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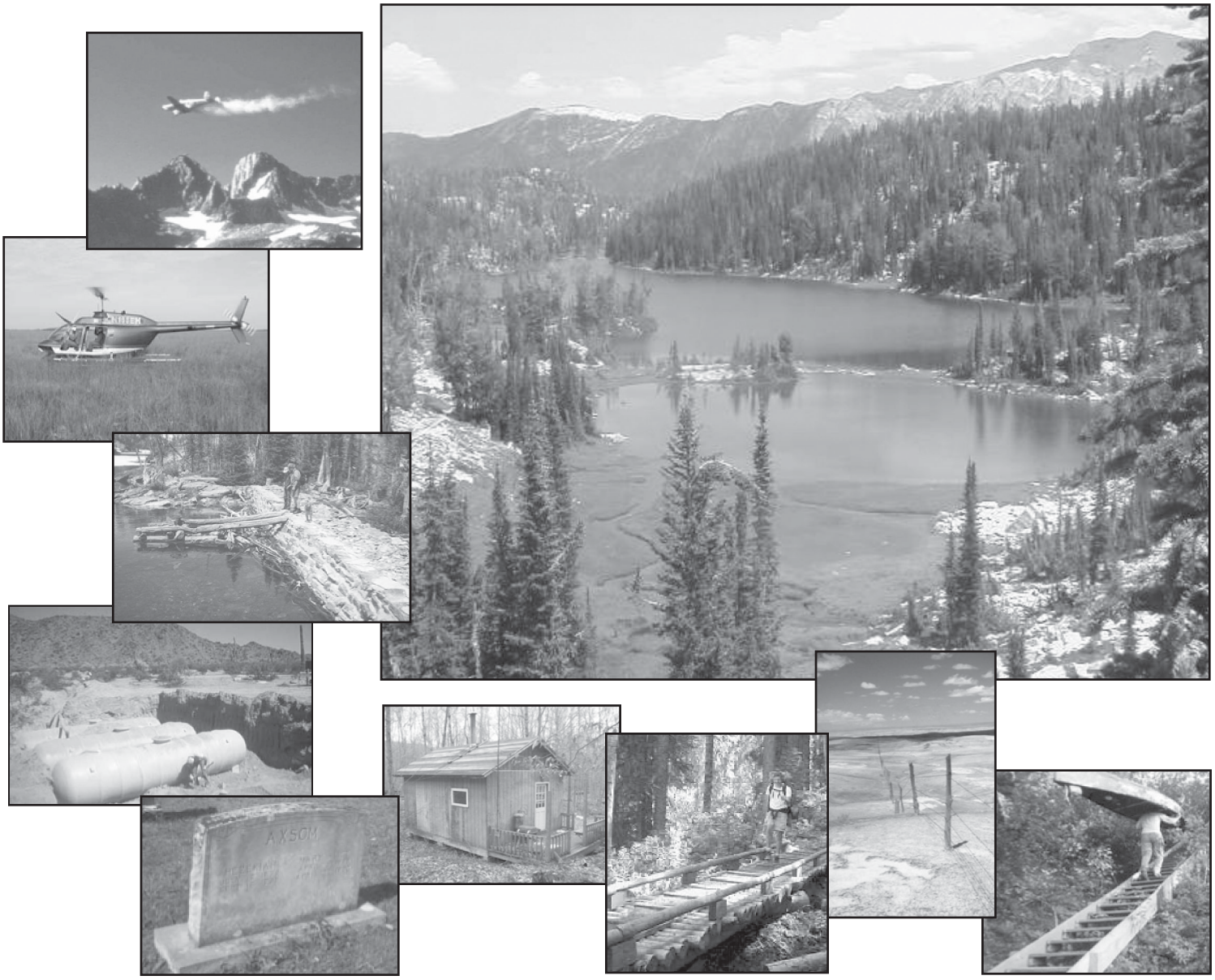
Monitoring Selected Conditions Related to Wilderness Character: A National Framework

Peter Landres, Steve Boutcher, Linda Merigliano, Chris Barns, Denis Davis, Troy Hall, Steve Henry, Brad Hunter, Patrice Janiga, Mark Laker, Al McPherson, Douglas S. Powell, Mike Rowan, Susan Sater



Abstract

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One of the central mandates of the 1964 Wilderness Act is that "each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area." Although wilderness comprises about 20 percent of National Forest System lands (over 35 million acres), the agency lacks a way to evaluate progress in fulfilling this mandate. This document, developed by the Forest Service Wilderness Monitoring Committee, lays the conceptual foundation for a national assessment of how wilderness character is changing over time. The purpose of this monitoring is to provide managers a tool they can use to answer key questions about wilderness character and wilderness stewardship:

- What is the current state of wilderness character?
- How is wilderness character changing over time?
- How are stewardship actions affecting wilderness character?
- What stewardship priorities and decisions would best preserve wilderness character?

This monitoring uses the Section 2(c) Definition of Wilderness from the 1964 Wilderness Act to identify four statutory qualities of wilderness, from which specific monitoring questions and key monitoring indicators are derived. The status and trends of these national indicators are monitored, allowing managers to evaluate how selected conditions and stewardship actions related to wilderness character are changing over time within a wilderness. This Framework provides the conceptual basis for combining this information into a single integrated assessment of wilderness character within an individual wilderness, and whether it is degrading, stable, or improving over time. This information is compiled for upward reporting, allowing regional and national program managers to evaluate how wilderness character is changing and the effectiveness of wilderness programs and policies to preserve wilderness character. No national standards are developed or comparisons made among wildernesses in terms of their wilderness character because each wilderness is unique in its legislative, administrative, social, and biophysical setting. While this monitoring will provide vital information, it is only a portion of what could, and should, be monitored in wilderness and of wilderness character.

Keywords: forest planning, monitoring, primitive and unconfined recreation, solitude, undeveloped, untrammeled, wilderness, Wilderness Act, wilderness character, wilderness stewardship

Cover: Large photo taken by Dave Spildie of Moccasin Lake, Eagle Cap Wilderness. The small photos, counterclockwise from the upper left, are: 1) stocking fish from an airplane within a Sierra Nevada wilderness; 2) helicopter bringing gear for sampling Cape Sable Seaside Sparrow populations within the Marjory Stoneman Douglas Wilderness, photo courtesy of Chris Barns; 3) dam in the Selway Bitterroot Wilderness; 4) burying storage tanks to provide water for bighorn sheep within wilderness near Tucson, AZ; 5) headstone in a cemetery within the Charles C. Deam Wilderness, photo courtesy of Les Wadzinski; 6) cabin on private inholding within the Lye Brook Wilderness, photo courtesy of Russ Eastwood; 7) bridge in the Selway Bitterroot Wilderness, photo courtesy of Dave Spildie; 8) fenced goat allotment within the Bisti/De-Na-Zin Wilderness, photo courtesy of Chris Barns; 9) stair providing lake access within the Boundary Waters Canoe Area Wilderness.

Monitoring Selected Conditions Related to Wilderness Character: A National Framework

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Acknowledgments

This Framework was made possible because of the passionate dedication to wilderness shown by so many people who actively participated in discussing, reviewing, and supporting this effort. In the beginning stages of developing this Framework, Roger Kaye, Dennis Roth, Doug Scott, and especially Ed Zahniser patiently helped the Forest Service Wilderness Monitoring Committee understand the spirit behind the phrase "wilderness character." We are grateful to the over 40 wilderness managers, scientists, and others who offered extensive and thoughtful review comments on various drafts of this Framework; these comments significantly helped the Committee craft the broad view and the many details of this monitoring Framework. In-depth discussions with David Cole, David Parsons, and Alan Watson at the Aldo Leopold Wilderness Research Institute helped refine the overall goals and scope of this monitoring effort. Even with all these review comments, the ideas expressed in this Framework are solely those of the Forest Service Wilderness Monitoring Committee.

This Framework was developed through the support of many people. Beth Boyst, as a new committee member, brought fresh eyes and a sharp pencil to this framework. Pam Wright, formerly with the Forest Service Inventory and Monitoring Institute, gave invaluable help to the Committee to understand the advantages and disadvantages of various types of analyses. Lane Eskew, Technical Publication Editor at the Rocky Mountain Research Station, helped clarify the oftentimes tortuously convoluted writing of this Framework. Don Fisher, Forest Service National Wilderness Program Manager, and Mary Wagner, Forest Service Director for Wilderness & Wild and Scenic Rivers, were a constant source of support and help as this Framework reached maturity. The Forest Service Wilderness Advisory Group was instrumental both in their support and in getting this monitoring effort recognized at the highest administrative levels. Department of the Interior wilderness program managers Geoff Middaugh and Jeff Jarvis (Bureau of Land Management), Nancy Roeper (Fish and Wildlife Service), and the late Wes Henry (National Park Service) offered encouragement and financial support for their representatives on the Committee. Ultimately, the biggest thanks are to Jerry Stokes, retired Forest Service National Wilderness Program Manager, for his audacious vision pushing for wilderness monitoring and starting the Forest Service Wilderness Monitoring Committee.

Executive Summary

One of the central mandates of the 1964 Wilderness Act is that "each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area." Although wilderness comprises about 20 percent of National Forest System lands (over 35 million acres), the agency lacks a way to evaluate progress in fulfilling this mandate. This Framework document lays the conceptual foundation for selecting and monitoring indicators of conditions and actions related to wilderness character. Information on wilderness character that is consistently gathered and reported offers managers a powerful tool to evaluate if wilderness character is stable, degrading, or improving over time, and to communicate progress toward fulfilling this central mandate of the Wilderness Act.

Why This National Wilderness Monitoring is Being Developed

The purpose of this monitoring is to improve wilderness stewardship by providing a tool managers can use to evaluate how selected actions and conditions related to wilderness character are changing over time. Many wilderness field and program managers perceive a steady erosion of wilderness character, yet there is no consistent means for describing this loss or the positive outcomes from stewardship decisions. A national set of core indicators allows compilation of information at local, regional, and national levels. Improvement in wilderness stewardship must occur at the local level, but the ability to compile information at regional and national levels provides a powerful communication tool essential to make the case for wilderness stewardship needs. This monitoring Framework also improves wilderness stewardship by more clearly articulating what wilderness character means, which may help managers evaluate proposed actions and improve agency performance measurement and policy review.

Turnover in wilderness managers with field knowledge also contributes to the lack of understanding about how wilderness character is changing over time. Integrating this Framework into agencywide monitoring programs and using consistent indicators can make data available to a succession of managers. This information legacy is one of the strongest defenses against the erosion of wilderness character and for the showing positive outcomes of stewardship.

How This Monitoring Defines Wilderness Character

Although wilderness character is not defined in the Wilderness Act or its meaning discussed in the legislative history of this Act, it may be described as the combination of biophysical, experiential, and symbolic ideals that distinguish wilderness from all other lands. These ideals form a complex set of relationships between the land, its management, and the meanings people associate with wilderness.

This Framework uses the Definition of Wilderness from Section 2(c) of the 1964 Wilderness Act to identify four qualities of wilderness related to wilderness character. All wildernesses, regardless of size, location, or any other feature, are unified by this statutory definition of wilderness. These four qualities of wilderness are:

- *Untrammeled* – wilderness is essentially unhindered and free from modern human control or manipulation.
- *Natural* – wilderness ecological systems are substantially free from the effects of modern civilization.
- *Undeveloped* – wilderness is essentially without permanent improvements or modern human occupation.

- *Outstanding opportunities for solitude or a primitive and unconfined type of recreation* – Wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge.

Specific monitoring questions under each of these qualities, and indicators under each question, are identified in this Framework. While these indicators are based on best professional judgment combined with the available scientific literature, they will undoubtedly be refined and improved over time.

Limitations of this National Wilderness Monitoring

While the indicators were selected to be useful to local wilderness managers, this Framework is not intended to monitor all aspects of the wilderness resource or actions needed to manage wilderness. In addition, this national program does not monitor the full range of ecological and social conditions inside wilderness, aspects of wilderness character unique to a particular wilderness, societal values of wilderness character, or the experiences of visitors.

How This National Wilderness Monitoring Will Be Implemented

This monitoring will be implemented in several phases. The first phase was completing this Framework that develops the conceptual foundation for this monitoring. The second phase is developing the *Technical Guide for Monitoring Selected Conditions Related to Wilderness Character*, which will give detailed procedures for collecting, storing, analyzing, reporting, and using the data. The third phase is testing and revising the *Technical Guide.* National implementation of this monitoring on every National Forest System wilderness is targeted to begin in the winter of 2006-2007.

For this national monitoring, every effort has been made to minimize impact on local staff and funding needed by using data that are already being collected or available from national datasets. For example, data will be used from the Forest Service's Infra-WILD and Natural Resource Information System. Existing national data sets will also be used to estimate conditions within a wilderness. The use of standard templates for queries and analysis will further reduce required staff time.

Most wildernesses lack detailed information on conditions since the time of designation, and although appropriate historical data may be used, the first time this Framework is applied will likely become the baseline for evaluating change over time. Change is evaluated only within a single wilderness, and the information resulting from this monitoring cannot be used to compare different wildernesses. Such comparisons are inappropriate because there are aspects of wilderness character that are unique to each wilderness, determined by the area's legislative, administrative, biophysical, and social setting. This monitoring does not establish national standards for indicators, which would need to be developed through formal planning processes.

The Forest Service is currently developing a coordinated, agencywide program for the design, collection, and use of monitoring data, and the Framework described here fits within this program. In addition, all wildernesses are part of the National Wilderness Preservation System, and representatives from the other three wilderness managing agencies have been an integral part of the team developing this Framework. This participation allows ongoing interagency communication and lays the foundation for monitoring that could be applied across the entire wilderness system.

