

HART MOUNTAIN NATIONAL ANTELOPE REFUGE

Poker Jim Ridge Proposed Wilderness

A Report on Wilderness Character Monitoring

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2014



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INTRODUCTION

The Wilderness Act of 1964 (16 U.S.C. § 1131) was passed by a nearly unanimous vote in the United States Congress to protect natural lands from the threats of “expanding settlement and growing mechanization.” The primary mandate given by the Wilderness Act is to “preserve the wilderness character of the area,” a responsibility given to each agency that administers any area designated as wilderness (Section 4(b)). Wilderness character was formally defined in 2006 by an interagency monitoring team – including the Department of the Interior Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, U.S. Geological Survey, and the U.S. Forest Service (Department of Agriculture) – to establish a common understanding of wilderness character.

The definition of wilderness in The Wilderness Act describes five qualities of wilderness. Together, these qualities comprise wilderness character and are used nationwide to monitor the status and trends in wilderness (preservation or degradation) over time from stewardship actions, as well as impacts from modernization and other changes occurring outside of the wilderness itself. The five qualities apply to all wilderness areas – regardless of their size, location, administering federal agency, or other unique place-specific attributes; they are based on the legal definition of wilderness in the Act. Descriptions of the five qualities as derived from Section 2(c) of the Wilderness Act are below.

1. *Untrammeled*

Wilderness is “...an area where the earth and its community of life are untrammeled by man”

Wilderness ecological systems are essentially unhindered and free from the actions of modern human control or manipulation when the untrammeled quality is preserved.

2. *Natural*

Wilderness “...is protected and managed so as to preserve its natural conditions”

Wilderness ecological systems are substantially free from the effects of modern civilization when the natural quality is preserved.

3. *Undeveloped*

Wilderness is “...an area of undeveloped Federal land ... without permanent improvements or human habitation”

Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation when the undeveloped quality is preserved.

4. *Solitude or Primitive and Unconfined Recreation*

Wilderness “...has outstanding opportunities for solitude or a primitive and unconfined type of recreation”

Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation when the quality of solitude or primitive and unconfined recreation is preserved.

5. Other Features of Value

Wilderness “...may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value”

Other tangible features of scientific, educational, scenic, or historical value in wilderness preserve wilderness character when they are preserved.

In addition to the five tangible qualities of wilderness character, wilderness also has important intangible aspects that are difficult or impossible to quantify or monitor. These intangible aspects are diverse and can include the scenic beauty, spiritual experience, immensity of an area, and the opportunity for self-discovery, self-reliance, and challenge that comes from wilderness settings. Currently, these intangible aspects of wilderness can only be addressed in narrative form.

In 2008, an interagency Team published *Keeping It Wild* (Landres et al, 2008), an interagency strategy for monitoring trends in wilderness character across the National Wilderness Preservation System. The framework provided in *Keeping It Wild* is based on the qualities of wilderness character defined above. Each quality is divided into a hierarchical set of monitoring questions, indicators, and measures to assess trends in wilderness character over time. Monitoring questions frame wilderness character monitoring to answer particular management questions; indicators are distinct and important elements within each monitoring question; and measures are a specific aspect of wilderness on which data are collected to assess trend of an indicator (Landres et al 2008). Expanded definitions of qualities, monitoring questions, indicators, and measures are available in Appendix D. While the qualities, monitoring questions, and indicators are nationally consistent, measures are specific and sometimes unique to individual wilderness areas (figure 1).

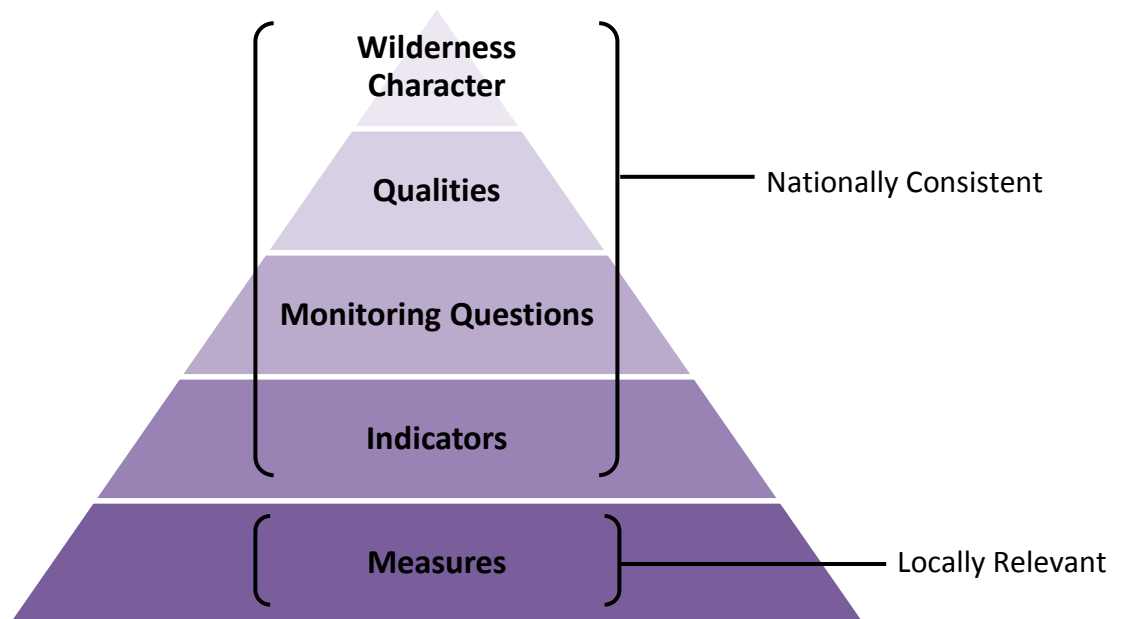


Figure 1. *Keeping It Wild* Hierarchical Framework

This framework balances national and local needs for monitoring by defining locally relevant measures whose trends can be compiled at higher levels for national or regional reporting. This interagency monitoring strategy:

- Provides on-the-ground information to assess trends and make defensible decisions;
- Provides valuable information on wilderness on regional and national scales;
- Provides a set of key wilderness stewardship goals;
- Communicates a common definition of wilderness character;
- Communicates a tangible vision of wilderness within the agency and to the public;
- Clarifies how stewardship decisions and actions influence wilderness;
- Evaluates and documents the effects of actions taken inside the wilderness and effects from threats outside the wilderness;
- Synthesizes data into a single, holistic assessment of wilderness character;
- Creates a legacy of staff experience and knowledge of a wilderness;
- Improves on-the-ground wilderness stewardship.

Under this monitoring strategy, wilderness character in a particular wilderness cannot, and will not, be compared to that of another wilderness. Each wilderness is unique in its legislative and administrative direction, and in its social and biophysical setting. Therefore, comparing wilderness character among different wildernesses is inappropriate. The purpose of this monitoring strategy is to offer a consistent means for documenting the status and trends in wilderness character and wilderness management within a wilderness, not across wildernesses. This strategy has proved to be an effective tool for wilderness managers with limited resources.

Wilderness character may show either upward or declining trends over time. The challenge of wilderness stewardship is that decisions and management actions taken to protect one aspect of wilderness character may diminish another aspect. In addition, the accumulated result of seemingly small decisions and actions may cause a significant gain or degradation of wilderness character over time. Because of this complexity, preserving wilderness character requires that refuge staff document decisions made and the impacts of those decisions.

The following report establishes a baseline condition and monitoring strategy for the Poker Jim Ridge Proposed Wilderness Area based on the five qualities of wilderness character and measures that are specific to the Poker Jim Ridge Proposed Wilderness Area and are indicative of local trends in wilderness character. An online Wilderness Character Monitoring Database (WCMD at <https://wc.wilderness.net/>) accompanies this document and includes entries for all measures and baseline data specific to this Refuge where trends in wilderness character can be monitored.

The purpose of this report and the measures of wilderness character is to improve wilderness stewardship by informing managers' understanding of the wilderness they manage, how wilderness character is changing over time, and evaluate why changes may have occurred. Trends in wilderness character cannot be used to 'rate' or 'grade' stewardship; wilderness character is a tool to holistically assess the preservation of wilderness character, not to place judgment on managers. Trends in wilderness character inform stewardship and are not meaningful when taken out of the context of this report or of WCM.

HISTORICAL AND ADMINISTRATIVE SETTING OF THE POKER JIM RIDGE PROPOSED WILDERNESS

History of establishing the wilderness

The Hart Mountain National Antelope Refuge was established by Executive Order in 1936 as a range and breeding ground for antelope (*Antilocarpa americana*) and other species of wildlife. Shortly following the passing of the Wilderness Act the U.S. Fish and Wildlife Service conducted a wilderness study of Hart Mountain in 1967. Based on the findings of this study the Service proposed two units for wilderness designation; Poker Jim Ridge (17,464 acres) and Fort Warner (32,743 acres). The Secretary of the Interior approved the proposal and the President subsequently sent the proposal to Congress in 1969. The proposal was introduced into legislation in that same year.

The Hart Mountain proposal garnered a generally favorable response, but public hearings and letters did reveal some objections to wilderness designation. Then Governor of Oregon Tom McCall was concerned that wilderness designation would limit the uses of the lands in question stating, "...It is a question of continuing good management as opposed to no management." However, it was determined that a large number of the additional objections were based on the misunderstanding that wilderness designation would remove the refuge status of the land. Additionally, many citizens voiced their support for wilderness on Hart Mountain including a Dr. Buscho who expressed concerns that refuge status alone wouldn't be enough to protect from future development and stated his hope that he, "...might give to my children the wilderness experience that my parents gave to me as a boy."

Despite supportive statements such as these Congress ultimately heeded to the objections and removed the Hart Mountain proposal from legislation. The proposal was reintroduced to Congress in 1971, but similar circumstances once again caused its removal. Following this the Service reevaluated the proposal. The Fort Warner unit was completely removed from the proposal pending further study and private inholding acquisition. Additionally the Poker Jim Ridge unit was reduced in size to 16,462 acres in order to remove a tract of private land. Also during this time the U.S. Geological Survey and the Bureau of Mines completed a library survey that revealed no history of mineral production within any of the proposed wilderness areas. This new proposal was submitted to Congress in 1972 but no action has been taken on it to date.

The 1994 Comprehensive Management Plan (CMP) for Hart Mountain states, "The Refuge will be evaluated in order to determine areas that potentially meet the criteria for Wilderness Study Areas." To date no Wilderness Study Areas (WSA) have been established on Hart Mountain, thus the Poker Jim Ridge Proposed Wilderness Area (PWA) remains the only Portion of the Refuge managed as wilderness. Within the Poker Jim Ridge PWA a Research Natural Area (RNA) was established on November 30, 1972. RNAs are set aside as areas to be used solely for research and education purposes. The main goals of RNAs are to provide a baseline against which the effects of human activities can be measured, an opportunity to study ecological processes in undisturbed ecosystems, and gene pool reserves for all types of organisms. The Poker Jim Ridge RNA was established specifically to provide an undisturbed example of a western juniper savannah vegetative community.

Refuge purposes

Executive Order 7523 established Hart Mountain National Antelope Refuge, "...as a range and breeding ground for antelope and other species of wildlife..."

The 1994 Comprehensive Management Plan lists five goals for Hart Mountain NAR:

- (1) Manage for healthy and balanced populations of pronghorn and other species of native wildlife in their natural habitat, to the extent that populations can be influenced on Refuge lands.
- (2) Manage for the conservation and recovery of threatened and endangered species of plants and animals in their natural ecosystems.
- (3) Restore and maintain, on Refuge lands, the structure, species composition, and processes of native ecological communities and ecosystems of the northern Great Basin Region.
- (4) Provide opportunities for wildlife/wetlands-dependent recreation and education oriented to the Great Basin ecosystem while maintaining the rugged, remote and undeveloped character of the Refuge.

BIOPHYSICAL SETTING OF THE POKER JIM RIDGE PROPOSED WILDERNESS

Geographic setting

Hart Mountain National Antelope Refuge is located in southeastern Oregon within the northern reaches of the Great Basin Ecosystem. This region is defined by the dryness associated with being in the rain shadow of the Sierra Nevada and Cascade Mountains. Summers tend to be hot but winters can get quite cold and severe, especially at higher elevations. The Refuge is quite isolated with the closest town (Plush) having a population of less than 100. Despite its remoteness recreational hunting and wildlife viewing opportunities, along with an inviting patch of hot springs, attracts a number of visitors to the Refuge.



Poker Jim Ridge (far distance) as seen from Warner Mt.

The majority of the Hart Mountain Refuge is comprised of volcanic plateaus that gradually rise from their low point of 4400 feet in elevation to the east to a high ridge that reaches elevations of over 8000 feet to the west. The western edge of this ridge gives way to a steep, rocky escarpment that drops 2500 vertical feet in some areas and was created by faulting. The southern part of this ridge contains the Refuge's namesake Hart Mountain while the northern portion of the ridge is known as Poker Jim Ridge. The long and thin Poker Jim Ridge proposed wilderness areas stretches north to south and encompasses the majority of this northern section of the ridge, including much of the escarpment to the west and some flat plateau areas to the east.

The Poker Jim Ridge receives slightly more precipitation on average than the lower elevation areas of the Refuge. Most of that precipitation falls in the winter months as snow. Once that snow melts it quickly flows off into the lowlands. As such water availability within the wilderness is limited to a small number of intermittent streams.

Ecological setting

The western, rocky portion of the Poker Jim Ridge wilderness has historically provided a natural sanctuary from fire and allowed fire sensitive western juniper (*Juniperus occidentalis*) to thrive. Large stands of old growth juniper are common along the ridgeline. The flatter plateau areas of wilderness tend to be dominated by sagebrush shrubs and some herbaceous forbs and grasses. Much of the sagebrush habitat on the refuge at large has reached a late successional stage where shrubs dominate over forbs and grasses. However, fires within the wilderness in 2001, 2002, and 2010 pushed approximately 4,300 acres of sagebrush and western juniper habitats back to an early successional stage with higher abundances of forbs and grasses.

The westward expansion of European settlers in the early 1800's brought about changes to Hart Mountain's ecology that persist to this day. Namely the effects of livestock grazing (which was discontinued on the refuge in 1994), alterations in the historic fire regime, and invasive species such as cheatgrass have changed the vegetation dynamics of the area. Alteration of the historic fire regime through wildfire suppression is the primary reason much of the sagebrush habitat within the Poker Jim Ridge PWA has progressed to and remains in a late successional stage. In many cases this has also allowed juniper to leave its traditional rocky sanctuaries and spread into areas of sagebrush habitat. In the past juniper stands added an important element of habitat diversity to sagebrush dominated landscapes but now its expansion is reducing the amount of available sagebrush habitat. Such expansion has occurred to a large degree within the Poker Jim Ridge wilderness area due to its large amounts of preexisting old growth juniper. In many areas within the wilderness this 'encroaching' juniper has become dense enough to shade out understory plants that would provide fine fuels for a fire.

The Poker Jim Ridge wilderness area supports a number of large mammal species. The titular character of the Refuge, the pronghorn or American antelope (*Antilocarpa americana*), is often seen within the wilderness. This species is the last remaining from a family that included 12 species in the Pleistocene period and its explosive speed most likely evolved in response to now extinct predators from that time. Mule deer (*Odocoileus hemionus*) also frequent the wilderness. The charismatic bighorn sheep (*Ovis canadensis*) was extirpated from the state of Oregon in 1915 due to a combination of overhunting and competition with and parasites introduced by domestic livestock. In 1954 a successful reintroduction program established a new population of bighorn on Hart Mountain that's has in subsequent years been used as a source population for other reintroduction programs. The rocky escarpments of the Poker Jim Ridge wilderness area provide ideal habitat for bighorns. A number of mammal predators are also seen in the wilderness including coyotes (*Canis latrans*) and mountain lions (*Puma concolor*).

