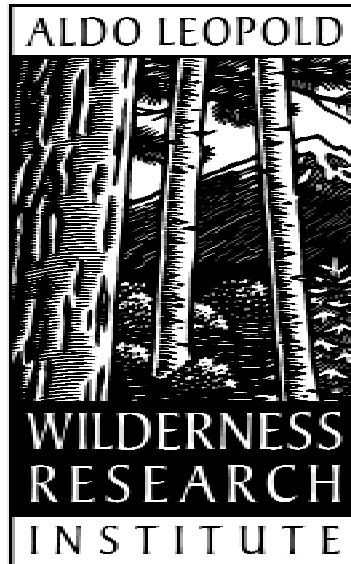

ACCOMPLISHMENTS REPORT
Prepared for the Institute's Program Review (28 April 2004)

Jan 1996 – April 2004



Aldo Leopold Wilderness Research Institute
USDA Forest Service
Rocky Mountain Research Station
Missoula, Montana

Mission: provide scientific leadership in developing and using the knowledge needed to sustain wilderness ecosystems and values



Summary of Accomplishments, 1996-2004

The Aldo Leopold Wilderness Research Institute was established in 1993 to bring focus to and recognize leadership in the development and application of research that is important to the understanding and management of wilderness and similarly protected wildland ecosystems. Direction to date has been provided by a 1996 Strategic Plan that identified recreation, natural disturbance (with emphasis on fire), and non-native species as the highest priority issues upon which to focus the Institute's agenda. As these programs have evolved, emphasis has also been given to additional issues important to the understanding and management of wilderness. For accomplishment reporting we are thus including an issue related to wildlife, with emphasis on the status of declining amphibian populations, as well as an issue called "syntheses and frameworks" related to the science and stewardship of wilderness.

The 1996 Strategic Plan also emphasized research application. We have developed a Research Application Program (RAP) to build on and supplement our scientist's application activities and facilitate access to and use of a broad array of scientific resources in support of wilderness stewardship. The RAP has created and maintained an extensive web site featuring searchable databases of Leopold Institute projects and publications, descriptions of research priorities, staff activities, and access to a variety of scientific resources in support of wilderness and wildland stewardship. Of particular note are the *Linking Wilderness Research and Management* series of annotated reading lists and the *Research in a Nutshell* series of project summaries. In addition, the RAP has helped identify research gaps, provided a liaison for management teams, and developed trainings on specific Institute tools.

The following represent selected research and research application accomplishments related to the Institute's emphasis areas. Selected Technical and Professional Services, Awards and Recognition, Selected Invited Presentations, Workshops Organized or Coordinated, and the more significant Publications resulting from this work are listed following the accomplishment statements.

Selected Accomplishments

Issue #1 *Understanding the effects of recreation use and recreation management strategies on wilderness attributes and visitor experiences.* Key Cooperators: U. Idaho, U. Montana, U. Arizona, U. Alaska, U. Illinois, U. Vermont, Virginia Tech, Colorado State U., North Carolina State U., State University of New York, BLM, NPS, NFS, Alaska DNR, Alaska Dept. of Fish & Game, Parks Canada, the Native Village of Kotzebue (Alaska), National Outdoor Leadership School, Western Whitewater Association, Three Rivers Consulting

- The *Limits of Acceptable Change (LAC) planning framework* for managing recreation use was developed and implemented in the 1980s. Since then, work has continued on adapting the process and increasing its utility. An Institute sponsored workshop in 1997 specifically addressed the applicability of LAC after 10 years of use. It also provided training to for LAC trainers for representatives from each Forest Service region. LAC has now been adopted in numerous situations, nationally and internationally, both within

and beyond wilderness. It is hard to overestimate its influence on recreation planning. Its concepts have also influenced national forest planning generally. In addition to North America, LAC is being used for park planning in South America, Central America, Africa, Europe, Australia and Asia. Courses on LAC have been given on all of these continents.

- Research findings were applied to the *development of low-impact practices* that minimize recreation impacts in wilderness. Much of the curriculum of the Leave-No-Trace program is derived from fundamental recreation ecology research conducted by the Institute (and its predecessor). Particularly important has been research on the relationship between amount of use and amount of impact and on site durability. The third edition of *Soft Paths* (coauthored by Hampton & Cole), the first book on low-impact practices, was published in 2003. This is the primary reference source for the Leave-No-Trace program.

