

policy

# The US Wilderness Managers Survey: Charting a Path for the Future

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The Wilderness Manager Survey (WMS) was developed in 2014 to support interagency strategic planning for the National Wilderness Preservation System (NWPS) and asked managers about their perceived threats to the NWPS, the need for science information to support decisionmaking, the need for education and training, and the most important problems for managers in the future. The WMS was administered during Feb. 24 to May 19, 2014, to wilderness managers in the four federal agencies who manage the lands of the NWPS, and 368 wilderness managers responded. The important external and internal threats as perceived by managers for the NWPS for the next 20 years were the following: the lack of political and financial support for wilderness protection and management, invasive exotic plant or animal species, disconnected urban audiences unaware of wilderness, adjacent land management and incompatible uses, and legislation designating wilderness that included compromised natural conditions or incompatible special provisions for management.

**Keywords:** wilderness, stewardship, management

The year 2014 marked the 50th anniversary of the Wilderness Act of 1964 (US Public Law 88-577 1964). Public celebrations of this anniversary were held across the country to focus on the success of the Wilderness Act and National Wilderness Preservation System (NWPS) it created. The NWPS now includes 110 million acres, managed by the four federal land management agencies (the US Department of Agriculture Forest Service [FS], the National Park Service [NPS], the Bureau of Land Management [BLM], and the Fish and Wildlife Service [FWS]) (Carlson et al. 2016). One focus in 2014 was on planning for the future of the NWPS, and this focus presented a research opportu-

nity to contribute to identification of the most relevant and pressing management and stewardship issues.

The previous strategic planning for the NWPS occurred in 1994 (Sydoriak 1994) and 1995 when directors of the four federal land management agencies, charged with managing wilderness, signed an Interagency Wilderness Strategic Plan (BLM et al. 1995). It is somewhat unclear how much that plan guided stewardship and management of the NWPS for the past 20 years. However, since that signing, much has changed in the United States, such as more invasive plant and animal species and shifts in the global climate (Millennium Ecosystem Assessment 2005). The agencies de-

cided it was time to revisit the 1995 strategic plan and to update management goals and objectives for the NWPS.

Updating goals and objectives for the next 5 years required identifying today's and tomorrow's most pressing stewardship issues. In support of NWPS planning, a Wilderness Manager Survey (WMS) was developed and administered to managers through each of four federal agencies that manage the NWPS. The emphasis of this national survey was to have managers think about the threats, research and training needs, and most pressing challenges likely to face wilderness stewardship over the next 20 years, providing an opportunity for short-term tactical response and long-term strategic planning for stewardship, training, and research.

## Survey Methods

Research about the NWPS has most often focused on specific units and management issues. Examples include the more than 800 publications listed online with the Aldo Leopold Wilderness Research Institute.<sup>1</sup> Very limited research has been conducted on stewardship and management of the entire NWPS. Two surveys were conducted in the 1980s: one by a mail question-

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naire in 1980 (Washburne and Cole 1983) and one by telephone in 1988 (Reed et al. 1989). Both studies used a probability sampling approach by attempting to contact one or more employees responsible for wilderness management through mail or telephone calls to agency national forest or field offices; no comprehensive list of wilderness managers was identified in either study. These studies were conducted when the NWPS system had fewer units and less acreage than in 2014. The Washburne and Cole (1983) study also surveyed managers at units that could potentially be added in future years to the NWPS but were not at the time of the survey. The main emphasis of the Washburne and Cole (1983) study was management of recreation use, and for Reed et al. (1989) it was the nature and extent of non-recreational use. Dawson and Hendee (2009a) compiled a list of threats to the NWPS based on a literature review (e.g., Cole 1994) and qualitative interviews with the four agency lead administrators.

