



Report on the 2011 Wilderness Fellow Initiative

Implementing Wilderness Character Monitoring
in the U.S. Fish & Wildlife Service
National Wildlife Refuge System



FEBRUARY 2012

"It was refreshing to just establish a baseline and to now have something to work from and not dip below. This was a great opportunity to focus on an important part of the refuge in a new way." – Virginia Rettig, refuge project leader, Edwin B. Forsythe National Wildlife Refuge

"I think it's great and it sent a message about the Fish & Wildlife Service's commitment to wilderness. I hope that someday, in the not too distant future, we can speak on a national level, regardless of agency, about wilderness character trends." – Steve Henry, deputy project leader, Great Swamp National Wildlife Refuge

Prepared by

Peter Landres

Aldo Leopold Wilderness Research Institute

Erin Clark

2011 Wilderness Fellow

Contents

Executive Summary	3
Introduction	4
Background	6
Process.....	7
Results.....	10
Did it work?	10
What did refuges choose to monitor?	12
Was it worthwhile?	15
Recommendations	18
Wilderness Character Monitoring in the NWRS	18
Wilderness Fellows Initiative	20
Appendix A. Summary of participating national wildlife refuges.....	24
Appendix B. Summary of wilderness character monitoring measures by refuge	32
Table 1. Number of wilderness character monitoring measures by refuge.....	32
Table 2. Measure monitoring frequencies by refuge	32
Table 3. Hours of effort expended by Wilderness Fellows and Refuge Staff.....	33
Appendix C. Summary of wilderness character monitoring measures by wilderness quality.....	34
Undeveloped monitoring measures.....	34
Untrammeled monitoring measures	35
Solitude or primitive recreation monitoring measures.....	36
Natural monitoring measures	37
Appendix D. Summary of refuge project leader responses to debriefing questions	39

Executive Summary

This report summarizes the background, process, results, lessons learned, and recommendations from the 2011 Wilderness Fellows Initiative. This initiative was a new effort of the U.S. Fish & Wildlife Service to preserve the character of wilderness by assessing trends in wilderness character in the National Wildlife Refuge System (NWRS). Two questions have been used to frame the success of this initiative—"Did it work?" and "Was it worthwhile?"

Did it work?

The NWRS hired 10 Wilderness Fellows who established wilderness character monitoring protocols at 18 national wildlife refuges, representing 29% of the NWRS refuges with designated wilderness. An average of 32 wilderness character monitoring measures were developed for each national wildlife refuge.

72% of refuge managers that participated in the initiative believe that the baseline assessment of wilderness character developed reflects what's happening on the ground in their refuge wilderness. Furthermore, 89% of refuge leaders indicated that participating in the Wilderness Fellows Initiative increased their staff's wilderness and wilderness character awareness. More than three-quarters also indicated that wilderness character monitoring will likely have a future impact on refuge wilderness stewardship and refuge operations.

Was it worthwhile?

83% of refuges that participated in the 2011 initiative indicated that monitoring the trend in wilderness character is worth their time and effort. Refuge project leaders indicated that they are, or are intending to, widely use the initiative produced information. Wilderness Fellows contributed to the refuges in valuable and unexpected ways from producing content for Comprehensive Conservation Plans to providing outreach to external organizations interested in wilderness stewardship.

The implementation of this initiative also resulted in a significant set of recommendations that are relevant to both the future of wilderness character monitoring in the NWRS and the Wilderness Fellows Initiative. These recommendations include:

- Continuing the Wilderness Fellows Initiative to perpetuate an understanding that wilderness and refuge purposes are integrated. It also ensures meeting the goal of establishing wilderness character protocols at all national wildlife refuges with designated wilderness by 2014.
- Developing and distributing a national wilderness character monitoring strategy for the NWRS.
- Substantially improving the Wilderness Character Monitoring database to maximize functionality.
- Addressing refuge concerns about how wilderness character monitoring data will be used beyond local refuge wilderness stewardship decisions.
- Ensuring that refuge project leaders have an accurate understanding of the effort required to establish and continue wilderness character monitoring.

In conclusion, the 2011 initiative developed a baseline understanding of wilderness character at more than a quarter of national wildlife refuges with wilderness, helped these refuges to understand how stewardship decisions and actions influence trends in wilderness character, and developed a comprehensive and systematic approach for evaluating wilderness character. The continuation of this initiative would enable the NWRS to ensure the development of wilderness character monitoring measures at all refuge wildernesses, a critical step in meeting the Service's policy mandate to preserve wilderness character.

Introduction

Wilderness in the National Wildlife Refuge System



"Refuges are home to some of the nation's most treasured, iconic and rare wildlife and wilderness."

– U.S. Fish & Wildlife Service's *Conserving the Future: Wildlife Refuges and the Next Generation*

This report summarizes the background, process, results, and recommendations from the 2011 Wilderness Fellows Initiative. This initiative is a new effort of the U.S. Fish & Wildlife Service to preserve the character of designated wilderness by assessing trends in wilderness character in the National Wildlife Refuge System (NWRS).

As of 2011, the National Wilderness Preservation System consisted of 109.5 million acres with nearly 21 million of these acres within the NWRS. The Wilderness Act of 1964 established the legal foundation to designate land as wilderness and, in the Statement of Policy, Section 2(a) the basis for stewardship of wilderness, stating 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."

U.S. Fish & Wildlife Service policy (Wilderness Stewardship Policy, 1.17 A) similarly mandates that all refuges with wilderness preserve wilderness character: "The wilderness portion of a refuge is encompassed both within the Refuge System and the National Wilderness Preservation System. Refuge System laws, regulations, and policies apply to refuge wilderness, but we carry them out in ways that *preserve wilderness character* and comply with the Wilderness Act's prohibitions."

Prior to the Wilderness Fellows Initiative, the U.S. Fish & Wildlife Service had not undertaken any refuge system-wide efforts to assess whether wilderness character was being preserved. A successful Wilderness Fellows Initiative initiated by the National Park Service in 2010 provided a model for the NWRS Wilderness Fellows Initiative, which was implemented in 2011 by NWRS Inventory and Monitoring. The initiative assessed baseline conditions of wilderness character. These assessments will allow refuges to monitor trends in wilderness character in future years providing many benefits, including:

- *Understanding how stewardship decisions and actions influence trends in wilderness character.* There are tradeoffs in almost all aspects of wilderness stewardship. Evaluating trends in wilderness character helps staff determine priorities for what should be done where.

- *Providing a set of key wilderness stewardship goals.* Wilderness stewardship has historically been limited by subject assessments and uncertainty about what should, or should not, be done. Wilderness character helps link management actions—or lack of actions—directly to the legislative direction of the 1964 Wilderness Act and refuge purposes.
- *Providing a comprehensive and systematic approach.* This approach may be used in evaluating impacts in project planning, thereby improving accountability, transparency, and defensibility. It also addresses emerging information needs associated with the challenges of managing refuges in the face of climate change and other stressors, such as habitat fragmentation and contaminants. The Service's vision document, *Conserving the Future: Wildlife Refuges and the Next Generation*, emphasizes the importance of wilderness. "There is no better place to monitor environmental change than in wilderness... Because wilderness areas emphasize natural conditions, they can serve as baseline or reference areas to be compared with similar ecosystems undergoing active management. Natural processes predominate without human intervention in wilderness areas, making these areas an important component in a national strategy for monitoring long-term ecological change, such as climate change."
- *Creating a legacy of staff experience and knowledge about a wilderness.* Such a legacy may be the only means for documenting and understanding the changes that are occurring in a wilderness and its stewardship over time. This legacy is especially important with staff turnover and the increasing pace of environmental and social change.

The Wilderness Fellow Initiative is also a collaboration with other FWS initiatives (particularly Inventory and Monitoring), federal agencies, and conservation organizations. The Wilderness Fellows Initiative is an extension of the partnership with the National Park Service's Inventory and Monitoring Program.

Background

In 2006, an interagency team was formed to develop a strategy that would standardize wilderness character monitoring across all four wilderness managing agencies. This team, which consisted of two representatives each from the BLM, FWS, FS, NPS and one representative from the USGS, published in 2008 the Technical Report *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System*.

In 2010, the NWRS chartered the Wilderness Character Monitoring Committee to establish wilderness character monitoring standards consistent with the National Wildlife Refuge System Inventory and Monitoring Strategy. The committee was tasked with ensuring that NWRS wilderness character monitoring is purposeful, practical, and cost effective. The Committee developed the Wilderness Fellows Initiative to accomplish these goals and adopted the *Keeping It Wild* framework to guide the work of the Fellows.

Keeping It Wild defines four qualities of wilderness character: untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreation. Two or more indicators are used to describe each of these qualities in greater detail. There are a total of thirteen indicators, and each wilderness identifies at least one locally relevant measure for each indicator. This strategy allows national consistency (all refuges use the same four qualities and 13 indicators) while maintaining local flexibility—refuges independently develop their own measures and protocols. *Keeping It Wild* also provides a framework for evaluating trends in wilderness character, which should be assessed once every five years based on change within the wilderness.

The Wilderness Fellows Initiative utilized a Wilderness Character Monitoring Database, which was built in Microsoft Access. The database houses all data collected at the refuge level and is capable of calculating wilderness character trends as outlined in *Keeping It Wild*. The database was developed through a collaboration of NWRS Inventory and Monitoring, the National Park Service Inventory and Monitoring Program, and the Aldo Leopold Wilderness Research Institute of the U.S. Forest Service. The database was developed with the intent of being used by all four wilderness managing agencies.

