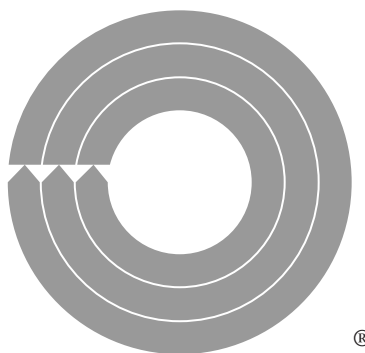


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Federal Natural Resources Agencies Confront an Aging Workforce and Challenges to Their Future Roles

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Conference on Personnel Trends, Education Policy, and Evolving Roles of Federal and State Natural Resources Agencies

Presented by

Renewable Natural Resources Foundation

in association with

American Association for the Advancement of Science

at

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Washington, DC
October 28 - 29, 2003

Sponsored by

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National Oceanic and Atmospheric Administration
USDA Forest Service

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RNRFB Program Director **Ryan Colker** performed admirably in working with our committee volunteers, speakers, and delegates. He managed meeting logistics and contributed to this report as an editor.

Finally, sincere thanks go to the dedicated conference speakers and delegates who shared their expertise, experience, insight, and passion for sustaining this country's professional workforces and agencies to continue their essential work. The conference program and a complete list of conference delegates appear in the appendix.

Robert D. Day

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Issues and Recommendations— A Conference Summary

Ryan M. Colker and Robert D. Day, Editors

Introduction

Government agencies charged with managing America's renewable natural resources are facing two unprecedented challenges. First, significant demographic changes in the federal workforce in the near term will deprive agencies of significant numbers of senior scientists and managers. Maintaining core scientific and managerial competencies will pose extraordinary difficulties.

Second, while coping with these workforce issues, federal agencies are confronting questions about their future roles. The questions stem from decades of budget cutting and reductions-in-force, changing national priorities, and the quest for new and diminished roles of government by some interests.

The seriousness of these challenges to federal natural resources management first was suggested to RNR in 1999, when Thomas A. Fry, then director of the U.S. Bureau of Land Management (BLM), met with members of RNR's Washington Round Table on Public Policy. Fry reported that BLM was reexamining the kinds of skills that its workforce should possess in light of continuing workforce reductions. He observed that BLM's capabilities and mission were changing in response to diminishing financial and human resources. He also observed that the changes were occurring although there

had been no congressional action to amend the agency's organic act.

Upon further examination, discoveries included an impending wave of retirements in all environment and natural resources agencies, and universal agency concerns about maintaining core scientific and managerial competencies.

An emerging and more complete appreciation of what was happening to the natural resources agencies led to questions of how we had gotten to this point. Leaders of the Renewable Natural Resources Foundation concluded that the time had arrived for the natural resources and related professions to assess these demographic trends, determine how we and the federal agencies were responding, and how the future roles of government were being profoundly affected. We also wanted to consider how the professional, scientific, educational, and engineering communities should respond to these trends in the current fiscal and political environment. Finally, there was a consensus among conference organizers that the academic community also should be challenged to reexamine its role and leadership responsibilities in the emerging social and political landscape.

Thus, the "Conference on Personnel Trends, Education Policy, and Evolving Roles of Federal and State Natural Resources Agencies" was conducted October 28-29, 2003. The conference

was presented in association with the American Association for the Advancement of Science (AAAS), and conducted at its headquarters in the District of Columbia. Participating in the conference were more than 80 delegates from 25 states, and from numerous natural resource disciplines.

Primary Issues

Conference presentations and discussions concentrated on three primary issues:

- First, the emerging workforce demographic trends, how they are affecting agencies, and how agencies are responding;
- Second, the role of government in natural resources management and research, how it is changing, and what impact it is having on the resources, the agencies, and the related professions; and
- Third, new responsibilities that should be assumed by educational institutions and the new skill sets natural resource agencies desire in their employees.

Principal Findings and Recommendations

The following findings and recommendations are presented in abbreviated form. More complete descriptions are included in the report. Findings and recommendations were identified by

conference delegates and do not necessarily represent policies and views of RNR, its member organizations, AAAS, or the sponsoring agencies.

Emerging Demographic Trends and Responses

Government agencies, particularly those charged with managing and protecting the nation's natural resources, are facing a crisis. Their employee base is changing as more employees become eligible to retire resulting in lost institutional memory and difficulties in maintaining core competencies. Agency leadership and science capacity will be most affected. Over one-half of the Senior Executive Service (SES) members at the Department of the Interior (DOI), USDA Forest Service, and Environmental Protection Agency (EPA) will retire by 2007. Key functions within the agencies also will be adversely impacted. Within the same period, DOI will lose 61 percent of its program managers, the Forest Service will lose 81 percent of its entomologists and 49 percent of its foresters, and EPA will lose 45 percent of its toxicologists and around 30 percent of its environmental specialists.

Agencies have begun strategic human capital planning, but some, like EPA, are lagging behind. These demographic issues must be addressed, but prospects for a federal gross debt of \$7 trillion and pressures on discretionary spending (which includes natural resource spending) will further complicate agency abilities. See Figure 1, page 10.

Some effort is being taken by the agencies and interested non-governmental organizations to mitigate the impacts. However, a systematic and holistic approach focusing on current agency employees, near-term natural resources program graduates, and students is necessary. Partnerships among agencies, universities, professional so-

cieties, and NGOs must be energized and strengthened.

To retain and conserve institutional memory, federal employees should be encouraged to move into an emeritus status or associate with universities. Promoting life-long learning and providing leadership training for existing younger employees can help retain leaders. Encouraging some exceptional employees to remain beyond the 30-year career cycle also could help mitigate the problem.

Attracting young hires to fill the vacancies may prove to be difficult. Positions with federal agencies have been few and far between for many years. Most universities have long since ceased encouraging and preparing students for public service. This must change. The complicated application and hiring process, mobility requirements, and salary discrepancies may further discourage recent graduates from pursuing careers in government.

For long-term environmental security, interest in natural resources must develop from an early age. People's connection to natural resources must be re-established. Elementary school lessons should incorporate decision-making skills and environmental issues. Tying natural resource issues to the urban environment also could help.

The Role of Government

Demographic changes in the federal workforce, shifting national priorities, and budget cuts are changing and often diminishing government's role in natural resources management and science. Some changes in government's role are unintentional. They occur by default and accident—without discussion and deliberation about agency missions and priorities. However, some changes are deliberate and reflect the view that less government is good, even when it comes to managing and conserving the nation's natural resources and its environmental integrity. What

is needed is a holistic and strategic approach to assessing the role of government.

Part of the challenge is that, more than ever before, natural resources are less clearly linked to the nation's economic welfare, and fewer people derive their livelihoods directly from the land and water. This disconnection has translated into less importance and influence in the federal establishment, and a resulting decline in bipartisan support. Professionals lose access and influence at the highest level of policy-making, and agencies lose power. This diminished power, declining budgets, and shrinking workforce are all occurring as the number of stakeholders increases, goals become more complex, resource use rises, and science knowledge grows.

An energetic and sustained outreach program to the public is desperately needed and overdue. All available media should be employed to inform the public and policymakers about critically important land management, conservation, and environmental issues. Greater public awareness of an agency's essential work will make the public more supportive of its role. Public education should be a part of every federal program, including in communities far from Washington, D.C. However, budget limitations, political resistance, and the diversity of the audiences will make such outreach efforts difficult.

Perceived problems with federal ineffectiveness at the local level can be overcome by agencies working together via a community approach. Delivery of services should be made as seamless (and painless) as possible.

Federal agencies and state and private universities, should consider partnerships which result in political advantage for natural resources management and science. Greater cooperation among federal and state natural resources agencies also would be mutually beneficial. It is important to note

that while states appear to be facing the same demographic trends and workforce declines as the federal government, with few exceptions, they are not mobilizing public or political support, or developing mitigating measures.

Finally, the professional, scientific, and education communities should undertake a strategic campaign to support a continuing vigorous role for the federal government in natural resources stewardship, science, and research. Part of this campaign should be to identify common interests with organized labor and environmental groups, and enlist their support. Recent experience suggests further use of D.C.-based coalitions.

Educational Institution Responsibilities

Universities have been and remain essential partners in the conservation and management of natural resources. Their traditional responsibilities have included educating new professionals, providing continuing education, and furthering resources management theory and practice. Today, leaders in the academic community—like their federal-employee colleagues—face some uncommon and unprecedented challenges.

Universities need to reconnect with federal agencies, and federal agencies need to reconnect with universities. The disconnection has been brought about by, as much as anything, a protracted period of little or minimal hiring of new university graduates. Federal agencies have not been hiring and recruiting, and universities have not

been training students for federal service. Now, federal agencies are facing new workforce requirements that relate not only to numbers but to specific training requirements of the next generation of natural resources professionals.

The skills necessary for effective and successful natural resources professionals are well documented in this report, and in a report published by RNRF as a result of its national congress in Portland, Oregon, in September 2000 (*Renewable Resources Journal*, Vol. 19, No. 1).

In brief (and much too briefly), the next generation of scientists and natural resource managers should be very bright, talented and well educated. They will need the ability to address broad issues at the ecosystem or watershed level, be broadly trained, capable of working across disciplines, able to process, filter and distill copious quantities of information, be familiar with advanced technologies, and have communication, dispute resolution, and social skills.

Tailoring higher education to the future needs of federal agencies will require creativity and collaboration. Changes in university organization and tenure would contribute to necessary innovations. (Additional suggestions were offered by conference delegates.) Such changes likely will come very slowly. The challenge to academic leaders in the conservation disciplines is to recognize the serious need and to respond with uncharacteristic speed and success.

