GLOBAL MARKETS FORUM

SUMMARY REPORT MAY 4, 2005

NATIONAL COMMISSION ON SCIENCE FOR SUSTAINABLE FORESTRY

NCSSF PROJECT C9

Forum Convened
February 15–17, 2005
Peabody Hotel
Orlando, Florida

A Program Conducted by the

National Council for Science and the Environment
Improving the scientific basis for environmental decisionmaking

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The Global Markets Forum Speakers' Presentations are available at **www.ncssf.org**

COVER PHOTO NASA

1 OVERVIEW

Background

For the past three years the National Commission on Science for Sustainable Forestry (NCSSF) has focused on science and science-based tools for managing forests in the United States in ways that will enhance future forest biodiversity. While NCSSF believes science-based tools will certainly continue to be important, people also act based on the future scenario they think will most likely occur. When various parties embrace different scenarios, their actions often tend to conflict.

Wood demand and industry practices, including product mix and effects on forest harvesting and management intensity, rotation lengths, etc., are all influenced by global market changes. These global changes, in turn, have material effects on demand for wood products from U.S. forests and, consequently, on the forests themselves, including forest biodiversity. To ensure the relevance of NCSSF projects and their results, the Commission decided it was important to explore the market context within which forest owners and foresters in the U.S. will be practicing forestry during the next 10-20 years.

On February 15-17, 2005, the Commission convened thirty-two senior individuals from government agencies, forest industry, forest investment organizations, conservation NGOs, and other organizations, as well as NCSSF members (see list of participants on pg. 2). The purpose of the Forum was to explore current trends and potential future changes to the increasingly global forest products market and to build a shared understanding of what these changes could mean for forest biodiversity in the U.S. See the Appendix to view the agenda.

In planning this Forum, NCSSF members noted that some earlier forecasts included significant increases in future wood flows from forests in the United States along with a potentially large expansion of the area of planted forests in the Southern states. At the same time, many forest owners were noting the steady closure of pulp and paper mills and some solid wood plants, the shrinkage of many local wood markets, and steady increases of imported wood products. Such contrasting scenarios offer drastically different contexts for future forestry practices and forest landscapes.

The emphasis of the Global Markets Forum was on developing a shared view of likely scenarios and their implications, rather than trying to agree upon a single scenario. NCSSF hoped that such common understanding could provide a basis for greater consensus on expected changes and help identify collaborative actions to address forest productivity and biodiversity challenges. While the focus of the meeting was on forests in the U.S., it was acknowledged that some effects on forests and biodiversity are global, depending on the role of wood imports and exports and the resulting demands placed on forests in the U.S. and elsewhere.

Approach

The objectives of the workshop participants were to: (1) review and discuss four independent market forecasts in the context of their own experience to develop a shared perspective, and (2) develop a common understanding of likely global market changes for forest products and the effect of these changes on forests and forest biodiversity in the U.S. over the next 15-20 years.

The Global Markets Forum was led by NCSSF Commission member Scott Wallinger. Other Commission members participating in the forum included Ann Bartuska, Bruce Cabarle, Al Lucier, and Hal Salwasser. Tim Mealey of the Meridian Institute facilitated the Forum and its discussions to ensure neutrality in approach and the opportunity for all views to be heard and considered. Science writer Michelle Harvey recorded the discussion so it could be documented. Chris Bernabo and Aaron Lien of NCSSF managed the Forum's planning and implementation.

The workshop began with presentations from four individuals from prominent organizations, presenting their views of emerging factors and trends in global forest products markets and how those trends are affecting the demand for forest products in the United States. The presentations examined changes in overall markets as well as shifts within product groups, including, for example, the displacement of softwood plywood by oriented strand board and the displacement of virgin kraft linerboard by recycled linerboard. Geographical shifts in market demand among world regions, relative costs and efficiencies of production, comparative investment in new technology and capacity and changing demographics were among the market drivers that were examined.

After the presentations, workshop participants discussed the information and perspectives provided by them in the context of their own experience. The primary focus of these discussions was on prevailing market trends and the drivers of those trends, not on an analysis of the economic causes of those trends. However, in some cases matters of accounting and tax policy were identified as important economic elements of current trends. Building on the discussion of future demand scenarios, participants discussed the implications of these scenarios for forest biodiversity in the decades ahead.

Outcomes

Even though the planners of the Global Markets Forum were not seeking agreement on a single scenario, an unexpectedly strong convergence of views arose among both the independent presenters and the participants that global market data does not support a major expansion of wood flows from U.S. forests during the next 10-20 years; in some areas, existing flows may even diminish. Although silvicultural intensity may increase in some stands that are managed primarily for forest products, no overall expansion of intensively managed forests is anticipated for the forest landscape.

Participants also agreed that rapid urbanization in many areas is having a profound influence on forests and forestry, often overriding the importance of the forest product market. While this trend is particularly acute in the South Atlantic states from Virginia to Florida, similar changes are occurring in many other parts of the country where rapid urbanization is changing the character of forests and the ability of forest owners to practice traditional forestry. In this discussion it became apparent that demographic changes related to urbanization and the reasons for owning private forests may have just as strong an effect on forest biodiversity as market trends.

