incorporate specific data necessary for effective policy design. Along these lines, I will be attending this conference as much to present information as to ask for input on the design and content of the next woodland owner survey.

Birch Pulpwood Imports-A Substitute or a Complement for National Wood Supply in Finland - *Tapio Tilli[1], Ritva Toivonen[1] and Anne Toppinen[2]*

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[2]Finnish Forest Research Institute, Unioninkatu 40 A, 00170 Helsinki, Finland

Continuous increase in pulpwood imports to Finland has raised discussion about the possible impacts on domestic wood markets. In Finland, about 80 % of the industrial roundwood is supplied from domestic wood markets, and about 80 of this by NIPFs. However, the importance of roundwood imports in the forest industry's wood supply has increased. In addition, major institutional and structural changes in the market environment have taken place both in import and domestic markets during the 1990s.

These recent changes in the market environment underline the need to analyze the demand for imported wood. Our data includes average monthly domestic and import prices and quantities of birch pulpwood from 1986 to 1998. Assuming competitive markets, the demand for birch pulpwood was modeled separately for the whole time period and three shorter sub-periods within it. Our results indicate that market mechanism in the Finnish birch pulpwood imports has substantially improved in the latter part of the 1990s. While the estimation results were vague for the first two sub-periods, during the last period imports were found to be elastic with respect to changes in pulpwood import price, domestic pulpwood price and pulp export price. Interestingly, imports of birch pulpwood have complemented the domestic wood supply rather than been a substitute for it. In the future, it would be important to broaden the analysis with data of coniferous assortments since the demand/supply conditions especially in the pine pulpwood and sawlog markets differ from birch pulpwood markets.

The Auburn University Center for Forest Sustainability: An Integrated Approach to Sustainability Issues in the Southern United States - *Elizabeth Lanier, Graeme Lockaby, Ralph Mirarchi, Lisa Samuelson, and Daowei Zhang*

Auburn University School of Forestry and Wildlife Sciences, Auburn, Alabama

Forest sustainability as a societal issue continues to elude resolution because of the influence of an exceedingly complex array of social and biological factors. In addition, many of these factors operate at temporal and spatial scales that have traditionally not been incorporated into forestry planning and research. Clearly research and education efforts to address the sustainability issue will be ineffective unless innovative approaches can be designed and implemented by teams of scientists, which entail broad, non-traditional ranges of expertise. In response, the Center for Forest Sustainability (CFS) will maximize the creativity of new approaches to the sustainability issue by fostering collaborations among scientists representing expertise in socioeconomics, policy, wildlife biology, and forest ecology/management. Emphasis will be placed on collaborations that integrate social and biological approaches at the landscape scale to research and education questions related to forest sustainability. Particular examples of these endeavors include examination of the impact of forest certification on the flow of societal values from forested landscapes. In all efforts, the CFS solicits participation of industrial, governmental, and other partners who have active interests related to forest sustainability.

Hybrid Poplar in High-End Solid Wood Product Markets: An Old Species in a New Market Direction Which Will Change Forest Policy Dynamics on Private Lands in the US - *Catherine M. Mater*

Mater Engineering, Ltd., Corvallis, Oregon and Senior Fellow - The Pinchot Institute for Conservation

In 1998, major wood products corporations in the US (Potlatch Corporation, Boise Cascade, James River) were all faced with continuing low chip/fiber prices impacting investment pictures for their hybrid poplar fiber farms (totaling over 60,000 acres) in the Pacific Northwest alone. The corporations were left with two fundamental options: divest themselves of their hybrid poplar fiber farms, or evaluate technical and market capabilities to transition the fiber into the sawlog market. Potlatch Corporation took the lead in undertaking intensive mechanical testing and markets research for moving hybrid poplar into higher-end (furniture, moulding and millwork, etc.) solid wood markets. In 2000, in conjunction with Boise Cascade, Potlatch successfully offered the first commercial flow of hybrid poplar sawlogs into US solid wood markets, setting a new market direction for an old fiber species.

The transition of this wood fiber into higher-end markets is not only expected to significantly change private forestry and farmland options for financially productive "crop" development in 10-12 year rotations, but change the dynamics of market demand for non-structural hardwood and softwood resource from native forests in the US. The species transition portends unique opportunities for US to strengthen it's position against offshore competition from imported species, such as radiata pine and eucalyptus, and is even now being considered for forest development opportunities in China. The development of forest options on under-productive private forest and farmlands in the US has also created unexpected support from environmental organizations looking for options to decrease pressures on native public forestlands.

This paper will highlight the current status of the solid wood hybrid poplar movement, and delineate the intended and unintended market impacts both domestically and abroad, as well as expected policy impacts private forest and farmland owners in the US.