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1. INTRODUCTION

The purpose of this monitoring is to improve wilderness stewardship by providing managers a tool they can use to evaluate how selected actions and conditions related to wilderness character are changing over time. Although nearly 20 percent of all the land managed by the Forest Service (about 35 million acres) is designated wilderness, the agency lacks the means for evaluating fulfillment of the central mandate of the 1964 Wilderness Act (Public Law 88-577) to preserve the area's wilderness character. Wilderness monitoring is needed for various purposes, and while several programs already monitor specific resources within wilderness, the most critical need is to monitor what makes wilderness unique among all other National Forest System lands, its wilderness character.

To build this national protocol, the conceptual foundation for monitoring wilderness character must first be developed because, unlike other resources such as air, water, and wildlife, the concept of wilderness character is poorly understood, cuts across many resource areas, and has never been formally described or monitored. This monitoring protocol is therefore composed of two distinct parts, this Framework that develops the conceptual foundation, and a forthcoming *Technical Guide for Monitoring Selected Conditions Related to Wilderness Character* that develops the protocols for data collection, storage, analysis, reporting, and use (fig. 1).

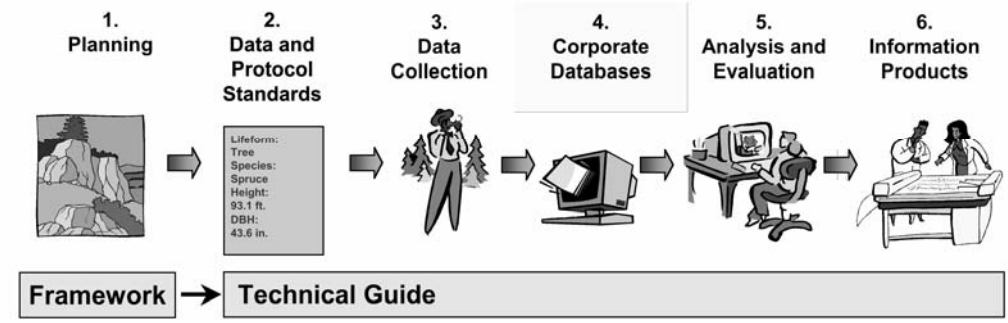

Figure 1—The protocol for monitoring selected conditions related to wilderness character is composed of two documents, a Framework and a *Technical Guide*. The Framework develops the conceptual foundation for this protocol, and the *Technical Guide* develops the detailed and standardized protocols (figure adopted from Powell 2000).

This national protocol is also embedded within a larger agency effort to develop better monitoring systems to improve management. Part of this larger effort is developing better integration to share data among all the various resource areas. From the wilderness perspective, this means ensuring that other resource programs collect their data in wilderness and that wilderness-appropriate methods are used.

1.1 What This Monitoring Seeks to Accomplish

This monitoring will provide information to help answer key questions about wilderness character and wilderness stewardship:

- What is the current state of wilderness character?
- How is wilderness character changing over time?
- How are stewardship actions affecting wilderness character?
- What stewardship priorities and decisions would best preserve wilderness character?

The primary goal for this monitoring is to develop a national assessment of trends in wilderness character. This Framework establishes a logical and defensible foundation for using a set of nationally consistent key indicators of wilderness conditions and stewardship actions to assess trends in wilderness character. Within the context of this national assessment, every effort has been made to select indicators that will be useful and cost-efficient for the local wilderness to monitor.

As explained in detail below, this monitoring uses the Section 2(c) Definition of Wilderness from the 1964 Wilderness Act to identify four statutory qualities of wilderness, from which specific monitoring questions and key monitoring indicators are derived. The status and trends of these national indicators are monitored, allowing managers to evaluate how selected conditions and stewardship actions related to wilderness character are changing over time within a wilderness. This Framework provides the conceptual basis for combining this monitoring information into a single integrated assessment of wilderness character within an individual wilderness, and whether it is degrading, stable, or improving over time. This information is compiled for upward reporting, allowing regional and national program managers to evaluate how wilderness character is changing and the effectiveness of wilderness programs and policies to preserve wilderness character.

These indicators are a vital core of what needs to be monitored in wilderness, but they are only a portion of what could, and should, be monitored in wilderness and of wilderness character. No national standards are developed or comparisons made among wildernesses in terms of their wilderness character because each wilderness is unique in its legislative, administrative, social, and biophysical setting. After pilot testing, national implementation of this monitoring is targeted to begin in winter 2006-2007.

1.2 Why This Monitoring Is Needed

Many wilderness field and program managers perceive a steady erosion of wilderness character, yet there is currently no consistent means for describing this loss or the positive stewardship outcomes to protect wilderness character. This lack of agency monitoring occurs despite (1) Zahniser's (1961) declaration that "in all concern with wilderness, the first safety must be for the wilderness character itself"; (2) increasing wilderness visitor use (Cole 2002) and other widespread threats to wilderness character (Peine and others 1988, Cole and Landres 1996, Landres and others 1998); and (3) repeated calls for monitoring to improve wilderness stewardship (Government Accounting Office 1989, Fleischner 1992, Sellars 2000, USDA Forest Service 2000, Pinchot Institute 2001). This monitoring Framework provides a more solid foundation than has previously existed to tie key national monitoring indicators to the statutory requirements of wilderness legislation and agency policy.

This monitoring may also be useful to a variety of citizens who value wilderness and who are interested in the preservation of wilderness character. For example, in their book on Wilderness Ethics, the Watermans (1993) ask, "Once land is designated as wilderness, how do we preserve the spirit of the land, its wildness and naturalness?" This monitoring Framework provides an important part of the information that may be used to answer this question.

1.2.2 Meeting the Requirements of Wilderness Legislation and Agency Policy

Congressional legislation and agency policy mandate an affirmative responsibility for preserving wilderness character. The Wilderness Act Statement of Policy, Section 2(a), states that wilderness areas "shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, *and so as to provide for the protection of these areas, the preservation of their wilderness character*" (emphasis added). In addition to this Statement of Policy, legal scholars Rohlf and Honnold (1988) and McCloskey (1999) assert that Section 4(b), Use of Wilderness Areas, gives the primary management direction for wilderness that "… each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area." The Congressional Record (U.S. Congress 1983) reinforces this assertion, stating, "The overriding principle guiding management of all wilderness areas, regardless of which agency administers them, is the Wilderness Act (section 4(b)) mandate to preserve their wilderness character." Section 4(b) further states that even when the agency administers the area for other purposes, the agency must also "preserve its wilderness character."

This monitoring also helps managers meet the requirements of Forest Service policy pursuant to the Wilderness Act. Forest Service Manual Chapter 2320.2, No. 4, directs the agency to "protect and perpetuate wilderness character" and to evaluate whether wilderness character is degrading, stable, or improving over time (fig. 2). In addition, the Government Performance and Results Act of 1993 requires Federal agencies to demonstrate accountability "by providing … information about program results and service

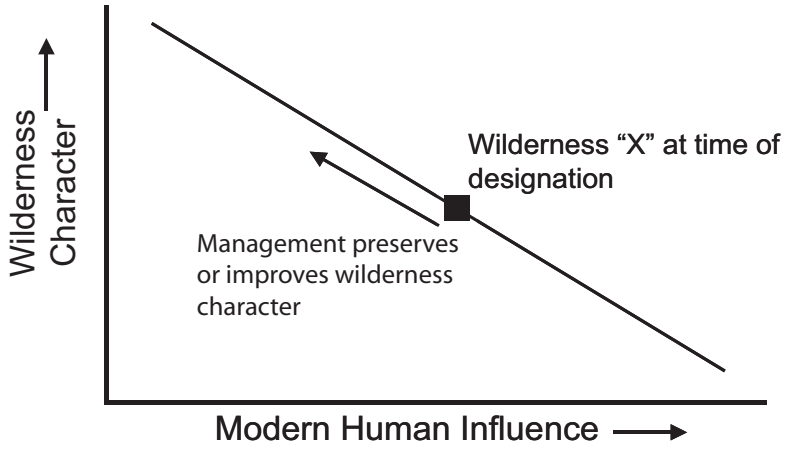

Figure 2—The "Wilderness Management Model" modified from the Forest Service Manual 2320.6. The vertical axis represents wilderness character, improving upwards. The horizontal axis represents the amount of modern human influence on wilderness character, with increasing influence to the right. The diagonal line shows the general relationship of increasing human influence causing a decline in wilderness character. A goal of wilderness management is to maintain or improve wilderness character from its state at the time of wilderness designation.

quality." This monitoring will yield information useful in documenting the outcomes of agency decisions and actions to "preserve wilderness character."

1.2.3 Improving Wilderness Stewardship

Linking a national core set of selected on-the-ground indicators to the concept of wilderness character anchors wilderness stewardship to the mandates of the Wilderness Act and agency wilderness policy (Babu and Reidhead 2000). While improving wilderness stewardship must occur at the local level, the ability to compile information at regional and national levels provides a powerful communication tool that is essential to make the case for wilderness stewardship needs and for evaluating program effectiveness at all administrative levels. This monitoring can improve wilderness stewardship in several ways, including:

- Inform decisionmaking by organizing information in NEPA analyses to more clearly disclose the effects of proposed actions on wilderness character and understand the trade-offs associated with different proposed actions.
- Evaluate program effectiveness and help prioritize where future actions should be focused to improve wilderness character.
- Improve Land and Resource Management Planning, or Forest Planning, by providing a framework to help describe desired future conditions for wilderness and identify wilderness monitoring requirements.
- Express how different funding levels affect the statutory requirement to preserve wilderness character.
- Link performance measures directly to the Wilderness Act mandate to preserve wilderness character.
- Make all resource information about a particular wilderness more accessible to a wilderness manager (including air quality, wildlife, watershed, and vegetation).
- Establish a permanent database that allows information to be passed on and used by future managers.

2. DEVELOPING NATIONAL MONITORING OF CONDITIONS RELATED TO WILDERNESS CHARACTER

To develop a practical and useful national monitoring program, it's necessary to understand the nature of wilderness character, to base this monitoring on a solid logical structure or conceptual model, to clearly define the scope and limitations of this effort, and to clarify the basis for applying this monitoring nationally.

2.1 Understanding Wilderness Character

Developing a national Framework to monitor wilderness character requires understanding the legislative origin of this concept, as well as the ideals, meanings, and relationships inspired in this concept.

The Wilderness Act does not define "wilderness character" and despite a rich legislative history on many aspects of the Wilderness Act, the Congressional committees that developed and debated the Wilderness Act of 1964 did not discuss the meaning of this phrase (Scott 2002). To develop a deeper understanding of the meanings of wilderness character, Kaye (2000, 2002) and Scott (2002) explored the historical writings of the framers of the Wilderness Act, especially those of Howard Zahniser, its principal author. This exploration reveals three mutually reinforcing societal ideals that are integral to the historic purpose of wilderness and to understanding wilderness character:

- *Natural environments relatively free from modern human manipulation and impacts.* These environments include the native plants and animals, ecological and evolutionary processes (including disturbances such as fire and insect outbreaks), clean air, natural sounds, dark night skies, and the scenic quality that come from such places.
- *Personal experiences in natural environments that are relatively free from the encumbrances and signs of modern society.* Wilderness visitors may derive a broad range of psychological benefits from experiences of challenge, self-reliance, and self-discovery (for example, Driver and others 1987, Kaplan and Talbot 1987, Roggenbuck and Driver 2000), as well as spiritual benefits (for example, Heintzman 2003). These experiences and benefits are highly individual, and preserving wilderness character allows visitors the freedom to experience wilderness in their individual ways.
- *Symbolic meanings associated with wilderness*. Wilderness is valued for what it conveys about the relationship individuals and society have with this land, and its effect on visitors and on others who may never set foot in a wilderness. Zahniser (1956), for example, wrote that humility and the sense of dependence and interdependence, indebtedness, and responsibility are "… the *distinctive* ministration of wilderness to modern man, the characteristic effect of an area which we most deeply need to provide for in our preservation programs" (emphasis in original). In general, these symbolic meanings of wilderness are associated with experiences and feelings of humility and being part of and interconnected with the larger community of life, and with "our capacity for badly needed self-restraint in our relationship to nature" (Nash 2004). Our unique American cultural heritage is also symbolically tied to the existence of wilderness (Nash 1982).

The word "character" commonly means "the combination of qualities or features that distinguishes one person, group, or thing from another" (American Heritage Dictionary 1992) or "the aggregate of distinctive qualities" (Webster's Dictionary 1976). Drawing on these definitions, wilderness character may be described as the combination of biophysical, experiential, and symbolic ideals that distinguishes wilderness from other lands. These ideals combine to form a complex and subtle set of relationships between the land, its management, and the meanings people associate with wilderness. These relationships and meanings are described in this monitoring Framework as "wilderness character."

Key Points

Wilderness character is…

- A primary administrative responsibility mandated by the Wilderness Act, but is not defined in the Act.
- The biophysical, experiential, and symbolic relationships and meanings that distinguish wilderness from all other lands.
- Supported or degraded by stewardship decisions and actions.
- In part, unique to each wilderness.

Agency decisions and actions may either support or degrade wilderness character, and the humility, restraint, and respect shown by managers is central to preserving wilderness character. For example, choosing not to use a chain saw, not building a footbridge across a stream, or not suppressing a naturally ignited fire may preserve certain qualities of wilderness character. In contrast, other management actions such as requiring permits, designating campsites, or authorizing administrative use of motorized equipment and mechanical transportation diminish certain qualities of wilderness character. Because management decisions and actions in wilderness may have a lasting effect on the land and on the meanings associated with wilderness, the accumulation of seemingly small decisions may result in the loss of

wilderness character. Wolke (2003) called this "creeping degradation," and Udall (1995) commented that there is "a real danger that hundreds and thousands of small decisions—none of them too striking in and of themselves—will produce a cumulative effect that effectively diminishes the wilderness resource the Act was written to protect."