- *Knowledge about recreational impacts has been developed, synthesized and organized into a coherent discipline.* A number of fundamental principles have emerged (e.g. the relationship between use and impact is curvilinear; deterioration occurs more rapidly than recovery). These principles, along with an organization of research into factors that influence the magnitude of impact, provide much of the theoretical and conceptual foundation for both the field of recreation ecology and for current professional management of recreation impacts. The second edition of *Wildland Recreation: Ecology and Management* (coauthored by Hammitt & Cole), the first textbook on recreation ecology, was published in 1998.

- Experiential and scientific knowledge about *how to successfully restore damaged recreation sites*, particularly in subalpine ecosystems, has been synthesized and new knowledge developed. Information is being disseminated in training courses and a restoration handbook will soon be published. Results are already being used to prescribe restoration treatments for subalpine sites in the Pacific Northwest. They should potentially greatly increase the cost-effectiveness of resources spent on restoring recreation impacts.

- Information has been developed about *wilderness day users and visitors to both high- and low- use portions of wilderness.* Decisions about appropriate management objectives and strategies for these users and situations are particularly contentious. Research on visitor experiences in these situations is ongoing. We are employing multiple methods, conducted at a wide range of spatial and temporal scales to move beyond user evaluations of their experiences to a better understanding of the nature of experiences and influences on experiences. Results of this research will be incorporated into wilderness, forest and park management plans that will influence future visitation levels, wilderness conditions, local economics and politics.

- Available knowledge was assembled and summarized about *the ways recreation user fees influence the relationship between the public and public lands.* Two theme issues of journals (*Journal of Leisure Research* and *Journal of Park and Recreation Administration*) were co-published and provided the bulk of the scientific information

available for consideration in developing positions on recreation fee policies. We also published an annotated reading list summarizing a variety of literature pertinent to recreation user fee decisions. This publication continues to be hosted on the Forest Service's national fee demonstration project web site.

- A manual on techniques available for managers to *monitor wilderness use and user characteristics* was developed. Training sessions were developed and delivered in California, Nevada, Georgia and Alaska to increase the rate of diffusion and adoption of techniques described in the manual. As a result, field units report increased accuracy of use reports, better understanding of trends in use and user characteristics, greater control of violating uses, and thus, reduction of impacts. For example, guidance we provided as the result of a visitor study has helped NPS managers reduce intrusive impacts of patrol boats during hunting season on the Kobuk River in Gates of the Arctic National Park & Preserve.

- Understanding we developed on the *impacts of use levels and use of motorized transportation* on visitors' experiences has formed the foundation for evaluating alternatives for restriction or distribution of use in river environments.

- Science projects were conducted to support indicator-based planning efforts at specific parks, forests, refuges and management areas to provide understanding of *wilderness visitor experiences and influences on those experiences* in Georgia, New York, California, Alaska, Montana, Washington, Oregon and Idaho.

Issue #2 *Understanding natural disturbance regimes and the effects of their alteration by human actions; developing strategies to manage and restore natural disturbances in wilderness ecosystems.* Key Cooperators: U. Arizona, Montana State U., U. Idaho, RMRS Fire Lab, PNW, Bitterroot NF, Sequoia, Kings Canyon, Yosemite, Glacier, Great Smoky Mountains NPs.

- Summarized data on the extent of *wildland fire use (natural fire) and prescribed fire* throughout the National Wilderness Preservation System, showed a surprising lack of progress in restoring natural fire to wilderness managed by all four wilderness management agencies. With suppression continuing to be the dominant management strategy in most wildernesses, we are providing managers with a means of evaluating the feasibility of wildland fire use for restoring more natural fire regimes.

- *Fire atlases* (i.e., maps of fire perimeters) we developed provided, for the first time, a complete data set of fire history across the boundaries of 4 national forests. These data, provided in a CD format, are being used by the 4 national forests, 2 USFS Regions and several other interested parties, to understand current conditions in the context of fire history, set priorities, plan across boundaries, and track accomplishments.

- *Fire history and fuels data* collected by University of Arizona cooperators were used to support the Incident Command Team on the Helens2 Fire in May 2003. This valuable reference data will also be critical for defining target conditions and management

prescriptions.

- Results from a national questionnaire and workshop helped us to identify the contemporary *information needs of wildland fire and fuels managers*. Based on findings that effective fire management planning requires information on the benefits and risks of fire to a wide variety of values, we developed a conceptual model for evaluating these risks and benefits. Results, their management implications, and the model were highlighted in recent GAO investigations on the impact and effectiveness of managing fire and fuels.