A third theme of the workshop was the relationship between the health and biodiversity of U.S. forests and the competitiveness of forest products derived from wood fiber and round wood supplied from those forests. Workshop participants noted the growing evidence that forest products derived from U.S. forests are becoming less competitive in certain segments of the increasingly global forest products market. Workshop participants from diverse forestry interests and backgrounds reached a strong common view about the desirability of "keeping forests as forests." They identified this goal as an important area of potential common cause for greater collaboration among industry, government and conservation organizations to ensure the United States' forested landscape is sustained in the years ahead.

2 FINDINGS

Four presentations on national and global trends in forest products' supply and demand provided a starting context for group discussion. Presentations and speakers were as follows:

Future Trends in U.S. Forestry in a Global Context
Roger A. Sedjo, Senior Fellow, Resources for the Future:

Global Timber Trends: Implications for the U.S. Forest Products Sector
Keith Balter, Vice President, Resources Information Systems, Inc. (RISI)

Global Competitiveness of U.S. Forestry and Forest Industry
Doug Parsonson, Principal, Jaakko Pöyry Consulting (North America) Inc.

Assessing Market Impacts on Forest Conditions in the U.S. South
Dr. David Wear, Project Leader, USDA Forest Service

The four opening presentations provided a strongly congruent pattern of global market trends that suggest only modest growth in demand for products from U.S. forests will occur during the next 10-15 years. Copies of the slides used in these presentations can be found at our web site: **www.ncssf.org**.

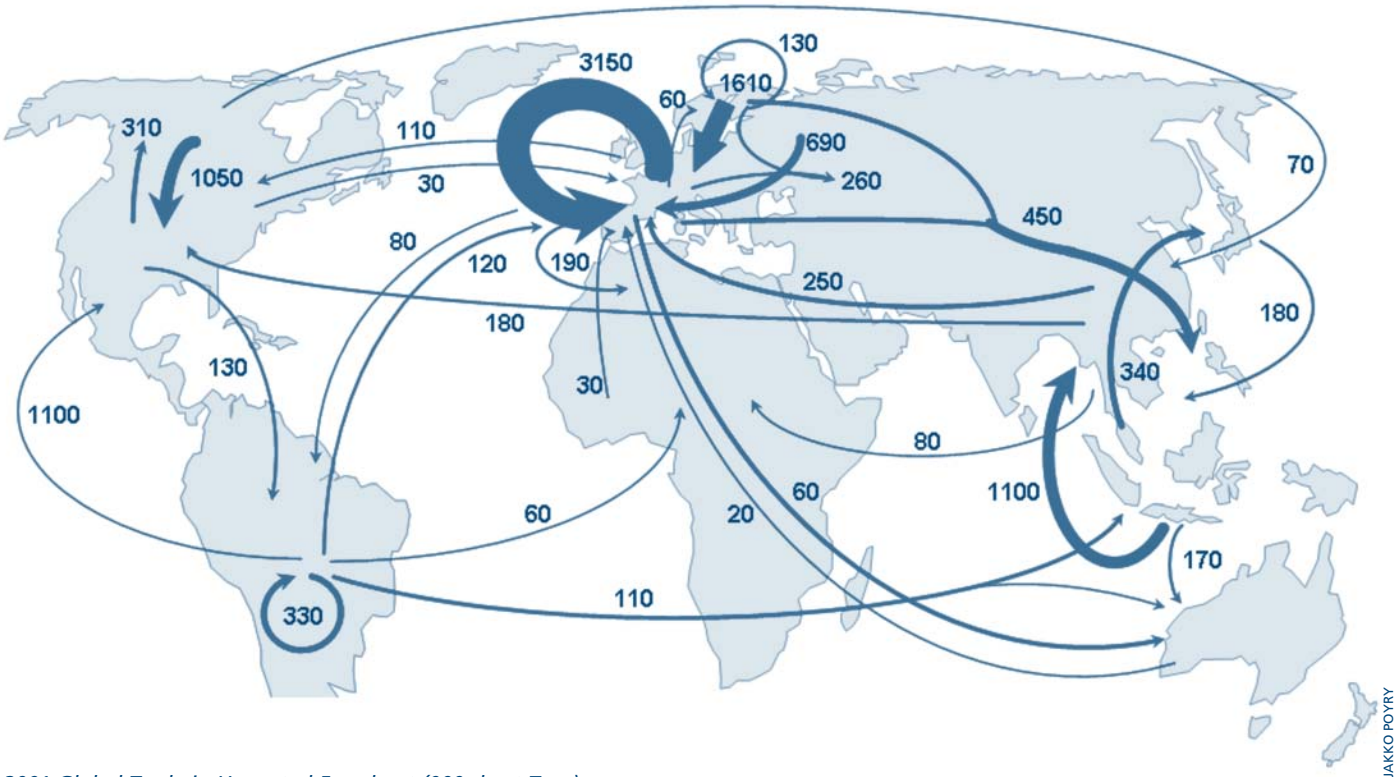
Global market trends

On a global basis, some of the salient industrial wood market trends include the following:

- **Flat Demand Over Last 20 Years**—Global demand and consumption of industrial wood was essentially the same in 2002 as it was in 1982. It has been stagnant for the last two decades despite growing world economies and population.
- **Greater Efficiency in Use of Wood**—Raw wood is being used more efficiently and the use of wood-substitutes such as plastic packaging and steel in residential construction has increased. Greater recycling is reducing demand for virgin wood.
- **Population Dynamics**—Countries with one-half the world's population do not have fertility rates high enough to maintain their current populations. These include most of the largest users of industrial wood: Europe, Russia, Japan, North America, China, and Thailand. Population growth in the U.S. is driven by immigration, not birth rates.