Another potential response by universities to the demographic trends and challenges to government's role, would

be to actively engage. Can universities step outside of their traditional roles to participate and contribute to political decisions regarding the federal government's future role in conservation? Can universities provide leadership, knowledge, and perspective for the debate? Some educators suggested that it was unlikely that universities would assume leadership responsibilities. By their nature, universities harbor diverse perspectives. Strong consensus and forceful recommendations do not come easily. Also, universities will face the same budgetary pressures as federal agencies, and this could stifle action.

Professional, scientific, and educational societies—like universities—have a history of conservative actions, usually suggesting small and incremental changes. Although stakes for the future of natural resources management and conservation science are high, it remains an open question of the extent to which the professional and scientific communities will rise to the occasion and exert leadership. University faculty members and others with leadership capabilities and vision should be encouraged to operate through their professional societies.

Conclusion

Federal and state agencies, universities, and natural resource professionals face monumental challenges in assuring that natural resources conservation and management remains a priority. Only by working together in partnership and with considerable planning can they accomplish these essential goals.

Emerging Demographic Trends and Responses

Government is facing a major crisis in its ability to perform its missions—an alarming percentage of employees, particularly in leadership, are becoming eligible to retire. These impending retirements raise serious questions about agencies' abilities to maintain core competencies and to properly manage the nation's natural resources. These workforce changes also may be partially responsible for a shift in the role of government in the management and conservation of natural resources.

To understand the impacts that these workforce demographics have on agencies and its missions, it is necessary to understand the demographics. Robert Robinson, managing director, natural resources and environment team, U.S. General Accounting Office (GAO), provided background on workforce trends government-wide and in selected natural resource agencies (Department of the Interior, USDA Forest Service, and U.S. Environmental Protection Agency). Case studies provided additional information on particular natural resource agencies.

Government-wide, total employment has been decreasing since fiscal year 1997 with the exception of a slight upturn beginning in 2001 largely due to the addition of the Transportation Security Administration. The covered natural resource agencies have shown slight increases over the same period. Permanent full-time employees at the end of FY2002 were:

- Government-wide: 1,608,587
- Interior: 58,857
- Forest Service: 30,811

- Environmental Protection Agency: 16,776

One striking characteristic of the government workforce, in contrast to the civilian labor force, is the age profile. Over 40 percent of the government workforce is over the age of 50, about 23 percent have more than 25 years of service, and only about six percent are under the age of 30. In the civilian labor force, about 24 percent are over age 50 and about 38 percent are under 30. The natural resource agencies mirror the government-wide statistics with length of service slightly longer.

This age distribution illustrates the significance of the numbers of anticipated retirements, particularly among the more experienced managers and scientists. Government-wide, the Office of Personnel Management projected that 19 percent of the workforce would retire between 2001 and 2005. When looking at agency leadership, over one-half of career Senior Executive Service (SES) members, about 46 percent of GS-15s, and about 34 percent of GS-14s likely will leave government service between October 2000 and October 2007.¹

At the time of the conference, the Department of the Interior had an overall attrition rate of 20 percent over the previous 4 years. Over one-half of its SES members will have left by October 2007. Several key functions within Interior will see a high turnover within the same period including computer operations (74%), program managers (61%), and engineers (44%).

At the Forest Service, 50 percent or

more of the leadership in key areas will become eligible to retire by 2007. Forty-six percent of its permanent workforce is projected to turn over in the same time frame. In some key specialties, the projections are particularly significant—entomologists (81%), foresters (49%), engineers (40%), and wildlife biologists (35%). Competitive sourcing activities likely will increase the attrition rate in occupations associated with programs or functions under study for competition.

According to GAO and the National Research Council (NRC), the Environmental Protection Agency (EPA) has struggled with maintaining adequate scientific expertise to carry out its mission. NRC believes these concerns are related to EPA's ability to attract and retain first-rate scientific talent largely due to intense job market competition from the private sector and academic institutions. This challenge could intensify as a significant portion of EPA's scientists and technical staff will become retirement eligible by 2008—including about 45 percent of toxicologists, about 40 percent of health specialists, around 30 percent of biological scientists and environmental specialists, and over 20 percent of ecologists, environmental engineers, and physical scientists. Additionally, about 52 percent of the SES members will have left by 2007.

In response to these worrisome trends, federal agencies have begun strategic human capital management planning. Interior has determined that in addressing its strategic management

and major programmatic challenges and achieving performance goals, it must overcome skill gaps in technical and leadership areas. These technical skill gaps include fire management, natural and physical science, mediation and negotiation skills, and strategic business planning skills. Programmatic challenges of extreme urgency and importance include Indian Trust Fund management, wildland fire management, and law enforcement and security.

The Forest Service also has determined specific competency needs and current skill gaps. Administrative employees need skills in database management, conflict resolution, analysis, communication, and Geographic Information Systems (GIS). The professional staff needs skills in recreation-related activities, communication, collaboration, analysis, social sciences, GIS, statistics, conflict resolution, databases, and natural resource program

knowledge. Technical staff needs skills in GIS, data identification and gathering, databases, landscape-scale data gathering, and organization.

EPA has lagged behind in strategic human capital management. It has conducted a study of its workforce and issued a human capital strategy. However, the agency still must determine the number of employees necessary to accomplish its mission, the technical skills required, and how best to allocate employees among EPA's strategic goals and geographic locations. Similarly, EPA needs to fully prepare for the loss of leadership, institutional knowledge, and scientific expertise that likely will result from upcoming retirements.

To provide a framework for addressing pervasive human capital challenges, GAO has developed a model for strategic human capital management. This framework is based on:

- Leadership, continuity, and succession planning;
- Strategic human capital planning and organizational alignment;
- Acquiring and developing staffs whose size, skills, and deployment meet agency needs; and
- Creating results oriented organizational cultures.²

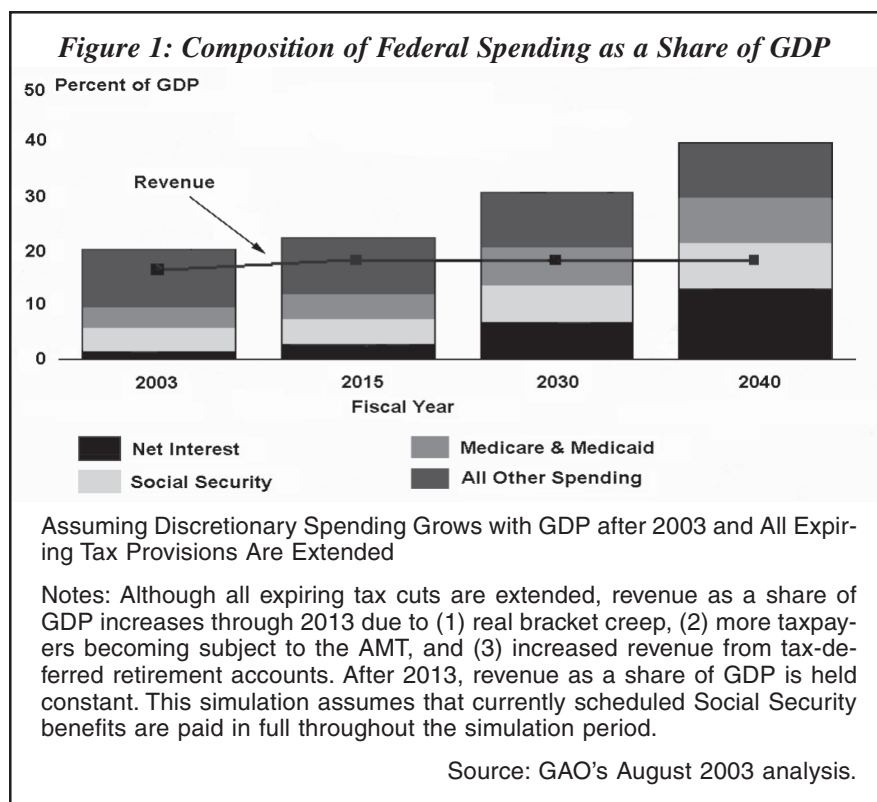
Agencies must address these human capital challenges in the context of a dismal fiscal picture. The government faces a gross debt of \$7 trillion. At the time of the conference, the Congressional Budget Office estimated that the total deficit for fiscal years 2003 and 2004 would be \$562 billion and \$644 billion respectively (excluding Social Security surpluses). Finally, "discretionary spending" (which includes natural resource agencies) will face increasing pressure and competition for limited funds. Figure 1 illustrates the fiscal challenges that decision-makers may encounter in the future.

Case Study: U.S. Geological Survey

Robert Ridky, national education coordinator, U.S. Geological Survey, provided additional information on the USGS workforce and activities currently underway.³

The USGS workforce is nearly half professionals with 15 percent in research and development, and a quarter in data collection, processing, and analysis. The workforce is smaller now (FY 2002) than it was a decade ago (FY 1990)—even with the addition of the National Biological Survey and Bureau of Mines in 1996. Currently, 10.7 percent of all employees are eligible to retire in FY 2003. The percentages are projected to increase over the next five years, particularly in critical areas including:

- Science staff: from 11.9% currently to 20.6%;
- Science technical staff: from 8.2% currently to 15.7%;



- Administrative staff: from 12.7% currently to 23.6%; and
- Information technology staff: from 8.7% currently to 17.8%.

While not all employees eligible for retirement in a given year take it, at USGS over the last two fiscal years, nearly 14 percent did (including 20 percent of science managers, and ten percent each in research and development). This rate is expected to continue over the next five years.

