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**Vegetation Management
and Protection Research**

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Proceedings RMRS–P–1

WILDLAND FIRE RESEARCH

FUTURE SEARCH CONFERENCE NOTES

PARK CITY, UTAH
OCTOBER 6 – 8, 1997

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Note:

To quickly publish these meeting notes, the drafts did not receive conventional Forest Service editorial processing. Views expressed are those of meeting attendees and not necessarily those of the Forest Service or other organizations represented at the meeting. Trade names are used for information purposes and do not imply endorsement or preferential treatment by the Forest Service or other organizations represented at the meeting.

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A web page for this Future Search Conference will be located on the Forest Service home page at http://www.fs.fed.us/land/#fire. Users may make comments and receive feedback about the conference via a chatroom that will be available spring 1998.

Acknowledgments

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I thank Future Search Conference facilitators, Marvin Weisbord and Sandra Janoff, for their hard work, interest, and commitment to wildland fire research. A special thanks to the conference organizers and documentation team; these people are listed in Appendix A.

Jim Saveland, Conference Organizer
USDA Forest Service
Vegetation Management and
Protection Research

Outcomes

This conference provided an arena for identifying common key issues that are shaping wildland fire research. Commonly identified desired outcomes include:

- Research, integrated across disciplines, and management form partnerships.
- Communication between management and research is effective and continuous.
- Responsive and proactive research balances long-term scientific goals with rapidly changing management issues.
- The success of research and development is measured by on-the-ground implementation.
- Fire research is responsive to national goals and receives long-term, stable political support.

Action plans were developed around the following five key themes:

1. Create an interdepartmental competitive grant program.
2. Create a coordinated response to managing fire regimes for ecosystem health.
3. Create an environment for management and research collaboration.
4. Integrate social science expertise.
5. Assess ecological risk.

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PREFACE

The USDA Forest Service sponsored the Future of Wildland Fire Research Conference held in Park City, Utah, on October 6-8, 1997. The participants, scientists and decision and policy makers came from various government agencies and non-government organizations. These individuals gathered to discuss the past, present, and future of wildland fire research in a unique and innovative setting. The conference was an experiment, a beginning.

Due to size limitations and conflicting schedules, many who might have contributed to this effort were unable to do so. We hope this report accurately expresses the commitment and work of those attending.

Government and non-government organizations represented included USDA Forest Service, Bureau of Indian Affairs, U.S. Environmental Protection Agency, National Park Service, U.S. Geological Survey, U.S. Fish and Wildlife Service, Bureau of Land Management, Los Alamos National Laboratory, National Center for Atmospheric Research, National Weather Service, National Aeronautic and Space Administration, Canadian Forest Service, California Department of Forestry and Fire Protection, Colorado State Forest Service, Florida Forest Protection Bureau, Tall Timbers Research Station, University of Washington, University of Idaho, University of Montana, University of Wyoming, University of Arizona, Fire Protection Research Foundation, and The Nature Conservancy.

CONFERENCE GOALS

This Future Search Conference was a task-focused planning effort that relied on the knowledge, expertise, and experience of individuals interested in improving wildland fire research. The goals of this conference were to:

- discover common ground in the wildland fire research community;
- develop a future vision of wildland fire research; and
- devise a set of action plans to achieve that vision.

To accomplish these goals, all conference attendees participated in a series of activities to increase their common pool of information about wildland fire research. Some exercises focused on the past, others looked at the present, still others projected the future.

CONFERENCE STRUCTURE

Each participant was a member of two groups: a stakeholder group and a mixed group. The group type was appropriate to the exercise. The conference planning committee identified eight stakeholder groups and eight mixed groups. The stakeholder groups were:

- Administration/Policy (two groups)
- Fire Behavior/Risk Management
- Fire Behavior/Physical Science
- Biology/Ecology/Watershed Sciences (two groups)
- Air Issues
- Social Science/Wilderness

Within these groups were key stakeholders in wildland fire research who could commit to actions and plans. Conference participants were identified and recruited by a conference steering committee (Appendix A) to attend the conference. Stakeholder and mixed group members are listed by group in Appendix A. Conference participants are listed individually in Appendix B.

Each group generated information and ideas on flip-charts and made presentations. Two facilitators helped keep the groups focused, the tasks on schedule, and highlighted the major themes.

Contents

ACRONYMNS

The following is a list of some of the acronyms used during this conference. No attempt was made to include an exhaustive list or to verify each meaning.

AQ	Air Quality
BEMRP	Bitterroot Ecosystem Management Research Project
BLM	Bureau of Land Management
CAA	Clear Air Act
DOI	Department of the Interior
EPA	Environmental Protection Agency
FACA	Federal Advisory Committee Act
FS	Forest Service
GIS	Geographic Information System
GPRA	Government Performance and Results Act
IMRT	Interagency Management Review Team
ICRB	Interior Columbia River Basin
ICS	Incident Command System
I&M	Inventory and Monitoring
IPA	Integrated Planning and Assessment
LMP	Land Management Plan
LTERS	Long-Term Ecological Research Site
NGO	Non-Governmental Organization
NF	National Forest
NFS	National Forest System
NP	National Park
NFDRS	National Fire Danger Rating System
NSF	National Science Foundation
OH	Overhead
PL	Project Leader
PNF	Prescribed Natural Fire
Rx	Prescribed Fire
RD&A	Research, Development, and Applications
USFS	United States Forest Service
USGS	U.S. Geological Survey
WFAS	Wildland Fire Assessment System

I. The Challenge

The challenge for the wildland fire research community is to meet the rapidly changing and diverse needs of fire managers, ecosystem scientists, and society. Traditionally, this close-knit community has had a well-defined mission; to support effective fire protection and the use of fire by land management agencies. Recently that mission and output have become more diffuse, just as the demand for traditional support has expanded.

As the importance of natural disturbance has become more widely appreciated, fire science has become increasingly relevant to the ecological, social, and physical sciences. In conjunction, fire scientists are often aligning themselves with colleagues in other disciplines. This beneficial trend can lead to a perception that fire scientists are unresponsive to traditional clients or that they lack a common sense of purpose.

Fire managers, faced with the greatest challenges in their history, struggle to:

- restore and maintain ecosystem health;
- decrease fire hazard, especially in the wildland-urban interface;
- improve cost effectiveness of suppression, especially reduce the cost of large fires;
- improve safety of fire operations;
- anticipate effects of global change; and
- protect environmental quality.

Management action increasingly depends on scientific knowledge and on the ability to mobilize scientific talents in response to on-the-ground needs.

Who constitutes the wildland fire research community as it moves into this new era? Do they retain a common sense of purpose, shared values, and mission? What past influences, perceived trends, and future visions guide wildland fire research? Who will take a leadership role in defining and accomplishing the needs of wildland fire research in future decades? And, most critically, what is the relationship of wildland fire research to its clients and how will it provide research support for the new Federal Wildland Fire Policy and other strategic direction?

This conference assembled representatives of the fire research community, along with principal clients, colleagues, and managers of research, to discuss future challenges. An energetic dialogue was conducted to begin the important work of sharing ideas, forming relationships, and initiating action. Participants shared visions of the future and made personal commitments to meet future challenges. There is dedication, partly through this document, to reach out to others participating in the future of wildland fire.

—Conference Steering Committee

II. The Past

Participants were asked to bring to the conference items or artifacts symbolizing wildland fire research. Some items were personal, others had universal meaning.

The anemometer with bullet holes (below), symbolizes the chronic problems in collecting weather data. Tree rings continue to be useful records of fire history. The BEHAVE program disks remind us how far we have come in computer modelling.

Giant sequoias in the Sierra Nevada of California contain numerous fire scars that record the years of past surface burns. These tree-ring records extend back more than 2,000 years and show that fires were frequent (at least twice per decade before circa 1860) and were often correlated with droughts. Photo by A.C. Caprio, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ.

Over the decades, global events, advances in technology, government regulations, and society's expectations have changed dramatically. To find common ground for the future of wildland fire research, it is important to look at the past not as a static chain of events, but as an evolutionary activity.

In the first conference exercise, members of the wildland fire community were asked to share their histories. Single, brief events may shape one's future; a Rocky Mountain ski trip may lead to a long, accomplished career in natural resources; a fleeting encounter with a charismatic leader may inspire a successful public career. For many participants, looking at the past helped identify trends, define roles, detect patterns, and recall personal delights and sorrows.

The conference began with mixed groups that included at least one member from each stakeholder group. The assignment was to describe the past to discover what has influenced the evolution of wildland fire research. What brought the community to its present state?

The conference room walls were lined with large sheets of paper used to create timelines. Each participant listed personal, global, and wildland fire research events on a timeline. The sheets of paper were soon filled with personal recollections, key global events, and the history of wildland fire research.

When the timelines were completed, many themes and patterns emerged. Despite the wide range of stakeholders, the results of this exercise emphasized the commonality of experience and perspective. The following is a summary of the timelines (Appendix C).

Personal

Most participants were born before 1960 and many grew up in the Western U.S. on farms or in rural towns. Participants commonly had significant outdoor experiences leading to job and career choices. Many first jobs were firefighting or fire-related. Participants had lived in many places and had a wide range of professional experience in geographically diverse areas.

Most group members were earning advanced degrees during the 1960s and 1970s. Several had contact with charismatic natural resource leaders such as Henry Wright, Harold Weaver, and Harold Biswell.

In the 1980s many members' careers included bio-political experience with a focus on and responsibility for fire policy and research. Career tracks appear more evolutionary than revolutionary; few individuals had changed careers rapidly.

II. The Past

By the 1990s, this well-educated group had a significant amount of fire experience and a high level of influence in fire management and research. Responsibility for managing large land areas and numerous published books and articles are indicators of this group's wealth of fire knowledge.

Although the group is highly influential, most individuals recognize limits and constraints. Some who consider their positions bureaucratic, expressed discontentment stemming from the desire for more hands-on research. Many, feeling a sense of renewed energy, were willing to devote more of themselves toward opportunities for integrated problem solving.

Global

In the past, increased focus and concentrated resources helped scientists deliver results promptly. The bombing of Pearl Harbor galvanized and focused the country. Research activities surrounding the Manhattan Project, which produced the first atomic bomb, exemplifies the urgent demand for scientific answers and technology.