Because wilderness character is multidimensional, composed of both biophysical and social aspects, actions taken to protect one aspect of wilderness character may diminish another aspect. For example, a bridge built to protect a stream bank from erosion caused by people or horses crossing the stream may also diminish the opportunity for people to experience the challenge of crossing a stream. Similarly, the required use of designated campsites to prevent the proliferation of sites and associated impact on soil and vegetation may also diminish the opportunity for unconfined recreation and the sense of freedom from the constraints of society.

While there are national perceptions and meanings associated with wilderness character, there are also unique, place-dependent or locally based aspects within each wilderness. Every wilderness is a unique biophysical environment, with specific establishing purposes, management direction, and relationships people have with the area. The combination of biophysical environment, purposes, management, and relationships results in aspects of wilderness character that are unique to each wilderness. Such aspects of wilderness character can best be evaluated with locally meaningful monitoring indicators.

2.2 The Logical Basis for Monitoring Conditions Related to Wilderness Character

The overall logical structure, or conceptual model, for this monitoring program is shown in figure 3. The two elements of this figure enclosed by the box are derived directly from the 1964 Wilderness Act, while the four elements outside the box are developed in this monitoring effort. The first step uses the Section 2(c) Definition of Wilderness to identify specific qualities of wilderness that are related to the concept of wilderness character. Each of these legislative qualities of wilderness is sequentially divided into a set of monitoring questions, indicators, and measures. As explained in detail in *Appendix 6.2,* monitoring questions are the basic elements within each

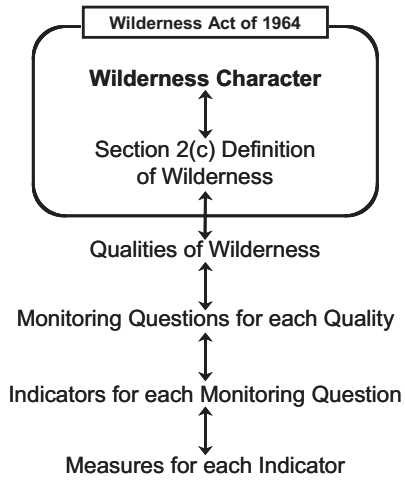

Figure 3—The logical basis for this monitoring, showing the inferences (arrows) used to develop indicators and measures from the concept of wilderness character. The downward-pointing arrowheads show that the concept of wilderness character drives selection of all the subsequent elements and ultimately the data that are collected. The upward-pointing arrowheads show how data collected on the measures are used to evaluate successively higher elements.

legislative quality and set specific monitoring goals, indicators are the types of information used to answer each monitoring question, and measures are the numeric values that are measured or derived to quantify the indicator. This hierarchical approach logically links key indicators and measures to wilderness character.

2.3 Scope and Limitations of This National Monitoring

The idea of wilderness character is too complex and place-dependent to develop a national monitoring protocol for the entire set of meanings and relationships embodied by this concept. For example, there are important emotional, spiritual, and intangible aspects of wilderness character (reviewed by Putney and Harmon 2003) that form a unique basis for the relationships that people have with wilderness landscapes (Watson 2004). This monitoring does not monitor these aspects or relationships, or "reduce wilderness to data." Instead, for the overall purpose of this monitoring to improve stewardship that meets the intent of the Wilderness Act, the scope of this Framework is narrowed to (1) legislatively defined qualities of wilderness, (2) selected conditions and stewardship actions that influence these legislatively defined qualities of wilderness, and (3) a set of indicators related to these conditions and actions that can be monitored consistently at the national level and are meaningful at the local level.

Key Points

The scope of this Framework is limited by…

- Using the legislative definition of wilderness to identify qualities of wilderness and its stewardship that are linked to wilderness character.
- Focusing on selected conditions and stewardship actions that are linked to these legislatively defined qualities.
- Identifying indicators of these conditions and actions that, based on best professional judgment, will be meaningful at the local and national level.

2.3.1 Legislatively Defined Qualities of Wilderness

This Framework uses the Definition of Wilderness, Section 2(c) from the Wilderness Act of 1964, to focus monitoring on relatively distinct qualities of wilderness that link directly to wilderness character. The legislative Definition of Wilderness is used because it directs management of Congressionally designated wilderness. In addition, legal and wilderness scholars refer to this legislative definition to understand congressional intent for the meaning of wilderness character (Rohlf and Honnold 1988, Scott 2002). For example, McCloskey (1999) explains, "… what that character was intended to be can only be determined by looking to the definition of wilderness."

For the purposes of developing this Framework, agency interpretation of Section 2(c) is used to derive four relatively distinct qualities of wilderness. These qualities, described in detail in *Section 3 Using Legislative Qualities of Wilderness as a Foundation for Monitoring Related to Wilderness Character,* are then used to develop monitoring questions and indicators related to wilderness character. These qualities are "untrammeled," "natural," "undeveloped," and "outstanding opportunities for solitude or a primitive and unconfined recreation."

There are two general problems or concerns in using agency interpretation of Section 2(c) to derive specific qualities of wilderness that are linked to wilderness character. First, by breaking the legislative definition of wilderness into four relatively distinct qualities, this Framework imposes reductionistic thinking on the fundamentally holistic concept of wilderness character. One problem of this reductionism is that, as discussed in *Section 2.1 Understanding Wilderness Character,* a particular action may be associated with either a positive or negative outcome depending on the particular quality the action is viewed from. The second concern is that by focusing on just these four qualities

of wilderness, this Framework may allow managers and others to ignore important experiential, symbolic, and intangible aspects of wilderness character (Putney and Harmon 2003).

While both of these concerns have merit, the current lack of an explicit means to monitor conditions related to wilderness character is hindering wilderness stewardship because there is no way to evaluate how wilderness character is changing over time. To address these concerns, the Framework and *Technical Guide* will provide specific cautions about how this monitoring information should be interpreted and used, partly to avoid reductionist interpretations. In addition, as explained in *Section 5 Revising and Improving This Monitoring Program Over Time*, there will be opportunities to revise this Framework as new and better knowledge is gained on integrating the legislative qualities into a holistic expression of wilderness character, and on the experiential and symbolic meanings of wilderness character. This national Framework, while far from perfect, provides a solid foundation to tie wilderness stewardship to the legislative direction of the Wilderness Act.

2.3.2 Selected Wilderness Conditions and Stewardship Actions

This Framework proposes monitoring a set of selected conditions and stewardship actions that influence each of the legislated qualities of wilderness mentioned above. For example, travel routes, recreation sites, and structures are physical evidence of modern human occupation or modification that influence the "undeveloped" quality of wilderness. Likewise, mechanically reducing fire-suppression accumulated fuels across a broad area is a stewardship action that directly influences the "untrammeled" quality of wilderness.

2.3.3 National Core Indicators

Indicators for assessing these selected wilderness conditions and stewardship actions are derived from management experience to be useful at the local level, and at the regional and national levels when information from these indicators is compiled (see *Appendix 6.2 Monitoring Questions, Potential Core Indicators, and Potential Core Measures* for details on how indicators were chosen). The "wedding cake" model adapted from Powell (2000) illustrates the intent as well as limitations of these national core indicators (fig. 4). Nationally consistent indicators with data collected from

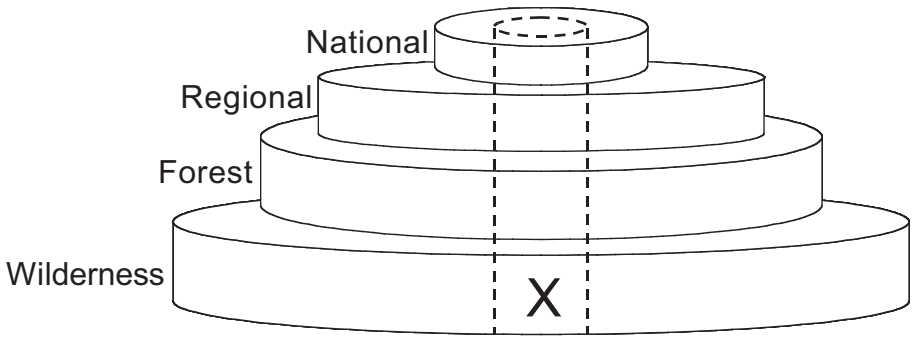

Figure 4—The "wedding cake" model adapted from Powell (2000). Each horizontal layer represents the breadth of information needs of the different administrative levels within the agency. The space enclosed by the dashed vertical lines represents national core indicators that cut across all administrative levels. The portion of each administrative level outside the pair of vertical lines shows the information needs of that level in addition to the core monitoring indicators. The "X" represents the data collected from the individual wilderness under this monitoring Framework.

individual wildernesses are necessary to paint a compelling picture of wilderness stewardship needs and to assess trends across broader geographic areas.

As shown in figure 4 by the area outside the dashed lines at the local wilderness level, the data collected for this monitoring are necessary but only part of the information needed to manage the local wilderness. For example, an individual wilderness may need information about specific areas (for example, popular campsites), particular resources (for example, specific nonnative invasive plants), or place-dependent aspects of wilderness character (for example, a particular meadow discussed in designating legislation), and these are beyond the scope of this national monitoring Framework. Given the broad meaning and place-dependent nature of wilderness character, these national core indicators do not provide a complete understanding of wilderness character in its entirety, or of those aspects of wilderness character that are unique to an individual wilderness.

2.3.4 Summary of Scope and Limitations

Various aspects of the scope and limitations of this monitoring Framework were discussed throughout the previous sections. These are summarized here to clearly contrast what this monitoring does and doesn't do:

- *Monitors managerial progress in meeting the Wilderness Act mandate to preserve wilderness character, not the full range of resources covered by other legislation or management needs.* This national Framework is designed to monitor selected conditions and stewardship actions that are related to wilderness character based on the Section 2(c) Definition of Wilderness from the 1964 Wilderness Act for the purpose of improving wilderness stewardship. This Framework does not monitor the full range of resources covered by other legislation that influences wilderness, such as all the air quality related values that would be monitored under the Clean Air Act, or detailed species population monitoring under the Threatened and Endangered Species Act. In addition, this Framework does not cover the intensive and site specific monitoring necessary to understand (1) natural ecological variation and change in ecological systems, or (2) visitor characteristics, preferences, and the benefits or meanings derived from wilderness experiences and the existence of wilderness within our society.
- *Applies to designated wilderness, not to other lands.* This national Framework applies to all National Forest System wildernesses. Because it is designed to track selected conditions and actions related to wilderness character, this monitoring Framework is not intended for assessing the condition of lands outside wilderness.
- *Monitors at the scale of an entire wilderness, not at the project scale.* This national Framework is designed to monitor selected conditions and stewardship actions related to wilderness character at the level of an entire wilderness. While intended to complement existing wilderness monitoring programs where they exist, this Framework does not provide guidance for all the monitoring needed to manage an individual wilderness. It does not replace project- or issue-specific monitoring, nor does it monitor specific resources within a wilderness.
- *Evaluates change over time within a wilderness, not in comparison with other wildernesses.* This national Framework provides information about changes in selected conditions and stewardship actions related to wilderness character only within an individual wilderness. Each wilderness is unique in its enabling legislative direction, condition at the time of designation, Forest Plan direction, and ecological and social setting. This Framework therefore does not assign a single national rating or standard for the legislatively defined wilderness qualities. The value of using this Framework will be tracking trends within individual wildernesses over time and not in comparing one wilderness against another.

2.4 Applying This Framework Nationally

This monitoring Framework can be applied to all National Forest System wildernesses, regardless of size, location, or other place-specific attributes, because it is based on the Section 2(c) legislative Definition of Wilderness, and every wilderness law includes specific language that ties it to the provisions of the 1964 Act and this legislative definition (Hendee and Dawson 2002, Landres 2003). While wilderness acts often include specific exceptions or special provisions that apply to the uses and values of particular areas, no act changes the Section 2(c) Definition of Wilderness provided in the Wilderness Act, nor does any subsequent legislation change the affirmative management responsibility of Section 4(b) for "preserving the wilderness character of the area."

3. USING LEGISLATIVE QUALITIES OF WILDERNESS AS A FOUNDATION FOR MONITORING RELATED TO WILDERNESS CHARACTER

As introduced in previous sections, this Framework uses the Definition of Wilderness, Section 2(c) from the Wilderness Act, to focus monitoring on qualities of wilderness linked directly to wilderness character. Based on this Definition of Wilderness, the following four qualities were chosen to represent the general level of concepts and ideals, and sometimes subtle distinctions that distinguish wilderness from other lands:

- "Untrammeled"
- "Undeveloped"
- "Natural"
- "Outstanding opportunities for solitude or a primitive and unconfined type of recreation"

These four qualities reinforce one another and together comprise a coarse approximation of wilderness character for the purposes of this national monitoring Framework. In this Framework all of these qualities are equally important and none is held in higher regard than the others. Monitoring these four qualities provides management staff, decisionmakers, and policymakers a solid basis of information to tie some of the changes occurring within wilderness to the legislative and policy direction for wilderness.

Legal and wilderness scholars have interpreted Section 2(c) of the Wilderness Act differently than in this monitoring Framework. For example, Rohlf and Honnold (1988) interpret this section to mean that wilderness is defined on the basis two distinct elements: "absence of … evidence of human activities" and "presence of a healthy, natural ecology." Hendee and Dawson (2002)

The Wilderness Act of 1964, Section 2(c), Definition of Wilderness

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

interpret this section to mean "naturalness and solitude are the distinguishing qualities of wilderness." Scott (2002), relying on Senate testimony of Howard Zahniser and legislative history of the definition of wilderness, concludes that the first sentence of Section 2(c) defines the wilderness ideal as untrammeled, and that this ideal is the proper meaning of "wilderness character."