Elements of Effective Working Conservation Easements - *Mary Chapman*

Forest Stewards Guild, Santa Fe, New Mexico

Conservation easements provide protection for open space, including forestland, and tax relief for landowners struggling to keep land from being developed. In recent years, "working conservation easements have grown in popularity. Working easements allow the continuation of forest management practices, typically with a number of guidelines to ensure environmental protection. Organizations such as the Nature Conservancy, the Pacific Forest Trust, and the New England Forestry Foundation have been pioneering these efforts. The development of forestry guidelines that effectively facilitate the achievement of easement objectives is complex. On the one hand, guidelines must ensure adherence to conservation goals. Typically this involves consideration of a range of ecological criteria. At the same time, guidelines must provide flexibility to adopt diverse approaches to achieve goals. Often, land trust personnel lack sufficient expertise in the design and implementation of forestry practices to either develop effective approaches or to discern the viability and appropriateness of approaches proposed by contracted forest resource managers.

The Guild is now working with the Land Trust Alliance to set parameters for effective technical support on working easements, including forestry guidelines, and design strategies to provide land trusts with field support in the implementation of sustainable forestry practices. The poster will showcase the Baraboo Hills, a collaborative relationship among The Nature Conservancy, NIPFs, and an FSC-certified resource manager in south-central Wisconsin.

From *Forest Policy for Private Forestry: Global and Regional Challenges*

(Abstracts for Keynote Addresses were not prepared)

Changing Philosophies of Forest Management

Forestry in the Long Sweep of History – [Keynote Address] – *Clark S. Binkley.*

International Dialogue on Forests: Impact on National Policies and Practices – [Keynote Address] – *J.S. Maini*

New Trends in Forest Policy and Management: An Emerging Postmodern Approach? - *John Schelhas*

USDA Forest Service, Southern Research Station, Tuskegee University

Forest policy and management in the 20th Century was firmly rooted in patterns established during the progressive era. Progressive era conservation sought to "provide the greatest good for the greatest number," and arose in response to overexploitation of forests for short-term private gain. Progressivism believed that natural resource decisions should be made by technically trained experts, based on scientific notions of appropriate resource use and efficiency often in support of narrowly defined resource values. Local users were seen special interests seeking to distort technically correct decisions, rather than as knowledgeable users and managers of the resource. These beliefs, in turn, were used to justify standardized national level policies, ownership, and control of resources. However, a number of trends that began in the latter part of the century suggest that a new, postmodern conservation philosophy is emerging.

The past 20 years has seen the rise of a broad cultural and intellectual trend of postmodernism. Postmodernism rejects comprehensive theories and universal truths, emphasizing instead the contingent nature of events as played out at particular places and times. Another theme is recognition and legitimacy of multiple social groups with different concerns and voices. Many of the changing views and approaches in forest management reflect postmodernist thinking. These include: (1) increasing emphasis the multiple products and benefits for forests, (2) new claims on forests by groups with diverse interests, histories, and relationships with the forest, (3) managing forests at large landscape scales (e.g. ecoregions and watersheds) that comprise complex socio-environmental systems, and (4) new management regimes, including participation, collaborative management, community-based approaches, and market-based approaches.

These changes are opening new, and sometimes confusing, options for forest management and policy. This paper will review how some of these changes are being reflected in people-forest relationships, using as examples private forests in Costa Rica and the United States.

Utilizing Issue Network Analyses to Assess Potential Policy Implications of Sustainable Forest Management in the United States - *Steverson O. Moffat[1], Frederick W. Cubbage[2], Thomas P. Holmes[3], and Elizabethann O'Sullivan[4]*

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Utilizing quantitative issue network analysis techniques in conjunction with the Delphi method identified potential federal and state policy actions for sustainable forestry. Results suggest that the parity in the distribution of influence among sectors in the sustainable forestry issue network indicates that moving sustainability concerns onto the formal policy agenda requires greater consensus on problems and solutions than exists at the present time. Accordingly, broad policy actions resulting from the expansion of the issue of sustainable forestry are unlikely in the short-term. However, experts on the Delphi panel anticipate that changes will occur in response to sustainability issues. At the federal and state level, this is likely to result in changes to public forest management and to the objectives assigned to the USDA Forest Service and to the state forestry agencies. States are projected to draft new and to change old private forest practices regulations as a result of sustainable forestry concerns. In the private sector, the trend of applying criteria and indicator-based sustainable forestry management standards and certification programs will continue. Non-industrial private forest owners are projected to make the fewest direct accommodations in response to forest sustainability concerns.

New methodological procedures were developed and tested to meet research challenges. In addition to presenting these public policy forecasts, the methodological merits of combining Delphi with traditional issue network analysis are examined.

