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# *The Southern* Forest Futures Project:

## *Using Public Input to Define the Issues*

David N. Wear,
John G. Greis,
and Nancy Walters




## Authors:

David N. Wear, Project Leader, Forest Economics and Policy Research, Southern Research Station, Forest Service, U.S. Department of Agriculture, Research Triangle Park, NC 27709; John G. Greis, Analyst, State and Private Forestry, Southern Region, Forest Service, U.S. Department of Agriculture, Tallahassee, FL 32399; Nancy Walters, Organization Development Specialist, Southern Research Station, Forest Service, U.S. Department of Agriculture, Asheville, NC 28804.

## Cover photo:

First infrared data from GOES-12 geostationary satellite taken September 21, 2001. [photo courtesy of National Oceanic and Atmospheric Administration (NOAA)]

## Inset photos:

**UPPER SET**: Top row, left to right: kudzu kills trees by shading them (photo by Kerry Britton, U.S. Forest Service, Bugwood.org); damaged trees after Hurricane Katrina (photo by Patrick Hesp, Louisiana State University Hurricane Katrina and Rita Clearinghouse Cooperative); acorns (U.S. Forest Service photo); hurricane damage (photo by Peter L. Lorio, U.S. Forest Service, Bugwood.org). Bottom row, left to right: Buffalo River, Ozark National Forest, AR (photo by Bill Lea, U.S. Forest Service, retired); small diameter biomass (U.S. Forest Service photo); kayaker (photo by Bill Lea, U.S. Forest Service, retired); and prescribed fire (photo by Dale Wade, U.S. Forest Service, retired).

**LOWER SET**: Left to right: site preparation with a track-layer (U.S. Forest Service photo); ice storm damage in Arkansas (U.S. Forest Service photo); industrial electrical generating plant (photo by Larry Kohrnak, University of Florida); and 2007 Georgia wildfires (photo courtesy of the National Interagency Fire Center archive, Bugwood.org).

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Southern Research Station
200 W.T. Weaver Blvd.
Asheville, NC 28804

*The Southern*

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# The Southern Forest Futures Project: Using Public Input to Define the Issues

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**Abstract**

The Southern Forest Futures Project has been designed to evaluate the implications of potential futures for the many goods and services forests in the Southeastern United States provide. To ensure that the Futures Project is comprehensive and relevant, we have begun with a thorough scoping of issues using a process that elicits input from various interested publics. We have held public meetings in 14 locations around the South and through 3 online "Webinars." The meeting sites provided at least two public meetings in each of five ecological subregions and no fewer than one public meeting in each State. We gathered > 2,200 comments using a structured-workshop format and processed the compiled data to define a comprehensive view of how forces of change may reshape forests, and how these changes could affect the various goods, services, and values of forest ecosystems. We also identified a set of meta-issues that warrant in-depth analysis to evaluate their potential influence on the future of forests. These topics of concern include bioenergy, climate change, forest ownership change, invasive species, fire, taxes, and water. The input on meta-issues, forces of change, and resource implications will be used to organize subsequent stages of the Southern Forest Futures Project.

**Keywords:** Assessment, forecasting, public involvement.

## Introduction

The Forest Service, U.S. Department of Agriculture, Southern Research Station and Southern Region, in partnership with the Southern Group of State Foresters, is conducting a broad-scale assessment of potential futures called the Southern Forest Futures Project. This effort builds on the Southern Forest Resource Assessment (SFRA; Wear and Greis 2002a, 2002b), which identified several forces of change reshaping forests and the potential implications of these changes for economic conditions and ecological services. The Southern Forest Futures Project (herein referred to as the Futures Project) is planned to further examine how these and some emerging factors could reshape forests over the next half century and beyond. While the SFRA provided forecasts of some key variables, it focused primarily on understanding trends and conditions. The Futures Project will focus on forecasting change and its potential implications for forest ecosystems, their services, and human communities (both near to and far from those ecosystems). The Project's overall goal is to inform forest management choices, policy discussions, and science programs with the best possible understanding of the long-term implications of changes in southern forests and critical uncertainties regarding forest sustainability.

To begin the Futures Project, we surveyed broad public interests and concerns regarding current and anticipated trends affecting forests in the South. This paper describes the public participation process used to elicit public input and understand the findings. These findings define how driving variables and implications of these drivers are interlinked in a network of social and natural systems in the Southeast, and helps define a suite of issues to be considered in conducting the Futures Project.

In the next section we present an overview of plans for the Futures Project, and then describe the design of the process used to elicit public input on the issues to be addressed, followed by the process we used to summarize input for use in the subsequent stages of the project. We conclude with a description of what our publics said and how we will use their input in subsequent phases of the Futures Project.

## Overview of the Southern Forest Futures Project

Regional scale resource assessment in the South is especially challenging because of the broad diversity of ecological systems, economic conditions, and social settings found in the region. Much of the knowledge base relevant to forests is ecosystem-specific; social dynamics and resource problems are spatially variable. Further, the various forces of change at work in southern forests are understood by varying degrees and with different levels of certainty. We have designed a three-tier analysis approach to address the simultaneous needs for a coherent regional outlook on forest futures and a detailed analysis of ecological, economic, and social effects.

### Forecast Analysis

This tier of analysis will start with the development of various scenarios for describing potential futures and for guiding detailed analyses. Each scenario will be defined by a storyline describing the (exogenous) economic and biophysical context of the region and will need to be internally consistent across multiple driving variables. First, a team of experts will draft scenarios using input from public meetings. An analysis team will then use quantitative models to forecast implications of these discrete scenarios.

The analysis team will perform quantitative analyses of forest futures organized around a technical forecasting

system, the U.S. Forest Assessment System or USFAS[1] (Wear 2005). This forecasting system simulates future forest conditions and structure in response to land management and resource markets, as well as climate and other disturbances for all States in the South (fig. 1). Detailed future scenarios, defined by trajectories of population, wood product markets, climate, and other factors can be evaluated using the USFAS. The results will include detailed forecasts of forest inventories, land uses (including forests and their management), timber harvests, and economic and social conditions across the South. These generated data are provided at relatively fine scales and can be aggregated to address regional and subregional questions.

## Meta-Issue Analysis

This tier of analysis will be used to address some issues at the broad regional level using a knowledge-synthesis approach similar to that used in the SFRA. That is, for each of what we call meta-issues, scientists/analysts will be enlisted to pull together the best available information to address specific concerns that are not necessarily amenable to technical forecasting. They will use a deductive approach to describe possible effects of the scenarios we developed, including how such issues may evolve and how we might better gauge the uncertainty associated with effects.

## Subregional Analysis

Every subregion of the South has unique ecological and social attributes and specific issues of concern about forest ecosystem and economic changes. Further, most ecological and forest resource research is specific to particular ecosystem types. In this tier of analysis, an interdisciplinary team will be formed for each subregion to interpret the scenario-based forecasts and the findings of the regional issue analyses to develop specific implications for each subregion.

For this project, we have divided the South into five subregions (fig. 1). (In addition, Puerto Rico and the U.S. Virgin Islands are initiating a forest resource assessment as a first step toward forecasts of future Islands forests. An Islands Team will eventually be formed, and a parallel approach to evaluating the Islands forest future will be linked to the Futures Project.) The divisions are roughly based on aggregations of similar ecological sections, and each has separate social/cultural/economic identities as well. However, subregions are not homogenous, and teams will need to address the diversity of conditions and concerns within each subregion. A separate report will draw out the implications for each subregion of the South.