None of these interpretations, however, were for the purpose of developing monitoring to improve agency wilderness stewardship. Based on the combination of these interpretations above, agency experience managing wilderness, and the scientific literature, the four qualities used in this Framework are considered necessary and sufficient for this national monitoring to improve agency wilderness stewardship.

Some parts of the Section 2(c) Definition of Wilderness were not used in identifying qualities of wilderness for this monitoring Framework. Section 2(c)(3) was not used because a wilderness must be managed as wilderness regardless of its size. Section 2(c)(4) was not used because the values described in this section *may* occur but are not required for an area to be wilderness, and they do not apply uniformly to wildernesses nationwide (Hendee and Dawson 2002).

Each of the four wilderness qualities is described in detail below. Each quality is first described with relevant quotes from Section 2(c) of the Wilderness Act. For the purpose of developing this monitoring Framework, an interpretation of the intent or meaning of each quality is provided in terms that differentiate it from the others. This interpretation is followed by a brief summary statement in italics of the quality as used in this Framework. Government agencies are required to implement laws in their entirety; this summary statement therefore reflects the qualifications in the 1964 Wilderness Act (McClosky 1999). This brief summary statement is followed by detailed discussion of the historic and scientific support for the quality and any specific concerns with using the quality in this monitoring Framework.

3.1 "Untrammeled"

The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man," and "generally appears to have been affected primarily by the forces of nature." This quality monitors modern human activities that directly control or manipulate the components or processes of ecological systems inside wilderness. In summary, *wilderness is essentially unhindered and free from modern human control or manipulation.*

The word "untrammeled" and its meaning for wilderness management have been discussed at length (for example, Aplet 1999, Scott 2002). Untrammeled means "allowed to run free" (American Heritage Dictionary 1992); synonyms for untrammeled include unrestrained, unrestricted, unhindered, unimpeded, unencumbered, self-willed, and wildness. Zahniser (1963) noted that the inspiration for wilderness preservation "is to use 'skill, judgment, and ecologic sensitivity' for the protection of some areas within which natural forces may operate without man's management and manipulation." Adding to this, Cole (1996) suggested that the management goal based on the word untrammeled "is to protect some lands from human control, from conscious, active, intentional manipulation." Cole (2000) also stated that untrammeled "suggests more about the process of management than it does about the outcomes of management," reinforcing the need to consider carefully all actions taken in the name of wilderness stewardship.

All actions that manipulate or control ecological systems inside wilderness diminish the untrammeled quality of wilderness character. For example, when naturally ignited fires are suppressed inside wilderness, when dams are built that impede natural flood cycles, when animals or plants are transplanted inside wilderness, wilderness is manipulated and the untrammeled quality of wilderness character diminished. Furthering this

notion, Lucas (1973) commented, "If ecological processes operate essentially uncontrolled within the Wilderness frame of reference, the results, whatever they might be, are desirable by definition. The object is not to stop change, nor to recreate conditions as of some arbitrary historical date, nor to strive for change favorable to big game or scenery. The object is to let nature 'roll the dice' and accept what results with interest and scientific curiosity." This applies to all manipulation since the time of wilderness designation but does not apply to manipulations that occurred prior to wilderness designation, for example, the use of fire by native people to promote game habitat. In addition, the intent of monitoring this untrammeled quality is to track significant manipulations such as reducing fire-accumulated fuels over a large area, and not track small-scale manipulations such as removing a single hazard tree. An explicit definition of "significant manipulation" will be developed in the *Technical Guide*.

This untrammeled quality monitors all actions that manipulate or control ecological systems in wilderness, including actions that managers traditionally authorize for restoring natural conditions. For example, many wildernesses have nonnative invasive plants, and various actions, including the release of biocontrol agents and the use of herbicides, are used to control these invasive plants and restore natural plant communities. Similarly, the problems of fire exclusion in wilderness are well known, and managers are considering reducing human-caused fuel accumulations with mechanical treatments or management-ignited fire as a first step toward restoring natural fire regimes. All such actions diminish the untrammeled quality of wilderness in the short term, even though they are intended to restore natural conditions and support the natural quality of wilderness over the long term, and may eventually lead to reduced trammeling. By monitoring both the action and the reasons behind the action, managers will be able to evaluate how they are affecting the untrammeled quality of wilderness over time. Other aspects of restoration actions are discussed in the natural quality of wilderness below.

The tools used to manipulate resources are not monitored under this untrammeled quality. For example, it doesn't matter if a chain saw or a cross cut saw is used to thin trees because wilderness is still trammeled by the action to reduce forest fuels. In this example, use of a chain saw would be monitored as an administrative use of motorized equipment under the undeveloped quality (see *Section 3.3 "Undeveloped").*

Every manipulation of wilderness, even those intended for a specific purpose, may also cause unintended and often unknown effects on the ecological system. For example, when a fire is suppressed inside wilderness, the long-term effects on vegetation composition and patterns, and therefore on animal distributions and populations, are rarely considered. For several reasons, this national monitoring Framework separates the actions (tracked in this untrammeled quality) from the effects of these actions (tracked under the natural quality, described below). First, given the prominence of "untrammeled" in the Wilderness Act, it is important to provide explicit monitoring direction for this important wilderness concept. Second, actions and their effects are often confounded and blurred with one another, hampering monitoring, understanding of cause and effect, and effective management analysis and planning. Third, natural conditions in wilderness are affected by actions taken there as well as by a host of regional impacts such as air pollutants that may have nothing to do with management actions inside wilderness. Separating actions from effects therefore allows more explicit and effective monitoring direction.

3.2 "Natural"

The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." This quality monitors both intended and unintended effects of modern people on ecological systems inside wilderness since the time the area was

designated. In summary, *wilderness ecological systems are substantially free from the effects of modern civilization.*

One of the major themes running throughout the Wilderness Act is that the "earth and its community of life" in wilderness should be free from the effects of "an increasing population, accompanied by expanding settlement and growing mechanization" (Section 2(c) and 2(a), respectively, Wilderness Act of 1964). In today's terms, this means that the native species composition, structures, and functions of ecological systems in wilderness are protected and allowed to function on their own, without the planned intervention or even the unintended effects of modern civilization. Arguably, the single greatest result of such protection is allowing evolution to occur unfettered by the desires or effects of modern people (Nash 1980, Landres 1992, Western 2001, Ashley and others 2003). Only through such protection may wilderness truly serve as "a laboratory for the study of land-health" (Leopold 1949) and as an ecological baseline for understanding the effects of modern civilization on natural systems (Arcese 1997).

The purpose of this monitoring is to track the effects of modern people on wilderness ecological systems, not to maintain static or unchanging natural conditions in wilderness. Ideally, all threats, all impacts of these threats, and the status of all natural conditions in wilderness would be monitored. Practical and conceptual constraints, however, require that only a limited set of threats to natural conditions and a limited set of effects of human-caused changes to biophysical conditions and processes will be monitored. For example, this monitoring is not intended for understanding the status of the full range of ecological conditions in wilderness such as trends in species populations, landscape scale vegetation patterns, and ecological processes such as carbon or mineral cycling. Monitoring impacts to natural conditions also implies that there is sufficient understanding about these conditions and how they naturally vary over time and across a landscape to separate human-caused from natural change. In practice, this understanding is lacking in nearly all wildernesses. Understanding cause-and-effect relationships is likewise beyond the purpose, and practical and technical scope, of this current effort. Therefore this monitoring, at least initially, will focus on selected threats and human-caused effects that are directly relevant to this natural quality of wilderness, and track how these change from one monitoring period to the next.

Ecological conditions are also directly affected by a variety of actions intentionally taken inside wilderness. These actions manipulate wilderness ecological systems causing both the anticipated as well as unintended impacts. For example, nonnative fish are intentionally introduced for recreational angling, yet the far-reaching and unintended effects on native biological diversity and nutrient cycling in wilderness lakes are just now becoming known (Knapp and others 2001). Wilderness is also intentionally manipulated for the purpose of restoring natural conditions, for example by applying herbicides to eradicate invasive nonnative plants or by using chemicals to eliminate nonnative fish. The negative impact on the untrammeled quality of wilderness from these types of manipulations is monitored in this Framework, as is the positive intent of this action to restore natural conditions. Despite the best of intentions, however, restoration actions may cause unintended, long-term, subtle, or as-yet-unknown effects on wilderness ecological systems (Cole and Landres 1996, Murray 1996). While beyond the current scope of this national monitoring Framework, monitoring these effects should be an integral part of all projects that intentionally manipulate wilderness.

> ***For Example…***
>
> Authorization to use prescribed (or management-ignited) fire in wilderness is monitored under the untrammeled quality because it is a decision to manipulate wilderness. The ecological effects of this manipulation are monitored under the natural quality.

Actions that occur outside wilderness may also have unintended effects on the ecological systems inside wilderness. Wildernesses are increasingly isolated within a "sea" of modern development, and the impacts of this development can be seen in just about every wilderness (Landres and others 1998). For example, naturally ignited fires that start outside wilderness and would have spread into the wilderness are now typically suppressed, irreversibly changing wilderness vegetation patterns (Christensen 1995). Dams outside wilderness alter hydrological flow regimes, adversely affecting the riparian plant communities within wilderness (Cowell and Dyer 2002). Air pollutants from sources outside wilderness disperse long distances, affecting wilderness vegetation, soils, and aquatic systems (Schreiber and Newman 1987).

For several reasons it is difficult to establish "natural reference" conditions for determining modern anthropogenic impacts on wilderness ecological systems. First, many areas were substantially affected from burning, logging, farming, road building, and a variety of other human activities long before wilderness designation. Young and others (1994), for example, showed that driving railroad ties down streams from the 1860s through 1940 significantly affected current riparian vegetation, coarse woody debris within the stream, and stream channel structure in the Savage Run Wilderness, Wyoming. Second, there is a general lack of understanding about natural conditions prior to current impacts. In a few cases there is fairly good understanding about specific ecological conditions or processes derived from empirical data, but in most cases this understanding comes from opinions or from conceptual and statistical models, with varying levels of certainty and variability. Third, all ecological systems, including those in wilderness, are in a constant state of natural change (Pickett and Ostfeld 1995), making it difficult to identify change that is solely anthropogenic. And fourth, for some large-scale anthropogenic impacts, such as global climate change, differentiating natural from human-caused change typically requires an intensive research effort beyond the means of this monitoring Framework.

Not being able to establish "natural reference" conditions has several important implications for this monitoring Framework:

- Change over time in indicators of the effects of human-caused changes are only "red flags" that suggest the need for research and more intensive monitoring to verify the change and understand its cause.
- The baseline for determining human-caused change in biophysical conditions and processes is ideally the time of wilderness designation, but practically baseline will likely be determined the first time this monitoring is conducted. This does not assume or imply that current conditions are "natural" or in a desired condition, but current conditions are the only practical baseline from which change can be evaluated forward in time. For example, prior to wilderness designation nonnative fish were stocked in many naturally fishless lakes to provide recreational fishing opportunities, and these fish do not become native or "naturalized" when this monitoring starts. Monitoring change in the number of lakes that have nonnative stocked fish would allow managers to evaluate whether existing conditions in aquatic systems are stable (in other words, the number of lakes with nonnative fish has not changed between the two monitoring periods), improving (in other words, there are fewer lakes with nonnative fish), or degrading (in other words, there are more lakes with nonnative fish).
- Management actions may cause a variety of ecological impacts that will not be tracked under this natural quality because of insufficient understanding about these impacts. Suppressing naturally ignited fires, for example, may directly change the species composition and spatial distribution of vegetation and cause many other indirect ecological impacts, on wildlife and aquatic systems for example. But

detailed, local understanding of prior vegetation conditions and how ecological succession in that area is affected by fire suppression is required to evaluate these ecological impacts. In general, understanding these types of impacts would require research that is beyond the scope of this monitoring Framework.

3.3 "Undeveloped"

The Wilderness Act states that wilderness is "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation," "where man himself is a visitor who does not remain" and "with the imprint of man's work substantially unnoticeable." This quality monitors the presence of structures, construction, habitations, and other evidence of modern human presence or occupation. In summary, w*ilderness is essentially without permanent improvements or modern human occupation.*

A basic requirement of wilderness is that it is undeveloped Federal land. This theme runs through every definition of wilderness. For example, Aldo Leopold (1921) envisioned wilderness as "a continuous stretch of country preserved in its natural state, open to lawful hunting and fishing, devoid of roads, artificial trails, cottages, or other works of man." Marshall's (1930) definition of wilderness conveyed a similar theme: "I shall use the word wilderness to denote a region which contains no permanent inhabitants, possesses no possibility of conveyance of any mechanical means… The dominant attributes of such an area are … that it preserves as nearly as possible the primitive environment." Humphrey (1957), the original sponsor of the Wilderness Act, clarified his definition of wilderness as "the native condition of the area, undeveloped … untouched by the hand of man or his mechanical products." Contemporary support can be found in a recent survey of visitors to Shenandoah Wilderness within Shenandoah National Park, where "undeveloped" emerged as the second most frequently mentioned response when visitors were asked to define wilderness in their own words (Kendra and Hall 2000).

The Wilderness Act identifies "expanding settlement and growing mechanization" as forces causing wild country to become occupied and modified. An early Forest Service review of wilderness policy noted that buildings or structures are usually installed for only one purpose – to facilitate human activity (USDA Forest Service 1972). The building or structure not only "occupies" the land, but also makes it easier for people to impose their will on the environment, thereby modifying it. The policy review also found that motorized equipment and mechanical transport similarly make it easier for people to occupy and modify the land. Zahniser (1956) articulated this idea when he argued the need for "areas of the earth within which we stand without our mechanisms that make us immediate masters over our environment." While the use of motorized equipment or mechanical transport affects the opportunity for visitors to experience natural quiet and primitive recreation, these uses are included under this undeveloped quality due to the close association in the legislative history between motorized use, mechanical transport, and people's ability to develop, occupy, and modify wilderness.