The WMS was developed in 2014 by a team of seven wilderness-related specialists that included the FS, US Geological Survey, and university scientists to ask managers about their perceived threats to the NWPS, their needs for science information to support decisionmaking regarding wilderness management, their needs for education and training, their perceptions of the major stewardship and management challenges, and the most important problems likely to face managers in the future. The survey instrument went through numerous rounds of team and agency reviews and revisions.

The WMS included questions about job characteristics of the responding managers, science information needed for stewardship, and education and training needs for staff. Descriptive questions asked about management duties, tenure in wilderness management, years with their agency, and name of state and the wilderness area(s) where individual respondents had spent most of their work time in the past year (both office and field). A series of open-ended and ordinal-level categorical questions were asked about threats to the NWPS, major stewardship and management challenges, training needs for staff, research needs for decisionmaking, and the most important problems likely to face managers in the future. A series of categorical questions asked managers to rate the level of threat or challenge to stewardship and the level of need for training and research.

Both the WMS instrument and its administration were managed online through SurveyMonkey.<sup>2</sup> The WMS was pilot tested by a panel of 17 retired NWPS managers who had worked at a variety of levels in one or more of the four federal land managing agencies. They took the survey, indicated the time to complete it, commented on potential design improvements, and provided opinions on content, such as the appropriateness of categories of the most significant issues.

For administration of the survey, the final revised WMS survey instrument was distributed by each agency to its managers (local to national). The primary agency contact for the survey team was each agency's national wilderness management program lead. These program leads were asked to distribute to their managers a letter that was provided by the survey team inviting participation and giving a link to the survey. The letter was sent by the program leads through their own agency's internal communications setup for personnel with wilderness management responsibilities. A comprehensive list of wilderness managers across the agencies and their field, regional, and national offices was not available for use by the survey team and, in fact, had not been compiled by any of the agencies.

Not having lists of wilderness personnel is obviously a limitation of this survey. The team was not able to describe proportions of all managers nor of all areas and acreages specifically represented by the responding managers. The four agencies are organized differently and use different job titles under which wilderness responsibilities are assigned. The survey asked responding man-

agers to identify the state and wilderness area where they had spent most of their wilderness work time in fiscal year 2013 so it would be possible to identify the location of most of their management duties. It was expected that respondents would have worked in more than one unit. It was also expected that most of the personnel assigned wilderness management duties had other assignments as well. The survey team concluded that the national wilderness program lead for each agency was in the best position to distribute the survey invitation through their internal system to their personnel with wilderness stewardship duties.

Wilderness managers were broadly defined as those having responsibility in law enforcement, public information, resource and visitor management, or planning and policy. The letter requesting participation in the WMS introduced the survey and explained the importance of participating. This follows the survey design method recommended by Dillman (2000). Reminder letters were sent after 1 month to improve the response rate and reduce the nonresponse bias, also recommended by Dillman (2000). The nonprobability, convenience sampling used in this study to gather input for planning and to identify issues, threats, and needed research is considered an appropriate and valid approach when inferential statistics and population parameters are not required (Battaglia 2008).

Completed surveys were forwarded by respondents through SurveyMonkey to team members at the University of Georgia in Athens, Georgia, for analysis. Data were analyzed and reported by the FS and University of Georgia team members to both the

## Management and Policy Implications

The findings from the WMS provide an in-depth look at the status and needs for managing the NWPS. These findings were a major source of current information used to develop a strategic plan for guiding policy and management over the next two decades. The resulting plan is entitled "2020 Vision: Interagency Stewardship Priorities for America's National Wilderness Preservation System" (BLM et al. 2014) and was signed by the directors of the four federal land management agencies. The knowledge and insights shared by managers through their responses to the WMS were central for identifying broad themes for guiding the interagency Wilderness Policy Council and the management agencies in stewardship of the NWPS. Those themes included the following: protection of the wilderness resource, better connection between the people of the country and the wilderness resource, and strengthening agency leadership and professional management skills. The detailed analysis of responses to the WMS (Ghimire et al. 2015) regarding the identified threats to the NWPS, staff training needs, and science information needed for management decisionmaking is being used to shape the field management and training of the federal agency staff and cooperating nongovernmental wilderness stewardship organization staff.