The post-World War II period saw major technological and social changes. Much of modern fire technology arose from the war; surplus aircraft, improved fire suppression and aerial detection became available. Use of and competition for natural resources increased as soldiers enrolled in colleges, built homes, and worked outdoors. The spirit of controlling nature was prevalent.

The Soviet Union challenged the U.S. in space exploration in the 1950s. The space race led to an infusion of research money to universities and government-controlled technological development. Electronic equipment, such as remote sensing, aircraft, satellites, global positioning systems, and infrared were being developed. Seeing the earth from space initiated a global perspective.

The Civil Rights and Women's Movement gathered momentum in the 1960s. As the Vietnam War continued, people began to question the government's authority. Rachel Carson's *Silent Spring* sounded the environmental alarm. Richard Nixon was elected president.

The 1970s gave rise to greater environmental awareness and increased environmental actions. Love Canal, Three Mile Island, and other human-induced disasters revealed our vulnerability to technological "accidents." Population growth and gasoline shortages focused attention on the earth's resource limitations. The National Environmental Policy Act and the Endangered Species Act were enacted.

During the 1980s and 1990s, the world economy continued to grow, while the earth's natural resources continued to decline. There were more competing interests and a lack of common social focus. Communication technology assisted the fall of the Eastern bloc. The Internet and other technologies are increasing personal freedoms but also creating a dichotomy; those on the information highway and those looking for it.

Wildland Fire Research

Fire research is an evolutionary process. Suppression has received the longest and most consistent research attention. Later came activity-fuels research. Recently, research activities have included the ecological role of fire and natural fuels, the results of which are being applied by land managers to benefit ecosystems.

Fire research has historically been tightly coupled with fire management and the critical events that drive it. Research projects, funding, and new management policies typically follow fire-related disasters. These disasters are usually followed by a policy review, along with increased safety awareness, increased funding, and emphasis on the need for fire research. An early critical event was the the 1910 fires. This event led to the beginning of fire management. Following the Selway fires in

the 1930s, the 10 AM policy (fires will be extinguished by 10 AM or a plan will be initiated to extinguish the fire by 10 AM the following day) went into effect. In 1988, Western fires, especially those in Yellowstone, caused another examination of fire policy; and the extensive and numerous catastrophic fires in 1994 and 1996 were followed by further scrutiny of fire policy and direction.

Other external drivers of fire research include commodities, disaster, technology, demographics, environmental politics, and budgets. These are relatively short-term events that commonly receive short periods of intense attention. Internal fire research drivers include habit, tradition, professionalism, individual bodies of knowledge, myth, specialization, institutionalization, and chaos (response to short-term events; no organized approach). Safety awareness is fairly constant and has increased slowly over time.

Fire labs were opened in the 1950s and research shifted from data generalizations to model simulations. Fire research programs and funding continues to be reactive to disaster.

The pre-1960s approach to fire research and management was a focused attempt to scientifically control nature. Prediction of fire potential, behavior, and danger rating systems were emphasized.

During the 1960s, seeds of the ecological use of fire were planted with the first Tall Timbers Fire Ecology Conference and the Leopold Report on Fire and Wildlife in National Parks.

There was a transition from firefighting science to fire ecology during the 1970s. Formalized ecological research looking at the role of fire restoration, regimes, and ecology became widespread. The fuels problem gained recognition as did the natural role of fire. The environmental movement brought several new laws, regulations, and policies (e.g., National Environmental Policy Act and the Wilderness Act) that directly or indirectly affected fire management.

During the 1980s, the Yellowstone fires ignited debate about "let it burn" policies; the public began to question fire-management policies.

Federal agency reorganization and downsizing in the 1990s resulted in a decreased capacity to conduct research. Simultaneously, increased public involvement in policy making and the incorporation of social factors in research occurred.

Fire research has become more integrated with related disciplines and interests; yet, further integration is needed. Fire research remains dominated by public-land fire management needs rather than private needs. Current fire research is increasingly complex and is incorporating various degrees of the social dimension.

Implications

Physical, technological, and social trends have implications for fire policies: How are we a part and how will we evolve with the trends? We have seen fire research and management move toward ecosystem research and management.

Political conservatism has resulted in conservative fire research. Innovative and creative research is often stifled by prioritization. Forced into "safe" research, scientists are unlikely to venture out of traditional arenas. Because fire research historically responds to events, there is a need to generate a sustained demand and proactive communication with the public and media.

Communications technology has had a time-compressing effect; rapid solutions are expected. Although much needed research is long-term and highly complex, the management expectation is to produce significant results quickly.

A nationally coordinated fire research program that establishes priorities, tracks success, and builds program support is needed. The program would foster integrating and monitoring of long-term ecological changes.

III. The Present

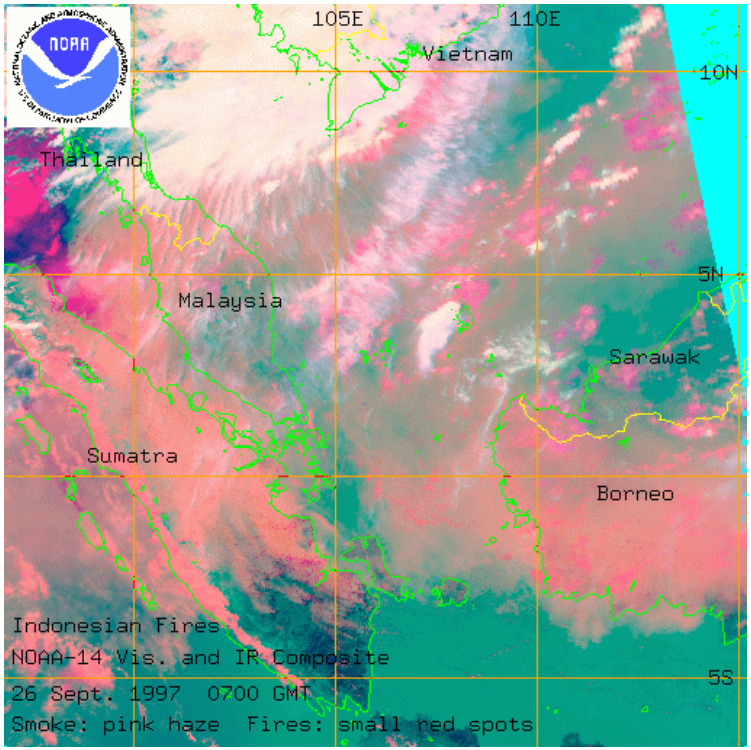
Increasing social value of air quality and escalating climate change are current trends.

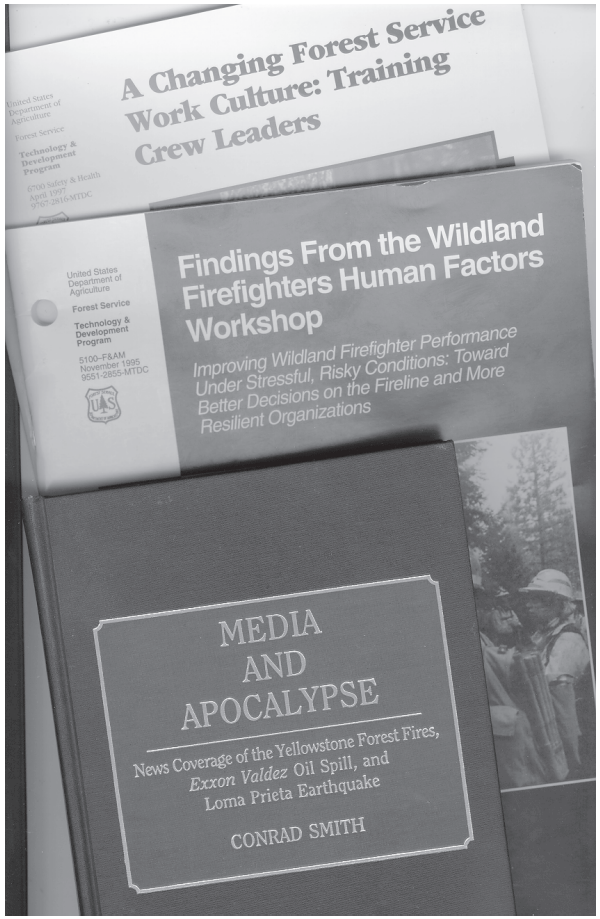

DENVER AND THE WEST

SECTION B

EPA hears haze debate

Agencies plead their cases over park visibility rules





Increasing awareness of social issues is a key trend.

III. The Present

Looking at the past created a context to view the present. To analyze the present situation, participants formed eight stakeholder groups.

- Administration/Policy (two groups)
- Fire Behavior/Risk Management
- Fire Behavior/Physical Science
- Biology/Ecology/Hydrology (two groups)
- Air Issues
- Social Science/Wilderness

The stakeholder groups used the analysis of the past to better understand the present status of wildland fire research.

Looking at the present consisted of four exercises: article summaries, group mind map, stakeholder perspectives on trends, and "prouds" and "sorries."

Participants were asked to bring a newspaper or magazine article that reflected an event, trend, or development that is shaping the future of fire research. Each person shared their article with their group and discussed its significance. Using this information, each group then focused on the trends, events, and developments shaping wildland fire research today and in the future.

Next, all participants gathered to create a mind map (page 8). The mind map soon became a complex branched structure reflecting the diverse interrelated issues relevant to wildland fire research. Participants identified key issues and trends in wildland fire research.

Wildland Urban Interface issues continue to increase

The next task for the stakeholder groups was to identify which trends they cared about, what actions they are taking, and what actions they want to take. Group findings were reported back to the larger group in terms of what is being done and what needs to be done about each issue (pages 10-14).

The final task focused on how participants feel about the current situation, each stakeholder's contribution to what is working, and their contribution to what is not working. Each stakeholder group listed issues and activities that they are currently associated with that they are proud of and issues and activities that they are currently associated with that they are sorry about. Each group selected their proudest "prouds" and sorriest "sorries" to present to all conference participants (pages 15-17).

III. The Present

A mind map illustrates a collective view of complex factors influencing a core issue. Participants determined the factors and pathways that represented their individual concerns and those developed in their stakeholder groups.