Many other animal species are found within the Poker Jim Ridge wilderness. Sage grouse (*Centrocercus urophasianus*), iconic to sagebrush habitats, can be found and seen displaying at mating leks in the wilderness. Other sagebrush obligate birds such as brewer's sparrow (*Spizella breweri*) and sage thrasher (*Oreoscoptes montanus*) also call the wilderness home. The wilderness also hosts assemblages of reptile and insect species.

DOCUMENTS CONSULTED

Hart Mountain National Antelope Refuge Comprehensive Management Plan and Final Environmental Impact Statement. U.S. Fish and Wildlife Service, Region 1. 1994.

Wilderness Additions in Alaska, New Mexico, Oregon, and Washington. Hearings Before the Subcommittee on Public Lands of the Committee on Interior and Insular Affairs. United States Senate; 91st Congress. U.S. Government Printing Office. 1970.

Minimum Requirements Decision Guide; Action: Sagebrush Habitat Restoration within the Poker Jim Proposed Wilderness Area. U.S. Fish and Wildlife service, Sheldon-Hart Mountain National Wildlife Refuge Complex. 2011.

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PROCESS USED FOR IDENTIFYING MEASURES

The process used to identify and select measures to monitor wilderness character is outlined below. All actions were carried out by the Wilderness Fellow unless otherwise specified.

1. *Gather information* – Background information was gathered to understand the wilderness and refuge including its history, ecosystems, and potential threats in the future. This information was gathered by reading background and guiding documents for the wilderness and refuge (listed in Documents Consulted), interviews with Refuge staff and other individuals, visiting selected islands, and viewing islands from shore.
2. *Create list of possible measures* – Preliminary measures were identified and compiled for all indicators based on the information gathered and interviews with Refuge staff. Several measures were based on measures described in wilderness character monitoring documents, including the Forest Service Technical Guide, National Park Service User Guide, and the U.S. Fish and Wildlife Service (USFWS) Wilderness Character Monitoring Framework “Keeping it Wild”, and refined to suit the Refuge.
3. *Refine measures* – Measures were prioritized and refined through discussing measures with staff and evaluating the significance, feasibility, vulnerability, and reliability of measures (see worksheet in Appendix A). Availability of reports and scientific information was also considered.
4. *Approval of measures* – Final list of measures was developed and submitted to wilderness supervisors Nancy Roeper (National Wilderness Coordinator, USFWS), Peter Dratch (Senior Biologist, NWRS Inventory and Monitoring), and Peter Landres (ecologist, Aldo Leopold Wilderness Research Institute).
5. *Write report* – Each measure was described, including background information, collection protocol, data adequacy, measure weight, data source, and significant change. All measures were written into final report and the report was submitted to supervisors.
6. *Locate and synthesize data* – Available scientific information for each measure was collected by contacting relevant individuals and pulling information from the internet and Refuge Complex shared drive. Data was processed as necessary.
7. *Enter data* – Data was entered into the WCM database at <https://wc.wilderness.net/>.
8. *Incorporate comments* – Changes, edits, and feedback from refuge staff, regional Inventory and Monitoring staff, and wilderness supervisors were received by Wilderness Fellow. Edits were incorporated into the final draft.
9. *Approval of final report* – Report was finalized and approved by supervisors.

WILDERNESS CHARACTER MONITORING MEASURES

This section describes in detail the measures selected to monitor the Poker Jim Ridge Proposed Wilderness Area. The following aspects of each measure are described: background information, measure description & collection protocol, data source, data frequency, and significant change. The content and purpose of each section is described below.

- **2014 data value**—this is the measure value entered into the Wilderness Character Monitoring Database for 2014—the baseline year for Poker Jim Ridge PWA wilderness character monitoring. When measures have legacy data available, the baseline *for that specific measure* will be from the first year for which data is available post becoming proposed wilderness. For Poker Jim Ridge PWA, proposed in 1971, the earliest possible baseline year for a measure would be 1971. A measure’s 2014 data value, therefore, may not necessarily be the *measure’s* baseline data value. For examining trends in wilderness character for the wilderness as a whole, 2014 remains the overall baseline year.
- **Background information** – defines the context and relevance for the measure at an individual wilderness and addresses why the measure was selected.
- **Measure description and collection protocol** – defines what is being measured and how, including the process through which data is compiled or gathered. “Collection protocol” is defined and used in this document to refer to the process by which data is gathered from existing sources and does not include in-the-field data collection instructions. If field data collection protocols are relevant to a measure and available, a location of where the protocol can be found is included.
- **Data source** – defines where baseline information for the measure can be found into the future. The intent of this section is to encourage written documentation of wilderness character so that information is accessible into the future.
- **Data frequency** – defines how often data for this measure should be entered into the WCMD. Frequency is typically determined by the time frame in which data becomes available under existing monitoring protocols and becomes available for use in wilderness monitoring purposes.
- **Data adequacy** – defines the reliability of the data to assess trends in the measure by rating the data adequacy as high, medium, or low. Data adequacy is based on data quantity and data quality. Data quantity refers to the level of confidence that all appropriate data records have been gathered. Data quality refers to the level of confidence about the source(s) of data and whether the data are of sufficient quality to reliably identify trends in the measure. Further information on the role of data quantity and quality in WCM is available in the FS User Guide (pp. 26). Subjective evaluation of these two aspects is used to determine if data adequacy as high, medium, or low. Please note that the WCMD refers to data adequacy as 'data confidence.'
- **Significant change** – defines how much change a measure must undergo to indicate a changing trend wilderness character for a particular measure. “Significant change” is defined and used in this document differently than definitions used by other departments within USFWS and is not intended to mean “statistically significant change” nor imply use of the Environmental Impact Statement (EIS) process under the National Environmental Protection Act (NEPA).

In most cases, frequency and significant change were assigned by the Wilderness Fellow and approved by Refuge staff. All measures within an indicator are weighted equally unless described otherwise.

Together, these sections provide a comprehensive overview of each measure, provide transparency into wilderness character monitoring measures selected at the Refuges, and the form the basis of the wilderness character monitoring strategy of the Poker Jim Ridge Proposed Wilderness Area.

Table 1. Data quantity categories	
Complete	This category indicates a high degree of confidence that all data records have been gathered. For example, to assess the occurrence of nonindigenous invasive plants, a complete inventory of the wilderness was conducted or all likely sites were visited.
Partial	This category indicates that some data is available, but the data is generally considered incomplete (such as with sampling). For example, to assess the occurrence of nonindigenous invasive plants, a partial inventory was conducted or a sampling of sites was conducted where these plants are likely to occur.
Insufficient	This category indicates even less data records have been gathered or perhaps this measure is not dependent on actual field data. For example, no inventory for nonindigenous invasive plants has been conducted, and visitor use was not assessed anywhere.

Table 2. Data quality categories	
High	This category indicates a high degree of confidence that the quality of the data can reliably assess trends in the measure. For example, data on the occurrence of nonindigenous invasive plants is from ground-based inventories conducted by qualified personnel; for visitor use, data would come from visitor permit data.
Medium	This category indicates a moderate degree of confidence about the quality of the data. For example, data on invasive plants could come from national or regional databases; for visitor use, data could come from direct visitor contacts.
Low	This category indicates a low degree of confidence about the quality of the data. For example, data on invasive plants and visitor use could come from professional judgment.

Overview of wilderness character monitoring measures

The table below lists all 35 wilderness character measures used to monitor the Poker Jim Ridge Proposed Wilderness Area and provides at least one measure for every indicator. Each measure is described in more detail in its respective section later in the report.

Table 3: Wilderness Character Monitoring Measures used for the Poker Jim Ridge Proposed Wilderness Area

Quality	Indicator	Measure
Untrammeled	Actions authorized by the Federal land manager that manipulate the biophysical environment	Percentage of naturally ignited fires suppressed
		Number of Prescribed Fires
		Number of vegetation projects
		Number of actions that directly manipulate native animal populations
		Number of functioning guzzler years
	Actions not authorized by the Federal land manager that manipulate the biophysical environment	Number of actions not authorized by the federal land manager that alter the biophysical environment
Natural	Plants	Acres of cheatgrass
		Acres of historic juniper
		Acres of mountain mahogany
	Animals	Bat Diversity
		Population of feral horses
		Pika presence index
	Air and Water	Air quality - ozone
		Air quality – total nitrogen deposition
		Air quality – total sulfur deposition
		Air quality - visibility
	Climate change	Average annual summer and winter temperatures
		Annual precipitation
		Pika upslope contraction
	Ecological processes	Geographic extent of juniper encroachment
	Undeveloped	Presence of non-recreational structures, installations, and developments
Number of study/management installations		
Roads index		
Presence of recreational structures, installations, and developments		Number of recreational structures, installations, and developments
Presence of inholdings		Number of inholdings

	Use of motor vehicles, motorized equipment, or mechanical transport	Authorized uses of motor vehicles, motorized equipment, and mechanical transport for management activities index
		Number of emergency uses of motor vehicles, motorized equipment, and mechanical transport
Solitude or primitive and unconfined recreation	Remoteness from sights and sounds of people inside the wilderness	Structure visual impact index
		Number of survey flight days
		Percentage of wilderness covered by a Military Operations Area
	Remoteness from occupied and modified areas outside the wilderness	Roads on wilderness boundary index
		Light pollution
	Facilities that decrease self-reliant recreation	Number of facilities that decrease self-reliant recreation
Management restrictions on visitor behavior	Number of restrictions on the backcountry camping permit	
Other features of value	Deterioration or loss of other tangible and integral features of value	Degradation of Poker Jim Ridge Research Natural Area quality index

Untrammelled Quality

Wilderness is essentially unhindered and free from modern human control or manipulation.

The untrammelled quality of wilderness character tracks the actions of humans in wilderness that intentionally manipulate the biophysical environment. Actions that intentionally manipulate or control ecological systems inside wilderness degrade the untrammelled quality of wilderness character. This is true regardless of what instigated the action or if benefits to other qualities of wilderness character are gained by the action. When monitoring the untrammelled quality of wilderness we can track the number, extent, and intensity of manipulative actions in wilderness, but the untrammelled quality also includes restraint, and the opportunity for humans to let natural processes occur without intervention. Further information on determining whether an action meets the criteria for the untrammelled quality can be found at <http://ecos.fws.gov/ServCatFiles/Reference/Holding/26180>.

Table 4: Measures of the Untrammelled Quality used to monitor the Poker Jim Ridge Proposed Wilderness Area

Indicator	Measure	Frequency	Data Adequacy	Significant Change	Baseline Value
Actions authorized by the Federal land manager that manipulate the biophysical environment	Percentage of naturally ignited fires suppressed	Every 5 Years	High	Any	100%
	Number of Prescribed Fires	Every 5 Years	High	Any	0
	Number of vegetation projects	Every 5 Years	High	Any	3
	Number of actions that directly manipulate native animal populations	Every 5 years	High	Change of category	Caution (6)
	Number of functioning guzzler years	Every 5 years	High	Any	10
Actions <u>not</u> authorized by the Federal manager that manipulate the biophysical environment	Number of actions not authorized by the federal land manager that alter the biophysical environment	Every 5 Years	Medium	Change of category	Good (0)

Measure: Percentage of naturally ignited fires suppressed

2014 Data Value: 100%

Data Year: 2009-2013

Background and Context: Fire is an important factor in the creation and sustained health of the ecology of sagebrush ecosystems (Wright and Bailey, 1982). Human intervention, mostly in the form of livestock grazing, fire suppression, and invasive species introduction, has altered the natural fire regime of Hart Mountain NAR and made fire difficult to manage. Much of the refuge's sagebrush has advanced to a late seral (dry) stage. On Poker Jim Ridge PWA specifically juniper has been encroaching into areas that were historically sagebrush habitat. Where this juniper has expanded but is not dense enough to shade out understory plants it presents an unnaturally large potential fire fuel load. Additionally, in areas within the wilderness where there has been recent fire invasive cheatgrass often dominates. Cheatgrass presents a large fine fuel load with the potential for increasing fire occurrence above a tolerable threshold for sagebrush. Due to these dangers 100% of naturally ignited fires are suppressed on all of Hart Mountain NAR.

There have been no naturally ignited fires within Poker Jim Ridge within the last 5 years, and somewhat patchy data exists for wildfires further in the past. However, since any naturally ignited fire would most likely have been suppressed in that time period the baseline measure for this value is 100%.

Measure Description and Collection Protocol: The percentage of naturally ignited fires within Poker Jim Ridge PWA that are suppressed, calculated via the following formula:

$$(\# \text{ naturally ignited fires suppressed} / \# \text{ naturally ignited fires}) \times 100$$

The percentage is calculated based on the fires suppressed within the previous 5 years. 'Natural outs', naturally ignited fires that are discovered after they have naturally extinguished themselves, do not count in this measure. If a future situation arises where natural fires could be allowed to burn unsuppressed Poker Jim Ridge PWA that would improve the untrammelled quality, but this is unlikely in the near future. If there have been no naturally ignited fires in the previous 5 years then the measure value is reported as 'no value', with the exception of this initial baseline report

Data Source: SHMNWRC Fire Management Officer (Betsy Schenk), Fire Management Information System

Data Adequacy: High. Firefighting events are closely monitored. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Measure: Number of prescribed fires**2014 Data Value:** 0**Data Year:** 2013

Background and Context: Alterations to fuel loads by grazing, invasive species introductions and fire suppression have altered the natural fire regime of North America's sagebrush habitat (Mensing et al. 2006). Controlled, prescribed fires are implemented as a management strategy to mimic a historic fire regime and maintain the health Poker Jim Ridge PWA's ecosystems. Historical data indicates that a small number of prescribed fires have been conducted within Poker Jim Ridge PWA, including one in 2002, but none have occurred in the previous 5 years.

Measure Description and Collection Protocol: A count of the number of prescribed fires that burn any part of Poker Jim Ridge PWA, regardless of the location of their ignition site, over the previous 5 years. A decrease in the number of prescribed fires improves the untrammled quality.

Data Source: Prescribed fire GIS folder

[-V:\Fire\Hart\RX-treatments](#)

[-S:\Wilderness\Wilderness Character I&M\Hart Mt 2014 Baseline Report Materials\HMNAR Poker Jim Rx Fire History.xlsx](#)

Data Adequacy: High. Prescribed fires are closely monitored and the fire office has recently curated a large amount of prescribed fire data. Therefore Data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Measure: Number of vegetation projects

2014 Data Value: 3

Data Year: 2013

Background and Context: Vegetation within Poker Jim Ridge PWA is managed with some frequency. Vegetation management projects within the wilderness fall into three main categories; juniper thinning projects, seeding projects, and weed spraying projects. These projects affect the untrammeled quality. Each type of project is described in more detail below.

Juniper thinning projects: Western juniper (*Juniperus occidentals*) is a fire sensitive species that historically grows within sagebrush ranges where rocky areas provide protection from fire. In recent years large scale factors such as climate change along with local factors such as the alteration of historic fire regimes, have allowed juniper to encroach into areas of sagebrush habitat (Rowland et al. 2008). Within Hart Mountain NAR and to a large degree specifically within Poker Jim Ridge PWA juniper has been spreading from its traditional rocky sanctuaries, most likely in part due to grazing impacts and increased fire suppression. In some areas these encroaching juniper canopies have become dense enough to shade out understory plants, essentially eliminating fine fuels and making the stands fireproof. This has led to the cutting and thinning of juniper stands to protect and restore sagebrush habitat.

Seeding projects: Cheatgrass, a harmful invasive in many sagebrush ecosystems, is often able to outcompete native plant species immediately following a disturbance such as fire (Baker, 2006). To combat this native seeds are sometimes spread immediately following fires within Hart Mountain NAR. More often than not this is done using aircraft. Only one seeding project occurred on Poker Jim Ridge PWA between 2009 and 2013 following a large fire in 2010.