- We developed and tested a *protocol for generating libraries of maps that classify likely fire effects* into beneficial/detrimental categories for different fire weather conditions. Managers on the Bitterroot National Forest are testing this protocol that will help update their fire management plans and set priorities for fuels management. Fire and fuels managers nationwide expect to use the map libraries as a valuable public communication tool.

- A prototype decision-support modeling tool, called BurnPro, developed by the Leopold Institute estimates the *probability of burning across a landscape*. This prototype is being tested in 3 national parks and 3 USFS wilderness areas to help delineate fire management zones in fire management plans, to evaluate the availability of natural ignitions for restoring natural fire regimes, and to evaluate and revise wilderness fire management objectives.

Issue #3 Understanding effects of alien species and their management in wilderness.

Key Cooperators: Idaho State U., U. Montana, BLM, FWS, California Department of Fish and Game, Montana Fish Wildlife & Parks

- A workshop we organized in 1998 on the *effects of fish stocking on wilderness lakes* brought together researchers, federal and state managers, and wilderness users for presentations and discussion. Seven papers developed from this workshop were published as a special feature in the journal *Ecosystems* in 2001. This feature has achieved wide distribution and visibility, significantly clarifying and improving planning and communication among federal and state land and fisheries managers.

- An interagency survey of *exotic plant invasions* in designated wilderness provide information on problem species in individual wilderness areas, control methods that have been used, and key contact information. The resulting database, available on the Institute's website, is a useful tool for allowing managers to monitor and track the control of invasive species. We also published an annotated bibliography of literature relevant to understanding and managing non-native invasive plants in wilderness

- A survey conducted in collaboration with the Fish and Wildlife Service, assessed *invasive and exotic species (animals, plants, and pathogens) within all National Wildlife Refuge wilderness areas*. The resulting database provides an internet-based tool for monitoring the status of invasive species in specific wilderness areas and a resource for

information on invasive species problems and control measures in National Wildlife Refuges.

- We surveyed existing research on non-native species and identified *important research questions specific to the understanding and management of non-native plants, animals, and pathogens* in wilderness that need attention. This provides a basis for developing Institute projects related to invasive species, and will help focus future research on understanding and managing non-native species in and near wilderness.

Issue #4 *Understanding wildlife and their interactions with wilderness ecosystems.*

Cooperators: U. Montana, Idaho State U., U. Washington, U. of Arizona, U. California, U. Nevada, Utah State U., Redlands U., USGS (water & mapping divisions), NPS, FWS, BLM, USFS, EPA, Montana Fish Wildlife & Parks, Partners in Amphibian and Reptile Conservation

- Information developed on the *effects of ultraviolet radiation (UV) on amphibians* in seven national parks showed that the UV dose in amphibian habitats is extremely variable, with dissolved organic carbon providing protection from harmful levels of UV in most habitats. Amphibian distributions were largely unrelated to UV exposure. This information is useful in better understanding the effectiveness of wilderness in providing refuges for declining wildlife populations.

- Information developed on the *effects of atmospheric (acidic) deposition on exposed amphibian embryos* in surface waters with high and low acid neutralizing capacity (ANC) documented that hatching success was unrelated to ANC, but was strongly influenced by weather. These findings will inform decisions regarding permitting of upwind power plants.

- The USGS's *Amphibian Research and Monitoring Initiative (ARMI)* was begun in 2000 to document status and trends of amphibian populations and to investigate causes of declines. The USGS at the Leopold Institute collaborates with other scientists to conduct ARMI monitoring and research in the Rocky Mountains. Long-term population data have been important in documenting that a decline of boreal toads in Rocky Mountain National Park was caused by a pathogenic fungus thought to be responsible for numerous amphibian declines globally. Long-term data have also been important in studying the effects of global change on amphibians in protected areas.

- We continue to assist the Fish and Wildlife Service in *monitoring the threatened desert tortoise* by analyzing data and conducting research to refine sampling methods. Sampling takes place in the Mojave Desert on lands administered by the Department of the Interior and the Department of Defense. The finding that transect sampling of tortoises does not satisfy the main assumption of distance estimation - that all objects on or near the transect line are located, has important implications for the validity of population estimates for species other than tortoises. Recent research has investigated estimation of detection probability, which allows correction for sampling bias.

- We have promoted research to understand the *relationship between wilderness and wildlife*. Research needs have been presented to scientists and managers at professional meetings of The Wildlife Society, the Society for Conservation Biology, Watchable Wildlife Incorporated (operates under an MOU signed by eight federal agencies and five wildlife nonprofits), USFWS Wilderness Coordinators, and most recently at the USFS Wildlife Research Scientists meeting.