The national America's Great Outdoors program has encouraged all agencies to increase efforts to engage youth as users of federal lands and employees of federal agencies. The Wilderness Fellows Initiative represented an opportunity to recruit highly educated, passionate, young conservationists into the U.S. Fish & Wildlife Service. All Fellows hired are the product of either Masters or undergraduate programs in the environmental, biological, or natural resource sciences. Fellows expressed interest in potential employment with the U.S. Fish & Wildlife Service following their time as Wilderness Fellows. Their enthusiasm for the initiative is exemplified on the U.S. Fish & Wildlife Service webpage, "Youth in Natural Resources," where a Wilderness Fellow is highlighted in the "Spotlight on YOUTH" section (<http://www.fws.gov/refuges/about/youth.html>).

The Wilderness Fellows Initiative also represented an opportunity to further develop interagency coordination. By utilizing the *Keeping It Wild* strategy, the U.S. Fish & Wildlife Service created a diverse and robust set of wilderness character monitoring measure examples that can be referred to by other agencies and refuges who implement wilderness character monitoring.

Process

At the April 2011 meeting of the NWRS Wilderness Character Monitoring Team, a plan was developed to implement the Wilderness Fellows Initiative. Twenty potential refuges were identified and contacted for their interest and support. Each refuge was required to provide housing for their Wilderness Fellow for three months (either June-September or September-November 2011). Refuges with project leaders known as champions of wilderness were considered ideal candidates. The following refuges were ultimately selected to receive Wilderness Fellows:

Refuge	State	Wilderness Acres*
Agassiz	Minnesota	4,000
Becharof	Alaska	400,000
Cabeza Prieta	Arizona	803,418
Charles M. Russell (UL Bend)	Montana	20,819
Chassahowitzka	Florida	23,579
Edwin B. Forsythe	New Jersey	6,681
Fort Niobrara	Nebraska	4,635
Great Swamp	New Jersey	3,660
Havas	Arizona & California	17,801
Imperial	Arizona & California	15,056
Izembek	Alaska	300,000
Kenai	Alaska	1,354,247
Kofa	Arizona	516,200
Moosehorn	Maine	7,392
Okefenokee	Georgia	353,981
Red Rock Lakes	Montana	32,350
Seney	Michigan	25,150
Unimak	Alaska	910,000

* Represents only designated wilderness acres.

Outreach to recruit Wilderness Fellows occurred simultaneously with contacting potential refuges. Given the high quality of the National Park Service Wilderness Fellows in 2010, career offices at the universities attended by the NPS Fellows were targeted. This included Duke University's Nicholas School of the Environment, Yale School of Forestry and Environmental Studies, University of North Carolina, and University of Pennsylvania. Ten wilderness fellows were hired, one of whom was stationed at the NWRS Inventory and Monitoring offices in Fort Collins, Colorado. The Student Conservation Association (SCA) was contracted to handle all administrative aspects for the Wilderness Fellows.

Wilderness Fellows received three days of training in mid-June at the NWRS Natural Resource Program Center in Fort Collins. This training focused on the U.S. Fish & Wildlife Service mission, the Wilderness Act of 1964, the legal and policy mandates to preserve wilderness character, the Service wilderness policy, the concept of wilderness character, the national qualities and indicators of wilderness character, and the interagency wilderness character monitoring strategy described in *Keeping It Wild*. Fellows left the training with an understanding of the wilderness measures they were responsible for producing at each refuge and guidance on how to comport themselves as U.S. Fish & Wildlife Service employees and Wilderness Fellows. Throughout their six-month service, weekly conference calls with Peter Landres, Nancy Roeper (NWRS National Wilderness Coordinator), and Peter Dratch (Inventory and Monitoring Senior Biologist) were used to evaluate progress, discuss issues, and ask questions.

Fellows were given freedom to work how they best saw fit with refuge staff. On most refuges, Wilderness Fellows proceeded as follows:

1. *Gather information.* Upon arriving at a refuge, a Wilderness Fellow gathered background information on the refuge's wilderness by reading materials provided by refuge staff, which often included a Comprehensive Conservation Plan, Wilderness Management Plan(s), and any available historical wilderness documentation. Wilderness Fellows also spent significant time with refuge staff (in the office or the field) discussing staff perceptions of wilderness and potential monitoring measures.
2. *Identify and draft measures.* The Wilderness Fellow drafted a recommended set of monitoring measures, making sure to provide at least one measure for each of the indicators identified in *Keeping It Wild*.
3. *Review draft measures.* Refuge staff reviewed recommended measures. Wilderness Fellows facilitated the review either by holding a group meeting for all invested refuge staff or reviewing the measures in one-on-one or small meetings with those members of the staff most invested in the wilderness character monitoring process (most often this was the refuge project leader, deputy leader, and/or a wildlife biologist). Wilderness Fellows guided refuge staff in vetting measures using a method developed by the National Park Service that took into account the significance, vulnerability, feasibility, and reliability of each proposed measure. This method allowed some measures to be eliminated and remaining measures to be given priority rankings.
4. *Select final measures.* Refuge staff who would ultimately be responsible for providing data for each measure vetted all potential measures. Measures were eliminated if data was deemed too difficult or costly to obtain. Wilderness Fellows emphasized to refuge staff that measures should only be selected if supported by data that was already being collected, available nationally, or could be acquired using minimal additional resources. The definition of each measure and measure data source were detailed. Wilderness Fellows were empowered to collect or evaluate data themselves. In other cases, refuge staff provided the data for measures.
5. *Enter information into the database.* Once a measure was defined and data were made available, Wilderness Fellows input all information into the Wilderness Character Monitoring database.
6. *Produce a final report.* Once the data for all measures was gathered and input in the database, Wilderness Fellows compiled a final report for the refuge that summarized all measures selected and detailed the relevance, background, data source, definition, and frequency of data collection for each measure. This report also described measures which had been considered, but ultimately were not included. The refuge project leader and anyone else at the refuge who supervised the Wilderness Fellow's work reviewed the final report. Refuge leadership decided whether to distribute the final report to selected or all refuge staff, other agencies, advocacy groups, and refuge partners.

In December 2011 and January 2012, Wilderness Fellow Erin Clark interviewed project leaders at all participating 2011 Wilderness Fellows Initiative refuges via telephone. The purpose of the personal interviews was to learn their impressions of the initiative, understand how they intend to use the information produced, and to gather their recommendations for future initiative implementation. Conversations lasted approximately 30 minutes and 14 questions were asked that addressed whether the initiative worked and whether it was worthwhile from the refuge perspective. Project leaders were also given the opportunity to provide unstructured comments. In several instances, project leaders insisted that other members of their staff be contacted, specifically a wildlife biologist and deputy project leader.

Here are the questions that were asked during the debriefing interviews:

Did it work?

- Did this baseline assessment of wilderness character reflect what you feel is happening on the ground at your refuge?
- Did this monitoring help you and your staff have a better understanding about wilderness and wilderness character?
- Would monitoring this set of measures provide information to help improve wilderness stewardship on your refuge?
- Would a better understanding about wilderness character and how it is changing over time affect refuge operations?
- Was it worthwhile to have a Wilderness Fellow complete this effort instead of your own staff?
- Were your expectations of the initiative and of your Wilderness Fellow fulfilled?
- Will your staff be able to continue monitoring the measures in 2012 and beyond?
- Was the duration of the Wilderness Fellow's stay at your refuge appropriate?
- Were there surprises or impediments to accomplishing the work of the Wilderness Fellow?

Was it worthwhile?

- Is monitoring the trend in wilderness character worth your time and effort?
- What were the benefits of having a Wilderness Fellow at your refuge?
- Do you plan to use the information produced by the Wilderness Fellow (ex. CCP, refuge I&M plans, step-down plans, MRAs, share with public, share with partners)?
- Do you have any lessons learned to offer to future Wilderness Fellows?
- Do you have any lessons learned to offer to future refuges participating in the initiative?

Results

Results from the Wilderness Fellows Initiative are presented in three sections—“Did it work?”, “What did refuges choose to monitor?” and “Was it worthwhile?” The first and third sections correspond with the questions that were asked in the initiative’s debriefing interviews, as well as feedback received from Wilderness Fellows. The second section summarizes the measures refuges chose to monitor.

Did it work?

- 1. Wilderness character monitoring measures were developed for 18 national wildlife refuges, representing 4.5 million acres of designated wilderness.**

The 2011 Wilderness Fellows Initiative established wilderness character monitoring measures at 18 refuges, 29% of the NWRS refuges with designated wilderness. This represents 23% of the total NWRS wilderness acreage.

An average of 32 wilderness character monitoring measures were developed for each national wildlife refuge. The fewest measures established at any refuge was 23 and the largest set of measures was 48. There was no correlation between the number of measures selected by a refuge and the size of the refuge’s wilderness. Across the 18 participating refuges, 269 measures were developed (when minor differences in definitions and sampling methodologies are taken into account measures can be summarily reduced to 153 measures). Appendices B and C contain more information about the developed wilderness character monitoring measures.

- 2. 72% of participating refuges feel that the baseline assessment of wilderness character completed reflects what’s happening on the ground in their refuge wilderness.**

13 of 18 participating refuge project leaders report that the baseline assessment reflects the reality of their wilderness. Four project leaders reported that more work is necessary to capture the complete state, but that this effort was a start. Of these four, several emphasized that their uncertainty stemmed from the refuge’s hand-off approach to wilderness management and lack of wilderness access. One project leader indicated that this effort neglected too many of the important and complex natural elements of the wilderness to be a true reflection of what’s happening on the ground.