**Table 1. The percentage of survey respondents and number of areas in the NWPS identified by respondents as the area where they spent most of their work time, by agency, 2014.**

	BLM	NPS	FS	FWS	Total
Percentage of survey responses by agency <sup>a</sup>	21	22	30	26	99
Responses per NWPS number of units <sup>b</sup>	0.34	1.34	0.25	1.34	

<sup>a</sup> Total number of surveys = 368; agency percentages only add to 99% because 1% of respondents have responsibilities in more than one agency.

<sup>b</sup> NWPS units = 792 (Data from [www.wilderness.net](http://www.wilderness.net)).

Aldo Leopold Wilderness Research Institute and the Arthur Carhart Wilderness Training Center in Missoula, Montana (Ghimire et al. 2014). The staff at the Institute and Center were charged with developing drafts of the 2020 Vision documents to guide management of the NWPS for the next 5 years. The WMS will also be used in development of longer term strategic planning beyond the 5-year horizon of the 2020 Vision. The 2020 Vision document was signed by the directors of the four federal land management agencies and the US Geological Survey at the 50th Anniversary National Wilderness Conference held in Albuquerque, New Mexico, Oct. 15–19, 2014 (BLM et al. 2014). The full report of WMS results were published as a USDA Forest Service General Technical Report (Ghimire et al. 2015).

## Results and Discussion

### Who Were the Responding Managers?

Between Feb. 24 and May 19, 2014, responses to the main survey were received from 368 wilderness managers in the FS, BLM, NPS, and FWS.

The largest percentage of respondents (30%) was from the FS, followed by the FWS (26%), NPS (22%), and BLM (21%) (Table 1). Determining the representativeness of the survey respondents was very difficult. For example, one test of how representative the number of respondents was for each agency was measured by calculating the number of respondents per management units of NWPS managed by each agency. The BLM and FS had the fewest number of responses per number of NWPS management units they manage (0.34 and 0.25, respectively) (Table 1).

Most survey respondents (78%) work in the western United States and Alaska where the majority of the NWPS lands are designated. Whereas responding managers work at different levels in their respective

agencies, the majority (80%) work at local field levels.

Responding managers reported they had been in their current position an average of 8 years; however, 55% had been in their position for 5 or fewer years. The years in current position varied only a little across the four management agencies, with BLM and the FS showing higher percentages with more than 20 years of experience. In consideration of both current and previous positions, on average, respondent managers had about 12 total years of experience with some level of wilderness stewardship responsibility; distribution of percentages across the year categories were as follows: 5 or fewer years, 33%; 6–10 years, 21%; 11–15 years, 14%; 16–20 years, 13%; and more than 20 years, 19%.

Respondents' primary wilderness stewardship responsibilities included resource management (22%), planning (18%), public information and education (17%), policy (15%), visitor management (14%), and law enforcement (7%). The amount of time and effort respondents spent on administrative duties dealing with wilderness stewardship-and planning-related activities were as follows: less than 10%, 26%; 10–20%, 34%; 21–40%, 16%; 41–60%, 8%; 61–80%, 8%; and 81% or more, 8%. Overall, 60% of the respondents spend 20% or less of their duties dealing with wilderness stewardship-and planning-related activities. With more than one-quarter (26%) of the respondents reporting only 10% or less of their time engaged in wilderness stewardship or planning, it suggests that some managers are forced to find time to manage their wilderness areas or even make wilderness compete for their time in deciding work priorities. The 8% of the respondents who indicated they work in wilderness for the majority (more than 80%) of their professional endeavors is an exception to the more common multiple duties assignment.