Private Sector Participation on Public Forestlands—Challenges and Policy Issues - *Barin N. Ganguli*

Jaakko Pöyry

In many developing countries, in the coming decades, the management of public natural high forests as a source of industrial timber will decline. Instead technology based timber plantations, which permit foresters to substitute capital, and technology for land will be the main source of industrial timber. The Paper argues that the public forestry agencies in these countries neither have adequate financial resources nor the wherewithal to establish these plantations on forestlands under their control. The Paper therefore reasons that a better option for these countries would be to promote private sector participation (PSP) in the production of industrial timber on some of these public forestlands, which are currently degraded or are being encroached upon.

The Paper documents the increased initiatives in market-based instruments (MBIs) to encourage PSP in timber plantation and management in many developing countries over the past 10 years to further strengthen the argument. The Paper also negates the argument of many professional foresters in the developing countries that given additional financial resources, the public forest agencies will be able to establish and manage timber plantations as efficiently as the private sector. The rationale for the counter argument put forward in the paper is that mixing "market" and "non-market products" creates difficult business.

The Paper lists the challenges involved in bringing about this change in the public policies as some country governments in general are not yet very receptive to the idea of increasingly handing over public forest lands and their management and development responsibilities to the private sector. Required new policy orientation have been detailed as issues that need to be resolved for mainstreaming PSP on public forest lands in these countries. These have been grouped under: appropriate incentive framework: processing and log trade policies; leasing of forestlands versus outright sale of public forestlands; regulatory procedures; sectoral governance and conflict resolution.

Planning Private Native Forest Use in Australia -*Ray D. Spencer, Michael Ryan, Phillip K. Tickle and Claire I. Howell*

Bureau of Rural Sciences, Kingston ACT 2604, Australia

Since 1995 Australia's State and Commonwealth governments have been developing regional forest agreements across key timber production regions of Australia to establish a comprehensive, adequate and representative reserve system and provide 20-year resource security to industry. The scientific process which led to agreements being made in 9 regions, considered environmental, heritage, indigenous, economic, social and sustainable management issues across the regions.

Of Australia's 156 million hectares of forest, 42 million hectares are on private land and 66 million hectares are private leasehold. Twenty percent of the total private native forests are within the regional forest agreement regions. While a substantial effort was undertaken in assessment of public native forest, relatively minor effort was directed towards private native forests. As such, a substantial knowledge gap in private native forests for national and international reporting of forest based information remains.

In order to address this situation, Australia is developing a framework for implementing regional assessments on a national basis to assess private native forests. This will provide a greater understanding of the sustainable management of private forest for industry development and conservation outcomes. It will also improve the capacity for international reporting and lead to more consistent approaches to private land management with the potential to improve overall forest management and economic returns to landowners.

The private native forest inventory framework for Australia will address a combination of bottom up and top down assessment procedures to gather consistent regional data for national reporting. The Inventory methods will be trialled on a pilot region before being modified and extended for other regions.

Challenges Abound – Designing and Implementing Policies for Private Forestry

The Three Impediments: Time, Fire and Taxes – [Keynote Address] – *George H. Weyerhaeuser, Jr.*

Global Initiatives, Public Policies and Private Forestry in Bolivia: Lessons to Date and Remaining Challenges - *George Taylor[1], John Nittler[2], and Ivo Kraljevic[3]*

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After decades of discussion, Bolivia undertook fundamental reform of its forest policy and legislation in 1996. The new Forestry Law mandated sweeping changes in orientation, institutions, incentives and procedures. It opted for private sector led forestry development with the role of the state limited to setting the rules and enforcing them. It also opted for greater decentralization and for greatly increased transparency. Forest certification, still in its infancy, was recognized as a global initiative that could give Bolivian producers access to new markets while a the same time helping to insure that unsustainable forest extraction was replaced by more sustainable and socially responsible production systems. During the first several years it was unclear whether forest certification would take hold. In 1998 the tide turned and the majority of large producers embraced certification. The area of certified forest jumped quickly. By the end of 2000 Bolivia had 1,075, 678 hectares under FSC-certified production (the largest area of managed natural forest in the tropics). It is currently estimated that this figure will rise to 2.4 million hectares by the end of 2004.

While progress with certification on the ground has been impressive, and overall implementation of the new Forestry Law has been moving forward, there have been a number of important bumps in the road (lessons learned) and there are some significant storm clouds on the horizon (remaining challenges). The paper:

Briefly reviews the steps and the key issues that led to the fundamental reform of forest policy and legislation in 1996 (and points readers to a substantial and growing body of literature on this topic)
Discusses forest certification as a key "driver" to change (including the global and national/local dimensions of the certification process in Bolivia)
Reviews a series of other global initiatives and assesses their impact (or otherwise) on forestry in Bolivia.
Discusses the impact of public policies and public sector institutions on private forestry, including macroeconomic, land use, social and forestry-specific policies; a wide range of macro institutional issues; and the specific impacts of national, Department-level and municipal institutions on private forestry. This section identifies key lessons learned to date and remaining challenges.

