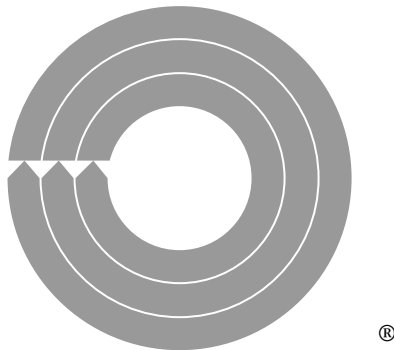


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Congress on Promoting Sustainability in the 21st Century

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SPECIAL REPORT:
CONGRESS ON PROMOTING SUSTAINABILITY
IN THE 21ST CENTURY

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Nine distinguished plenary-session speakers provided valuable background information and thoughtful insight: **Hal Salwasser**, Oregon State University; **William Acevedo**, U.S. Geological Survey; **Ron Sims**, King County, Wash.; **Mike Burton**, Metro; **Samuel Poole**, formerly of South Florida Water Management District; **Ron Rempel**, Cal. Department of Fish & Game; **Craig Perkins**, City of Santa Monica; **Gordon Bradley**, University of Washington; and **A. Scott Reed**, Oregon State University. **Cassie Phillips**, Weyerhaeuser, presented an informative dinner address.

The College of Forestry, Oregon State University, and the College of Forest Resources, University of Washington, provided faculty and graduate students to assist in administering the meeting.

Leadership and planning for the congress were provided by **David W. Moody** and **Albert A. Grant**, who served, respectively, as chair and vice-chair of the program committee. Also deserving of recognition are the ten dedicated volunteers who served on the program committee (see list on page 3).

Conduct of the meeting and preparation of this report would not have been possible without the volunteered assistance of working group chairs, facilitators and reporters (see notations in list of delegates).

Special appreciation goes to former RNRF Program Director **Kristen L. Krapf**, who assembled this report from plenary-sessions presentations, working group reports, notes, flip chart sheets and delegate comments.

Finally, sincere thanks are extended to the congress delegates who shared their expertise, experience, passion and ideas in support of this important meeting. They provided the essential interdisciplinary content for this report. (A list of delegates appears in the appendix.)

R.D.D.

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EXECUTIVE SUMMARY: CONGRESS ON PROMOTING SUSTAINABILITY IN THE 21ST CENTURY

The Renewable Natural Resources Foundation (RNRFF) was incorporated in Washington, D.C. in 1972. It is a consortium of 14 scientific, professional, and educational organizations interested in natural resources and interdisciplinary science. RNRFF was established to: advance sciences and public education in renewable natural resources; promote the application of sound scientific practices in managing and conserving renewable natural resources; foster coordination and cooperation among organizations having leadership responsibilities for renewable natural resources; and develop a Renewable Natural Resources Center.

RNRFF convened a congress in 1996 on the application of geographic information systems (GIS) to the sustainability of renewable natural resources. Delegates discussed how GIS technology could empower citizens and communities to more effectively participate in land-use planning to sustain their natural resources base.

Two years later, RNRFF convened a congress on human population growth and its impacts on the sustainability of renewable natural resources. Delegates concluded that assessing the effects of population growth must include consideration of our high level of consumption of natural resources, and our extravagant use of land in developing urban and rural areas. Delegates agreed on the need to develop models and descriptions of how communities can become sustainable. Stopping population

growth, limiting sprawl, preserving the environment, and using natural resources more efficiently were identified as important steps in moving towards a sustainable society.

These two congresses also made it obvious that neither local nor national planning models or efforts would suffice. Although there are constituencies for both national and community planning, regional approaches are hampered by the lack of regional institutions with trans-boundary authority. Yet, the natural resources that we seek to sustain do not observe political boundaries. We must recognize that regional, cross-boundary institutions are an essential part of the quest for a sustainable society.

The U.S. also is home to a broad grassroots movement that has embraced community planning to protect neighborhoods, enhance quality of life, protect open space and natural areas, and foster a sustainable economy. This movement prompted former President Clinton's Livability Agenda and the National Town Meeting for a Sustainable America (sponsored by the President's Council on Sustainable Development). Both activities promoted sustainability through community initiative, management plans, and economic incentives.

Thus, an examination of the strengths and weaknesses of current approaches to community and regional planning was a fitting subject for RNRFF's most recent congress. Entitled, "Promoting Sustainability in the 21st

Century," RNRFF's fourth national congress was convened September 6-9, 2000, in Portland, Oregon. Approximately 110 delegates from among RNRFF's member organizations and other institutions participated. Delegates traveled from 26 states and two foreign countries to attend.

The meeting objectives were twofold. First, delegates used a case-study approach to explore tools and strategies of community and regional planning for sustainability. Second, delegates examined the evolving roles of resource professionals in the 21st Century. Delegates also considered education and training that will be required for successful execution of new responsibilities.

In advance of the congress, a survey was developed to solicit ideas and suggestions for consideration by delegates. Surveys were mailed to key, identified personnel with federal and state agencies, universities, associations, and corporations. Gordon Bradley of the University of Washington and Scott Reed of Oregon State University assisted with the evaluation of the survey responses, and presented them at the congress.

The report of the congress is based upon notes recorded during speaker presentations and the question-and-answer periods that followed. Survey results and the working-group notes (recorded by the chairs, facilitators, and reporters) also were incorporated into the report. Although there were no formal votes among delegates regarding find-

ings, recommendations, and alternative solutions, consensus was noted informally. Also, each delegate was provided an opportunity to comment on the draft report.

The findings and recommendations are those of the delegates and not necessarily those of RNRF, its member organizations, and the supporting partners.

TOOLS AND STRATEGIES FOR SUSTAINABILITY

Using a case-study approach, delegates examined the three most challenged regions of the country – the Pacific Northwest, South Florida, and Southern California. Local (community) case studies included Portland, Oregon, and Santa Monica, California.

Although each of the regions and localities had site-specific problems, delegates noted common issues and trends. These included accommodating population growth, increased development, fresh water stress and scarcity, pollution, transportation issues, loss of fish and wildlife, and loss of agricultural lands and open space.

The Pacific Northwest clearly is the region with the clearest vision. It is using sustainability as a framework for addressing environmental, economic, and social challenges. This vision was reflected in the tools, strategies, policies, and programs implemented by cities such as Portland and Seattle.

Building on the information provided by the case studies, delegates concluded that the two greatest pressures on sustainability are population growth and consumption. An increasing U.S. population and high consumption rates are multiplying the impacts on natural resources and the environment. High consumption rates can be attributed to higher incomes and abundant, inexpensive, and accessible natural resources. Given the unprecedented scale of consumption in the U.S., even slight increases in population or consumption

can have detrimental impacts.

Although there was no consensus on the ideal population growth rate or level, there was general agreement that if the human population continues to increase, it soon will strain the environment and natural-resources base critical to community and regional sustainability.

Delegates identified and discussed successful tools and strategies for sustainability, including: a strategic plan for sustainability, strategic partnerships, identifying and cultivating leaders, encouraging continuing and life-long education, utilizing new technologies (GIS, remote sensing, spatial models, and satellite imaging).

There was a consensus among delegates that the environmental challenges we face are serious and urgent. By serving as advocates, educators, and leaders, resource managers should play an important role in promoting sustainability in the 21st Century.

EVOLVING ROLE OF RESOURCE PROFESSIONALS

In advance of the congress, RNRF conducted a survey on the evolving role of resource professionals. The purpose was to gather ideas, and to stimulate interest and discussion by the delegates. Delegates identified and assessed the education and training that students will require for future roles. Delegates also were challenged to identify ways in which students entering the natural resource fields can satisfy employer and other professional needs.

The roles of resource managers will evolve and expand over the next 25 years due to social, political, economic, and environmental issues and trends. Some of the most significant issues and trends include population growth (domestic and global), demographic changes (population-aging and increasing diversity), and increasing per-capita consumption. Urbanization, sprawl, and globalization of trade, travel, commu-

nications, and economics also were identified as issues of concern that will influence the role of resource managers.

Resource managers will require a broader knowledge base, and more training and skills than ever before. Necessary qualities will include intelligence, adaptability, flexibility, and dynamism because resource professionals will be coping with changes and developments in science, engineering, the economy, and society. Multidisciplinary courses, technological and computer training, and interpersonal skills will be required. Especially important will be a resource manager's ability to communicate complex and politically sensitive issues.