- 3. Wilderness character monitoring would not have been implemented without the Wilderness Fellows Initiative. Wilderness Fellows are more effective than utilizing refuge staff to develop wilderness character monitoring measures.**

All but one project leader indicated it was better to utilize Wilderness Fellows to accomplish this effort than to use refuge staff. Many respondents indicated that Wilderness Fellows were objective, managed staff biases, minimized staff interpersonal conflicts, and worked more quickly on developing wilderness measures than their staff. One third of refuges indicated that due to the time and effort required implementation of wilderness character monitoring would not have happened without a Wilderness Fellow.

Several project leaders indicated that although their staffs could have accomplished the work, it would not have been as detailed as the Wilderness Fellows Initiative products. Several commented that the Wilderness Fellows Initiative is a highly cost effective method for focusing staff energy and accomplishing this work. On average, refuge staff spent 55 hours supporting each Wilderness Fellow in developing measures and obtaining, then analyzing data. For this investment, each refuge received an average of 276 hours of Fellow time and effort spent directly on wilderness character monitoring.

Not one project leader indicated that they would have preferred their staff to develop the wilderness character monitoring measures. Several project leaders promoted the idea of having a Wilderness Fellow return to their refuge once every three to five years to update the monitoring protocols, collect data, and evaluate trends.

4. Wilderness character monitoring will likely have a future impact on refuge wilderness stewardship and refuge operations.

83% of project leaders indicated that wilderness character monitoring will have at least some impact on wilderness stewardship and 61% indicated that it will have an impact on refuge operations. Those expressing skepticism indicated that many wilderness character impacts are out of their control (ex. border patrol operations to deal with illegal border crossings, waterways being excluded from wilderness designation, etc.) or conflicts between wildlife conservation practices and wilderness character (ex. providing water to critical wildlife populations via human installed structures). These individuals took a long term view of the value of wilderness character monitoring and indicated that it will increase management awareness, regardless of refuge operation impacts.

Several project leaders suggested that additional staff may be required to improve wilderness stewardship on their refuge. One project leader suggested she would like to hire a dedicated wilderness staff member, because the Wilderness Fellows Initiative exposed a lot of things occurring in their wilderness of which they were previously unaware. Another refuge indicated they would like additional law enforcement support to increase coverage of wilderness.

5. Participating in the Wilderness Fellows Initiative increased refuge staff's wilderness awareness and understanding of how wilderness character could be quantified.

89% of project leaders expressed that participating in the Wilderness Fellows Initiative improved their and their staff's understanding of wilderness and wilderness character. Some project leaders (39%) indicated that staff interaction with Wilderness Fellows was an educational experience for the staff. In several cases, project leaders indicated that Wilderness Fellows educated refuge staff about aspects of their own refuge wilderness about which they were previously unaware. Some project leaders (33%) specifically mentioned that Wilderness Fellows brought knowledge about The Wilderness Act, FWS wilderness policy, and were well trained in the fundamentals of wilderness character.

Having a Wilderness Fellow on the refuge allowed project leaders to re-engage with their own staff about wilderness without concern of preaching on the subject. In several instances, project leaders expressed delight about having another wilderness advocate present to help them approach members of their staff less sympathetic to wilderness.

Not all refuges shared the wilderness character monitoring measures widely with their staffs. In several cases, project leaders indicated that the information has not been shared beyond biological staff. Nonetheless, there was almost unanimous agreement that most refuge staff that interacted with Wilderness Fellows gained a new perspective on wilderness and wilderness character.

What did refuges choose to monitor?

An average of 32 wilderness character monitoring measures were developed for each national wildlife refuge. The fewest measures established at any refuge was 23 and the largest set of measures was 48. There was no correlation between the number of measures selected by a refuge and the size of the refuge's wilderness.

The *Keeping it Wild* framework categorizes measures according to the quality of wilderness (natural, untrammeled, undeveloped, and solitude or unconfined recreation) and indicator of wilderness character they address. This measure summary utilizes that same framework.

Natural

On average, refuges developed more measures for this wilderness quality than any other (an average of 11 measures per refuge). More than any other wilderness quality, developed natural measures are capable of monitoring climate change sensitive aspects of wilderness. Nineteen refuge-adopted natural measures have been flagged as likely to demonstrate climate change impacts on wilderness.

Plant, animal species, and communities

% of refuges	Measure
89%	Number of non-indigenous (invasive) species
39%	Number of threatened, endangered, candidate, or species of concern federally or state-listed species
33%	Number of extirpated, indigenous species

In addition, more than 75% of refuges developed one or more measures to monitor specific species populations. Eight other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Physical resources

% of refuges	Measure
89%	Air quality

Ten other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Biophysical processes

% of refuges	Measure
33%	Change in mean annual temperature
28%	Departure from natural fire regime index
28%	Water level changes in pools, lakes, or oceans
22%	Change in annual average precipitation

Fifteen other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Undeveloped

On average, refuges developed eight measures for the undeveloped wilderness quality.

Non-recreational structures, developments, or installations

% of refuges	Measure
72%	Number (or index) of authorized physical structures, developments, or installations
28%	Number of unauthorized physical structures, developments, or installations

Nineteen other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Inholdings

% of refuges	Measure
100%	Number (or acres) of inholdings

Three other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Use of motorized vehicles, motorized equipment, or mechanical transport

% of refuges	Measure
83%	Index / number of vehicle days of miscellaneous authorized use
67%	Index / number of vehicle days of unauthorized use
44%	Number of emergency uses
22%	Number of management flyovers

Six other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Loss of statutorily protected cultural resources

% of refuges	Measure
67%	Number (and severity) of disturbances to cultural resources

Four other measures applicable to this indicator were developed, but adopted by less than 20% of refuges. 11% of refuges did not designate any measures for this indicator and several additional refuges indicated difficulty developing measures for this indicator because their wilderness does not contain statutorily protected cultural resources. Refuges also expressed an interest in measuring restoration of cultural resources in addition to or instead of cultural resource loss.

Solitude or unconfined recreation

On average, refuges developed seven measures for the solitude or unconfined recreation wilderness quality.

Remoteness from the sights and sounds of people inside the wilderness

% of refuges	Measure
44%	Number of visitor days of usage per year
39%	Miles of trails and/or roads
28%	Number of commercial guides or client days

Eleven other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Remoteness from the sights and sounds of people outside the wilderness

% of refuges	Measure
33%	Artificial night sky brightness or visibility
33%	Miles of road on wilderness boundaries
28%	Intrusions on the natural soundscape
22%	Index or number of aircraft overflights

Nine other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Facilities that decrease self-reliant recreation

% of refuges	Measure
100%	Number or index of agency provided facilities
33%	Number of user created facilities or installations

Three other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Management restrictions on visitor behavior

% of refuges	Measure
78%	Number or index of restrictions on visitor behavior

Four other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Untrammelled

On average, refuges developed fewer measures for the untrammelled wilderness quality than for any other (an average of five measures per refuge).

Authorized actions that manipulate the biophysical environment

% of refuges	Measure
89%	Number of actions to manipulate wildlife
78%	Number of actions to manipulate fire
72%	Number of actions to manipulate vegetation
56%	Number of actions to manipulate water and/or soil

Six other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

Unauthorized actions that manipulate the biophysical environment

% of refuges	Measure
72%	Number of miscellaneous unauthorized actions
33%	Number or acres of human-ignited fires

Five other measures applicable to this indicator were developed, but adopted by less than 20% of refuges.

The measures adopted by refuges demonstrate that there is considerable consistency among desirable monitoring measures across refuges and regions. In addition, the measures demonstrate that there must be leeway to select measures that capture an individual refuge's unique wilderness character. This is particularly true for the natural quality of wilderness character, but applies to all other qualities as well.

Appendices B and C contain more information about the developed wilderness character monitoring measures.

Was it worthwhile?

1. 83% of refuges indicate that monitoring wilderness character trends are worth their time and effort.

Fifteen project leaders indicated that monitoring wilderness character is worth their time and effort—and not only because it's legally required. Two refuge project leaders indicated they weren't yet sure whether it was valuable and were withholding judgment until reviewing the trends following five years of monitoring. The one refuge manager who indicated that monitoring the trend in wilderness character is not worth the time and effort said that it's not worth it because of the potential negative reflection it might have on refuge operations.

2. Refuges will widely use Wilderness Fellows Initiative information.

13 out of 18 refuge project leaders were asked whether they are already using or have plans to use Wilderness Fellows produced information for purposes beyond wilderness character monitoring. 77% indicated they intend to do so.

U.S. Fish & Wildlife Service planning processes require coverage of wilderness in Comprehensive Conservation Plans (CCPs) and Habitat Management Plans (HMPs), a commitment that is re-emphasized in the Service's recently released *Conserving the Future* vision document. That document states, "An HMP uses the best available scientific information...addresses ways to better protect areas with special designation status (such as wilderness...)"

46% of initiative refuges indicated they have plans to incorporate wilderness character information into CCPs and 15% indicated plans to use information in specific, upcoming HMPs. Other examples of ways in which this information will be used include:

- Wilderness Stewardship Plans (23% refuges)
- Inventory and Monitoring Plans (15% refuges)
- Fire Management Plan (8% refuges)

In addition, refuges indicated interest in sharing information with partners and other parties such as:

- local community (15% refuges)
- advocacy groups, such as The Wilderness Society, American Wilderness Society (15% refuges)
- other agencies, such as U.S. Forest Service and National Park Service (15% refuges)

Several project leaders also indicated that some measures developed for wilderness character monitoring will help them better monitor and track the impacts of climate change on their refuge. Over 20 of the 2011 refuge chosen wilderness character measures are likely sensitive to climate change. See Appendix C for these measures.