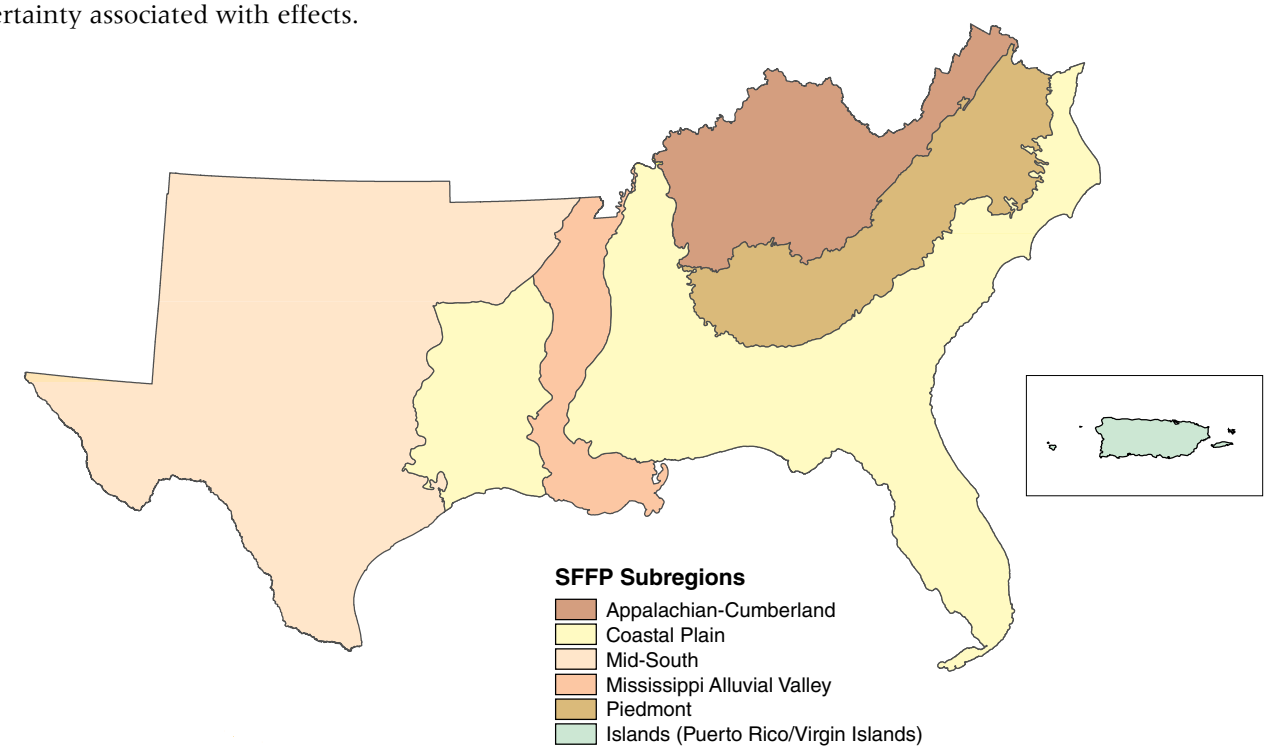


Figure 1—Subregional analysis areas defined for the Southern Forest Futures Project.

[1] Wear, D.N. 2005. U.S. Forest Assessment System: Project Plan. Unpublished manuscript on file with: Forest Service, U.S. Department of Agriculture, Forestry Sciences Laboratory, Research Triangle Park, NC 27709.

### Defining the Scope of the Project

A wide array of issues could be addressed by a project such as this, so deciding what to focus on (and what not to focus on) will be critical to conducting and ultimately discerning a project's usefulness. Because the Futures Project is intended to address a broad complement of issues that affect the decisions of forest managers, policymakers, science leaders, and the interested public, we sought extensive input from the public on specific issues that need to be addressed. Input was integral to the formulation of specific plans for all tiers of analysis. For the forecasting work we sought input that would help shape the scenarios we would analyze using technical models. In addition, we needed input to define and describe the sets of regional assessment questions. For the subregional analysis, we sought input on the potential ecosystem and local economic impacts of future changes and the values at risk within each of the subregions.

It is important to consider what "the public" represents in the context of this project. In contrast to public involvement processes for resource planning or administrative decisionmaking—where input focuses on deducing values held by the public and their preferences regarding outcomes—we simply sought information regarding the range of issues, questions, and uncertainties regarding the future of forests and their various goods, services, and values in the South. This information will be coupled with the expertise of the analysis teams to define the most important issues for analysis within the Futures Project. We sought broad participation from all "stakeholders," including landowners, researchers, and forestry agencies, as well as the public at large, but did not have a means of determining whether this was a representative cross section of all demographic subgroups within the region. No weighting or voting was applied to the comments received, so that the focus was on the entire set of issues, not just an aggregate of preferences.

## The Input-Elicitation Process

We sought public input on the focus of the Futures Project because a broad array of citizens and organizations has strong interests in the issues regarding southern forests and important stakes in how the Futures Project addresses those issues. In addition, the geographic scope and the objectives of the project are broad and must be vetted by a wide range of local stakeholders, who bring their own perspectives and expertise. Accordingly, we used a carefully designed public participation process to elicit input from the interested individuals and public organizations or groups. Our primary objective was to consider their insights into the forces of change in southern forests, as well as the potential implications of such changes in forests from an ecological and socioeconomic point of view. In effect, we want to get the questions right.

Our second objective was simply to review and discuss the project with the interested public in order to build interest and trust in the process. By providing information on the project's scope and objectives, we hope to clarify stakeholder expectations.

This input elicitation phase represents only one part of an ongoing discourse with the public in the conduct and evaluation of the Futures Project. Following principles described by Bleiker and Bleiker (1995), we intended to make the project fully transparent to the public and to provide stakeholders with ample opportunities to have meaningful input at several junctures throughout the process, including our elicitation of input on the scope and focus of the project, evaluation of study plans, review of final reports, and broad discussions of findings. Input is only meaningful to the extent that the project is responsive to it, and we posted records of the input we received. This document is intended to describe how public input is interpreted and used.

The largest part of our input elicitation process was focused on public meetings held in 14 locations around the South (table 1). This set of meeting sites provided at least two public meetings in each of the five subregions and at least one public meeting in each State. It was important to have a meeting in each State because State agencies had a strong interest in participation in these meetings, but would have had difficulty traveling to out-of-State meetings. We also reproduced the face-to-face meetings through three "Webinars" using internet and phone access, which allowed people to participate without traveling to meetings. Two of these were held in the evening to provide opportunities for people to participate after work hours. The public was also invited to provide input through the project Web site, which provided the same information delivered at the face-to-face meetings.

We applied what could be called a "viral" approach to seeking public participation. We sent meeting notices to a general mailing list for the Forest Service Southern Research Station, and Public Affairs offices on the national forests sent notices to citizens on their contact lists. We also contacted State forestry agencies and asked them to forward the announcement to their contact lists. The State Forester, land-grant forestry departments, and forestry associations in each State also were notified. In each case, recipients of meeting notices were invited to disseminate the notice through their own networks of associates. In addition, to alert the public-at-large, we issued press releases to media outlets in the cities where meetings were held.

We designed the meeting format to encourage input on a full set of issues relevant to forest futures but within a formal structure that helped organize discussion. To set appropriate context, we started each meeting with a 1-hour general session, where the project's co-leaders introduced objectives, the general management plan,

**Table 1—Locations, subregions represented, and schedule of public meetings held for the Southern Forest Futures Project, 2008**

| Meeting location | Subregion represented | Date |
|---|---|---|
| Baton Rouge, LA | Coastal Plain/ Mississippi Alluvial Valley | Jan 29 |
| Stoneville, MS | Coastal Plain/ Mississippi Alluvial Valley | Jan 30 |
| | | |
| Gainesville, FL | Coastal Plain | Feb 7 |
| Charleston, SC | Coastal Plain | Feb 8 |
| | | |
| Little Rock, AR | Mid-South/Mississippi Alluvial Valley | Feb 13 |
| College Station, TX | Mid-South | Feb 11 |
| Stillwater, OK | Mid-South | Feb 12 |
| | | |
| Lexington, KY | Appalachian Cumberland | Feb 19 |
| Nashville, TN | Appalachian Cumberland | Feb 21 |
| | | |
| Raleigh/Durham, NC | Piedmont/Coastal Plain | Feb 25 |
| Blacksburg, VA | Appalachian Cumberland | Feb 26 |
| Asheville, NC | Appalachian Cumberland | Feb 27 |
| | | |
| Athens, GA | Piedmont/Coastal Plain | Mar 6 |
| Auburn, AL | Piedmont/Coastal Plain | Mar 7 |
| | | |
| Webinar #1 | All subregions | Apr 8 evening |
| Webinar #2 | All subregions | Apr 16 afternoon |
| Webinar #3 | All subregions | Apr 16 evening |

and a timeline for implementation. This addressed a need to inform the public of our intent, and offered the participants an opportunity to ask questions—and the leaders to respond to them—regarding the legitimacy, objectives, and structure of the project.