This undeveloped quality of wilderness character monitors present-day physical indicators such as the presence and development level of trails, campsites, and structures that were built before wilderness designation as well as those built since designation. One of the concerns with these kinds of physical evidence is the impact on the opportunity visitors have to experience a "primitive" environment since wilderness is supposed to be a place where the evidence of human activity is "substantially unnoticeable." Some physical evidence of occupancy and use may be acceptable because of special provisions in legislation or because it may be considered "necessary to meet minimum requirements for the administration of the area for the purpose of the Act" (Section 4(c), 1964

Wilderness Act). For example, a minimal system of trails and campsites is considered essential to manage the effects of recreation use while allowing people to use and enjoy wilderness. However, since campsites, travel routes, and structures strongly influence people's opportunity to experience wilderness, managers must exercise restraint in fulfilling their administrative responsibilities so that wilderness does not appear developed, occupied, and modified.

At least 17 wilderness acts specifically authorize facilities and structures or allow some motorized use and mechanical transport for a variety of purposes (Hendee and Dawson 2002). While special provisions represent legal uses of wilderness, the resulting facilities, structures, and authorizations for motorized use and mechanical transport can have far-reaching effects on wilderness character (Hendee and Dawson 2002). The different special provisions unique to each wilderness underscore the importance of using information gained from this monitoring to compare only one wilderness against itself over time, rather than using this information to compare different wildernesses.

This Framework is designed to monitor changes in these physical indicators of occupancy and use over relatively long periods. For example, an upward trend over the course of 5 to 10 years in the number of trail miles, structures, recreation sites, or authorized actions for motorized use should trigger a red flag to both the local manager and regional manager to determine why there is an increasing trend and what can be done to reverse or at least stabilize this trend.

3.4 "Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation"

The Wilderness Act states that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This quality monitors conditions that affect the opportunity for people to experience solitude or primitive, unconfined recreation in a wilderness setting, rather than monitoring visitor experiences *per se*. In summary, *wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge.*

The human experience of wilderness is shaped by interaction with conditions related to all four qualities discussed in this Framework. However the Act's mandate to "provide outstanding opportunities for solitude or a primitive and unconfined type of recreation" is the one quality that relates only to the human experience. Due to the complexity of human interactions with their environment and with other people, this quality has long been a source of debate and varying interpretations. It is essential at the outset to understand what monitoring this quality intends and does not intend to accomplish. First, wilderness stewardship is focused on the Wilderness Act's mandate to provide *outstanding opportunities* for wilderness experiences; thus the monitoring goal is to evaluate if and how these *outstanding opportunities* are changing over time. This monitoring will not answer questions related to whether people perceive these changes as good or bad, nor will it answer questions about whether the changes are causing people to alter their expectations or their behavior. While important, these questions are beyond the current scope of this Framework which focuses on assessing how the *opportunity* is changing, not how visitors are changing. Second, wilderness experiences are multidimensional, influenced by far more than the conditions people find in wilderness (Manning and Lime 2000, Hendee and Dawson 2002, Borrie and Birzell 2001), and this monitoring, focusing on the mandate of the Wilderness Act, will not track how these other dimensions of the experience are changing over time.

What the framers of the Wilderness Act specifically meant by solitude or a primitive and unconfined type of recreation is not recorded in the legislative history of the Act. In such situations, the dictionary is used to define the common meaning of

words (see Meyer 2000 for guidelines on using legislative history and interpretation). In addition, early wilderness writings paint a rich picture about the type of experience envisioned in wilderness environments. There are a variety of ways to categorize the themes emerging from these wilderness writings (Borrie 1995, Kaye 2000, Hendee and Dawson 2002). For this monitoring Framework, the language from Section 2(c) of the 1964 Wilderness Act is used to structure discussion of this quality around three core themes: solitude, primitive recreation, and unconfined recreation. Along with providing outstanding opportunities for solitude or a primitive and unconfined type of recreation, "inspiration" and "physical and mental challenge" are also identified in Forest Service Policy (Forest Service Manual 2320.3, 2330.6, and 2323.12) and subsequent wilderness legislation (in particular, the Eastern Wilderness Areas Act of 1975). Discussion of the three core themes includes these additional values of inspiration and physical and mental challenge. Each core theme is described first with quotes from prominent wilderness writers, and then in terms of this monitoring Framework.

- *Solitude.* Marshall (1930) expressed this notion as: "For me, and for thousands with similar inclinations, the most important passion of life is the overpowering desire to escape periodically from the clutches of a mechanistic civilization. To us, the enjoyment of solitude, complete independence, and the beauty of undefiled panoramas is absolutely essential to happiness." Leopold (1949) wrote, "Recreation is valuable in proportion to the intensity of its experiences, and to the degree to which it differs from and contrasts with workaday life." And Zahniser (1956) wrote, "We have a profound, fundamental need for areas of wilderness – a need that is … essential to our understanding of ourselves, our culture, our own natures, and our place in nature." Solitude is defined as the "state of being alone or remote from society" (Webster's Dictionary 1976). The meaning of solitude has been at the center of considerable debate among researchers and the public (for example, Washington Trails Association 1997), with meanings ranging from a lack of seeing other people, to privacy, to freedom from societal constraints and obligations, to freedom from management regulations (Hollenhorst and Jones 2001). Given the content of early wilderness writings, it is likely that solitude was viewed holistically, encompassing attributes such as separation from people and civilization, inspiration (an awakening of the senses, connection with the beauty of nature and the larger community of life) and a sense of timelessness (allowing one to let go of day-to-day obligations, go at one's own pace, and spend time reflecting).
- *Primitive recreation.* Leopold (1949) expressed the sense of primitive recreation as: "Wildernesses are first of all a series of sanctuaries for the primitive arts of wilderness travel, especially canoeing and packing." Marshall wrote that "a wilderness journey provides the ideal conditions for developing physical hardiness. If he gets into trouble he must get himself out of it or take the consequences" (quoted from Zahniser 1956).Primitive is defined as "pertaining to an early age; characterized by simplicity" (Webster's Dictionary 1976). Primitive recreation in wilderness has largely been interpreted as travel by nonmotorized and nonmechanical means (such as horse, foot, canoe) that reinforce the connection to our ancestors and our American heritage. However, primitive recreation also encompasses reliance on personal skills to travel and camp in an area, rather than reliance on facilities or outside help.
- *Unconfined recreation*. Leopold (1949) addressed the importance of opportunities for unconfined recreation when he wrote, "I am glad I shall never be young without wild country to be young in. Of what avail are forty freedoms without a blank spot on the map." Marshall (1937) wrote passionately about the adventure and challenge of primitive, unconfined environments: "To countless people the wilderness

provides the ultimate delight because it combines the thrills of jeopardy and beauty. It is the last stand for that glorious adventure into the physically unknown." Unconfined means "not kept within limits" and encompasses attributes such as self-discovery, exploration, and freedom from societal or managerial controls (Lucas 1983, Nash 1996, Hendee and Dawson 2002). Primitive and unconfined environments provide ideal opportunities for the physical and mental challenges associated with adventure, real consequences for mistakes, and personal growth that result from facing and overcoming obstacles (Dustin and McAvoy 2000, Borrie 2000).

Wilderness visitors generally believe that the attributes described in these three core themes define wilderness (Brown and Haas 1980, Hall 2001, Kaye 2000, Kendra and Hall 2000). However, the complexity of human experiences suggests that many factors contribute in known and unknown ways to the experience of solitude or primitive and unconfined recreation. For example, experiences may be influenced by factors largely beyond the control and influence of managers, including attributes of the physical landscape, the presence of certain animals (such as mosquitoes and grizzly bears), local weather, intra- and intergroup dynamics, and the skills and knowledge an individual brings to the experience. In contrast, managers may exert some control over use levels, types and patterns of use, level of development (both inside and adjacent to wilderness), amount and type of information available about the wilderness, and kinds of regulations imposed, all of which influence the opportunity to experience solitude or a primitive and unconfined type of recreation (Lucas 1973, Cole and others 1987, McDonald and others 1989, Watson 1995, Patterson and others 1998, Cole 2001, Hollenhorst and Jones 2001). These latter factors suggest that managers strive to protect outstanding opportunities in wilderness by:

- Minimizing the number of people seen or heard.
- Minimizing the sounds and sights of motorized equipment and mechanical transport.
- Promoting "primitive" means of traveling, camping, and accomplishing stewardship work.
- Promoting self-reliance by minimizing developments and facilities.
- Promoting unconfined recreation by minimizing regulatory controls and maximizing the opportunity visitors have to make their own choices and discover things for themselves.
- Allowing some degree of challenge, such as streams that must be forded, log stringers in rivers that must be negotiated, rough trails.
- Maximizing the contrast of the wilderness environment with the sounds and sights of civilization so that natural sounds and sights dominate.
- Promoting immersion in nature.

This monitoring Framework does not and will not establish standards for what is an acceptable degree of solitude or primitive and unconfined recreation. Such standards need to be developed at the local level incorporating enabling legislation, planning direction, and place-based information about the area. This Framework is solely intended to give managers a tool to evaluate how selected conditions and actions that influence the outstanding opportunities visitors have available to experience solitude or a primitive and unconfined type of recreation are changing over time.

To date, social science in wilderness has primarily focused on understanding wilderness visitor characteristics and exploring issues related to use density. These investigations have led to greater understanding about the nature of wilderness experiences, but

meaningful correlations between experience quality and measures of crowding have not emerged (Patterson and Hammitt 1990, Watson and Williams 1995, Borrie and Birzell 2001, Cole 2001). Very little research has been done to explore how specific wilderness conditions influence the opportunity for people to experience solitude or a primitive and unconfined type of recreation, and it is unrealistic to expect this monitoring Framework to answer basic research questions. However, in order to fulfill the mandate of the Wilderness Act, managers must strive to provide outstanding opportunities for solitude or primitive and unconfined recreation. Understanding how these outstanding opportunities are changing over time is the first defense managers have to guard against the loss of this essential wilderness quality.

3.5 How Legislated Uses and Special Provisions Affect These Four Qualities

In this national monitoring Framework, legislated uses and special provisions are monitored for their impacts on wilderness character. Section 4(b) of the Wilderness Act states that there are several legislated uses of wilderness: "Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use." Section 4(d) of the Wilderness Act contains several special provisions allowing activities that would typically be prohibited in wilderness, such as mining and commercial livestock grazing, or landing of aircraft or use of motorboats, where these uses were already established before wilderness designation. Subsequent wilderness legislation often includes specific language to continue activities that would otherwise be prohibited under the 1964 Wilderness Act (reviewed in Hendee and Dawson 2002). For example, several laws have special provisions allowing mining (for example, Central Idaho Act, West Virginia Wilderness Act, Florida Wilderness Act), wildlife management activities (for example, Wyoming Wilderness Act, California Desert Protection Act), and structures (for example, Utah Wilderness Act, Vermont Wilderness Act, Arizona Wilderness Act) that would otherwise be prohibited.

Although the managing agency may be required to allow all legislated uses and special provisions, none of these uses or provisions from the 1964 Wilderness Act or from subsequent laws modify or amend the Section 2(c) Definition of Wilderness, or the Section 4(b) direction that agencies preserve wilderness character when allowing other uses (Hendee and Dawson 2002). This monitoring Framework therefore does not include the uses or special provisions from the Wilderness Act of 1964, or from other wilderness legislation, as a part of wilderness character. For example, while aircraft landing strips may be legally allowed inside the Frank Church River of No Return Wilderness, they are not part of the wilderness character in this wilderness. The impacts to wilderness character from all such legally allowed uses and special provisions are monitored in this national Framework.

The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) is perhaps the most important example of legislated use and special provision language because this one law established roughly 55 percent of the area in the entire National Wilderness Preservation System and about 16 percent of National Forest System wilderness acreage (Landres and Meyer 2000). Recognizing the unique conditions in Alaska and the importance of subsistence uses by rural residents of Alaska, ANILCA includes special provisions allowing subsistence hunting and gathering of natural resources inside wilderness, certain uses of motorized equipment and mechanical transport (including snowmobiles, motorboats, and airplanes), maintenance of existing cabins and building new ones for public use, and permanent facilities for fisheries management. These special provisions range in applicability from the general public to Alaska Natives and non-Native rural resident subsistence users, and to individual special use permit holders. With the passage of ANILCA, however, Congress did not modify the basic provisions

of the 1964 Wilderness Act (Hendee and Dawson 2002), the definition of wilderness, or the mandate to preserve wilderness character. While ANILCA's special provision uses may be legally allowed, they also may diminish certain qualities of wilderness as defined in Section 2(c) of the 1964 Wilderness Act and are therefore monitored for their impacts to wilderness character over time.

3.6 Defining Baseline Conditions and How These Four Qualities Change Over Time

Baseline conditions are the reference point against which change over time in the indicators and four qualities of wilderness is measured and evaluated. Ideally this baseline is described at the time a wilderness is designated. For already designated wildernesses, appropriate historic data, if available, may be used to describe retrospectively this baseline condition. However, few existing wildernesses actually have this information, so baseline condition would most likely be described the first time this monitoring Framework is applied. When newly designated wildernesses use this Framework to describe baseline conditions, change in the indicators and qualities of wilderness can be evaluated from this baseline forward in time.

There are two important implications from describing baseline conditions at the time of designation or the first time this monitoring Framework is applied:

- For existing wildernesses, describing baseline conditions from the first time this monitoring Framework is applied may not give an accurate picture of how the wilderness has changed since the time of designation or an accurate picture of historical changes prior to designation.
- For newly designated wildernesses, describing baseline conditions in terms of this monitoring Framework may not give an accurate picture of historical changes that occurred within the wilderness prior to the start of this monitoring.