3. Wilderness Fellows contributed to refuges in unanticipated, valuable ways.

Wilderness Fellows made themselves available to help their refuges with non-wilderness character monitoring related efforts. As a result, they contributed to their refuges in significant ways that were not expected when this initiative was conceived. Wilderness Fellows spent between 8 and 300 hours at each refuge on non-wilderness character monitoring related tasks. On average, Fellows spent 103 hours at each refuge on such tasks. The contributions that resulted from these extra efforts included:

- *Wilderness Fellows tackled whatever the refuge needed.* Over the six month Wilderness Fellows Initiative, Wilderness Fellows transported rescued brown pelicans, assisted a paleontologist in excavating a prehistoric fossil, tagged ducks, removed miles of fence, assisted on a bison round-up, performed trail maintenance, assisted with a wildfire, and removed invasive fish from the Colorado River. Wilderness Fellows spent a total of 1,752 hours assisting refuges in non-wilderness character monitoring related projects (an average of 103 hours per refuge).
- *Drafting wilderness reviews for Comprehensive Conservation Plans.* Two refuges called upon their Wilderness Fellows to write wilderness reviews for use in their CCPs.
- *Wilderness Fellow remained at refuge as a volunteer.* The Imperial NWR Wilderness Fellow remained at the refuge for two additional weeks following the end of the fellowship to act as a volunteer to assist the refuge with a significant Sonoran pronghorn relocation effort.
- *Provided outreach to external organizations.* Wilderness Fellows represented their refuge and refuge wilderness to community and advocacy organizations across the country including the American Hiking Society, Montana Wilderness Society, a New Jersey county mosquito commission, The Nature Conservancy, The Wilderness Society, U.S. Forest Service, and World Wildlife Fund.
- *Offered intellectual support for refuge wilderness advocates.* Wilderness Fellows acted as “fellow Wilderness advocates”, in the words of one project leader. One project leader enjoyed sharing a recently published book about wilderness with their Fellow. Another refuge project leader was thankful that the initiative provided another opportunity to broach wilderness with a staff that generally bristled at the topic. Fellows made refuge wilderness champions feel less isolated and connected to national wilderness leadership.
- *Wilderness Fellow hired as a member of refuge staff.* One refuge hired their Wilderness Fellow as a Biological Technician following the fellowship.

4. The Wilderness Fellows Initiative improved interagency coordination.

This initiative created a platform for discussion among agencies. Specifically, the Wilderness Fellows Initiative work at Red Rock Lakes NWR within the Greater Yellowstone Ecosystem (GYE) has initiated discussions and interest in implementing wilderness character monitoring across all national wildlife refuges, national forests, and national parks that are within the GYE. A national park in Michigan took note of the work happening at Seney NWR and expressed interest in pursuing a similar effort. Other agencies have also expressed interest in supporting the Wilderness Fellows Initiative and suggested allowing Wilderness Fellows to work across agency lands over the course of a single fellowship. The Wilderness Fellows Initiative coordinated with the National Park Service Air Resources Division for the data for air quality measures.

5. The future of wilderness character monitoring at participating refuges is uncertain.

Only 39% of refuge project leaders indicated they are confident that their refuges will continue wilderness character monitoring efforts in 2012 and beyond. Specifically, 33% of project leaders indicated that they are uncertain monitoring will continue in the absence of a Wilderness Fellow to conduct it, and 28% of refuge project leaders stated monitoring would not continue. Project leaders cited declining staffs and budgets, an uncertainty in the national importance of this initiative, hands-off management of wilderness, and concerns that this monitoring data could be used to criticize refuge management as reasons for not continuing the monitoring.

In two instances where refuge project leaders indicated monitoring would not continue a wildlife biologist and a deputy project leader were contacted at the suggestion of the project leader. At both of these refuges the additional staff member contacted, because they were closer to the Wilderness Fellows Initiative efforts in 2011, indicated that monitoring could continue without undue strain on staff resources.

These examples suggest there may be a disconnect between project leader perceptions of effort required for wilderness character monitoring and actual effort required. Most measures (56%) require data input once every five years or longer than five years. See the Recommendations section of this report for more details on effort required to develop protocols.

Recommendations

The lessons learned from the 2011 Wilderness Fellows Initiative produced a number of recommendations for the future of wilderness character monitoring in the NWRS and for the success of the Wilderness Fellows Initiative. The following recommendations are relevant to both the U.S. Fish & Wildlife Service and the other wilderness managing agencies.

Wilderness Character Monitoring in the NWRS

- 1. Continue the Wilderness Fellows Initiative to perpetuate an understanding that wilderness and refuge purposes are integrated and that wilderness designation supports many refuge purposes. The initiative also ensures meeting the goal of establishing wilderness character monitoring measures at all national wildlife refuges with designated wilderness by the 50th anniversary of The Wilderness Act in 2014.**

All refuges that participated in the initiative indicated that bringing in an external resource was the most effective way to establish wilderness character monitoring at their refuge. One-third of refuges indicated that wilderness character monitoring would not have been established in 2011 without the Wilderness Fellow Initiative.

No refuges expressed concerns that their staffs were less invested in the monitoring because an external initiative had helped them to establish the monitoring protocols. Instead, project leaders indicated that Wilderness Fellows helped their staff to minimize biases, understand the *Keeping It Wild* framework, quickly develop measures, chose measures relevant to data already being collected at the refuge, and to institutionalize a culture of refuge wilderness stewardship. Refuge staff members who will carry on monitoring in the future were highly involved in the development of measures and guided Wilderness Fellow efforts. As a result, refuge staffs reflect a sense of ownership in the wilderness character monitoring measures.

- 2. Develop and distribute a national wilderness character monitoring strategy for the NWRS.**

The Wilderness Fellows Initiative was highly successful in establishing wilderness character monitoring at refuges, but the initiative did not address how monitoring data will be reviewed, compiled in future years, and how monitoring should impact wilderness stewardship. Refuge project leaders, although happy with the Wilderness Fellows Initiative, have many unanswered questions. They asked: What happens next?, Where do we [the refuge] go from here?, When will we next be asked to supply wilderness character monitoring data?, How will we supply data going forward?, Who can I expect to hear from about our monitoring data?, and Who will this data be shared with and how will they evaluate it?.

Developing and distributing a national wilderness character monitoring strategy that addresses these questions would establish a long-term direction for wilderness character monitoring in the NWRS. It would also be an opportunity to further emphasize that wilderness stewardship is a national priority for the NWRS. This strategy should also develop ways to recognize refuges that exhibit excellence or overcome wilderness stewardship challenges. Such a strategy would help ensure that the gains in wilderness awareness made through wilderness character monitoring are not lost.

3. Substantially improve the Wilderness Character Monitoring database to maximize functionality.

The Access database that was developed in 2011 is not robust enough to handle the demands of further wilderness character monitoring across the NWRS or the NWPS. Additional funds should be sought to develop a web-based database that is capable of compiling monitoring data from all NWPS wilderness managing agencies into a single interface that is user-friendly, stable, and allows users to search, compile, and sort data from across the NWPS. Training on how to use this database should be provided to primary wilderness contacts at refuges, so that it can be used as a portal for submitting future wilderness character monitoring data.

4. Ensure that refuge project leaders have an accurate estimate of effort required to continue wilderness character monitoring after measures are established.

Refuge project leaders expressed concerns about the amount of staff resources necessary to continue wilderness character monitoring efforts. In contrast, deputy project leaders and wildlife biologists who helped to develop wilderness character monitoring measures in conjunction with Wilderness Fellows expressed few concerns about continuing monitoring, citing that the monitoring data is already available or easy to collect. It is important that project leaders have an accurate understanding of the effort that will be required of their staff to continue monitoring. Otherwise, they will be likely to cut wilderness character monitoring from their staff's duties.

56% of all 2011 refuge adopted measures only require monitoring at intervals of five years or longer.

5. Address refuge concerns about how wilderness character monitoring data will be used beyond local refuge wilderness stewardship decisions.

Refuge project leaders are uncertain what actions they will be asked to take if wilderness character monitoring trends demonstrate degrading wilderness character. This uncertainty makes them hesitant about adopting wilderness character monitoring measures. There are also concerns about who will receive wilderness character monitoring trend data. One refuge manager indicated they expected the Wilderness Fellows Initiative to be more critical of in-place wilderness management activities and was relieved to find that there was little to no negative judgment in their interaction with their Wilderness Fellow. The concern, however, is that judgment may come in the future.

National and regional U.S. Fish & Wildlife Service wilderness leadership could openly address these concerns with refuges, possibly as part of a national wilderness character monitoring strategy.

6. Name monitoring measures consistently across refuges, wilderness areas, and agencies. Use similar monitoring methods where appropriate.

2011 refuge developed wilderness character monitoring measures demonstrated a considerable level of repeatability from one refuge to another. 98 measures were used at more than one refuge. In many instances, however, effectively identical measures were given slightly different names from one refuge to another. For example, the following measures from the untrammeled quality: *number of actions to manage animals* -OR- *number of actions to manage native wildlife* -OR- *number of actions to manage wildlife*.

Future wilderness character monitoring efforts should use previously selected measures if at all possible. Initiative leaders should also ensure consistency in data measurement methods across refuges when appropriate (i.e. miles versus kilometers).

7. Provide additional guidance and assistance to monitor natural trends that are important, yet difficult to measure.

Several refuges expressed concern that the measures developed emphasized only the simplest trends and monitored only those processes, populations, etc. for which data was already available. These refuges expressed interest in diving deeper into complex monitoring. While this was certainly not a concern expressed by a majority of refuges, it was a strong criticism at several.

Going forward, the NWRS would benefit from identifying refuges constrained by current data availability and extend extra resources to assist them in developing more sophisticated measures. These extra resources could help the refuge to establish more sophisticated sampling methodologies to track trends. This might include spatial analyses of wilderness or sharing of data collection techniques used by NWRS Inventory and Monitoring initiative or cooperation with another agency.