- **Declining Prices**—Rising timber prices during the first half of the 1990s triggered a very strong market response, but that trend peaked in the late 1990s and prices have since declined.
- **Expanding Forest Plantations**—Global tree harvesting for industrial wood is shifting rapidly from natural forests to forest plantations, and it is clear that much of the world's future incremental needs for industrial wood will come from plantations. In 2000, about one-third of industrial wood came from planted forests and by 2050 this will rise to two-thirds to three-fourths of total industrial wood used.
- **Greater Competition**—Global market cost competitiveness is increasingly being shaped by the low production costs of subtropical tree plantations in the Southern Hemisphere. Non-native tree plantations in Latin America in 2000 equaled the area of pine plantations in the U.S. South and by 2010 Latin American plantations may exceed southern U.S. plantations by some 5 million hectares. However, we noted that Brazil is not currently establishing new tree plantations at the rate required to meet its forecast internal wood needs and under current trends will be 5 million hectares short of the area needed to supply its domestic requirements 20 years from now.

Figure 1
Increasingly Global Markets…



2001 Global Trade in Uncoated Freesheet (000 short Tons)
Total 12 million short tons

- **Canadian Exports**—Canada is the primary exporter of wood to the U.S. from the boreal forest region; it has exerted a major influence of U.S. internal demand in recent years. Quebec is publicly discussing a need to reduce the annual harvest of provincial forests by 20% over the balance of this decade to reach a sustainable harvest level. Western Canadian harvest levels are artificially elevated now due to efforts to salvage huge volumes of timber killed by bark beetles and, once that timber is beyond the point of salvage, those volumes are likely to decline.
- **Russia's Role**—Russia is the other country in the boreal region with enormous softwood reserves. Harvests in Russia declined significantly after the collapse of the former Soviet Union and are only beginning to recover. Forests in western Siberia supply important and rising volumes of softwood to the Nordic countries and Europe. Forests in eastern Siberia are the primary supply of wood to meet China's rapidly growing demand, and much of this is allegedly harvested illegally. Investments in Russia from Europe and China will likely support steady growth in exports of manufactured wood products from Russia to these two regions.
- **China's Role**—China has a large area of planted forests and has been planting large areas but at a declining rate. However, much of that area is for watershed protection and other environmental purposes, and the potential success of many plantations is suspect. China will continue to be a major importer of market pulp and wood from Asia-Pacific and South America.
- **Emerging Markets**—Demand growth for paper and paperboard is largest in the emerging markets of Eastern Europe, China, Asia, and Latin America, on the order of 3.5-4.5% annually. Demand growth in the mature markets of Western Europe, North America, and Japan is on the order of 0.5-1.5% annually. North America and Western Europe will still account for more than 50% of global production in 2015. Recycled paper will supply most of the fiber needed to meet growth in demand, with virgin fiber accounting for only about 25% of the increase.

U.S. Forest Products Trends

A number of trends are evident in the United States in the face of changes in global demand and wood supply:

- **Flat Production**—Softwood lumber production trends have been flat for at least 15 years and are forecast to remain flat in the face of stagnant future demand. Demand trends for all solid wood products made from softwood sawtimber continue to trend downward.
- **Shift to OSB**—Structural panel demand has shifted steadily from plywood to oriented strand board (OSB), thereby shifting the timber demand from large softwoods suitable for veneer to smaller softwoods and "soft" hardwoods suitable for OSB.
- **Solid Wood Investments**—The solid wood products sector has been investing in new plants, mainly led by investments in OSB to replace plywood and upgrades of sawmills producing commodity construction lumber. Less visible is the hardwood lumber industry, which in many cases retains a strong position in domestic and export markets with high quality furniture grade species.
- **Flat Chemical Markets**—U.S. chemical market pulp capacity is projected to remain flat, with modest increases in some mills offset by closure of older, less efficient mills; no new Greenfield mills are expected.
- **Capacity Investments**—A very important influence on future U.S. pulp and paper capacity will be decisions by U.S. pulp and paper mills to replace aging chemical recovery boilers. These boilers cost about $80-100 million and are normally

depreciated over 30-40 years. Currently about 9% of U.S recovery boilers are over 40 years old but in 10 years almost half of U.S. boilers will be 40 or more years old. Decisions to replace them represent a major commitment to continued future production, while decisions to defer suggest assets will be depreciated in the U.S. and replaced elsewhere.