Baseline conditions are simply the beginning point for tracking change and do not imply that these conditions are "good," "bad," or "desired." For example, at the time of designation a wilderness may have existing roads. In this monitoring Framework such roads would be part of the baseline condition of this wilderness, and monitoring would simply show how the undeveloped quality of wilderness stays the same if the roads are not removed, and improves if these roads are removed. This will allow wilderness managers to evaluate how wilderness character is changing over time in accordance with the Wilderness Management Model (fig. 2 as modified from Forest Service Manual 2320.6). Baseline conditions are the starting point for tracking change over time; local interpretation is crucial for placing this change in its proper historical and legislative context, and for evaluating its relevance.

4. ANALYZING, REPORTING, AND USING THESE MONITORING DATA

This section describes the overall strategy for how collected data will be analyzed, reported, and used. The actual protocols for these actions will be developed in the forthcoming *Technical Guide for Monitoring Selected Conditions Related to Wilderness Character*.

4.1 Evaluating Current Status and Trends

The goal of this monitoring is to determine if wilderness character is stable, improving, or degrading over time. This goal is accomplished by evaluating the status and trends of the indicators to answer the monitoring questions. These answers are then used to determine how the four qualities and ultimately wilderness character are changing over time. The types of indicators and analyses will be nationally consistent, allowing

compilation and summarization of data regionally and nationally, even though the baseline condition for an indicator is unique to each wilderness. For example, if the number of campsites is used as a measure of the recreation sites indicator, then all wildernesses would consistently collect these data and perform subsequent analyses, even though the baseline number of campsites for each wilderness would be different. Overall, this evaluation is composed of two phases: an analysis phase providing a detailed evaluation of individual measures and indicators, and a synthesis phase providing an overall picture of how the qualities of wilderness character are changing over time.

4.1.1 Analysis of Core Measures and Core Indicators

In this phase, the analysis of specific measures or groups of measures for a given indicator is performed. Standard analytical, graphing, and display techniques allow in-depth understanding of the status of an individual measure or indicator. Two general types of data analysis and presentation are needed for each measure and indicator: comparison of the currently measured data value against the baseline data value, and long-term trends (where the data allow). Each of the indicators will vary in the period that is relevant for evaluating change, and these periods will be described in the *Technical Guide*. Supporting text would explain any data quality limitations and the type of baseline data used.

Local wilderness managers may need or want detailed analyses of the core measures and indicators. In addition to this detailed analysis, regional and national wilderness program managers may want more general and standardized information on how each of the measures and indicators have changed between monitoring periods. Because the sampling unit for each measure is different, change in the measure and indicator will expressed as a standardized or "normalized" change (fig. 5), ranging from –1 (a decline of 100 percent) to +1 (a gain of 100 percent). (Simply expanding the scale can easily show change greater or less than 100 percent, but it is not anticipated that such large changes would occur.) Normalizing the data in this way may be useful for understanding and communicating how the measures and indicators are changing but requires data from two monitoring periods.

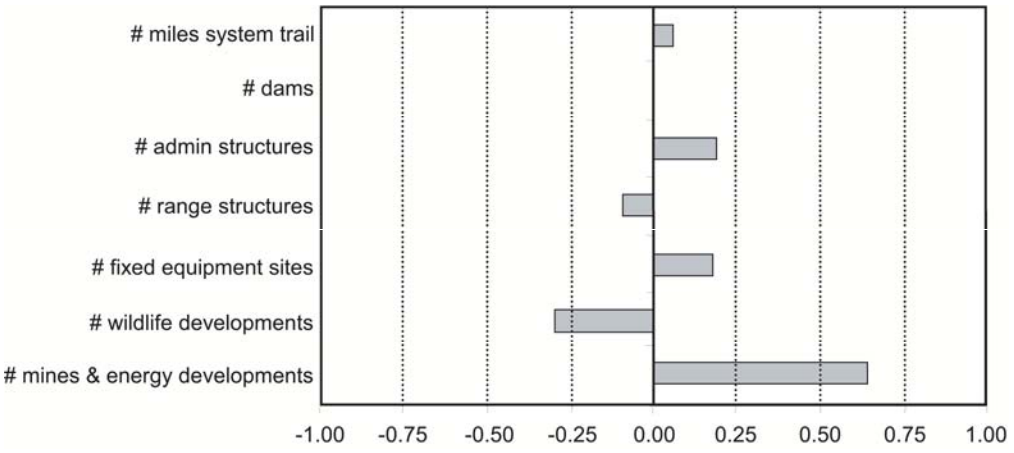

Figure 5—An example directional histogram for some of the individual measures associated with the "undeveloped" wilderness quality. Data values for each measure have been normalized by comparing the current observed value with the baseline reference value. The result is a scale ranging from +1 (the current observed value is 100 percent greater than the baseline value) to –1 (100 percent less than the baseline value). If there is no change between the current and baseline value, the data value is 0 (as shown for the # dams above).

4.1.2 Synthesis of Wilderness Qualities and Wilderness Character

Although evaluating detailed information on individual measures and indicators is critical, the synthesis phase of the evaluation process helps managers understand the larger picture—the status and trends of qualities related to wilderness character and whether wilderness character is stable, improving, or degrading. The purpose of this synthesis is to facilitate this larger, more comprehensive understanding in a narrative and diagrammatic form. There are at least two important reasons for developing and using such integrative diagrams to portray wilderness qualities and wilderness character. First, the Wilderness Act mandates the Forest Service to preserve wilderness character, not four separate qualities of wilderness. An amoeba diagram (see fig. 6 for an example) displaying the four qualities in one figure provides a better approximation of wilderness character than any single wilderness quality could on its own. This single representation of all the qualities makes the impacts associated with certain decisions clearer. Using herbicides to eradicate invasive weeds, for example, may improve the natural quality of wilderness character while adversely affecting the untrammeled quality. Second, a single diagram is potentially more powerful and effective for communicating the overall status and trend of wilderness qualities and wilderness character to a broad audience, including the public, agency decisionmakers and policymakers, and legislators (Failing and Gregory 2003).

This synthesis will not produce a single numerical index of each wilderness quality or of wilderness character. Such a numerical index would be theoretically and practically invalid because of the uniqueness of each wilderness (as explained in *Section 2 Developing National Monitoring of Conditions Related to Wilderness Character*), leading to inappropriate comparisons among the different legislated qualities of wilderness, as well as among different wildernesses. Certain comparisons among wildernesses based on this monitoring Framework, however, may be appropriate and useful. For example, it may be useful for a regional wilderness program manager to compare administrative use of motorized equipment or mechanical transportation across several wildernesses. Any such comparisons, along with their uses and limitations, will be developed in the *Technical Guide*.

Many graphical display techniques facilitate synthesis of distinct elements, including amoeba (or radar) diagrams and wind roses. Specific recommendations for these diagrammatic tools will be developed in the *Technical Guide*. Amoeba diagrams graphically represent the performance of different elements that cannot be expressed mathematically as a function of one another (fig. 6); in other words, elements cannot be combined. Each "ray" of the amoeba diagram represents an indicator with values along the ray showing the normalized or percent change of the indicator. When all the normalized data points from each ray are connected, the resulting amoeba shape represents visually the differences among time periods or between the current year and the expected baseline condition (fig. 6). No summary statistics or aggregate values are generated. Instead, the amoeba diagram is simply a graphical way to tell the stories of how a suite of indicators contribute to the overall status and trend of each wilderness quality and of wilderness character. Standard "plug-in" templates will be developed using data stored in Infra-WILD to automatically produce the appropriate amoeba diagram.

In addition to these amoeba diagrams of a legislative wilderness quality, it may be possible to develop specific amoeba diagrams or other syntheses of data to evaluate distinct parts of the definition of wilderness, specific stewardship concerns, or specific threats. For example, separate amoeba diagrams could be produced focusing on specific aspects of "motorized equipment and mechanical transportation," or on specific concerns with "urban proximate," large, or small wildernesses. Amoeba diagrams or other

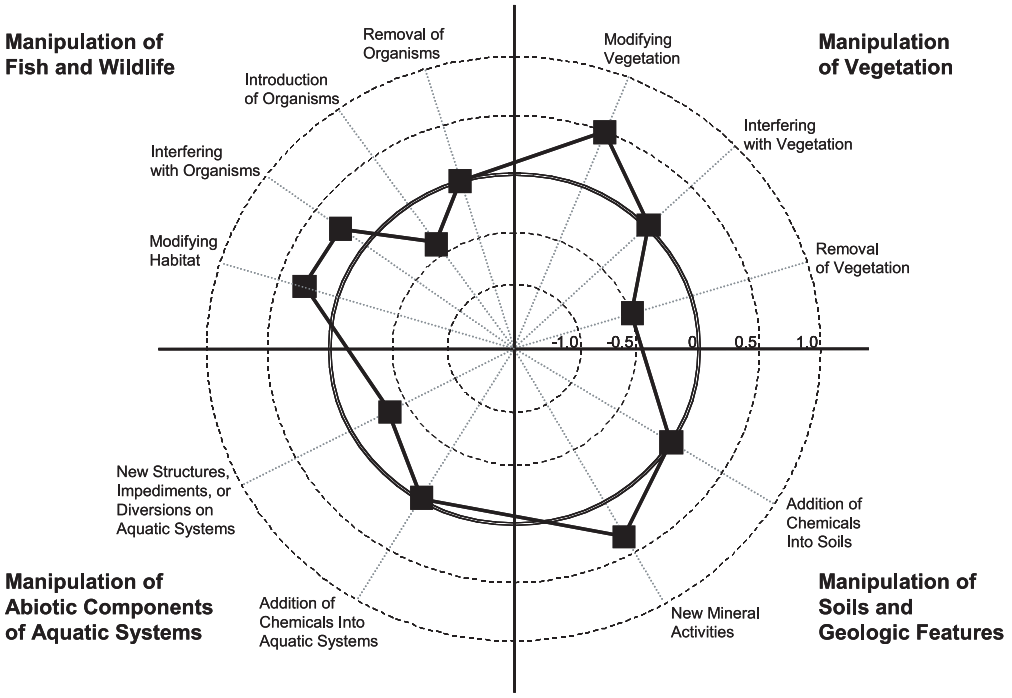

Figure 6—An example amoeba diagram for trends in the untrammeled quality of wilderness. The straight black lines divide the circle into four zones for each monitoring question under this untrammeled quality. Each concentric ring shows the normalized (or percent) change in each indicator (1.0 is 100 percent increase from the previous sampling period, 0.5 is a 50 percent increase, –0.5 is a decline of 50 percent, and –1.0 is a 100 percent decline). The thin double ring shows "no change," that is, 0 percent change in the indicator between monitoring periods. Each ray represents an indicator, and the normalized percent change of each indicator in this example is shown by the black squares in relation to the concentric rings. In this example, an increase in the percentage of "trammelings" represents a decrease in this untrammeled quality of wilderness. The heavy black line connecting the squares shows an overall graphic portrayal of the trends in this untrammeled quality.

syntheses of the normalized data could also be used to understand regional or national trends in how wildernesses are changing in relation to their own baseline. All data syntheses will be described in the *Technical Guide*.

4.2 Reporting on Current Status and Trends

The goal for reporting is to describe the current status and trends over time of the indicators, the monitoring questions, the four qualities related to wilderness character, and of wilderness character within an area as stable, improving, or degrading, compared to the baseline conditions in that area. In addition, reporting would offer detailed, site-specific information on the likely reasons and causes for the status and trends reported. To facilitate reporting, standardized database queries will be developed. Monitoring reports would not define or set recommended values or "desired future conditions" for the qualities of wilderness or for wilderness character because such standards would need to be developed through formal planning processes. Details of reporting frequency, organization, and content will be described in the *Technical Guide for Monitoring Selected Condition Related to Wilderness Character*.

The report's highlights or the whole report could be included in the monitoring and evaluation report issued by the National Forest, as required by planning regulations.

Furthermore, these compiled monitoring data may be useful for the annual "State of the Wilderness" report to Congress, as required by the 1964 Wilderness Act.

4.3 Using This Monitoring Information

This monitoring is a tool that will help managers improve wilderness stewardship by gathering and synthesizing information at the local, regional, and national levels about conditions and actions related to the central mandate of the 1964 Wilderness Act—preserving wilderness character. Information from this monitoring will help answer key questions about wilderness character and wilderness stewardship:

- What is the current state of wilderness character?
- How is wilderness character changing over time?
- How are stewardship actions affecting wilderness character?
- What stewardship priorities and decisions would best preserve wilderness character?

Forest Service national policy (Forest Service Manual 2320.6) directs managers to improve, or at least maintain, wilderness character relative to the conditions that existed at the time of designation. This monitoring provides local, regional, and national managers a way to assess whether or not wilderness stewardship programs are improving or maintaining conditions related to wilderness character over time and fulfilling agency policy. Each of the different components of this monitoring program (qualities, questions, indicators, and measures) reflects only part of the wilderness character in an area, and may not be sufficient on their own to evaluate change. Together, however, the "weight of evidence" from the compilation of multiple indicators should be sufficient to evaluate change and to identify where future stewardship efforts could be focused to "preserve wilderness character."

4.3.1 Using This Monitoring Information at the Local Level

For most wildernesses, the first time this Framework is applied the information will describe the "baseline" state of conditions related to wilderness character. With first-year monitoring information, managers will be able to examine only the status of individual indicators and use this information to inform decisions if locally-developed standards defining acceptable conditions have been established for some of the measures. However, with only baseline information it will not be possible to evaluate whether these conditions related to wilderness character are stable, improving, or declining. This monitoring will have greater value in subsequent years when it will be possible to evaluate how conditions related to wilderness character are changing over time. Trend information over 5 years or more and information that transcends the careers of individual wilderness managers will be especially powerful in efforts to preserve wilderness character. For example, knowing the number and type of actions taken to manipulate vegetation occurring now versus what will occur 10 years from now is a valuable indicator about whether management programs are trending toward more or less interference with natural processes. Similarly, knowing the number of campsites that exist today versus the number that will exist 5 years or more from now is a valuable indicator about whether the evidence of human occupation and modification is increasing or decreasing. Such trend information can be used to evaluate the effectiveness of existing stewardship programs and help prioritize what actions will most improve wilderness character.