Fund availability would constrain this effort, but if these monitoring needs address a high refuge priority funding could be sought from NWRS Inventory and Monitoring to put advanced monitoring methods in place. Refuges would also need to demonstrate the ability and willingness to dedicate resources to continuing this monitoring long-term.

8. Increase communication between national, regional, and refuge wilderness leaders.

The act of performing wilderness character monitoring creates a desire and need for dialogue between national, regional, and refuge wilderness leaders. Project leaders, in particular, expressed that the process of establishing wilderness character monitoring increased their interest in more contact with U.S. Fish & Wildlife Service wilderness leadership. Refuges could benefit greatly from refuge visits, reminders and guidance related to wilderness character monitoring, discussions about on-going or new wilderness issues, feedback on planning documents that include wilderness (CCPs, HMPs, WMPs, etc.), and discussion about national wilderness efforts and monitoring (i.e. air quality monitoring). Project leaders often feel isolated in supporting wilderness stewardship at their refuge. Through increased communication, national and regional wilderness coordinators can help ensure that project leaders and other refuge wilderness stewards are supported and accountable.

The Wilderness Fellows Initiative should also seek to increase interaction between regional wilderness coordinators and Wilderness Fellows.

Wilderness Fellows Initiative

1. Increase communication before, during, and after the initiative between refuges and initiative leadership. Create opportunities for Wilderness Fellows to communicate with refuge staff prior to their refuge arrival.

In its initial year, project leaders participating in the Wilderness Fellows Initiative largely went into the initiative without any expectations of what the effort would entail, what products would result, and what would be expected of them. Although almost all were pleased with the end result, they indicated they would have appreciated being better informed about the initiative, as it would have enabled them to better support their Wilderness Fellow, prepare their staff, and provide better feedback about the products produced.

Refuge project leaders specifically suggested that future refuges be informed about the particulars of the training Wilderness Fellows receive prior to arrival at their refuge, that there be more information provided about the initiative that they could pass along to their staff, that there be clear communication about who is responsible for supervising the Fellow, and to be provided examples of the final products they should expect their Wilderness Fellow to produce. Refuge project leaders also requested that Wilderness Fellows be given

the means and encouraged to reach out to all refuge staff to announce themselves and their project before they arrive, in addition to communicating with the refuge project leaders or deputies about logistics regarding what to bring, when to arrive, where they'll live, etc.

Refuge project leaders were left wondering about next steps after their Wilderness Fellow departed. In the future, regional, national, or initiative leadership should reach out to participating refuges to communicate what is expected and hoped of their refuge going forward in regards to wilderness character monitoring. In addition, refuge project leaders expressed appreciation at the request for feedback about the initiative. The practice of requesting feedback should be continued.

2. The Student Conservation Association (SCA) is not an effective administrator of a Fellowship initiative such as this one.

The SCA experience was, unfortunately, negative for both Fellows and initiative leaders. SCA was disorganized, disrespectful of privacy and sensitive personal information, and generally unprepared for this type of extensive effort.

Eliminating the SCA relationship in the future will also eliminate the overhead SCA charged, but will require finding another method for hiring and compensating Fellows. One positive aspect of SCA affiliation was the opportunity to provide Fellows with tuition assistance or loan forgiveness via Americorps Education Awards. The financial value of this award (\$2,675) could instead be offered to future Wilderness Fellows in the form of a higher weekly stipend.

SCA was only able to offer health insurance to Fellows that would cover injuries that occurred on the job. Ideally, the initiative should be able to offer Wilderness Fellows general health insurance, even if it requires Fellows to pay monthly fees.

3. Hire Fellows with proven track records working outdoors and on independent projects.

Refuges acknowledged that not much supervision and guidance was offered to Wilderness Fellows (for a number of reasons: the initiative took place during the field season when refuge staff were busy, some refuges thought this oversight came from the national level, and others were uncertain about the training and background Wilderness Fellows had received). To be successful, Wilderness Fellows had to be comfortable working independently, tactful at requesting help from refuge staff when needed, and capable of setting deadlines and goals for refuge staff and leadership.

Two project leaders expressed concerns that the initiative did not emphasize hiring individuals with field or outdoor experience. The refuges that provided this feedback felt that it impacted the confidence and safety of their Fellows. In one case, a refuge had to provide proper basic hiking equipment (i.e. boots) for their fellow. Future hiring should ensure that Wilderness Fellows are comfortable working outdoors and have preferably spent time in a wilderness setting.

4. Dedicate a refuge staff member to work closely with Wilderness Fellows.

One project leader emphasized that, like anything, "you get out of this initiative what you put in" and stressed that participating refuges should designate one of their permanent staff to guide the Wilderness Fellow. This sentiment was then reasserted by additional project leaders. Providing a dedicated staff resource to assist Wilderness Fellows ensures that they work as efficiently as possible, have a go-to contact for questions, and that the final products are more likely to meet approval by refuge leadership. In the one case where a Fellow did not finish the assigned products for a refuge, the project leader acknowledged that no one on the staff periodically checked in the Fellow, as it was assumed that the initiative leadership was providing close supervision. This singular failure might have been avoided if the Fellow had a refuge staffer monitoring his or her progress.

In order for refuges to ensure the success of their Wilderness Fellows, provided information needs to detail what is expected of their Fellow. This will require more communication between initiative leaders and invested refuge staff prior to the Wilderness Fellow's arrival.

5. Re-evaluate the length of time Wilderness Fellows spend at each refuge.

Refuges and Wilderness Fellows alike acknowledged that it takes longer to establish wilderness character monitoring measures at the first refuge they visit. The initiative should consider allotting four months at the first refuge and two to three months at the second.

Given the amount of training and on the ground experience each Wilderness Fellow accumulates, the initiative might make better use of its resources by hiring Wilderness Fellows for up to one year, instead of six months. Over a one year period, Wilderness Fellows could develop wilderness character monitoring for four to five refuges, instead of two. One Wilderness Fellow hired in 2011, who had previous wilderness character monitoring experience for the National Park Service, successfully completed wilderness character monitoring efforts for three refuges in six months. This Fellow's success suggests that a one-year Fellow could develop wilderness character measures for four or five refuges.

A one year term might also allow the initiative to deploy Fellows to refuges at times in accordance with their respective field seasons. All refuges in the southwest who participated in the 2011 initiative indicated that they would have preferred having a Wilderness Fellow in the winter or spring, rather than summer and fall when temperatures are not conducive to outdoor work.

6. Provide Wilderness Fellows with standard certifications and IT security clearance as part of the training they receive before arriving at the first refuge.

The main impediment refuges indicated Fellows encountered was a lack of proper certifications. The most significant issue was the lack of IT security clearance upon arrival. At some refuges, Fellows were unable to gain email or Active Directory access for several months. This made it difficult for Fellows to use office computers and access digital data. Ideally, IT security clearance should be granted before Fellows complete training and the training should demonstrate how to access web email and use Lotus Notes.

Determine which certifications Fellows need to be functional members of refuge staff. If possible, these certifications should be completed during training. These certifications might include defensive driving, ATV safety, B-3 training (plane passenger safety), etc. If training can't be provided at Wilderness Fellows training, coordinate with refuges prior to arrival to ensure that certification sessions will be available at the refuge or nearby.

7. Continue weekly conference calls to bring together all Wilderness Fellows with initiative leaders.

Refuge project leaders felt more confident in their Wilderness Fellows knowing that they had a weekly forum available to discuss questions and issues. They also counted on the conference call as a source of supervisory oversight. Wilderness Fellows appreciated the opportunity to connect with other Fellows and check in with initiative leadership. Conference calls offered initiative leaders the opportunity to pinpoint potential Fellow problems.

Going forward, conference calls can be used to promote consistency in process and measure development across refuges. Efforts should also be made to encourage sharing between Fellows in a digital forum. SharePoint was a problematic interface for many Wilderness Fellows in 2011.

Initiative leaders should also consider instituting one-on-one calls with Wilderness Fellows once a month. This would allow Wilderness Fellows a forum for asking detailed and/or personal questions. It also would allow initiative leaders to ensure that all Fellows are following through on expectations.

8. Facilitate communication of measures with all Wilderness Fellows as they are developed at individual refuges.

The weekly conference calls did not provide enough time for Fellows to share information about all the measures they were assisting refuges to develop. If Fellows had been presented with an interactive opportunity to share measures with other Fellows this would have promoted the creation of consistent measures across refuges and would have allowed Fellows to course correct one another. Review of 2011 Wilderness Fellow developed measures suggests that efforts were repeated across refuges. Time could have been saved if Fellows had the opportunity to share methodologies with one another.

9. Encourage Wilderness Fellows to take on refuge tasks that expose them to experiences beyond their immediate wilderness character monitoring mission.

Refuge project leaders cited Wilderness Fellows' willingness to participate in other, non-wilderness refuge activities as an important method of developing trust with refuge staff, as well as a way to broaden their refuge experience. These efforts significantly increased the value of Wilderness Fellows in the eyes of refuge project leaders. They also allowed Wilderness Fellows to build a diverse portfolio of skills during the fellowship. Future Wilderness Fellows should leave training with an understanding that they are expected to participate in diverse set of refuge activities—not all of which will be directly related to wilderness. They should be empowered to protect the time they need to complete the required wilderness character monitoring effort, but should also recognize that they are almost always allotted more time at each refuge than needed to develop wilderness character monitoring measures.

10. Encourage refuges to share wilderness character monitoring efforts with refuge partners (ex. friends groups, advocacy groups) and the community. Prepare Fellows to provide outreach services.