The paper concludes with a synopsis of the most important pieces of the unfinished agenda for fully operationalizing the forestry paradigm shift in Bolivia. The potential role of global forestry initiatives and the impacts of globalization are used as themes to help illuminate the Bolivia experience and draw lessons for similar efforts elsewhere.

Today and Tomorrow of Private Forestry in Central and Eastern Europe - *Jacek Siry*

Department of Forestry, North Carolina State University

Central and Eastern Europe's communist governments nationalized the majority of private forests, and only in some countries small private forests persevered and were allowed to develop. While most forests still remain state owned, the role of private forests is growing as democratic governments consider or conduct the restitution of nationalized forests and the privatization of state owned forests. Already today private forests play an important role in timber production and trade and, once the ownership reforms are concluded, they may dominate forest sectors in some countries. Commonly associated with private forests overcutting and unsatisfactory management raise worries regarding their sustainability and largely influence the continued debate regarding their future. We examine private forestry legislation, regulations and assistance programs, identify likely causes of these problems, and propose more effective policies to assist in the development of this sector. Poland, which today fervently debates the privatization of its state forests, is used here as a primary example, but relevant experiences from the Baltic States, Czech Republic, Slovakia, Hungary, Bulgaria, Romania and other countries are provided. Since most countries in the region negotiate their access to the European Union, the discussion includes European Union's access requirements and forest policies and examines their likely impact on private forestry in the region.

Redesigning Forest Policy Tools Under a Transitional Economy Setting - *Maksym Polyakov and Lawrence Teeter*

Forest Policy Center, School of Forestry and Wildlife Sciences, Auburn University

Making a transition from a state oriented forest economy to a market oriented one is very difficult without reformulation of the state's forest policies and corresponding changes in the set of a forest policy tools. This paper attempts to look at the system of regulatory forest policy tools available to nations making a transition to a more market based economy. We analyzed the current system of determining allowable cut in Ukraine. Changes are proposed which alter how allowable cut is determined. The method proposed here applies the current non-declining yield provisions of the regulations to the forest resources of the region instead of to the individual (and often small) working sections. A comparison of the application of existing and proposed methods for determination of allowable cut for two administrative oblasts of Ukraine shows that use of the new method for both oblasts will allow them to reach the level of sustained yield harvests in a shorter time while providing higher yields in the initial periods.

Private Land and Public Goods: Policy Lessons From Habitat Conservation Planning - *Denise Keele and David Ostermeier*

Department of Forestry, Wildlife & Fisheries, University of Tennessee

Privately held forestlands impact multiple public goods and services including wildlife, bio-diversity, water quality and scenic beauty. Habitat conservation planning has become the primary conservation tool under the Endangered Species Act to address the policy paradox of balancing private rights with public responsibilities. These plans are relatively new mechanisms (95% being developed since 1993) and are charged with addressing the inherent conflicts between private and public interests through integrated decision making. Research results involving 11 private forestland habitat conservation plans (HCPs) are discussed. These results are part of a larger nation-wide study of HCPs conducted in 1998 and 1999 (NCEDR[1]). This research focused on decision-making and HCP process management. Analysis of the 11 forest based cases provides information on who was involved in these cases, roles they played, how data and other information was managed, how important decisions were negotiated and how participants viewed the process. Lessons learned address policy and decision-making mechanisms for private forestland management and provide an analytical base for HCP process improvement. Results indicate that the management of data and information varied considerably across the plans and that these mechanisms involve multiple players beyond landowners including both federal and state natural resource agencies, consultants and other affected stakeholders. These and other results including participant views of the process provide valuable information to address the paradoxes of balancing private and public interests regarding private forestlands.

Ensuring the Application of Sound Forest Practices on Private Forests: Challenges Facing the Design and Implementation of State Compliance Monitoring Programs - *Michael A. Kilgore, Paul V. Ellefson and Michael J. Phillips*

Minnesota Forest Resources Council
Forest Resource Policy and Administration, University of Minnesota

Critically important to the sustainability of private forests is the application of sound forest practices and information about their application. In the United States, 34 states implement compliance monitoring programs to determine if landowners and timber harvesters are applying voluntary or mandatory forest practices. In only 20 states the lead forestry agency has sole responsibility for monitoring. Since the early 1990s, some states have completed five or more monitoring survey cycles, the most recent costing an average of $60,000. Information from compliance monitoring is used to modify forest practice rules or guidelines, refocus education and training programs, and inform policy makers and the general public of forest practice application rates. Major issues for compliance monitoring include specification of the types of information to be gathered, selection of harvest sites for examination, access to private property, and determining responsibility for conducting monitoring activities. Conditions favoring effective compliance monitoring are positive landowner-harvester sentiments toward monitoring, assigning monitoring responsibility to a single agency, establishing credible and uniform evaluation processes, presenting results in timely and useful ways, involving individuals in the evaluation process who are knowledgeable of the forest practice rules or guidelines, and investing sufficient resources. Minnesota's forest practice guideline program provides significant insight on these attributes.