In response to these trends, USGS has undertaken a strategic planning exercise to help assure the existence of employees necessary to achieve its mission. The USGS will evaluate its current capabilities and skills and actively invest in training employees in the skills needed to keep pace with technology, and to understand and model natural systems. USGS is aligning its rewards systems to encourage integration of its capabilities and support increased responsiveness to customers' needs. Finally, USGS will take steps to increase its flexibility to respond quickly and effectively to the needs of its customers. These steps include implementing new contractual vehicles for obtaining new skills, removing barriers to resource sharing, and increasing use of cooperative agreements and partnerships with entities who use USGS data and information.⁴

The USGS Leadership Program was developed to fulfill the vision "to create a leadership-centered culture throughout the USGS that emphasizes the importance of people in the USGS to ensure high-quality science for the benefit of society." The program is designed to (among other things) attract and retain high quality employees. The program will be integrated with the management development program, and closely linked to mentoring, rewards, workforce planning, and other human resource programs.

An organizational assessment survey given to USGS employees in 2002 re-

vealed additional concerns for the future effectiveness of USGS. In general, the employees were positive about their contributions to the science mission, having the needed information and tools, their relationships with their customers, their work, their supervisor's skills, and the USGS as a rewarding place to work. Employees also identified several items of concern. These concerns can be separated into two key issues. First, employees view USGS as not preparing adequately for the future. This includes concerns about insufficient understanding for direction and investments needed to ensure long-term viability of science, senior leadership not providing a compelling vision, barriers to working across disciplines, the science planning process not giving adequate opportunity for input, recruiting and retaining talent, and overcoming barriers to working across disciplines. Second, organizational changes are not seen as achieving intended results.

USGS sees another critical challenge—assuring the development of a future scientific workforce. Several factors are working against this including a weak national literacy base in natural sciences, a decreased cultural emphasis including the cost-benefit of graduate level education, the strong foreign student presence, and the diminishing governmental focus on earth and environment research and development (see text box on page 13, *Where Have all the Students Gone?*). Foreign students are often ineligible for government service, and sometimes return to their native country resulting in a loss to the potential scientific workforce.

To address this challenge, USGS has integrated educational goals in all programs. Its strategic goals indicate, "Education and research are always in the public service, and therefore are inextricably bound at all levels." Particular challenges include assuring that earth and environmental science con-

tinue to be included in school curriculums (e.g., recent assaults by Texas and California) and that teachers (particularly at the elementary school level) have the necessary background and enthusiasm.

USGS is working with universities and professional organizations to deliver its science more effectively. All this is done with the vision of USGS as a world leader in its ability to integrate its educational programs with its ongoing research programs.

Case Study: USDA Forest Service

John Kusano, assistant director of human resource management at the USDA Forest Service, spoke about the Forest Service workforce. Workforce planning is an essential tool in human capital management. It starts with the analysis and identification of key trends and issues including retirement/attrition projections, hiring trends, diversity, age distribution, skill-gaps, and new competency needs.

The permanent Forest Service workforce has been declining since 1992, but current analysis shows a slight increase over the past couple of years. This is largely due to a change in the ratios of hiring to losses. Between 1993 and 2000, attrition rather than hiring was the dominant factor shaping the workforce composition—more employees left than were hired. The trend reversed in FY2001. The attrition-led workforce trend in the 1990s explains the lack of progress in diversity, yet, when the trend reversed, no significant progress was made. In fact, despite significant progress in the 1970s and 1980s, the representation of women and minorities has remained static for more than a decade.

The age distribution trend also has been a focal point. Due to the lack of hiring in the 1990s, the youngest age group (15-29) has almost disappeared, while the oldest cadre (over 50) has

been increasing. From 1988 to 2003, the oldest group has increased from just over 20 percent of the workforce to nearly 40 percent, while the youngest group hovered between less than five percent (1998) to just under ten percent (1988 and 2003). The middle age group (30-50) has declined from 70 percent to just over 50 percent. The oldest group consists of over 12,000 employees, exhibits a 49 percent attrition rate, and has 75 percent of all GS-15s, 64 percent of all GS-14s, and 57 percent of all GS-13s.

The Forest Service has lost employees in important skill areas including wildlife biologists, soil scientists, and landscape architects.

All these trends lead to the need for systematic solutions. Currently, there is a de-centralized system of hiring with about 5,000 managers making selection decisions. These managers have maximum flexibility to use (or not use) recruitment tools and hiring methods. However, there is no widely utilized system for tracking the cumulative impacts of the thousands of hiring decisions made each year.

In pursuit of these systematic solutions, the Forest Service has prepared a series of documents examining the workforce and developing strategic plans to deal with the demographic shifts.

The Forest Service is using a four-legged stool approach to address its workforce issues. The first leg is workforce planning utilizing a service-wide workforce plan, a template for regional or research station plans, a workforce database, and a best practices website. Recruitment tools are the second leg, and include the development of national recruitment initiatives, professional recruitment materials, a trained recruiter cadre, a web-based scheduler, and a diversity resume database. The third leg, communications, includes a recruitment website, a national recruitment council, presentations to national, regional and station

leadership teams, the Chief's Workforce Advisory Group, and policy, directives, and letters. Finally, accountability systems require development of a workforce plan and affirmative employment measures for each unit, performance agreements as part of line officers' performance appraisals, and service-wide periodic progress reports.

Finally, the strategic workforce plan requires linkages throughout human resources management activities.

Case Study: National Oceanic and Atmospheric Administration

Marlene Kaplan, acting director of the Office of Education and Sustainable Development at NOAA, described NOAA's activities.

NOAA's cross-cutting priorities for the 21st century include an integrated global environmental observation and data management system; environmental literacy, outreach, and education; sound, reliable state-of-the-art research; international cooperation and collaboration; homeland security; and organizational excellence in leadership, human capital, facilities, information technology, and administrative products and services.

Of NOAA's 12,400 employees, 58 percent are in scientific and technical occupations including over 2,500 meteorologists, nearly 1,000 fishery biologists, nearly 300 hydrologists, and over 250 oceanographers. Agency-wide, slightly more than 40 percent of employees are under age 45; and slightly less than 60 percent are over age 45. However, in some of the core occupations, the percentage of older workers is significantly higher. For example, nearly 80 percent of meteorological technicians are over the age of 45. Fisheries biologists, physical scientists, and oceanographers have similar age profiles to the average. Meteorology and hydrology show the greatest age diver-

sity with about half above age 45 and half below.

With the concern for future agency leadership, the retirement rate among GS-13s and higher is an important statistic. Across NOAA, about 20 percent retire within the first year of eligibility, and nearly 70 percent by the end of the fifth year. The scientific and technical occupations generally reflect this rate with around 20 percent retirement in the first year of eligibility, but the fifth year numbers vary from just over 50 percent for hydrologists to about 75 percent for fisheries biologists and oceanographers.

All these trends are occurring at a time when, over the past ten years, the workforce downsized by 2,400 and the NOAA budget nearly doubled.

In responding to these workforce trends and public education needs, NOAA has formed leadership training programs, a training council, the Office of Education and Sustainable Development, and an education council. The education council began by defining environmental literacy, outreach, and education, and currently is developing a strategic plan for education, an implementation plan, participating in NOAA's planning and budgeting process, and identifying challenges. Some NOAA programs already have an educational element in its missions including the National Marine Sanctuary Program, the National Estuarine Research Reserves Program, the National Sea Grant College Programs, the NOAA Chesapeake Bay Program, and the National Weather Service.

Within its education strategic plan, NOAA has three main goals. First, increase public awareness and understanding of NOAA data, resources, and programs. Second, support education and outreach efforts that enhance environmental literacy and foster an informed public. Finally, increase the number and diversity of people who choose education and careers that support NOAA's mission.

Where Have All the Students Gone?

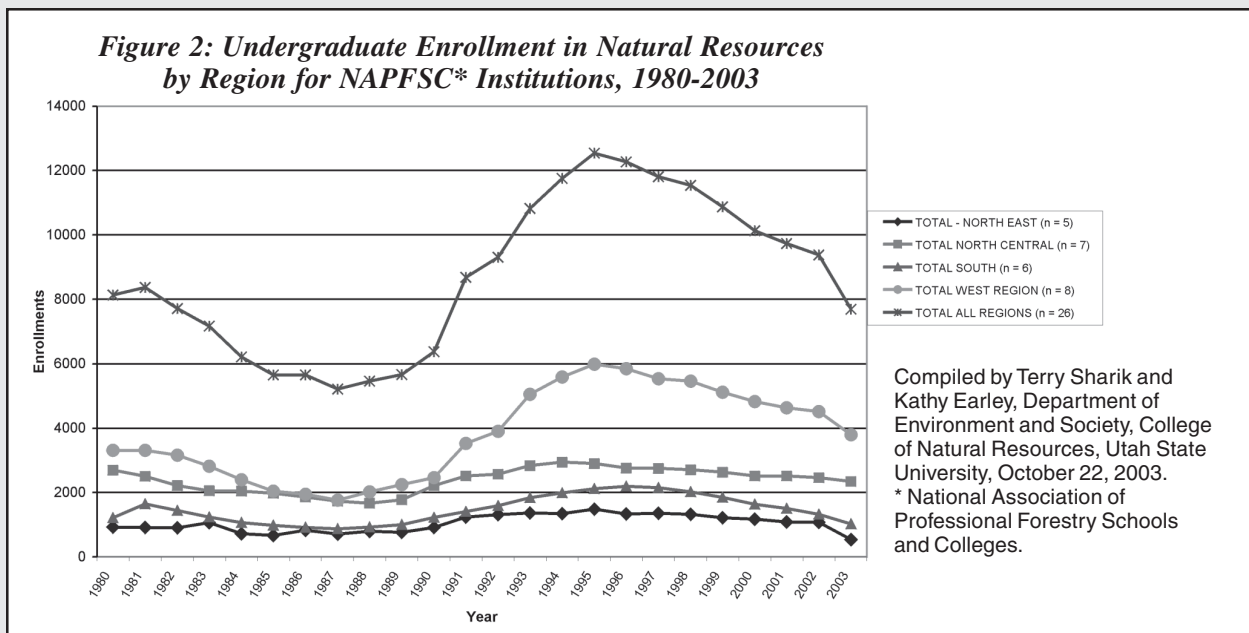
One concern delegates raised while discussing agency workforce demographics is whether a sufficient number of students will exist to fulfill future agency needs. From all accounts, the answer seems to be no. As shown in Figure 2, the number of students in natural resource programs has been declining. This decline is taking place at a time when overall university undergraduate enrollment has nearly doubled from 8.5 million in 1970 to 15.8 million today.