Issue #5 Syntheses and frameworks related to the science and the stewardship of wilderness. Cooperators: U. Montana, USFS National Forest Systems, FWS, BLM, NPS

- The basic *conceptual foundations for managing the ecological and social values of wilderness* are generally lacking. We have been at the forefront of developing these foundations for (1) defining and managing for naturalness, natural variability, and wildness; (2) understanding the impacts of administrative boundaries on wilderness; (3) defining wilderness character in terms of stewardship actions and outcomes; and (4) evaluating proposals for scientific activities in wilderness. These findings are directly helping wilderness managers develop better plans, understand the likely consequences of potential alternative decisions, and make more informed decisions.

- Currently, there is no means for *monitoring agency stewardship outcomes for protecting and preserving wilderness character*. Institute research and team leadership has developed a national program for monitoring selected indicators of conditions and effects of stewardship actions related to wilderness character. This national program provides the first solid basis to tie national monitoring indicators to wilderness legislation and agency policy. Information from this monitoring program will improve planning and analysis of impacts and consequences of alternative decisions, and improve local to national wilderness stewardship programs and policies.

- *Comprehensive, nationwide databases* developed by the Leopold Institute provide key sources of information for managers and the public on a variety of issues related to wilderness and its management. The National Wilderness Preservation System database, receiving an average of 20,000 online visitor sessions (not just browser hits) a month, has evolved to become the standard source of basic information (e.g., designated name, current acreage, administration, enabling public law) on wilderness in the United States. The Wilderness Stewardship Reference System provides easy online access to all the legislation, legislative history, agency policies, and summaries of judicial cases on over 60 specific (and often controversial) wilderness management issues. Last, a database of recreation-related monitoring of campsite and trail conditions, and visitor characteristics, in every wilderness facilitates baseline comparisons to evaluate future changes in resource conditions. These databases are routinely used by managers nationwide in wilderness planning and decision making.

- For over a decade we have led efforts to develop consistent, scientifically rigorous *monitoring in wilderness*. We have developed (1) campsite monitoring protocols that are

now commonly used nationwide; (2) a conceptual framework for determining monitoring direction based on structured interactions between managers and scientists; (3) visitor use monitoring protocols; (4) the first book on monitoring stream ecosystems using wilderness-appropriate protocols; and (5) a conceptual framework for monitoring wilderness character. An Institute scientist serves on the steering committee for a national training course on monitoring natural resources in wilderness. All of these activities are geared toward developing credible wilderness monitoring at both the national and individual wilderness levels. These monitoring protocols are routinely used, and in many cases are the only protocols available, for evaluating change in wilderness conditions. The resulting data form an integral part of wilderness planning and stewardship activities.

- We provided scientific leadership on a team to evaluate the *application of private sector marketing principles* to Forest Service management. The team rejected this traditional transactional marketing approach, but described an alternative, relational approach based upon the public purpose of public lands. This information has been used to segment public stakeholders on the basis of their relationships with public protected lands, and provides the basis for establishing objectives for public purpose marketing.

Selected Technical and Professional Service

Ongoing

-Research liaison to Chief's Wilderness Advisory Group (WAG). (Since 2004; D. Cole)

-Research Liaison, USFWS Regional Wilderness Coordinators (Since 2003; V Wright)

-Editor, *Herpetological Conservation* (Since 2002; S. Corn)

-Member, IUCN's World Commission on Protected Areas (WCPA) (Since 2001; D. Parsons)

-Research Liaison, USFS Regional Wilderness Specialists (Since 2001; V. Wright)

-Co-Chair, USFS National Wilderness Monitoring Committee (Since 2001; P. Landres)

-Editorial Board, *Environmental Management* (Since 2000; D. Cole)

-Member, Ecological Society of America - Mellon Foundation's National Parks Ecological Research Post Doctoral Review Committee (Since 2000; D. Parsons)

-Member, Board of Directors, The George Wright Society (Since 2000; D. Parsons)

-Executive Committee Member, Bitterroot Ecosystem Management Project (Since 2000; A. Watson)

