

New Knowledge and Science Needed to Advance Our Understanding of Forests: A Forest-based Research Agenda for the 21st Century

A Summary of Ideas from the NAUFRP Summit: Defining Strategic Directions and
Rebuilding Capacity – January 4-6, 2006 – NCTC – Shepherdstown, WV

The relationships between forests and the dynamic human landscape have evolved dramatically over recent years. These relationships are both essential and complex; they drive the future health, productivity, and sustainability of forests at local, national, and global levels. At the same time, technology has advanced, allowing us to explore, discover, and monitor changes at scales ranging from outer space views of macro environments to molecular analyses to nano-sensor monitoring of interstitial spaces. Indeed, our capacity for discovery is greatly enhanced, as is our need to re-examine the questions we ask, our approaches to analysis, and the areas requiring our exploration and investment. Under the leadership of the National Association of University Forest Resources programs, 100 leading scientists from academic, agency, non-profit, and industrial sectors gathered to define the new knowledge and science needed to advance our understanding of forests --- to articulate the elements of a new forest-based research agenda for the 21st century.

Major Emergent Themes – Remarkably, there was substantial agreement among participants in the new science needs and opportunities related to forest and natural resources. An overriding goal of global sustainability seemed to drive the major themes that emerged. In particular, the potential exists for forests to become the focus for the development of a *New Science of Integration*. This scientific endeavor would focus on whole system analysis and the development of models, tools, and theories for integration of ecological, social, and cultural dimensions of natural resources management. Integration across boundaries, including ownerships and jurisdictions, must also be explored. This recommendation acknowledges that forests are inherently “integrated settings” that simultaneously involve communities, economics, and environmental implications. While the call for interdisciplinary research is widespread in environmental sectors, the need for such a science is emphatic in forest systems and forest-based research is exceptionally well-suited for integration. The forest research community could lead this effort globally.

The broad arena of *Ecosystem Services* also emerged as a consensus topic for new forest-based research. This would include valuation of forest ecosystem services, full cost accounting, the establishment and viability of ecosystem service markets (e.g., carbon credits and trading), and the contribution of forests to the global economy. Furthermore, the role of forests in quality of life, and the values associated with restoration of healthy and productive forests need to be better understood. The forestry community’s lack of attention in the past to the study of *Human Attitudes and Behaviors* surfaced as cause for public misperceptions. Participants highlighted this area for future attention and investment. This line of inquiry might include tools to understand and gauge public perceptions, attitudes, and behaviors as well as multicultural dimensions of resource management and the broad realm of communication sciences.

Recognizing the complexity of forests and the numerous and often conflicted stakeholder needs and wants, participants identified a much needed new research thrust focused on *Conflict, Uncertainty, and Decision-making*. This would include understanding the roles of government

structures, disturbance, adaptive management, and decision-making in an atmosphere of risk and uncertainty. Finally, participants also recognized the exploratory opportunities for forests associated with *Technology Advancements and Applications*. While this could include advancements and applications of remote sensing and nanotechnology for monitoring and assessing impacts, it also encourages applications for sustainability of the earth, including earth system analysis focused on the convergence of ecology and people on a global scale.

Additional Themes --- Some participants also recognized the need to explore *New Applications for Forests and Products*. This broad arena focused on the development of sustainable industrial practices and “green” business models as well as exploring possibilities for the development of bio-based polymers, alternative wood fibers, bio-energy, and bioremediation. The recognition that half the world’s population now resides in urban communities stimulated exploration of *Urbanization* as an additional priority area for natural resources research. In particular, understanding the role of urban forest landscapes in quality of life, human health, mitigation of stormwater pollution, and air and water quality are of increasingly high priority as are issues of the equitable distribution of forest resource benefits across ethnic and socioeconomic communities.

Crosscutting Issues --- As part of the discussion of new knowledge and science needed, numerous critically important issues were mentioned, not so much as future research foci, but rather as examples of areas in which new comprehensive approaches to research are needed. Prominent environmental issues that emerged included *global change, alternative energy, biodiversity, invasive species, and carbon fluxes*. These were all seen as issues that included biophysical and social science dimensions that needed to be addressed through new comprehensive and “integrated” approaches to research. Furthermore, issues related to *climate, water, air, and nature-based recreation and leisure activities* can be addressed in the context of the major emergent research themes. Finally, recognizing the complexity associated with the human-forest interface, participants recognized the need for increased attention to the development of *comprehensive approaches to natural resources and ecological planning* at varying scales.

New Challenges Represent New Opportunities --- While numerous themes for new and needed research were articulated, there was substantial consensus that the *status quo* is not effectively serving our forests, our economy, the research community, or the nation. New ideas, energy, and approaches are necessary to advance the status and health of our nation’s forests. Participants recognized the need to educate a new generation of scientists with different knowledge and skills than their predecessors and to rethink the strategies and mechanisms for supporting forest-based research needed to promote and sustain healthy and productive forests and to enhance the competitive position of our nation. Indeed, recognizing the need for change is a key element of a new forest-based research agenda for the 21st century.

The forestry and broader natural resources community has an opportunity to define a new forest-based research agenda built around new knowledge and scientific needs and approaches that emerged from the ideas and experiences of 100 thoughtful national leaders from several sectors. The new knowledge and science needed for forests is summarized below:

New Knowledge and Science Needed to Advance our Understanding of Forests
From the National Summit to Define the Future of Forest Research

FOREST RESEARCH FOR THE 21ST CENTURY:
DEFINING STRATEGIC DIRECTIONS AND REBUILDING CAPACITY
January 4-6, 2006, National Conservation Training Center, Shepherdstown, WV
National Association of University Forest Resources Programs

Major Emergent Themes

A New Science of Integration—All natural resources issues and opportunities include ecological, social, and cultural dimensions and forests are inherently “integrated” settings. We can lead in the development of the “science of integration,” which would focus on whole system analysis and the development of tools, models, and theories for integrative approaches to natural resources management. Integration across boundaries, including ownerships and jurisdictions, must also be explored.

Ecosystem Services – This would include valuation of forest ecosystem services and restoration, full cost accounting, the viability of ecosystem service markets, and the contributions of forests to the global economy and quality of life.

Human Attitudes and Behaviors – Public misperceptions and actions are related to our lack of serious attention to meaningful communication and understanding behavior. We must develop tools to effectively gauge public perception and explore multicultural dimensions of issues.

Conflict, Uncertainty, and Decision-making – Forests are complex systems connected to many conflicting stakeholder needs. Decision-making must be analyzed and informed by roles of government structures, disturbance, adaptive management, and analysis of risk and uncertainty.

Technology Advancements and Applications – Technological advancements allow remote sensing of broad scale impacts and nano-sensors for micro-monitoring. Applications to convergence of ecology, forests and people at the earth system scale must be explored.

Additional Themes

New Applications for Forests and Products – There is a demand to develop sustainable industrial practices and viable “green” business models applied to forest industries as well as exploration of new technologies, such as alternative fibers, bio-energy, and bioremediation, that can transform the wood products industry.

Urbanization – Half the world’s population lives in urban settings, thus highlighting the need to understand the forest/urban community interface. Issues such as quality of life, human health, air and water quality, and the mitigation of stormwater pollution are complex as are issues of the equitable distribution of forest benefits within communities.

Crosscutting Issues

Issues to be addressed through the lens of these new knowledge and science themes:

<i>Global change</i>	<i>Alternative energy</i>
<i>Biodiversity/complexity</i>	<i>Invasive species</i>
<i>Carbon fluxes</i>	<i>Water and air quality</i>
<i>Ecological Planning</i>	<i>Recreation and tourism</i>