### Threats Perceived

Managers were provided a list of 24 potential internal and external threats that could possibly degrade or damage wilderness character, specific resources, or visitor experiences over the next 20 years. Respondents were provided a five-point threats scale (from none to very high) and a "not sure" option for rating the level of potential threat each item poses to the wilderness area(s) they work in most.

Lack of political and financial support for wilderness protection and management, invasive exotic plant or animal species, disconnected urban audiences unaware of wilderness, adjacent land management and incompatible uses, and legislation designating wilderness that included compromised natural conditions or incompatible special provisions for management were the top five potential threats to resources or visitor experiences identified by managers (Table 2). Wildland fire, motorized vehicles and illegal trespass, fragmentation and isolation of designated areas, aircraft noise and other intrusions, and increasing noncommercial recreation pressures rounded out the ranked top 10 threats. Percentages for each threat varied by agency. For example, the NPS and FS respondents rated lack of political or financial support much higher than did the BLM and FWS respondents.

Some of the differences between agency responses were probably due to the variety of multiple responsibilities of the managers who responded, differences in management issues the agencies emphasize, or historic patterns of decisionmaking and policy solutions in these agencies. For example, wildland fire suppression and management is the sixth highest overall threat (39%) with major differences between the percentage of respondents from the FS (57%) and the FWS (15%). There are many other differences between agency respondents in identifying the major threats, and although the agencies have certainly tried to unite in defining priorities, establish interagency training and research programs, and bring consistency across the NWPS, setting priorities for stewardship over even the next 5 years may require some agency-specific attention.

Other potential threats, with decreasing ranking in the list of 24, included diminishing air quality, wildfire escaping from inside wilderness, incompatible electronic equipment use, disruption of wildlife corridors, encroaching development, energy project development, increased commercial recre-

**Table 2. Top 10 potential threats (of 24 listed) for the next 20 years by percentage of managers indicating the potential of threat to be high or very high.**

Potential threats	All agencies	BLM	NPS	FS	FWS
.....(%).....					
Lack of political and financial support for wilderness protection and management	74	61	80	88	63
Invasive species	56	60	73	48	46
Disconnected urban audiences	53	39	62	58	50
Adjacent land management and use	44	48	52	37	40
Legislation designating wilderness with compromised wilderness conditions or special provisions for management	41	39	41	52	30
Wildland fire suppression and management	39	44	33	57	15
Motorized and mechanical equipment trespass and illegal use	38	50	22	48	27
Fragmentation and isolation of wilderness as ecological islands	38	37	38	40	34
Aircraft noise and airspace reservations	37	19	55	41	31
Increasing or changing noncommercial recreation	35	26	30	52	27

ation, pressure on threatened and endangered species, external pressures on water quality, administrative access issues, invasive water projects, livestock grazing, coastal erosion, and uses on private inholdings.

### Challenges and Most Important Problems

In addition to the ranking of threats shown above, an analysis of open-ended responses identifying challenges and important problems revealed six broad categories. At the top was the challenge of mitigating the effects of external threats such as encroachment onto the NWPS from adjacent lands, wildfire, climate change, and invasive exotic species (44%). Other challenges included adequacy of resources and policies to support management (32%), managing visitation and better assurance of quality visitor

experiences (21%), managing the resource in ways that sustain natural conditions (20%), adequately building or maintaining public support (7%), and appropriately managing resources such as trails and cultural resources (5%).

### Training Priorities

Content of the training identified by managers as high priorities for the coming years followed closely the threats, challenges, and problems described earlier. The top training needs included wilderness history, law, regulation, policy, planning, and field skills. Other high-priority training needs included effective communications, problem solving, decisionmaking, use of analytical approaches, the latest information technologies, organizational management, best practices for cultural resources management,

and best practices for recreation management in wilderness. There were some differences in training needs expressed by managers in the different agencies.