After broadly reviewing and discussing the project, we then provided a general taxonomy of changes likely to affect forests in the South, based largely on the findings of the SFRA (Wear and Greis 2002a, 2002b). This framework included three primary drivers of change:

1. Economic factors—changes in the demands for goods and services derived from land and natural resources, and changes in the scale and distribution of economic activity

2. Social factors—changes in the social context of resources management, including general societal changes related to the size and demographic composition of the general population, as well as changes in the demographics of forest landowners

3. Institutional factors—changes in the institutional framework within which land is managed, including current and new systems of taxation, regulations, and public policies and programs

Changes in these three primary drivers help drive changes in forested landscapes through four broad forces of change:

1. Land use—Changes in economic, social, and institutional factors can all have direct and indirect effects on land use choices. Notably, population and income growth give rise to development and urbanization, which consume forest and other rural land. In addition, changes in agricultural and forest product markets can shift land use within the rural landscape.

2. Forest Management—Much of the forested landscape of the South is actively managed for timber and other forest products; nearly every acre of forest has been harvested at least once in the past 100 years. Changes in timber markets as well as in forest-growing technologies can alter the way forests are managed.

3. Physical—Changes to the environmental context of forests can have important implications for forest structures and uses. Climate change portends changes in forest extent and species composition in parts of the South. Wildfire and changing fire regimes, hurricanes, ice storms, and other large-scale events alter the health, productivity, and structure of forests in the region.

4. Biological—Biological agents can have important impacts on forests. Both floral and faunal invasive species have restructured forests, and newly introduced invasive species foster uncertain implications for future forest ecosystem structure and health.

For each of the three primary drivers and four forces of change, we presented our public audiences with definitions and then several examples of relevant changes (based on the SFRA) during the opening general session. Doing so provided a starting point for the second part of the meeting, where we conducted 2-½ to 3 hours of facilitated discussions organized around these seven topical areas. To ensure that discussion groups were effective, we set up several breakout discussion areas according to the factors/forces of change. At each location we grouped topical areas to define discussion groups of 10 to 12 people and assigned a facilitator to each of the breakout areas. We recruited potential facilitators before the meetings and briefed them on process and expectations immediately prior to each session. We coached facilitators to elicit and record the input without debate or judgment as to value or validity, and instructed them to focus discussion on clarification of content but not on approving or rejecting the comments. This highly organized approach

provided a structure for the meetings that helped focus discussions for the limited meeting time, while it provided a context broad enough for participants to raise whatever issues or concerns they came to share.

Within each discussion group, facilitators asked participants to provide input on (1) details regarding how the drivers/forces of change could play out both at the regional and subregional scales and (2) potential implications of such changes in forest conditions, services, and other values in the region. Team facilitators gathered input on flip charts and in some cases keyed input into a computer onsite. At regular intervals, we signaled participants to move to another discussion area where the facilitators provided a briefing on previous discussions of the topic and asked for additional input. This encouraged discussions that were additive rather than repetitive. We allowed time for participants to provide input to all of the breakout groups.

Following each meeting, all input was transcribed from flip charts and entered into a spreadsheet. Each comment was labeled with the location of the meeting and the topical session in which it was provided. In addition, comments addressing local concerns were labeled with the specific subregion. Co-leaders then examined each comment and grouped comments under several labels. The groupings included, as appropriate, (1) the specific driver/force of change the comment addressed, (2) an implication category for those comments that provided input on implications of change, and (3) a secondary factor/force of change where more than one category was offered. The specific categories of implications were deduced from studying the comments, that is, they were not defined *a priori*. This spreadsheet then provided raw data for further synthesis of public input.

After reading all the comments, the co-leaders next identified several meta-issues contained in the public comments and coded them to respective issues. We defined a meta-issue as a broad area of concern that contained a complement of interrelated drivers and/or implications. We then evaluated comments and generated a report for each force of change, implication category, and meta-issue. Sorting algorithms grouped comments according to the various categories with extensive cross-referencing; and we then summarized major points raised within each group. For example, we examined all of the comments addressing land use and summarized those comments using the primary factors (social, economic, and institutional changes) to organize these points. (The spreadsheet containing all public comments along with their labels can be found at the Southern Forest Futures Project Web site.) Public dialogue and review will play a role in all subsequent phases of the Project as well. In addition to review of this interpretation of input, public reviews will be encouraged when study plans describing research methods and data sources are being developed and when draft reports are generated by the Futures Project.

## Results

The 14 public meetings described above were preceded by a meeting with invited leaders of public and private natural resource organizations in Asheville, NC, in January 2008. The initial meeting was used to refine and finalize our meeting structure and design. (Most notably, in response to feedback from this meeting, we (1) separated out the primary factors from the discussion of forces of change and (2) changed the structure of breakout sessions so that participants could attend sessions for all the topic areas—that is, participants were not forced to choose among topics of interest.) Public meetings then were conducted between January and March 2008. The average participation rate was 37 people (fig. 2). Attendance ranged from lows of 24 to 26 in Stoneville, MS; Nashville, TN; and Charleston, SC, to highs of 76 at the initial meeting in Asheville and 54 at the final meeting in Auburn, AL. Webinars were offered at three different times in April 2008, but attendance was quite limited, ranging from 1 to 12. Participants provided > 2,200 recorded comments. These were entered into tables, and a record of comments from each meeting was posted on the Futures Project Web site for inspection by participants and others.

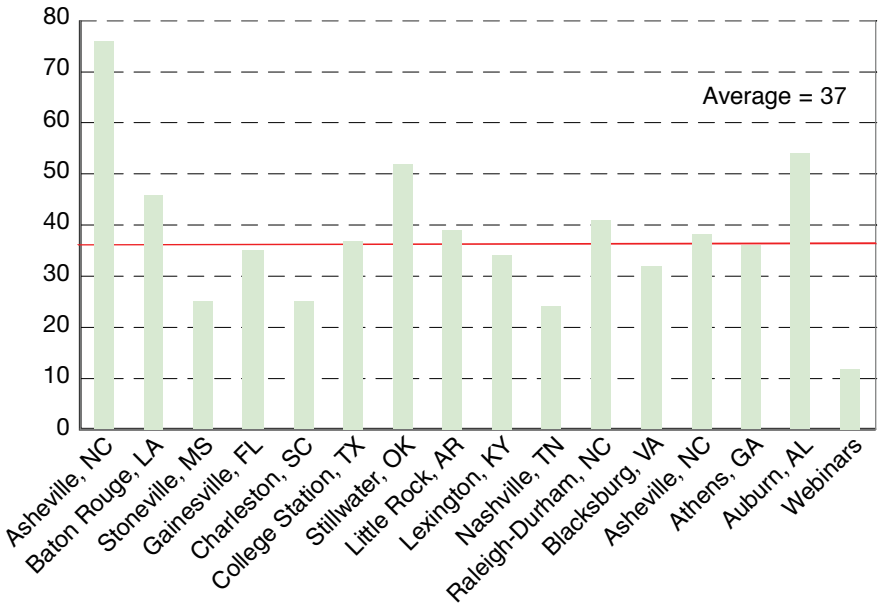


Figure 2—Number of participants attending public meetings by location.