As the U.S. becomes increasingly racially and ethnically diverse, resource managers will need ethics and diversity training, and multiple language skills. Resource managers will build and participate in interdisciplinary partnerships and teams. As national priorities shift, important leadership and advocacy skills will include conflict resolution, decision management, critical thinking, negotiation, and facilitation. To cope with the complexity of environmental issues, resource managers will require education in business, economics, social sciences, and natural sciences, as well as technological and computer training. Continuing education and training will be a life-long requirement.

CONCLUSION

Moving towards a sustainable society will be a complex, long-term and daunting task. It will require human population stabilization, reduction of per-capita consumption, and wiser use of land, air, and water resources. In the absence of progress, our renewable natural resources base will be in jeopardy.

A sustainable society also will require a new economic blue print; one that does not rely on perpetual growth.

Success will be achieved only through national resolve and persistence. Public education and new decision-making tools also will be important components. In the U.S. today, there are a thousand pieces of the sustainability puzzle and 270 million people are at the table.

Finally, a sustainable society will require recognition of the important roles of values and science. We must

value our natural resources heritage enough to save it. The cost of rescue will be significant. At the same time, our biological, physical and social scientists must cooperate as never before to develop the necessary interdisciplinary science and solutions.

There is reason for optimism in the fact that representatives of the scientific disciplines represented by RNRF came

together for the first time to examine the impacts of human population growth on renewable natural resources. Through numerous recommendations and alternative solutions, these representatives have demonstrated that they highly value our natural resources heritage. They also have identified many of the necessary first steps to sustain them.

Introduction

Kristen L. Krapf

Communities all across the United States are facing the common challenges of urban sprawl, loss of open space and agricultural lands, traffic congestion, and a decline in the overall health of the environment. Environmental trends include air and water pollution, deforestation, over-fishing, and species loss and extinction. America's natural-resources base, which has provided the foundation for a vibrant economy, is being depleted and degraded. Natural systems need protection to support the environmental, economic, and social well-being of the country. A country that protects its ecosystems and manages its natural resources wisely lays a foundation for a stable and prosperous future.

The challenges facing communities today can be attributed to an increasing human population and increasing demands on natural resources and the environment. Urban sprawl currently is consuming land at almost three times the rate of population growth in the United States (Rusk, David, "Growth Manage-

ment: The Core Regional Issue," Brookings Institution). Local communities and regions have begun to respond by identifying the pressures and problems that urbanization exerts on the land and its natural resources. Communities are experimenting with new tools, strategies, and policies that emphasize preserving, protecting, and restoring natural resources including water, fish and wildlife, forests, soils, agriculture, rangelands, coastal marine, and air.

A diverse group of approximately 110 delegates explored these and other urban development issues at the Renewable Natural Resources Foundation's (RNRF) Congress on, "Promoting Sustainability in the 21st Century," September 6-9, 2000, in Portland, Oregon. Delegates discussed tools and strategies for sustainability and examined the evolving role of resource professionals.

Delegates represented a wide spectrum of disciplines including those of RNRF's 14 member organizations. Among the delegates were prominent natural-resources professionals from federal and state resource management agencies, academic institutions, non-governmental organizations, and research institutes and agencies. Delegates traveled from 26 states and two foreign countries to attend the congress. (A complete list of delegates appears in the Appendix beginning on page 27.)

TOOLS AND STRATEGIES FOR SUSTAINABILITY—EVALUATING CASE STUDIES

Using a case-study approach, congress delegates examined three challenged regions of the United States—the Pacific Northwest, South Florida and Southern California. Local case studies included Portland, Oregon and Santa Monica, California. By evaluating these regions and communities, delegates sought insight into initiatives directed at sustaining natural resources and managing growth. Speakers explained how regions and communities are trying to integrate principles of sustainable development, support legislation to preserve open space, redevelop brownfields, recycle and reuse materials, and reduce sprawl. It is evident that many communities and regions across the U.S. are working towards utilizing natural resources in a manner that does not compromise options of future generations.

EVOLVING ROLE OF RESOURCE MANAGERS

Delegates also examined the evolving role of resource managers in the 21st Century. Prior to the congress, 650 survey forms were mailed to key personnel with federal agencies, state agencies, universities, associations, and corpora-

The author of this report, Kristen L. Krapf, formerly served as program director of the Renewable Natural Resources Foundation.

tions. The sample was not random; surveys were sent to leaders, agency heads, deans, and administrators. Approximately ten percent responded to the survey. Specific survey questions included:

- What are the most important social, political, economic, and natural resource trends and/or issues that will affect the role of resource managers and professionals in the next 25 years?
- How should/will the role of resource managers and professionals change and evolve as a result of these trends/issues?
- What skills, tools, strategies, education and training (e.g., conflict resolution, decision-making, spatial technology, computer training) are suggested by the evolving roles?

The purpose of the survey data was to stimulate thinking and discussion by delegates on current and future natural-resource trends, and the associated education and training of resource managers and professionals.

PROGRAM AND PROCESS

RNRF used a case-study approach to examine tools and strategies for sustainability. Following each speaker's presentation, delegates were afforded

opportunities to ask questions and make comments. These question and answer periods allowed for informal yet in-depth discussions of the tools and strategies for sustainability. This format also permitted delegates to identify common challenges, as well as successes and failures that occurred in different regions and communities throughout the country.

Delegates also engaged in discussions as members of two working groups. RNRF made every effort to create a diverse and balanced group of disciplines and perspectives in each working group. Working group chairs were resource professionals and educators representing RNRF member organizations. Faculty from Oregon State University and the University of Washington served as facilitators. Graduate students from those institutions served as reporters.

This report was developed using the plenary-session notes and audio tapes, as well as working-group notes and summaries prepared by the chairs, facilitators, and reporters. The report would not have been possible without their dedication and contributions.

The congress opened with an evening reception on September 6. RNRF Chairman Richard L. Duesterhaus welcomed delegates to the

congress. David Moody, RNRF Vice-chairman and chair of the Congress Program Committee, briefed the delegates on the purpose and goals of the meeting.

One of the congress highlights was a special dinner presentation by Cassie Phillips, director of Forestry, Western Timberlands, Weyerhaeuser Company, on September 7. She discussed, "Sustainability and Private, Industrial Forest Lands—Part of the Problem, or Part of the Solution?" Phillips spoke about the importance of private forestlands, particularly those in the Pacific Northwest, and the strategies necessary to sustain working forests. She also discussed the social, economic, and environmental issues associated with sustainable forestry.

The congress concluded on September 9 with a field trip up the Columbia River Gorge. Thirty-five delegates were treated to the sites, sounds, and history of the area. Michael Ferris, public affairs officer for the Columbia River Gorge National Scenic Area, U.S. Forest Service, served as the guide, providing information about the landscape, politics and local sustainability initiatives. Ron Saranich, Rural Community Assistance Program manager for the U.S. Forest Service's Pacific Northwest Region, prepared the program of events.

Summary of Presentations

WORKING DEFINITIONS OF SUSTAINABILITY

The plenary sessions began on September 7 with Hal Salwasser, former USDA Forest Service researcher and administrator, and new dean of the College of Forestry at Oregon State University. His presentation, "Working Definitions of Sustainability," provided a framework for how to think about sustainability, and identified challenges faced in implementing the concept. Forests were used as a case study, but the ideas described could be applied to all ecosystems.

Salwasser observed that sustainability is a broad concept that provides room to find common ground in addressing environmental, economic, and social challenges. He explained that in the past, the natural-resource arena found common ground on these issues. In the past decade or two, however, there has been less agreement. As a result, Americans have suffered the consequences of the politics of power instead of the politics of consensus. Salwasser maintains that we are more easily influenced by people who are intrigued by polarization rather than by those interested in bridge building. Sustainability is a concept that provides a framework for reform.

The word "sustainability" comes from "sustain" which comes from a Latin word that means to hold up and prolong, to keep in existence, to endure or withstand. The question that im-

mediately arises is, "What is it that we want to hold up and sustain and prolong?" Using a forest analogy, Salwasser articulated the importance of sustaining forests because of their diverse uses and numerous benefits.

Today, a smaller global forest must serve more people in more ways. Before the Industrial Revolution, there were about 25 hectares of forest per person. Today, only about 2.5 hectares of forest are available per person. As we strive to achieve sustainability, we will have to adapt to a reduced natural-resource base. To sustain forests as well as other natural systems, communities need to overcome several challenges. These include keeping ecosystems in their natural state, coping with megaforges such as climate change and urbanization, meeting people's resource needs, increasing active management and conservation, investing in new knowledge and technologies, enhancing lifelong and extended education, and developing incentives for sustainable production and conservation. Salwasser stressed that another key to sustainability is intelligent consumption. Wise-use of natural resources creates and sustains value while overuse and poor choices deplete ecosystems and diminishes long-term value.