- USFS Liaison, NPS National Wilderness Steering Committee (Since 2000; D. Parsons)
- RMRS liaison with Rocky Mountain CESU Executive Committee (Since 1999; D. Parsons)
- Member, Wilderness Information Network Working Group (Since 1998; V. Wright and D. Spildie)
- Member of the Department of the Interior's Amphibian Research and Monitoring Steering Committee and Principal Investigator in the Rocky Mountain Region (Since 2000; S. Corn)
- Associate Editor, *International Journal of Wilderness* (Since 1996; D. Cole)
- Executive Editor for Science, *International Journal of Wilderness* (Since 1994; A. Watson)
- Associate Editor, *Journal of Leisure Research* (Since 1989; A. Watson)

2005

- Chair, George Wright Society Conference. Philadelphia, PA (D. Parsons)

2004

- Co-chair, 8th World Wilderness Congress Symposium: Science and Stewardship to Protect and Sustain Wilderness Values. (A. Watson)
- Session Coordinator, 5th International Congress on Arctic Social Sciences, Protecting and restoring relationships between evolving cultures and wilderness landscapes. Anchorage, AK (A. Watson)

2003

- Co-Chair, George Wright Society Conference, Protecting Our Diverse Heritage: the role of parks, protected areas and cultural sites. San Diego, CA (D. Parsons)
- Organized and co-edited special feature on Wilderness, *The George Wright Forum*. (D. Parsons and D. Cole)
- Member and research liaison to Chief's Wilderness Advisory Group (WAG). (V. Wright)

2002

- Associate Editor, *Ecological Applications*; 1992-2002. (D. Parsons)
- Advisor on Science, Board of Trustees, Valles Caldera National Monument, Los Alamos, NM (D. Parsons)

2001

- Chair, World Wilderness Congress Symposium, Science and Stewardship to Protect and Sustain Wilderness Values, Port Elizabeth, South Africa (A. Watson)
- Member, Ecological Society of America, Sustainable Biosphere Committee, 1998-2001. (D. Parsons)
- Member and Chair of the Science Team of the Chief's Marketing Resources Group, 1998-2001. (A. Watson)
- Detail to National Fire Plan's Cohesive Strategy Implementation Team. (V. Wright)
- Detail to National Resources Information Systems-Air Program. Sandy, OR (D. Spildie)

1999

- Co-Chair, National Wilderness Science Conference. (D. Parsons)
- Program Chair, National Wilderness Science Conference. (D. Cole)
- Member, NPS task force on the ethics of live trapping wolves on Isle Royale (D. Parsons)
- Co-organized and edited Invited Feature on Historical Variability, *Ecological Applications*. (D. Parsons, with Tom Swetnam and Norm Christensen)
- Guest Editor for theme issues of the *Journal of Leisure Research* and *Journal of Park and Recreation Administration* on recreation fees and pricing in the public sector. (A. Watson)
- Member, Environmental Protection Agency national review panel for STAR research proposals on indicators of ecosystem integrity (P. Landres)

1998

- Co-chair, World Wilderness Congress Science Symposium on Personal, Societal, and Ecological Values of Wilderness, Bangalore, India (A. Watson)
- Assigning Editor, *Conservation Biology* (P. Landres)
- Organized and edited Special Feature on Wildlife Management in National Parks, *Ecological Applications*. (D. Parsons, with Mary Foley)
- USGS/Biological Resources Division Global Change Peer Review Committee (D. Parsons)

1996

-National Research Council Working Group on Science in Pristine Areas (D. Parsons)

Awards and Recognition:

2003

-RMRS Outstanding Early Career Science Publication Award (Carol Miller)

-National Park Service, Director's Award for Natural Resources Research (David Cole)

-Council for International Exchange of Scholars and Fulbright Senior Specialist Award to spend month of September at the University of Sao Paulo, Brasil (Alan Watson)

-National Park Service, Intermountain Regional Director's Award for Natural Resources Research (David Cole)

-RMRS Nomination for Chief's Superior Scientist Award (Alan Watson)

-RMRS Nomination for Chief's Technology Transfer Award (Vita Wright)

-RMRS Nomination for Chief's International Service Award (Leopold Institute)

-WILD Foundation and the Wilderness Foundation of South Africa Award to prioritize wilderness research issues in South Africa (Alan Watson)

-RMRS Certificate of Merit; Leadership as Director's Rep (David Parsons)

-RMRS Civil Rights Certificate of Appreciation (Leopold Institute)

2002

-Outstanding Service on the USFS Chief's National Wilderness Advisory Group (Vita Wright)

- R-1 Certificate of Merit; Input to R-1 Cohesive Strategy Team (Vita Wright)

2001

-RMRS Outstanding Technology Transfer Publication Award (Alan Watson and David Cole)

-National Science Foundation, Office of Polar Programs, Arctic Social Sciences award (Alan Watson)