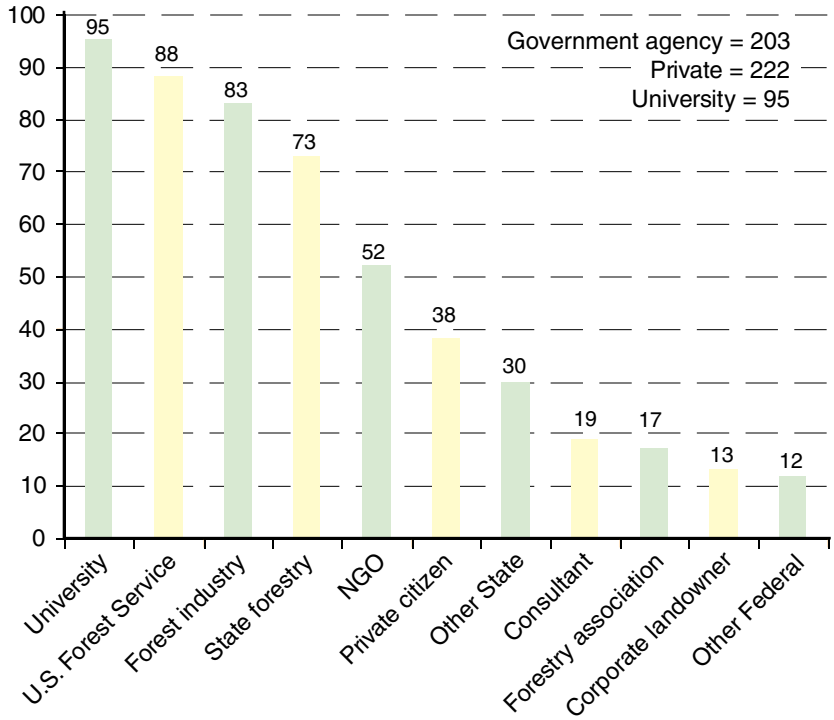


Figure 3—Number of participants attending public meetings by participant affiliation.

Meeting participants represented a broad range of organizations (fig. 3). The largest group of participants came from universities (95) and included students as well as faculty. We held nine meetings in close proximity to universities with large natural resource programs. The Forest Service was represented by 88 participants, including several who served as facilitators (facilitators were allowed to provide their own input within the process used for these meetings). States were represented by 73 participants from forestry departments and 30 from other State agencies. Nongovernmental organizations (NGOs), largely conservation and environmental groups, were represented by 52 participants. In total, 203 participants represented State or Federal agencies and 222 participants were from the private sector (forest industry, NGOs, forestry associations, corporate landowners, and private citizens)

Substantial input was provided regarding all forces of change, both in terms of specific concerns about how such forces might be expressed and the potential short- and long-term implications of resulting changes. We then presented a synthesis of the public input organized in three different dimensions. First, we summarized the input on the four forces of change and how they might be expressed in the South. Second, we summarized the input with respect to the potential implications of change—that is, values at risk—that the public thought should be assessed within the Futures Project. Finally, we presented the set of meta-issues that emerged from an analysis of these inputs. These can be viewed as a set of overarching issues that represent a web of implications associated with a common force of change. Each meta-issue warrants its own focused analysis.

## Forces of Change

The set of primary factors and forces of change evaluated here are listed in the tabulation below. Each of the forces of change is discussed in turn below.

### Land Use

Participants identified issues that could affect land use changes in the future (box 1). Economic issues addressed both the drivers of urbanization and the allocation of rural land to forest and agricultural uses. With respect to urbanization, population growth and income were acknowledged as key issues. With respect to rural lands, discussions focused on the potential future of agricultural and timber markets, with special emphasis placed on the uncertain effects of the emergence of various markets for biofuels and their feedstocks. Some participants raised concerns about the potential shift from forest to cropland uses if demands for grains increase, but they also spoke of the potential for more intensive forest management if demands for wood material in bioenergy production increases.

Social factors focused largely on the changing profile of the South's forest landowners and the potential to accelerate development. Participants at all locations

**Primary factors and forces of change used to organize public input**

| Primary factors | Forces of change |
|---|---|
| | Land use |
| Economic | |
| | Forest management |
| Social | |
| | Biological |
| Institutional | |
| | Physical |

Box 1—Summary of comments regarding **Land Use** changes in the South

1. **Economic factors**
   a. How will change in agricultural markets—i.e., food prices—affect land use?
   b. How will change in timber markets affect land use?
   c. How will bioenergy markets—including markets for both wood and other fuel stocks—affect land use?
   d. How will changes in populations and income affect land use?
   e. How will energy prices influence peoples' choice of where to live—will this alter development of land?
   f. What are the options for agroforestry, and how might they influence land use patterns?
2. **Social factors**
   a. How will changing ownership patterns (for large and small owners) affect land use?
   b. How will changing demographics influence associated demands for esthetic settings, recreation, and second homes?
3. **Institutional factors**
   a. How will increasing urban populations affect options for land use through various regulations?
   b. What effects do regulations have on land use in the South?
   c. How will policies regarding bioenergy affect land uses?
   d. How could ecosystem service payments, especially for carbon sequestration, influence land use and forest loss in the future?
   e. How does tax policy influence ownership and uses of land and forest land?
   f. How do conservation easements and "unbundling" of landowner rights affect land uses?

raised specific concerns regarding the divestiture of forest industry lands in the South over the past 10 years (Clutter and others 2005) and the rise of the corporate investment ownership group, including Timber Investment Management Organizations and Real Estate Investment Trusts (TIMOs and REITs). Additional concerns focused on smaller landowners, in particular an anticipated generational turnover of owners. In addition, several comments spoke to how changes in demographics might increase the demand for recreational and retirement uses of lands in more remote locations. Among institutional factors affecting land use, participants focused on current and future effects of tax policy. Comments also addressed how potential new policies related to biofuels and ecosystem service payments (including carbon storage to reduce atmospheric carbon dioxide), as well as increased numbers of local regulations in high-growth areas, might affect land uses.

## Forest Management

Most economic factors raised with respect to forest management in the South addressed either the future demand for current forest products or the emergence of biofuels markets in the region (box 2). Participants highlighted the need to understand regional demands for wood products in the context of global markets and how wood might substitute for other natural resource materials. With respect to biofuels, participants asked how new demands might directly affect forest

Box 2—Summary of comments regarding **Forest Management** in the South

1. **Economic drivers**
   a. Evaluate changes in the demands for all forest products and the implications for forest management in the South.
   b. Consider the effects of global demands in domestic wood products markets (important case is the European demand for wood pellets).
   c. Consider how the development of bioenergy markets could affect the demand for other f orest products.
   d. Consider how the development of bioenergy markets could affect management regimes in southern forests.
   e. Evaluate how the markets for other nonwood materials could influence demand for timber products.
   f. Evaluate the potential emergence of other wood and nonwood forest products markets and their influence on management.

*(continued)*

Box 2—Summary of comments regarding **Forest Management** in the South *(continued)*

2. **Social drivers**
   a. Consider how ownership changes may the affect forest management approaches (harvesting and investment).
   b. Evaluate the effects of fragmentation and parcelization on viability for forest management, for example, minimum viable stand size.
   c. Consider the effects of a shrinking work force and human capital in the logging sector.
3. **Institutional drivers**
   a. Consider the potential for new policies regarding biofuels production to distort wood products markets.
   b. Consider the potential (negative and positive) impacts of the farm bill on forest management in the South.
   c. Consider how conservation easement and land withdrawal programs could affect timber availability.
4. **Technology**
   a. Consider how technological changes will influence demands for various forest products.
   b. Consider changes in plantation technology and productivity and explore their implications for forest management.

management and compete with established markets for traditional forest products in the region.

Participants asked how social change might influence forest management in the South. In particular, they raised questions about the propensity of new large corporate (TIMO/REIT) landowners to continue levels of forest investment observed on industry land in the past. The trend toward smaller tract sizes caused by urbanization and recreation development—and the constraints this places on management—was seen as another big issue. Institutional issues focused especially on the potential for future biofuels policies to distort existing markets. Technology was seen to drive change in forest product demands and to possibly change the demand for plantation forests in the future.