Spatial Assessment of a Voluntary Forest Conservation Program in North Carolina -

Kirsten Cassingham[1], Erin Sills[2], Subhrendu Pattanayak[3], and Carol Mansfield[3]

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[3] Research Triangle Institute

Conflict between the public interests in non-timber amenities of forests and the private rights of forest owners has focused attention on voluntary conservation agreements as a policy tool. In North Carolina, the Natural Heritage Program identifies ecologically significant sites and provides two mechanisms for landholders to participate in conservation of those sites. We evaluate implementation of the program on private lands in western North Carolina, using a geographic information system to characterize the conservation outcome of the program (i.e., what has been conserved) and the determinants of participation in the program (i.e., who has conserved). We model the decision to conserve sites as a function of characteristics of the site, including percent forest cover and ecological rank assigned by the Natural Heritage Program; characteristics of the owner and value of the site for development and conservation, as reflected in county socio-economic data, distance to roads, and political variables; environment surrounding the site, measured by distance to other priority conservation areas; and number and types of site landowners. We find that sites with more ecological elements identified as significant by the Natural Heritage Program are more likely to be protected.

Sustainable Forestry Economics

Policy Developments Affecting Demand, Supply and International Trade of Forest Products – A European Perspective – [Keynote Address] – *Birger Solberg*

Private Forest Management and Investment in the U. S. South: Alternative Future Scenarios - *Ralph J. Alig, Darius M. Adams, John R. Mills, Brett J. Butler and Robert J Moulton*

USDA Forest Service

We use a system of models to project future changes in private U.S. forest management and investment, designed to aid forest managers and policymakers in assessing forest sustainability options on a fixed land base and better understand prospects for future supply of timber and ecological characteristics of private forestlands. Private forestlands are projected to provide an increasing share of the U.S.'s timber supplies, with forest investment a key component in long-run sustainability. Our long-range projections of demand and supply, as part of the 2000 Resources Planning Act Assessment, include changes in land use, land cover, and forest management investment that point to an increasing source of U.S. timber from private plantations. Private forestlands will face increasing pressures from growing human populations, and we examine the likelihood that over the next 50 years some private forestlands will be unavailable or reserved from timber production. Conversely, implementation of additional opportunities for private forest investments could bolster the future supply of timber, as well as alter habitat for terrestrial and aquatic species. Dynamics of land use and land cover warrant attention in forest policy deliberations, including a substantial area on non-industrial private timberlands that receives passive regeneration after harvests and then transitions to other forest covers. Incentive programs have had important influences on land use and forest conditions, especially in the U.S. South, but are projected to play less of a role over the next 50 years. Private timber yields per acre are projected to substantially increase in some cases, and size of timber harvested is projected to be stable to slightly declining. We use data from more than 70,000 permanent plots used by the USDA Forest Service Forest Inventory and Analysis units to monitor site characteristics, forest conditions, and forest management.

An Economy-Wide Assessment of a Forest Carbon Policy in the U.S. - *Grace Y. Wong and Janaki R.R. Alavalapati*

School of Forest Resources & Conservation, University of Florida

Forests play a prominent role in the global carbon cycle by absorbing atmospheric carbon dioxide (CO_2) through photosynthesis and storing carbon in biomass. This forest-climate linkage has assumed political prominence in recent years, driven in part by the inclusion of forestry activities as an option for meeting CO_2 emission targets in the Kyoto Protocol, and in part by growing social consciousness about global warming.

Since forest carbon sequestration is a public good, there is little incentive for private forest landowners to produce carbon benefits alongside its other objectives. Thus, if the developed countries intend to use forestry as a CO_2 mitigation option under the Kyoto Protocol, incentives will be required to encourage increased tree planting activities in the private sector. This could have significant impact - a carbon subsidy could lead to long-term shifts in wood supply and market prices, and ultimately fluctuations in the stock of carbon. This paper is an analysis of a carbon subsidy policy in the U.S. forestry sector. The study is novel because it uses a dynamic computable general equilibrium (CGE) model to examine the economy-wide impacts of the policy by linking changes in the forest sector to other sectors and households in the economy. In addition, the model will also provide insights into implications for wood products trade with both the developed and developing countries. Results will provide policy-makers with information on the broader impacts of a policy and thus, enable decisions that are economically sound and socially beneficial.