- **Industry Consolidation**—For the last 15 years the majority of capital expenditures by major companies in North America have been used for acquisitions to consolidate ownership among a shrinking number of companies. Acquisitions have been an important factor in Europe too, but proportionately more capital has been spent on new production equipment and product lines.
- **U.S. Competitiveness**—As a result of the focus on consolidation in the U.S., the "technical age" of U.S. pulp and paper assets has increased during the past 15 years, and the competitiveness of many U.S. manufacturing facilities has fallen behind those in Europe in terms of size (scale) and new technology.

Trends in the U.S. South

The Southern Forest Resource Assessment (SFRA) completed by the USDA Forest Service in 2002 and subsequent economic studies have identified some very important trends for the U.S. South. The South currently accounts for about 60 percent of all timber products made in the United States.

Trends in the South identified in the assessment include:

- The SFRA modeled four possible future trends ranging from optimistic growth to a decline in demand for forest products and timber in the South.
- Based on the rising markets that were prevalent during most of the 1990s, the SFRA report gave greater visibility to the optimistic trend that implied significant growth in demand for timber and a much larger area of plantations.
- Subsequent changes in markets suggest the flatter, less optimistic trend for wood demand from the U.S. South is more representative of current trends because increasing wood imports are decreasing consumption from these forests. This could lead to pressure to find alternative uses of forest land by many owners.
- Rapid urbanization is occurring in Northern Virginia and the "Piedmont Crescent" that extends from Raleigh to Charlotte, NC, through Greenville-Spartanburg, SC to Atlanta, GA. Similar patters are occurring in Northern Florida, Northern Alabama and the vicinity of Nashville, TN.
- Studies suggest a strong correlation between population density (people per square mile) and the ability and interest of forest owners to practice forestry. The urbanizing zones where population densities are crossing this threshold are much more extensive than the areas that have actually become urban and these areas are exerting a much stronger influence on future forestry and forest products decisions than has been realized.
- In contrast, some areas in the eastern Carolinas, southern Georgia and much of Alabama, Mississippi, Louisiana, and Arkansas are shifting from agriculture into forests.

Consensus View of Participants: The factors described in this section led to a very strong convergence of opinion among the Global Markets Forum participants that the demand for wood products made from U.S. forests is unlikely to increase during the next 10-15 years and may even decline in some regions. Although the intensity of forest management may increase in some forests managed primarily for forest products, the overall area of forests managed for wood production is unlikely to increase across the forest landscape.

3 FUTURE OUTLOOK

The presentations and subsequent discussion brought into much clearer focus three very important trends that are causing major changes in forest ownership and objectives and ultimately may exert a greater influence on forest biodiversity than trends in global markets.

First, there is the unprecedented transition of forest industry land to Timber Investment Management Organizations (TIMOs) that acquire and manage land on behalf of large institutional investors like pension funds, insurance companies, university endowments and high net worth individuals.

The forest industry has traditionally been an aggregator of forest land into large, contiguous holdings. Many of these holdings have been managed as woodlands by forest products companies for long periods of time that often exceed a half century or more. There has thus been a long period of relatively stable tenure with a focus on professional forest management based on research. Industry has been a major funder of forest research and often a driving force in the development and application of new technology. However, changing global competition and financial dynamics are causing many forest companies to divest huge areas of their forests, and the TIMOs have been the major buyers.

TIMOs and their investors also have a strong interest in high quality forestry with an emphasis on productivity for commercial products. Since their forests are not a part of a broader corporate strategy, their emphasis is primarily financial, and typically the investment is for a fixed period of time. At this point it is simply too soon to know whether TIMOs will prove to be long term holders of large blocks of forest land and funders of future research, or whether the changing financial goals of large investors will force more frequent resale of forests or their parcelization into smaller holdings as investors seek to recover their capital.

Second, the discussion of the recent Southern Forest Resource Assessment brought another factor into strong focus—the effects of urbanization on the character and management of forested landscapes in the South, as well as other regions. It is becoming clear that once population exceeds a threshold density, forested landscapes begin to lose their rural character. Forestry and land use decisions become much more reflective of rising real estate values and the potential for development than of timber markets and long-term returns from forest management. The net result of these pressures is that the effects of urbanization are felt beyond the area of actual development, affecting a much larger area of forest land than what are normally defined as “urban forests.”

Third, participants recognized the traditional role of rural family forest owners has shifted from a focus on growing trees for market. There are very large areas of family forest ownership where timber management is not the primary objective. Rather, management is secondary to recreation, use as home sites, hunting, fishing, bird watching, and so forth. The "value equation" for these owners is different from the traditional rural owner and is less influenced by timber markets, although many of these owners do sell timber and timber is usually a part of the land's value to its owner.

For these reasons, the new demography of ownership could potentially be as important to forest biodiversity as market forces in driving land use changes. This creates very important new "social marketing" challenges to engage people in new and different behaviors which they perceive as serving their own emerging goals and interests while preserving biodiversity, demanding intelligent and nuanced education.

Table 1 below, which was discussed during the workshop by one of the breakout groups, provides a useful context for discussion of those factors.