At the same time the number of students is declining, large portions of those students are foreign—and thus ineligible for most government (or government con-

tractor) jobs. In engineering, over 35 percent of masters candidates and over 45 percent of doctoral candidates are foreign students. In the physical sciences, over a quarter masters and over 30 percent doctoral candidates are foreign. The natural resource related biological sciences likely exhibit similar percentages, but growth in the biomedical sciences has skewed the statistics.

Upon discussion of these disheartening statistics, delegates identified several theories to explain them and possible solutions. An increasing disconnect between society, particularly young people, and natural resources has resulted in decreased interest in a career in natural resources. There also is considerable uncertainty in the existence of jobs. Many employers re-

quire a graduate degree, but the amount of time required beyond the baccalaureate degree detracts from its desirability—it typically takes between six and seven years to get a PhD while medical or law school takes two to three years. Implementing two or three year professional masters degree in natural resources may encourage greater enrollment—particularly within the minority community where students cannot afford the long time frames currently necessary for a graduate degree. Further discussion of these issues appears in the Responsibilities of Educational Institutions (page 20).



Help from the NGO Community

To follow-up on the statistics from GAO, Max Stier, president and CEO of the Partnership for Public Service, explained how the federal government arrived at its current demographic character, its continued challenges, and what his organization is doing to help.

The federal government is facing multiple challenges to attracting and hiring employees. There is a general lack of interest in government service among college graduates—only 25 percent express a significant interest in working for the government. Graduates see the private sector as offering a more positive career. College graduates believe that the private sector offers more interesting and challenging work (40% vs. 9%), rewards outstanding performance (62% vs. 5%), and allows employees to take more initiative (69% vs. 3%). Non-federal employees believe that nonprofit employment provides better opportunities to contribute to society and make a difference (52% vs. 10%).

An imbalance in skills also has posed a challenge. Due to a decade of downsizing, skill gaps are now evident—particularly in the mid- to senior-levels. Changing skill requirements have strained hiring—for example, the government will need to increase its IT workforce by 16,000 over the next ten years. Competition for the best talent is increasing due to the shrinking U.S. labor force, and fewer candidates are graduating with needed scientific and technical skills.

Stier identified three barriers to recruiting and retaining highly qualified employees. The first is a lack of information—52 percent of non-federal workers believed that they were well informed about public sector career opportunities, while only 29 percent believed the same about federal government opportunities. The government hiring process is broken. It is too difficult to apply, too slow to respond, and

employment rules are too confusing. Over two-thirds of college juniors and seniors surveyed in spring 2003 said they could not afford to wait more than four weeks to make a job decision. Finally, employers need to show potential employees that their work is meaningful. A poll of liberal arts students graduating in 2002 found that more than 80 percent thought the most important criteria in choosing a job was interesting work. The opportunity to help people was second at 70 percent, and the chance to learn new skills was next at 66 percent.

The Partnership for Public Service was formed to revitalize the public service and to tackle some of these challenges. Its mission is to serve as a non-partisan, non-profit organization dedicated to recruiting and retaining excellence in the federal workforce. To accomplish this goal, the Partnership has a five-part plan:

- Education and outreach—motivating America's best and brightest;
- Communications—reshaping public perception of civil service;
- Agency partnerships—creating and improving opportunities from within;
- Policy and research—leveraging knowledge to effect change; and
- Legislative affairs—addressing structural barriers to reform.

As part of this plan, the Partnership began a “call to serve” program.⁵ The program involves a network of nearly 500 colleges and universities and 62 federal agencies working to promote public service. It provides schools and students with tools to learn about federal jobs, and provides agencies with bi-monthly best practice forums. An awards program, The Service to America Medals, recognizes federal employees in many categories for their excellence in serving the public.⁶

Agency partnerships are facilitated through multiple programs including the development of a solutions center. The center offers guidance on leader-

ship, performance management, recruiting, and strategic human capital management. Some best practices from the natural resources community include USGS's Online Automated Recruiting System, NOAA's career development programs including the integrated learning management system and the rotational assignment program, and the Forest Service's recruitment efforts including the SES Ambassadors and the recruitment field offices.

To encourage sharing of positive practices and the overall improvement of agencies, the Partnership developed a “Best Places to Work” index based on the results of employee satisfaction surveys. Among the natural resource agencies, all three conference sponsors (USGS, NOAA and USDAFS) were above the government average.

Finally, many positive steps have been taken recently, largely because of the formation of the Department of Homeland Security. These include the establishment of a chief human capital officer for each agency, the availability of workforce reshaping tools (VERA and VSIP), and the categorical ranking for all Federal agencies.⁷ Additionally, long-range workforce planning and management are to clearly be linked to each agency's strategic performance plan. Other reforms that may be implemented include performance sensitive pay banding, increasing top pay for critical positions and sweetener incentives for mid-career talent, recruitment and retention bonuses, and the authority to establish science and technology scholarship programs.

A significant challenge exists in maintaining a government workforce, but an important advantage is government's unselfish goal of public service.

Findings and Recommendations

Following the plenary sessions, delegates met in working groups to fur-

ther discuss the pressing issues and develop findings and recommendations.

As Robinson indicated, the government workforce is aging. Experienced employees, including significant numbers of senior management and scientists, are headed toward retirement in unprecedented numbers. Delegates feared that when these employees leave, so will the institutional memory—the expertise and wisdom derived from long-term employees on how things were done and why, and agency history and experiences. To retain and conserve this memory, employees could be recruited to move into an emeritus status where they would work with agency personnel on a regular basis as a mentor. Retirees also should be encouraged to associate with

universities where they can educate natural resource students who will become agency employees.

Delegates also recommended that some employees should be encouraged to remain beyond their 30th anniversary with an agency.⁸ Many employees leave government after 30 years to pursue second careers in the private sector. Encouraging these employees to stay—using new retirement requirements—will help assure that necessary leadership and scientific expertise can remain in the agency longer. Agencies also should embrace the idea of a knowledge-based organization that promotes lifelong learning and continuous training. Such programs tend to revitalize employees and keep them interested in their work. Preparing existing younger employees for leader-

ship through accelerated SES training programs can help fill anticipated leadership vacancies. Allowing greater flexibility in work schedules also may help. Examining what the private sector has done in similar situations may provide additional options.

The general lack of diversity in the retiring population may provide an opportunity to diversify the workforce. The influx of younger hires could introduce fresh and innovative approaches to solving problems. New professionals and scientists also have the benefit of recent changes in higher education including new emphasis on cross- and interdisciplinary curricula.

Agencies may face difficulty in attracting these young hires—particularly when the current workforce is practically devoid of employees under

Diversity in Natural Resources: Agency and Educational Institution Responsibilities

Although assessing the implications of an aging federal workforce was a primary focus of the conference, delegates took time to recognize another workforce characteristic—diversity. Delegates recognized and supported the goal of having a federal workforce that reflects both gender and ethnic diversity.

Delegates learned that government-wide diversity goals have yet to be realized. However, it turns out that agencies with conservation missions have had more difficulty than other agencies in identifying and hiring qualified minority workers.

Some delegates feared that recruitment is likely to remain a difficult task given current natural resource program enrollment. Minority students typically are interested in issues and careers connected to problems affecting their communities. Natural resource and environment issues typically are not viewed as important as other issues.

Another way to bolster minority employment is to be sensitive to their special needs. For example, land management agencies should place new minority employees in locations with minority communities. This provides new hires with an extra element of support and “comfort” in their new careers and locations. Agencies

also should extend support at the office by making mentors available.

Another approach is to permit trial placements—and permitting easy relocation if the employee is uncomfortable. Once employees have become acclimated to agency culture, relocations to other settings are easier and can be considered.

The increase in women in the agency workforce also has been a catalyst for change. Women seek modern solutions such as telecommuting or flexible schedules to accommodate family roles and responsibilities.

Universities play an important role in attracting minorities to natural resource professions. The natural resource community should embrace and help develop programs at historically minority universities. Other universities should work with community colleges and other programs with large percentages of minorities in preparing students for entrance into four-year programs and natural resource careers. Providing social support groups may make minorities comfortable within the natural resource program. While efforts to engage minorities will be ongoing, and progress may be slow, all undergraduates should be made aware of multi-cultural issues and develop appropriate sensitivities.

the age of 30. Delegates identified several barriers deterring young candidates from public service. First, it is unclear whether careers in natural resources even exist. Further, the agency hiring process is too long and too difficult—reform is necessary. Agency mobility requirements and salary discrepancies with the private sector may further deter the best candidates.