Many refuge project leaders didn't consider sharing the wilderness character monitoring effort with external groups. Several indicated they now wish they had thought to when their Fellow was present. In the future, Wilderness Fellows should be prepared to provide presentations or run meetings with community or partner groups (ex. national or local wilderness society, hunting club, etc.).

Refuge managers should seek assistance from partners in completing wilderness character monitoring efforts on a yearly basis. Friends groups and advocacy organizations can be relied upon to collect and provide some data that refuge staff wouldn't otherwise have time to prepare.

11. Develop methods for initiative leadership to give Wilderness Fellows feedback about individual measures to increase the likelihood of adopting highly measurable, reliable, sensitive, and well-described measures.

Initiative leaders have more experience developing and evaluating wilderness character monitoring measures and that experience should be used to evaluate all measures developed by Wilderness Fellows in conjunction with refuges. Initiative leaders should step in to help ensure that final measures are reliable, sensitive, well-described, and measurable. This will help to ensure that measures developed aren't subject to misinterpretation when monitored by future staff, employ the most reliable data collection methods, are capable of elucidating trends, and answer more questions than they open.

Appendix A. Summary of participating national wildlife refuges



The following section provides descriptions of all national wildlife refuges that participated in the 2011 Wilderness Fellows Initiative and highlights the diversity of wildernesses involved. There is a brief description of each refuge and its wilderness, plus these supplementary details:

- refuge project leader
- acres of wilderness
- year(s) of wilderness designation



Region 1

None



Region 2

Cabeza Prieta Arizona	
	<p><i>Refuge Project Leader:</i> Sid Slone <i>Acres of designated wilderness:</i> 803,418 <i>Year(s) of designation:</i> 1990</p> <p>Cabeza Prieta is located in the southwest corner of Arizona and lies along 56 miles of the international border in the heart of the Sonoran Desert. It is the third largest wildlife refuge in the lower 48 states and contains the largest refuge wilderness outside of Alaska. The Cabeza Prieta Wilderness makes up 93% of the refuge. Mean annual precipitation is less than 10 inches and temperatures between mid-May and mid-September generally exceed 100 degrees Fahrenheit. Wilderness management on Cabeza Prieta incorporates significant special provisions allowing for border law enforcement agency and military activities.</p>
Havasu Arizona & California	
	<p><i>Refuge Project Leader:</i> Linda Miller <i>Acres of designated wilderness:</i> 17,801 (14,606 in Arizona and 3,195 acres in California) <i>Year(s) of designation:</i> 1990 (AZ), 1994 (CA)</p> <p>Havasu is located along the Colorado River in the Mojave Desert, one of the hottest and driest regions in the United States. Wilderness at Havasu consists primarily of the Topock Gorge, which represents one of the last natural stretches of the lower Colorado River. Havasu Wilderness provides habitat for the endangered desert tortoise and the poisonous Gila monster. The Californian portion of Havasu Wilderness shares its western border with the Chemehuevi Mountains Wilderness.</p>


Region 2 (continued)


Imperial Arizona & California	
	<p><i>Refuge Project Leader:</i> Elaine Johnson <i>Acres of designated wilderness:</i> 15,056 (9,220 in Arizona and 5,836 in California) <i>Year(s) of designation:</i> 1990 (AZ), 1994 (CA)</p> <p>Imperial NWR is located along 30 miles of the Lower Colorado River. Imperial Wilderness is composed of Sonoran Desert upland habitats and a surprisingly lush riparian zone. The land is a sparsely vegetated combination of sandy washes, scattered highly-eroded hills, and low, boulder strewn mountain slopes. Species of concern residing in the wilderness include the Sonoran desert tortoise, chuckwalla, and Gila monster. Imperial Wilderness is surrounded by other wilderness areas to the west, south, and east.</p>
Kofa Arizona	
	<p><i>Refuge Project Leader:</i> Susanna Henry <i>Acres of designated wilderness:</i> 516,200 <i>Year(s) of designation:</i> 1990</p> <p>Kofa NWR is located in the Sonoran Desert in an area where the Kofa Mountains and Castle Dome Mountains dominate. The landscape is typified by extensive exposures of bedrock, sparse vegetative cover, little soil development, and narrow side canyons. Kofa protects one of Arizona's largest desert bighorn sheep populations and the rare Kofa Mountain barberry. Approximately 82% of the refuge is designated wilderness and it is the second largest wilderness area in Arizona.</p>

Region 3


Agassiz	Minnesota
	<p><i>Refuge Project Leader:</i> Margaret Anderson <i>Acres of designated wilderness:</i> 4,000 <i>Year(s) of designation:</i> 1976</p> <p>Agassiz NWR is located in the extreme northwestern corner of Minnesota, only 40 miles south of Canadian province of Manitoba. Ecologically, the refuge is situated in a narrow transitional zone known as aspen parkland and is part of the larger Mississippi Headwaters / Tallgrass Prairie ecosystem. Agassiz Wilderness contains Minnesota's westernmost black spruce-tamarack swamp, plus peatland and poor fen plant communities. Agassiz Wilderness takes the form of a peninsula of bog habitat between three major impoundments. It is divided into two units by an east-west, cherry-stemmed dike bordered on either side by drainage ditches. The wilderness is approximately 3.5 miles long on its north-south axis and 2.5 miles across at its widest east-west point.</p>
Seney	Michigan
	<p><i>Refuge Project Leader:</i> Mark Vaniman <i>Acres of designated wilderness:</i> 25,150 <i>Year(s) of designation:</i> 1970</p> <p>Seney NWR is in the eastern Upper Peninsula of Michigan. This portion of Michigan is dominated by a glaciated landscape and a mosaic of forests and wetlands. The wilderness comprises 26% of total refuge acreage. It is divided into three areas: Strangmoor Bog, Walsh Fen, and West Branch Manistique. The wilderness contains spruce-fire-cedar and beech-sugar maple-hemlock stands as well as muskeg-bog, mixed conifer swamp, white and red pine stands, and shrubland. There is also a "String" bog, which consists of long, string-like peatland swamps interspersed with mixed-conifer forests on extinct sand dunes.</p>

Region 4



Chassahowitzka Florida	
	<p><i>Refuge Project Leader:</i> Michael Lusk <i>Acres of designated wilderness:</i> 23,579 <i>Year(s) of designation:</i> 1976</p>
	<p>Chassahowitzka Wilderness encompasses marshlands, swamplands, shallow bays, and tidal streams. It supports thousands of wintering waterfowl, marsh and waterbirds, shorebirds, and a variety of animal species that depend on such prime estuarine habitat. Special provisions allow for commercial guiding and motorboat usage through Chassahowitzka Wilderness.</p>

Okefenokee Florida & Georgia	
	<p><i>Refuge Project Leader:</i> Curt McCasland <i>Acres of designated wilderness:</i> 353,981 <i>Year(s) of designation:</i> 1974</p>
	<p>The Okefenokee NWR is a vast peat bog. Swamp forests of mainly pond cypress, black gum, loblolly bay, red bay, and sweet bay cover about 80 percent of the refuge. On the east side of the swamp prairies form vast expanses of marsh and water. Upland islands are found throughout the swamp. 88% of the refuge consists of designated wilderness. The law that established the Okefenokee Wilderness stipulates that a minimum of 120 miles of trail be maintained for management and public enjoyment. The bill also permits motorboats of 10 horsepower or less in wilderness.</p>




Region 5

Edwin B. Forsythe New Jersey	
	<p><i>Refuge Project Leader:</i> Virginia Rettig <i>Acres of designated wilderness:</i> 6,681 <i>Year(s) of designation:</i> 1975</p>
	<p>Edwin B. Forsythe National Wildlife Refuge extends along more than 50 miles of the New Jersey shoreline. The refuge contains coastal marshes, where uplands taper gradually to a wide band of salt marsh, terminating in open, shallow bays. More than 80 percent of the refuge is tidal salt meadow and marsh. The Brigantine Wilderness of Edwin B. Forsythe NWR contains two undeveloped barrier beaches which provide important habitat for rare piping plover, black skimmer, and least tern. The wilderness also includes emergent tidal marsh islands. The wilderness boundaries of these islands are mean high water.</p>




Region 5 (continued)

Great Swamp	New Jersey
	<p> <i>Refuge Project Leader:</i> Bill Koch <i>Acres of designated wilderness:</i> 3,660 <i>Year(s) of designation:</i> 1968 </p> <p> Great Swamp National Wildlife Refuge contains the first Wilderness Area designated within the Department of the Interior. The refuge provides an island of undeveloped wildlife habitat surrounded by dense population and development. The wilderness is a mosaic of forested wetlands, emergent wetlands, and various successional stages of upland vegetation. Great Swamp NWR is an important migratory link in the Atlantic Flyway. Almost half of Great Swamp NWR is designated wilderness. </p>
Moosehorn	Maine
	<p> <i>Refuge Project Leader:</i> Bill Kolodnicki <i>Acres of designated wilderness:</i> 7,392 <i>Year(s) of designation:</i> 1970 (Edmunds Division and Birch Islands), 1975 (Baring Division) </p> <p> Moosehorn NWR consists of upland, forested land with elevations from 50 to 480 feet above sea level. Its glaciated terrain includes ten natural lakes, numerous ericaceous bogs, beaver flowages, and streams interspersed with mixed conifer / hardwood forest. The refuge's wilderness is divided into two divisions: the Edmunds Division, which includes the Birch Islands, and the Baring Division. Moosehorn is known for its American woodcock population, a reclusive bird. </p>