Urban and "Urbanizing" Forests

Urban forests are expanding rapidly at the expense of rural forests. Once the influence of urbanization crosses a threshold, landowner focus tends to shift toward oncoming urbanization and away from traditional forestry attitudes. Urban workers or dwellers begin to focus on adjacent forest lands for rural home sites and locations for nearby second homes. Rising property values and taxes begin to cause parcelization of forest ownerships. Forestry practices are no longer based on long-term

Table 1.
Emerging Forest Ownership Continuum

Urban and Urbanizing Forests…
Rapidly expanding areas in which rising population densities are changing forest characteristics from "rural" to "urban"
- Opportunities to practice traditional forestry are decreasing
- Industry is less likely to invest in new facilities

Rural "Non-Timber" Family Forests…
A growing area of forests in rural areas where the primary emphasis is on second homes, wildlife, recreation and other values
- Timber production and harvesting are secondary to other uses
- Forestry intensity will yield lower future wood flows

Rural "Traditional" Family Forests…
A shrinking area of rural forests where wood production for revenue is a major influence on forestry practices
- Area losses mainly to urbanizing and "non-timber" focus
- Few market drivers for major increases in intensity of forestry practices

Public Forests Managed For Multiple Uses
A constant area of rural forests managed for multiple uses and values where timber is not the dominant goal.
- Fairly constant area, some of it contiguous to urban areas
- Heavily dependent on government and legal policy processes

Intensively Managed Commercial Forests…
A relatively stable area of forests where genetics and other factors drive upward wood productivity
- Strong shift from industry to TIMO ownership
- No visible driver for investments in large areas of new plantations

Public Forests Managed for "Naturalness" and "Wildness"
Wilderness Areas, National Parks and similar areas where no management or management for purely natural aspects is predominant.
- Primarily within National Forests, National Parks and NGO preserves
- Important reservoirs of older forests with minimal human influence on biodiversity

forestry objectives, but may be interim actions pending future development decisions. Increased forest fragmentation and ownership parcelization are major trends.

Rural "Non-Timber" Family Forests

"Non-timber" family forests are an emerging sector within the traditional rural private forest ownership class whose implications are not yet fully understood. Landowners may continue to derive value from the sale of timber, but these revenues are not the driving factor in decisions about use and management of the properties. Revenue sources are increasingly shifting to hunting and recreation leases or fees and other uses. Sometimes the owners focus is entirely on meeting their personal recreational and privacy needs. Silviculture must accommodate these new primary emphases. However, while these provide alternative values to forest owners, the resulting forest stand conditions may not be efficient in terms of wood harvesting and procurement and may detract from the future efficiency of firms that now depend on these forests for wood supply.

Rural Traditional Family Forests

This segment of private forest ownership was at one time eroded by expanding forest industry ownership. It is now shrinking due to shifts towards urbanization and other non-timber emphases. Family forests east of the Great Plains have traditionally been the source of the majority of forest industry's wood supply; their shrinkage in this region may limit the growth of industry in the future even if market and economic conditions were to warrant such growth. Supply is a major factor in the forest industry's decision to invest capital in mill and manufacturing facilities. The perception that wood supply will decrease from family forests in the future may lead to major capital investments outside the U.S.

Public Forests Managed for Multiple Uses

National Forests and many State Forests represent a fairly constant area of rural forests that are managed for multiple uses and values where timber is not the dominant goal. They are generally not at risk of conversion to non-forest uses, but they are not immune from the effects of urbanization and global markets. Public forests near urban areas are subject to heavy recreational use and to especially strong demands for prohibitions on timber harvesting, prescribed burning, and other management activities. Changes in policy on timber versus other outputs often have a significant impact on other forests. Management and investment decisions are made for multiple objectives that are not necessarily driven by markets. Forestry decisions are heavily influenced by relevant laws and regulations and often involve comprehensive and often cumbersome planning procedures. While such procedures provide opportunity for large numbers of diverse stakeholders, they often inhibit rapid adaptation of new science and practices.

Intensively Managed Commercial Forests

For the last 50 years, the forest industry's intensively managed forests and many family forest owners were the dominant participants in this group. Planted softwood forests are the most visible ownerships (especially in the South), but this segment also includes significant areas of natural

forests in the South and other regions, managed with high ilvicultural intensity. The forest industry has begun a large and highly visible reduction of its ownership, reflecting changing self-sufficiency needs as forest productivity has increased along with needs to generate cash to reduce debt resulting from industry consolidation. In recent years, a significant amount of forest industry land has been sold to timber investors (pension funds, endowment funds, insurance companies, high net worth individuals, etc.) who wish to diversify their investments. The long-term future of this class of investments is still unknown beyond this initial cycle of ownership transition.

Commercial forestry appears to be an area in which increasing intensity of forestry practices will continue in order to raise productivity and enhance returns on investments. Continued use of trees improved by genetic tree breeding and potentially greater use of clonal plantings will be supported by use of fertilizers and weed control to maximize gains. The volumes we see now from plantations are from investments that were made years ago.