While natural resource program enrollments continue to decline (see *Where Have all the Students Gone?* page 13), even graduates of natural resource programs do not choose government employment. Agencies and universities must work together to re-establish an interest in government service (see *Educational Institution Responsibilities*, page 20). Recent graduates are looking for meaningful work. This requires thoughtful planning by employers. Therefore, agencies should not rush to fill vacated positions, but should consider the need for the position or the creation of a position requiring new skills. Increased options for college students and recent graduates, including internships and mentoring programs, may help inter-

est students in public service. Some programs also ease the transition to government employment. Agencies must market opportunities in government as meaningful.

While attracting current natural resource students and maintaining the existing employee base is important in the short run, long-term solutions require a systematic and holistic approach. Agencies will continue to have the same problems, though perhaps delayed by five or ten years in the face of moderately effective solutions. Workforce models should account for changes in career trends and job turnover rates.

“Recruitment” must begin at an early age. Once most students reach college, their interests and possible career paths already are decided. Young people are avoiding natural resource career paths due to a lack of interest in natural resources. As discussed later, people’s connection to the land and water is more tenuous than in previous generations. That connection must be re-established. Beginning in elementary school, teachers should incorporate decision-making skills and environ-

mental issues into lessons. They need a better understanding and appreciation of government and how it works. New curricula that focus on urban natural resource issues could help.

Delegates commended the efforts of the Partnership for Public Service to promote federal service, but strongly recommended increased partnerships and efforts from all segments of the natural resources community.

Building Bridges

Just as natural resource issues are interconnected, so are agencies, universities, professional societies, and NGOs. All should work together to professionally conserve and manage our renewable natural resources. Recruiting and training the next generation of professionals and scientists also should be a cooperative effort. Agencies and other members of the conservation community should form alliances to introduce and better prepare students for government service. The recruiting links between agencies and universities also must be re-established.

The Role of Government

Demographic shifts, shifting budgets, and shifting national priorities are affecting government's role in natural resources conservation. Natural resources agencies have a long and admirable history in the growth of the nation. Federal agencies have provided leadership in science, management, and within the professional communities—including having employees elected to offices within their professional societies.

Over the past few decades, federal agencies have been challenged to mediate disputes over how public lands are managed. Demands for outdoor recreation, and maintenance of ecosystems and habitat, have overshadowed some traditional market products such as timber and grazing. Special interests have lobbied Congress and the agencies to produce the services and products that they favor. Precious few have lobbied to support a holistic approach to management.

Most recent controversies over management have centered on questions of values rather than questions of science. Natural resources managers have not been trained to divine the relative merits of different people's values. Congress has not given very specific direction on what mix of services and products should flow from national lands. Managers in the field are left to determine the balance of multiple uses. Ongoing administrative processes and appeals have become part of the managers' daily routine.

Finally, there have been calls to diminish or eliminate the role of government altogether. Congress has entertained selling federal lands, shifting ownership to the states, and diminish-

ing the federal workforce and assigning ministerial responsibilities to private or local government entities.

Addressing the Shifting Role

John Gordon, Pinchot Professor Emeritus and former Dean, School of Forestry and Environmental Sciences, Yale University, and Chairman, Interforest LLC, examined these changes and some of the continuing questions they raise.

Gordon argues that the role of government has remained relatively constant in general terms over the past century. However, changed conditions and societal goals are challenging agency structures and people to change. An inadequate response will lead to a decline in the number and importance of federal natural resources agencies. Despite the increasing pressures for and on natural resources, we are flirting with fade out and irrelevance.

Central to the role of federal government is the allocation of natural resources of the public domain, the wise use of individual resources, and the retention of options for the future. From the beginning, a significant part of the "American idea" was to see land and resources as tradable commodities. The federal government has served as trader, and still serves as the allocator of resources (timber, fish, water) derived from public and some private land and water. It also acts as arbiter to assure trade on a level playing field and that non-commodity values are not ignored.

These roles continue to be necessary but now must be accomplished in the face of radically different societal

goals. Old methods no longer fit the goals, so government is struggling with its role. For example, much of the federal forestry establishment has spent most of its time and expertise worrying about timber. The notion that only as much timber as grows on an area should be harvested has guided more than one federal agency. Today, however, people seem more concerned about recreation, biological diversity, and water. Some old worries like fire remain but new ones like urban sprawl have emerged.

Before moving headfirst into change, it is important to understand what is at risk if there is no change. At greatest risk is "resource national security," a subset of "environmental security," which describes the role of the environment in making the foundations and operations of the country secure. These roles include making sure we: do not run out of resources; do not fall behind other countries in technology for environmental management; do not make unnecessary enemies; maintain a livable environment; and support economic development.

To meet these changed concerns and to serve new goals, agencies are attempting to shift from "conservation," the metering out of resources at some agreed upon rate, to "maintaining complex systems." Shifting from sustained yield to sustained systems involves a shift in goals from "get what you want within rational limits" to "maintain the system and take what it gives you." The forest rather than the trees, and the ocean ecosystem rather than fish populations become the focus of management and policy.

Implementing a sustained systems

approach demands the integration of several federal functions including knowledge creation (research and outreach), regulation, direct management of the public estate (applying knowledge and regulation to specific places), and support of state, local, and private efforts. Change will occur with a shift in emphasis among these functions—either through funding or personnel. Although these functions, and even the emphasis among them, may seem obvious, severe problems exist that must be solved if security is to be served adequately. The most important functions are the least funded (knowledge creation and support), the most funded is most easily done by others (direct management), and the least understood is the most critical (regulation). The “resource knowledge deficit” constrains positive change. This has become more severe with the increased complexity of the world.

The central challenge to resource security is the reconciliation of short- and long-term risks. Short-term risks usually dominate. Therefore, the maintenance of a long, integrated view is a central task for the federal resource management establishment. This long view is particularly important when looking at natural and policy processes—for a sustainable legislative agenda. It should be formed with a high level of citizen involvement and awareness, and in support of other national goals (economic, social, and diplomatic). A long view implies long effort, and that requires stability of funding and quality.

Today, natural resources have a smaller slice of the pie. In fact, the slice may be inadequate to maintain resource security. There are more people, more science, more complex goals, and more problems; yet, there is no more effort in terms of budgets and numbers of personnel than before. Natural resources less clearly are linked to the national economic welfare, and fewer people derive their livelihoods directly

from the land and water. This translates into natural resource agencies being less important in the federal establishment and a resulting decline in bipartisan support. Professionals within the agencies lose access and influence at the highest level of policymaking, and the agencies lose power. In addition, the increased complexity of resource problems has eroded agencies’ abilities to provide clear solutions to problems.

To renew this agency power, and to ensure resource national security, principles for “perfect” agencies need defining, criteria and indicators to monitor the principles’ implementation need development, and gaps between the real and the ideal need elucidation. Setting limited goals and making incremental changes toward these goals may be the best path. Renewal will be a long process, but its thoroughness will determine the maintenance of “resource security.” Federal agencies must step forward to initiate this process. Professional and scientific societies and professionals must work together now, for the long future that they see and that others may not see so well.

Findings and Recommendations

Government’s principal role has been and remains stewardship of natural resources informed by scientific knowledge. This role includes management, setting standards and monitoring, and public education. Natural resource agencies are competing with other agencies for limited funding (see Figure 1 for a graphical depiction of the coming financial squeeze).

Such constraints force administrators to choose among priorities leaving critical mission-oriented programs underfunded or understaffed. The role of government is changing by default and accident, not with discussion and deliberation. No one is taking a holistic, strategic look at how the role of government is changing.

Different Roles for Government

The overall approach to governance is changing from one focused on rules and regulations to one oriented by values and goals (e.g., desire for a sustainable ecosystem). Current approaches no longer are conducive to solving current environmental problems. For example, methods designed to control point sources of water pollution cannot adequately control nonpoint sources.⁹ Transportation choices and conspicuous-consumption lifestyles also suggest government’s role as educator to facilitate movement toward sustainability.

A serious outreach program to the public is necessary, using all available media to inform about land management, conservation, and environmental issues. Federal agencies must recognize the importance of significantly increasing public outreach activities, and if necessary, provide funding from existing programs. However, budget limitations, political resistance, and the diversity of the audiences will make these efforts difficult. As conservation programs have dropped on the list of national priorities, it has become increasingly difficult to secure necessary budget support.

Another symptom of the challenge ahead is that the public is largely unaware of who is responsible for particular management decisions. Federal agencies should highlight their services and projects at the local level. Also, make delivery of services as seamless (and painless) as possible. The expansion of responsibilities within agency regions and breaking down barriers across agencies may help. Such a breakdown promotes the use of co-location and the utilization of place-based science. By working together via a community approach, perceived problems with federal ineffectiveness at the local level can be overcome. However, challenges do exist including the current lack of uniformity of

regional divisions among agencies. Fragmented or even competing missions need reconciling (e.g., the Bureau of Reclamation and U.S. Fish and Wildlife Service within the Department of the Interior compete to provide water for farmers and fish respectively).

A greater focus on human capital and natural capital can counteract the perception by some segments of the public that natural resource scientists are more concerned with the environment than with humans. Scientists should no longer take their concern for humans as a given. Promotion of the human value of natural resources as opposed to the economic value (e.g., "Parks for the People") could help.

Congress plays a key role in determining the government's role and responsibilities. Legislation sets priorities, guides budgets, and steers outcomes; yet, current natural resource legislation is old and does not comprehensively reflect current national needs and priorities. However, passing new or updated legislation today could be challenging or even counterproductive.

Concerns for Science and Research

There is reason for serious concern about the future of federal science and research programs. To remain leaders in natural resource management, federal agencies must sustain and improve their research and science capabilities. However, agencies and scientists are under increasing pressure to produce rapid results. Political managers expect programmatic results right away. Congress requires research outcomes within three years. It is difficult, and often impossible, for researchers to produce results that quickly. Serendipitous discoveries are limited and long-term research is negatively impacted. Government research funding is especially susceptible to attack in the current political/fiscal environment. For

example, recent assaults questioned the value of long-term national water quality and quantity monitoring.