-RMRS Certificate of Merit (David Parsons)

2000

- RMRS Visionary Science Award (Alan Watson)

1999

-Fulbright Scholar Award for lecturing and conducting research at the Arctic Centre, University of Lapland, Finland (Alan Watson)

- Chief's Award, Special Recognition for Long-Term Research Applications to Wilderness Management (David Cole)

-USFS Certificate of merit, for science leadership for Chief's Office Marketing Resource Group (Alan Watson)

1998

-RMRS nomination for Chief's Honor Award for Distinguished and Superior Science (Alan Watson)

1997

-Theodore and Franklin Roosevelt Award for Excellence in Recreation and Park Research, National Recreation and Parks Association (David Cole)

1996

-Chief's Award for Excellence in Wilderness Management Research (Alan Watson, Don Hunger and Kurt Becker)

-Forest Service Certificate of Merit for service on Sierra Nevada Ecosystem Project Science Team (David Parsons)

Invited Presentations (Selected)

2004

-Cole, D. **Keynote** to 2nd International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas: Monitoring and management of recreation and protected areas: science perspectives. Rovaniemi, Finland

-Cole, D. **Keynote** to Nordic and Baltic Workshop on Visitor Information Needs and Monitoring Methods: The limits of acceptable change process: theory and practice. Arctic Circle Hiking Area, Finland.

-Miller, C. University of Montana Wilderness Lecture Series: Restoring wilderness fire regimes: challenges and opportunities for landscape conservation. Missoula, MT

-Parsons, D. Mountain Climate Sciences Symposium: Plenary closing synthesis speaker. No. Lake Tahoe, CA

-Watson, A. Alaska Wilderness Recreation & Tourism Association Annual Conference: Science partnerships to understand wilderness values in Alaska. Anchorage, AK

-Watson, A. Society of Human Ecology International Conference: Contributors to trust in collaborative fuels management planning. Cozumel, Mexico.

-Wright, V. RMRS Management Team Meeting: Barriers to the use of science. Albuquerque, NM

2003

-Cole, D. George Wright Society conference: Wilderness stewardship dilemmas: insufficient commitment, inadequate policy. San Diego, CA.

-Landres, P. George Wright Society Meeting: The challenge of monitoring wilderness character. San Diego, CA

-Landres, P. University of Idaho Wilderness Issues Colloquium: Conflict between state and federal agencies over fish stocking in wilderness. Moscow, ID

-Parsons, D. National Commission on Science for Sustainable Forestry Annual Symposium: Fire, Forest Health and Biodiversity; Fire management. Denver, CO

-Watson, A. University of São Paulo Institute for Protected Area Management: Protection of wilderness values across cultural orientations. Piracicaba, Brazil

-Watson, A. Alaska Recreation and Parks Association; Solitude is to recreation as respect is to spirituality; Anchorage, AK

-Watson, A. National Park Service panel to initiate public planning for the Grand Canyon; Allocating use across competing groups in wilderness. Phoenix, AZ

-Wright, V. BLM Science Coordination Committee: Developing and sharing scientific knowledge, approaches, and data with federal land managers. Shepherdstown, WV

2002

-Cole, D. Monitoring and Management of Visitor Flows in Recreational and Protected Areas: Simulation of recreational use in backcountry settings: an aid to management planning. Vienna, Austria.

-Corn, P.S. Ecology and Earth Sciences of Mountain Areas: Endangered toads in the Rockies. Banff, Canada.

-Landres, P. University of Montana Wilderness Lecture Series: Wilderness restoration: the dilemma of managing for wildness and naturalness. Missoula, MT

-Miller, C. Fire and Climate History in Western North and South America: Linking forest dynamics models and fire-climate history data to understand effects of climatic variability and change. Tucson, AZ. Published as chapter in 2003 book by *Springer*.

-Watson, A. Ecological Society of America/Society for Ecological Restoration Annual Meeting: The relationship between traditional ecological knowledge, evolving cultures, and wilderness protection in the Circumpolar North. Tucson, AZ

2001

-Cole, D. 7th World Wilderness Congress: Ecological research and educational programs to support protected area management: lessons from the United States experience. Port Elizabeth, South Africa.

-Corn P.S. Society of Environmental Toxicology and Chemistry and the Johnson Foundation Workshop, Global Decline of Amphibian Populations: Amphibian declines: status, causes, & cautions. Racine WI.