However, there is no market evidence to suggest that the total area of planted forests will increase significantly during the next 10-15 years:

- Forest industry is divesting, not acquiring, land and the land it owns is already in forest plantations.
- TIMOs are primarily acquiring forest industry lands, and while they tend to replant the planted forests that they harvest, they are not heavily engaged in converting natural forests to plantations.
- Family forest owners are more concerned about declining markets for their timber than a need to grow more wood to meet rising demands, and their emphasis tends to be on diversification of revenue streams rather than intensification of forestry practices. Federal forestry cost-share programs that encouraged new forest plantations in the past (Soil Bank, Conservation Reserve, ACP, FIP, etc.) are no longer in existence and current programs emphasize conservation and environmental practices rather than wood production.

Public Forests Managed for "Naturalness" and "Wildness"

This category includes the substantial legally designated Wilderness Areas and roadless areas within National Forests, forested areas in National Parks, many of the forests owned as biodiversity reserves by various conservation non-governmental organizations and a diversity of scattered smaller parcels. These areas are not significantly affected by market and social forces and are protected under policies and regulations intended to ensure the human impact on them is minimal.

Consensus View of Participants: The most important challenge for maintaining and enhancing U.S. forest biodiversity is keeping current forestland in forest usage. This means slowing conversion of forests to other land uses such as development that permanently removes forest cover. A globally competitive forest products sector will be essential but not sufficient in meeting this challenge regarding privately owned forests.

4 IMPLICATIONS FOR FOREST BIODIVERSITY

Participants spent the second day of the meeting discussing the biodiversity implications of flat demand for U.S. wood products and changing demographics of forest ownership, as well as possible interventions. Participants agreed stagnant markets will have regionally variable repercussions for forest biodiversity. In the western half of the U.S., where public land predominates, harvesting has been reduced drastically over the last 10 – 20 years. This has led to a pronounced shift in demand to the South and regions outside the United States.

National forests and most other federal and state forests lands are managed to mimic natural processes—a trend with potential to spread to private lands, leading to the following:

- As simulation of natural forest patterns and processes spreads from public lands, more private land owners may choose longer rotations in order to increase the proportion of higher valued wood products, and this could lead to a larger area of complex, older planted forests. This is already occurring on some family owned and some industrial forests where owners are trying to differentiate their forest products from traditional commodities. Owners in some states may also choose not to reinvest in planting after harvest, thus allowing areas to revert to mixed species of natural origin. However, this is not permitted in states with forest practice laws if natural reforestation fails.
- The total area of intensively managed forest land is unlikely to increase. Some of today's intensively managed forests will be converted to non-forest uses or to less intensive forest management regimes. At the same time, some of today's agricultural lands and natural forests will be converted to plantations and managed intensively for timber as owners seek higher and more competitive financial results. Implications for biodiversity depend on many factors. Perhaps none is more important than the net effect of land use conversions on total forest area.
- In fire dependent ecosystems, traditional management interventions are insufficient to keep forests healthy and resilient. If current trends continue, these lands will be hit hard by uncharacteristically intense fire, invasive plants, and insects, with subsequent impacts on native species biodiversity, most of which will be negative.

In the Northeast and South and parts of the northwest, industry-owned forest lands are being divested rapidly, primarily to timber investment and management organizations (TIMOs), but sometimes to smaller landowners who use their land as home sites and for recreation, not as commercial forests.

- Conversion of large aggregates of forest industry lands to multiple ownerships may ultimately lead to *parcelization* if future owners resell the land in smaller tracts. The potential for future forest *fragmentation* into small discontinuous areas of forest and the resulting implications

for forest biodiversity are unknown, though more fragmentation is likely. However, it is clear parcelization, regardless of fragmentation, has important and often negative implications for forest biodiversity.

- In general, increased parcelization makes it harder to manage forests with fire, to control invasive species, and to undertake other forms of management necessary to maintain and restore forests. It increases the human footprint on forests by increasing the likelihood of additional houses and the associated effects of commercial development, traffic, impervious surfaces, invasive species, artificial lights, noise and other factors. Parcelization increases timber harvesting and forest management costs by reducing economies of scale, and this may enlarge competitive disadvantages. It increases the transaction costs of managing forest landscapes because of the need to deal with multiple landowners instead of just one.
- A diversity of many different owners can also generate healthy forest diversity across a landscape with advantages for some elements of biodiversity. However, this landscape-scale diversity may also create adverse impacts for species needing large, contiguous parcels of relatively undisturbed land to survive, and those that need very specific sites to remain protected and undisturbed. Biologists note that thriving populations of some endangered species are more likely to be found within larger properties than scattered among smaller tracts. Others, however, will thrive only where frequent disturbance keeps their habitats productive, e.g., Kirtland's warbler.
- In parcelized landscapes, water quality is also often at risk. Disparate land uses will have different impacts on water quality. When different landowners are managing their lands for different uses and goals without communicating with one another, though the management on each individual parcel of land may be sound and not cause undue harm to water quality, the cumulative effects of fragmented planning across the landscape may adversely affect aquatic resources.