Key trends identified on the mindmap

- **Increasing wildland urban interface problems.**
- **Increasing fuel buildup and decreasing ecosystem health.**
- **Fire management becoming more integrated and complicated.**
- **Data acquisition and analysis advancing faster than the ability to put the information to practical use.**
- **Increasing air quality requirements and concerns.**
- **Need for system integration by taking existing models and data and applying them to management decision systems.**
- **Desire to bridge the gap between today's fuel problems and tomorrow's solutions.**
- **Increasing social value of air quality at local and global scales.**
- **Escalating climate change.**
- **Increasing occurrence of prescribed and wildland fire.**
- **Increasing communication and collaboration among all interested wildland fire stakeholders.**
- **Increasing need to understand the relationship between society and wildland fire (e.g., research on fire issues such as prescribed fire and the media).**
- **Increasing recognition of the need for wildland ecosystem restoration.**
- **Increasing emphasis on ecosystem sustainability.**
- **Escalating concerns about restoring natural fire regimes.**
- **Increasing prescribed fire and fuel management treatments to affect fire hazard, regime, and restoration.**
- **Increasing public resistance to fire, smoke emissions, resource loss, and treatments.**
- **Lack of trust in government.**

III. The Present

Administration / Policy (Groups 1 & 2)		
Trend	**What we're doing now**	**What we need to do**
• Increasing Wildland Urban Interface (WUI) problems.	• Some assessment of conditions. • Federal, state, and local efforts to improve awareness, training, and coordination. • Some broad-scale public education programs. • Federal fire policy provides direction concerning the WUI.	• Better clarify the federal fire policy concerning WUI issues. • Incorporate WUI into land use planning and fire management planning. • Train firefighters to work in interface conditions. • Develop a clearer message to communities about WUI strategies.
• Increasing fuel buildup and decreasing ecosystem health.	• Increase in funding and fuels planning and treatments. • Gradual increase in prescribed fire accomplishments. • Assessment of fuel conditions, risks, and priorities vary nationwide. • Southeastern states have enacted "right to burn" laws that protect prescribed fire activities. • Federal Fire Science plan established. • Fuel management strategies are being developed by various agencies. • Public is more aware of and concerned about fuel management issues.	• Increase fuel treatment. • Develop fire plans that support appropriate management actions. • Establish a better understanding of fuel treatment alternatives in relation to science, politics, and social concerns. • Better understand go/no-go decision conditions and options.
• Fire management is becoming more integrated and complicated. There is a broader recognition of social and environmental concerns including the physical and biological sciences. There is a desire to join together on an interagency basis to solve problems.	• Not explored due to time	• Not explored due to time
• Data analysis is advancing faster than the ability to put the information to practical use.	• Not explored due to time	• Not explored due to time

Administration / Policy (Groups 1 & 2) (continued)		
Trend	**What we're doing now**	**What we need to do**
• Increasing air quality requirements and concerns.	• Increasing regulatory requirements. • Measuring smoke emissions. • Controlling emissions through smoke management. • Educating the public about regulations. • Using dispersion models.	• Create better air quality monitoring. • Establish better control measures. • Develop better tools for predicting emissions and impacts. • Make data easily available.

Fire Behavior / Risk Management / Physical Science (Groups 3 & 4)		
Trend	**What we're doing now**	**What we need to do**
• Managers are looking for integrated systems that are useful in land management.	• Using outside research for system development and integration. • Bringing information to the field through training. • Increasing participation from other stakeholders and managers. • Forming management alliances at regional levels.	• Develop an integrated system using existing models and data and apply it to a management decision system. • Produce technology transfer from fire research. • Find more money from nontraditional sources.
• Fuels management is an increasing concern.	• Using pilot projects and demonstrations to help manage forests. • Using prescribed fire as a long-term solution when we may need short-term solutions.	• Manage the land with a consistent purpose. • Provide quality external and internal education programs. • Determine accurate science-based programs for short- and long-term solutions.

III. The Present

Fire Behavior / Risk Management / Physcial Science (Groups 3 & 4) (continued)

Trend	What we're doing now	What we need to do
• Increasing feeling that it is possible to develop a systematic model that captures knowledge and integrates physical and social models.	• Moving from art to science in terms of fire behavior. Dealing with physical and social aspects of the wildland urban interface problem. Introducing local and regional fire modeling into fire operations. • Coupling weather and fire modeling. • Studying fire dynamics. • Developing a physical understanding of satellite data.	• Build a perfect fire model. • Understand how to implement an integrated fire-weather model anywhere. • Develop physically-based satellite-derived data sets. • Reorganize current knowledge and problems. • Evaluate model-based predictions with real data for any time or place. • Develop a feedback path from behavior to data to help understand fuel-fire links. • Repackage existing knowledge for practical use by land managers and those in the field.

Biology / Ecology / Watershed Sciences (Groups 5 & 6)

Trend	What we're doing now	What we need to do
• Increasing concern about fuels.	• Simulation modeling of forest fuels. • Accomplishing many isolated studies. • Recognizing that we have type conversion, exotic species, and structure changing fire regimes. • Running static fuel models.	• Establish comprehensive dynamic inventories of the entire fuel profile (including grasses, shrubs, trees). • Better understand historic conditions. • Clearly communicate with fire managers and help them with biological applications. • Increase the amount of ecological work on nonforest ecosystems.

Biology / Ecology / Watershed Sciences (Groups 5 & 6) (continued)

Trend	What we're doing now	What we need to do
• Increasing recognition of the need for restoration.	• Producing demonstration projects. • Accomplishing large-scale spatial assessments. • Using fire as a restoration tool in local prescribed fire projects.	• Recognize variability. • Communicate differences between restoration and commodity production. • Integrate fire and other disturbances. • Establish clear communication between researchers and managers.
• Increasing emphasis on ecosystem sustainability.	• Starting to address ecosystem integrity. • Increasing the amount of local fire projects. • Beginning to define disturbance regimes.	• Accomplish long-term studies. • Integrate fire into ecosystem management. • Assess fire affects on biodiversity.
• Escalating concerns about restoring natural fire regimes. • Increasing prescribed fire and fuel management treatments to affect fire hazard, regime, and restoration. • Public resistance to fire hazard, smoke emissions, resources loss, and treatments. • Lack of trust in government.	• Identifying knowledge about historic fire regimes in relation to vegetation and climate including human interventions. • Gaining support, administratively and financially. • Increasing the amount of monitoring, fuels mapping, and assessments. • Linking fire management with land management plans.	• Increase training and professional development. • Increase fire-history database compilation. • Compile adequate vegetation maps. • Engage in more long-term studies and experiments. • Evaluate the cost and benefit of post-fire rehabilitation efforts. • Evaluate the post-fire potential for mass erosion on regional and landscape scales. • Develop more interagency cooperative research. • Expand the study of exotics in relation to fire affects and behavior.

Air Issues (Group 7)

Trend	What we're doing now	What we need to do
• Increasing social value of air quality at local and global scales. • Escalating climate change. • Increasing occurrence of prescribed and wildland fire.	• Continuing to develop dispersion models that are disjointed and lack clear guidance. • Establishing many significant, joint problem-solving efforts. • Producing a proliferation of meteorological models. • Understanding better how weather and streams of mesoscale weather affect fire regimes. • Creating source-strength models. • Linking current meteorological, fire behavior, smoke production, and dispersion models.	• Better demonstrate how to use models and obtain technical support. • Directly apply tools to land management projects. • Increase model development rather than model system development. • Expand public outreach for decision making. • Increase collaboration between and among agencies. • Foster university curriculum in mountain meteorology. • Better understand the role of fire in increasing or decreasing carbon sink.

Social Science / Wilderness (Group 8)

Trend	What we're doing now	What we need to do
• Social components, which exist in all previously identified trends, are being recognized. • Need for increased communication and collaboration is being recognized. • Increasing need to understand how society drives wildland fire research.	• Recognizing that a significant amount of anecdotal social science evidence exists. • Acknowledging the need to establish systematic social science research within fire management programs.	• Identify social science researchers and build a community. • Obtain funding for social science research regarding fire research issues. • Systematically identify social science research needs. • Better understand how society influences wildland fire issues. • Complete field visits to observe applied research; obtain feedback from field users. • Identify fire lab customers and assess their needs. • Integrate social science into fire research.

Administration / Policy (Groups 1 & 2)

Prouds	Sorries
• Moving toward a balanced, national fire management program. • Progress in developing the fire discipline and professionalism. • Fire is in the mainstream of national and global ecosystem views. • Taking a leadership role in inter-agency training and cooperation. • The Incident Command System and all that has derived from it. • Budget process is more cost efficient, unified, and interagency; Choosing-By-Advantage. • Diversity in fire knowledge (physics, math, ecology, social science). • Increasing use of risk analysis. • Fire is included in other research communities. • North American fire research community remains a world leader. • Putting fuels on the national agenda. • Serving customer needs. • Landscape and regional scale efforts (Columbia Basin) and integrated assessments are occurring. • Packaging research, development, and application. • Land managers are using research information. • Collaborating at local levels. • Gaining political support and understanding.	• Missed opportunities to provide fire research leadership on emerging natural resource issues. • Connection between similar work is limited. • Organized around functions not goals. • Risk aversion makes it difficult to adapt to changing conditions and situations. • Lack of fiscal accountability. • Do not mobilize for opportunities as well as we do for threats. • Do not commit resources based on long-term net benefits as is done for short-term risks. • Opportunities missed to contribute to rehabilitation and restoration. • A crisis is required to spur action. • Research is not meeting management needs. • Not insisting on thorough fire investigations. • Lack of accountability. • Lack of integrated research and integrated planning. • Not supporting visionaries, risk takers, and the Federal Wildland Fire Policy. • Not burning enough acres/hectares. • Not enough objective monitoring.

Fire Behavior / Risk Management (Group 3)

Prouds	Sorries
• Building a business process that combines management, science, and social aspects. • Effort of multiple disciplines to integrate fire into land management. • Progress in software integration. • Moving from macroscale support to mesoscale support. • Quality educational programs to increase stakeholder knowledge. • Bringing tools to the field for application, training, and collaboration.	• Fire is not fully integrated in the land management process. • Doing things for the wrong reason; activity accomplishment is money driven. • Prescribed fire operations are commonly discounted as a part-time job that occurs between the primary jobs (suppression). • Using yesterday's technology on today's issues. • Unable to move faster to upgrade technologies. • Some want to do business the way we used to. • Management decisions are made without adequately understanding the ecological consequences. • Decisions are often based on product attractiveness rather than on a sound scientific foundation.