Forestry Implications of Agricultural Short-Rotation Woody Crops in the United States - *Peter J. Ince[1] and Alexander N. Moiseyev[2]*

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Two economic models, the Forest Service North American Pulp And Paper (NAPAP) Model and the USDA POLYSYS agricultural policy analysis model were linked together to analyze and project future market scenarios for pulpwood supply from agricultural short-rotation woody crops in the United States. This paper briefly describes the analysis, results and some interesting forestry implications. Hybrid poplars and cottonwoods (*populus sp.*) were chosen as representative woody crops in the analysis, because operational experience has been obtained already on a commercial scale in the United States with fast-growing hybrid poplars and cottonwoods. The development of pulpwood supply from agricultural woody crops will likely interact with markets for hardwood pulpwood from private forestlands in the future. The linkage of NAPAP and POLYSYS models enables the projection of annual market equilibria across both the agricultural and forest product sectors, with projections extending several decades into the future. Results indicate that pulpwood supply from agricultural short-rotation woody crops in the United States will become marginally economical in the next several decades as projected hardwood pulpwood prices gradually increase, but supply will remain fairly limited under conventional assumptions. However, the market potential and supply could become quite significant under certain alternative scenarios. Such scenarios include reduced hardwood pulpwood supply from natural forests, limited future expansion in paper recycling, and higher productivity or lower costs for woody crops. Hybrid poplar and cottonwood crops might also someday be developed as feedstock for fuels or chemicals in the United States, but competitive expansion of such markets would require biomass feedstock values that are several times higher in real prices than current market values for wood biomass fuel. Alternative crops such as switch-grass or coppice willow may be more competitive as biomass energy or chemical feedstock crops. Future development of agricultural wood fiber supply, with potential to augment traditional sources of timber supply, could have some interesting implications for forestry in the future.

Management of the Forest Biodiversity: Feasibility, Efficiency and Limits of a Contractual Regulation - *Anne Stenger and Dominique Normandin*

Laboratorie d'Economie Forestiere, Nancy, France

Forests have many functions: production, environment, leisure ... A monetary valorization minimizes the risks of conflicts between users. It consists in creating a market, a regulatory system or a contractual management, that can reflect a real or fictitious price. In this paper, we raise the question of an environmental regulation of the forest. The principal objective is to study the feasibility, the efficiency and the limits of a contractual regulation project for a particular environmental function, biodiversity. An analysis of the existing tools of regulation shows that the future contracts "Natura 2000" will be the first economic tool of biodiversity regulation in France and more generally of environment in forest. These contracts will be studied from a theoretical point of view, *ex ante* in a Principal-Agent model in a forestry production context:: how to incite the private owners of forest to conserve biodiversity in an asymmetry of information? This asymmetry concerns both the owners' motivations before contracting and their efforts during contracting. This regulation raises the question of the compatibility between environment and (wood) production in a physical and economical point of view.

The paper presents our objective in two parts. The first one characterizes the environmental management in France relative to the production one. The second part is a principal-Agent model in a moral hazard context. Three cases are considered: (a) a conservation contract to private owners to avoid irreversible actions on biodiversity; (b) a conservation contract with maintenance actions and (c) a restoration contract to the private owners in an intensive production zone.

Case Studies Examining the Economic Impacts of New Forest Practices Regulations on NIPF Landowners - *Kevin Zobrist and Bruce Lippke*

The College of Forest Resources, University of Washington

The Washington State Forest & Fish Agreement is designed to protect salmon and provides the most complex forest practice requirements yet adopted in the western USA. To help offset increased costs to the landowner, management within defined riparian zones to achieve desired future biological conditions is necessary. Large variations in impacts across ownerships and site conditions are revealed by case studies. Road improvement issues and management on unstable slopes increases managerial complexity and costs of management. The relative economic impact on land values is more extreme than the immediate impact on timber harvest volume and raises questions about the future viability of ownership for non-industrial private owners. While habitat conservation plan alternatives and riparian easements may improve both habitat and economic conditions, the planning and administrative costs may be prohibitive.

Effect of the Federal Estate Tax on Rural Land Holdings in the U.S. - *John Greene[1], Tamara Cushing[2], Steve Bullard[3], and Ted Beauvais[4]*

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There are many reasons to believe that the impact of the federal estate tax on transfers of rural landholdings is increasing. To provide insight into the magnitude of the impact, the Mississippi State University, College of Forest Resources, and the USDA Forest Service, Southern Research Station, are cooperating on a study to gauge the effect of the federal estate tax on non-industrial forestlands and other rural land holdings. Data for the study were collected by means of random samples of two national woodland owner organizations and a national database of rural landowners, using the Dillman Total Design Method. Results from the woodland owner samples indicate that in about 30 percent of the cases where a federal estate tax is due, timber or land must be sold to pay part or all of the tax. The amount of forestland that must be harvested to pay the estate tax appears to be on the order of 2.6 million acres per year, and the amount of forestland that must be sold appears to be on the order of 1.4 million acres per year. Of the acres sold, it appears that approximately one-fourth are converted to other, more developed uses. The paper will compare the survey results for forestland estates to those for other rural land holdings.