Research cast in terms of its relation to communities likely will have an advantage. Scientists can help by showing the relevance of research—its historic role, past achievements, and application to current public issues.

Partnerships and Outside Assistance

Federal agencies and state and private universities, should consider partnerships that result in political advantage for natural resources management and science. Greater cooperation among federal and state natural resources agencies also would be mutually beneficial. However, while states appear to be facing the same demographic trends and workforce declines, with few exceptions, they are fretting but not taking mitigating measures. Staff of the National Governors' Association even advised conference organizers that workforce demographic changes were not an issue of current interest.

The professional, scientific, and education communities should undertake a strategic campaign to support a continuing vigorous role for the federal government in natural resources stewardship, science, and research. Natural resource professionals should identify common interests and enlist the support of environmental groups and organized labor.

The use of D.C.-based coalitions has become more prevalent in defining and defending the roles of federal agencies. The National Institutes of Health, National Science Foundation, and U.S. Geological Survey (among others) have coalitions comprised of universities, and professional, scientific, and educational organizations supporting federal agency programs. These coalitions focus their efforts on members of con-

gress and their staffs, federal political appointees and agency personnel. Their expanded use should be considered.

Questions were raised about whether universities have a role or opportunity in influencing the political decisions regarding the federal government's role. Can universities provide leadership, knowledge, and perspective for the debate? Some educators at the conference suggested that it was unlikely that universities would assume leadership responsibilities. By their nature, universities harbor diverse perspectives. Strong consensus and forceful recommendations do not come easily. Also, universities will face the same budgetary pressures as federal agencies, and this could stifle action.

Professional, scientific, and educational societies—like universities—have a history of conservative actions, usually suggesting small and incremental changes. Although stakes for the future of natural resources management and conservation science are high, it remains an open question the extent to which the professional and scientific communities will rise to the occasion and exert leadership. University faculty members and others with leadership capabilities and vision should be encouraged to operate through their professional societies.

Changing Administrations and Priorities

Changes in federal government administrations every four to eight years make shifting priorities in federal agencies a chronic reality. This makes federal agency long-term planning and implementation very difficult. The public may not even notice changes made by newly elected officials. The professional, scientific, and educational community has a responsibility to monitor shifts that adversely affect the environment and notify the public and congress.

Educational Institution Responsibilities and New Skill Sets

Along with federal and state agencies, universities are an essential partner in the conservation and management of natural resources. They are responsible for educating future employees, helping keep existing professionals' skills up-to-date, and furthering resource management theory and practice. Universities, like government, also may face changes in priorities through declining budgets and changing personnel. Universities, in conjunction with agencies, can lead the discussions—or even lead the changes. In light of the changes occurring in government through shifting roles and changing demographics, universities have new responsibilities to assure an adequate cadre of natural resource professionals with desired skill sets, and to assist in providing support for essential natural resource programs.

Educational Institution Responsibilities

A panel of natural resource educators, administrators, and funders discussed the leadership roles for higher education in the face of workforce trends, shifting agency roles, and declining conservation funding. The panel consisted of Michael Orbach, marine laboratory director, Nichols School of the Environment, Duke University; Margaret Cavanaugh, staff associate, office of the director, National Science Foundation (NSF), Michael DeLuca, senior associate director, Institute of Marine and Coastal Sciences, Rutgers University; and Jo Ellen Force,

head, Department of Forest Resources, University of Idaho.

Educational Institution Response to Changing Demographics

Preparing an adequate science and engineering workforce has piqued the interest of the National Science Board, which released a major report, *Science and Engineering Workforce: Realizing America's Potential*.¹⁰ The report examines undergraduate and graduate education, educational programs' knowledge base, pre-college teaching, and the international aspects of education. Also within NSF, an external advisory committee examining environmental issues has shown great concern about attracting the best and brightest to environmental sciences and engineering. New advanced tools in modeling, genomics, and other fields will require very bright students to utilize them. The advisory committee prepared a report outlining these concerns and the actions that NSF can take.¹¹

The committee's recommendations included obtaining more information about the environment as a teaching tool and as a pathway to careers. In addition, non-traditional educational settings like community colleges and informal education should receive more attention. It is believed that there will be great demand for environmental technicians, which are largely trained in these settings. Further, many of the under-represented groups get their introduction to natural resource professions in these settings.

Agency sponsored graduate research fellowships are stable existing partnerships between academic institutions and the federal government. They provide opportunities for students to work on real world issues. In many cases, the fellows go into government service in environmental management fields. The continuation and expansion of fellowship programs is necessary.

While graduate and undergraduate education are important focal points in meeting workforce demands, developing a pipeline and raising awareness among the nation's youth is essential. Programs do exist to introduce students to the sciences, but there are not many programs directed at aspiring teachers. Opportunities for teachers, including internships and field experiences, will benefit their students and ultimately the future workforce. Universities should not only focus on the science and engineering in which they are engaged, but also on its implications and educational impact. NSF has added funding to current research grants to require new educational projects in conjunction with research. The funds were specifically requested for interdisciplinary projects in diverse settings, K-12 teachers, and outreach activities.

Continuing education for mid-career professionals provides opportunities for employee retraining, resulting in new leadership opportunities. Many universities are developing certificates for training in new technologies, such as remote sensing, fire models, and stable isotope analyses. Distance education technologies are providing web-

based courses and other on-line courses without the requirement of coming to the campus. Universities are attempting to provide educational opportunities by scheduling around work and seasonal schedules, while at the same time maintaining the on-campus academic calendar.

Findings and Recommendations

Conference delegates identified several additional areas where educational institutions can assist government in responding to the changes necessitated by changing demographics and shrinking budgets. Recommendations also were made on how conservation education methods must adapt to meet the needs and interests of students and employers.

Responding to Changing Demographics

Universities and government must reestablish lines of communication to discuss and solve mutual problems. Universities—through its research, publication, and education missions—have a part to play in describing and supporting the necessary role of government in natural resource management. The public perceives academicians as having the freedom to speak out and provide leadership. Professors and administrators should act through and with the support of their professional and scientific societies.

Following years of limited opportunities for government positions, particularly at the entry level, universities have severely curbed preparing students for careers in the federal workforce. Federal agencies heavily curtailed and even stopped university recruitment programs. However, impending agency employee retirements should result in new opportunities for university graduates. Universities—in partnership with government—will need once again to prepare students for

public service. Universities can identify positive and rewarding aspects of public service.

It is important—to both the student and the university—that universities provide information about where their graduates are being employed. Making a distinction between life paths and careers also is valuable (careers typically change every three years).

A collaborative curriculum development process can assure that students receive desired skills. Government assistance in curriculum development at minority institutions would be particularly valuable. However, universities must not focus solely on the needs of government. Similar collaborations with the private and nonprofit sectors will benefit students' preparation. "Industry advisory panels" should be considered. They have been successfully employed by many non-conservation disciplines.

While universities face budgetary shortfalls similar to those of government agencies, they are still being asked to assume new responsibilities. Agencies rely on academic studies for direction. This may become even more important as agency budgets are slashed—universities may more consistently supplement the government's research capacity.

Changes in Conservation Education

Student and employer needs have changed, and curricula and teaching methods must change to reflect these new needs. Courses should encourage the use of critical thinking and introduce the concept of critical and integrative decision-making. Elective credits should be available for students to take courses of interest, which will encourage creativity, adaptability, and flexibility. Including social skills and human dimensions is important. Providing students with insight about working in different environments will

be increasingly useful. Students need context knowledge. Ecological literacy should be taught in all majors—citizens are more likely to support natural resource programs if they have knowledge and connections.

Changing the current university tenure structure would encourage the development of professors, and subsequently students, who better understand current societal needs. Promotion and tenure criteria should include alternatives to publication, including activities outside the university such as policymaking and interdisciplinary activities. A flexible structure should promote experiences across government, academia, nonprofits, and the private sector. This experiential mobility would help establish links within these sectors and better prepare students for whatever career path they choose. Universities also should encourage this mobility among its students through internships. These temporary work experiences will open up career paths and give students an understanding how particular sectors work.

Universities also should look at the curriculum they offer. Students are looking for subjects that will provide meaning in their life.

New Skill Sets

RNRF began the discussion of emerging skill needs in 2000 at its "Congress on Promoting Sustainability in the 21st Century."¹² In preparation for the congress, employers were asked to identify education and training that will be most beneficial over the next several years. Delegates to the congress found that 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, engineer-

ing, the economy, and society. Multi-disciplinary 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. Multiple language skills will be very useful. 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.

University Response to New Skills

In preparing the next generation of scientists and natural resource managers, certain skills will be necessary—particularly the ability to address broad issues at the ecosystem or watershed level. Graduates should be broadly trained, capable of working across disciplines, able to process, filter and distill a lot of information, familiar with advanced technology and taking real time data streams and interpreting and converting them into useful decisions, and have communication skills to deal with the local population, which often is heavily engaged in public policy.

Integrated, collaborative teamwork is critical. This requires very different educational experiences than most professors experienced when they were in college. Teamwork skills, such as conflict management, negotiation, listening, as well as excellent communication skills and interpersonal skills are

essential. This classroom environment is hard to achieve and a challenge to professors and students as the evaluation and grading system is still individualized—with as much pressure as ever on achieving a high GPA in a tight, competitive job market.