Some of this agency disparity in training priorities suggests the need for acknowledging important differences in when and how wilderness lands received Congressional designation, the differences in management on adjacent lands, and background emphases of agency missions. For instance, 71% of NPS managers place high to very high importance on wilderness planning as a training need, whereas only 47% of FWS managers reported the same need. The majority of FS managers (68%) want more training on visitor use management and monitoring, but only 41% of FWS managers agreed with that need. Trying to understand why these interagency disparities exist could be the emphasis of additional research and policy investigation.

### Research Priorities

In responding to questions regarding the adequacy of science for management decisions and problem solving, respondents were provided a five-point scale (not adequate, somewhat, moderate, good, and excellent) to rate 19 types of science-based information needed for decisionmaking by managers. The top 10 research needs for science-based information were ranked based on the percentage of respondents indicating that science-based information was not adequate or only somewhat adequate (Table 3). Managers identified needs for better understanding of the public's attitudes toward potential interventions to adapt to climate change and public attitudes toward ecological restoration as the most inadequate science-based information. Respondents reported a need for improving science-based information on wilderness benefits to different groups of stakeholders, for improving understanding and stewardship of spiritual values and uses of wilderness, for improving effectiveness in managing field staff, for scenic quality protection, and for wilderness visitor management. Washburne and Cole (1983) reported more than 40 years ago that wilderness visitor management information was not adequate for effective wilderness stewardship related to visitor impacts. As our science questions have evolved (Watson et al. 2016) over time, some basic answers to questions about the best visitor management techniques continue to elude us.

**Table 3. Top 10 research needs (of 19 listed) by percentage of respondents indicating that science-based information was not adequate or only somewhat adequate for each agency and all agencies.**

Science-based information	All agencies	BLM	NPS	FS	FWS
.....(%).....					
Public attitudes toward intervention to adapt to climate change influences	58	65	56	56	53
Public attitudes toward ecological restoration (fire, vegetation, wildlife, etc.) activities	52	60	56	53	42
Relative value of wilderness benefits to stakeholder groups	51	55	53	47	51
Stewardship of spiritual values and uses	44	52	52	40	34
Managing field staff	36	45	39	32	31
Scenic quality protection	36	44	44	29	30
Visitor management (controlling use, managing conflict, mitigating impacts, etc.)	35	40	45	29	33
Wilderness monitoring protocol	34	35	47	29	28
Wilderness planning	33	31	41	35	28
Air quality protection	32	48	23	26	31

Many research subjects that have been investigated for 30 or 40 years have a lot of information already available and were listed as needed by a relatively low percentage of WMS respondents, e.g., fire and fuels management (21%), fish and wildlife management (21%), and information and education for visitors and the public (27%). However, the research topics reported as most highly needed were not topics that have been investigated very much to date in wilderness. These are research topics only recently identified by scientists as study topics and only investigated in a very few areas at this time. Managers responding to the WMS tended to put more importance on these newly emerging issues, suggesting that information on these new topics will be most helpful to them in future decisionmaking challenges.

The only climate change item specifically included in the question list to evaluate was about “public attitudes toward intervention to adapt to climate change influences.” Overall, 58% of managers indicated this is a need and the available information was not adequate. There are agency differences, but even the widest gap, between BLM (65%) and FWS (53%), is only 12 percentage points in this case and the NPS and FS have strong agreement among 56% of their managers that this information need exists.

A relatively new research subject that received the second highest percentage (52%) of responses as a priority research need is “public attitudes toward ecological restoration (fire, vegetation, wildlife, etc.) activities.” For example, although a limited amount of social science research has been done on visitor attitudes (Knott et al. 2008) and public attitudes (Knott 2006) toward management-ignited fire in wilderness and older attempts to understand public attitudes toward fire restoration policies (McCool and Stankey 1986, Manfredo et al. 1990), this is still a relatively unstudied topic. Restoration after disturbance (e.g., wildfire) typically involves correcting human influences of the past that have either excluded or eliminated some element of the environment or introduced new influences into the wilderness environment. With strong public beliefs about the value of protecting intact wilderness ecosystems (Cordell et al. 2008), managers are probably concerned about public opinion toward restoration efforts, such as the mix of attitudes between state wildlife agencies, subsistence

and recreation hunters and anglers, preservationists, and the general public.