Each stakeholder group listed issues and activities that they are currently associated with that they are proud of and issues and activities that they are currently associated with that they are sorry about. Each group selected their proudest "prouds" and sorriest "sorries" to present to all conference participants.

III. The Present

Fire Behavior / Physical Science (Group 4)

Prouds	Sorries
• Working in a cross-disciplinary manner in fire research. • Initiating steps to help understand fire-line dynamics. • Developing a significant quantity and quality of models and products. • Supporting remote sensing with physical science. • Recognizing where technology stops and social science begins. • Canadian Forest Service has met the current need of fire and land managers. • Attracting external cooperators to research problems.	• Unable to understand research complexities fast enough. • Have not communicated model limitations to nonmodelers. • Model use is limited. • Not expressing concerns to land management agencies. • Distracted by administrative policy and technological “red herring.” • Canadian Forest Service delayed necessary groundwork for long-term work. • Inability to effectively and efficiently get products from research to users.

Biology / Ecology / Watershed Sciences (Groups 5 & 6)

Prouds	Sorries
• Informative demonstration projects. • Successful new treatments. • Increased communication between researchers and managers is fostering a climate of cooperation and collaboration. • Complex and integrative projects, long-term planning models, and multiple temporal/spatial data. • Implementing management programs based on research. • National key message about fire. • Increased use of natural history experiments and long-term studies. • Increased interagency and multiagency collaboration effort. • Integrated resource and fire management objectives. • Educating public, peers, managers. • Improved understanding of fire and climate relations. • Leadership in fire and watershed effects and in engaging USGS scientists. • Successful international and interagency cooperation on fire and fuels management. • Research results are influencing management.	• Ignoring hydrologic impacts of fire. • Hazard reduction is rationale for prescribed fire. • Inadequate communication between researchers and land managers. • Money being unnecessarily spent on fire suppression. • Conducting expensive, unnecessary rehabilitation operations. • Limited spatial- and temporal-scale work. • Single discipline approach continues to be the norm. • Lost public trust. • Lack of consideration about political and social events related to fire. • The five national key messages about fire are not widely known. • The overhead proportion of funding is increasing. • A small percentage of agency budget is obligated to research. • Rewards for innovation are few. • Not using field offices to help identify research needs.

Air Issues (Group 7)

Prouds	Sorries
• Successfully linking fire, climate, and social values. • Joint problem solving between the EPA and other agencies related to the Clean Air Act and visibility standards. • High level of professionalism. • Interagency cooperation on a local scale.	• Bureaucratic inertia / provincialism. • Weak link with social science. • Government mistrust. • Disconnected between reality and public opinion; chaotic science. • Lack of long-term focus on priorities. • Less willing to take risks associated with fire. • Lack of focus and agency expertise in monitoring.

Social Science / Wilderness (Group 8)

Prouds	Sorries
• Human factors are being promoted (ad-hoc work). • Variety of demonstrations exist. • Helping agency people work with media. • Improving our professional communication. • Accomplishing much with little. • Value of and what social science can offer is being recognized. • Included as stakeholders in this conference.	• Lack of public understanding. • Promoting safety has negative consequences. • Firefighter safety is a third or fourth priority. • Funding is being channeled away from human dimensions. • No mechanism exists to relay research funding to the ground. • Inadequate social science data. • Ineffective identification work. • Not managing across boundaries. • Limited understanding of other disciplines. • No unified statement on the role of social scientists. • Constrained time.

"The absence of social science integration in wildland fire research is a systems problem. Communication across disciplines is rare. Misunderstandings continue."

— Social Science Group Participants

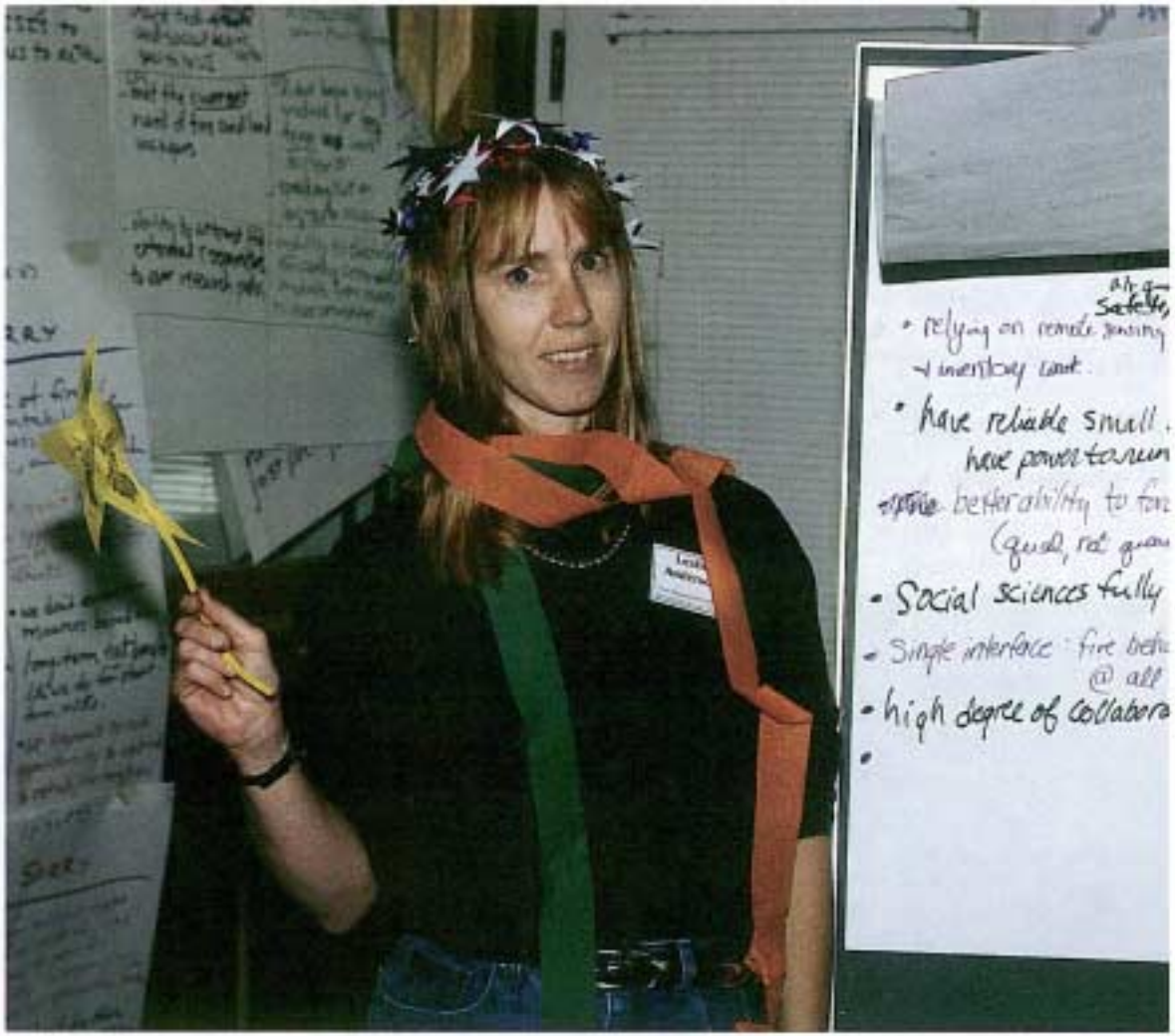
IV. Future Scenarios

Participants were somewhat impressed when they realized the broad commonality of their interests and concerns about wildland fire research and management. Two key questions emerged. What do we want to see in the future? What are we prepared to do to achieve this future vision?

Conference facilitators asked participants to imagine a future for wildland fire research and management that they would want to help make a reality. Participants were asked to design a story, a play, or some other creative way of communicating their future vision. Using flip charts, participants described current events in fire research and the barriers that must be overcome to reach their envisioned future of wildland fire research and management.

The assignment was to imagine 13 years into the future—October 7, 2010—and dramatize the changes in the wildland fire community that had taken place. Attendees were encouraged to exercise creative dreaming. Visions could include anything possible, desirable, or motivating.

The activity was challenging. Participants developed outlines and made props to dramatize an often humerous story about their group's future vision. Each mixed group produced its own scenario of an ideal future wildland fire research and management situation.



We dared to dream and were pleased by the commonalities of our dreams.

Mixed Group #1

The setting: *It is the year 2010. The Fire Wizard walks among a group of sleeping people. In 1997, the Fire Wizard had cast a sleep spell on these people. It's now the moment of awakening.*

First person: I must call Don Latham and Jack Cohen to tell them **how effectively the fire lab is transferring information to the field.**

Second person: Our flip charts? They've been updated! I'm going to **accept ecosystem change as a part of everyday life. The wildland urban interface is a social space, not just a geographic zone. Management and research communicate well.**

Third person: My, what day is it? 2010! I'd better check my long-range forecast. **I now have the ability to make better seasonal forecasts and excellent small-scale forecasts.**

Fourth person: I just had this amazing experience. We spent a day with **the House Committee on Natural Resources** and they supported everything we are doing. They understand that **science has a role in making management decisions,** and they **met our funding requests!**

Fifth person: Wow, the International Cooperative Interagency Committee has **a new way to obtain funding.** I'll apply right away!

Sixth person: I wouldn't get any sleep at all if it weren't for these meetings. **More decisions are based on high-quality risk assessments** than they were 13 years ago. Now we're relying mostly on **remote sensing** for the majority of our **monitoring and inventory work.** We have a **reliable small-scale wind model and better ability to forecast seasonal trends.** And finally, **social research is fully integrated with other disciplines.**

Seventh person: I'm meeting with the new Forest Service Chief today to discuss the issue of **looking at biodiversity more holistically** rather than just in regard to threatened and endangered species. I expect that we'll be **collaborating more based on shared information**, too!

Fire Wizard: What do you think? Should I put them back to sleep?