Altering the current educational system to meet new needs based on new technologies and changes in employer needs may be slow and incremental. However, universities and agencies have begun developing new programs. Rutgers, for instance, has developed a new masters program in operational oceanography. With the increase in earth observing systems comes a need for people who understand the technology. The science community is proficient in gathering and analyzing information. Now that community needs to improve on its ability to format and transmit that information to diverse audiences.

NOAA's National Estuarine Research Reserve Program has been working on translating research into a useful management program. The program is unique in that it is a federal-state partnership—even academic institutions are involved through the administration of some sites. The program's aim is to promote science-based decision making through research, education, and stewardship. At each of the 26 sites across the country, there is an emerging coastal training program, a graduate research fellowship program, as well as professional development for educators.

Needed Skills from an Agency Perspective

Thomas Casadevall, director of the U.S. Geological Survey Central Region, supplemented findings of RNRF's prior congress with anticipated skill needs at USGS. USGS employees will be expected to exhibit science excellence, excellent interpersonal skills and team efforts, written and ver-

bal communication skills, flexibility and adaptability, energy, balance, curiosity, and an understanding of the USGS mission and non-advocacy approach.

In obtaining and keeping necessary talent, USGS is facing many challenges. These challenges include currency in key science and technical skills (largely due to workforce aging and recruitment and retention), informing and improving the public's perception of government workers, competitive sourcing, managing FTEs (full time equivalencies), changing demographics, stagnant or declining budgets, and expectations of the Department of the Interior (DOI).

Findings and Recommendations

More than just producing natural resource graduates, universities will be asked to teach many of the new skills that agencies seek. These skills are a reflection of the evolving role of government, technological developments, and societal changes. Delegates argued that universities need to produce scientists capable of working in teams. At the same time, scientists who comprise teams must still be able to apply their own discipline in order to make good assessments and analysis.

Delegates recognized that there is no single skill set necessary for all employees. However, all skill sets should include context competencies and content competencies. Context competencies include communication skills, critical thinking, teamwork, conflict resolution capabilities, interpersonal skills, project management and planning skills, and synthesis skills. Content competencies include necessary disciplines such as ecology and economics, which form the basis for an agency's mission. Other important skills include the ability to use and manipulate information science and the enthusiasm to take work to the next step (i.e., thinking outside the box). Incor-

porating social science skills such as policy and politics also may benefit resource science.

While delegates recognized the need for broader skill sets, many were concerned that agencies will be unable to know the exact skills needed when there appears to be a gap between the agency vision and the mission. Anticipating areas of agency studies will be important, and necessary to elicit the needed skills.

Agency planning can answer necessary questions like the importance of training professionals on the job, or hiring candidates with the desired skills already. The professional and scientific community can help define needed professional skills.

Once the desired skills are identified, assuring that employees have these skills is another challenge. Agencies should be flexible about the necessary skill sets, and able to adapt and redirect skills and provide the necessary training and sabbaticals. Employees also should be willing to adapt and receive new training. A life-long learning strategy should be employed to keep professionals up-to-date.

Several possible programs were recommended as ways to develop needed skills. These include, for students and current employees, problem-based courses and case studies. Making use of existing Intergovernmental Personnel Act (IPA) programs could help existing employees.¹³ Any needed changes should be articulated to state educational regulatory boards to facilitate inclusion in curriculums.

Even with agency recognition that new skill sets are needed, each has a distinct culture that must be considered as changes in workforce skills are introduced. Agencies also must develop multiple long-range employment options to allow employees to remain scientists their whole career rather than forcing them into administrative positions where their skills or desires may not fit. Employees also should be able

to evolve and change their scope of work. Understanding what motivates employees can assist in increasing employee productivity.

Conclusion

Natural resource agencies, its associated professions, and the resources themselves are facing increasing challenges. Assuring the continued viability of natural resource programs depends on the cumulative efforts of the agencies themselves, its employees, universities, professional and scientific societies, NGOs, Congress, and society as a whole. Strategic planning that includes all necessary partners is essential.

Endnotes

¹ SES consists of employees above GS-15 or equivalent in managerial, supervisory, and policy positions typically directing the work of an organization, monitoring progress toward organizational goals, etc. The Office of Personnel Management classifies government employees according to pay grade reflecting length of service and responsibilities. GS-15 and GS-14 are the highest grades before entering the SES.

² *A Model of Strategic Human Capital Management*, GAO-02-373SP, March 2002. Available at <http://www.gao.gov>.

³ In order to preserve the flow of this report, some of the background information on USGS was taken from a presentation on desired employee skill sets given by Thomas Casadevall, central region director, USGS.

⁴ USGS FY2000-2005 Strategic Plan, <http://www.usgs.gov/stratplan/>.

⁵ See <http://www.calltoserve.org>.

⁶ See <http://www.govexec.com/pps>.

⁷ VERA (Voluntary Early Retirement Authority) and VSIP (Voluntary Separation Incentive Payment) are tools to help federal managers shape

the experiences and skill mixes of their workforces. By providing workers with an incentive to retire early or separate, it is hoped that managers will be able to hire replacement workers with different skills or experience levels.

⁸ After 30 years of service, government employees usually become eligible for full retirement benefits. Limited benefits are available after 25 years (early retirement).

⁹ For more information on nonpoint source water pollution, please see *Renewable Resources Journal* Special Report, "Control of Nonpoint Source Water Pollution: Options and Opportunities," Volume 21, Number 4, Winter 2002-2003.

¹⁰ See http://www.nsf.gov/od/lpa/news/03/fs03_americas_potential_rpt.htm.

¹¹ See http://www.nsf.gov/geo/ere/ereweb/acere_synthesis_rpt.cfm.

¹² See *Renewable Resources Journal* Special Report, Volume 19, Number 1, Spring 2001, for a summary of this prior discussion and survey.

¹³ This program allows assignment of employees to or from state and local governments, institutions of higher education, tribal governments, and other eligible organizations and is intended to facilitate cooperation between the federal government and non-federal entity through the temporary assignment of skilled personnel. IPA objectives include:

- To strengthen the management capabilities of federal agencies, state, local and tribal governments, and other eligible organizations;
- To assist in the transfer and use of new technologies and approaches to solving governmental problems;
- To serve as an effective means of involving state and local officials in developing and implementing federal policies and programs; and
- To provide program and developmental experience which will enhance the assignees performance in his or her regular job.

Appendix A: List of Delegates

Shere Abbott Chief International Officer American Association for the Advancement of Science Washington, DC	Peter Black Professor Emeritus Water & Related Land Resources SUNY College of Environmental Science & Forestry Syracuse, NY	Tom Casadevall Central Region Director U.S. Geological Survey Denver, CO	Margaret Davidson RNRF Board of Directors Director NOAA Coastal Services Center Charleston, SC
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University
Arlington, VA

* *Working Group Chair*

** *Working Group
Recorder*

Appendix B: Conference Program

Conference on Personnel Trends, Education Policy, and Evolving Roles of Federal and State Natural Resources Agencies

Tuesday, October 28, 2003:

8:45 am—8:55 am

Welcome and Opening Remarks

Albert A. Grant, RNRF Chairman &
Conference Program Committee Co-
Chair

Sherburne B. Abbott, Chief

International Officer and Director,
Center on Science & Technology and
Sustainable Development, American
Association for the Advancement of
Science

8:55 am—9:00 am

Conference Context, Structure and
Process

Robert D. Day, RNRF Executive
Director

Introduction of Speakers

Margaret A. Davidson, RNRF Board
Member, Conference Program
Committee Co-Chair, and Director,
Coastal Service Center, National
Oceanic and Atmospheric
Administration

9:00 am—9:25 am

Federal & State Agencies Workforce
Demographics: Emerging Trends

Robert Robinson, Managing Director,
Natural Resources and Environment,
U.S. General Accounting Office

9:25 am—9:45 am

Discussion/Questions

9:45 am—10:05 am

Conservation Sciences in Federal &
State Agencies

Sherburne B. Abbott, Director, AAAS
Center on Science & Technology and
Sustainable Development

10:05 am—10:25 am

Discussion/Questions

10:45 am—11:05 am

Reflection on the Causes of These
Trends

Max Stier, President, Partnership for
Public Service

11:05 am—11:25 am

Discussion/Questions

11:25 am—11:55 am

What is the Role of Government in
Conservation and Management of
Natural Resources?

John C. Gordon, Pinchot Professor
Emeritus and former Dean, School of
Forestry and Environmental
Sciences, Yale University, and
Chairman, Interforest LLC

11:55 am—12:35 pm

Discussion/Questions

1:35 pm—2:35 pm

Case Studies: How Are Federal
Agencies Responding to These
Trends?

Robert Ridky, Education Program
Coordinator, Office of the Director,
U.S. Geological Survey

John Kusano, Assistant Director of
Human Resources Management,
USDA Forest Service

Marlene Kaplan, Director, Office of
Education and Sustainable
Development, National Oceanic and
Atmospheric Administration

2:35 pm—3:05 pm

Discussion/Questions

3:25 pm—3:55 pm

How Should Educational Institutions
Respond?

Moderator: Margaret A. Davidson,
Director, NOAA Coastal Service
Center

Michael Orbach, Director, Marine
Laboratory, Nichols School of the
Environment, Duke University

Margaret Cavanaugh, Office of the
Director, National Science
Foundation

Michael DeLuca, Institute of Marine
and Coastal Science, Rutgers
University

Jo Ellen Force, Head, Department of
Forest Resources, University of Idaho

3:55 pm—4:25 pm

Discussion/Questions

Wednesday, October 29, 2003:

9:00 am—9:30 am

What Skill Sets are Agencies
Looking for in Their Employees?