This monitoring information will also be useful in other ways at the local wilderness level. Wilderness managers may use the logical structure of this Framework to organize NEPA documentation for proposed actions. For example, a manager may analyze the effects of a proposed action such as the use of prescribed fire on the untrammeled,

undeveloped, natural, and outstanding opportunities qualities of wilderness. By explicitly analyzing the effects of a proposed action on these qualities of wilderness, managers can make informed decisions that result in a net benefit to wilderness character. Additionally, this Framework can be used to develop wilderness direction and monitoring requirements in Forest Plans. For example, desired future condition direction could be described in terms of the desired untrammeled, natural, undeveloped, and outstanding opportunities qualities for the particular wilderness. Individual indicators and measures from this Framework could be incorporated into Forest Plan monitoring requirements along with additional monitoring requirements unique to each wilderness. For example, local managers could ask themselves, "Are we monitoring the right things?" and "What should we be monitoring?" in light of the qualities, questions, and indicators discussed in this Framework.

Monitoring information about locally important or place-dependent aspects of wilderness character is also important, and this Framework is intended to compliment—not replace—these local information needs. It is recognized that some wildernesses have insufficient resources for any monitoring, and in these cases this Framework will provide a minimum set of core information requirements.

4.3.2 Using This Monitoring Information at the Regional and National Level

At the regional and national level, the information from this monitoring Framework has two primary uses: to improve agency performance measurement, and to improve agency policy review and oversight to support wilderness stewardship needs at the local level.

- *Agency Performance Measurement.* Information from this monitoring Framework can be incorporated into agency performance measurement and reporting systems. To fulfill the mandate of the 1964 Wilderness Act to "preserve wilderness character," the agency needs to account for trends in wilderness character across National Forest System wildernesses. Having nationally consistent indicators allows compilation of trend information to produce simple graphic and narrative summaries showing the number of wildernesses in which wilderness character is stable, improving, or declining. The summary can also show which qualities are most significant in creating the overall trend picture for wilderness character. Simple displays that capture the essence of complex concepts offer a powerful communication tool for both "external" and "internal" uses. The "external" use would be reporting to Congress and other interested stakeholders on agency wilderness stewardship performance. This reporting could be built into a "State of the Wilderness" report and an annual report of the Forest Service. The "internal" use would be for agency evaluation of whether current priorities are appropriate and if the level of investment (funding, staffing, attention of leadership) is sufficient to meet the intent of Congress.
- *Agency Policy Review and Oversight.* Information from this monitoring Framework can be used to help evaluate if current wilderness management policy is fulfilling the mandate of the 1964 Wilderness Act to "preserve wilderness character." If wilderness character across the Forest Service is declining, a review of policy implementation may provide information on whether this decline is due to existing policies that are not being consistently implemented, or to existing policies that are consistently implemented but are insufficient to preserve wilderness character. For example, a widespread trend showing an increase in the number of administrative uses of motorized equipment could trigger a review about why this is occurring. Such a review could examine whether current policies are sufficient, examine the consistency of policy implementation, and assess the need for higher level direction to help stabilize or reverse the trend.

5. CHANGE MANAGEMENT: REVISING AND IMPROVING THIS MONITORING PROGRAM OVER TIME

A change management process to revise and improve this monitoring program over time will be described in detail in the forthcoming *Technical Guide* and will include the following topics:

- The need for a dedicated team responsible for overseeing the change management process and for reviewing and evaluating implementation of this monitoring.
- A regularly scheduled process for reviewing and evaluating the implementation and success of this monitoring program, including:
  - o Frequency of this review
  - o Appropriateness of the currently used legislated wilderness qualities, monitoring questions, indicators, and measures
  - o Need for changing or adding new monitoring questions, indicators, and measures and the process used to develop, test, and incorporate these
  - o Data collection, storage, and analysis procedures
  - o Peer and program review of the proposed revisions
- The circumstances that would trigger a special review of this monitoring program and the process, if different from the regular process, that would be followed to accomplish this review
- The potential for each Forest Service region or forest to supplement this wilderness monitoring Framework

A change management process is necessary in all monitoring programs, but especially so in this Framework because a national program to monitor selected conditions related to wilderness character has never been attempted before. The desire to change and improve on indicators and measures that have already been selected, however, needs to be tempered by the potential loss of compatibility between the new indicators and the old ones. Close interaction between managers and scientists will be needed to evaluate the effectiveness of this monitoring program, and for generating new research on the appropriateness and effectiveness of the four qualities of wilderness, monitoring questions, and the core indicators and measures (Landres and others 1994). Research will also be needed to gain better understanding of the experiences, meanings, and benefits associated with wilderness character and how these are affected by stewardship actions. And research will be needed to evaluate the statistical rigor and ability to make inferences from the data collected under this monitoring Framework.

6. APPENDICES

These appendices provide information that, while not crucial for understanding this conceptual Framework for monitoring wilderness character, is important for understanding the context of the monitoring terms and definitions used in this Framework, potential indicators being considered for development in the *Technical Guide*, how this monitoring fits within the broader the agency monitoring context, and how this Framework was developed and who developed it.

6.1 Monitoring Terms and Definitions

There are different definitions for "monitoring" but all convey the same basic elements: data are collected to answer particular questions; data are collected in a standardized, systematic fashion; and data are collected over time. A successful monitoring program is composed of four necessary components that drive one another (fig. 7). First, monitoring

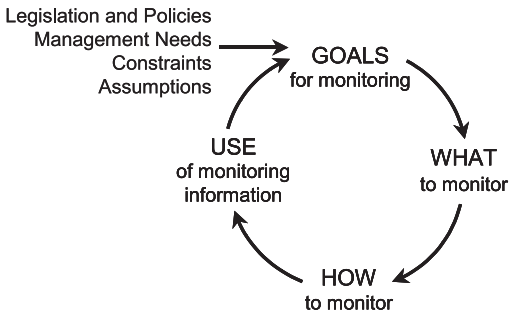

Figure 7—The four necessary elements of a monitoring program.

goals need to be established, with a clear explanation of how these are derived and their relevance to management. Second, these goals drive the selection of what will be monitored, allowing managers to evaluate accomplishment toward the goals. Third, standardized methods need to be developed and tested for how these indicators will be monitored—that is, collecting the data. And fourth, standardized methods need to be developed and tested for analyzing, reporting, and using the resulting data.

Wright and others (2002) discuss the nuances of many terms commonly used in monitoring programs. They recommend the phrase *reference value* as the most inclusive and general term for giving "a point of reference to help interpret what we know about an indicator … to help us assess whether we are moving forward in the desired direction." In contrast, this monitoring protocol uses the term *baseline* because it conveys the specific sense of "initial conditions" from which long-term trends in the four qualities of wilderness may be evaluated.

Several other commonly used terms are not used in this monitoring Framework. *Standard* is an agreed upon measurable target, often defined in a Forest Plan, and may define a legal or regulatory target. Standards are based on a unique combination of legislative direction, ecological and cultural setting, public discussion, and administrative direction for a specific area. Therefore, this monitoring Framework does not propose or endorse any national standards for measures associated with the qualities of wilderness. *Benchmark* is a "point of reference against which a measurement can be made and against which others may judge progress" (Wright and others 2002). While this term does convey the notion of "initial conditions," it also is commonly used in the sense of a "guidepost" to assess progress toward some desired future condition, and therefore it was deemed inappropriate for this Framework. *Trigger* and *threshold* are used to denote a specific condition that, when reached, causes a specific action to occur. Triggers and thresholds are not appropriate in this national Framework for two reasons: this Framework assesses long-term trends and does not determine the actions that occur as a result of these trends, and similar to standards, they must be determined at the level of the individual wilderness.

6.2 Monitoring Questions, Potential Core Indicators, and Potential Core Measures

As explained in *Section 2.2 The Logical Basis for Monitoring Conditions Related to Wilderness Character,* each of the four qualities derived from Section 2(c) of the Wilderness Act is progressively divided into a set of monitoring questions, potential core indicators, and potential core measures. Each of these phrases has a specific meaning in this monitoring Framework:

- *Monitoring questions* are the relatively distinct components contained within each of the qualities of wilderness. These questions reflect the best professional judgment of the Forest Service Wilderness Monitoring Committee about the

components that directly relate to the statutory language in Section 2(c) of the Wilderness Act and that may be practically monitored. Although the phrase "monitoring questions" is used in this Framework for conformance with other Forest Service monitoring protocols, each question is functionally equivalent to what is often considered a monitoring goal or "endpoint" as described by Failing and Gregory (2003).

- *Core indicators* are the types of information used to answer each monitoring question. In this national monitoring Framework, each wilderness would be required to report on the status of each core indicator. Further discussion about these core indicators is presented in *Section 6.2.1* below.
- *Core measures* are the types of numeric values that are measured or derived to quantify the indicator. These data will be reliable (that is, different people, when trained, would collect the same data), practical (the data are easy and cheap to collect), and repeatable (data collection is standardized over time and across all National Forest System wildernesses). Core measures will be developed in the forthcoming *Technical Guide to Monitoring Selected Conditions Related to Wilderness Character* and are not reported here.

6.2.1 Further Discussion About Core Indicators

Monitoring programs often use the term "variable" to describe the type(s) of information required to answer specific monitoring questions. In contrast, "indicator" is purposefully used in this Framework. The term "indicator" is used when the actual variables of interest are too difficult or costly to monitor or when it is uncertain exactly what types of information are needed to answer the monitoring question (National Research Council 2000, Dale and Beyeler 2001). There is little existing guidance on the types of information needed to answer the monitoring questions posed in this Framework and on the relationship between these questions and the qualities of wilderness. The term "indicator" is therefore more appropriate for this monitoring framework.

The indicators used in this Framework are surrogates that estimate conditions related to wilderness character based on best professional judgment and the available scientific literature. Each indicator reveals a relatively small and partial understanding about the quality of wilderness. Change in an indicator is foremost a red flag for further investigation, both about the conditions the indicator is tracking and about the appropriateness of the indicator and the quality of the data. Evaluating trends in a quality of wilderness should be based on how the set of all indicators is changing, rather than change in any one indicator (Failing and Gregory 2003). The indicators currently in the Framework are a first iteration that will be revised over time, and new indicators and measures will be developed based on experience from this monitoring effort and new research. These indicators will likely be most effective for evaluating change over relatively long periods.

Using four relatively discrete qualities of wilderness means that some indicators could fit under more than one quality. For example, a dam and its effects could be monitored under all four qualities:

- "Untrammeled" – because the dam was built to manipulate water flows inside wilderness.
- "Natural" – because the dam causes ecological impacts to natural streams.
- "Undeveloped" – because the "dam is an imprint of man's work."
- "Outstanding opportunities" – because the dam may interfere with the outstanding opportunity visitors have to experience a primitive recreation environment.

Such crosscutting indicators are not intended to be more important than any other indicator within this monitoring Framework. Instead, such crosscutting indicators reflect

the holistic nature of wilderness character. In some cases an indicator may be placed under just one quality if it appears directly and primarily connected to it. In other cases, an indicator may be placed in more than one quality to monitor subtle differences among the different qualities. For example, in the case of dams, the action to build a dam is monitored in the untrammeled quality, the ratio of stream miles to number of dams is monitored as a surrogate for the ecological effects of dams, the presence of the dam as a structure is monitored in the undeveloped quality, and its presence would also affect the amount of area free of development under the outstanding opportunities quality.

6.2.2 Criteria for Selecting Core Indicators

Indicators were selected by applying nine criteria, grouped into four broader categories of feasibility, significance, responsiveness, and credibility. The categories and criteria used in selecting indicators are:

Feasibility
- *Affordable*: the indicator is relatively inexpensive to monitor or data for it already exist.
- *Practical*: the indicator does not cause a significant increase in workload or require significant funding and skill levels.

Significance
- *Useful*: the indicator has value and meaning for the quality of wilderness that can be applied to all National Forest System wildernesses, and it has value and meaning to managers of an individual wilderness.
- *Explainable*: the indicator and its value toward assessing the quality of wilderness are explainable to a layperson.

Responsiveness
- *Responsive*: the indicator responds readily to management actions.
- *Free from environmental variation*: the indicator is relatively free from environmental variation and changes in the indicator can be reasonably attributed to the effects of modern people or management actions.

Credibility
- *Measurable*: the indicator can be measured accurately with a high degree of confidence.
- *Reliable*: the indicator yields the same result when measured by different people when conditions are the same.
- *Repeatable*: the indicator yields the same result when measured over time and across different wildernesses when conditions are the same.

While an attempt was made to maximize application of all the criteria in choosing each indicator, feasibility criteria were generally given the most weight. Giving feasibility the most weight means that only a small number of indicators will be used for any given monitoring question. For example, under the natural quality, only a few of the many different indicators used to monitor air quality related values are initially recommended for monitoring because data are already being collected for them in many wildernesses, and equal-value isogram lines may be used to interpolate data for all other National Forest System wildernesses across the United States.

Some indicators were selected because they were considered critical to wilderness character even though they may not be entirely under the control of Federal land managers. Light pollution that degrades night sky related values, for example, may be considered a component of the natural quality of wilderness. It is important to report on the trends in these indicators over time because they may reflect broad, regional impacts to the local wilderness character regardless of managers' ability to alter those trends. In

addition, monitoring these external factors is sometimes a good and less expensive proxy for measuring the actual quality within wilderness.