Salwasser asserts that sustainability will not be achieved through increased regulation. Sustainability will require tools and strategies such as interdisciplinary partnerships, clear and common goals, a sense of ownership, new incen-

tives, affordable and efficient monitoring systems, increased management, well-educated graduates, and an informed citizenry. Salwasser further asserts that it is necessary to empower localities, test and build new technologies, and integrate the social and biophysical sciences with cultural diversity.

Although the term may not be perfect, Salwasser believes that sustainability is a good paradigm for the 21st Century because it helps natural-resource scientists and professionals, public officials, teachers, manufacturers, and communities focus on common ground.

U.S. POPULATION GROWTH AND DEVELOPMENT PATTERNS

William Acevedo, a research physical scientist with the U.S. Geological Survey (USGS), used geographic information systems (GIS) time-series maps and data from the U.S. Census Bureau to provide powerful visual displays of "Population Growth and Development Patterns." Several U.S. cities and regions were showcased including Portland, Oregon; Houston, Texas; Atlanta, Georgia; Miami, Florida; San Francisco/San Jose, California; and the Baltimore-Washington area.

Land-use changes are being driven by population growth, zoning laws, property values, economics (such as taxes), and desire for open space. Today, about 75 percent of the U.S. population lives in urban centers and approxi-

mately 25 percent lives in rural areas. Many urban centers are not prepared to accommodate increasing growth and development and are facing immense pressures as they receive new inhabitants. Consequences of this growth and development include sprawl, traffic, decline of inner cities, and decreased quality of life. Environmental impacts associated with growth and development include habitat loss and fragmentation, depletion of resources, altered fire ecology, landslides, coastal erosion, and flooding.

Acevedo stated that the USGS has a variety of powerful tools that can help local communities and regions identify and monitor environmental trends, and identify the forces driving land-use changes. Tools such as data sets, GIS, topographic maps, LandSat TM images, and TM Panchromatic and IKONOS are being improved and refined. The USGS can facilitate the transfer of these tools to communities, natural resource managers, and policy makers. For additional information on the USGS's Urban Dynamics Research program, visit <http://edcwww2.cr.usgs.gov/urban/> or the USGS web site at <http://www.usgs.gov>

REGIONAL CASE STUDY:

Pacific Northwest

Ron Sims, County Executive of King County, Washington, presented information on the Pacific Northwest. He identified major challenges being addressed in King County, including making urban communities livable, linking land use and transportation, maintaining a rural legacy, and protecting natural resources and the environment. King County, like the Pacific Northwest region, has experienced population growth, rapid changes in the economic base, and increasing confrontation on natural resources issues. King County stretches from the waters of the Puget Sound up to the crest of the Cascade Mountains. Home to Seattle and 38 other cities, it is the nation's thirteenth

most populous county with more than 1.6 million people. The county also contains some of the most productive farmlands and one of the most vibrant economies with 1.1 million jobs.

In 1994, the county adopted a "Comprehensive Growth Management Plan"; a framework designed to advance the Smart Growth Initiative. Smart growth is a concept that promotes compact and efficient growth patterns that reduce sprawl, protect the environment, and build a strong sense of community. King County's plan promotes an environmentally conscious culture, good science, local markets, recycling, brownfield redevelopment, collaborating and partnering with different stakeholders, using GIS, and developing urban areas.

One of King County's goals was to have 95 percent of the growth in urban areas and five percent of the growth in rural areas. It currently is meeting this expectation because its constituents and leaders have a compelling vision—planning and sustainable practices are cheaper and more prudent than unsustainable growth and development. Sims presented three examples of unsustainable practices that are detrimental to the environment and the economy. First, loss of forest canopy leads to soil erosion and water loss. Second, air pollution leads to smog and high costs for removing particulates. Third, declines in salmon populations can lead to ESA listing, species extinction, and high recovery costs. These examples are being used to promote sustainability with citizens in King County and throughout the Pacific Northwest.

Building support for prudent urban development requires that you illustrate the costs of sprawl and give people economically viable options. For example, in order to reduce sprawl, King County's Comprehensive Growth Management Plan increased land-use and density options in the urban areas where facilities and services already exist or can be readily provided. The plan also protects

rural areas by slowing growth and preserving agricultural lands and open space.

Sims observed that crises can play an important role in promoting sustainability. He contends that crises can precipitate laws that give the government authority to make significant changes. He noted that although that was not the case in King County, it might take a crisis to cause changes in regions that are less committed to planning.

To view King County's 2000 Comprehensive Growth Management Plan visit http://www.metrokc.gov/exec/orpp/compplan/2000/exec_rec.htm. You also can call (206) 296-8777 or send email to compplan@metrokc.gov

LOCAL CASE STUDY:

Portland, Oregon

Metro Executive Officer Mike Burton presented information on how metropolitan Portland is implementing tools and strategies to promote sustainability. Metro is the directly elected regional government that serves more than 1.3 million residents in Clackamas, Multnomah and Washington counties, and the 24 cities in the Portland, Oregon, metropolitan area. Metro provides transportation and land-use planning services, oversees regional garbage disposal and recycling waste reductions programs, and manages regional parks and green spaces. Metro is governed by an executive officer who is elected region-wide, and a seven-member council elected by districts (<http://www.metro-region.org/index.html>).

The Portland metro area is unique because it is home to an unrivaled number of urban open spaces. Portland's 37,000 acres of park space includes the nation's largest urban wilderness—a 5,000-acre Forest Park—to a tiny 24-inch Mill Ends Park. Expansive green spaces make even the downtown feel natural and friendly. Portland has an area of 130 square miles and a population of 503,000 within the city limits—1.7 mil-

lion within the metro area (<http://www.ci.portland.or.us>).

The President's Council on Sustainable Development (1996) defined sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs. In Oregon, however, the term sustainability has not been defined. Instead, Oregonians describe sustainability as an ever-increasing awareness and acknowledgment that many resources are finite. They recognize that resource consumption cannot continue at the current pace without severely damaging the health of the planet.

Burton explained that this vision started 25 years ago with the enactment of Oregon's land-use planning laws. Oregonians clearly stated that they valued natural-resources conservation and that they would not tolerate unplanned urban development. The Portland region based its planning on what Bruce Katz of the Brookings Institution calls a metropolitanists policy agenda. It focuses on changing the rules of the development game by limiting development to major activity centers, giving people access to all parts of the metropolitan area, and reforming governance. To reflect this theory, Portland created a process to integrate "sustainable thinking" into their value-based planning. Value-based planning is a type of growth management tool that overlays traditional planning with a community vision.

From 1940-1970, Portland's population doubled and the area of land occupied quadrupled (www.darkwing.uoregon.edu/~pppm/landuse/sprawl.html). It became necessary to implement policies dealing with growth and development. The Urban Growth Boundary (UGB), which marks the separation between rural and urban land, was created in the early 1970's as part of the statewide land-use planning program. The UGB is Metro's primary tool for regulating sprawl, promoting efficient use of urban land, and

preserving farm and forestland.

Citizens in the Portland metropolitan area also voted to create Metro, a directly-elected regional government. Metro is responsible for the long-range, strategic, land-use and transportation planning for 27 local governments in the urbanized and urbanizing metropolitan area. Metro manages solid waste, regional facilities, and regional parks and open space. However, Metro's central responsibility is thinking ahead about how to regulate sprawl and develop a sustainable urban form.

Portland has reinvigorated the urban core by restoring brownfields, building light-rail and street-car lines, and configuring a bridge so that it is accessible to bicycles and pedestrians. Other important initiatives include a newly created office of sustainable development and a habitat acquisition program. Land acquired under the habitat program will be protected in perpetuity for people and wildlife.

Burton believes that Portland is a good example of a city that is successfully promoting sustainability. Although the Portland region has been experiencing some of the fastest economic growth in the U.S., its anti-sprawl and transit-friendly policies are helping to sustain wildlife habitat and biodiversity, protect riparian corridors, and buffer zones along rivers, wetlands, and lakes. Portland's visionary planning tools and commitment to stewardship make it a model city.

REGIONAL CASE STUDY:

South Florida

South Florida is an 18,000-square-mile region of subtropical uplands, wetlands, and coral reefs that extends from the Chain of Lakes south of Orlando through the reefs southwest of the Florida Keys. It encompasses many nationally significant conservation areas including the Everglades and Biscayne National Parks, Big Cypress National Preserve, and the Florida Keys National

Marine Sanctuary.