## Biological Forces

Public input focused on three categories of biological forces of change in the South: invasive species, genetics, and forest succession (box 3). Invasive species issues were raised at every meeting and addressed 26 individual species (see tabulation, p. 9). Many comments focused on the potential influence of invasive plant species (most commonly, cogon grass) and of various insects (e.g., hemlock woolly adelgid) and

Box 3—Summary of comments regarding **Biological Forces** of change in the South

1. **Invasive species**
   a. Evaluate the spread of existing and the emergence of new invasive plant species in the South.
   b. Evaluate the spread of existing and the emergence of new invasive insect and disease species in the South.
   c. Consider how land use patterns affect the distribution and spread of invasive species.
   d. Consider how forest management may affect the success of invasive species.
   e. Consider how climate change may affect the success and spread of invasive species.
2. **Genetics**
   a. Evaluate the potential deployment and effects of genetically modified trees in the South
   b. Consider the institutional structures that govern the licensing of genetically modified plants.
   c. Consider the potential for the escape of genetically modified plants and potential interactions with native species in forested ecosystems.
3. **Forest succession**
   a. Evaluate the implications of changes in disturbance regimes for natural succession in forests (e.g., reductions in early successional habitats).
   b. Consider how fire suppression alters species composition and successional pathways.

diseases (e.g., sudden oak death) on forest composition and productivity. Comments also addressed the vectors of spread for these invasives and identified land use, forest management, and climate change as being especially important factors affecting the establishment and spread of invasive species.

Comments addressed the potential use of trees for timber production. Participants raised questions about the effect of high-productivity genetically modified organisms (GMOs) on the economics and distribution of timber production, but also on the ecological implications of potential "escapes" of genetically modified stock. In addition, they focused their comments on how changes to disturbance regimes (e.g., fire and storms) might affect the availability of early successional habitat and restructure the successional pathways of southern forests.

## Physical Forces

Input focused on three categories of physical changes affecting forests in the South: fire regimes, climate change, and storms (box 4). Comments indicated the

**Invasive species considered issues (by the public) in meetings for the Southern Forest Futures Project**

| Common Name | Scientific Name |
|---|---|
| Anosus root rot | *Fomes annosus* |
| Asian jumping carp | *Hypophthalmic molitrix* |
| Beavers | *Castor canandensis* |
| Callery pear | *Pyrus calleryana* |
| Chinese privet | *Ligustrum sinense* |
| Chinese tallow tree | *Triadica sebifera* |
| Cogon grass | *Imperata cylindria* |
| Dutch elm disease | *Ophiostoma ulmi* and *Ophiostoma novo-ulmi* |
| Emerald ash borer | *Agrilus planipennis* |
| Feral hogs | *Sus scrofa* |
| Gypsy moth | *Lymantria dispar* |
| Hypoxylon canker | *Hypoxylon spp.* |
| Japanese climbing fern | *Lygodium japonicum* |
| Kudzu | *Pueraria lobata* |
| Laurel wilt | *Ophiostoma sp.* |
| Mimosa | *Albizia julibrissin* |
| Nutria | *Myocastor coypus* |
| Red oak borer | *Enaphalodes rufulus* |
| Salt bush | *Atriplex sp.* |
| Sawtooth oak | *Quercus acutissima* |
| Sirex woodwasp | *Sirex notilio* |
| Southern pine beetle | *Dendroctonus frontalis* |
| Sudden oak death | *Phytophthora ramorum* |
| Whitetail deer | *Odocoileus virginianus* |

need to examine the effects of future fire regimes on forests and human populations. Participants anticipated that fire regimes would be complicated by land use patterns and regulations, especially in the wildland-urban interface. Participants asked how climate change, fuel treatments, and fire suppression activities might interact to influence broad-scale fire regimes.

Participants asked how future climates could alter forest extent and composition in the region. In particular, they asked how temperature, precipitation, and $CO_2$ fertilization would influence forest productivity; how rising sea levels might affect the area of forest by way of inundation and saltwater intrusions; and about the potential interaction of climate change with water availability and drought. In addition to climate change effects, participants suggested that climate change mitigation activities, through carbon cap-and-trade programs, might have an important influence on forest land use and management.

Box 4—Summary of comments regarding **Physical Forces** of change in the South

1. **Fire regimes**
   a. Evaluate current and anticipated fire regimes and how these disturbances affect forests.
   b. Consider how fire regimes might be altered by changes in climate.
   c. Consider how fire regimes might be altered by changes in land use patterns, especially in the wildland-urban interface.
   d. Consider how regulations affect fire regimes (e.g., clean air regulations).
   e. Consider the effects of both fuel treatments and fire suppression on long-run fire dynamics.
2. **Climate change**
   a. Examine how climate influences forest area and conditions via temperature, precipitation, and $CO_2$ fertilization.
   b. Examine how sea level rise would influence forests.
   c. Consider the effects various climate-change mitigation activities would have on forests.
   d. Examine how climate could influence drought, water availability, and saltwater intrusions
3. **Storms**
   a. Examine disturbance regimes from hurricanes and other storms and how they may change in the future.
   b. Consider the effects of climate change on storm frequency, strength, and variability.
   c. Examine disturbance regimes from ice storms and how they might change in the future.

Storm frequency and intensity were seen as other important variables in determining forest conditions and values. Participants asked how storms might be affected by changes in climate and how storms would alter forests. While many of the comments about storms addressed hurricanes, several raised questions about ice storms in the northern half of the region.

## Implications of Change

Participants identified a very broad range of potential implications associated with current and anticipated forces of change in southern forests. We aggregated these implications into four categories (see tabulation, p. 10): ecosystem structure, forest conditions, social/economic implications, and ecosystem services. Of course these are interrelated, with forest conditions being a subset of ecosystem structure, and ecosystem services being closely linked with social/economic implications of forest changes. Under forest conditions we mainly considered tree species and changes in tree composition and forest condition. Ecosystem structure focused on implications of changes to the broader complement of plant species, as well as the effects

such changes have on wildlife habitats and species composition. Social/economic implications looked at the direct economic and social effects of changes in forest uses, while ecosystem service implications focused on the "public good" kinds of forest benefits, such as fresh water and biodiversity.

## Ecosystem Structure

Public input on ecosystem structure implications focused on aquatic and terrestrial ecosystems, riparian forests, and ecotones (box 5). Appalachian riparian forests are seen as especially vulnerable to changes caused by the expected widespread mortality of eastern hemlock.

Participants raised a number of concerns regarding the effects of management activities on long-term soil productivity, chemistry, and biota. Concerns also spoke to possible impacts on soil productivity brought by land use change and the potential intensification of cropping for future biofuel production.

**Categories of implications used to organize public input**

| Implication category | Subcategories |
|---|---|
| Ecosystem structure | Aquatic ecosystems |
| | Soils |
| | Terrestrial ecosystems |
| Forest conditions | Forest area |
| | Forest conditions |
| | Productivity |
| Social/Economic | Employment |
| | Policy |
| | Recreation |
| | Wood production |
| Ecosystem services | Biodiversity |
| | Carbon storage |
| | Water and forests |

Concerns also linked multiple forces of change—including invasive species and disturbance regimes related to fire and storms—with the vegetative structure of terrestrial ecosystems. Participants asked about the impact of fire exclusion on the persistence of fire-adapted forest communities. Resulting habitat changes were linked to concerns regarding species persistence in the South.

Box 5—Summary of comments regarding the effects of change on **Ecosystem Structure**

1. **Aquatic ecosystems**
   a. Evaluate the effects of land use change, management activities, and the spread of invasive species on the quantity and function of riparian forests.
   b. Evaluate the potential cascade of effects of hemlock woolly adelgid on Southern Appalachian riparian forests, stream quality, aquatic species, and trout fishing.
2. **Soils**
   a. Evaluate the effects of land use change on soil chemistry and biota, as well as sedimentation.
   b. Evaluate the effects of forest management extent and intensity on soil chemistry and biota, and sedimentation.
   c. Evaluate the potential effects of increased utilization rates on soil nutrients and the need for fertilization.
3. **Terrestrial ecosystems**
   a. Examine how changing disturbance regimes, including fire and storms, will affect forest species and conditions.
   b. Assess the potential loss and modification of fire-adapted forest communities.
   c. Assess the impact of invasives on forest structures.
   d. Consider the effects of fragmentation on habitat structure and wildlife and on the spread of invasive species.
   e. Evaluate the cumulative impacts of forces of change on rare forest types.
   f. Evaluate the effects of habitat changes, driven by multiple forces of change, on wildlife of all types in the South.