The desired or needed level of certainty of monitoring data, determined in large part by the purpose for which the information will be used, strongly affects selection of indicators. Highly contentious issues, for example, require highly accurate and precise data to answer very specific questions, in turn requiring indicators and sampling methods of typically great cost. By carefully selecting indicators that provide general information on national trends in the wilderness qualities, this national monitoring program strives to reduce costs by optimizing certainty and feasibility. For example, as described in the next section, actions that manipulate plants and animals are used as an indicator of impacts to the untrammeled quality of wilderness, providing data of relatively high certainty and low cost.

6.2.3 Table of Monitoring Questions and Potential Core Indicators

Each quality of wilderness and its related monitoring question(s) and potential core indicators are presented in the hierarchical table on page 31. The potential core indicators described in this table are merely illustrative and not final because they will certainly change based on the work of the subject-matter experts and their associated Technical Teams who are developing the *Technical Guide for Monitoring Conditions Related to Wilderness Character*. For example, the indicators currently are not structured or worded to be consistent in their directionality, as they will be in the *Technical Guide*.

Under the "monitoring question" column, italics clarify and emphasize how specific monitoring questions under each quality differ from one another. Under the "potential core indicator" column, examples, in italics, are given in some cases to clarify the specific types of indicators that would be monitored; these examples are meant to be illustrative, not exhaustive. Potential core measures are not reported in this table because the Technical Teams will develop them.

6.3 The Context of Agency Wilderness Monitoring

The need for a national program of wilderness monitoring within the Forest Service and the other wilderness managing agencies has long been recognized. Since 1985, there have been five formal recommendations calling for improved wilderness monitoring, and two task forces charged with developing wilderness monitoring direction. Several of these efforts were in response to a Government Accounting Office (1989) report on Forest Service wilderness management, which found that the agency could not assess the status and trends of wilderness conditions because of a lack of monitoring. Cole (1990), reviewing the status of wilderness management since passage of the Wilderness Act in 1964, concluded that monitoring, along with other actions, was needed for "professional wilderness management." Recently, the Forest Service wilderness agenda and action plan "Thinking Like a Mountain" (USDA Forest Service 2000) identified wilderness monitoring as one of the top three priorities for improving the agency's capacity for wilderness stewardship. Similarly, the blue-ribbon panel report "Ensuring the Stewardship of the National Wilderness Preservation System" (Pinchot Institute 2001) identified wilderness monitoring as one of four key recommendations to improving wilderness stewardship. Despite all these calls for wilderness monitoring and the work of two task forces, no national program of wilderness monitoring has yet been developed.

6.3.1 How This Effort Is Different From Previous Agency Wilderness Monitoring Efforts

This current effort is different from past agency efforts to develop wilderness monitoring in four important ways. These differences are partly due to different

Quality of Wilderness	Monitoring Question	Potential Core Indicator
"Untrammeled" – wilderness is essentially unhindered and free from modern human control or manipulation	What are the status and trends of intentional modern human controls or manipulation of wilderness?	Actions that control or manipulate *(for example, actions that ignite fire, mechanically reduce fuels, physically remove plants or animals, introduce plants or animals, amend soil or water, apply herbicides or pesticides, control flooding)*
		Suppressed natural fire starts
"Natural" – wilderness ecological systems are substantially free from the effects of modern civilization	What are the status and trends of *human threats to natural conditions?*	Pollutants that degrade air quality and air quality related values that affect plants, animals, soil, water *(for example, ozone and wet deposition)*
		Developments that degrade the free-flowing condition of rivers and streams *(for example, dams)*
		Nonnative species that alter the composition of natural plant and animal communities *(for example, nonnative plants, animals, fish, livestock, invertebrates, and pathogens)*
		Light pollution that degrades night sky quality and night sky quality related values
	What are the status and trends of selected *biophysical conditions and processes sensitive to human threats?*	Visibility *(for example, anthropogenic fine nitrate and sulfate, deciview)*
		Water quality
		Ecosystems, plant communities, and plant species that are rare or at risk
		Fire regime *(for example, fire regime condition classes)*
"Undeveloped" – Wilderness is essentially without permanent improvements or modern human occupation	What are the status and trends of *physical evidence of modern human occupation or modification?*	Evidence of physical developments *(for example, buildings, system trails and major trail features, dams & other in-stream structures, roads, utility infrastructure)*
	What are the status and trends of the *use of motorized equipment and mechanical transport?*	Mechanical transport and motorized equipment use authorizations
"Outstanding opportunities for solitude or a primitive and unconfined type of recreation" – Wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge.	What are the status and trends of outstanding opportunities for *solitude?*	Remote, trailless wilderness *(for example, amount of wilderness more than ¼ mile from open trail or road)*
		Wilderness visitation *(for example, wilderness users within the primary service area)*
	What are the status and trends of outstanding opportunities for *primitive recreation?*	Creature comforts *(for example, amenities provided by management such as toilets, shelters, developed water sources, developed campsites)*
		Trail development level *(for example, amount of trails in primitive condition classes)*
	What are the status and trends of outstanding opportunities for *unconfined recreation?*	Management restrictions on visitor behavior *(for example, permits, fees, quotas, regulations)*

circumstances within the Forest Service now compared to when previous wilderness monitoring efforts were undertaken, and partly due to choices made during the development of this Framework. Collectively, these differences improve the chances of successfully developing and implementing a national program to monitor selected conditions related to wilderness character:

- This Framework focuses on a relatively small number of indicators that are cost effective and explicitly related to the qualities of wilderness. Unlike previous monitoring efforts that developed extensive lists of conditions that could be monitored within a wilderness, the indicators within this Framework use data that are already being collected within the Forest Service or are available nationally.
- This Framework is focused on *implementing* a program of wilderness monitoring. Consequently, the Committee developing this Framework is composed largely of field-level wilderness staff and representatives of key Forest Service national monitoring programs. These two groups, respectively, ensure practical and relevant management application of this monitoring Framework and facilitate integration of wilderness monitoring across agency organizational levels and resource programs.
- This Framework is directly tied to several agency monitoring programs, such as the Infrastructure Project, the Natural Resource Information System, and Forest Inventory and Analysis. These programs are actively seeking to integrate wilderness information needs into their programs, just as the wilderness program is seeking to use information from these other programs
- This Framework evaluates trends in conditions related to wilderness character at the level of an individual wilderness and compiles this information up to the forest, regional, and national levels. Consequently, instead of offering a variety of monitoring methods that individual wildernesses may choose from, the forthcoming *Technical Guide* will describe standardized techniques that are applied consistently across all National Forest wildernesses.

6.3.2 How This Effort Fits With Agency Policy, Forest Planning, and Budget and Accountability Systems

This monitoring is consistent with existing Forest Service policy. Protecting and perpetuating wilderness character is a national wilderness management objective (Forest Service Manual 2320.2, No. 4), and this monitoring enables managers to determine if wilderness character is stable, declining, or improving over time (Forest Service Manual 2320.6).

With approximately 75 percent of National Forests containing wilderness, a similar percentage of Forest Plans contain wilderness management direction. Although the Framework can be implemented without Forest Plan amendment or revision, few current Forest Plans use wilderness character to describe the desired future condition, standards, or monitoring requirements. This monitoring Framework provides forests with the conceptual basis to amend or revise Forest Plans with a focus on this core wilderness stewardship responsibility.

Although the Forest Service's new 10-Year Wilderness Stewardship Challenge and current budget and performance accountability processes do not directly address wilderness character, there is overlap between these efforts and this monitoring. In the short term, implementation of this monitoring will provide useful information for these efforts. In the long term, this monitoring will allow the Forest Service to explicitly address preservation of wilderness character in budget and accountability systems.

6.3.3 Integrating This Effort Within the Forest Service and With Other Federal Agencies

This effort to monitor selected conditions related to wilderness character is integrated within a broader movement to refine and focus inventory and monitoring activities across the Forest Service. This effort is integrated with these larger efforts in several ways. First, the Washington Office Wilderness & Wild and Scenic Rivers staff and Ecosystem Management Coordination staff chartered the Committee developing this Framework. Second, key representatives from Forest Service national inventory and monitoring staffs directly participated in developing this Framework. Third, when completed, this wilderness monitoring will be incorporated into agencywide Inventory and Monitoring Program Plans. And fourth, this Framework document and the forthcoming *Technical Guide* follow a standard template used by other monitoring "protocol development teams" and will become part of the Forest Service directives system.

The other wilderness managing agencies (Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service) are integrated into this Forest Service effort to monitor selected conditions related to wilderness character. All wildernesses, regardless of which agency administers them, are part of a single National Wilderness Preservation System. Although each of the wilderness-managing agencies has a unique culture and set of traditions, as well as unique needs for monitoring wilderness, all share the same legal responsibilities under the Wilderness Act of 1964 and subsequent wilderness legislation. Representatives from each of the other agencies have been active members of the Forest Service Wilderness Monitoring Committee making significant contributions to this Framework. This participation ensures ongoing interagency communication, with the intent of eventually developing a monitoring program that could be applied across the entire National Wilderness Preservation System.

6.4 The Process Used to Develop This Framework

This monitoring Framework was developed over 2 years of biannual Committee meetings, monthly conference calls, two formal reviews, and many informal reviews. Many different monitoring needs and tasks were identified at the first face-to-face meeting of the Committee. From among all the tasks and needs that were identified, the Committee decided to focus on two parallel efforts: (1) develop better integration between the wilderness program and other resource programs to capitalize on the monitoring that was already being conducted inside wilderness, and (2) develop a new protocol to monitor wilderness character because this is what is truly unique in wilderness, and no other resource program has direction to monitor it.

Initially, a subgroup of the Committee worked to craft the general direction of this Framework document. As the Framework matured, the entire Committee became involved, and work on this document has to date dominated the time and energy of the Committee.

Two specific projects were undertaken and completed to provide background information for developing this Framework. First, the Committee conducted an exploratory survey in spring 2002 to evaluate the types of monitoring currently being conducted in all National Forest System wildernesses. This survey showed there was a lot of resource-specific monitoring, especially related to recreation, but no systematic monitoring of conditions specifically related to wilderness character. The second project was to develop specific questions about the Committee's interpretation of wilderness legislation in crafting the conceptual foundation for this monitoring program. The Committee solicited informal opinions on these questions from several lawyers familiar with wilderness legislation and judicial decisions regarding this legislation. In all cases, the Committee's interpretation was supported by these informal opinions.

The Committee adopted a two-phase review strategy. The purpose of the first review, conducted in the fall of 2002, was to solicit comments from a relatively small group of individuals intimately familiar with wilderness and its management. Responses were received from 37 individuals: 13 from Forest Service personnel; nine from agency, academic, and nongovernmental organization scientists; seven from the National Park Service; three from the Fish and Wildlife Service; and one from the Bureau of Land Management. Three Committee members individually reviewed all responses to ensure that a particular concern or nuance of a concern wouldn't be missed if just one person reviewed the responses. All together, approximately 420 person-hours were spent reviewing and discussing these comments. Personal responses were sent to each reviewer with the decision of how the Committee would address each of their comments. The purpose of the second review, conducted during the summer of 2004, was to solicit comments from across the entire Forest Service, including all staff areas in National Forest Systems and Forest Service Research and Development.

In addition to these formal reviews, many informal reviews and discussions took place over the course of developing this Framework. Both formal and informal reviews and discussions greatly helped the Committee craft the final concepts presented in this Framework.

6.5 The Forest Service Wilderness Monitoring Committee

The Forest Service Wilderness Monitoring Committee was chartered in the spring of 2001 by two Washington Office staff groups. The Committee is composed primarily of staff with direct field experience managing wilderness, and together, Committee members have a cumulative 130 person-years of experience directly managing wilderness. The Committee also includes representatives from Washington Office monitoring staffs and from the other Federal wilderness managing agencies to ensure two-way communication. The Committee is composed of:

- *Chris Barns*, Bureau of Land Management Representative to the Arthur Carhart National Wilderness Training Center, Missoula, MT
- *Steve Boutcher*, Committee co-chair, Wilderness Information Manager, Washington Office-Remote, South Burlington, VT
- *Beth Boyst*, Wilderness Specialist, White River National Forest, Minturn, CO
- *Denis Davis*, Strategic Planner, National Park Service Intermountain Regional Office, Denver, CO
- *Troy Hall*, Associate Professor, Department of Conservation Social Sciences, College of Natural Resources, University of Idaho, Moscow, ID
- *MaryBeth Hennessy*, Wilderness Management, Inyo National Forest, Bishop, CA (no longer active on the Committee)
- *Steve Henry*, Ecologist, U.S. Fish and Wildlife Service Charles M. Russell National Wildlife Refuge, Lewistown, MT
- *Brad Hunter*, Wilderness and Developed Recreation Manager, Tongass National Forest, Petersburg, AK
- *Patrice Janiga*, Assistant Director Design and Quality Assurance, Forest Service Inventory and Monitoring Institute, Fort Collins, CO
- *Mark Laker*, Ecologist, U.S. Fish and Wildlife Service Kenai National Wildlife Refuge, Soldotna, AK (no longer active on the Committee)
- *Peter Landres*, Committee co-chair, Research Ecologist, Aldo Leopold Wilderness Research Institute, USDA Forest Service Rocky Mountain Research Station, Missoula, MT

- *Al McPherson*, Wilderness and Trails Program Manager, George Washington and Jefferson National Forests, Roanoke, VA
- *Linda Merigliano*, Recreation/Wilderness/Trails Program Manager, Bridger-Teton National Forest, Jackson, WY
- *Doug Powell*, National Monitoring and Evaluation Coordinator, Washington Office, Washington, D.C.
- *Mike Rowan*, Resource Assistant, Naches Ranger District, Okanogan-Wenatchee National Forest, Naches, WA
- *Susan Sater*, Wilderness, Wild and Scenic Rivers Program Manager, Pacific Northwest Region, Portland, OR

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