-Corn, P.S. University of Georgia State-of-the-Art Conference: The Big Unknowns in Global Change: Climatic, Biotic, Human Systems. Amphibian declines and global climate change. Athens, GA.

-Landres, P. Social Acceptability of Fuel Treatments on Western Public Lands Conference: Ecological considerations in using prescribed fire. Missoula, MT

-Landres, P. The Precautionary Principle in Ecosystem Decisionmaking: Its Promise and Practice Conference: Application of the precautionary principle to wilderness management. Leavenworth, WA

-Parsons, D. Ecological Society of America annual conference, Symposium on Science and Parks: Research in parks and protected areas. Madison, WI. Appeared as lead article in 2004 Forum section of *Ecological Applications*.

-Watson, A. Wilderness Action Group of South Africa Training for Wilderness Managers and Government Ministers; International perspectives on wilderness. South Africa

-Watson, A. Wilderness Great Britain? Conference on Wild Land Conservation: Re-wilding in the U.K.; Needs to articulate attributes and threats to wild land character in the U.K. Leeds, U.K.

-Watson, A. **Keynote** address to the Australian Academy of Sciences Fenner Conference on Nature Tourism and the Environment; Public lands in the U.S.: Marketing versus protecting in response to increasing recreation demand. Canberra, Australia

2000

-Landres, P. National Park Service West by Northwest 2000 Conference: Science and management in wilderness: a framework for evaluating proposed scientific activities in wilderness. San Diego, CA

-Landres, P. The Wilderness Society Conference: Ecological restoration in wilderness: how far should we go? Denver, CO

-Watson, A. World Congress on Adventure Travel and Ecotourism; International perspectives on wilderness values and uses. Anchorage, AK

1999

-Cole, D. Recreational Impact Monitoring Workshop: The significance of recreation impacts: towards an impact monitoring program. Mount Vernon, WA. (Keynote)

-Parsons, D. Sierra Nevada Framework Conference: Old forest reserves. Davis, CA

-Watson, A. Conference on tourism and national parks in Finland; Recreation fee issues: an emphasis on science involvement. Phyätunturi National Park, Finland

1998

-Cole, D. Forest Service National Wilderness Program Leaders Meeting: Wilderness users today and tomorrow. Washington, DC.

-Watson, A. Presentation to scientists, managers and public lands agency administrators. Travel and site visits sponsored by New Zealand Department of Conservation; Managing conflict on public lands. Wellington, New Zealand

1997

-Cole, D. Recreation Impacts in Alaskan Ecosystems Workshop: Recreation ecology: implications for managing impacts in Alaskan wildlands. Fairbanks, AK. (Keynote)

-Cole, D. International Llama Association Conference: Llamas, horses, and hikers: which cause the most impact? Bend, OR

-Landres, P. Ecological Society of America Symposium on Natural Variability: Evaluating the usefulness of natural variability concepts in managing ecological systems. Albuquerque, NM

-Landres, P. Natural Areas Conference Symposium on Naturalness: What is natural? An ecological perspective. Portland, OR

-Parsons, D. Univ. of Montana Wilderness Lecture Series: Restoring fire in wilderness. Missoula, MT

-Parsons, D. BLM's Grandstaircase-Escalante National Monument Science Symposium plenary speaker: Integrating science into natural resources management and planning. St. George, UT. Published in 1997 BLM symposium proceedings.

-Watson, A. Presentation to National Interregional Ecosystem Management Coordination Team; Human dimensions, recreation, biological values, societal benefits: sorting out social science priorities in ecosystem management research. Las Vegas, NV

1996

-Cole, D. Recreation Impact Management Seminar: The carrying capacity and limits of acceptable change models of wilderness planning (and 3 other presentations). Torres del Paine National Park, Chile

-Landres, P. Wilderness & Natural Areas in Eastern North America Conference: Managing for naturalness and natural variability: definitions, concepts, and strategies. Gatlinburg, TN

-Parsons, D. Seminar for Univ. of Montana Wilderness Lecture Series: Technology in wilderness. Missoula, MT

-Watson, A. Parks Canada Wilderness Management Workshop; Determining indicators of the wilderness experience. Vancouver, B.C.

Workshops Organized or Coordinated

2004

-Special session on Scaling Laws in Fire Regimes: Moving Landscape Fire History into the 21st Century; International Association for Landscape Ecology Symposium. Las Vegas, NV. Co-organized by Carol Miller and Don McKenzie (PNW). Has been invited to be written up as special section in both *Ecosystems* and *Ecosystem Complexity*. Followup is also being

considered for a NCEAS workshop proposal, a summary article in *Frontiers in Ecology and the Environment*, and possibly a NSF Biocomplexity grant proposal.