Samuel E. Poole, former executive director of the South Florida Water Management District, described the ever-increasing challenges in South Florida resulting from extraordinary development and population pressures in the region. One of the biggest challenges is that over six million people currently live in South Florida and that figure is expected to reach 12-15 million (more than double!) by 2050. The vast region contains seven of the ten fastest-growing metropolitan areas in the country. Freight traffic also is expected to double in South Florida within the next five to nine years. As one might expect, direct impacts of population growth and development on land conversion have been substantial. Poole used several photographs and models to depict the region's land-management history resulting from this excessive population growth. Compelling images were used to contrast urban development in 1912 and the 1990s.

Another immediate problem is that growth and development have been pushing west onto prime agricultural lands. Beyond these agricultural lands, a national treasurer is at risk—the Everglades. The conversion of land for human use also has led to a high number of federally listed threatened and endangered species and an increase in exotic species. Poole believes that unless Florida implements aggressive resource conservation programs, all restoration efforts in this region will fail.

South Florida is sustained by water and this system has been seriously degraded by disruptions to the natural regional hydrology, as well as wasteful usage and pollution. Additionally, population pressures have made it difficult for the region to meet urban and agricultural water needs. South Florida's water-management system was designed to serve two million people but more than six million people currently live in the region. This growth has strained the water system's ability to perform its intended purpose.

The South Florida Comprehensive Plan was designed to address these and other problems. The key principles include public outreach, stakeholder involvement, and performance measures and targets. Poole believes that the Comprehensive Plan falls short, however, because there is no real strategy for protecting agricultural land and open space.

The future of the South Florida region is in doubt. It is anticipated that the health of the Everglades and other inland and coastal waters will continue to decline, plant and animal species will continue to face extinction, and water shortages for urban and agricultural uses will become more frequent.

REGIONAL CASE STUDY:

Southern California

Ron Rempel, deputy director of Habitat Conservation, California Department of Fish and Game, discussed some of the many challenges Southern California faces in the next millennium. The region, which includes over six counties and 184 cities within approximately 38,000 square miles, leads the states in urbanization growth (<http://www.scag.ca.gov>). This has created numerous challenges including water stress and scarcity, air pollution, growing transportation problems, rising living costs and housing shortages, decreasing agricultural lands and open space, and difficulty in protecting wildlife and their habitats.

California currently is the most populous state in the country. It is projected that California will experience the fastest population growth rate of any state for the next twenty years. Much of the growth will take place in Southern California, a region that currently is adding between 800,000-900,000 people per year, and is expected to reach 18 million people by 2020. This increase in population can be attributed to births, foreign immigration, and migration from other states.

How can this population growth be

accommodated? Without a long-term commitment to water conservation and land-use planning and protection, Southern California's sustainability is threatened. Rempel described a few steps that are being taken. For example, before new construction can begin in Southern California, a developer must demonstrate a sustainable water source. Despite this and other conservation measures, water will be diverted from agricultural areas to urban areas to meet the rapidly growing residential needs. This includes diverting water from some of the world's most productive farmlands that support the state's billion dollar agricultural industry (California Dept. of Conservation, Div. of Land Resource Protection, Jan. 4, 2000).

In 1991, Southern California embarked on an experimental regional wildlife conservation plan—the Natural Community Conservation Program (NCCP). The NCCP promotes whole-habitat preservation through good science, local-level decision-making, public participation, and city and county support. For conservationists, the NCCP offers proactive, multiple-species planning of an ecosystem. For land developers, it offers freedom from the project-by-project permit requirements of the Endangered Species Act.

Many Californians believe that the NCCP is an important step towards conservation in Southern California. Rempel identified and discussed three counties that are included in the plan—Orange, San Diego and Riverside. In these counties, homes, businesses, and roads are rapidly replacing orchards, ranches, and natural lands. The NCCP requires open space protection, conservation easements, land exchanges, zoning changes, habitat banking, and accounting for future urban and farming development. The NCCP promotes good science, decision making at the local level, public participation, and landowner and environmental-group coalitions. The ultimate goal is to use these tools and strategies to prevent further

habitat fragmentation and degradation in Southern California.

Rempel stressed that leadership will be a key to making notable changes in Southern California. The region needs leaders who are willing to promote sustainability and take political risks. He also believes that education, infill in urban centers, a refocus on downtown and town centers, increased public transportation, regional coordination in transportation infrastructure, green belts, and wildlife habitat conservation will play an important role in promoting sustainability. Successful tools include ordinances, zoning, and a shared responsibility among stakeholders. Sustainability in Southern California also will require a shift in per-capita consumption patterns.

LOCAL CASE STUDY:

Santa Monica, California

Craig Perkins is the director of the Environmental and Public Works Management for the City of Santa Monica. He identified issues that have prompted change in Santa Monica, including population growth, urban development, rising housing costs, and increased tourism. He described tools and strategies that Santa Monica developed to deal with these potential problems.

Perkins explained that Santa Monica initiated the Sustainable City Program as a way to create a new paradigm for the city's programs and policies. The city focused on two main areas for improvement—reduced resource consumption and reduced waste production. Related goals included reducing hazardous material use, pollution, and safeguarding the local environment and public health. Santa Monica's political leaders and citizens believe that sustainability is not just a destination but a process. They believe that sustainability can be cost-effective, particularly if a long-term perspective is adopted.

Established in 1994, the Sustainable

City Program became a comprehensive, long-term vision for the future. It avoids “piecemeal” solutions, secures formal commitments from the local government, defines the future path by setting milestones (16 indicators), and sets numerical targets and measures progress. The program focuses on resource conservation, transportation, pollution prevention, public health protection, and community and economic development.

Santa Monica has reduced the amount of wastes going into landfills, increased water conservation, and reduced energy consumption. To improve transportation, urban- design improvements have been made and ride-sharing is encouraged. The amount of affordable housing was increased and local jobs were created. Green Building Design and Construction Guidelines were instituted. Santa Monica also developed one of the most successful and comprehensive “green” purchasing programs in the United States. Perkins stated that Santa Monica is the first city in California to adopt energy efficiency standards for new construction that are stricter than state requirements.

Although Santa Monica has made much progress, there is more work that needs to be done. The city needs to set new goals for 2010 that reduce per-capita energy and water use—and waste generation. The plan needs to incorporate new indicators to create a more comprehensive approach. Population growth and development impacts should be tracked. The city also is developing programs and activities that engage and encourage residents, businesses, elected officials, and city staff to think “outside the box.” Finally, the city plans to assume a leadership role for communities throughout Southern California.

Promoting sustainability in Southern California will be extraordinarily difficult because a coordinated regional planning authority currently does not exist. The Southern California Association of Governments (SCAG) is the only regional resource that is examining

short- and long-term issues impacting the Southern California region. SCAG is trying to provide leadership, vision, and progress to promote economic growth, personal well-being, and livable communities in Southern California (<http://www.scag.ca.gov>). Although SCAG promotes long-range regional plans and strategies, and provides regional information services and analysis, the region is a long way from effectively coordinating and promoting regional sustainability.

For additional information about the city of Santa Monica, visit <http://www.ci.santa-monica.ca.us>. For more information on Santa Monica’s Sustainable City Program, visit <http://santamonica.org/environment>.

EVOLVING ROLE OF PROFESSIONALS IN THE 21ST CENTURY

RNRF conducted a survey of approximately 650 key personnel with federal and state agencies, U.S. universities, associations, and corporations. Respondents provided perspectives on the evolving role of resource professionals over the next 25 years. The responding ten percent, represented several disciplines including forestry, range management, fish and wildlife biology, engineering, landscape architecture, and geography. Survey results were used to stimulate thinking and discussion by delegates on current and future natural-resources trends and associated education and training of resource managers and professionals.

Gordon Bradley of the University of Washington, and Scott Reed of Oregon State University, presented survey results at the congress. Christina Kakoyannis, a faculty research assistant at Oregon State University, assisted with the evaluation and compilation of the results. Kathleen Wolf of the University of Washington also presented a review of the working-group discussions. The specific survey questions that were ad-

ressed were: What are the most important social, political, economic, and natural resource trends and/or issues that will affect the role of resource managers and professionals in the next 25 years? How should/will the role of resource managers and professionals change and evolve as a result of these trends/issues? What skills, tools, strategies, education and training (e.g., conflict resolution, decision-making, spatial technology, computer training) are suggested by the evolving roles?

A detailed description of survey results and delegate discussions can be found beginning on page 22.