Global Trade Liberalization and Forest Product Trade Patterns - *Jianbang Gan and Sabyasachi Ganguli*

Forest Resources Program, Tuskegee University

This study examines the impacts of the North America Free Trade Agreement (NAFTA) and the World Trade Organization (WTO) negotiations on global forest product trade patterns. A general equilibrium global trade model was developed and used to simulate the tariff reductions proposed in the NAFTA and WTO negotiations. The model consists of ten regions and ten sectors including three forest product sectors. The effects of NAFTA and WTO on the import and export of forest products were analyzed. The NAFTA seems to have a mixed impact on the trade balance of the U.S. forest products industries. The WTO would improve the competitiveness of U.S. forest products in the global markets.

Perspectives on Forest Certification

Gaining Leverage: NGO Influence on Certification Institutions in the Forest Products Sector - *Erika N. Sasser*

Nicholas School of the Environment, Duke University

This paper explains the emergence and evolution of certification institutions in the forest products industry in terms of three variables: the structure of the industry at different points along the supply chain, the ability of firms in the industry to differentiate themselves from competitors, and the strategic campaigns of civil society actors concerned with the management of forest ecosystems. Using supply chain analysis and in-depth interviews with firms and NGOs, this paper demonstrates that firms at the retail end of the supply chain are more vulnerable to civil society pressure and have greater ability to establish reputations independent of their competitors; therefore, these firms move quickly to adopt certification institutions. Moreover, their vulnerability to outside pressure makes them more likely to pursue third-party certification (standards are set, monitored and enforced by parties outside the firm or industry). On the other hand, firms at the raw materials/production end of the supply chain, which are more isolated from consumers and have a shared reputation, are shown to avoid certification or adopt less rigorous first- or second-party certification mechanisms (where standards are set, monitored and enforced by the firms themselves or by industry associations). These trends toward first-, second- and third-party certification have accelerated as civil society has become more sophisticated in its campaigns against the forest products industry. Specifically, as civil society has learned the spots in the supply chain where reputation matters most, it has increasingly targeted the more vulnerable players (the retailers), and has used their vulnerability to force upstream producers to pursue certification.

Forest Certification Experiences in Maine and the Canadian Maritimes: A Comparative Institutional Study - *Benjamin Cashore and James Lawson*

Forest Policy Center, School of Forestry and Wildlife Sciences, Auburn University

This paper compares the forest certification process in two similar, neighboring forest regions where private forestlands have historically predominated: the US Northeast and the Canadian Maritimes. However, different certification standards have gained legitimacy in each place, and even single companies have had sharply different certification experiences. In particular, central constituencies in the industry have agreed to certification in the Northeast, while withdrawing from a certification process in the Canadian Maritimes. The paper investigates and seeks to explain these differences, as part of a larger, multinational study of certification policy and politics at the Auburn University School of Forestry.

Reconciling forest sustainability with competitiveness on international markets is a contemporary problem with deep historical roots. Recently, forest certification programs, generally non-state international institutions, have been portrayed by some as an exciting policy response to sustainability problems -- and to international environmentalist campaigns. More recently, this debate has become more complex as more private landowners and more companies using private forestlands seek out the benefits of these programs. Many have identified aspects of such programs that seem to have vertically integrated firms and public lands in mind. Still, as an alternative to direct state regulation, forest certification programs create important new opportunities. They may even constitute a potential source of competitive advantage in a growing market niche. The comparative regional study of certification suggests both the potential for win-win scenarios and the limits to private-forestry certification under current conditions.
Improving Forest Management Through the Supply Chain: The State of Wood Procurement Management Systems in the Forest Products Industry

Improving Forest Management Through the Supply Chain: The State of Wood Procurement Management Systems in the Forest Products Industry - *Stephen Harris and René Germain*

State University of New York, College of Environmental Science and Forestry

Non-industrial private forestlands (NIPF) are a critical component of the forest products industry's total wood supply. As a result, there is an increasing emphasis within industry to improve their forest management practices on these lands as well as that of their suppliers such as independent loggers and timber brokers. To do this, companies are increasing the use of trained loggers throughout their supply chain, engaging in public outreach and expanding landowner assistance programs. Though broadly endorsed within industry, the industry-wide adoption of these and other practices to improve forest management on NIPF's is uncertain. For this research, an industry-wide assessment was conducted, using a mailed survey, which measured the level of development of management systems by individual companies to implement these programs. Management systems were evaluated for the presence of policies and goals and a process for implementing, monitoring, evaluating and improving performance. The results indicated that small, privately owned sawmills – particularly those who do not participate in certification standards of any kind – do not have well developed supply chain management systems. Companies with high levels of public-participation, that have been third-party certified, or participate in the Sustainable Forestry Initiative (SFI) Program had highly developed supply chain management systems. If participation in some form of certification becomes a prerequisite to doing business in the future, small sawmills may have the most difficulty in meeting the rising performance standards.