Weed spraying projects: A number of invasive plant species have been introduced to Hart Mountain NAR. In the past spray application of herbicide has been used within Hart Mountain NAR in order to control invasive species outbreaks, usually following some kind of disturbance. Weed spraying only occurred once within Poker Jim Ridge PWA between 2009 and 2013 following a large fire in 2010.

Measure Description and Collection Protocol: A count of the number of vegetation projects that have occurred within Poker Jim Ridge PWA within the previous 5 years. A decrease in the number of vegetation projects improves the untrammeled quality.

Definitions:

-Juniper thinning project: Juniper thinning projects are most often planned on a bigger scale with large areas being identified as being in need of juniper thinning treatments. Smaller patches within the defined area are then treated as short term logistics and funding allow. After being cut downed juniper trees are often piled and burned. The timing of this burning is dictated by weather and fire severity conditions and often does not occur for a year or more after the actual thinning has been conducted. To simplify the situation for the purposes of this measure a binary count of projects is used. If any aspect of juniper thinning operations has occurred in the previous 5 years within Poker Jim WSA it is counted as 1 project. If there have been no operations within Poker Jim Ridge WSA in the previous 5 years it is counted as 0 projects. The temporal aspect of these projects is reflected under the undeveloped quality.

-Seeding project: Each continuous area of seed application is counted as one project regardless of size. Seeding projects are most often done from the air and their timing can be heavily influenced by weather conditions. Therefore each continuous area that is identified and planned to be seeded counts as one project regardless of how long seeding operations take to complete. Projects that span WCM monitoring report periods are counted as a project in both reports. For example, if a continuous area was planned for seeding and operations began in 2013 but did not conclude until 2014 it would be counted as 1 project in both the 2014 and 2019 WCM monitoring reports.

-Weed spraying project: Weed spraying projects are defined in the same manner as seeding projects. Additionally, for projects that involve ‘spot spraying’, or the selective spraying of small patches of weeds rather than blanket spraying an entire area, spraying will be considered a new project and new area if it occurs further than 0.5 miles from any other areas that have been spot sprayed.

Data Source: SHMNWRC and Fire Office Staff. Fire Office staff will be working on curating GIS shapfiles of juniper mechanical treatments in the winter of 2014-2015.

Data Adequacy: High. Vegetation projects are planned and executed or closely monitored by refuge and fire office staff. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Table 5. Number of vegetation projects within Poker Jim Ridge PWA between 2009 and 2013	
Project type	# of projects
Juniper thinning	1
Aerial seeding (following 2010 fire)	1
Weed spraying (following 2010 fire)	1
Total	3

Measure: Number of actions that directly manipulate native animal populations

2014 Data Value: 6 (caution)

Data Year: 2013

Background and Context: Native animal populations are sometimes manipulated within Poker Jim Ridge PWA. The vast majority of these actions involve bighorn sheep, though refuge staff has been pressured to engage in predator control as well. Bighorn sheep are well adapted to the rock escarpments of Poker Jim ridge, but were extirpated from the area in the early 20th century by introduced diseases from domestic sheep. Using Canadian animals as a source population bighorn were reintroduced to Poker Jim Ridge in 1956. In the following years the new Poker Jim Ridge population was used as a source population for a number of other reintroductions throughout the region. While actions that manipulate bighorn populations degrade the untrammled quality it is important to note that bighorn sheep population health is important to the natural quality, though no reliable, meaningful measure of it currently exists. The presence of functioning guzzlers is not counted in this measure as their trammeling impact is counted under the number of functioning guzzler years measure.

Measure Description and Collection Protocol: A count of the number of actions taken to manipulate native animal populations within Poker Jim Ridge PWA during the previous 5 years. Actions are counted according to table 6 below. Actions that take place outside of the wilderness with the clear intention to trammel the wilderness should also be counted here and must be determined by staff judgment. A decrease in the number of these actions improves the untrammled quality.

Type of action	Example	Counting rule
Single action at a single location	Bighorn sheep are released at a single location	Count as one action
Single action at multiple locations	Bighorn sheep are released at multiple locations	Count as one action for the single species regardless of the number of locations
Multiple actions at a single location	Bighorn sheep and pronghorn are released at the same location	Count as multiple actions, in this case two (one for each species)
Multiple actions at multiple locations	Traps and active hunting are used to remove predators	Count as multiple actions, in this case two (one for each treatment of each species)
Action occurs within a single calendar year	Bighorn sheep are released between June and July 2007	Count as one action
Action spans multiple calendar years without interruption	Traps for removing predators are deployed June 2007 and remain deployed until March 2008	Count as one action
Action spans multiple calendar years with interruption	Predator hunting initiated in August 2007 ends in November 2007 and is reinitiated in August 2008	Count as multiple actions, in this case two (one for each calendar year in which the action was initiated)

Data Source: SHMNWRC Staff

Data Adequacy: High. These types of activities are rare but when they do occur are carefully planned and monitored. Therefore data quantity is complete and data quality is high

Frequency: Every 5 years

Significant Change: Any change from one category to another (see table 7 below) is a significant change.

Table 7. Categories for significant change for actions that manipulate native animal populations				
Category	Good	Caution	Poor	Very Poor
Measure value	0-2	3-6	7-9	10+

Table 8. Actions that directly manipulate native animal populations within Poker Jim Ridge PWA 2009-2013		
Action	Year	# of actions
Bighorn introduction (to augment genetic diversity)	2012	1
Salt/deworming treatment, bighorn	All 5	5
	Total	6
	Category	Caution

Measure: Number of functioning guzzler years**2014 Data Value:** 10**Data Year:** 2013

Background and Context: Guzzlers have been installed within Poker Jim Ridge WSA to benefit bighorn sheep populations, although no specific data exists to ascertain whether the guzzlers are effective to this end. The guzzlers are passive rain catchment systems so they are not actively filled with water as is done on other refuges. However, the decision to allow these guzzlers to function constitutes an action with the intent to manipulate the populations of the aforementioned species. Guzzlers are monitored on an annual basis to see if they are functioning. If they are found to not be functioning a decision is made as to whether the guzzler should be repaired or left as is. Therefore the presence of these functioning guzzlers affects the untrammeled quality. Poker Jim Ridge PWA contains 3 guzzlers, two have been fully functional while one was not functioning at all between 2009 and 2013.

Measure Description and Collection Protocol: A count of the number of functioning guzzler years within Poker Jim Ridge WSA during the previous 5 years. One guzzler functioning for one year constitutes a guzzler year. Therefore a single guzzler functioning for the entirety of the measuring period would contribute 5 guzzler years to the total. A decrease in the number of functioning guzzler years improves the untrammeled quality.

Definitions: A functioning guzzler is one that is equipped to funnel water from its rain catchment system into its associated trough. If a guzzler cannot transfer water from its rain catchment system into its associated trough it is considered non-functioning even though a small amount of water may still collect in the trough.

Data Source: SHMNWRC staff. Guzzlers GIS layer.

- <V:\Hart\BaseData\Facilities Structures\WATERHOLES&GUZZLERS>

Data Adequacy: High. Guzzlers are closely monitored by refuge staff. Therefore data quantity is complete and data quality is high.

Frequency: Yearly

Significant Change: Any

Measure: Number of actions not authorized by the federal land manager that alter the biophysical environment

2014 Data Value: 0 (good)
Data Year: 2013

Background and Context: Unauthorized actions that manipulate the biophysical environment of Hart Mountain NAR are rare, but do happen on occasion. Most commonly these actions would involve trespass grazing of livestock or the release of horses onto the refuge. In recent years there have also been releases of bighorn sheep outside the refuge by state agencies with possible intention of augmenting bighorn sheep populations on Poker Jim Ridge, however there is currently no evidence that those sheep made it onto the wilderness.

Measure Description and Collection Protocol: A count of the number of actions not authorized by the federal land manager that manipulate the biophysical environment of Poker Jim Ridge PWA during the previous 5 years. Actions are counted according to table 9 below. An increase in these actions degrades the natural quality.

Table 9. Counting the number of actions not authorized by the federal land manager that alter the biophysical environment (adapted from the Forest Service Wilderness Character Technical Guide)		
Type of action	Example	Counting rule
Single action at a single location	Bighorn sheep are released at a single location, or trespass grazing of a single domestic species is initiated through a single break in the boundary fence	Count as one action
Single action at multiple locations	Bighorn sheep are released at multiple locations, or trespass grazing of a single domestic species is initiated at multiple breaks in the boundary fence	Count as one action for the single species regardless of the number of locations
Multiple actions at a single location	Bighorn sheep and pronghorn are released at the same location, or trespass grazing of two domestic species is initiated through a single break in the boundary fence	Count as multiple actions, in both of these cases two (one for each species)
Multiple actions at multiple locations	Traps and active hunting are used to remove predators, or trespass grazing of two domestic species is initiated at multiple breaks in the boundary fence	Count as multiple actions, in both of these cases two (one for each treatment of the predator species and one for each domestic species that is trespass grazing)
Action occurs within a single calendar year	Bighorn sheep are released between June and July 2007, or trespass grazing is initiated on the same timeline	Count as one action
Action spans multiple calendar years without interruption	Traps for removing predators are deployed June 2007 and remain	Count as one action

	deployed until March 2008, or trespass grazing is initiated and continues on the same timeline	
Action spans multiple calendar years with interruption	Predator hunting initiated in August 2007 ends in November 2007 and is reinitiated in August 2008, or trespass grazing is initiated, concluded, and reinitiated on the same timeline	Count as multiple actions, in both of these cases two (one for each calendar year in which the action was initiated)

Data Source: SHMNWRC Staff

Data Adequacy: Medium. The nature of these actions means there is no guarantee that some may escape the notice of refuge staff. Therefore data quantity is partial and data quality is medium.

Frequency: Every 5 years

Significant Change: Any change from one category to another (see table 10 below) is a significant change.

Table 10. Categories for significant change for actions not authorized by the federal land manager that manipulate the biophysical environment				
Category	Good	Caution	Poor	Very Poor
Measure value	0-1	2-3	4-5	6+

Table 11. Number of actions not authorized by the federal land manager that manipulate the biophysical environment within Poker Jim Ridge PWA 2009-2013		
Year	Action	Description
N/A	None	No actions not authorized by the federal land manager that manipulate the biophysical environment of Poker Jim Ridge PWA have occurred in the baseline monitoring period
	Total # of actions 2009-2013	0
	Category	Good

Natural Quality

Wilderness ecological systems are substantially free from the effects of modern civilization.

The natural quality of wilderness assesses the integrity of local ecosystems and their freedom to change and develop without human manipulation. As a quality of wilderness character, the natural quality of wilderness tracks the effects of human actions and modern civilization on natural ecosystems (in contrast to the untrammeled quality which tracks the actions themselves). Ecosystems include all living and non-living things in an area, as well as the interactions between them. Within wilderness, changes to the natural quality can be caused directly or indirectly as well as caused intentionally or unintentionally. Monitoring ecosystem changes inside wilderness is key to understanding the unique character of each wilderness area and how it is impacted by human actions. In addition, the NWRS Improvement Act states that refuges shall “ensure that the biological integrity, diversity, and environmental health of the System are maintained,” complementing naturalness as quality of wilderness (16 U.S.C. § 668dd).

Table 12: Measures of the Natural Quality used to monitor the Poker Jim Ridge Proposed Wilderness Area

Indicator	Measure	Frequency	Data Adequacy	Significant Change	Baseline Value
Plants	Acres of cheatgrass	Every 5 years	Medium	≥10%	346.6 acres
	Acres of historic juniper	Every 5 years	Medium	≥10	546 acres
	Acres of mountain mahogany	Every 5 years	Medium	≥10%	396.2 acres
Animals	Bat Diversity	Every 5 years	Medium	Any	12 species
	Population of feral horses	Every 5 years	High	≥10%	5 horses
	Pika presence index	Every 5 years	Medium	Change of category	1
Air and water	Air quality - ozone	Every 6 years	Medium	Change of category	69.63 ppb (moderate)
	Air quality – total nitrogen deposition	Every 6 years	Medium	Change of category	0.36 kg/ha (good)
	Air quality – total sulfur deposition	Every 6 years	Medium	Change of category	0.16 kg/ha (good)
	Air quality - visibility	Every 6 years	Medium	Change of category	4.26 dV (moderate)
Climate change	Average annual summer and winter temperatures	Yearly	High	Any	0 (index value)
	Annual precipitation	Yearly	High	Any	0 (index value)
	Pika upslope contraction	Every 5 years	Medium	≥100 meters	2036 meters

Ecological processes	Geographic extent of juniper encroachment	Every 5 years	Medium	≥10%	601.2 acres
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Measure: Acres of cheatgrass

2014 Data Value: 346.6 acres

Data Year: 2010

Background & Context: Cheatgrass (*Bromus tectorum*) is an invasive grass, most likely originating from southwestern Asia, which has plagued many parts of the great basin. It has many negative impacts including outcompeting native plants and altering fire regimes by drastically changing fuel loads (Billings, 1992). Cheatgrass often is the first plant to colonize after a disturbance such as fire. Remote sensing, namely data from the National Aerial Imagery Program (NAIP), is able to detect areas dominated by cheatgrass. NAIP data identifies the dominant vegetation type of an area at a 30 meter by 30 meter pixel resolution. While this technique is not able to measure understory cheatgrass, it is the most realistic method for assessing cheatgrass abundance over the entirety of the Poker Jim Ridge PWA.

Measure Description & Collection Protocol: A measure of the area occupied by cheatgrass within Poker Jim Ridge PWA as determined by remote sensing. An increase in the area of cheatgrass degrades the natural quality.

Data Source: Detailed vegetation maps are created by the SHMNWRC in conjunction with the Pacific Northwest Laboratory. The most recent map was constructed in 2010 and will be updated before the next wilderness character monitoring report.

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Data Adequacy: Medium. NAIP imagery is able to survey the entirety of the wilderness but can only detect larger areas dominated by cheatgrass and not understory cheatgrass. Therefore data quantity is partial and data quality is medium.

Frequency: Every 5 years

Significant Change: A 10% change or greater is considered significant.

Measure: Acres of historic juniper**2014 Data Value:** 546 acres**Data Year:** 2010

Background & Context: Western juniper (*Juniperus occidentals*) is a fire sensitive species that historically grows within sagebrush ranges where rocky areas provide protection from fire. Although recent large and small scale anthropogenic effects have allowed juniper to encroach upon and degrade important sagebrush habitat (Rowling et al. 2008), areas of historic juniper are important to the natural quality and provide vital areas of habitat diversity to Poker Jim Ridge PWA. National Aerial Imagery Program (NAIP) data provides high quality data of juniper crown density. NAIP data identifies the dominant vegetation type of an area at a 30 meter by 30 meter pixel resolution. This data has already been used by refuge staff to prioritize sagebrush habitat restoration projects. To that end staff have also preliminarily delineated areas of old growth juniper (including the entirety of the Poker Jim Ridge RNA) within Poker Jim Ridge PWA. Although this delineation is somewhat anecdotal it is currently the best available estimation of juniper's historic range within Poker Jim Ridge PWA. This measure quantifies the area within that historic range that NAIP imagery identifies as being dominated by juniper. This measure could be improved in the future through a more sophisticated delineation of juniper's historic range within Poker Jim Ridge PWA.

Measure Description & Collection Protocol: The area in acres identified as being dominated by juniper by NAIP imagery within juniper's delineated historic range within Poker Jim Ridge PWA. A significant reduction in the acreage of this historic juniper degrades the natural quality.

Data Source: Detailed vegetation maps are created by the SHMNWRC in conjunction with the Pacific Northwest Laboratory. The most recent map was constructed in 2010 and will be updated before the next wilderness character monitoring report. Areas of old growth juniper were first identified in the minimum requirements decision guide for sagebrush habitat restoration on Poker Jim Ridge PWA.