Tools and Strategies for Sustainability

But first a word about working groups—

Working groups met for half a day to debate and discuss tools and strategies for sustainability, and the evolving role of resource professionals. The report presents the content and spirit of discussions that took place during the working-group sessions and plenary sessions.

Each working group had its own dynamic and incorporated different approaches for structuring discussions and reaching conclusions. There also were variations from session-to-session within working groups.

Although there were no formal votes among delegates regarding population impacts or proposed actions, consensus was noted informally and recorded by working-group chairs and note takers. Each delegate also was given an opportunity to comment on the draft report.

Discussion of alternative strategies for sustaining renewable natural resources inevitably leads to considerations beyond the purview of science. Scientists can identify natural resource conditions and trends reasonably well. However, the decision of what can or should be done in response to scientific information ultimately depends in large measure on the value society attaches to these resources. Thus, it should come as no surprise that many of the alternative strategies favored by congress delegates reflected their personal values. A group of scientists with different val-

ues related to our natural heritage would likely have formulated different alternative strategies. Readers should appreciate the fact that discussion of sustainability will include consideration of values. The findings, recommendations, conclusions and strategies identified reflect the opinions and ideas of the delegates attending the congress and not necessarily those of RNR, its member organizations, and the sponsoring agencies.

Building on the plenary speaker presentations, delegates assembled in small working groups on September 8, to identify and discuss tools and strategies for sustainability. James Bowyer of the University of Minnesota, reviewed the working-group notes and presented a report to the delegates. Delegates identified factors influencing sustainability and suggested tools and strategies aimed at finding common ground, making necessary connections, promoting public education and outreach, and identifying leaders. Many important recommendations were proposed including developing a strategic plan for sustainability, encouraging public understanding and participation in the decision-making process, and encouraging strategic partnerships in order to confront controversial issues (Table 1). Delegates also discussed new ways to manage, protect, and preserve the nation's natural-resources base. As natural-resources managers, professionals and scientists, delegates agreed that it is their job to lead the way in promoting sustainability.

Defining the Problem—Population Growth and Consumption

There was consensus among delegates that the two greatest obstacles to sustainability in the U.S. are continued population growth and consumption patterns. An increasing U.S. population and higher incomes are multiplying the impacts on natural resources and the environment. There are indications that we are extending beyond our ecological limits. Based on current trends, adopting sustainable practices that protect natural resources such as fresh water, cropland, fisheries, and forests, should be a high priority in the next century.

The U.S. population currently is growing at approximately one percent annually—more than twice the annual growth rate in most of Europe and in most industrialized countries (President's Council on Sustainable Development, 1996). Nearly doubling in the past half-century, the American population is 285 million and is increasing by more than 2.5 million a year. Much of the population growth can be attributed to the sharp rise in immigration to the U.S. Each year about one million people arrive in the states, with the majority settling in urban areas. According to data from the U.S. Census Bureau, 62 percent of the increase from now until 2050 will come from immigration along with high birth rates among new immigrants (Palmer, Tim. The Fate of America. Negative Population Growth Forum, 2000).

Perhaps even more compelling is

Table 1. Tools and Strategies for Sustainability

A. SUCCESSFUL TOOLS AND STRATEGIES

- Strategic plan for sustainability (vision, framework and implementation plan)
- Effective leadership (recognize and reward leaders)
- Alter behavior through incentives, education, monetary rewards
- Make sustainability a value (sustainability ethic)
- Use media to send messages to the public
- Community involvement (community-based projects, inclusive decision-making process, community-derived indicators to measure progress, concept of shared fate)
- Use technologies such as GIS, remote sensing, spatial models, and satellite imaging
- Involve all stakeholders
- Develop effective networks for sharing information
- Encourage continuing education and life-long learning
- Use economic incentives (articulate economic trade-offs and cost of services, tax consumption not income)
- Use demonstration and pilot projects to test and identify successful and less successful tools and strategies
- Establish strategic partnerships
- Remain creative and innovative
- Develop a decision support system
- Neighborhood advisory councils

B. LESS SUCCESSFUL TOOLS AND STRATEGIES

- Command and control
- Regulations that are not flexible
- Prescriptive policies
- Short-term goals and outlooks
- Enabling unsustainable behavior and practices through government policies and programs
- Isolation
- Manufacturing crises to get public attention

that while the U.S. only comprises 4.5 percent of the world's population, it consumes 45 percent of available materials and products. Many Americans enjoy a high standard of living and an associated high level of consumption. It may not be surprising that if the earth's population was represented by precisely 100 people, with all the existing human ratios remaining the same, six people would possess 59 percent of the entire world's wealth, and all six would be from the U.S. (<http://d6b.cas.psu.edu/100people.htm#100people>).

Finding Common Ground

Developing a Strategic Plan for Sustainability

In order to intelligently address population growth and consumption, and find common ground in promoting sustainability, delegates recommended developing a strategic plan for sustainability. The plan should include an assessment of what we are trying to sustain and a framework for achieving sustainability. In his presentation, Salwasser stated that it is important to have a fundamental understanding of, and goal for, sustainability. This is necessary because some groups subscribe to the concept of sustained yield and benefits of natural resources while others evaluate sustainability in terms of preserving environments or ecosystems. More recently, sustainability has broadened to include creating livable communities and sustaining social capital.

Because sustainability is a long-term process, a strategic plan should incorporate a long-range outlook and an ongoing inventory and monitoring system that is socially and economically feasible. Using the inventory and monitoring system, a baseline of ecosystem health should be established. Delegates agreed that there is a lack of the baseline information needed to determine ecosystem condition, which in turn is

key to developing a strategic plan.

A strategic plan should be adaptive and innovative yet maintain rigorous standards that are outcome-based, performance-oriented and target-desired. It also should be holistic, incorporate sustainable criteria and indicators, include a time frame for measuring success, consider human values, maintain consistent funding, and use a common database. To avoid confusion, terms and concepts such as sustainability, resource conservation, and stewardship should be defined. Because they already have explored these and other important concepts, delegates suggested using reports from the 1987 Brundtland Commission (*Our Common Future*) and the 1992 Earth Summit held in Rio de Janeiro (*Agenda 21*) as background information.

Delegates recommended that strategic plans should include standardized tools for assessing sustainability. (The USDA Forest Service's PIVOT program was given as an example.) Delegates believed that use of standardized tools is necessary to help measure progress along the way. Some examples included life-cycle analyses, inventory and monitoring programs, sustainability indicators, and measurements of payback time. Information should be available to the public on recycling and energy conservation, and the "real" costs of production. This information would help the public better understand the urgency of the issues. It also would help people realize that unsustainable growth and consumption ultimately limit options.

According to delegates, the strategic plan also should use available technologies such as GIS, geo-spatial models, and satellite imaging to develop knowledge-based approaches to issues. The information that this technology reveals should be accessible to the public and easy to understand. A strategic plan should avoid command and control approaches, inflexible regulations, or prescriptive policies. Delegates believed that a performance-based or incentive-based approach is the best strategy.

Coordinating Local and Regional Planning

Delegates recognized that social and economic trends over the past half-century have profoundly impacted the U.S. landscape. Urban sprawl has resulted in the outward-growth and decentralization of metropolitan areas. The American Planning Association describes regional planning as planning that transcends the boundaries of individual government units but shares common social, economic, political, natural resource, and transportation characteristics. Regional planning approaches can help guide, direct, and coordinate local planning efforts that can influence the social, economic, and environmental composition of a community.

Delegates recommended that local governments revise old planning models and work closely with surrounding jurisdictions to devise regional solutions for growth-related issues. Delegates suggest implementing regional plans that encourage compact development, restrict growth on sensitive lands, reduce competing interests, and provide coordination and promote communication among local communities. Regional plans also can be used to coordinate decisions involving water and air, transportation systems, infrastructure projects (e.g., roads and sewers), and watershed management. Delegates endorsed developing regional comprehensive plans because sustainability does not occur in isolation but rather within the influences of surrounding areas.

Delegates noted that regional plans and planning agencies exist throughout the U.S. It was their observation, however, that many entities do not have the authority to enforce policies and programs that bind local plans. Many of the plenary speakers noted that effective and efficient regional structures are needed in order to promote sustainability.

Necessary Connections

Encouraging Strategic Partnerships and Stakeholder Involvement

Delegates believed that strategic partnerships and interdisciplinary teams are necessary elements in implementing a strategic plan and promoting sustainability. Such partnerships need not be newly created; they can utilize existing networks and cultures.

Interdisciplinary teams can coordinate technical information, examine and promote issues, and assist in the planning process. These teams can provide a scientific and ethical “compass” for communities and regions. Collaboration among different disciplines also can help reduce confusion on controversial issues.