## Forest Conditions

Participants raised issues regarding how changes will affect the standard measures of a forest inventory, including forest area, biomass, and tree species composition (box 6, p. 11). Specific concerns addressed the effects of intensified management for biofuel production and invasives on forest conditions.

Comments also focused on how various forces of change might affect the production of a variety of timber products—comments that included the use of clonal materials and genetically modified organisms, intensified management, ownership changes, and climate. Constraints on management actions also were linked to forest productivity in the wildland-urban interface.

Box 6—Summary of comments regarding the effects of change on **Forest Conditions**

1. **Forest area**
   a. Evaluate the effects of all forces of change on the future area of forest land in the South.
   b. Examine the impact of demand for population-driven new infrastructure developments (e.g., highways and reservoirs) on the area of forest land in the South.
2. **Forest composition**
   a. Evaluate the effects of all forces of change on the condition of forest inventories in the region, including biomass, species composition, and products.
   b. Evaluate the potential implications of cloning/genetically modified tree species for diversity of pines and associated risks
   c. Examine the impact of invasive species on forest composition and health.
3. **Productivity**
   a. Evaluate the implications of intensified harvest activities with increased demand for biofuel production or other products on the long-run productivity and sustainability of timber production.
   b. Evaluate the implications of increased productivity from cloning/GMOs on the location of forest management and the condition of forests.
   c. Examine how management shifts related to ownership changes affect the overall productivity of forest land in the South.
   d. Consider the effects of climate on forest productivity including the effects of changed growing seasons, precipitation, and $CO_2$ fertilization.
   e. Consider how constraints to management, e.g., loss of fire and herbicide use in the wildland-urban interface and increasing costs for fertilizer and transportation, may affect productivity in the future.

## Social/Economic

Public comments addressed several concerns regarding the economic and social implications of changes in the forests of the South (box 7). How might changes in forest uses affect direct employment in rural areas of the South? Employment issues and concerns also extended to how immigration policy might affect the availability of labor for woods work. Other policy issues spoke to how economic activity—primarily wood production—might be affected by policies designed either to encourage carbon storage in forests or encourage the production of biofuels from forests.

Comments also addressed forest-based recreation—both its supply and demand—and the potential for increased congestion and conflicts among types of recreation uses. Another set of comments spoke to the future of wood products production across product classes and subregions in response to various forces of change. Participants also suggested that analysts track the total value of forest benefits to the quality of life in the region.

Box 7—Summary of comments regarding the effects of change on **Social/Economic** implications

1. **Employment**
   a. Evaluate changes in labor supply including the role of immigrant labor and the potential implications of immigration policy for labor supply.
   b. Evaluate the demographics of logging and other woods workers and the potential for increased scarcity of labor for these services.
   c. Consider how changing wood production will affect employment and income in rural areas of the South.
2. **Policy**
   a. Consider how bioenergy policies might affect timber supply and activities in other wood products sectors.
   b. Consider how carbon budgeting policies might affect timber supply and activities in other wood products sectors.
3. **Recreation**
   a. Evaluate how population growth and changing demographics will affect changes in demands for different types of recreation activities, and explore implications for forest land uses.
   b. Evaluate how changing ownership and land uses will affect the supply of recreation opportunities.
   c. Examine the potential for increased congestion and conflict among recreational users of forests as a result of changing supply and demand factors.
   d. Examine the changing economics of hunting leases and implications for forest land uses.
4. **Wood production**
   a. Evaluate changes in ownership and land uses in terms of how such changes will affect timber supply and potential changes in the structure of wood products sectors.
   b. Evaluate the implications of changing industry structure on the distribution of economic activity and employment throughout the South.
   c. Consider how energy markets may differentially affect wood products sectors due, for example, to high transportation costs.

*(continued)*

Box 7—Summary of comments regarding the effects of change on **Social/Economic** implications *(continued)*

d. Evaluate the shift in markets away from some wood products toward ecosystem services of different types.
e. Consider the effects of habitat fragmentation on the economics of timber harvesting/logging and the associated costs of timber. Consider the futures of various wood products sectors in detail, e.g., hardwood lumber, treated southern pine, oriented strand board.
f. Examine how biofuel markets may interact with other wood products markets in the South and cause an affect of overall economic activity, returns, and employment.

**5. Other**

a. Evaluate the total economic value of forest benefits including in situ as well as extractive benefits.
b. Examine the effect of forest conditions on overall quality of life in the South.

## Ecosystem Services

Participant concerns about ecosystem services focused largely on biodiversity, carbon storage, and water (box 8). Participants expressed concerns regarding the effects of multiple forces of change on the persistence of various imperiled plant and animal species and on the genetic diversity of forests. Specific concerns were for the effects on wildlife habitats wrought by land use change, fragmentation, and climate change. Issues related to carbon storage provided by forests centered on how a new cap-and-trade program might affect the quantity and quality of forests in the region (especially given other policy initiatives). Water issues focused on the role of forests in providing water filtration and the effects of management on those benefits. Finally, participants raised general questions about the implications of proposed markets for ecosystem services on forest persistence and uses in the South.

## Meta-Issues

As summarized in the public's comments on forces and implications of change, we identified issues that had several interrelated concerns. A distillation of the themes synthesized from those concerns led to seven meta-issues, listed in the tabulation to the right. Each meta-issue is defined by a set of interrelated drivers and outcomes associated with a common topic. A meta-issue defines a set of questions that have broad regional implications and might therefore warrant careful analysis at the broad regional scale. We describe each of the seven meta-issues below.

Box 8—Summary of comments regarding the effects of change on **Ecosystem Services**

**1. Biodiversity**

a. Assess how loss and alteration of habitats will affect the biodiversity of the South.
b. Evaluate the influence of climate change on the persistence of plant and animal species.
c. Examine the implications of multiple forces of change on imperiled (or threatened and endangered) species in the South.
d. Assess the potential effects of management strategies (including restoration activities) on genetic diversity of forests.

**2. Carbon storage**

a. Evaluate implications of the development of carbon-credit markets for forest area and conditions in the South.
b. Examine the potential interactions of a new carbon-credit market with current timber markets and potential markets for cellulose-based biofuels.

**3. Water**

a. Evaluate the effects of forces of change on the ability of forested wetland to assimilate wastewater and dampen the effects of nutrient flows into water courses (including effects on hypoxia in the Gulf of Mexico).
b. Evaluate the role of forests in protecting municipal watersheds and how land use and other changes might affect this role.
c. Examine how a program of watershed protection credits could affect forest area and conditions in the South.

**4. Other**

a. Examine the potential for and the effects of ecosystem service credit markets for forest landowners in the South.
b. Examine the potential use of tax credits and other tax incentives to encourage the provision of ecosystem services.

**Meta-Issues regarding Southern Forest Futures Project derived from public input**

| Meta-Issue |
|---|
| Bioenergy |
| Climate change |
| Forest ownership change |
| Invasive species |
| Fire |
| Taxes |
| Water and forests |

## Bioenergy

Participants had numerous concerns and questions regarding the potential development of bioenergy markets in the South. They raised such comments at every meeting we held to explore the emergence of new markets for grain-based and/or cellulose-based bioenergy products, the potential impact on forests and forestry, and the secondary impacts on forest ecosystems and productivity (box 9). Economic issues were focused either on the potential for new returns to landowners or the effects of potential competition for raw material between new bioenergy firms and other wood products sectors—in particular, the potential for the displacement of existing sectors if biofuel production consumes large amounts of timber. As an extension of this latter point, participants asked how subsidies and other policies might distort markets and provide competitive advantage of biofuels over other sectors that currently consume wood fiber.