Additional future vision:

- Interact more directly with the public.
- Discussions include below and above-ground processes.
- Make appropriate management decisions and establish a better balance between prescribed fire and wildfire.
- Single interface between fire behavior, fire effects, etc., at all scales.
- Research filters and packages information and models are effectively used by managers.
- More "seamless" research community; fire research is no longer a separate community.
- Public trust of management is restored.
- International cooperation is expanded with a global focus.
- Large, international research projects are ongoing.
- More competitive, peer reviewed funding is open to all.
- Blurred distinction between research and management funding sources.
- Prescribed fire is fully integrated into land management practices.
- Land managers view themselves as risk managers.
- Science is used as the foundation for a national, natural resource policy.
- Sustainable resource and forest management indicators are the accepted criteria used as a framework for full stakeholder involvement.

MIXED GROUP #2

The setting: Five men and three women sit around a table at the front of a room. The meeting is called to order. . .

The Interagency, International Cooperative Research Consortium is convened. This consortium exists because many barriers have been broken. We're all **united** under the **Department of Natural Resources. Funding barriers** have been **eliminated;** we can **use suppression money for research.** Fear is gone; we can make decisions and take risks without worry. Communication barriers do not exist. This agency is **funding competitive grants.**

Member: My interest in this work goes back to the 1990s when the cost of ineffective fire suppression and the risk to human health was high. Now we have **cost effective, ecologically sound systems.**

Member: I'm concerned about restoration ecology. I want to see **competitive research.** I want to see **research on ecosystem structures and processes to reduce hazard of catastrophic fires.**

Member: I'm interested in ways to educate ourselves and others. I think people should spend a year doing work that is outside the realm of what they currently do **to unleash and harvest their creative potential.**

Member: **Good communication** is very important. I think that good communication will ensure that the **general public continues to understand the role of fire.**

Member: It seems to me that the real **success stories** from land management have come **from mutual, personnel exchanges.**

Member: My interest is building cohesive, yet diverse **communities that take effective action.** I'm always looking for **management/research partnerships that integrate management and social sciences.**

Welcome to your new board!

Additional future vision:

- Institutional barriers to research/management exchange and interdisciplinary research are eliminated.
- All budget opportunities are fully investigated.
- Substantial progress in ecosystem restoration and reduction of damaging and undesirable wildfire through a research and management partnership.
- Public understanding and acceptance of the cost of fire management.
- Research has initiated work on the next generation of problems.
- Fire community is integrated, coordinated, and flexible with a common understanding of problems and priorities. International Fire Science Plan is in place.

MIXED GROUP #3

Setting: A freak, early-season snowstorm in the year 2010 has isolated Park City, Utah.

Isolated individuals, known as the Saveland Party, develop **a new vision** and establish a new **land management planning process** that becomes the "north star" for fire research. One aspect of the process defines **a new fire research triangle involving federal, state, and private entities.** People are **approaching land management as an an integrated, holistic process.**

Land management objectives combine research and management components. We're evaluating the progress made on the next generation of land management plans.

We had a significant paradigm shift; it is **no longer important to achieve tenure and promotion.** We understand that **fire plays a fundamental land-management role.** We realize that we must target our research to the larger issue and ask, "Does this work influence the way we manage our public lands?"

Additional future vision:

- Teams are working on objectives that are monitored and evaluated by a wide range of disciplines.
- Events are not crisis driven nor are disciplines isolated.
- Fire impacts on watershed and vegetation are considered when making fire management decisions.
- Monitoring air quality.
- Accomplishing basic and applied research.
- Greater firefighter safety because of increased knowledge and technology.
- Complex models are running on laptop computers.
- Strong technology transfer program.
- Land-management plans connect monitoring, research, and management objectives with strategies and activities.
- Land management is ecosystem based.
- National policy guides efforts but allows local decisions.
- Public support for land management policy, specifically fire.
- Integrated atmospheric fire model is used onsite to forecast fire behavior.
- Work is accomplished in multidisciplinary teams.

Mixed Group #4

My name is Sue and I'm the legal representative for Group #4, which has been doing subversive research for the past 15years. They launched a satellite to eliminate all unwanted fires. In 1998, they found a whippersnapper who said the use of fire for rehabilitation was minimized. The fire research community is completely disbanded. Just kidding!

Our future vision of an ideal organization is one that:

- uses an **adaptive system that includes managers and researchers** symbiotically;
- is based on **fluid teams** that **identify, sort, and prioritize problems**; and
- has institutionalized the concept of **integrative thought** (beginning in university curriculums).

Additional future vision:

- Fire manager's role is to light fires, aided by realtime tools.
- Risk takers are rewarded.
- Honest, safe interaction. People meet in cyberspace and face-to-face.

Mixed Group #5

The setting: A group of people are sitting at a bar at the Intergalactic Inn . . .

Bartender: In 1997, there were many major barriers. We didn't know how to project a common future and couldn't agree on what indicators to use. There was a lack of appreciation for science in the decision-making process. Incentives for monitoring, funding, and staffing were inadequate to support research and development. So, what are the issues today?

Group: Well, we are developing a statement of our vision for 2020—10 years from now. We decided where we want

our terrestrial, aquatic, economic, and social systems to go, but to accomplish our desires, we had to sufficiently understand the systems. **We designed a monitoring and feedback system to track variables and indicators, which was agreed to by all.**

We now have a **coordinated, balanced** intergalactic **approach.** We discovered forest ecosystems on Titan and are conducting fire and emissions tests on them there. We can now **easily transfer money between agencies, and agency managers conduct in-house monitoring, outside of research.**

Additional future vision:

- Clear perception of reality and understanding of how to think productively.
- Highly effective knowledge transfer from research to field users and managers at all levels.
- Neutralization of past conditioning; more creativity.
- Institutionalized ways, techniques, and procedures to establish common ground.

Mixed Group #6

The setting: A television reporter proceeds with the news broadcast . . .

Today's headlines:

- El Nino forecasts were successful.
- 990,000 acres in the Southwest treated for fuel hazard.

We interrupt your regularly scheduled program for a special **National Weather Service** report. There will be an **acceptable, prescribed burning window** two weeks from today. **Combined burns by federal and state agencies** will produce smoke that will affect local areas for up to four hours per day.

(Viewer changes channel.)

Tonight we're talking about the history of fire science and Colin Hardy's role in creating an intergalactic consortium that:

- **reduced the average response time** of research from 3 years to 9 months with **no quality reduction** when **addressing management questions;**
- taught researchers to operate on parallel tracks **providing unpublished answers versus productivity as peer review;** and
- **established an Internet site** where users can visit and **research any local area of interest.**

Colin established Society's Use of Information as Developed by the University Community. A wealth of knowledge is continuously mined by researchers and collected in this **knowledge pool.** The **public and decision makers may** dip into this pool and **use information**. The **information is not controlled by any government.**

Additional future vision:

- Basic and applied science are equally valued in all communities.
- Improved climate and weather forecast capability, with a better ability to integrate information.
- Weather forecasts are linked to satellite technology using a toolbox of models.

Mixed Group #7

The setting: A gentleman sits at a table holding a sheaf of papers. He speaks . . .

Good afternoon ladies and gentleman, this is Tom Brokaw. The President will

present the **State of the Environment Address.** Ladies and gentlemen, the President of the United States.

She speaks: Good afternoon, its wonderful to be here again after so many years. As I close my second term, I want to reflect on a major Presidential accomplishment. My first initiative, back in 2003, was **creation of the Department of Natural Resources, which merged the Department of Interior and the USDA Forest Service.** This Department is under the leadership of our Secretary of Natural Resources. Under her fine leadership, we have reached a **broad public consensus on management of natural resources** and have **created a broad public trust.** Additionally, we developed a new **integrated research management division responsible for natural resource management research in the United States** and **international issues** such as global climate change.

We **doubled the Natural Resources budget.** This larger budget allowed us to:

- maintain a **strong, basic federal research program;**
- develop an extensive network of **long-term ecological research**; and
- initiate a large, **competitive grant program** for rapid response to changing needs.

We are in a new era of **collaboratively setting research priorities** among states, the federal government, and non-government organizations.

I am here at Yellowstone Natural Resource Area, the site of the 1988 fires, to tell you that **fire is a key component in managing natural resources.**

Additional future vision

- Balanced approach to public, state, and private research needs on all wildlands, with a commitment for basic and applied research.
- Comprehensive definition of missions and goals with broad input.
- Balance between basic and applied research.
- U.S. is an international leader in fire research and management.
- Solid support for maintaining long-term research demonstrations representative of all regional ecosystems on a landscape and watershed scale.
- Applying results of fire and fuel research started in the 1990s.
- Full collaboration and cooperation among scientists, disciplines, and agencies.
- Research programs are fully integrated and interdisciplinary (including social sciences).
- Department of Natural Resources is committed to long-term university activities and involvement of scientists.
- Universities are committed to holistically teaching basic natural resource management to majors and non-majors.

Mixed Group #8

The setting: A group of people are at a meeting. The chairperson speaks . . .

Welcome to the 5th annual meeting of the National Fire Research Council. We are meeting to consider competitive grant proposals.

Speaker: This proposal is on behalf of the Boise Team, a consortium of various agencies and researchers, which will develop proactive measures to protect the city from flood and fire. This team wants to develop knowledge about fire, water, and geomorphological processes and to involve the community in taking responsibility for managing its vegetation.

Question: How does that fit into the **national goals that we've set as research priorities**?

Group chair: Let's review those priorities.

Nationally, **fire research supports forest, rangeland, and aquatic ecosystems.** Annual goals drive this support. **Priorities are developed collaboratively with stakeholders. Fire research is proactive and responsive to issues.**

Group chair: The Research, Development and Application Program has been modified to:

- implement specific **integrated multi-agency objectives** that are **responsive to national goals** within specified time frames;
- be **jointly funded** from research design through applied technology implementation; and
- make a difference.

Additional future vision:

- Fire research is an integral part of national policy and program goals for natural resource management.
- Bringing the best of science to decisions that are applied on the ground is valued.
- Fire research program attracts the best scientists by its clear focus, a renowned program, and support for innovative solutions.