One of the primary goals of forming partnerships or teams is to foster discussion of important issues. Delegates believed it is important to have an open and inclusive process. The agenda should be visible, and all stakeholders should participate in the decision-making process. If it is not feasible for all the stakeholders to be involved, delegates recommended establishing an advisory board of stakeholder representatives.

Engaging Individuals—Integrating the Three E's

Delegates observed that a key to engaging individuals is to raise awareness that environmental health, economic prosperity, and social equity are interconnected components. Referred to by the President's Council on Sustainable Development (1997) as the three E's (environment, economy, and equity), sustainability can be described as the link between these three components. Communities are developing goals and indicators that are organized around these three components and that measure progress towards sustainability. If

the components are viewed as separate and unrelated, solutions to one component can make another component worse. It is the connection between these components that creates the basis for a sustainable community.

Environment. A critical component of sustainability is protecting and preserving the environment. Delegates agreed that an important strategy is to instill in the public a sense of urgency about environmental issues. This does not mean inventing an environmental crisis to initiate change. Instead, programs and policies should be designed so that they prioritize environmental issues and encourage citizen involvement.

Economy. Another important component of sustainability is the economy. It is important to draw connections between sustainable development and economic development. Sustainable practices should be described and promoted to consumers. Americans have had difficulty accepting sustainability as economically beneficial. This likely is due to the fact that during the Industrial Revolution, unsustainable economic development was responsible for economic expansion and prosperity (Porter, Douglas R., *The Practice of Sustainable Development*, Urban Land Institute, 2000). New economic paradigms must incorporate sustainable principles and recognize the long-term value of natural resources.

Delegates recommended that sustainable economic models should be designed to provide tax incentives for incremental environmental improvements, and use market forces to achieve environmental and sustainable economic goals. The new economic models also should account for the economic tradeoffs of growth and development, and recognize the costs of sprawl on natural resources, transportation, and utilities. Pricing should incorporate environmental risks and recognize “real costs.”

Equity. Delegates described equity as equality, fairness, equal access to a

healthy environment, and opportunities such as jobs, income, and education. Sustainability promotes intergenerational equity and equity among various social elements. Equity is another integral part of the sustainability equation because enhancement of quality of life supports maintenance or improvement of environmental and economic health

Identifying Unsustainable Actions — Implementing Sustainable Solutions

Communities need to identify unsustainable actions and implement sustainable solutions while there still is time to make meaningful changes. Delegates encouraged communities to pool their resources, skills and knowledge to develop “win-win” solutions. Although win-win solutions may not always be possible, it is important to develop flexible and creative alternatives that promote sustainability.

Case studies or demonstration projects (pilots) can be used to highlight successful (sustainable) and less successful (unsustainable) solutions to problems. Delegates identified sustainable solutions as tools and strategies that can be applied to problems in different environments (rural and urban) and at different scales (local and regional). The tools and strategies identified using case studies and pilots could be compiled to develop a “sustainability toolkit.” Because every community has unique characteristics, tools and strategies from the toolkit could be adapted to resolve their particular issues or problems. Delegates also suggested investigating European models and case studies for additional tools and strategies.

Delegates believed that sustainable tools and strategies are successful only if they can be articulated and then reduced to tasks. To encourage community involvement, tasks must be simple and performance based, an endpoint must be defined while the path to this endpoint must be flexible, and progress should be measured and rewarded. If

also is important to involve the community in examining the problems, determining standards, and developing indicators so that they are better informed. This approach gives communities a clearer vision of where they are heading and how.

Promoting Public Education and Outreach

Public education on sustainability is needed to unite people on the issues and to make them aware of the challenges and opportunities for action. Delegates believed that education and training on sustainability and the environment should start when children are young, and life-long learning should be encouraged. Teachers are encouraged to serve as role models. Natural resource scientists and professionals also are encouraged to serve as role models by providing public outreach on important issues.

Knowledge begins with the dissemination of effective and reliable scientific information. Knowledge and “good” science can empower people and communities. Delegates agreed that the world wide web is a good host and outlet for such information. It is relatively easy and inexpensive to develop and maintain web sites that relay “real time” information about current issues, policies, and debates. The web also can be used to maintain catalogues, reports, and assessments, and serve as a clearing-house for information.

In addition to being accessible, information also needs to be easy to understand. Delegates identified symbols, graphics, icons, and diagrams, as important tools for relaying information and educating the public on critical issues. If issues are defined in comprehensible, non-technical terms, it will be easier for communities to embark on developing sustainable strategies and solutions. Delegates recognized work by David Hulse, University of Oregon, because he uses

models to describe the impacts of population growth, transportation, and natural-resource use on the Willamette Valley.

The media has an important responsibility to relay information that is accurate and engaging. In the past, many environmental issues have been treated superficially in the news media because the stories do not fit conventional molds. Environmental problems often do not have clear endings or solutions. Thus, coverage tends to be fragmented and reactionary. Delegates resolved that in order to promote, explain, and popularize environmental issues, media departments should have resources specifically dedicated to environmental journalism. More news stories should focus on urban sprawl, natural resources, and the environment. These stories should incorporate familiar concepts such as smart growth, environmental protection, social equity, and pollution prevention.

Identifying Leaders

Who are the champions? The plenary speakers emphasized that effective leadership is one of the most important prerequisites to successfully promote sustainability. Leaders can be business people, politicians, scientists, resource managers, or members of the community. Delegates described a successful leader as someone who takes risks, communicates effectively, tries to be bi-partisan, engages local activists, enlists help from advisory councils, and recognizes emerging leadership.

Role of the Policy Makers in Promoting Sustainability

It is becoming increasingly evident that policy makers and politics strongly influence public opinion. As a result, delegates believed that policy makers need to be leaders in “promoting” through policies, practices, and programs. Policies and programs should

discourage unsustainable behavior and consumption. At the same time, leaders should encourage compact urban development, mass transit, recycling waste, reducing pollution, and minimizing energy use. Political decisions should be based on science, and science should be incorporated into planning and practices.

Because sustainability requires an interdisciplinary approach to planning and implementation, politicians need to make it easy for agencies and institutions to collaborate and cooperatively pursue projects. Sustainability also requires that policy makers enlist participation from a broad-range of interests in the decision-making process. Policy makers also need to encourage and enable communities to create regional structures like Portland’s Metro.

Role of Natural Resources Professionals in Promoting Sustainability

Serving as advocates, educators, and leaders, natural resources professionals have a unique and important role in promoting sustainability. They are architects of change, coalition builders, listeners, and scientific and ethical compasses. Delegates believed that simply by participating in the sustainability debate, natural resources professionals can make an important contribution.

Delegates discussed the important role of natural resources professionals in the community. Because most have spent their entire careers researching and sorting through facts, natural resources professionals have reliable and accurate information needed to empower communities. By convening educational workshops, making quality presentations, and sharing comprehensive information, resources professionals can help people better understand different perspectives on conservation, resource management, and planning. Through active involvement with the public—

being effective listeners, providing citizens with hands on experience, serving as technical experts, and volunteering time, skills and knowledge—natural resources professionals can be catalysts in the community. They can facilitate discussions on controversial issues and encourage communities to innovate.

Profound behavioral changes will be required to move the U.S. towards sustainability. Natural resources professionals can be leaders and exemplars by practicing what they preach, participating in life-long learning, and by demonstrating the feasibility and benefits of sustainability.

Because many environmental challenges can be addressed only through collaboration and cooperation, natural resources professionals must work with their peers in promoting sustainability. Professional societies and associations provide valuable services by bringing resource managers, educators, scientists, and students together. Delegates also suggested that collaboration serves to attract more of the best and the brightest into the natural resources professions.

Natural resources professionals have both reason and responsibility to participate in the public-policy process and to help make sustainability a priority on the public-policy agenda. Among their many capabilities, natural resources professionals can generate policy ideas, provide the science to make sustainable decisions, monitor and review technical information, and help predict the outcomes of policy changes on natural resources and the environment. Natural resources managers also can aid policy makers in anticipating, preparing for, and communicating information about environmental crises.

Summary

Delegates agreed that the environmental issues that we currently face are serious and urgent. Tools and strategies will be required that contribute to the environmental, economic, and social

welfare of the nation. Natural resources professionals will play a large role in using and implementing these tools and strategies in order to sustain our natural

resources, improve public health and well-being, increase national security, and protect the global commons.