Comments also focused on how the emergence of new biofuel markets could influence management of forests in the South. In particular, participants asked whether afforestation or deforestation would result, and to what degree materials used to produce biofuels would be derived from existing forest inventories or from more intensively managed plantations. Comments also addressed the impacts of management changes on site productivity and ecosystem integrity.

## Climate Change

This topic defined another meta-issue regarding southern forests (box 10, p. 14). Participants were concerned about the impact of climate on various economic and ecological values. Economic concerns spoke to the potential for changes in the location of industry, as well as potential losses due to declines in productivity and increases in damaging storm events.

With regard to forest productivity, participants asked how future climate change could affect timber production rates as growing season, temperature, precipitation, and $CO_2$ changes occur. Input also indicated a need to analyze the potential for adaptation strategies that would move tree species to more favorable locations. Participants asked about the potential for climate change to exacerbate the spread of invasive species. They asked for additional insights into the effects of climate on drought cycles and the frequency of severe weather events. A broad complement of questions spoke to how climate might restructure forest ecosystems and change the provision of the full array of ecosystem services.

Box 9—Summary of comments regarding the **Bioenergy** meta-issue

1. **Social/Economic**
   a. Evaluate likely effects of emerging biofuel feedstock markets on markets for all other forest products.
   b. Will potential new markets lead to substantial increases in timber scarcity?
   c. How will economic returns to forest landowners be affected by potential markets for biofuel feedstocks?
   d. Evaluate expected rural labor supply and demand needed for a bioenergy market.
2. **Forest conditions**
   a. How will afforestation (gain of forest land) and deforestation (loss of forest land) be driven by a bioenergy market?
   b. What will be the likely effects of intensive management for biofuels on soil fertility and productivity?
   c. Consider how the development of bioenergy markets could affect management regimes in southern forests.
3. **Ecosystem structure**
   a. Evaluate how wildlife habitat and other ecosystem functions could be affected by the growth in biofuel markets.
   b. What will be the likely ecological characteristics of energy plantations and their management?
   c. How will emergence of forest bioenergy affect forest ecosystem integrity?
   d. What will be the ecological effects of utilizing increasingly small material?
4. **Other**
   a. Consider various ways the markets for different biofuels could develop in the future.
   b. Consider the potential for distortive and negative effects on wood products markets from policies that would encourage bioenergy production.
   c. Describe the pros and cons of potential financial incentives and other policies for encouraging production of bioenergy from wood (including new Farm Bill policies).
   d. Describe the current and potential technology needed to realize large-scale production of biofuels from cellulosic feedstocks.

## Forest Ownership Change

Many participants voiced their experience and concerns regarding forest ownership changes observed since we published the SFRA (box 11, p. 14). Most comments focused on forest industry's divestiture of timberland and concomitant increases in ownership by TIMOs and REITs. But other comments focused on changes in the nonindustrial forest landowner class. In the latter, questions focused on the implications of a generational turnover in owners. In both cases, however, the implications concerned changing the physical and

Box 10—Summary of comments regarding the **Climate Change** meta-issue

1. **Social/Economic**
   a. Evaluate the implications of climate change relative to the location of forest industry.
   b. Evaluate the total costs of increased extreme weather events.
2. **Forest Conditions**
   a. Consider the implications of changes in growing season length, temperature, precipitation, and $CO_2$ fertilization for forest productivity.
   b. Evaluate strategic options for adapting forest management to climate change—e.g., species to plant and treatments to favor, as well as the assisted migration of tree species.
   c. Consider how climate will change the range of invasive species and otherwise interact with invasives and native pests.
   d. How will climate change affect the drought cycle and therefore the persistence of forest types?
   e. How might changes in extreme weather events (hurricanes, tornadoes, and ice storms) affect forest structure?
3. **Ecosystem Structure**
   a. How might climate change alter the range of forest types in the South?
   b. How might climate change affect the distribution of rare forest types—e.g., spruce fir types in the Southern Appalachians?
   c. How might climate change alter the structure of and change the effectiveness of conservation areas, including wildlife refuges?
   d. How would climate change alter fire regimes in southern forests?
   e. How resilient are various forest communities to climate change?
   f. Consider the effects of sea level rise and increased salinization on coastal forests.
4. **Ecosystem Services**
   a. Examine how potential increases in drought might affect the comparative value of forests in protecting watersheds.
   b. How will climate change affect species composition of forests?
   c. How will threatened/endangered/imperiled species be affected?

management structure of forests. What happens to management as lands become more fragmented? What are the long-run implications for timber supply and economic activity? Participants looked beyond the recent history of ownership changes to ask how this new ownership structure might lead to increased turnover of ownership in the future.

Box 11—Summary of comments regarding the **Ownership Change** meta-issue

1. **Social/Economic**
   a. Examine how the divestiture of forest industry land could affect long-term timber supplies and the structure of the wood products industry.
   b. How might ownership changes alter recreation opportunities on private lands?
2. **Forest conditions**
   a. Will increasingly fragmented and parcelized ownerships limit management options and timber productivity from these lands—what is the minimum manageable tract size?
   b. Consider opportunities to "rescale" forestry to include new owners with smaller tracts—defining new silvicultural practices.
   c. What will be the likely extent of conversion and loss resulting from ongoing transactions by TIMOs, REITs and other large ownerships?
   d. How might economic conditions work to stabilize (or destabilize) forest ownership and keep (or reduce) forest cover?
   e. Describe how the expected new owners will change management activities that could affect forest health.
3. **Ecosystem structure**
   a. What will be the major conservation challenges posed by expected ownership changes?
   b. Evaluate the full suite of expected ownership trends relative to management activities, forest conditions and health, and the implications of these factors for wildlife habitat and species.
   c. Consider the effects of fragmentation on wildlife persistence.
4. **Other**
   a. Define how much land has changed hands in the South and where changes might be focused in the future.
   b. Estimate the likely rate and direction of ownership turnover in the future.
   c. Estimate the likely impacts of ownership changes on fragmentation and parcelization.
   d. Consider all economic determinants of ownership change (e.g., resource markets, land markets, and alternative investment returns) and how these might change in the future.
   e. Evaluate changes in the demographics across all categories of owners.
   f. How will change in industry/TIMO/REIT management influence opportunities for other landowners?

## Invasive Species

Participants were concerned about invasive plants and animals as well as new insects and diseases and their effects on forests (box 12). Because these species have the potential to restructure forest vegetation, comments regarding invasives largely focused on how ecosystem structure might be altered. Economic concerns focused on the costs of management and control (where controls are available). Participants asked about the effect of invasives on forest productivity. In addition to questions regarding the effects on terrestrial ecosystems, participants asked about the effects on riparian forests and aquatic ecosystems (especially with regard to hemlock woolly adelgid).

Box 12—Summary of comments regarding the **Invasive Species** meta-issue

1. **Social/Economic**
   a. How will invasive species affect management costs and the returns to forest management?
2. **Forest conditions**
   a. What effects will nonnative animals, e.g., nutria, have on the regeneration and reestablishment of forests?
   b. How will expected changes in forest species composition due to invasives affect the overall productivity of forests?
   c. What are the likely effects of the interaction of forest insect or disease pests and changes in forest species composition due to climate change, population expansion, and fragmentation?
   d. How do (will) policies, laws, and regulations affect the introduction, spread, and control of forest pests?
   e. What is the likely future capability to control invasives, given future land uses, fragmentation, ownership patterns, and other forces of change?
   f. What will southern forests look like if catastrophic loss of dominant species, e.g., oaks, occurs?
3. **Ecosystem structure**
   a. Evaluate the impacts that invasive plant species, e.g., salt cedar, Russian olive, privet, Chinese tallow, will have on the composition and function of riparian forests.
   b. Evaluate likely impacts of the hemlock woolly adelgid on aquatic ecosystems.
4. **Ecosystem services**
   What will be the effects of the introduction and spread of invasives by urbanization, recreational use, and other human activities?
5. **Other**
   Examine historical spread rates for invasive species and forecast future spread of important invasives.