Forest plantations will remain under intensive management by forest industry, TIMOs, some state forests and many family forest owners in order to expand competitive advantages and enhance financial returns. However, the expected continued trends toward stagnant demand, increasing land values for development, and increasing costs for environmental management are unlikely to lead to any significant expansion of such forests. The forest industry is divesting rather than adding to its ownership already under intensive management. TIMOs tend to acquire existing intensively managed forests rather than marginal forests and then upgrade the productivity and value of their acquisitions as part of their investment strategy. Forest owners have little financial incentive to invest where markets are declining, and former government programs that encouraged forest plantations now emphasize "stewardship" in a broader environmental context.

Relationships between forest industry competitiveness and biodiversity must be analyzed in context of overarching trends in land use and forest management that vary greatly among regions. Forum participants were in agreement that a long-term decline in U.S. industry competitiveness would reduce economic returns to timber production and thus reduce incentives for keeping forestlands in forests. In areas where real estate development pressure is the greatest (e.g., suburban Atlanta), it is unlikely that changes in industry competitiveness could have more than a transient effect on land use decisions and biodiversity. In contrast, changes in industry competitiveness could have major effects on biodiversity in areas where economic returns of wood production affect a dynamic equilibrium in land uses among agriculture, forestry and low-density residential uses.

Maintaining system balance is the more complex issue. A healthy and competitive forest products industry can keep the small and large producers working and connected to achieve common goals. Biodiversity can be rich at a landscape level, despite varying degrees of biodiversity acre to acre. The re-conversion of farms to planted forests typically increases forest biodiversity on those lands, even though planted forests are typically less diverse than naturally occurring forests. Landscape- and community-level management are both important.

5 FUTURE CHALLENGES

A major future challenge is in maximizing incentives for family forest owners to retain their forests in either traditional wood-based forestry or in emerging recreationally-focused forestry. This places more emphasis on activities that discourage rampant urbanization—in advance of actual growth of cities, parcelization and fragmentation of ownerships—and maintain options to actually manage forest lands for rural versus urban objectives. Participants suggested the following:

- New means need to be devised to encourage society to "value forests as forests," augmenting values gained through traditional and niche wood markets with values derived from emerging markets and incentives that value the public benefits of forest conservation such as water quality, fish and wildlife, recreation, and carbon storage. A market for environmental services could be a valuable incentive for converting marginal agricultural lands to forests. Virginia has a working program for buying and selling conservation agreement tax credits which is one potential model. In North Carolina, wetland credits have outperformed development as a return on investment.
- An environmental services market requires a regulatory framework, e.g. there is a limited market for carbon because there are no limits. Appropriate trading mechanisms are also important for such markets to function. This could be developed privately, as in the case of the Chicago Carbon Exchange, but there may be a role for government in providing incentives or a context. Certain federal legislation, including the Farm Bill, may provide a context for discussion of these possibilities as well as their implications.
- Research is needed to develop metrics and design institutions to support markets for environmental services. Research could define specific biodiversity needs, provide specific indicators that will help identify and quantify biodiversity impacts, and support biodiversity valuation by parcel.
- More examples are needed of mechanisms that can provide financial incentives to forest owners to supplement or offset revenues from the sale of timber. Investments by New York City to provide financial incentives to emphasize management for enhanced water quality and flows from the Catskill Mountain region into the city's reservoirs is often cited, but similar examples are few and far between.

- Biomass harvesting is another viable option for forest growers, especially as the price of oil escalates. Incentives can target low value products to encourage the complementary removal of biomass in ways that enhance forest stand health and resilience to drought stress, insects and uncharacteristic fires, all potentially beneficial to forest biodiversity.
- Solid wood products research can find new ways to add value to trees of various species, but the U.S. is not investing at a level or on a scale comparable to many countries in wood products innovation research. European Union countries, for example, are constantly innovating new wood-based products.
- Traditional forestry tax incentives need continued support. Several states promote good forestry by significantly decreasing land taxes if the owner has a forest plan or allows access by the public for recreation and hunting.
- An uneven regulatory playing field—domestic or global—threatens forests in multiple ways. Forest certification is by itself not a sufficient lever. There is much federal and state governments, working in partnership with universities, industry, and conservation organizations, can do to ensure U.S. forests and forest industry have the conditions to remain competitive. This may include harmonized forest practices, tax policies, laws and regulations, an adequately educated work force, research and technology development and delivery, economic development incentives and other means to encourage investment in modern forestry practices and forest products manufacturing facilities.
- Intensively managing a small percentage of forest lands may enable taking advantage of all available options to maximize fiber production to meet most of our demand for wood. Meanwhile, other lands may take advantage of yet-to-be-determined financial incentives to enhance conservation of elements of forest biodiversity not well accommodated by intensive commercial forestry.

Forum participants had an active discussion of the changing nature of land protection. In the U.S. South, for example, the forest industry has for the last 60 years been a sort of public proxy, holding large contiguous tracts of land and managing areas with special conservation values. But the costs associated with special management have decreased industry competitiveness against lower cost global players. As industry lands are divested, it raises the question of who will protect large landscapes, creating a challenge and opportunity for both government agencies and NGOs such as The Nature Conservancy and The Conservation Fund to foster eco-regional planning. This is further complicated by increasing budget pressures on states leading to further reassessment and sale of public lands to reduce expenses and balance budgets.