Table 2. Critical Issues and Trends

1. Population Growth and Demographic Shifts
2. Consumption
3. Urbanization and Sprawl
 - Loss of important lands
 - Rural to urban development
 - Disconnect from land
 - Automobile dependence
 - Waste management issues
 - Pollution (air, water, noise)
4. Land-Use Issues
 - Open space and greenspace preservation
 - Brownfield redevelopment
 - Increased regulatory constraints on private land
 - Increased competition for land uses
 - Increased demand for recreational use
5. Natural-Resources Challenges
 - Water resources (supply, distribution, quality, increased competition)
 - Biodiversity loss and extinction
 - Increasing human-wildlife interactions and conflicts
 - Habitat loss
 - Forest fragmentation
 - Soil erosion and loss
 - Loss of agricultural lands/increased corporate agriculture
 - Shift from single- to multiple-species management
 - Watershed/ecosystem management approaches
 - Need for true-cost accounting
 - Shrinking federal budgets and workforce
6. Global Trends
 - Globalization (trade, travel, economies, communication)
 - Climate variability and change
 - Invasive species introduction
 - Increasing economic disparities
 - Information age—new communication and information technologies
7. Other Trends
 - Contentiousness on the rise (sound bite mentality, single issue politics, single issue organizations)
 - Perceived lack of strong leadership
 - Increased public participation in decision-making
 - Litigious society
 - Difficulty attracting good students to natural resources fields

Evolving Role of Resources Professionals

As reported in detail above, RNRFC conducted a survey to identify trends that will affect the role of natural-resources professionals, how that role will evolve, and how professionals can prepare through training and experience. The following section incorporates both the survey responses and notes from the working-group discussions.

Overview of Critical Issues and Trends

Social, political, economic and natural-resource trends will shape the evolving role of resources professionals over the next 25 years challenges. An examination of these trends suggests the education and training that will be needed to prepare for the future (Table 2). Some of the most important trends included population growth (both domestic and global), demographic changes such as population-aging and increasing diversity, and increasing per-capita consumption (high demand for energy, water, and forest products). Although there was no general consensus on the ideal population growth rate or level, there was general agreement that if the population continues to increase at current rates, it will strain the environment and natural-resources base critical to community and regional sustainability. Because of the unprecedented scale of consumption in the U.S., even slight changes in population or consumption can have

detrimental consequences.

Trends in population growth and consumption have led to increasing urbanization of rural areas and low-density dispersal, or sprawl. Rural to urban development and sprawl consume farms, forests, wetlands, wildlife habitat and rangelands. As society shifts from rural to urban, the rural social structure changes and a disconnect emerges between the community and its surrounding environment. Distancing people from their natural-resources base destroys the natural synergism between rural people and places. It also alters people's attitudes and perceptions regarding natural resources and conservation.

America's landscape is changing rapidly due to development. Trends in land use reflect land ownership (private versus public) and tenure, land-use patterns, legal restrictions, and economic influences such as taxation. Land use is becoming more intensive and extensive, resulting in metropolitan areas expanding faster than the population. Increased land-use intensity as well as concerns about threatened and endangered fish and wildlife species will increase regulation on private landowners by federal and state governments. Recent initiatives such as open-space and green-space preservation (including greenways, parks, trails, gardens, and wildlife habitats) and brownfield clean-up and redevelopment will be critical to the long-term protection of natural areas and resources. Not only are open spaces and

green spaces vital to the ecosystem, but they serve as filters for air, noise and water pollution, and help protect against flooding, fires, and erosion. Land protection also will help satisfy America's increasing demand for recreational and leisure activities such as hiking, camping, and biking. Despite multiple demands, public lands will be managed increasingly for recreation and less for economic uses such as logging, mining, and oil drilling.

Natural resources have contributed to the nation's development and prosperity. Conversely, development and prosperity have led to an unprecedented rate of environmental change. Current and future natural-resources trends include reduced water quality, increased demand and competition for water resources, forest fragmentation, reduced arable lands, soil erosion, and fish and wildlife extinction. Although water is a renewable resource, the rate of water use in some parts of the country is higher than the rate at which it can be renewed by natural hydrological and human processes. This unsustainable water use is depleting river flows, drawing down aquifers, and devouring wetlands and flood plains. Another problem includes the loss of wildlife habitat due to development that will result in increasing human-wildlife interaction and conflicts. To preserve resources for the long-term, true-cost accounting will be needed to help determine the "true" costs of resources and services. This pricing structure is more representative

because it considers clean-up and regeneration costs, and environmental impacts from cutting, extracting, and mining.

Globalization of trade, travel, communications and economics has resulted in worldwide repercussions, many of which have not been fully realized. Widely fluctuating markets and international trade agreements, such as the North American Free Trade Agreement, increase income variability and risk to natural resources. Globalization, which is directed at increasing the power and wealth of a few, is expanding the divide between the rich and the poor. Information and communication technologies are leading the global information revolution and are shaping the way most people live their lives. However, advances in trade, travel, and communication have failed to solve all of the world's problems. Additional issues of recent global concern include global climate change, invasive-species introduction, biodiversity loss, and the increasing number of catastrophic events such as droughts, floods, hurricanes, and tornadoes. High priority should be given to understanding the potential impacts of these trends on urban areas. This is particularly important in developing countries where there is less money and resources to prepare for the future.

Evolving Role and Necessary Education and Training

The issues and trends described above require that future resource managers and professionals have a broader knowledge base and more training and skills than ever before (Table 3). Resource managers will need to be adaptable, flexible, intelligent and dynamic individuals. Multidisciplinary courses, technological and computer training, and interpersonal skills will be required components of the natural resources curriculum. Resource managers must be effective communicators, decision-makers, negotiators, facilitators, educators and leaders. The philosophy of resource

managers will change to reflect developments in science, engineering, the economy, and the broader society.

In the future, the demand for resource managers will exceed the number of quality candidates. Universities must offer curricula that adequately prepares students for careers in natural resource fields while professional organi-

zations, such as those represented by RNRFF, must take an active role in attracting the best and the brightest students.

Interpersonal Skills

In today's information age, resource professionals must be able to effectively

Table 3. Changing Role and Necessary Education/Skills

1. Interpersonal Skills
 - Communication (writing, public speaking, visual presentations)
 - Listening
 - Multi-lingual
2. Partnerships and Team Building
 - Multi/interdisciplinary teams
 - Collaboration
 - Consensus building
 - Networking
3. Public Outreach
 - Community
 - K-12
4. Leadership and Advocacy Skills
 - Conflict resolution
 - Negotiation
 - Mediation
 - Facilitation
 - Decision-making
 - Critical thinking
 - Fiscal management
 - Political savvy
 - Ethics
 - Multicultural sensitivity
5. Broad-based Education
 - Multidisciplinary/interdisciplinary
 - Holistic approach
6. Technological Skills
 - Computer skills
 - Media training
 - GIS/GPS
 - Satellite imagery
 - Spatial technology
 - System management
 - Information management
7. Continuing Education/Life-Long Learning
 - Workshops
 - On-the-job training
 - Certification
 - Advanced degrees
 - Maintain scientific competence

communicate through writing, public speaking, and visual presentations. Resource managers also will play an important role in clarifying and summarizing thoughts, interpreting goals and ideas, and maintaining open and ongoing communications. Resource managers will need to anticipate crises and communicate to the public the environmental risks and impacts of natural disasters. Resource managers also will be required to guide debates on complex and politically sensitive issues.

Resource managers will need to acquire and practice good listening skills because listening is essential to effective communication between resource managers and employees, co-workers, and the public. It also is an important skill for dealing with dissatisfied individuals and groups. Good listening skills help resource managers focus their attention on important messages, pick out highlights of a conversation, ask relevant questions, and give well-developed answers. Listening demonstrates genuine interest that can help build and improve relationships.

It will be particularly important for resource managers to improve their interpersonal skills as the U.S. population becomes increasingly racially and ethnically diverse. In 1997, the proportion of the U.S. population that was foreign born reached an estimated one in ten, the highest proportion since 1930 (U.S. Census Bureau, Profile of Foreign-Born Population in The United States: 1997, Current Population Reports, Special Studies pp. 23-195). As a result, resource managers will need to be able to communicate and demonstrate respect for cultural groups that have different values and concepts of technology and natural-resources conservation.

Resource managers must be capable of appropriate behavior, communication, and listening styles to recognize and address differences. Language skills also will be important as resource managers increasingly interact with different ethnic groups to discuss their

unique local needs and help them solve problems. Additionally, as the world becomes more interconnected (e.g., global economy) and information becomes instantaneous, it will be increasingly important for resource managers to be multi-lingual.