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Data Adequacy: Medium. NAIP imagery can easily cover the entirety of the wilderness but may miss some areas of historic juniper with lower canopy densities. Areas of historic juniper were identified in an anecdotal manner. Therefore data quantity is partial and data quality is medium.

Frequency: Every 5 years

Significant Change: A loss 10% or more of area dominated by historic juniper constitutes a significant change.

Measure: Acres of mountain mahogany**2014 Data Value:** 396.2 acres**Data Year:** 2010

Background & Context: Historically Poker Jim Ridge WSA has contained small stands of mountain mahogany (*Cerocarpus montanus*) in riparian areas and where snow pockets form. These stands provide an important cover, forage, and nesting habitat. Currently the majority of stands within Poker Jim Ridge WSA are dominated by older trees and show little recruitment of new plants. These demographics are most likely the result of fire exclusion (Gruell, 1995). In this state, Poker Jim Ridge WSA's mahogany stands are at risk of disappearing through fire, lack of regeneration, disease, or another disturbance. The loss of these stands would be detrimental to the natural quality of Poker Jim Ridge WSA. Remote sensing techniques, namely data from the National Aerial Imagery Program (NAIP), are able to detect mahogany stands. NAIP data identifies the dominant vegetation type of an area at a 30 meter by 30 meter pixel resolution.

Measure Description & Collection Protocol: The area covered by mountain mahogany stands within Poker Jim PWA wilderness as determined by NAIP imagery. A decrease of mountain mahogany degrades the natural quality.

Data Source: Detailed vegetation maps are created by the SHMNWRC in conjunction with the Pacific Northwest Laboratory. The most recent map was constructed in 2010 and will be updated before the next wilderness character monitoring report.

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Data Adequacy: Medium. NAIP imagery can easily survey the entirety of the wilderness but may miss stands with lower canopy densities. Therefore data quantity is complete and data quality is medium.

Frequency: Every 5 years

Significant Change: A 10% change or greater is considered significant

Measure: Bat diversity

2014 Data Value: 12 species

Data Year: 2013

Background and Context: Bats play important ecological roles and can be effective bioindicators of ecosystem health (Jones et al. 2009). Additionally, monitoring bats could provide warning if white nose syndrome is introduced into the refuge. Thus healthy bat populations are important to the natural quality. Bats are monitored on Hart Mountain NAR using specialized audio recording devices. Due to sampling design and the fact that bats wander over large areas, this is a refuge wide -measure that is being applied to the wilderness.

Measure Description and Collection Protocol: A count of the number of bat species identified on the refuge in the previous 5 years as determined by audio sampling. A change in the number of bat species present degrades the natural quality.

Data Source: SHMNWRC annual biological reports.

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Data Adequacy: Medium: Detection methods are precise and accurate but it is impossible to survey the entirety of Hart Mountain NAR. Therefore data quantity is partial and data quality is high.

Frequency: Every 5 Years

Significant Change: Any

Table 13. Hart Mountain NAR bat species diversity WCM baseline measurement	
Species identified within Hart Mountain NAR 2009-2013	Total
Hoary bat, pacific townsend's big-eared bat*, pallid bat, spotted bat, fringe myotis, little brown myotis, long-legged myotis, big brown bat, silver haired bat, Mexican free tailed bat, western pipistrelle	12
*Two separate species, <i>Corynorhinus townsendii townsendii</i> and <i>Corynorhinus townsendii pallescens</i> exist under this common name. Both have been identified within the refuge.	

Measure: Population of feral horses

2014 Data Value: 5

Data Year: 2013

Background & Context: Feral horses can have negative impacts on soil and plant species abundance and diversity. This is especially true in the scrublands of the Great Basin, which have less of a history of abundant grazers than savannahs or grasslands (Beever et al. 2007). A large population of feral horses, leftover from the ranching and homesteading days of Hart Mountain NAR, has severely altered the ecology of the refuge through intense grazing. A large horse removal effort was conducted in 2009 (reducing the minimum population estimate from 270 to 22) and the first year in which no horses were observed on the refuge was 2013, but the opportunity remains for more horses from surrounding areas to make their way through the perimeter fence and onto the refuge. The horse population is determined through annual aerial surveys. For the purposes of this measure only horses that are seen within the wilderness are counted. In the baseline monitoring period horses were only observed within the wilderness in a single year in a group of 25.

Measure Description & Collection Protocol: The population of feral horse on Poker Jim Ridge PWA. The wilderness character monitoring value is the average population of the preceding 5 years. A decrease in the average population of feral horses improves the natural quality.

Data Source: SHMNWRC aerial survey reports

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Data Adequacy: High. Aerial surveys, while not perfect, represent one of the most comprehensive ways to survey the expansive area of Hart Mountain NAR for large mammal species and provides meaningful minimum population estimates. Therefore data quantity is complete and data quality is high.

Frequency: Yearly

Significant Change: A 10% change or greater is considered significant.

Measure: Pika presence index

2014 Data Value: 1

Data Year: 2011

Background and Context: American pika (*Ochotona princeps*) is a small mammal species that has historically occupied the higher elevations of the Great Basin. The discovery of a number of lower elevation populations, including one within Hart Mountain NAR, suggests pika may be more common at lower elevations than previously thought. Pikas have a small thermal tolerance range and very specific habitat requirements making them a very vulnerable species. Many Great basin populations have been extirpated (Collins and Bauman, 2012). This vulnerability makes pika presence important to the natural character of Hart Mountain NAR. The pika on Hart Mountain NAR present an interesting situation. The metapopulation dynamics of pika are such that they often quickly disappear from one area and reappear in another (Moilanen et al. 1998). The pika population within Hart Mountain NAR has been shown to be genetically isolated from surrounding populations. Additionally, though the escarpment within the Poker Jim Ridge PWA offers prime pika habitat it is too steep to safely survey. Therefore there is no record of Pika within the despite the fact that they are most likely present. However, with Pika’s propensity to shift locations so much a loss of pika in all other parts of the refuge would most likely mean there would be few if any individuals within the wilderness. Additionally, with the Hart Mountain NAR population being genetically isolated from surrounding populations a loss of Pika within the refuge would most likely be permanent. Therefore this is a presence/absence measure for the survey-able parts of the refuge that is applied to the wilderness.

Measure Description and Collection Protocol: The status of pika within Hart Mountain NAR. Locations of pika presence within the previous 5 years are determined and an index score is assigned using table 14 below. If pika were determined to be present in an area anytime in the previous 5 years they are considered present for the purposes of this measure, regardless of current presence. A decrease in the index value degrades the natural quality.

Table 14. Scoring chart for the pika presence index measure

Pika presence	Score
Not present within the refuge	0
Present within the refuge	1

Data Source: SHMNRWC Biologist (Gail Collins)

Data Adequacy: Medium. Surveys are very effective at locating evidence of pika presence, however the size of Hart Mountain NAR and the dangerous slope of the Poker Jim Ridge escarpment makes it unfeasible to survey all potential pika habitat. Therefore data quantity is partial and data quality is high.

Frequency: Every 5 years

Significant Change: Any change in status category is considered significant.

Measure: Air quality - ozone

2014 Data Value: 69.63 ppb (Moderate)

Data Year: 2009

Background and Context: Ground level ozone is created when volatile organic compounds (VOCs) and oxides of nitrogen (NOx) react together in the presence of sunlight. Industrial and motor vehicle emissions are the largest sources of VOCs and NOx. Ozone pollution can drastically alter ecosystems by affecting vegetation productivity. Plants exposed to ozone pollution exhibit impaired photosynthesis and growth rates and higher susceptibility to pests, disease, and drought. Ozone pollution can also negatively impact human respiratory health.

Measure Description and Collection Protocol: This measure counts the fourth highest 8-hour average ozone concentration in parts per billion (ppb). Values are reported as five-year averages. The USFWS Inventory and Monitoring Program uses data collected by CASTNet monitoring stations to interpolate ozone concentration for specific wilderness areas. Over time, the numerical value of ppb can be assessed for whether values are increasing (indicating degradation) or declining (indicating improvement). No trend can be assigned in the WCMD as it is statistically invalid to assign trends to interpolated data values. Due to data availability the 2014 baseline value will be the 2005-2009 average. A decrease in ozone improves the natural quality.

Data Source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality
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Data Adequacy: Medium. Data quantity is partial and data quality is medium because no monitoring stations lie within representative proximity to Hart Mountain NAR, therefore the data is interpolated from a number of regional monitoring stations.

Frequency: Every 6 years. The most recent available 5-year average is used as the measure value.

Significant Change: Any change from one category to another (see table 15 below) is a significant change.

Table 15. Ozone pollution categories		
Good	Moderate	Significant Concern
<60 ppb	61-75 ppb	>76 ppb

Measure: Air quality – total nitrogen deposition

2014 Data Value: 0.36 kg/ha (Good)

Data Year: 2009

Background and Context: Nitrogen deposition can affect ecosystems by acidifying water and soil. Nitrogen deposition can also contribute to unnatural nutrient enrichment, altering plant and animal diversity and ecosystem processes. Agricultural runoff and industrial emissions are the greatest sources of nitrogen pollution.

Measure Description and Collection Protocol: Concentration of nitrogen in atmospheric wet deposition is measured in units of kilogram per hectare (kg/ha). Values are reported as five-year averages interpolated from nearby data stations. The USFWS Inventory and Monitoring Program uses data collected by NADP monitoring stations to interpolate wet nitrogen deposition for specific wilderness areas. Over time, the numerical value of kg/ha units can be assessed for whether values are increasing (indicating degradation) or declining (indicating improvement). No trend can be assigned in the WCMD as it is statistically invalid to assign trends to interpolated data values. Due to data availability the 2014 baseline value will be the 2005-2009 average. A decrease in total nitrogen deposition improves the natural quality.

Data Source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality
[-S:\Wilderness\Wilderness Character landM\Air Quality Reports](#)

Data Adequacy: Medium. Data quantity is partial and data quality is medium because no monitoring stations lie within representative proximity to Hart Mountain NAR, therefore the data is interpolated from a number of regional monitoring stations.

Frequency: Every 6 years. The most recent available 5-year average is used as the measure value.

Significant Change: Any change from one category to another (see table 16 below) is a significant change.

Table 16. Total nitrogen deposition categories		
Good	Moderate	Significant Concern
<1 kg/ha	1-3 kg/ha	>3 kg/ha

Measure: Air quality – total sulfur deposition

2014 Data Value: 0.16 kg/ha (Good)

Data Year: 2009

Background and Context: Sulfur Deposition can affect ecosystems by acidifying water and soil. Industrial emissions are the largest source of sulfur pollution.

Measure Description and Collection Protocol: Concentration of sulfur in atmospheric wet deposition is measured in units of kilogram per hectare (kg/ha). Values are reported as five-year averages interpolated from nearby data stations. The USFWS Inventory and Monitoring Program uses data collected by NADP air quality monitoring stations to interpolate wet sulfur deposition for specific wilderness areas. Over time, the numerical value of kg/ha units can be assessed for whether values are increasing (indicating degradation) or declining (indicating improvement). No trend can be assigned in the WCMD as it is statistically invalid to assign trends to interpolated data values. Due to data availability the 2014 baseline value will be the 2005-2009 average. A decrease in total sulfur deposition improves the natural quality.

Data Source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality

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Data Adequacy: Medium. Data quantity is partial and data quality is medium because no monitoring stations lie within representative proximity to Hart Mountain NAR, therefore the data is interpolated from a number of regional monitoring stations.

Frequency: Every 6 years. The most recent available 5-year average is used as the measure value.

Significant Change: Any change from one category to another (see table 17 below) is a significant change.

Table 17. Total sulfur deposition categories		
Good	Moderate	Significant Concern
<1 kg/ha	1-3 kg/ha	>3 kg/ha

Measure: Air quality – visibility

2014 Data Value: 4.26 dV (Moderate)

Data Year: 2009

Background and Context: Anthropogenic particles in the air can scatter light and create a haze that impairs visibility. This measure quantifies those particles.

Measure Description and Collection Protocol: This measure tracks visibility using the amount of small particles in the air in units of deciview (dV). Data values are reported as five-year averages interpolated from nearby data stations. The USFWS Inventory and Monitoring Program uses data collected by IMPROVE monitoring stations to interpolate visibility for specific wilderness areas. Over time, the numerical value of dV can be assessed for whether values are increasing (indicating degradation and decreased visibility) or declining (indicating improvement). No trend can be assigned in the WCMD as it is statistically invalid to assign trends to interpolated data values. Due to data availability the 2014 baseline value will be the 2005-2009 average. A decrease in airborne particulates improves the natural quality.

Data Source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality
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Data Adequacy: Medium. Data quantity is partial and data quality is medium because no monitoring stations lie within representative proximity to Hart Mountain NAR, therefore the data is interpolated from a number of regional monitoring stations.

Frequency: Every 6 years. The most recent available 5-year average is used as the measure value.

Significant Change: Any change from one category to another (see table 18 below) is a significant change.

Table 18. Visibility categories		
Good	Moderate	Significant Concern
<2 dV	2-8 dV	>8 dV

Measure: Average annual summer and winter temperatures

2014 Data Value: 0

Data Year: 2013

Background and Context: Changes in temperature patterns can affect many facets of ecology including phenology, species distributions, and the rates of various ecological processes. Temperatures are recorded at Rock Creek weather monitoring station within Hart Mountain NAR.

Measure Description and Collection Protocol: Average annual summer and winter temperatures are calculated for all available years (1987-present) and a simple linear regression analysis is performed to ascertain if there is a significant trend ($\alpha=0.05$). The results for summer and winter trends are scored using table 18 below to reach a final value for the measure. Any non-zero value for this measure indicates a changing trend, however due to the complexities of climate change, measures a label of improving or degrading is not assigned.

Definitions

- Summer: June – August
- Winter: December – February (counted under the year corresponding with January)

Data Source: Raw weather data from the Rock Creek station is available from the Western Regional Climate Center

- <http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?orOROC>

- <S:\Wilderness\Wilderness Character I&M\Hart Mt 2014 Baseline Report Materials\Rock Creek RAWs weather HMNAR.xlsx>

Data Adequacy: High. The weather station is within the refuge and reports consistently. Therefore data quantity is complete and data quality is high.

Frequency: Yearly

Significant Change: A simple linear regression analysis for either season that results in a P-value of less than or equal to 0.05 constitutes a significant trend for that season. The final measure is calculated by scoring the season trends using table 19 below. Any change in the measure is a significant change.