"The time is right for things to come together."
—Susan Conard

ORGANIZATIONAL VISIONS

- Establish a Department of Natural Resources to eliminate interagency competition and foster interdiscliplinary collaboration.
- Create an integrated research structure to:
  - increase communication and collaboration between researchers and managers among federal, state, and private entities;
  - foster research and management integration; and
  - address issues across boundaries and from regional to global scales.
- Establish an oversight council to:
  - eliminate institutional and organization barriers and initiate seamless management structures;
  - enact an adaptive management system with long-term research; and
  - use research results in adaptive management, develop a true learning community, and relay results to the ground.
- Develop a common and compelling definition of wildland fire research and management to:
  - bring wildfire researchers together and
  - establish universal coordination of all wildfire research.

DECISION–MAKING VISIONS

- Science, fire science in particular, has a role in management decisions.
- Prescribed fire is part of resource management, which creates a better balance between prescribed fire and wildfire.
- Risk assessment is a primary decision-making tool.
- Remote sensing is a major tool for integrating state-of-the-art weather forecasting into decision making and for monitoring.

PROCEDURAL VISIONS

- Make competitive research money available to all researchers to:
  - emphasize integrated research and
  - allow greater discretionary fund use.
- Construct a feedback process with stakeholders to:
  - improve communication;
  - provide better technology transfer;
  - improve research implementation through the use of feedback from stakeholders; and
  - filter, package, and disseminate findings.
- Fully integrate social research into fire research and management.

DESIRED OUTCOMES

- Research, integrated across disciplines, and management form partnerships.
- Communication between management and research is effective and continuous.
- Responsive and proactive research balances long-term scientific goals with rapidly changing management issues.
- The success of research and development is measured by on-the-ground implementation.
- Fire research is responsive to national goals and receives long-term, stable political support.

V. Common Ground

Potential Projects

Participants began brainstorming potential projects based on the identified common ground. Projects ranged from administrative reorganization to discipline-specific programs and included the following.

- Federal land agencies establish a research branch for collaboration and increased effectiveness.
- Establish a Department of Natural Resources.
- Devise a reward system to credit researchers for working with management and vice versa.
- Establish a national, competitive grant program, with integrated research as a requirement.
- Support long-term research.
- Multiagency research development and applications that are issue-driven with specific objectives and are jointly funded, designed, and implemented by research and management.
- Project responsive to issues articulated by Congress and the White House (e.g., global change, catastrophic fire).
- Adapt National Science Foundation or an equivalent process for competitive grants.
- Lobby for support (dollars, program changes).
- Establish an International Wildland Fire Academy.
- Adopt a long-term, integrated research plan that supports long-term goals.
- Charter a committee of national fire managers to define national fire research goals and coordinate fire research.
- Establish an interdepartmental science team.
- Develop large, field-research campaigns involving multiple institutions.
- Produce an interagency budget initiative.
- Develop a shared vision of a "seamless" learning community.
- Evaluate existing processes, programs, and models.
- Finish information databases (GIS).
- Establish a geographical fire research library, information, and communication system on the World Wide Web.
- Develop technology transfer mechanisms.
- Institutionalize technology transfer.
- Seek money for more technology transfer.
- Integrate remote sensing.
- Obtain support for long-term monitoring and research of social and adaptive management.
- Apply EPA Ecological Risk Assessment guidelines to fire management.
- Develop long-term, landscape-scale vegetation management research in selected ecosystems.
- Survey public values related to prescribed fire and wildfire.
- Use the newly created council or institute for natural resource inventory and monitoring including fuels inventory and fire monitoring.
- Develop an internal and external outreach campaign.
- Study firefighter behavior.
- Complete a Wildland Fire Assessment System-integrated modeling system.
- Develop a short- and long-term fire modeling project.

Next Steps

With common themes and potential projects identified, participants were asked to begin planning action steps for the items they felt strongly about. Five groups organized around the following themes:

1. Create an interdepartmental competitive grant program.
2. Create a coordinated response to managing fire regimes for ecosystem health.
3. Create an environment for management and research collaboration.
4. Integrate social science expertise.
5. Assess ecological risk.

1. Create an interdepartmental competitive grant program

(*Group members:* Bell, Leehouts, Cahoon, Sieg, van Wagtendonk, Biehl, Brennon, Hutto, Mitchell, Conard, Botti)

This group determined a preliminary framework for an integrated program function and outlined some chief obstacles to overcome. Their framework consisted of two new organizational groups working in tandem to establish a national coordinated research agenda and award funds accordingly. The first group would include participation from many stakeholders at multiple levels and would meet at least annually. The purpose of this first group would be to define a 10-year vision and update it annually.

This vision would be conveyed to a smaller working group, a Fire Sciences Team, consisting of high-level managers and researchers who would transform the vision into a workable grant program that invites and reviews proposals, awards funds, and provides useful performance feedback to funding agencies.

The group will convene an ad hoc team including themselves and representatives of other agencies, such as the Department of Defense, Environmental Protection Agency (EPA), Federal Emergency Management Agency, and National Aeronautics and Space Administration, on November 5th. At that time, they will begin to detail a strategy to obtain a commitment from the leadership of the interagency partners.

Any new mechanism will require control of a substantial portion of research dollars to affect the direction of the system. Thus, agencies must be willing to cede some of their authority and resources. Legislative action may be necessary. The ad hoc team will examine and learn from other successful, competitive grant processes such as those at the National Science Foundation. They hope to submit a plan to agency leadership within a year.

Although similar efforts have been made and have failed, this group feels strongly that a mechanism for coordinated agenda setting and awarding of funds is necessary. They see a renewed commitment to this end, especially among those in attendance at the Future Search Conference.

2. Create a coordinated response to managing fire regimes for ecosystem health

(*Group members:* Sandberg, Swetnam, Sutherland, Agee, Ferry, Alexander, Bossert, Sugihara, Fujioka, Gorski, Blackwell, Atkinson, Hardy, Carlile)

This group outlined key researchable questions that could be addressed by a coordinated research program considering management sector needs. The questions were:

- What were the historical fire regimes?
- How have the historical fire regimes changed over time?
- What are the benefits and risks of fire/nonfire management alternatives?

- What are the spatial and temporal relationships?
- How do we prioritize the use of fire among other manipulations?
- How will fire regimes look in the future?

The group devised a preliminary plan for action after the Future Search Conference. They will form an ad hoc management and research team at the national level to articulate the issues collaboratively and to define end products. Team membership will include federal, state, and private land managers and federal researchers and academics. The group will be organized by geographic region and commonality of objectives. The goal of this group will be to define two or more options based on time, resources, and success probability.

In the first three months, efforts will be made to assemble the team and link its work to current administrative and land management activities. They will define the problem subsets, identify what is known, and determine the commonality of different issues. Members envision that the coordinated team will eventually undertake specific research problems and provide valuable feedback nationwide.

3. Create an environment for management and research collaboration

(*Group members:* Parsons, Anderson, Patton-Mallory, Hubbard, Braun, Cohen, Maloney, Williams, Sweet)

This group outlined many of the general strategic obstacles that prevent greater collaboration. They suggested that a general lack of consensus about the role of basic research versus applied research and the absence of an overall common agenda at the top hampered communication. Specifically, they asked, "What is the research agenda, and how does it support land management planning objectives?"

The group suggested further action to identify instances of better coordination among managers and researchers at local levels.

4. Integrate social science expertise

(*Group members:* Sorenson, Iverrson, Shaw, Putnam, Wood, Osterstock, Smith, Saveland, Thomas, Latham, Driessen)

This group agreed that the wildland fire research community had crossed some significant thresholds in its understanding of social issues and the potential benefit of social science expertise. There exists a growing recognition that ecosystem management includes people and their behavior. Technical solutions alone are not sufficient to deal with the social aspects of implementation. However, they also recognized that the absence of social science integration in wildland fire research is a systems problem. Social science is currently not well represented in the system. Funding and opportunities for communication across disciplines are rare. Misunderstandings continue to occur. For example, of the many different disciplines within the social sciences, which are the most relevant and germane to wildland fire research and management?

The group is committed to identify, within three months, an ongoing research/management project as a candidate for new collaboration. They hope social scientists will collaborate to discover what needs could be met through their involvement. For example, although the physical parameters of smoke, inherent in prescribed burning, are known and are the subject of continuing research, the social parameters, such as its affect on neighborhoods, the likelihood of community opposition, and how best to educate and use the media, are not well understood.

This group sees social/physical science integration as a process that requires sufficient time for members of the different disciplines to communicate effectively. By the end of the year, they group hope to produce a case study that reports the successes and failures of one such integration. They will continue discussing potential projects until they have identified a few candidates.

5. Assess ecological risk

(*Group members:* Morgan, Quigley, Miller, Betancourt, Wills)

This group focused on the problem of ecological risk assessment in watersheds. They determined that a national theoretical framework that assesses ecological risk, capitalizes on regional differences, focuses on ecological integrity, and permits analysis at multiple scales should be a goal.

The group noted that work on such a framework had begun under the auspices of the EPA. On October 19, 1997, Julio Betancourt began a series of watershed tours for the U.S. Geological Survey. He will use the EPA framework to begin identifying research needs consistent with the framework. This activity will be part of an ongoing refinement of national issues and research needs concerning post-fire storm probability, hydrophobicity, nitrification of water, and the effects of post-fire rehabilitation.

Other action items include the incorporation of the EPA framework within current continuing education classes and the Forest Ecosystem Management Assessment Team watershed assessment. Within a year, the group hopes to have assembled sufficient information to write proposals and obtain funding for specific research.

"...people fail to adapt because of the distress provoked by the problem and the changes it demands. They resist the pain, anxiety, or conflict that accompanies a sustained interaction with the situation. Holding onto past assumptions, blaming authority, scapegoating, externalizing the enemy, denying the problem, jumping to conclusions, or finding a distracting issue may restore stability and feel less stressful than facing and taking responsibility for a complex challenge."

—Ronald Heifetz, Leadership Without Easy Answers

Personal Intentions

Jim Douglas—"The actions listed today are NOT the only actions that will be taken. The short time didn't allow us to fully develop actions."

Enoch Bell—"On November 5, 1997 at 1 PM in Riverside, CA, Bill Leenhouts, Sue Conard, and myself will discuss ways to coordinate fire research nationally. All are invited."

Kathy Malone—"I will work harder with research folks and try to be a catalyst for connectivity and cohesion."

Lori Osterstock—"I'll share this information with fire people. A lot of people really care about fire research but don't know how to provide input; I'll try to facilitate the process."

Jim Saveland—"I will get documentation of this conference out for review and establish an Internet site where these groups can work."