- Environmental NGOs already invest $100 to $200 million a year in biodiversity through conservation agreements. To better capitalize on agreement efforts and keep valuable forests in working status, more public resources are needed for programs such as Forest Legacy, currently with $80 million in funds annually.
- The public land base needs to be reassessed to see if lands currently in public ownership are appropriate. Would it be better to sell highly productive public lands to the private sector, and own and manage public lands for environmental services and complex forest biodiversity?
- Low interest rates have also changed land ownership patterns. Individuals with significant acquired wealth have bought large areas of land. It is unclear how this will play into allocation of lands and impacts on biodiversity. Some people are setting up long term protected estates for biodiversity management, but these holdings may be broken up again through estate laws over time.

The role of public education was also considered. The traditional challenge of educating family forest owners with potential for either protecting specific aspects of biodiversity or succumbing to

development pressures is becoming more difficult, especially since many of the newer land owners don't see themselves as forest owners at all.

Another education challenge is linked to "supply chain activism"—efforts to change consumer buying patterns as a way of altering corporate land management practices. For example, some environmental organizations are arguing against large plantations and clearcuts in the Cumberland Plateau even though trends are in the direction of more parcelized land holdings and stable to reduced timber harvesting patterns. Forum participants saw a significant disconnect between campaigns to stop harvesting in the southern Appalachians and the desire to keep forests as forests and thereby preserve forest biodiversity, especially since industry is divesting much of its land holdings. As in the traditional policy arena, good and complete information support is needed to help people evaluate the validity of campaigns.

Emerging demographics as well as changes in economic markets highlight an urgent need to create equivalent financial values from environmental services: biodiversity, which might need to be communicated as native fish, wildlife and plants in some parts of the U.S.; water; carbon; and recreation. Today, hunting is the primary source of recreational value, although other forms of recreation show potential on a small scale to date. An early carbon trading exchange exists, and there are examples of payments to forest owners for water flows and quality, e.g. in upper New York state. Biodiversity enhancement for most private forests with wood production goals beyond simply maintaining forestland in forest use is primarily from voluntary conservation agreements at this time.

FORUM IMPLICATIONS FOR NCSSF

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The scientific information and the forestry tools that NCSSF is developing will be of value to the owners of managed forest properties. The information from this forum suggests tools developed to enhance forest biodiversity within the context of current forest management will remain useful during the next 10 to 20 years.

Science-based information and forestry tools to address the growing area of urbanizing forests may be a very important emerging need. This category of ownership lies between traditional rural forestry and traditional urban forestry. Since the management of those forests is not driven by markets as much as by the threat or potential for urbanization (depending on the viewpoint of the forest owners), special knowledge and tools may be needed to encourage good management decisions under these circumstances. Empirical knowledge in this area may be supported by existing elements of science, but it is unlikely much of that science has been synthesized in a way similar to what NCSSF has been doing for more traditional rural forests and forestry. As urban forests become more prevalent in large parts of the future landscape, the implications for biodiversity and other values such as watersheds and soil conservation may be enormous.

Also, much NCSSF emphasis is placed on the biodiversity of forest landscapes. This discussion introduced important new thinking about the rapid expansion of "urbanizing" forest conditions as well as the emergence of family forest owners who emphasize non-traditional ownership objectives. Both of these introduce important new elements into the forest landscape that have potentially positive and negative biodiversity implications. They also highlight the need for non-traditional forest management tools to aid these forest owners and the forestry professionals who support them.

These insights will be used as NCSSF shapes the final years of its program.

APPENDIX

NCSSF Global Markets Forum Agenda

Peabody Hotel
Orlando, FL

Day 1—February 16th

8:00 am Introduction and agenda review

8:15 am Presentations: possible future market scenarios (30 min each + 15 min for questions)
Roger Sedjo, PhD, Senior Fellow, Resources for the Future
Doug Parsonson, Principal, Jaakko Pöyry Consulting (USA)
Keith Balter, Vice President, Resource Information Systems, Inc.
David Wear, PhD, Project Leader, USDA Forest Service

11:30 am Additional Questions and Discussion

12:30 pm Lunch

1:30 pm Scenario Development Plenary—Drawing from the presentations and their own knowledge, participants will be asked to identify key trends and drivers in the U.S. forest products industry and develop a general outline for a limited number (2-4) of reasonably plausible scenarios for how these trends will influence demand for wood from U.S. forests.

2:45 pm Breakout Sessions—Participants in each breakout group will work to refine the scenarios developed in the plenary with the goal of describing the key features of the discreet scenarios on the future of the U.S. forest products industry and its wood needs.

5:30 pm Adjourn

Day 2—February 17th

8:00 am Plenary Session: Presentations from the breakout groups to the plenary

8:30 am Breakout Sessions Continued
What are the implications of the market scenarios developed during the first day on forest biodiversity in the United States? Specifically, what strategies, and by which key actors, are likely to deployed under each scenario, and what are some potential impacts these strategies may have on biodiversity?

10:45 am Plenary session: Synthesis and discussion of breakout session results

11:45 am Summarize Outcomes and Clarify Next Steps

12:15 pm Adjourn