Table 19. Scores for the average annual summer and winter temperatures measure		
Average annual summer temperatures	Average annual winter temperatures	Measure value
No significant trend	No significant trend	0
No significant trend	Significant trend	1
Significant trend	No significant trend	1
Significant trend	Significant trend	2

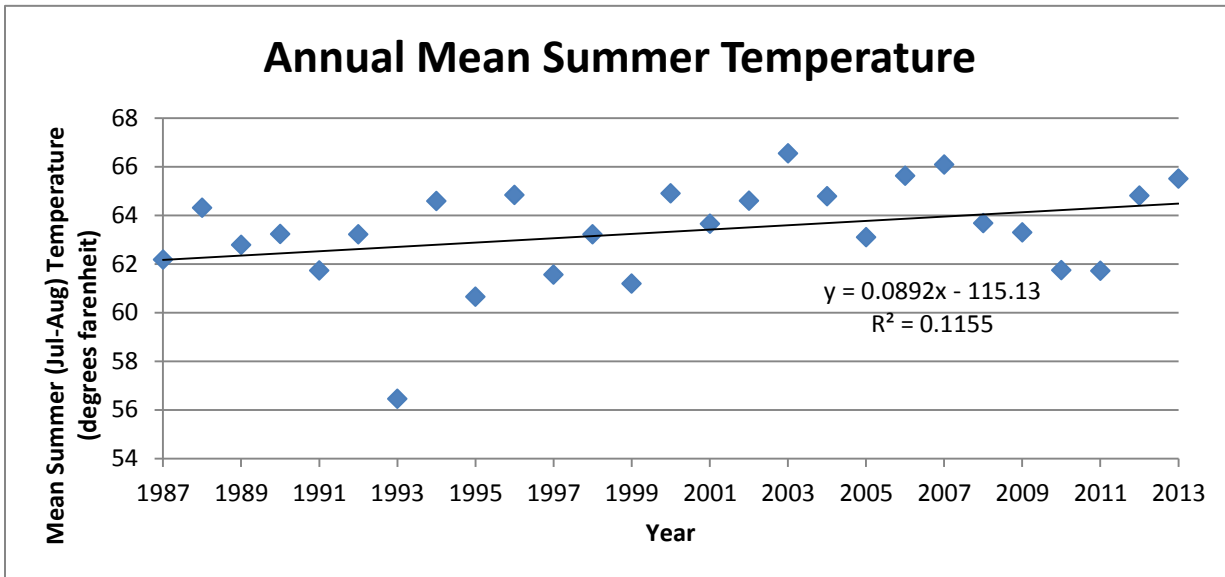


Figure 2. Mean summer temperatures recorded at the Rock Creek weather station 1987-present. The simple regression analysis revealed no significant trend (P-value=0.08)

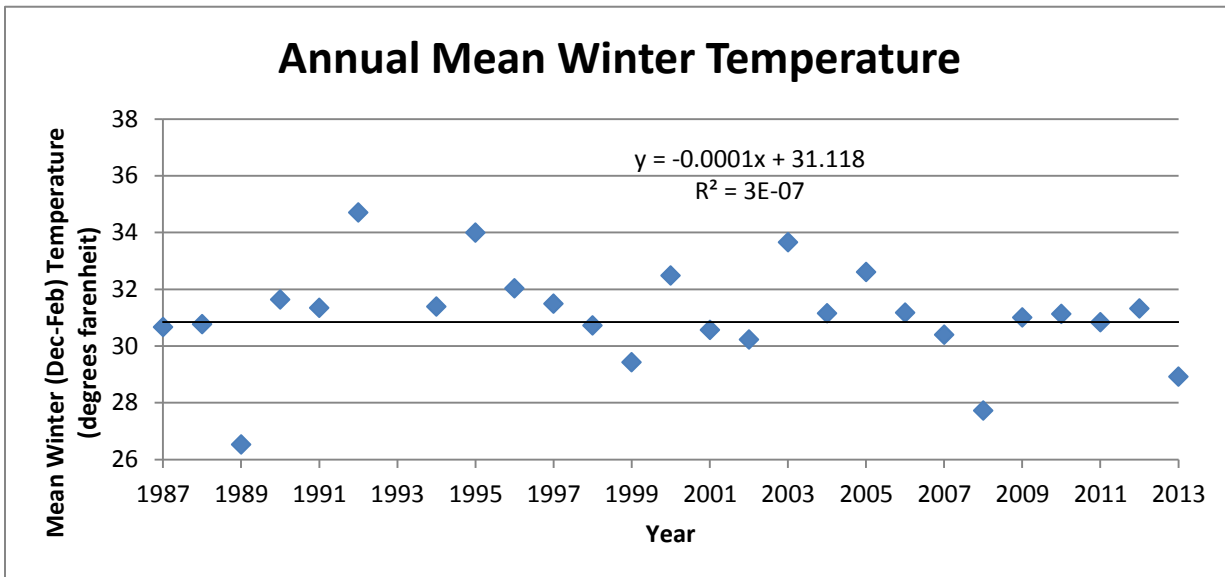


Figure 3. Mean winter temperatures recorded at the Rock Creek weather station 1987-present. The simple regression analysis revealed no significant trend (P-value=0.99).

Table 20. Hart Mountain annual summer and winter temperatures WCM baseline measurements			
Years analyzed	Average annual summer temperatures trend	Average annual winter temperatures trend	Measure value
1987-2013	No significant trend	No significant trend	0

Measure: Annual precipitation**2014 Data Value:** 0**Data Year:** 2013

Background and Context: The very dry climate of Hart Mountain NAR makes precipitation a very important factor for native flora and fauna. Rain patterns have large effects on widespread vegetation. The high basalt blocks of Poker Jim Ridge proposed wilderness area have very few springs so direct rain/snowfall is often the only source of water. Therefore precipitation is essential to the wilderness. Precipitation is recorded at the Rock Creek weather station on Hart Mountain NAR.

Measure Description and Collection Protocol: Total annual precipitation is calculated for all available years (1987-present) and a simple linear regression analysis is performed to ascertain if there is a significant trend ($\alpha=0.05$). The lack of a significant trend results in a 0 value for the measure while the identification of a significant trend results in a value of 1. A value of 1 indicates a changing trend, however due to the complexities of climate change measures, a label of improving or degrading is not assigned.

Data Source: Raw weather data from the Rock Creek station is available from the Western Regional Climate Center

- <http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?orOROC>

- <S:\Wilderness\Wilderness Character I&M\Hart Mt 2014 Baseline Report Materials\Rock Creek RAWS weather HMNAR.xlsx>

Data Adequacy: High. The weather station is within the refuge and reports consistently. Therefore data quantity is complete and data quality is high.

Frequency: Yearly

Significant Change: A simple linear regression analysis for annual precipitation that results in a P-value of less than or equal to 0.05 constitutes a significant trend. For this measure no trend=0 and significant trend=1. Any change in the measure is a significant change.

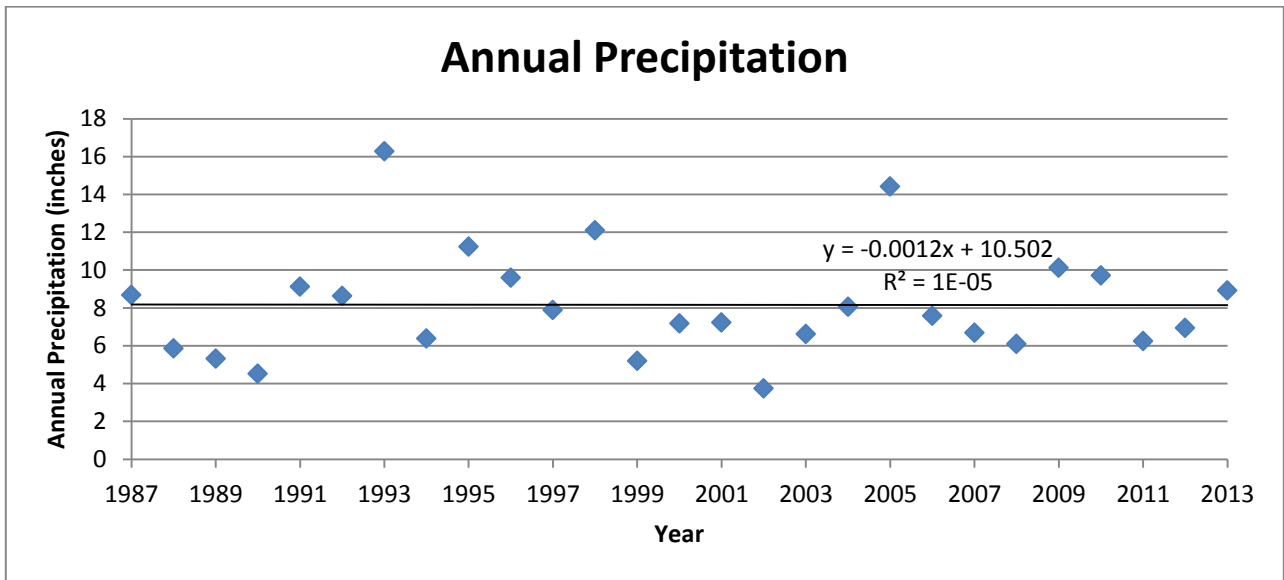


Figure 4. Mean annual precipitation recorded at the Rock Creek weather station 1987-present. The simple regression analysis revealed no significant trend (P-value=0.99).

Measure: Pika upslope contraction

2014 Data Value: 2036 meters

Data Year: 2011

Background and Context: American pika (*Ochotona princeps*) is a small mammal species with a correspondingly small temperature tolerance range. The population within Hart Mountain NAR has already displayed an upslope contraction in response to microclimatic changes (Collins and Bauman, 2012). This species presents a good opportunity to monitor a clear ecological response to climate change. Due to sampling protocols, the metapopulation dynamics of pika, and the fact that this measure aims to identify local climatic changes that are not confined to the wilderness boundary this is a refuge wide measurement that is applied to wilderness.

Measure Description and Collection Protocol: The average elevation (meters) of all of the sites where pikas have been determined to be present is calculated. Pika monitoring is conducted intermittently, so staff members determine the most reasonable set of data to use for each monitoring report. This average elevation is then compared to that of the previous report. A significant change in average elevation indicates a changing trend, however due to the complexities of climate change measures a label of improving or degrading is not assigned.

Data Source: SHMNWRC biologist (Gail Collins)

Data Adequacy: Medium. Surveys are simple presence/absence and are conducted intermittently. Therefore data quantity is partial and data quality is medium.

Frequency: Every 5 years

Significant Change: A change of 100 meters or greater is considered significant.

Measure: Geographic extent of juniper encroachment**2014 Data Value:** 601.2 acres**Data Year:** 2010

Background & Context: Western juniper (*Juniperus occidentals*) is a fire sensitive species that historically grows within sagebrush ranges where rocky areas provide protection from fire. In recent years large scale factors such as climate change, along with local factors such as the alteration of historic fire regimes, have allowed juniper to encroach into areas of sagebrush, resulting in a loss of sagebrush habitat (Rowling et al. 2008). Within Poker Jim Ridge PWA juniper has been spreading from its traditional rocky sanctuaries, most likely in part due to grazing impacts and increased fire suppression. In some areas these encroaching juniper canopies have become dense enough to shade out understory plants, essentially eliminating fine fuels and making the stands fireproof. Maintaining juniper within its historic range and keeping it from replacing historic sagebrush habitat is important to the natural quality. National Aerial Imagery Program (NAIP) data provides high quality data of juniper crown density. NAIP data identifies the dominant vegetation type of an area at a 30 meter by 30 meter pixel resolution. . This data has already been used by refuge staff to prioritize sagebrush habitat restoration projects. Areas of old growth juniper have been identified within Poker Jim Ridge PWA by analyzing tree stand dynamics. This type of analysis is effective at identifying areas of juniper that predate European settler influence (Miller et al. 2005). This measure considers the amount of area that outside of these old growth areas that has been identified as being dominated by juniper by NAIP imagery.

Measure Description & Collection Protocol: The area, in acres, within the Poker Jim Ridge PWA but outside of delineated old growth areas that has been identified by NAIP imagery as being dominated by juniper. An increase in encroaching juniper degrades the natural quality.

Data Source: Detailed vegetation maps are created by the SHMNWRC in conjunction with the Pacific Northwest Laboratory. The most recent map was constructed in 2010 and will be updated before the next wilderness character monitoring report. Areas of old growth juniper were first identified in the minimum requirements decision guide for sagebrush habitat restoration on Poker Jim Ridge PWA.

[-V:\Hart\BaseData\Vegetation\PNNL_FinalVegMap\June2010\Hart\Vegetation](#)

[-S:\Wilderness\Hart Mt Wilderness\MRMTD_sagebrush habitat resortation_Poker Jim Proposed Wilderness_070511.pd](#)

Data Adequacy: Medium. NAIP imagery can easily cover the entirety of the wilderness but may miss areas of encroaching juniper with lower canopy densities. Areas of historic juniper were identified on a coarser scale. Therefore data quantity is partial and data quality is medium.

Frequency: Every 5 years

Significant Change: A change of 10% or more is considered significant

Undeveloped Quality

Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.

The undeveloped quality of wilderness is the most familiar and recognizable quality of wilderness for many people. Without buildings, evidence of other humans, or improvements on the landscape, the undeveloped quality of wilderness speaks to “man himself as a visitor who does not remain” and the absence of lasting improvements to the landscape that would change this visitor relationship.

Table 21: Measures of the Undeveloped Quality used to monitor the Poker Jim Ridge Proposed Wilderness Area

Indicator	Measure	Frequency	Data Adequacy	Significant Change	Baseline Value
Presence of non-recreational structures, installations, and developments	Number of non-recreational structures and excavation developments	Every 5 years	High	Any	2
	Number of study/management installations	Every 5 Years	High	Any	3
	Roads index	Every 5 years	High	Any	3.0
Presence of recreational structures, installations, and developments	Number of recreational structures, installations, and developments	Every 5 years	High	Any	0
Presence of inholdings	Number of inholdings	Every 5 years	High	Any	0
Use of motor vehicles, motorized equipment, or mechanical transport	Authorized uses of motor vehicles, motorized equipment, and mechanical transport for management activities index	Every 5 years	High	Change of category	Good (46)
	Number of emergency uses of motor vehicles, motorized equipment, and mechanical transport	Every 5 years	High	Any	0

Measure: Number of non-recreational structures and excavation developments

2014 Data Value: 2

Data Year: 2014

Background & Context: Poker Jim Ridge PWA contains very few structures, installations, or developments. There are, however, a few remaining remnants from when livestock were present in the area. Namely these are excavations in shallow depressions that were constructed to collect water for said livestock. These excavations affect the undeveloped quality

Measure Description & Collection Protocol: A count of the number of non-recreational structures and excavation developments within the Poker Jim Ridge PWA. Study and management installations are not counted under this measure. An increase in these structures and developments degrades the undeveloped quality.

Data Source: SHMNWRC Staff

Data Adequacy: High. Refuge staff are aware of structures within the wilderness. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Table 22. Number of non-recreational structures and excavation developments within Poker Jim Ridge PWA 2014 WCM baseline measurement	
Structure type	Number present
Pit reservoir excavation for livestock	2
Total	2

Measure: Number of study/management installations

2014 Data Value: 3

Data Year: 2014

Background and Context: Poker Jim Ridge PWA contains a small number of study and management installations. Namely this consists of guzzlers that were installed to benefit bighorn sheep populations. These installations affect the undeveloped quality.

Measure Description and Collection Protocol: A count of the number of study and management installations within Poker Jim Ridge PWA. A decrease in the number of study and management installations improves the undeveloped quality.

Data Source: SHMNWRC Staff, guzzlers GIS layer
 - V:\Hart\BaseData\Facilities_Structures\WATERHOLES&GUZZLERS

Data Adequacy: High. Management and study installations are installed and/or closely monitored by refuge staff. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Table 23. Number of study/management installations within Poker Jim Ridge PWA 2014 WCM baseline measurement	
Installation type	Number present
Guzzler (to benefit bighorn sheep populations)	3
Total	3

Measure: Roads index

2014 Data Value: 3.0

Data Year: 2013

Background & Context: A small number of roads exist within the Poker Jim Ridge PWA. Most of these roads are associated with some sort of management activity such as guzzler maintenance or fire and juniper management. The presence of these roads affects the undeveloped quality.

Measure Description & Collection Protocol: A calculated index of the roads within Poker Jim Ridge PWA. Road lengths are measured using GIS and roads are categorized using table 24 below. The value of the index is calculated using the following formula:

$$(\text{miles of primitive road} \times 1) + (\text{miles of improved gravel road} \times 2) + (\text{miles of paved road} \times 3)$$

A decrease in the value of this index improves the undeveloped quality.