Conrad Smith—"I will apply my knowledge in a research team. I'm available to serve on any of the teams resulting from this conference."

Curt Topper—"I will conduct a second survey to assess changes and determine where action items have gone. I will summarize trends and disseminate results in the spring."

VII. Closing

"Let's integrate research into the established management processes. The timing is right, and the issues are dead-on. The opportunity exists to cast a wide net across the scientific community."

— Jerry Williams

"We have to accept the time limitations of this conference. Personally, I had no idea that things were so disorganized. "

— Lori Osterstock

"We met in a microcosm that gave us a glimpse of the macrocosm. Although I saw movement in the conference, many stakeholders avoided or were hesitant to make a personal commitment. We're all wrestling with that. This group is a reflection of society at large."

— Jim Saveland

"The success of this conference will be determined by the ripple effect in the fire community over the coming months."

— Conference facilitators

This conference provided an opportunity to identify and refine wildland fire research and management issues and to determine how science can contribute to these issues. More common ground had been discovered than some thought was possible. But there was also a sense of frustration and confusion. Acknowledging that this meeting was only a beginning, participants asked: How can we best take advantage of this meeting of stakeholders?

The Future Search method forced participants to admit that they often did not understand the needs of many of the other disciplines. What is our understanding of the state-of-the-art in each discipline? How is collaboration possible without fully understanding what others are doing and what their needs are?

Participants admitted that organizational structures and processes have been barriers to achieving desired results, and some felt that duplication and "hobby" research should stop. Several specialists in attendance expressed disappointment that the workshop did not provide a platform to resolve many critical scientific issues such as evaluation of the use or nonuse of fire history information. Identification of the difference between application needs and the research of problems is fundamental. Too often the focus of research is long-term and is concentrated on future fundamentals. Some thought funding must be spent to develop and communicate research to the ground.

Researchers stated that they must convince managers to obtain research funding for what they need. Managers expressed concern that fire management staffs do not have an organized way to collect the data and the qualified crews to accomplish the work. They believe that it is the responsibility of research to ensure that local units are supplied with what they need. Managers expressed the importance of mobilizing to meet the changing needs of society. They are concerned that integration will diffuse their energy and focus.

A process was initiated, new allies formed, and directions taken.

Some participants felt that the decreasing budget is a myth. They believe sufficient funding exists but is being shifted around. There was concern that the survival of research is threatened. How will research obtain money to survive over the long term? Also, some participants felt that a deliberate, broad consideration of stakeholders was absent for this conference. Others believed that those in attendance were notable members of their disciplines and represented a sufficiently complete spectrum of stakeholders.

Opinions about the action plans were mixed. The degree of agreement, commitment, and closure within each group was variable. A positive result of the action plans is that no action items were assigned to people not in attendance.

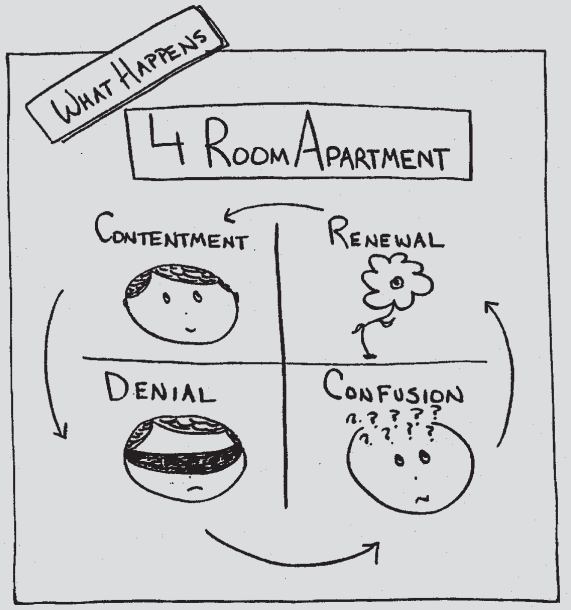
VII. Closing

Many participants were frustrated by the process because of thelimited time available, not knowing the desired outcome, or being unsure of the actual outcome.

Regardless of the issue addressed, the process must be interdisciplinary and coordinated. The question remains, **"What is the role of fire research in the context of future natural resource management?"**

"Things get fixed because leaders take personal responsibility. Integrating research is crucial for the success of our ability to manage the land."

— Jerry Williams



— Marvin R. Weisbord and Sandra Janoff, Future Search: An Action Guide to Finding Comming Ground in Organizations and Communities

A Future Search Conference requires us to explore different aspects of our perceptions, intellect, and emotions. In "contentment" we accept things the way they are. Unfamiliar experiences disturb the status quo. When we'd rather not admit or deal with change, we go into the "denial" room where we act as if things are okay. At some point though we admit that we are frustrated and unsure; we have entered the "confusion" room. Roughly half of Future Search Conference is spent in "confusion", which creates high anxietyand a readiness for new opportunities. Renewal becomes a welcome possibility after identifying a common future and beginning action plans.

VIII. Conclusions

The rapidly changing fire research environment, competition for existing resources, and new client expectations set the stage for an energetic exchange of ideas in a compressed, two-day forum. Fire scientists, colleagues from other disciplines, and fire managers, met to envision and chart the course of wildland fire research and to commit to its successful future.

Each participant carried personal frustrations and ideals and found others who shared or challenged their beliefs and feelings. They gained a better understanding of why some things are not working and brain-stormed possible solutions. Success stories were shared and ways to capitalize on them were discovered. New approaches to research administration, funding, and accountability were discussed. Attendees gained a better understanding of the major strategic decisions that are being weighed by managers and formed new research alliances to support the decision process. The group was invigorated by an intense and rapid exchange of ideas. Many participants became more aware of the positive trends that will affect the future.

The success of the conference, and the success of the research community, can only be measured by what occurs in the future. Quality science must be used to solve real problems.

Looking toward the future:

- Will better competitive interagency mechanisms to solicit new ideas and fund integrated research be implemented?
- Will a sharper definition of the future of wildland fire actually emerge to guide the direction of creative thought, scientific investigation, and the development of knowledge systems?
- Will the integration of social sciences into the fire research community provide better alignment to rapidly changing social values with regard to ecosystems, fire safety, air quality, the global environment, and economic efficiency?
- Will the integration of fire research with other science disciplines and emerging technologies add quality and efficiency to our delivery of knowledge systems?
- Will the science community be able to mobilize in support of the new dimensions of fire management?
- Will we be able to better anticipate the future and plot a course for fire research, or will we continue to be reactive?
- Will participants as individuals and in new alliances, do what is necessary to achieve what was jointly envisioned?

A need exists to find a way to coherently respond and adapt to changing conditions such as climate change and the role of fire in response to ecosystem change. In addition, there is a need for a coordinated expression of how land managers view research problems and where the lack of information limits decision making.

The process of dialogue and competition for ideas will take months and years to be fully translated into action. There are many tactical results that will come out of this conference; specifically, communicating and organizing.

A modest set of actions were identified and individual commitments were made. The new relationships formed and the visions shared will lead to significant future action. Several events over the next few months will bring the wildland fire research community a few steps closer to a shared vision of the future. This conference was not conceived as a single event but instead as a small, critical part of a lifetime process.

Appendix A — Conference Committees, Stakeholder Groups, and Mixed Groups

Conference Committees

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Leslie Anderson, assisted by Bitterroot National Forest, Stevensville Ranger District staff

Marvin Weisbord and Sandra Janoff, conference consultants and authors of *Future Search: An Action Guide to Finding Common Ground in Organizations and Communities*

Dave Thomas (USDA Forest Service, Region 4) assisted by Trish Haines (Wasatch-Cache National Forest), Jody Farrell (USDA Forest Service, Region 4), and Charlene Reed (USDA Forest Service, Region 4).

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Blackwell, Melissa
Douglas, Jim
Hubbard, Jim
Leenhouts, Bill
Osterstock, Lori
Quigley, Tom
Webb, Jim

Fire Behavior/Risk Management

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Fire Behavior/Physical Science

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Cahoon, Don
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Wills, Robin

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Appendix C — Timeline

Time period	Personal	Global	Fire
Pre-1960	Learn to ski and become aware of forests, mountains and snow Rock and roll lives Travel around the world Born! Growing up babyboomer Growing up in a small, safe Swedish community Basic values in a small, rural community	Soldiers back from WWII; going to school; working in forests; increased use of natural resources; major events driven by regional overpopulation Federal agencies (USFS, NPS) born 1910 Weeks Act 1933 10 AM policy National planning and management 1930s public works projects in the West Industrial revolution *Sand County Almanac* by Aldo Leopold Gandhi dies Holocaust	1910 Fires in northern Rockies 1922 Forest Service hires Harry Gisborne as fire scientist Beginning of fire prevention; suppressing “all” fires; aerial firefighting 1925 Fire research at Priest River Gisborne develops fire danger meter Fire environmental studies 1912 Plummer compiles fire statistics and maps of 1910 fires and lightning fire monograph 1910 Frederick Clements studies and publishes reports on fire and succession on lodgepole pine Pulaski and radios used in firefighting Fires in the Selway 1937 Journal of Forestry states that lightning-caused fires are <5%

Time period	Personal	Global	Fire
Pre-1960	See houses along mountains from Denver to Pueblo	Atomic age; U.S. bombing of Japan; "stop, drop and hide"	1937 Blackwater Canyon fire, 15 dead, leads to research and, after WWII, to professional firefighting
	See father's dissatisfaction with social perception that all fire is bad; father a district ranger	1957 Sputnik testing in New Mexico	1940s & 1950s Harold Weaver works on the relationships between fire and ponderosa pine ecosystems
			1949 Mann Gulch
		Atomic testing in New Mexico	1950s *Modern Wildland Fire Science* born
	Immigrate from Cuba		1950s droughts in Southern U.S. affect fire policy
			Fire labs established
		Smokey Bear	1954 Southern Fire Lab started
	Grow up in New York City; experience Eastern U.S. forests		Regional fire danger systems
			Chainsaw and brush hook
		Technology to attack fire	1959 *Forest Fire: Control and Use* published
	Fight forest fires		NFDRS
		Large fire events shape fire management policy	Application of WWII technology to fire suppression
			1958 Tall Timbers founded