-Session on Protecting and Restoring the Relationship Between Evolving Cultures and the Wilderness Landscape; International Congress on Arctic Social Sciences. Fairbanks, AK. Organized and Chaired by Alan Watson.

-Workshop on Identifying Monitoring Indicators of the “Outstanding Opportunities” Element of Wilderness Character. Lubrecht Forest, MT. Co-organized by Peter Landres and Steve McCool (U. Montana).

2002

-Workshop on Travel Simulation Modeling at Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas. Vienna, Austria. Co-organized by David Cole.

2001

- Science and Stewardship Symposia, 7th World Wilderness Congress. Port Elizabeth, South Africa. Organized and chaired by Alan Watson. Resulted in *RMRS General Tech. Report*.

-Workshop to develop an interagency process for evaluating proposals for scientific activities in wilderness, Seattle, WA. Co-organized by Peter Landres and Judy Alderson (NPS).

-Workshop on Fire History in the Northern Rockies. Missoula, MT. Organized by David Parsons.

2000

-Workshop on Use Density, Use Limits and Visitor Experiences. Lubrecht Forest, MT. Co-organized by David Cole and Wayne Freimund (U. Montana). Published as *RMRS General Tech. Report*.

- National Conference on the Social Acceptability of Fuel Treatments on Western Public Lands Program Committee, Missoula, MT. Alan Watson served on Program Committee and as Principal Investigator. Published as *RMRS General Tech Report*.

-Workshop on Social Acceptability of Forest and Fire Fuel Management Alternatives for the Northern Rockies. Missoula, MT. Co-organized by Alan Watson.

-Workshop to identify wildland fire and fuels management information needs. Missoula, MT. Organized by Carol Miller and Peter Landres.

1999

-Symposium on Paradigms of Forest Restoration: Managing for Structure and Process. Ecological Society of America Meeting, Spokane, WA. Co-organized by David Parsons and Norm Christensen (Duke University).

-Wilderness Science in a Time of Change Conference. Missoula, MT. Co-organized by David Cole, David Parsons with Perry Brown, Wayne Freimund, Steve McCool and Bill Borrie (University of Montana). Poster session chaired by Alan Watson.

-Workshop on Ecological Monitoring in Wilderness. Missoula, MT. Co-organized by Peter Landres and Paul Alaback (U. Montana).

1998

-Science symposia, 6th World Wilderness Congress. Bangalore, India. Organized and chaired by Alan Watson. Resulted in *RMRS General Tech. Report*.

-Symposium on Naturalness and Natural Variability: Definitions, Concepts, and Strategies for Wilderness Management at the Wilderness & Natural Areas in Eastern North America Conference. Gatlinburg, TN. Organized by Peter Landres.

-Workshop on Effects of Fisheries Management on the Amphibians and other Biota of Wilderness Lakes. Kalispell, MT. Organized by Steve Corn. Resulted in special issue of *Ecosystems*.

-Symposium on Society's Changing Attitudes Towards Wilderness: How Have Values Changed And Should These Changes Influence Management? at the 7th International Symposium on Society and Resource Management. Columbia, MO. Co-organized by Alan Watson, Mark Brunson (U. State U.), and Peter Landres.

- Public Response to Recreation Fees on Public Lands, International Symposium on Society and Resource Management Symposium Coordinator. Columbia, MO. Alan Watson served as Symposium Coordinator.

-Workshop on Limits of Acceptable Change. Lubrecht Forest, MT. Organized by David Cole. Hosted by Leopold Institute. Resulted in *RMRS General Tech. Report*.

1997

-Symposium on Stewardship Across Boundaries, Society of Conservation Biology, Victoria, BC. Organized by Peter Landres.

1996

-Workshop on Uses and Limitations of Historical Variability Concepts. Georgetown Lake, MT. Co-organized by David Parsons and Tom Swetnam (University of Arizona); Hosted by Leopold Institute. Resulted in special section in *Ecological Applications*.

-Symposium on Managing for naturalness and natural variability: definitions, concepts, and strategies at the Wilderness and Natural Areas in Eastern North America conference, Gatlinburg, TN. Organized by Peter Landres.

SELECTED PUBLICATIONS

The following include the most significant publications produced by Leopold Institute staff and cooperators on the identified priority issues.

Issue #1 Understanding the effects of recreation use and recreation management strategies on wilderness attributes and visitor experiences.

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