Data Source: Hart Mountain road GIS layers

[-V:\Hart\BaseData\Roads](#)

[-S:\Wilderness\Wilderness Character I&M\Hart Mt 2014 Baseline Report Materials\HMNAR roads index calculation 2014 WCM baseline.xlsx](#)

Data Adequacy: High. There has been an ongoing effort by refuge staff to map roads within the refuge in the past 3 years. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 Years

Significant Change: Any

Table 24. Miles of road of different construction categories within the Poker Jim Ridge proposed wilderness area and corresponding roads index score			
Primitive	Improved gravel	Paved	Score
3.0	0	0	3.0

Table 25. Road categories used for Poker Jim Ridge wilderness character monitoring	
Road Category	Description
Primitive	Road surface is made up of natural materials and no improvements beyond vegetation removal and possibly limited grading of the road surface have been made. These roads are often of the '2 track' variety and are composed of two parallel worn paths each the width of a normal car tire.
Improved Gravel	Gravel has been added to provide a smoother driving surface. Often other improvements accompany these roads such as water drainage culverts.
Paved	The road has been paved with asphalt or some other type of hard, permanent surface.

Measure: Number of recreational structures, installations, and developments

2014 Data Value: 0

Data Year: 2014

Background & Context: Currently Poker Jim Ridge PWA does not contain any type of recreational structure, development, or installation. However, the addition of such a structure would affect the undeveloped quality.

Measure Description & Collection Protocol: A count of the number of recreational structures, developments, or installations within Poker Jim Ridge PWA. An increase in the number of said structures degrades the undeveloped quality.

Data Source: SHMNWRC Staff

Data Adequacy: High. Refuge staff are aware of recreational structures on the refuge. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Measure: Number of inholdings

2014 Data Value: 0

Data Year: 2013

Background & Context: Inholdings within wilderness often offer opportunities for land use that are not in line with wilderness values and are outside the control of the federal land manager. Therefore the presence of inholdings within wilderness degrades wilderness character. Currently there are no private inholdings within the Poker Jim Ridge and the addition of any is extremely unlikely as the entirety of the wilderness is under federal ownership.

Measure Description & Collection Protocol: A count of the number of private inholdings within the Poker Jim Ridge proposed wilderness area. An increase in the number of inholdings degrades the undeveloped quality.

Data Source: SHMNWRC Staff

Data Adequacy: High. Refuge staff are aware the land status of the entirety of the refuge. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

UNDEVELOPED QUALITY**Use of motor vehicles, motorized equipment, and mechanical transport**

Measure: Authorized uses of motor vehicles, motorized equipment, and mechanical transport for management activities index

2014 Data Value: 40 (good)

Data Year: 2013

Background and Context: A number of management activities have taken place within Poker Jim Ridge WSA that require motor vehicles, motorized equipment, and mechanical transport such as fire management, seeding following disturbances, and juniper thinning.

Measure Description and Collection Protocol: An index is calculated for each project implemented within Sheldon NWR wilderness using table 26 below. Scores for each type of motor vehicle, motorized equipment, and mechanical transport used in each project are totaled together resulting in a maximum possible score of 6 for each individual project. Indices of all projects completed in the previous 5 years are totaled to arrive at the measure value. An increase in the value of this index degrades the undeveloped quality.

Table 26. Values for authorized use of motor vehicles, motorized equipment, and mechanical transport for management activities index			
Type of motor vehicles, motorized equipment, and mechanical transport used	Small hand operated equipment (chainsaws, wheelbarrows, hand herbicide sprayers)	Motor vehicle use	Landing of or deposition of material from aircraft (such as helicopters used for aerial seeding)
Score	1	2	3

Definitions: For management activities examined in other measures (seeding, weed spraying, juniper thinning, prescribed burning) refer to those measures for the definition of a single project. For projects that span multiple years calculate indices for the motorized equipment/mechanical transport used in each separate year of the project. For example, if a juniper thinning project involved the use of chainsaws in 3 separate years within the monitor period it would contribute a score of 3 to the overall total for this measure. For natural fire suppression each fire suppressed counts as one project. For horse and burro gathers all gather related operations are considered a single project with a maximum project length of four weeks. Therefore if gather operations occur more than four weeks from the starting day of previous gather operations it counts as a new project. Additionally, survey flights are not counted in this measure as they are counted separately under the solitude and primitive or unconfined recreation quality. Only aviation operations that land or deposit material within wilderness are counted in this measure.

Data Source: SHMNWRC Staff, management activities GIS layers (listed under other measures)

Data Adequacy: High. Management activities are planned and executed or closely monitored by refuge staff. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any change from one category to another (see table 27 below) is a significant change.

Table 27. Categories for the authorized use of motor vehicles, motorized equipment, and mechanical transport for management activities index				
Category	Good	Caution	Poor	Very Poor
Value	0-60	61-120	121-180	181+

Table28. Projects within Poker Jim Ridge PWA 2009-2013 and their motor vehicles, motorized equipment, and mechanical transport use scores		
Project	Year	Mech Equipment Score
Human caused wildfire suppression	2010	6
Seeding project (following fire)	2010	6
Weed spraying project (following fire)	2010	6
Guzzler maintenance helicopter landing	2012, 2013	3(x2)
Juniper thinning related work	2009, 2011, 2013	1 (x3)
Salt/dewormer treatment, bighorn	All 5 years	3 (x3)
Vehicle use for general resource inventory and monitoring	All 5 years	2 (x5)
	Total	46
	Category	Good

Measure: Number of emergency uses of motor vehicles motorized equipment, and mechanical transport

2014 Data Value: 0

Data Year: 2013

Background and Context: Search and rescue type operations have the potential of occurring within Poker Jim Ridge PWA and affecting the undeveloped quality through the use of motor vehicles, motorized equipment, and mechanical transport.

Measure Description and Collection Protocol: A count of the number of times an emergency situation precipitated the used of motor vehicles, motorized equipment, and mechanical transport within Poker Jim Ridge PWA in the previous 5 years. This measure exists mostly to identify any sudden spikes in emergency situations. A decrease in emergency mechanical transport/equipment uses improves the undeveloped quality.

Definitions: For the purposes of this measure each emergency situation that requires use of mechanical transport/equipment counts as one use regardless of the number of individual number of vehicles or pieces of equipment used.

Data Source: SHMNRWC Staff

Data Adequacy: High. Emergency vehicle use within Poker Jim Ridge PWA is rare but staff members are always notified of its occurrence. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any change greater than or equal to 2 is a significant change.

Solitude or Primitive and Unconfined Recreation Quality

Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.

Opportunities for solitude or primitive and unconfined recreation can be difficult to find as modernization and civilization continue to expand. In contrast, wilderness is a place where visitors can experience self-reliance, challenge, and self-discovery. When understanding this quality of wilderness, it is important to note that not all visitors will experience these features. Nonetheless, from a management perspective, the opportunity for these experiences must be preserved as part of wilderness.

Table 29: Measures of the Solitude or Primitive and Unconfined Recreation Quality of wilderness used to monitor the Poker Jim Ridge Proposed Wilderness Area

Indicator	Measure	Frequency	Data Adequacy	Significant Change	Baseline Value
Remoteness from sights and sounds of people inside the wilderness	Structure visual impact index	Every 5 years	High	Any	6
	Number of survey flight days	Every 5 years	High	Any	14
	Percentage of wilderness covered by a Military Operations Area	Every 5 years	High	Any	100%
Remoteness from occupied and modified areas outside the wilderness	Roads on wilderness boundary index	Every 5 years	High	Any	15.8
	Light pollution	Every 5 years	High	Any	0
Facilities that decrease self-reliant recreation	Number of facilities that decrease self-reliant recreation	Every 5 years	High	Any	0
Management restrictions on visitor behavior	Number of restrictions on Backcountry camping permit	Every 5 years	High	Any	3

Measure: Structure visual impact index

2014 Data Value: 6
Data Year: 2014

Background and Context: The remoteness of Poker Jim Ridge PWA makes it easy to escape from the sights and sounds of civilization. The only sources of signs of human activity within the wilderness are the small number of leftover livestock related excavations and the guzzlers installed for bighorn sheep. The visual impact of these structures affect he solitude or primitive and unconfined recreation quality.

Measure Description and Collection Protocol: The visual impacts of structures within the Poker Jim Ridge PWA are scored according to table 30 below. These scores are then summed to arrive at a final value for the measure. There are few enough structures within Poker Jim Ridge to use staff judgment to assign scores. In the future the implementation of repeated photo point surveys could provide a more standardized platform from which to assign these scores. A decrease in this visual impact index improves the solitude or primitive and unconfined recreation quality.

Table 30. Scoring sheet for the structure visual impact density measure	
Structure visual impact	Score
Structure is only clearly visible from close range (<100 yards)	1
Structure can easily be seen from over 100 yards, but is not so conspicuous that it could widely be used as a landmark	2
Structure is large and conspicuous enough that it can easily be seen from a relatively large distance and could be used as a landmark	3

Data Source: SHMNWRC Staff, future photo point surveys

Data Adequacy: High. The small number of structures makes staff judgment both a complete and accurate method for assigning scores. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Table 31. Poker Jim Ridge PWA structure visual impact 2014 wilderness character monitoring baseline measurement	
Structure	Score
Dugout excavation (x2)	1 (x2)
Guzzler (western most)	2
Guzzlers (remaining 2)	1 (x2)
Total	6

Measure: Number of survey flight days

2014 Data Value: 44

Data Year: 2013

Background and Context: Aerial surveys, generally focused on large mammals or exterior fence damage reconnaissance, are conducted over the Hart Mountain NAR. These relatively low flights perform transects, passing over the refuge and wilderness many times. Due to the long and narrow shape of the Poker Jim Ridge proposed wilderness area it would be unlikely for a survey flight to fly over the refuge and not pass over the wilderness. Therefore all refuge survey flights are counted as impacting the wilderness.

Measure Description and Collection Protocol: A count of the number of days on which survey flights were conducted over Hart Mountain NAR. The wilderness character monitoring value is the total number of survey flight days in the preceding 5 years. An increase in the number of these flights degrades the solitude or primitive and unconfined recreation quality.

Data Source: Aviation project plans and aerial survey reports.

[-S:\BiologicalProgram\!Aviation](#)

[-S:\BiologicalProgram\!Biological Reports](#)

[- S:\Wilderness\Wilderness Character I&M\Hart Mt 2014 Baseline Report Materials\HMNAR survey flights WCM baseline 2014.xlsx](#)

Data Adequacy: High. Survey flights are planned and executed by or under the supervision of refuge staff. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: A change of 10% or greater is considered significant.

Table 32. Survey flight days over Hart Mountain NAR 2009-2013	
Flight type	# of days 2009-2013
Ungulate survey	10
Fence repair reconnaissance	1
Tri-state horse survey	3
Total	14

Measure: Percentage of wilderness covered by a Military Operations Area

2014 Data Value: 100%

Data Year: 2014

Background and Context: A Military Operations Area (MOA) covers the entirety of Hart Mountain NAR. MOA airspace is used to conduct military aviation operations. The loud jet engines and released flares associated with these operations can have large impacts on the solitude quality of wilderness. Currently there is no readily available data on the number or duration of avian operations within MOA's, so simple presence/absence is the best way to quantify their effects. A decrease in MOA coverage percentage improves the solitude and primitive or unconfined recreation quality.

Measure Description and Collection Protocol: The percentage of the Poker Jim Ridge PWA that has an MOA directly above it. A removal or reduction in size of the MOA would improve the solitude or primitive and unconfined recreation quality.

Data Source: MOA maps

- V:\SH_Complex\BaseData\Aviation

- https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/vfr/

Data Adequacy: High. Accurate data is available on for the location of all MOAs. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Measure: Roads on wilderness boundary index

2014 Data Value: 15.8

Data Year: 2013

Background & Context: Portions of the Poker Jim Ridge boundary are adjacent to developed roads. Although most are not particularly busy these roads provide the most significant source of sights and sounds of occupied and modified areas outside the wilderness.

Measure Description & Collection Protocol: A calculated index of roads on wilderness boundaries. Road lengths are calculated using GIS and roads are categorized using table 33 below. The final index value is calculated using the following formula:

$$(\text{miles of primitive road} \times 1) + (\text{miles of improved gravel road} \times 2) + (\text{miles of paved road} \times 3)$$

An increase in this index degrades the solitude or primitive and unconfined recreation quality.

Table 33. Road categories used for Poker Jim Ridge wilderness character monitoring	
Road Category	Description
Primitive	Road surface is made up of natural materials and no improvements beyond vegetation removal and possibly limited grading of the road surface have been made. These roads are often of the '2 track' variety and are composed of two parallel worn paths each the width of a normal car tire.
Improved Gravel	Gravel has been added to provide a smoother driving surface. Often other improvements accompany these roads such as water drainage culverts.
Paved	The road has been paved with asphalt or some other type of hard, permanent surface.

Definitions: Any part of a road within 50 meters of the wilderness boundary is considered on the boundary.

Data Source: Hart Mountain road GIS layers

[-V:\Hart\BaseData\Roads](#)

[-S:\Wilderness\Wilderness Character I&M\Hart Mt 2014 Baseline Report Materials\HMNAR roads index calculation 2014 WCM baseline.xlsx](#)

Data Adequacy: High. There has been an ongoing effort by refuge staff to map roads within the refuge in the past 3 years. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 Years

Significant Change: Any

Table 34. Miles of road of different construction categories within 50m of the boundary of the Poker Jim Ridge proposed wilderness area and corresponding roads index score			
Primitive	Improved gravel	Paved	Score
13.7	1.1	0	15.8

Measure: Light pollution

2014 Data Value: 0

Data Year: 2012

Background and Context: Currently there is little to no light pollution within Poker Jim Ridge and cloudless nights bring gorgeous starry skies. However, expanding development in the surrounding area could provide sources of light pollution in the future. The Earth Observation Group provides data from the Defense Meteorological Satellite Program (DMSP) that quantifies light pollution.

Measure Description and Collection Protocol: The average light pollution value of Poker Jim Ridge proposed wilderness area and the surrounding area determined by the most recent light pollution raster available from DMSP remote sensing. For the purposes of this measure the entirety of the proposed wilderness and all the area within three miles of the proposed wilderness boundary are used to calculate light pollution for the proposed wilderness. Utilizing this three mile buffer better accounts for sources of light pollution outside of the proposed wilderness that may be visible from within it. The most recent available raster available for this report was from 2012. Raster cells are 30 arc second squares. The measure value is the average value of all of the raster cells that fall completely within the three mile buffer of Poker Jim Ridge PWA. An increase in light pollution degrades the solitude or primitive and unconfined recreation quality.

Data Source: Earth Observation Group DMSP average visible, stable lights and cloud free coverages data - <http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html>

Data Adequacy: High. Satellite imagery easily covers the entirety of the refuge and is the most reliable and accurate measure of light pollution available for the area. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Table 35. Poker Jim Ridge proposed wilderness area light pollution WCM baseline measurement

As of the most up to date (2012) data available from the DMSP there is no light pollution within the Poker Jim Ridge proposed wilderness and surrounding area that is measurable via remote sensing techniques.

2014 Data Value: 0

Data Year: 2014

Measure: Number of facilities that decrease self-reliant recreation

Background & Context: Facilities such as established campgrounds and trails and recreational signs decrease the opportunity of wilderness visitors to engage in self-reliant recreation. Poker Jim Ridge Proposed wilderness area currently contains no such facilities. The addition of this type of facility would have a large impact on Poker Jim Ridge's wilderness character.

Measure Description & Collection Protocol: A count of the number of facilities that decrease self-reliant recreation within the Poker Jim Ridge proposed wilderness area. As no such facilities currently exist in the area staff judgment, along with guidance from the Fish and Wildlife Keeping it Wild 2 document, would have to be used to determine if any potential future developments fit into this category. An increase in the number of these facilities degrades the solitude or primitive and unconfined recreation quality.