## Fire

This remains a central issue of concern for forests in the South (box 13, p. 16). Participants asked about the potential for damages associated with changing fire regimes. They were concerned about the potential for increased fire frequency and intensity related to climate changes. In addition to damages, participants raised questions regarding the effects of changed fire regimes on ecosystem structure, as well as a number of ecosystem services including clean air, clean water, and biodiversity.

## Taxes

Among the institutional issues raised in the public meetings, the most common was taxes (box 14, p. 16). The full suite of tax types—income, property, inheritance, and severance—was discussed. The accumulation and interaction of these various types of taxes on forest uses defined a meta-issue. Concerns focused on (1) the implications of tax treatment for the use of easements and other potential conservation instruments, (2) the effects of inheritance taxes on fragmentation and parcelization, and (3) the links between property tax treatments on land uses and the retention of forest cover. Comments were also raised about the potential to structure tax incentives that would encourage retention and management of forest lands.

## Water and Forests

Participants raised concerns regarding water production and quality as a key issue relevant to forests and forest management in the South (box 15, p. 17). Concerns focused on the ability of forested landscapes to protect water quality in the future and on the ability of forested wetlands to assimilate waste. Comments also addressed the various effects of forest management on water quality and the potential for adverse impacts with the intensification of management resulting from increased production of wood-based biofuels. Land use change and the loss of forests were also seen as critical factors in determining water quality.

# Conclusions

Taken together, the > 2,200 comments processed from public meetings define a comprehensive view of natural resource dynamics in the South. They address the social dynamics that reshape forested ecosystems and the myriad benefits that flow from forests. They also focus attention on a number of key uncertainties related to anticipated structural changes in this interrelated human-ecological system. We have summarized these as seven meta-issues: bioenergy, climate change, forest ownership change, invasive species, fire, taxes, and water.

Box 13—Summary of comments regarding the **Fire** meta-issue

1. **Social/Economic**
   a. Evaluate the likely economic consequences of reduced prescribed burning, including property and structural damage and loss, air pollution effects, timber quality, and others.
   b. Define and forecast the potential for economic losses of all types from wildfire in the South (values at risk).
   c. How will concerns regarding liability affect fire use in the future, and what will be the consequences for forest conditions?
2. **Forest conditions**
   a. Describe the relationship and likelihood that catastrophic events play in forest conversion.
   b. How will changed fire regimes affect the overall health of southern forests?
3. **Ecosystem structure**
   a. How will changing fire regimes affect the structure of forest vegetation in the future?
   b. What will be the likely effects of fire restriction or exclusion on fire-adapted or dependent communities, including critical or rare forest types or rare, imperiled or endangered species?
   c. How will the likely future changes in fire regimes affect biodiversity of affected forests?
4. **Ecosystem services**
   Describe the options for using (or not using) prescribed fire and their implications for stand composition, air and water pollution, and biodiversity.
5. **Other**
   Forecast future fire regimes and their implications for forest structure, as well as costs and benefits.

Box 14—Summary of comments regarding the **Taxes** meta-issue

1. **Social/Economic**
   a. Consider the effects of tax code on easements and other mechanisms for private sector conservation.
   b. Would taxes on recreation values affect landowners' willingness to lease land for this purpose?
2. **Forest conditions**
   a. Evaluate the effects of inheritance taxes on losses of forest land.
   b. Consider how property taxes (including differential tax rates) influence land use and ownership of forest land.
   c. Consider the effects of differential income tax rates for "C" corporations and other entities for land use and ownership of forest land.
   d. Consider the cumulative effects of all taxes—including property, income, estate, and severance taxes—on land use and ownership of forest land.
   e. How do taxes affect management practices and productivity of forests?
3. **Ecosystem services**
   a. Consider the potential use of tax incentives to encourage forest retention and management for ecosystem services.
   b. Consider potential "proactive" tax policy that would encourage forest stewardship—including ad valorem taxes or other alternative tax instruments.

Our synthesis of the comments defines a set of 178 key concerns regarding the 7 meta-issues, 4 categories of forces of change, and 4 categories of implications of change. They are helping define a broad research program for a community of researchers for years to come. Our objective was to distill comments in a way that helps shape the plan for the Southern Forest Futures Project, and the content analysis described here provides the first step, by summarizing key elements of what the public sees as important with respect to changing forested ecosystems in the South. Our next steps will be to define how we might best address these issues through the three tiers of analysis of the Futures Project.

For the Forecast Analysis tier we will use quantitative models to forecast the effects of the different forces of change on land area, forest inventories, and other measures of interest. The public comments on forces of change will be used to help shape a representative set of scenarios for analysis using quantitative models. Our approach will be to use this input as the starting point for a structured workshop led by a team of experts to form a manageable number of scenarios that address issues raised by the public. We will analyze these scenarios to forecast key changes and the potential effects on the "implications" identified in this document.

The Meta-Issue Analysis tier will apply a knowledge-synthesis approach to studying the spectrum of concerns involved in each of the seven meta-issues. For each meta-issue we will define the research question and important elements for evaluation using the public comments summarized here. Each meta-issue will be assigned to an expert scientist to manage the analysis.

Box 15—Summary of comments regarding the **Water and Forests** meta-issue

1. **Ecosystem services**
   a. Participants asked responsible managers and landowners to consider the growing demand for high-quality water in urbanizing areas of the South and to recognize the role of forests in providing clean water.
   b. They also asked for quantification and evaluation of a potential change in the ability of the region's wetlands to assimilate wastewater.
2. **Forest management**
   a. Evaluate how forest management practices affect water quality in subregions of the South.
   b. Examine how the use of herbicides and fertilizers in forest management may affect water quality, especially with potential increases in management intensity related to the production of biofuels.
   c. Evaluate the role of forest management regulations in protecting water quality in the South.
3. **Land use**
   a. Consider the impact of water impoundments and related infrastructure on forest area and conditions, especially in the mid-South.
   b. Consider how land use change and loss of forests to other uses could affect the water quality throughout the South.
   c. Evaluate anticipated changes in the amount and structure of forested wetlands.

The Subregional Analysis tier will further interpret the implications of forces of change for the five subregions of the South based on the results of the Forecast Analysis and Meta-Issue Analysis tiers. In each subregion a team of analysts will examine specific concerns and issues regarding forest futures.

After meetings in 13 States and interactions with about 600 people from a variety of backgrounds, it appears clear that the public anticipates important changes in forested landscapes of the South. Such changes will be driven by multiple forces of change, and their effects will span ecological, economic, and social dimensions. In this way the public sessions provided validation for undertaking the Futures Project now. As we have to a large extent described, public comments have provided the foundation upon which we will design the next phases of the effort.

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The Southern Forest Futures Project has been designed to evaluate the implications of potential futures for the many goods and services forests in the Southeastern United States provide. To ensure that the Futures Project is comprehensive and relevant, we have begun with a thorough scoping of issues using a process that elicits input from various interested publics. We have held public meetings in 14 locations around the South and through 3 online "Webinars." The meeting sites provided at least two public meetings in each of five ecological subregions and no fewer than one public meeting in each State. We gathered > 2,200 comments using a structured-workshop format and processed the compiled data to define a comprehensive view of how forces of change may reshape forests, and how these changes could affect the various goods, services, and values of forest ecosystems. We also identified a set of meta-issues that warrant in-depth analysis to evaluate their potential influence on the future of forests. These topics of concern include bioenergy, climate change, forest ownership change, invasive species, fire, taxes, and water. The input on meta-issues, forces of change, and resource implications will be used to organize subsequent stages of the Southern Forest Futures Project.

Keywords: Assessment, forecasting, public involvement.




The Forest Service, U.S. Department of Agriculture (USDA), is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress— to provide increasingly greater service to a growing Nation.