Thomas J. Casadevall, Central
Region Director, U.S. Geological
Survey

9:30 am—10:00 am

Discussion/Questions

10:00 am—10:05 am

Explanation of Working Group
Procedures

Ryan M. Colker, RNRF Director of
Programs

10:25 am—4:05 pm

Working Group Sessions

4:05 pm—4:35 pm

Overview and Summary

Margaret A. Davidson, Conference
Program Committee Co-Chair

Appendix C: Background Materials Bibliography

In advance of the conference, delegates were provided with a notebook of background materials. These materials featured reports and statistics from federal and state agencies and recognized authors and organizations depicting topics to be discussed at the conference. Many delegates commented on the usefulness of the information and the fact that this information previously had not been assembled in a cohesive manner. A bibliography of these items along with internet sites (where available) is provided below.

TRENDS IN FEDERAL NATURAL RESOURCES AGENCY WORKFORCES

The Fact Book 2002 Edition: Federal Civilian Workforce Statistics, U.S. Office of Personnel Management, June 2002. <http://www.opm.gov/feddata/factbook/index.asp>.

The Changing Federal Workforce: Employee Perspectives, U.S. Merit Systems Protection Board. <http://www.mspb.gov/studies/mps98.pdf>.

Urgent Business For America: Revitalizing the Federal Government For the 21st Century, National Commission on the Public Service, January 2003. <http://www.brookings.edu/gs/cps/volcker/urgentbusinessreport.htm>.

Retirement Wave Creates Vacuum, Stephen Barr, *Washington Post*, May 7, 2000, A1. http://www.washingtonpost.com/wp-srv/onpolitics/elections/empty_pipeline.htm.

Building Human Capital: The Public Sector's 21st Century Challenge, KPMG, Spring 2001. <http://www.feio.org/download/HumanCapital.pdf>.

Demography as Destiny? "Greening," "Graying," & Human Capital Challenges Facing Environmental Management, Robert F. Durant, *Renewable Resources Journal*, Summer 2003.

TRENDS IN STATE NATURAL RESOURCES AGENCY WORKFORCES

State Employee Worker Shortage: The Impending Crisis, James B. Carroll and David A. Moss, Council of State Governments, October 2002.

The Aging Government Workforce, Craig Abbey and Donald Boyd, Rockefeller Institute of Government, July 2002. http://www.rockinst.org/publications/gov_employ_reports.html.

Aging Workforce: The Employee Exodus, Jonathan Walters, *Governing Magazine*, March 2000. <http://www.governing.com/archive/2000/mar/age.txt>.

CAUSES OF CURRENT TRENDS

Federal Workforce: Payroll and Human Capital Changes During Downsizing, U.S. General Accounting Office, GGD-99-57, August 1999. <http://www.gao.gov/archive/1999/gg99057.pdf>.

Is There a Shortage of Scientists and Engineers? How Would We Know?, William P. Butz, et. al., RAND Issue Paper, 2003. <http://www.rand.org/publications/IP/IP241>.

The Unanswered Call to Public Service: Americans' Attitudes Before and After September 11, Council for Excellence in Government. <http://www.excelgov.org/displayContent.asp?Keyword=ppp100101>.

www.excelgov.org/displayContent.asp?Keyword=ppp100101.

The Human Capital Challenge: Offering Solutions and Delivering Results, Testimony of Max Stier, Partnership for Public Service, April 8, 2003. <http://govt-aff.senate.gov/index.cfm?Fuseaction=Hearings.Detail&HearingID=83>.

Occupational Outlook Handbook, 2002-03 Edition, U.S. Bureau of Labor Statistics. <http://www.bls.gov/oco/home.htm>.

ROLE OF GOVERNMENT IN CONSERVATION AND MANAGEMENT

The Changing Face of the Federal Government Natural Resource Management Professional, Mark Rey, *Renewable Resources Journal*, Spring 2003.

GAO Highlights, High Risk Series: Strategic Human Capital Management, General Accounting Office, GAO-03-120, January 2003. <http://www.gao.gov/pas/2003/d03120.pdf>.

Budget Woes: The Impact, States: Battling Cleanup. *National Journal*, 8/9/03, pg 2544.

Environmental Policy: The Next Generation, Donald Kettl, *Renewable Resources Journal*, Autumn 2003.

CASE STUDIES

U.S. Forest Service Workforce Plan, National Academy of Public Administration, Center for Human Resources Management

Major Management Challenges and Program Risks: Environmental Protection Agency, General Accounting Office, GAO-03-112, January 2003. <http://www.gao.gov/pas/2003/d03112.pdf>.

RESPONSE OF EDUCATIONAL INSTITUTIONS

Summary of 2001 Workforce Survey, NASULGC-USGS Partnership. http://www.nasulgc.org/publications/agriculture/nas_usgs_survey.pdf.

Will the Internet Transform Higher Education?, Walter S. Baer, RAND, 1998. <http://www.rand.org/publications/RP/RP685.pdf>.

Attracting the Best and the Brightest, William Zumeta and Joyce S. Raveling, *Issues in Science and Technology*, Winter 2002-2003. http://www.evans.washington.edu/FAC/Zumeta/pdf/attracting_the_best.pdf.

SKILL SETS DESIRED BY NATURAL RESOURCES AGENCIES

Evolving Role of Resource Professionals, *Renewable Resources Journal*, Spring 2001, Special Report: Congress on Promoting Sustainability in the 21st Century.

The 21st Century Federal Manager: A Study of Changing Roles and Competencies, Human Resources Management Consortium, National Academy for Public Administration, July 2002. http://www.napawash.org/pc_human_resources/index.html.

About RNRF

Purposes

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.

Membership

RNRF's members are professional, scientific and educational organizations interested in sustaining the world's renewable natural resources. The foundation is governed by a board of directors comprised of a representative from each member organization. The directors also may elect "public interest members" of the board. Board members are listed on the back cover of the journal. Individuals may become Associates for an annual contribution of \$50 or more.

Programs

RNRF conducts national meetings, public-policy round tables, policy briefings and leadership summits. It also conducts an annual awards program to recognize outstanding personal, project and journalistic achievements. These activities are supplemented by international outreach activities and internships. More information about RNRF's programs is available at www.rnrf.org.

Renewable Resources Journal, first published in 1982, promotes communication among RNRF's represented disciplines. The journal is provided to the governing bodies of RNRF member organizations, members of the U.S. Congress and committee staffs with jurisdiction over natural resources, federal agencies, and universities. Tables of contents of all volumes of the journal are available at RNRF's web site.

Center Development

The Renewable Natural Resources Center is being developed as an office and environmental center for RNRF's members and organizations with related interests. The Center is located on a 35-acre site in Bethesda, Maryland, where lawns and forested buffers provide an exceptional work environment. The site is the former family estate of Dr. Gilbert H. Grosvenor, of the National Geographic Society.

The master site plan for the Center contemplates the construction of approximately 283,000 square feet of office space—including a 16,500 square foot conference and common-services facility. The Center currently has approximately 52,500 square feet of office space.

RNRF PUBLICATIONS

Renewable Resources Journal

RRJ is a quarterly journal devoted to public policy and conservation of natural resources. The scope of the journal is broad, featuring articles on topics such as biodiversity, international conservation, sustainability, land-use change and climate policy. Also featured are news and announcements from prominent societies in the natural resources community, international news and a meeting calendar. Subscriptions available. US: \$25 individual, \$44 institution. Foreign: \$30 individual, \$50 institution.

National Congress and Workshop Reports:

Control of Nonpoint Source Water Pollution: Options and Opportunities

Nonpoint source pollution is difficult to control because of the diversity of sources and the complexities inherent in interactions between land use and hydrology. Conference delegates made recommendations on: 1) the roles of government, particularly monitoring, research, and legislation; 2) the importance of partnerships at all scales; 3) the need for regional management structures; and 4) the need for an extensive education effort including all sectors of society, from legislators to elementary school students.

Promoting Sustainability in the 21st Century

Recognizing that there is no consensus in the United States Congress to institute a national program of sustainable land use, and actions by communities are insufficient in geographic scope, RNRF's fourth congress examined regional tools and strategies for sustainability. The congress also focused on the evolving roles of resource professionals and the education and training needed to fulfill new responsibilities.

Human Population Growth: Impacts on the Sustainability of Renewable Natural Resources

The Congress report explores the impacts of human population growth, consumption and land-use patterns on the ability to sustain renewable natural resources.

Applications of Geographic Information Systems to the Sustainability of Renewable Natural Resources

The Congress report examines how GIS could empower citizens and communities to participate more effectively in land-use planning to sustain their natural resources.

Renewable Natural Resources: Critical Issues and Concepts for the Twenty-First Century

This report describes a benchmark event in interdisciplinary cooperation. Concerned over the rapid depletion of our renewable natural resources, 135 of the nation's leading scientists and resource professionals gathered to forecast critical natural resource issues that the U.S. will face in the 21st century.

National Parks Fire Policy: Goals, Perceptions and Reality

The workshop report is an interdisciplinary review of the goals and policies driving the National Park Service's fire-management decisions; the conflicts in balancing ecological and land-use goals with those associated with scenic values; the degree of success in implementing difficult congressional mandates; and the public perception of fire policy. While held in 1991, the workshop's recommendations are still relevant to today's fire policies.

Ecosystem Function and Human Activities—Reconciling Economics and Ecology

Edited by R. David Simpson & Norman L. Christensen, Published by Chapman & Hall—This book examines a problem of growing concern and importance: obtaining accurate estimates of ecological costs of human activities.

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Renewable Resources Journal also is independently indexed in Environmental Periodicals Bibliography. A complete list of tables of contents can be found at <http://www.rnrf.org>.

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