Data Source: SHMNWRC Staff, Hart Mountain structure GIS layers

Data Adequacy: High. Refuge staff manage recreational facilities on Hart Mountain and none of them are within the proposed wilderness. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Measure: Number of restrictions on the backcountry camping permit

2014 Data Value: 3

Data Year: 2014

Background and Context: The refuge requires a free backcountry camping permit in order to camp off of established campgrounds. This permit lists a number of restrictions such as how close one can camp to a water source. These restrictions represent the majority of restrictions placed upon visitors within the Poker Jim Ridge proposed wilderness. In the future there is a chance that the number of backcountry camping permits awarded may be limited. In such a case this measure could be modified to reflect that.

Measure Description and Collection Protocol: A count of the number or restrictions listed on the backcountry camping permit. An increase in the number of these restrictions degrades the solitude or primitive and unconfined recreation quality.

Data Source: Current backcountry camping permit

[-S:\Visitor Services\Camping\SHMRC Back Country Camping Permit.docx](#)

Data Adequacy: High. The backcountry camping permit is written by refuge staff. Therefore data quantity is complete and data quality is high.

Frequency: Every 5 years

Significant Change: Any

Table 36. Restrictions listed on the backcountry camping permit as of 2014	
1	No camping within ½ mile of the open road and the person’s vehicle
2	No camping within 100 yards of water
3	Pack out all trash – “Pack it in, pack it out”

Other Features of Value Quality

Wilderness may also contain other tangible features of scientific, educational, scenic, or historical value.

Wilderness may possess physical, site-specific features of value that are integral to wilderness character and whose presence adds value to the wilderness resource. These features are monitored in the Other Features of Value Quality with indicator(s) that are unique and defined by the individual Refuge. Features included in the Other Features of Value Quality are also counted under other qualities if relevant. For example, a building in the wilderness area that is on the National Register of Historic Places could add value to wilderness character under the Other Features of Value Quality for its historic or cultural significance, but as a structure in wilderness it would also be counted in the Undeveloped Quality.

Table 37: Other Features of Value Quality used to monitor the Poker Jim Ridge Proposed Wilderness Area

Indicator	Measure	Frequency	Data Adequacy	Significant Change	Baseline Value
Deterioration or loss of other tangible and integral features of value	Degradation of Poker Jim Ridge Research Natural Area quality index	Every 5 years	High	Any	3

Measure: Quality of Poker Jim Ridge Research Natural Area index

2014 Data Value: 3**Data Year:** 2014

Background and Context: Within the Poker Jim Ridge PWA a Research Natural Area (RNA) was established on November 30, 1972. RNAs are set aside as areas to be used solely for research and education purposes. The main goals of RNAs are to provide a baseline against which the effects of human activities can be measured, an opportunity to study ecological processes in undisturbed ecosystems, and gene pool reserves for all types of organisms. The Poker Jim Ridge RNA was established specifically to provide an undisturbed example of a western juniper savannah vegetative community and encompasses 607 acres.

Measure Description and Collection Protocol: Research natural areas are created to provide areas that are minimally disturbed and manipulated to provide baselines against which to compare other areas. Professional judgment is used to determine how much management actions or unnatural disturbances have affected the ability of Poker Jim Ridge RNA to provide such a baseline, and the quality of the RNA is scored according to table 38 below. A decrease in the value of this index degrades the other features of value quality.

RNA quality description	Score
The RNA is as undisturbed as possible and has not been affected by any management actions	3
The RNA shows some minimal disturbance from unnatural factors (such as human caused fire) and/or shows minimal manipulation from management activities, but still provides a robust 'natural' baseline against which other areas can be compared	2
The RNA shows significant disturbance from unnatural factors and/or significant manipulation from management activities, but to a lesser degree than surrounding areas and can thus still be used to some meaningful extent as a control area in a comparative study.	1
The RNA has been disturbed by unnatural factors or manipulated by management actions to such an extent that comparing other areas to it would not provide any meaningful information	0

Data Source: SHMNWRC Staff

Data Adequacy: High. Staff are aware of activities/disturbances that occur within the RNA and its relatively small size makes it easy to monitoring the activities and disturbances. Thus data quantity is complete and data quality is high.

Frequency: Every 5 years**Significant Change:** Any

MEASURES NOT USED FOR WILDERNESS CHARACTER MONITORING

The measures described below were considered as measures for wilderness character but were ultimately not used. The measure and why it was excluded are described in this section.

Natural: Bighorn sheep genetic diversity – Having a solid measure concerning bighorn sheep in the natural quality to serve the other side of the coin of the native population manipulations listed in the untrammelled would greatly improve this wilderness character monitoring framework for Poker Jim Ridge PWA. However, meaningful single species measurements are hard to come by as it is difficult to ascertain significant changes in high level measurements such as population size. A genetic diversity measure would get away from these problems and provide a clear and meaningful metric of population health. However, such data is not collected regularly enough to provide a meaningful measure.

Natural: Bighorn sheep pneumonia complex occurrence – The bighorn sheep on Poker Jim Ridge PWA have been significantly affected by pneumonia related die off events. A measure of the persistence of pneumonia related pathogens in bighorn would provide a meaningful measurement of population health and again serve as a counterpoint to the native population manipulations listed in the untrammelled quality. Unfortunately, monitoring such pathogens is too costly and labor intensive to be realistic in the long term.

Natural: Number of invasive plant species present – There are a number of invasive plants within the refuge and wilderness and there is a constant risk of new introductions. A comprehensive list of all these species would be quite significant and useful, but the amount of effort required to maintain an accurate list over the entirety of the Poker Jim Ridge PWA makes this an unrealistic measure.

Natural: Grass and forb diversity – Grasses and forbs are an important part of Poker Jim Ridge’s ecology. However, no data regarding their diversity on the refuge and wilderness exists and currently there isn’t enough staff to begin a new inventory and monitoring program. If this situation changes a grass and forb measure could be meaningful to wilderness character monitoring in the future.

Natural: Sagebrush health – Sagebrush and sagebrush habitat is a significant part of Poker Jim Ridge’s ecology, thus a measure of its health would be quite meaningful in a wilderness character monitoring context. However, no specific, meaningful, and realistic measurement of sagebrush health throughout the wilderness could be established in discussions.

Natural: Invertebrate diversity – Much of the animal inventory and monitoring conducted at Hart Mountain NAR focuses on sage-grouse and mammals. A desire for data on a broader range of animals, namely invertebrates, has been voiced but current shortages of staff and resources prevents the collection of such data. If this change and invertebrate measure could be meaningful to wilderness character monitoring in the future.

Natural: Pygmy rabbit population status – The pygmy rabbit (*Brachylagus idahoensis*) relies on sagebrush habitat and has extreme vulnerability to climate change, making pygmy rabbits meaningful to the natural character of Poker Jim Ridge PWA. However, little data exists about these rabbits and staff shortages make it unlikely more data will be collected in the near future. Additionally, single species measures present ambiguities as it is difficult to define natural variation in population or population demographic measures, therefore making it difficult to define what would constitute a significant change.

Natural: Pronghorn population status – Pronghorn is an iconic species and the namesake of Hart Mountain National Antelope Refuge. Thus, though pronghorn don’t heavily use Poker Jim Ridge, its presence is very

important to wilderness character. However, no meaningful measurement for pronghorn was found that didn't raise the problems and ambiguities of looking at single species populations or population dynamics and defining what natural variation and significant change would be within those measurements. Therefore it was concluded that no feasible measure for pronghorn currently exists that would be meaningful to wilderness character monitoring.

Natural: Sage grouse population status – Sage grouse is an iconic species within Poker Jim Ridge PWA and its presence is very important to wilderness character. However, no meaningful measurement for sage grouse was found that didn't raise the problems and ambiguities of looking at single species populations or population dynamics and defining what natural variation and significant change would be within those measurements. Therefore it was concluded that no feasible measure for sage grouse currently exists that would be meaningful to wilderness character monitoring.

Natural: Rare/threatened/endangered species populations – A measure detailing the status of all rare, threatened, and endangered species within the wilderness would be meaningful to natural quality of the wilderness. However, staff shortages and the difficulty in accurately monitoring a number of species over the entirety of Poker Jim Ridge PWA makes this an unrealistic measure.

Natural: Divergence from historic fire regime – Fire is an important factor in shaping sagebrush and juniper ecosystems. On Hart Mountain NAR years of fuel load alteration through grazing and the introduction of invasive species along with active fire suppression has drastically changed the local fire regime. A measure concerning the degree of this alteration is extremely relevant to the wilderness character of Poker Jim Ridge PWA, however such a measure is quite hard to come by. Database tools like LANDFIRE do a decent job of quantifying this in forested systems but their accuracy in sagebrush systems is questionable. Additionally, proxy measures such as number of natural ignitions tend to miss the mark. Adding an accurate fire regime measure would be the best way to improve wilderness character monitoring at Pker Jim Ridge PWA.

Undeveloped: Number of instances of unauthorized motor vehicle use – This measure is of great interest to the refuge and certainly has an impact on its natural character. However, there is currently no staff member at Hart Mountain NAR that is certified for law enforcement duties. Therefore consistent monitoring and enforcement of unauthorized vehicle use is unrealistic. In the future additional law enforcement staff may make this measure more realistic.

Solitude or primitive and unconfined recreation: Visitor use – A measure of visitor use would be very relevant to wilderness character on Poker Jim Ridge PWA. However, visitor traffic has not been tracked in the past and it would be difficult to ascertain how many visitors actually enter the wilderness..

Solitude or primitive and unconfined recreation: Military operations area activity – The Hart South Military Operations Area (MOA) encompasses the entirety of Hart Mountain NAR. Military aircraft operate here at altitudes of 11,000 feet and above, providing signs of occupied areas outside the wilderness. However, the only data available is hours of operation over the entirety of the MOA. No data is available on supersonic flights or flare releases in the vicinity of the refuge, which are the most impactful factors on wilderness character.

Solitude or primitive and unconfined recreation: Degree of restrictions on backcountry permit – Interest was expressed in categorizing the degree of limitation imposed by individual restrictions listed and the backcountry camping permit. However, the subjectivity and variability of individual opinions concerning these restrictions made it difficult to construct meaningful guidelines for such a measure.

Solitude or primitive and unconfined recreation: Number of hunting guide permits – This measure was considered as an easily monitored indicator of overall hunter activity within the wilderness. However, the link between number of guide permits and overall hunter use was determined to be tenuous at best and the measure was not used.

Other features of value: Quality of petroglyph sites – A measure regarding the quality of petroglyph sites within Poker Jim Ridge PWA would be meaningful to its wilderness character. However, not all the petroglyph sites within the wilderness are known and no large-scale inventory has been completed. Thus not much data exists with which to construct such a measure.

CONCLUSIONS

The location alone of Poker Jim Ridge Proposed Wilderness Area makes it feel remote and secluded, but add in the steep escarpments and rocky scree fields that guard its flanks and the ridge seems a world all its own. Bighorn sheep dot the escarpment always turning a wary eye to any passersby. Skeletons show evidence of mule deer and elk, and their vicinity to small caves and shaded stands of juniper suggest a mountain lion may have been responsible for picking them clean. Where rock and juniper give way to grass and sagebrush sage grouse and pronghorn, namesakes of the antelope refuge, can be seen.



Poker Jim Ridge embodies that somewhat intangible feeling of connection that one would hope to get from visiting a wilderness area. Maintaining this into the future will most likely present a few challenges, namely surrounding the relationship between sagebrush and juniper. The desire to prevent juniper from wandering outside of its historic range, along with national level initiatives to

preserve sagebrush habitat for the benefit of sage grouse, provides a strong impetus to employ aggressive juniper management on Poker Jim Ridge. While these actions may improve the natural quality they are contrary to the hands off management ethic championed by the wilderness act.

While striking a balance between juniper treatments and wilderness management ethics will be a challenge going forward the tools are in place to meet it. The Poker Jim Ridge Research Natural Area provides a valuable control against which to consider management decisions, and a passionate staff with clear understandings of wilderness values ensures sound decisions will be made in the future. It is the hope that this report will provide a solid starting point from which to make those decisions, and that official wilderness designation will soon make the long term management directives of Poker Jim Ridge much clearer.

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APPENDICES

APPENDIX A – Priority ranking of all measures considered

Directions: In each row, write the potential measure in the left column under the appropriate indicator. Add or delete rows as needed. Use the criteria and ranking guide below to create an overall score for each measure. If the combined score for criteria A and B is ≤ 2 , STOP and do not score criteria C and D. Those measures with the highest overall scores should be the highest priority for assessing trends in wilderness character.

A. Level of significance (the measure is highly relevant to the quality and indicator of wilderness character, and is highly useful for managing the wilderness):

High = 3 points, Medium = 2 points, Low = 1 point

B. Level of vulnerability (measures an attribute of wilderness character that currently is at risk, or might likely be at risk over 10-15 years):

High = 3 points, Medium = 2 points, Low = 1 point

C. Degree of reliability (the measure can be monitored accurately with a high degree of confidence, and would yield the same result if measured by different people at different times):

High = 3 points, Medium = 2 points, Low = 1 point

D. Degree of feasibility (the measure is related to an existing effort or could be monitored without significant additional effort):

High = 1 point, Low = 0 point (if 0 is given, do not use)

Assigning priority levels (see appendix C):

Total Score ≤ 5 : Low Priority Level $5.5 \leq$ Total Score $\leq 8^*$: Medium Priority Level $8^* \leq$ Total Score: High Priority Level

**When the total score = 8, if the subtotal for significance and vulnerability ≥ 5 (meaning that neither were low and that at least one was high) the measure was assigned a high priority level. If the subtotal for significance and vulnerability ≤ 4 it was assigned a Medium priority.*

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
UNTRAMMELED QUALITY						
Indicator: Authorized actions that manipulate the biophysical environment Measure: Percentage of naturally ignited fires suppressed	3	3	3	1	10	
Indicator: Authorized actions that manipulate the biophysical environment Measure: Number of prescribed fires	3	3	3	1	10	

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Authorized actions that manipulate the biophysical environment Measure: Number of vegetation projects	3	3	3	1	10	
Indicator: Authorized actions that manipulate the biophysical environment Measure: Number of actions that directly manipulate native animal populations	3	2	3	1	9	
Indicator: Authorized actions that manipulate the biophysical environment Measure: Number of functioning guzzler years	3	1	3	1	8	Highly significant, but addition of new guzzlers unlikely
Indicator: Unauthorized actions that manipulate the biophysical environment Measure: Number of actions not authorized by the federal land manager that alter the biophysical environment	3	1	2	1	7	Highly relevant, but actions are rare
NATURAL QUALITY						
Indicator: Plants Measure: Acres of cheatgrass	3	3	2	1	9	Reliability medium due to limitations of satellite imagery for detecting understory grasses
Indicator: Plants Measure: Acres of historic juniper	3	2	3	1	9	
Indicator: Plants Measure: Acres of mountain mahogany	3	3	3	1	10	
Indicator: Plants Measure: Number of non-native plant species present	3	3	1	0	7	
Indicator: Plants Measure: Grass and forb diversity	3	3	1	0	7	
Indicator: Plants Measure: Sagebrush health	3	3	1	0	7	

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Animals Measure: Bighorn sheep genetic diversity	3	3	2	0	8	Extremely relevant but unfeasible
Indicator: Animals Measure: Bat diversity	3	2	3	1	9	Hart Mt. most likely safe from white nose syndrome
Indicator: Animals Measure: Population of feral horses	3	3	3	1	10	
Indicator: Animals Measure: Greater sage-grouse population status	3	3	2	0	8	
Indicator: Animals Measure: Pronghorn population status	3	3	2	0	8	
Indicator: Animals Measure: Pika status index	3	3	2	1	9	Presence/absence limitation of surveys results in slightly lower reliability
Indicator: Animals Measure: Invertebrate diversity	2	3	1	0	6	
Indicator: Animals Measure: Pygmy rabbit population status	2	3	1	0	6	
Indicator: Animals Measure: Rare/threatened/endangered species populations	3	3	1	0	7	
Indicator: Air and water Measure: Air quality (ozone/total nitrogen deposition/total sulfur deposition/visibility)	3	2	2	1	8	Current remoteness from large scale development and lack of local air quality monitoring station reduces both vulnerability and reliability
Indicator: Climate change Measure: Average annual summer and winter temperatures	3	3	3	1	10	
Indicator: Climate change Measure: Annual precipitation	3	3	3	1	10	