The third highest need for information, with much higher consistency in the evaluation across agencies (ranging from 47 to 55%), is for information about the “relative value of wilderness benefits to stakeholder groups.” This item was developed to ask managers how important they felt information on the relative value of ecosystem services is to different groups, such as production benefits to farmers, domestic water users, recreation users, and benefits to other stakeholders. Our knowledge has changed about the functions and services provided by protected lands and water, and this knowledge may suggest the need to weight the contribution of environmental well-being toward human well-being more than in the past (Watson 2011). Research that is focused on flow of ecological services is useful in creating understanding of the value of protecting biodiversity, carbon storage reservoirs, and sources of high-quality water for offsite benefits. In the Millennium Ecosystem Assessment (2005), the link between ecosystem services and human well-being is described as contributing to security; material for livelihoods, food, and shelter; healthy environment, water, and air; social cohesion; and freedom of choice to do what an individual values doing. These are values received broadly across society, not just to those involved in and capable of outdoor recreation participation.

## Recommendations

Wilderness scientists are charged with helping managers and policymakers understand the likely outcome of alternative management decisions. This survey allowed managers to tell these scientists about the challenges they perceive they will be facing in the future. This survey of managers comes at a very important crossroads in the history of wilderness stewardship in the United States. In the 50th anniversary year of the Wilderness Act, the federal agencies came together and expressed the need and developed a strategic vision statement for stewarding wilderness in the immediate future. Now, as the federal agencies start to develop action plans for realizing this 2020 Vision (BLM et al. 2014), we as coauthors, based on knowledge from articles in this special issue and other recent research, suggest managers consider the following approaches to addressing at least some of the priority issues

identified through analyzing this survey of current NWPS managers:

1. To address concerns by managers about lack of political support both inside and outside of the agencies and financial support for wilderness stewardship in the future: develop and support a professional wilderness cadre without collateral assignments outside wilderness in the agencies. An important finding was that 60% of respondents to the survey spend 20% or less of their time and effort on doing wilderness stewardship- and planning-related activities. There is also an important need to capture the workforce skills and knowledge (e.g., wilderness research, primitive skills, minimum requirement analysis, etc.) of current employees at a time of rapid transition due to retirements and new skills being brought in to deal with technological challenges (Cordell et al. 2016). Agencies should consider including this cadre in training, capturing their knowledge and opinions through oral history research, and assure personnel incentives to mentor the next generation of stewards.
2. To implement sound approaches to mitigate both internal and external threats to wilderness: train managers about stewardship planning in the NWPS that puts wilderness stewardship principles first, supports and incorporates the best science into planning, and enlists the public to stand up for wilderness stewardship and management (Cole 1994, Dawson and Hendee 2009a, Cordell et al. 2016).
3. To address management concerns about incompatible adjacent land use and trespass: focus efforts to address adjacent land use and management conflicts based on the latest science and visitor management techniques (Dawson and Hendee 2009b, Watson et al. 2016). For example, in the case of illegal use, bring public pressure on violators to not take away wilderness benefits from society. In the case of conflicting uses, there is a long history of research on success of management solutions, depending on the cause of the conflict.
4. To increase manager capacity to improve communication with public and base problem solving on the best science: increase interagency collaboration through greater coordination between

the interagency Aldo Leopold Wilderness Research Institute, their extensive university network, and the Arthur Carhart Wilderness Training Center to address NWPS research and training needs that efficiently and effectively protect wilderness values (Fox and Hahn 2016). Application of research findings may be most effective when managers and scientists work together to define the issues, conduct the science, and implement the findings through solutions and monitoring success (Watson et al. 2013).