Region 6

Charles M. Russell (CMR) & UL Bend Montana	
	<p> <i>Refuge Project Leader:</i> Rick Potts <i>Acres of designated wilderness:</i> 20,819 <i>Acres of proposed wilderness:</i> 158,619 <i>Year(s) of designation:</i> 1976 </p> <p> CMR and UL Bend National Wildlife Refuges are jointly managed and consist of a narrow corridor of 1.1 million acres along 125 miles of the Missouri River in central Montana. The refuge is the second largest in the lower 48 states. The topography of the region is largely shaped by erosional forces and is referred to as the 'Missouri Breaks'. Wilderness at CMR and UL Bend provides critical wildlife habitat for big horn sheep, black footed ferrets, black tailed prairie dogs, pronghorn antelope, and sage grouse. In addition to 20,000+ acres of designated wilderness in UL Bend, CMR manages more than 150,000 acres of proposed wilderness. </p>
Fort Niobrara Nebraska	
	<p> <i>Refuge Project Leader:</i> Steve Hicks <i>Acres of designated wilderness:</i> 4,635 <i>Year(s) of designation:</i> 1976 </p> <p> Six different plant communities converge along the Niobrara River on the Fort Niobrara NWR. The north-central Nebraska refuge was once a military fort. The Fort Niobrara Wilderness lies north of the river and is a unique mix of prairie and wooded valleys. Buffalo winter here (approximately 350 bison and 100 elk are managed on the refuge to conserve herds representative of those that once roamed the Great Plains) and then head south of the river for the summer. </p>
Red Rock Lakes Montana	
	<p> <i>Refuge Project Leader:</i> Bill West <i>Acres of designated wilderness:</i> 32,350 <i>Year(s) of designation:</i> 1976 </p> <p> Red Rock Lakes NWR is situated at the eastern end of the Centennial Valley, a 60-mile long east-west valley in southwestern Montana. The wetland complex that dominates the valley, and Red Rock Lakes Wilderness, is the largest in the Greater Yellowstone Ecosystem. The wilderness provides important breeding, nesting, and resting habitat for trumpeter swans. Refuge wilderness' lakes and creeks contain the last endemic population of adfluvial Arctic grayling in the contiguous United States. </p>

Region 7

Becharof Alaska	
	<p><i>Refuge Project Leader:</i> Bill Schaff <i>Acres of designated wilderness:</i> 400,000 <i>Year(s) of designation:</i> 1980</p> <p>The Becharof Wilderness is in one of the world's most dynamic and pristine regions. The landscape is open tundra and broad valleys, fjords and glacially forged lakes outlined by active volcanoes, mountain peaks, and glaciers. Becharof NWR is sandwiched between networks of protected areas including Katmai National Park and Alaska Peninsula NWR. It is home to one of the world's largest concentrations of brown bears. Wilderness management at Becharof is subject to provisions found in ANILCA.</p>
Izembek Alaska	
	<p><i>Refuge Project Leader:</i> Nancy Hoffman <i>Acres of designated wilderness:</i> 300,000 <i>Year(s) of designation:</i> 1980</p> <p>Izembek NWR is located at the very tip of the Alaska Peninsula. It encompasses 315,000 acres of open tundra, mountains, and glacial moraines. Roughly 95% of the refuge is designated wilderness. The wilderness landscape is made up of active and extinct volcanoes, low tundra wetlands, lakes, sand dunes, and lagoons. A quarter million migratory birds visit Izembek every fall, including the entire world's population of black brants. No maintained trails exist at Izembek. Wilderness management is subject to provisions found in ANILCA.</p>
Kenai Alaska	
	<p><i>Refuge Project Leader:</i> Andy Loranger <i>Acres of designated wilderness:</i> 1,354,247 <i>Year(s) of designation:</i> 1980</p> <p>The Kenai Wilderness lies on the western side of the Kenai Peninsula, a 10,039 square mile peninsula in south-central Alaska. The peninsula is connected to mainland Alaska by a 10-mile wide isthmus. It contains rolling lowlands and gently sloping benchlands, the Kenai Mountains, and the Harding Icefield. The Kenai Wilderness is unusually diverse for its latitude because of the juxtaposition of two biomes: Sitka spruce dominated coastal rainforest and boreal forest. The refuge's proximity to Anchorage and road accessibility results in significant recreational use. Wilderness management is subject to ANILCA provisions.</p>

Region 7 (continued)

Unimak	Alaska
	<p><i>Refuge Project Leader:</i> Nancy Kauffman <i>Acres of designated wilderness:</i> 910,000 <i>Year(s) of designation:</i> 1980</p> <p>Unimak Island begins the >1,400 mile long Aleutian Islands chain. Unimak is approximately 70 miles long and 20 miles wide, making it the largest of the Aleutian Islands. Approximately 93% of the island is designated wilderness. While the Unimak Wilderness is considered part of the Alaska Maritime National Wildlife Refuge, it is physically managed by the Izembeck National Wildlife Refuge. Unimak Island has been and continues to be shaped by active volcano and glacier activity. It is dominated by maritime tundra. All five species of Pacific salmon are native and commercially harvested on Unimak Island. Aside from being the largest of the Aleutian Islands, Unimak is also the only island to have a self-sustaining, fully functional ecosystem, including populations of weasels, wolverine, brown bear, and grey wolf. Wilderness management at Unimak is subject to provisions found in ANILCA.</p>

Region 8

None

Appendix B. Summary of wilderness character monitoring measures by refuge

Table 1. Number of wilderness character monitoring measures by refuge

National Wildlife Refuge	Total	Untrammeled	Natural	Undeveloped	Solitude / primitive recreation
Agassiz	31	5	14	6	6
Becharof	48	6	25	10	7
Cabeza Prieta	26	4	8	9	5
Charles M. Russell/UL Bend	46	10	15	13	8
Chasshowitzka	23	5	8	5	5
Edwin B. Forsythe	26	5	7	7	7
Fort Niobrara	29	6	10	7	6
Great Swamp	29	4	11	6	8
Havasu	31	6	10	8	7
Imperial	30	4	10	9	7
Izembek	29	3	9	8	9
Kenai	43	7	15	12	9
Kofa	26	4	9	8	5
Moosehorn	30	6	10	6	8
Okefenokee	25	5	7	6	7
Red Rock Lakes	46	9	18	11	8
Seney	32	6	12	6	8
Unimak	30	4	7	8	11
AVERAGES	32	5	11	8	7

Table 2. Measure monitoring frequencies by refuge

National Wildlife Refuge	Annual	2-4 years	Every 5 years	Every 10 years
Agassiz	10	0	21	0
Becharof	21	0	27	0
Cabeza Prieta	5	3	15	0
Charles M. Russell/UL Bend	33	3	9	1
Chasshowitzka	1	0	22	0
Edwin B. Forsythe	11	0	15	0
Fort Niobrara	24	0	5	0
Great Swamp	7	0	22	0
Havasu	14	2	14	1
Imperial	10	0	20	0
Izembek	15	0	14	0
Kenai	8	0	32	3
Kofa	11	0	13	2
Moosehorn	11	0	19	0
Okefenokee	5	0	20	0
Red Rock Lakes	35	3	7	1
Seney	10	0	17	5
Unimak	13	0	17	0
TOTALS	244	11	309	13

Table 3. Hours of effort expended by Wilderness Fellows and Refuge Staff

National Wildlife Refuge	Hours of direct WF effort *	Hours of refuge staff effort **	Hours of WF time on other refuge efforts †
Agassiz	304	28	72
Becharof	212	37	75
Cabeza Prieta	320	57	40
Charles M. Russell/UL Bend	158	51	273
Chashowitzka	410	127	120
Edwin B. Forsythe	264	115	24
Fort Niobrara	Unavailable	Unavailable	Unavailable
Great Swamp	380	97	56
Havas	109	18	200
Imperial	305	38	300
Izembek	310	40	100
Kenai	210	65	16
Kofa	275	32	190
Moosehorn	224	36	32
Okefenokee	236	72	80
Red Rock Lakes	206	57	66
Seney	464	30	8
Unimak	310	40	100
TOTALS	4,697	940	1,752

* Includes time spent developing and prioritizing measures, as well as collecting, analyzing, and inputting data

** Includes time spent developing and prioritizing measures, as well as analyzing data

† Hours spent by Fellows on other refuge efforts are highly variable and depend on the overall duration of stay at a particular refuge, how often refuge staff requested help from Fellows, and other factors.

Appendix C. Summary of wilderness character monitoring measures by wilderness quality

Note: Measures marked with this symbol ☀ are climate change sensitive measures.