Partnerships and Community Outreach

The increasing complexity and differences in social perceptions of environmental issues will force a greater reliance on interdisciplinary teams and partnerships. Resource managers will be required to work in such circumstances. Well-constructed teams with specific goals and guidelines are critical to long-term regional and community sustainability. Interdisciplinary teams and partnerships must be formed to confront critical issues, resolve conflicts, and collaborate on monitoring, modeling, and other data efforts.

Population growth is placing immense pressures on communities. To maintain and improve conditions, provide a decent human existence, resource managers will need to work with planners, engineers, and landscape architects to make decisions regarding transportation, infrastructure, and urban works. For example, resource managers will need to partner with local leadership to encourage high-density development, infill, and mixed-use neighborhoods. Resource managers will need to facilitate partnerships between private and public sector leadership, and between Indian tribes and state and federal agencies. Resource managers also need to encourage interagency collaboration within the federal government. By forming effective teams and partnerships, communities can work together to outline positive changes, generate responsive actions, and work toward collaborative solutions and goals.

Communities that are well-informed and knowledgeable typically

make decisions and implement policies that sustain the long-term health of the community and environment. As a result, resource managers will need to increase their outreach and education to communities as well as school-age children. This will help ensure the advancement of conservation technologies and sustainable tools and strategies. It also will help reduce the risk of abandonment of rural centers, wasteful resource consumption, loss of valuable lands, and segregation by race, class, and age.

Holistic Approach

A holistic approach considers and manages social, economic, and ecological factors. It is required for resource stewardship and long-term natural-resources management. Many environmental problems are rooted in the fact that the world is not viewed as a whole, with interrelated systems. Thus, people fail to appreciate that even small changes in law or policy, demographics or consumption can have far-reaching consequences for the environment and economy.

A holistic approach to management recognizes the interrelated nature of air, land, water and all living beings, and the need for ethical principles to guide human conduct. It draws on expertise from many sectors of society. The "explosion" of information and myriad complex and confusing problems calls for a holistic approach that looks at well-defined ecosystems and natural boundaries (such as watersheds) as the unit of management.

The holistic approach is conceptually simple and sensible, but different than the decision-making process used previously. It can help a community achieve a transformation, not merely a modification, of the decision-making process and how people interact with each other. In the absence of connections and relationships among disciplines, resource managers increasingly will be required to apply a holistic approach.

Leadership and Advocacy Skills

As national emphasis shifts from environmental regulation to environmental negotiation, commodity production to amenity protection (protecting federal lands for recreation and education, not commodity production), and consumptive to non-consumptive (recreation shift), resource managers will require several new leadership skills. These include conflict resolution, decision management, problem solving and critical thinking. Resource managers will use these leadership skills to empower communities and help them focus on their values, mission, and goals. Resource managers will need to take on participatory roles as facilitators, mediators, and negotiators in order to help people work together and maintain important relationships. New skills and training also will be required to implement new sustainable-management techniques and methods.

Ethics and diversity training can help resource managers make a fundamental change in their attitude and behavior. A broader understanding of different cultures will help them be more effective leaders. Resource managers also will need to be politically savvy and become more involved in the political and policy process.

Broad-Based Education

Resource professionals in the future will have difficulty coping with increasingly complex environmental problems if the country continues on the dominant educational track of specialization. Although disciplinary and professional specialization is important to discovering knowledge and developing foundational concepts, the system must be reformed to include knowledge and training in multiple disciplines. Students who specialize in a particular area often ignore interdisciplinary relationships. This approach is inadequate when addressing "real world" problems and solutions

because the environment cannot be evaluated as individual problems or pieces. In the future, natural-resources education will be less specialized, and generalists who have integrated knowledge and skills will be in great demand.

Natural-resources managers need a breadth of knowledge, similar to a liberal arts education, but with some required training and skills. Natural-resources education should include courses in the humanities, social sciences, natural sciences, natural resource policy and politics, business and economics. Training in finance, product development, marketing, and even sales will assist resource managers in developing solutions that are environmentally, economically, and socially sustainable.

Resource managers also need training in systems thinking—cycles, feedback loops, amplifiers, and intervention opportunities. Interdisciplinary and multidisciplinary education supports the idea that one cannot learn science independently of philosophy, logic, literature, mathematics, economics, and language. Interdisciplinary education can help lay the foundation for resource managers who are well rounded and who have broad perspectives on issues.

As resource managers become more multidisciplinary and holistic, the challenge will be to maintain top-quality science. A resource manager's role cannot be so broad that he or she does not have a sound scientific background.

Technological Skills

As society becomes increasingly dependent on emerging communication and information technologies, resource managers will need to be technologically proficient to maximize the associated benefits. Managers will need to understand how these technologies work and how data is interpreted. For example, for natural resource inventory and monitoring it is imperative that resource managers have solid understanding of spatial mapping techniques, remote sens-

ing and GIS. Other necessary technological skills included computer skills, systems management, and information management. Media training also will be an important tool to aid resource managers in educating the public about important issues.

Continuing Education and Life-Long Learning

Resource managers will require advanced knowledge that only can be obtained through continuing education and life-long learning. This includes workshops, training programs, certification programs, and pursuing advanced degrees. Environmental issues demand that resource professionals have accurate and up-to-date information. The public increasingly will rely on resource professionals to advance scientific knowledge on current issues such as new energy sources, bioengineering and impacts from population growth and consumption. Resource managers also need to respond and communicate information on changing environmental, economic, and social conditions.

Summary

The social, economic, and environmental challenges facing those who have responsibilities for making sound resources-management decisions are multiplying. Resource management is supported by the trend toward a more holistic, interdisciplinary, and collaborative approach. Resource managers are being asked to work with scientists, land managers, policy makers, and the community to deal with natural-resources challenges. These challenges provide the basis for a new education curriculum and leadership skills.

Students entering the natural resources fields will need to have background in multiple disciplines, communication skills, and leadership skills in order to satisfy employer and other professional needs. RNRNF can help univer-

sities develop interdisciplinary curricula and continuing education programs that will help resource managers become future leaders.

Conclusions

Although congress delegates limited their discussion to sustainability in the U.S., we know, in fact, that sustainability is a global concern. Simply by choosing to discuss this issue, the natural-resources community—represented by RNR's 14 professional, scientific, and educational organizations—acknowledges the importance of developing models and descriptions of

how communities can become sustainable. Pursuit of this common goal will require sustainable tools and strategies and the embracing of difficult priorities such as stopping population growth, reducing consumption, limiting sprawl, strengthening local economies, using natural resources more efficiently, and preserving the environment. A strategic plan for sustainability in the 21st Century will need to outline where the nation wants to be and how it will get there.

The survey on the evolving role of resource managers showed that resource managers are starting to examine what they can do as professionals and indi-

viduals to protect and enhance the community. Colleges and universities will play a strategic role in educating resource managers on sustainability and emphasizing holistic approaches. Students will need to learn how to draw connections among environmental, economic, and social issues. They also will need to be trained how to communicate effectively with the public, form partnerships, facilitate discussions, and think critically about problems. This education and training will help resource managers appreciate the scale and scope of our environmental problems, and to develop meaningful policies and programs that lead the nation towards sustainability.

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About RNRF

The Renewable Natural Resources Foundation (RNRF) was incorporated in Washington, D.C., in 1972 as a non-profit, public, tax-exempt, operating foundation. It was established to: advance sciences and public education in renewable natural resources; promote the application of sound scientific practices in managing and conserving renewable natural resources; foster coordination and cooperation among professional, scientific and educational organizations having leadership responsibilities for renewable natural resources; and develop a Renewable Natural Resources Center.

The foundation represents a unique, united endeavor by outdoor scientists to cooperate in assessing our renewable resources requirements and formulating public policy alternatives.

RNRF's members are professional, scientific and educational organizations that have, among their primary purposes, the advancement of sciences and public education in renewable natural resources and/or the application of scientific knowledge to the management of renewable natural

resources. Each member organization is represented on the board of directors. Also, "public interest members" may be elected to the board.

Individuals who support the foundation's purposes and programs may become "associates."

RNRF conducts conferences, symposia and congressional forums on renewable natural resources issues, and roundtable sessions for public/government affairs staffers of RNRF member organizations. RNRF also conducts biennial summits of the elected and appointed leaders of its member organizations. Current and future leaders are able to explore common interests and plan collaborative activities.

The *Renewable Resources Journal* promotes communications among RNRF's represented disciplines, and it is provided to all members of the governing bodies of RNRF member organizations. *Renewable Resources Journal* also is provided to members of the U.S. Congress, federal agencies, universities, and staff members of congressional committees with jurisdiction over natural resources.

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