5. To address questions about relevancy to different stakeholder groups: acknowledge that wilderness is more likely to be valued by the American people as a contribution to human well-being through protecting environmental well-being than merely for recreational pursuits (Cordell et al. 2005, 2008, Watson 2011, Holmes et al. 2016, Watson et al. 2016). Wilderness is the core to many natural landscapes and large ecosystems such as in the Rocky Mountains, Sierra Nevada, Alaska, or the Cascades. Wilderness benefits from natural ecological processes makes wilderness relevant to every citizen now and even more in the future. Wilderness benefits include watershed protection, cultural values of American Indians and Alaska Natives, regulatory benefits in the face of climate change, and others. Relevance of wilderness to the public, to US conservation programs, to larger ecosystems, and to future generations must become a focus of discussion and research (McCool and Freimund 2016).
6. To improve effectiveness of communication with the public, including distant, urban populations: coordinate with public and private landowners who have lands adjoining and nearby NWPS lands to curtail external influences on wilderness (McCool and Freimund 2016). Work with local, state, and other federal agencies to become aware of these threats earlier and manage them to protect public conservation interests (Dawson and Hendee 2009b). For example, extractive activities and land-use change threaten wilderness lands and waters.
7. To address managers' needs for information for decisionmaking about ecological intervention proposals in wilderness: work more with the public and

membership organizations to fully understand the likely response to any intervention activities the agency initiates in coping with climate change impacts, as well as develop sound decisionmaking guidance policies (Cole and Yung 2010, Landres 2016, McCool and Freimund 2016). Coordinate with other agencies to better understand the vulnerability of society and the environment to climate change influences, the role of wilderness in increasing resiliency to change, and maintaining the NWPS as a baseline comparison to understand the impacts of intervention in other places.

8. To address managers' needs for understanding public response to restoration of ecological conditions in wilderness that have been influenced by human activities in the past: increase the public's understanding of the reasons behind proposed ecological restoration to fully understand how the public evaluates ongoing fire, wildlife, and invasive species management and restoration programs and the effectiveness of restoration efforts to achieve natural conditions and processes (Cole and Yung 2010, McCool and Freimund 2016, Landres 2016). For example, if restoration of ecological changes due to human-caused impacts is the management goal, explain the stewardship principles that guide those decisions.
9. To increase knowledge and understanding about the natural role of fire in wilderness ecosystems: use research and the influence of past fire exclusion on larger natural landscapes in addition to more complete documentation of agency and public response (McCool and Stankey 1986, Manfredo et al. 1990, Knotek 2006, Knotek et al. 2008, Miller and Aplet 2016). How fire influences water, wildlife, air, and other vital offsite values flowing from public lands are important concepts to understand, communicate to the public, and protect under future climate change scenarios.
10. To accurately describe the threats associated with encroachment, invasive species, and adjacent land activities: actively engage in defining wilderness character in both biophysical and social terms and incorporate both into large-scale assessments aimed to monitor the threats to values provided by the NWPS

(Landres et al. 2008, Dawson and Hendee 2009a).

The Wilderness Act of 1964 (US Public Law 88-577 1964) directs the federal agencies to protect wilderness character and manage the NWPS for present and future generations. If this goal is to be achieved, the managers of the NWPS need support, training, and research information to make appropriate and legal decisions for stewardship and management of this important American treasure. A bold implementation plan is needed.

Threats, challenges, and important problems as perceived by managers are key sources for guiding policy, management, training, and research for the NWPS over the next 20 years.

The findings from the WMS were one component of efforts in 2014 to develop a vision document for the NWPS: "2020 Vision: Interagency Stewardship Priorities for America's National Wilderness Preservation System" (BLM et al. 2014).

#### **Endnotes**

1. For more information, see [leopold.wilderness.net/](http://leopold.wilderness.net/).
2. For more information, see [www.surveymonkey.com](http://www.surveymonkey.com).

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