Appendix C — Timeline

Time period	Personal	Global	Fire
1960-1974	College graduation, marriage, and children Teach at universities JFK; Peace Corps in Nepal Education; anti-war demonstrations; learn about agent orange and tropical forest destruction. MS fire science; ties to fire lab Ph.D fire First position in the Forest Service Attend Biswell Field Day at Whitaker Forest Fight first wildfire as a 15-year old Boy Scout Hot Shot Crew job Permanent position in fire research Graduate high school, head West Dad takes me on my first wildfire	Jet aircraft Bay of Pigs Reality check U.S. civil rights movement begins Kennedy assassination Apollo program Scientific proof of global change *Silent Spring* by Rachael Carson Wilderness Act Vietnam; distrust of large organizations; belief that government (authority) would lie and that those not in authority could challenge effectively	Sleeping Child fire Cooper's fire ecology paper published Early 1960s CE Van Wagner begins experimental crown fires at Petawawa 1962 First Tall Timbers Fire Conference Northern Fire Lab dedicated 1964 *Synoptic Weather Types Associated with Critical Fire Weather* published Rx burning, Vietnam style Retarded drops, helitorch NPS and USFS experiments on prescribed natural fire Leopold report on fire and wildlife in parks First "Let Burn" policy in West Controversies: FS clearcutting Rothermel fire model Clean Air Act

Time period	Personal	Global	Fire
1960-1974	Career appointment Live in South Africa; see how influential culture is to the choices we make First fire jump Ph.D. in fire ecology Leave Chicago; begin to experience outdoors firsthand Beckwith fire escapes Start smokejumping Job in Yosemite Work on USFS Fire Crew Start of a lifetime friendship College textbook learning Find natural science; leave home Camping in the Rockies Burn with Henry Wright's crew Still teaching atmospheric science Chance to do things Meet some of the "gods" of fire research	Johnson "credibility gap" Flower children vs. mainstream Feminist movement *Feminine Mystique* by Betty Friedan First humans on the moon Environmental laws Earth Day Satellites, reality of earth limits *Population Bomb* by Paul Ehrlich Love Canal FIRESCOPE and Interagency cooperative fire management	FIRESCOPE ICS due to fires in California First university fire programs Fire shelters; foam; Nomex America Burning report issued by National Fire Protection and Control Administration First wilderness fire management plans NPS fire program challenged Research moves into large-scale fire systems Fire Danger Rating System in use Kessell's gradient modeling research at Glacier NP AVHRR monitoring of fire events DMSP-OLS mapping of active fires Fire histories developed in SW Pine barrens in New Jersey burned regularly to manage pitch pine ecosystems *Effects of Fire* series published

Appendix C — Timeline

Time period	Personal	Global	Fire
1975-1985	Raise 2 children; conduct research; USFS appointment First fire season Finish college Active fire research Graduate high school First FS job, fire lookout Involved in snow and avalanche forecasting and control; FS management Begin physiology/fire effects Decide upon career with FS	AVHRR launched Increase in sensitivity to tropical forest destruction Nixon, first confirmation that the government lied; government credibility declines Sustained economic growth erodes sense of individual responsibility 1976-1997 Pacific has higher average SSTs; tropical land masses drying out and accelerating deforestation Computer Age, PCs give computing power to the masses Consumption increases CFCs tagged to ozone decline 1981 U.S. has huge budget deficits; Graham-Ruddman Act Star wars/Space shuttle 1982-1983 El Nino alters climate and biomass burning	Luke & McArthur (1978) publish *Bushfires in Australia* BEHAVE system FIRECAST Peak funding for fire research New fire policy recognizes natural role Interdisciplinary research emphasis, mostly site focus 1981 first woman smokejumper Recognition of “exotics” problem 1982 S. Pyne begins publishing fire info Exploding interest in and funding for fire ecology research Urban interface issue escalates

Time period	Personal	Global	Fire
1985-1990	Career change Seasonal job with FS On first overhead team Move to Missoula, begin studying lightening and fire Master's degree in forestry Work with pine beetle crew in Colorado Front Range Move to DC Mop-up fires at Moose Creek Build house	Booming economy Domestic use of space technology Persian Gulf War, burning oil wells Terrorism Global awareness increases Recognition of climate change, Global Change Program Clean Air Act Earth Summit at Rio, growing recognition of deforestation concerns and global interconnections Iron curtain falls, define a new enemy Access to former USSR and China opens Global economy develops Bull stockmarket	1986 Urban interface, "Wildfire Strikes Home" Crow's 1988 Forest Science paper on fire and oaks 1988 news coverage of Yellowstone fires shows lack of understanding of fire as a natural process and sets back the reintroduction of the natural role of fire Major wildland/urban interface trials began to rollback "good samaritan" protections for fire managers Satellite maps, fuels, and NFDRS Integration of fire/vegetation research interest Grand Canyon Visibility Transport Commission Dude fire Major reorganization of FS Fire Research More complex ecological models incorporating disturbance Development of fire remote sensing approaches accelerates

Appendix C — Timeline

Time period	Personal	Global	Fire
1991-Present	Teach ecosystem management and disturbance regimes	Clean Air Act, 1990 amendments	DOI Wildland Fire Research Initiative
			Real-time georeferenced information on fire spread available, but rarely used
	Join FS research; shift emphasis from snow to fire	Republicans take over House and Senate; contract with America	South Canyon fatalities
			Major interface fires; Spokane, Oakland
			Record fire seasons
	Discover whole system dynamics		Firefighters trapped at Dome and Sheppard
		National Defense drive for science declines	Fire policy recognizes natural role; leads to more confusion
			Public distrust of FS ecosystem management goals
	Kids are gone!		Wide recognition of paradox: suppressing fires now means more intense fires later
		Human population growth curve steepens	Integration of human values with fire effects begins
	Fire effects project leader		Focus on global effects of fire/fuel/climate interactions
			Landscape context of fire begins to be considered
	One child out of college, one to go	Softening of nationalism	Basic behavior research and education

Time period	Personal	Global	Fire
1991-Present	Become fire management staff officer	Laptop computers; Internet; GIS, GPS; information overload	Recognition of human factors in accidents and fatalities
			IMRT Reports
			WFAS on net
			FARSITE; 3D fire
	Start work in Russia	1995 hurricanes	Recognition of relationship between oak regeneration failure and fire suppression recognized
	Competitive grants		Grand Canyon Visibility Transport Commission
		Increased micromanagement by Congress (prescribed fire, fire suppression, and commodity production)	Application of GIS to land-based observations of fire history and fire behavior
	Moved to Washington Office, FS Fire Research		Reintroducing fire to ecosystem
			Fire shelter study
			Tridata study of firefighter culture
	Plan for second half of career	Brazil and Indonesia on fire	Fire Policy Review
			SNEP
			AVIRIS fuels database
			NWT Crown Fire Experiment
		El Nino	Regional-scale estimates of change in fire regimes
			EPA; FACA air quality

Appendix D — Future Search Conference Principles

Principles

1. An attempt is made to get the "whole system" into the same room. The whole system consists of stakeholders from inside and outside government fire research. Whereever they are from, all stakeholders should have a stake in the outcome of the Future Search Conference.
2. Stakeholders are asked to think globally but act locally.
3. Stakeholders, through participation in the conference, seek "common ground" — issues that everyone agrees on. The only issues that move forward are issues that can be labeled "common ground."
4. The Future Search Conference is divided into smaller working groups. These groups are "self-managing" in that they come up with their own methods of time and conflict management.
5. Even though there are experts at the conference, no one person or group is seen or used as an expert.
6. A Future Search Conference is not a traditional problem-solving meeting. The goal of a Future Search Conference is to produce "ideal future scenarios" that stakeholders are willing to work toward in the future.

Conference Structure

1. At the Wildland Fire Research Future Search Conference, participants were asked to focus on their individual history and as a fire community. This history was recorded on a wall chart in the meeting room.
2. Fire Research stakeholders were asked to view the present. A large "mind map" with all the fire research trends on it was produced. The stakeholders were asked to vote on the most important issues.
3. The Future Search Conference facilitators asked the stakeholders to construct a list of "prouds" and "sorries"—things they feel good about and things they feel sorry about in relation to the trends previously identified.
4. An ideal future scenario for fire research was developed and presented as a skit by each mixed stakeholder group.
5. From the ideal future scenarios, common themes were listed.
6. Action plans were developed from the list of common themes, but only if the fire research stakeholders were willing to individually commit to working on them.

References

Bunker, Barbara Benedict and Billie T. Alban. 1997. Large Group Interventions: Engaging the Whole System for Rapid Change. Jossey-Bass Publishers. San Francisco.

Weisbord, Marvin and Sandra Janov. 1995. Future Search: An Action Guide to Finding Common Ground for Organizations and Communitites. Berrett-Koehler, San Francisco.

"Certainly the most exciting and richly textured organizational event I have participated in recently are "Future Search Conferences . . . " The richness of interpretations and the multi-layered complexity of the future scenarios that are created have convinced me of the powers of observation and perception that participation brings forth. In these conferences, wave functions collapse into all sorts of strange and powerful interpretations because the whole system is in the room, generating information, thinking about itself and what it wants to be."

— Margaret Wheatley, Leadership and the New Science: Learning about Organizations from an Orderly Universe

"To be a bureaucrat is to experience ourself as a victim. It takes strength and courage to acknowledge that the success and failure of our project, our function, our business, in fact our lives, is our own creation. . . . Having the courage to see the part of the problem that we have created, that is our rake we have stepped on, empowers us to take action to fix it."

— Peter Block, The Empowered Manager: Positive Political Skills at Work

"Don't get too prepared . . . . A lot of people who want to go into business want to know everything. They never do anything. My idea . . . is get out on the damn field and start kicking the ball . . . . All I had was the inspiration. I didn't know that much about soccer. I didn't know there were even two sizes of soccer balls . . . . So the next thing with inspiration is "get out and start doing something." The doing part of it is picking up the phone, calling a few friends, and saying, "Why don't you meet me over on Mercer Island and I've got an idea here. I really feel it." So when they come over, I pull out the soccer ball. They already have their crutches, and we start kicking it . . . . Then things start happening."

— Don Bennett, businessman and first amputee to climb Mount Ranier, on the Founding of the Amputee Soccer League; from The Leadership Challenge

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