Undeveloped monitoring measures

Quality of wilderness	Measure	# of refuges	Refuge Priorities		
			High	Medium	Low
Non-recreational structures, installations, developments	# (or index) of authorized physical developments / structures / installations	13	8	4	1
	- # of developed wildlife / livestock water structures	3	2	1	
	- # of bird nesting structures	1			1
	- # of research structures and equipment	3		2	1
	- Miles of fence	3	1	2	
	- Miles of powerline	1		1	
	- Miles of pipelines	1	1		
	- # of cabins and corrals	2	1	1	
	- # of landing strips and runways	1	1		
	- # of abandoned military structures	1		1	
	- # of abandoned vehicles	1		1	
	- # of sites with communication and security	1		1	
	Miles of non-recreational temporary roads and trails / illegal trails	3	1	2	
	Actions to cleanup modern human debris	3	2	1	
	- # of active and inactive mines	2	1		1
	# of culverts removed	1	1		
	# of ditch plugs	1	1		
	# of maintenance actions to upkeep structures and developments	1	1		
	# of unauthorized physical developments / structures / installations	5	2	1	2
	# of collared animals	1			1
	# of active, unpatented mining claims	1	1		
Inholdings	Acres or # of inholdings	18	4	6	8
	Miles of wilderness boundary adjacent to private land	2		2	
	Miles of road associated with inholdings	1	1		
	# of structures installed or constructed	1	1		

Undeveloped monitoring measures (continued)

Quality of wilderness	Measure	# of refuges	Refuge Priorities		
			High	Medium	Low
Use of motorized vehicles, motorized equipment, or mechanical transport	Index of use / number of vehicle days / miscellaneous authorized use	15	6	7	2
	- # of authorized uses on fire details	1	1		
	- # of days of power tools and equipment use	1	1		
	- Miles of fence installed or repaired using motorized equipment	1	1		
	Index of use / # of unauthorized uses	12	4	5	3
	# of emergency uses	8	4		4
	Number of management flyovers	4	1	1	2
	Uses of motorized boats or airboats	3	2	1	
	# and impact of actions requiring a minimum requirements analysis for tool or vehicle use	1			1
	Snowmobile abundance	1	1		
Loss of statutorily protected cultural resources	# (and severity) of disturbances to cultural resources	12	2	3	7
	% of cultural resource sites that have been inventoried	1		1	
	# of historic cabins restored and/or maintained	1			1
	# of fossil or archeological artifact removals	1		1	
	# of historical sites lost	1			1

Untrammelled monitoring measures

Indicator	Measure	# of refuges	Refuge Priorities		
			High	Medium	Low
Authorized actions	# of actions to manage:				
	- Wildlife ☀	16	8	6	2
	- Fire ☀	14	6	6	2
	- Vegetation ☀	13	6	3	4
	- Water / soil ☀	10	7	3	
	# of livestock AUMs	2	1	1	
	# of acres of habitat restoration ☀	2		1	1
	# of hours / instances of trail maintenance	2	1	1	
	# of removals of paleontological resources	1		1	
	# of hunting permits	1			1
	# of research projects / studies	2	1	1	
Unauthorized actions	# of miscellaneous unauthorized actions	13	5	5	3
	# or acres of human-ignited fires	6	3	3	
	# of violations	1		1	
	# of user-created campsites	1		1	
	# of removals of paleontological resources	1			1
	# of military and border patrol intrusions	1			1
	# of undocumented alien apprehensions	1	1		

Solitude or primitive recreation monitoring measures

Quality of wilderness	Measure	# of refuges	Refuge Priorities		
			High	Medium	Low
Remoteness from the sights and sounds of people inside the wilderness	Miles of trails and roads	7	3	2	2
	# of visitor days of usage per year	8	1	7	
	# of commercial hunting guides / client days	5		3	2
	Acres of contiguous wilderness	2	1	1	
	# of special use permits	2		1	1
	% of wilderness away from access or travel routes	2	1	1	
	# of campsites and cabins	2	1		1
	# of shotgun / bullet casings / buoys / sea cargo / litter	2		2	
	Viewshed	1		1	
	Soundscape	1		1	
	# of aircraft landing sites	2	1	1	
	Miles of drainage ditch	1		1	
	# of astronomy observation structures	1	1		
	# of remnants from restoration projects	1			1
Remoteness from the sights and sounds of people outside the wilderness	Artificial night sky brightness / visibility	6		2	4
	Miles of road on wilderness boundaries	6	2	4	
	Index / # of aircraft overflights	4	1	2	1
	Intrusions on the natural soundscape	5	1	4	
	Miles of boundary abutting other wilderness	1		1	
	# of developments on inholdings	1		1	
	# of man-made structures visible	1	1		
	Motorized vehicles / equipment incidents	1	1		
	Area of wilderness affected by access / travel routes	2	2		
	No wake zones adjacent to wilderness	1		1	
	# of large vessel trips adjacent to wilderness	1		1	
	% of ecoregion in protected lands	1		1	
	Private holding impacts on wilderness	3	1	1	1
Facilities that decrease self-reliant recreation	Index / # of agency provided facilities	18	5	7	6
	# of user created facilities / installations	6	2	2	2
	# of recreational signs	2		2	
	# of improved boat landing sites	1		1	
	# of months in a year that visitors are restricted from wilderness	1	1		
Management restrictions on visitor behavior	Index / # of restrictions on visitor behavior	14	5	3	6
	Acres where recreational camping is not permitted	3	1	1	1
	Acres where campfires are not allowed	1	1		
	Acres where hunting is not allowed	1	1		
	% of wilderness closed to public year-round	1	1		

Natural monitoring measures

Quality of wilderness	Measure	# of refuges	Refuge Priorities		
			High	Medium	Low
Plant, animal species, and communities	# of non-indigenous (invasive) species ☼	16	11	5	
	# of extirpated, indigenous species ☼	6	1	5	
	# of threatened, endangered, candidate, or species of concern on state or federal level ☼	7	5	1	1
	Population values ☼				
	- Mammalian populations	1	1		
	- Bighorn sheep	4	3	1	
	- Bat species	2	1	1	
	- Feral burros	2	2		
	- Sonoran pronghorn	1	1		
	- Black-footed ferrets	1	1		
	- Elk	1		1	
	- Mule deer	1		1	
	- Prairie dogs	1	1		
	- Manatees	1		1	
	- Shiras moose	1		1	
	- Avian populations	1	1		
	- Coniferous / open bog bird species	1	1		
	- Bald eagle nests	1		1	
	- Red-cockaded woodpecker	1			1
	- Trumpeter swans	1		1	
	- Cormorant nests	1			1
	Dominant tree species ☼	1			1
	Status of species affected by Exxon Valdez spill	1	1		
	Change demography / status of salmon escapement	1			1
	Ratio of % wetland cover to % forest cover ☼	1	1		
	# of waterbodies with spawning Arctic grayling	1	1		
	% waterbodies meeting sub-aquatic vegetation objectives	1			1
	Vernal pool quality ☼	2	1	1	
	# of grouse leks	1	1		
Physical resources	Air quality	16	10	3	3
	# of waterbodies with altered flow	3	1	2	
	Inches of available precipitation ☼	1	1		
	Contaminants in water / soil	2	2		
	Riparian habitat function assessment	2	1	1	
	Distance of glacier retreat ☼	1	1		
	Health of eelgrass beds	1		1	
	Sockeye salmon abundance estimates	2			2
	Water clarity	2		1	1
	Water temperature ☼	1		1	
	Winter water oxygen level	2			2

Natural monitoring measures continued

Quality of wilderness	Measure	# of refuges	Refuge Priorities		
			High	Medium	Low
Biophysical processes	Departure from natural fire regime index ☼	5	1	3	1
	Change in mean annual temperature ☼	6	2	2	2
	Change in average precipitation ☼	4	2	1	2
	# of actions to prevent natural fires	1	1		
	Change in phenology of vegetation ☼	2			2
	Water level changes in pools / lakes / oceans ☼	5	3		2
	Area and magnitude for pathways for movement of non-native species	3	2	1	
	Change in frequency in desirable plants ☼	1	TBD		
	Extent / magnitude of global climate change ☼	1		1	
	Present wildlife diseases	2	1		1
	Total summer evapotranspiration ☼	1	1		
	# of alterations of river flow	1		1	
	Value of development between wilderness units	1	1		
	Miles of road between wilderness units	1		1	
	Salmon spawning escapement	1		1	
	Percent of landfill acreage remediated	1	1		
	Average age of black spruce stands	1	1		
	AUMs of bison grazing	1		1	
	# of avalanches ☼	1			1

Appendix D. Summary of refuge project leader responses to debriefing questions

The below tables contain a interpreted summary of responses provided by refuge project leaders to the debriefing questions described in the Process section of this report. A summarized transcript of all interviews is available by request.

Did it work?

Debriefing Question	Refuge Responses (18 total)			Comments
	Yes	No	Unsure	
Did this baseline assessment of wilderness character reflect what you feel is happening on the ground at your refuge?	13	1	4	Two refuges indicated that natural monitoring wasn't adequate, while other qualities were accurately captured.
Did this monitoring help you and your staff have a better understanding about wilderness and wilderness character?	16	1	1	
Would monitoring this set of measures provide information to help improve wilderness stewardship on your refuge?	15	1	2	One 'Yes' respondent indicated this did not include natural measures.
Would a better understanding about wilderness character and how it is changing over time affect refuge operations?	11	5	2	
Was it worthwhile to have a Wilderness Fellow complete this effort instead of your own staff?	17	0	1	One refuge indicated having a Fellow do the work was equal to having had one of their own staff.
Were your expectations of the initiative and of your Wilderness Fellow fulfilled?	14	2	2	This summary reflects project leader responses, but in one instance a project leader indicated that expectations were not fulfilled and the refuge biologist indicated they were.
Will your staff be able to continue monitoring these measures in 2012 and beyond?	7	5	6	This summary reflects project leader responses, but in two instances project leaders indicated that monitoring would likely not continue and other interviewed staff indicated it would continue.

Did it work? (continued)

Debriefing Question	Refuge Responses (18 Total)			Comments
	Yes	No	Unsure	
Was the duration of the Wilderness Fellow's stay at your refuge appropriate?	9	9	0	All 'No' respondents indicated they would have preferred a longer stay.
Were there surprises or impediments to accomplishing the work of the wilderness fellow?	14	4		

Was it worthwhile?

Debriefing Question	Refuge Responses (18 Total)			Comments
	Yes	No	Unsure	
Is monitoring the trend in wilderness character worth your time and effort?	15	1	2	
Were there benefits from having a Wilderness Fellow at your refuge?	18	0	0	
Do you plan to use the information produced by the Wilderness Fellow (ex. CCP, refuge I&M plans, step-down plans, MRAs, share with public, share with partners, etc.)?	12	1	0	This question was added after interviewing began and five refuges did not have the opportunity to answer this question.