Perspectives on Forest Certification: A Survey Examining Differences Among the US Forest Sectors' Views of Their Forest Certification Alternatives - *Graeme Auld, Benjamin Cashore and Deanna Newsom*

Forest Policy Center, School of Forestry and Wildlife Sciences, Auburn University

In the past decade international, national and regional forestry arenas have seen the inception of certification programs that offer verification for the practice of good forest management. These programs offer such incentives as potential price premiums, market access, and more intangible benefits such as social license. While being voluntary in nature, their connection to markets through the pressures imposed by large retailers and environmental non-governmental organizations mean that some of these programs may become an industry standard or an access requirement for entry into certain forest product markets. This undoubtedly will have impacts on how business is carried out in the woods and in the corporate offices of the United States. How these changes transpire has important implications for the United State forest sector, and more broadly, the international forestry community. For this reason this study sought to assess the views of United States wood and paper producers towards certification programs.

A mail questionnaire was sent to top executives of 2000 wood and paper products companies in the United States that fall in either SIC 24 or SIC 26. The information obtained focused on the following four aspects of company participation in and perceptions of forest certification: (1) to what extent they were familiar with the various certification programs available, (2) the level of participation their company has in the various certification programs, (3) their assessment of the advantages and disadvantages of forest certification, and (4) their beliefs on the appropriateness of the certification process in terms of the rules, procedures and tactics used to promote certification programs. This study offers much needed information on how forest companies perceive forest certification and it expands on other surveys by addressing self-interest, moral and cognitive elements of company motivations for their participation in and attitudes towards certification programs.

Certification: A Comparison of Perceptions of Industrial and Non-Industrial Private Forestland Owners in Louisiana - *Richard P. Vlosky[1] and James E. Granskog[2]*

[1]School of Forestry, Wildlife, and Fisheries, Louisiana State University
[2]USDA Forest Service, Southern Research Station

Environmental certification of forest products and forestland is fast becoming an important issue facing the forest products industry and private forestland owners. In response to environmental concerns, some environmental groups, retailers, and wood products companies are encouraging consumers to purchase wood originating from certified forestland. The basis for these efforts is a perceived need for consumers to be assured by neutral third-party organizations that the forest industry is employing sound practices that will ensure a sustainable forest. Seventy-three percent of U.S. timberland is privately owned; therefore, private forestland owners have a major stake in forest certification. To date, most certification programs have been designed for large, industrial forestland owners, and not the non-industrial ownerships that make up 80 percent of the private forestland. Little research has been done to understand the different perspectives of the industrial and non-industrial private forestland owners. Louisiana industrial and non-industrial private forest landowners were surveyed to gain a better understanding of perceptions about certification in general and their opinions on potential alternatives to third-party certification. Results can help timberland owners understand the implications of certification as well as help develop planning and marketing tools for those that desire involvement in certifying their forest resources. Beyond timberland owners, this information may be useful in ultimately developing an industry-wide certification strategy.

Forest Certification in the Heart of Dixie: A Survey of Alabama Landowners - *Deanna Newsom, Benjamin Cashore, and Graeme Auld*

Forest Policy Center, School of Forestry and Wildlife Sciences, Auburn University

If domestic and international forest products buyers require "green certification" as a condition of sale, many industrial and non-industrial private forest landowners in the US will be asked to certify their forest lands. Although a number of surveys have focused on consumer and forest industry attitudes toward certification, few have assessed the opinions of private forest landowners, especially in the South. In October 2000 we sent questionnaires to a total of 2000 randomly chosen forest landowners (defined as owners of ≥1 ha forest land) from 14 counties within Alabama. Specific goals of this project include determining: 1) the level of knowledge of forest certification among private forest landowners in Alabama; 2) the attitudes of Alabama landowners toward market-based forestry initiatives versus government regulation; 3) the incentives and disincentives for certification that are most relevant for private forest landowners in Alabama; and 4) how the data gathered for goals 1-3 are affected by demographic variables such as landowner age, income, membership in landowner groups and forest owner objectives. Data analysis is still in progress. An updated abstract with results and discussion will be sent to the FPC by December 1, 2000.