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Climate change Measure: Pika upslope contraction	3	3	2	1	9	Presence/absence limitation of surveys results in slightly lower reliability
Indicator: Climate change Measure: Date of final snowpack melt	3	3	1	0	6	
Indicator: Ecosystem processes Measure: Bighorn sheep pneumonia complex occurrence	3	3	1	0	7	Extremely relevant but unfeasible
Indicator: Ecosystem processes Measure: Geographic extent of juniper encroachment	3	3	3	1	10	
Indicator: Ecosystem processes Measure: Divergence from historic fire regime	3	3	1	0	7	
UNDEVELOPED QUALITY						
Indicator: Presence of non-recreational structures, installations, or developments Measure: Number of non-recreational structures and excavation developments	3	1	3	1	8	Low risk of future developments reduces vulnerability
Indicator: Presence of non-recreational structures, installations, or developments Measure: Number of study/management installations	3	1	3	1	8	Non-permanent, tightly controlled nature of installations lowers vulnerability
Indicator: Presence of non-recreational structures, installations, or developments Measure: Roads index	3	2	3	1	9	Low risk of future large scale road development lowers vulnerability, though user created roads could be an issue
Indicator: Presence of recreational structures, installations, or developments Measure: Number of recreational structures	3	2	3	1	9	Low risk of many future additional structures lowers vulnerability

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Presence of inholdings Measure: Number of inholdings	3	1	3	1	8	Very low risk of future additional inholdings lowers vulnerability
Indicator: Use of motor vehicles, motorized equipment, or mechanical transport Measure: Authorized uses of motor vehicles, motorized equipment, and mechanical transport for management index	3	2	3	1	9	Relative unlikelihood of management activities to significantly increase lowers vulnerability
Indicator: Use of motor vehicles, motorized equipment, or mechanical transport Measure: Number of emergency uses of motor vehicles, motorized equipment, and mechanical transport	3	1	3	1	8	Potential for large scale use of vehicles makes this measure highly significant, but the unlikelihood of a large number of events lowers vulnerability
Indicator: Use of motor vehicles, motorized equipment, or mechanical transport Measure: Number of instances of unauthorized motor vehicle use	3	3	1	0	7	
SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY						
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Structure visual impact index	3	3	3	1	10	Vulnerability high mostly due to risk of future inholding developments
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Visitor use	3	2	1	0	6	
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Number of survey flight days	3	2	3	1	9	Unlikelihood of an increase in number of flights lowers vulnerability
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Percentage of wilderness covered by a Military Operations Area	3	2	3	1	9	

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Number of hunting guide permits	1	2	3	1	7	
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Roads on wilderness boundary index	2	2	3	1	8	Unknown traffic levels and low risk of future additional roads lowers both significance and vulnerability
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Light Pollution	3	2	2	1	8	
Indicator: Facilities that decrease self-reliant recreation Measure: Number of facilities that decrease self-reliant recreation	3	2	2	1	8	
Indicator: Management restrictions on visitor behavior Measure: Number of restrictions on backcountry camping permit	3	2	3	1	9	Low risk of future additional restrictions reduces vulnerability
Indicator: Management restrictions on visitor behavior Measure: Degree of restrictions on backcountry permit	3	2	1	0	6	
Other Features Quality						
Indicator: Deterioration or loss of other tangible and integral features of value Measure: Degradation of Poker Jim Ridge Research Natural Area quality index	3	3	2	1	10	
Indicator: Deterioration or loss of other tangible and integral features of value Measure: Quality of petroglyph sites	3	3	1	0	5	

APPENDIX B – Summary of effort required for wilderness character monitoring

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
Untrammeled	Actions authorized by the Federal land manager that manipulate the biophysical environment	Percentage of naturally ignited fires suppressed	Staff consultation	1	Data for wildfires within the refuge are kept on an online database accessible only by fire personnel, therefore much of the data must be retrieved from the fire management officer
		Number of prescribed fires	Prescribed fire GIS layers	3	
		Number of vegetation projects	Staff consultation	3	
		Number of actions that directly manipulate native animal populations	Staff consultation	2	
		Number of functioning guzzler years	Guzzlers GIS layer, staff consultation	2	Staff consultation required to determine if any guzzlers had been non-functioning for any period of time
	Actions not authorized by the Federal land manager that manipulate the biophysical	Number of actions not authorized by the federal land manager that alter the biophysical environment	Staff consultation	1	

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
	environment				
Natural	Plants	Acres of cheatgrass	PNNL vegetation GIS layer	2	
		Acres of historic juniper	PNNL vegetation GIS layer	2	
		Acres of mountain mahogany	PNNL vegetation GIS layer	2	
	Animals	Bat Diversity	Annual biological reports, CCP	2	
		Population of feral horses and burros	Annual biological report	2	
		Pika presence index	SHMNWRC Biologist (Gail Collins)	1	
	Air and Water	Air quality - ozone	Fish and Wildlife Service Inventory and Monitoring Center,	<1	

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
			Branch of Air Quality		
		Air quality – total nitrogen deposition	Fish and Wildlife Service Inventory and Monitoring Center, Branch of Air Quality	<1	
		Air quality – total sulfur deposition	Fish and Wildlife Service Inventory and Monitoring Center, Branch of Air Quality	<1	
		Air quality - ozone	Fish and Wildlife Service Inventory and Monitoring Center, Branch of Air Quality	<1	

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
	Climate change	Average annual summer and winter temperatures	Western Regional Climate Center, Rock Creek Station	2	Provides month by month totals
		Annual Precipitation	Western Regional Climate Center, Rock Creek Station	2	Provides month by month totals
		Pika upslope contraction	SHMNWRC Biologist (Gail Collins)	1	
	Ecological processes	Geographic extent of juniper encroachment	PNNL vegetation GIS layer	2	
Undeveloped	Presence of non-recreational structures, installations, and developments	Number of non-recreational structures and excavation developments	Waterholes GIS layer	1	Waterholes required ground truthing
		Number of study/management installations	Guzzlers GIS layer, staff consultation	2	Staff consultation required to make sure there wasn't anything else beyond guzzlers
		Roads index	Roads GIS layer	3	

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
	Presence of recreational structures, installations, and developments	Number of recreational structures, installations, and developments	Staff consultation	1	Staff consultation required to confirm there were actually no recreational structures
	Presence of inholdings	Number of inholdings	Staff consultation	1	Staff consultation required to confirm there were actually no inholdings
	Use of motor vehicles, motorized equipment, or mechanical transport	Authorized use of motor vehicles, motorized equipment, and mechanical transport for management activities	Prescribed burns, juniper treatment data, staff consultation	3	
		Number of emergency uses of motor vehicles, motorized equipment, and mechanical transport	Staff consultation	1	
Solitude and primitive or unconfined recreation	Remoteness from sights and sounds of people inside the wilderness	Structure visual impact index	SHMNWRC staff	1	
		Number of survey flight days	Aviation project plans and aerial survey reports	3	

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
		Percentage of wilderness covered by a Military Operations Area	FAA MOA data	1	
	Remoteness from occupied and modified areas outside the wilderness	Roads on wilderness boundary index	Roads GIS layer	2	
		Light pollution	DMSP satellite data	1	
	Facilities that decrease self-reliant recreation	Number of facilities that decrease self-reliant recreation	Staff consultation	1	Staff consultation required to confirm that there are actually no facilities that decrease self-reliant recreation
	Management restrictions on visitor behavior	Number of restrictions on backcountry camping permit	Backcountry camping permit	2	
Other features of value	Deterioration or loss of other tangible and integral features of value	Degradation of Poker Jim Ride Research Natural Area quality index	Staff consultation	1	

APPENDIX C – Data sources and protocols for all measures used

Keeping Track of Wilderness Character Monitoring Measures

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
Untrammelled Quality		
Percentage of natural fires suppressed	H	Count the number of naturally ignited fires that were suppressed within wilderness over the previous 5 years. Divide this number by the total number of naturally ignited fires within the wilderness over the previous five years. Multiply the resulting figure by 100 to obtain a percentage. Data Source: Fire Office
Number of prescribed fires	H	Count the number of prescribed fires that have burned within wilderness over the previous 5 years. Fires ignited outside wilderness that spread to within wilderness are counted. Data Source: Fire Office
Number of vegetation projects	H	Count the number vegetation projects that have occurred within wilderness over the previous 5 years. Generally the three types of projects are juniper thinning, seeding, and weed spraying. See the measure description for definitions of what constitutes a single project for each project type. Data Source: Fire office staff, SHMNWRC staff
Number of actions that directly manipulate native animal populations	M	Count the number of actions that directly manipulate native animal populations within wilderness over the previous 5 years. Staff judgment will have to be used to determine whether actions that occurred outside of the wilderness affect populations within the wilderness. Assign a category based on table 6. Data Source: SHMNWR Staff
Number of functioning guzzler years	M	Count and sum the number of years each guzzler within wilderness has been functioning over the previous 5 years. Data Source: Guzzlers GIS layer, SHMNWRC Staff
Number of actions not authorized by the federal land manager that alter the biophysical environment	M	Count the number of actions not authorized by the federal land manager that alter the biophysical environment within wilderness over the previous 5 years. Staff judgment will have to be used to determine whether actions that occurred outside of the wilderness affect the biophysical environment within the wilderness. Assign a category based on table 9. Data Source: SHMNWRC Staff
Natural Quality		
Acres of cheatgrass	H	Using the most up to date remote sensing refuge GIS vegetation layer determine the area within wilderness covered by invasive cheatgrass. The identity tool can be used to identify area of cheatgrass within wilderness. The acreage of those areas can be calculated in the attribute table and then summed by wilderness area using the summary statistics tool. See the link in the roads index portion of this table for more information on this process.

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		Data Source: PNNL vegetation GIS layer. If this layer is not updated in the future staff can determine another suitable vegetation layer to use
Acres of historic juniper	N/A	Determine the area dominated by juniper within its identified historic range Within PJR PWA using GIS analysis and layers resulting from NAIP imagery. Juniper’s historic range was determined by combining the areas identified as historic juniper in the sagebrush habitat restoration minimum requirements analysis with the entirety of the Poker Jim Ridge Research Natural Area. Data Source: PNNL vegetation GIS layer. If this layer is not updated in the future staff can determine another suitable vegetation layer to use
Acres of mountain mahogany	H	Using the most up to date remote sensing refuge GIS vegetation layer determine the area within wilderness covered by mountain mahogany. The identity tool can be used to identify areas of mountain mahogany within wilderness. The acreage of those areas can be calculated in the attribute table and then summed by wilderness area using the summary statistics tool. See the link in the roads index portion of this table for more information on this process. Data Source: PNNL vegetation GIS layer. If this layer is not updated in the future staff can determine another suitable vegetation layer to use
Bat Diversity	H	Count the number of bat species that have been detected within the refuge over the previous 5 years. Data Source: Annual biological reports, SHMNWRC Biologist
Population of feral horses	H	Determine the population of feral horses within Poker Jim Ridge PWA for each of the previous 5 years. Average these 5 numbers to arrive at the final measure value. Used SHMNWRC numbers, not tri-state count numbers Data Source: Annual aerial survey reports
Pika presence index	M	Determine if pika have been present in the refuge in the previous 5 years. Assign an index score based on table 14.
Air quality - ozone	M	Obtain the most up to date 5-year average interpolated ozone measure for Hart Mountain NAR. Assign a category based on table 15. Data source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality
Air quality – total nitrogen deposition	M	Obtain the most up to date 5-year average interpolated total nitrogen deposition measure for Hart Mountain NAR. Assign a category based on table 16. Data source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality
Air quality – total sulfur deposition	M	Obtain the most up to date 5-year average interpolated total sulfur deposition measure for Hart Mountain NAR. Assign a category based on table 17. Data source: National Wildlife Refuge System, Inventory and Monitoring, Branch of Air Quality
Air quality - visibility	M	Obtain the most up to date 5-year average interpolated visibility measure for Hart Mountain NAR. Assign a category based on table 18. Data source: National Wildlife Refuge System, Inventory and Monitoring,

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		Branch of Air Quality
Average annual summer and winter temperatures	H	Obtain the most up to date monthly average temperatures for the Rock Creek weather station. Calculate average summer (June-August) and Winter (December-February) temperatures for each year. Perform a simple linear regression of these figures. Assign a category based on table 19. A spreadsheet of average temperatures from 1986-2013 has already been calculated. A tutorial on performing simple linear regressions using excel is available on the S drive S:\Wilderness\Wilderness Character landM\Tutorials Data Source: Western Regional Climate Center www.wrcc.dri.edu
Annual precipitation	H	Obtain the most up to date monthly precipitation measurements for the Rock Creek weather station. Total these monthly figures into annual precipitation. Perform a simple linear regression of these figures Assign a value of 0 for no significant trend and a value of 1 for a significant trend. A spreadsheet of annual precipitation from 1986-2013 has already been calculated. A tutorial on performing simple linear regressions using excel is available on the S drive S:\Wilderness\Wilderness Character landM\Tutorials Data Source: Western Regional Climate Center www.wrcc.dri.edu
Pika upslope contraction	H	Determine the average elevation where pika have been determined to be present within the refuge over the previous 5 years. Data Source: SHMNWRC Biologist
Geographic extent of juniper encroachment	H	Determine the acreage within wilderness dominated by juniper outside of its historic range. Juniper's historic range was determined by combining the areas identified as historic juniper in the sagebrush habitat restoration minimum requirements analysis with the entirety of the Poker Jim Ridge Research Natural Area. Data Source: PNNL vegetation GIS layer. If this layer is not updated in the future staff can determine another suitable vegetation layer to use
Undeveloped Quality		
Number of non-recreational structures and excavation developments	H	Determine the number of non-recreational structures and excavation developments within the wilderness. Guzzlers are not counted as part of this measure. To date there are only 2 'waterhole' excavation developments within the wilderness and that number is unlikely to increase. Data Source: Waterholes GIS layer, SHMNWRC Staff
Number of study / management installations	H	Determine the number of study and management installations within wilderness. This includes weather stations, guzzlers, and exclosures, but currently Poker Jim Ridge only contains guzzlers Data Source: SHMNWRC staff, structures and facilities GIS layer
Roads index	H	Determine the length of primitive, improved gravel, and paved roads within. Road categories are assigned according to table 25. Use a layer of wilderness areas with a 50 meter interior buffer to avoid complications with roads that actually follow wilderness boundaries but appear to play jump rope with them because of small inaccuracies in the GIS data (see link at end of table to access these buffers). The identity tool can be used

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		to identify specific portions of different types of roads within wilderness. The lengths of these portions can then be calculated in the resulting identity layer attribute table. These lengths can be summed for specific wilderness areas using the summary statistics tool. A tutorial of this process can be found on the S drive S:\Wilderness\Wilderness Character landM\Tutorials . Assign a score based on the equation within the measure description. Due to the unlikelihood of new roads being built within wilderness it may be easier to simply add the length of new roads into the existing roads index calculations spreadsheet rather than doing an entire spatial analysis. Additionally, some extraneous roads appeared within PJR PWA so an adjusted roads layer was created to complete this analysis entitled PJR_Roads_AdjustedWCM2014. Data Source: Roads GIS layer, roads index calculations spreadsheet
Number of recreational structures, installations, and developments	H	Determine the number of recreational structures, installations, and developments within wilderness. Currently there are no such developments within the wilderness. Data Source: SHMNWRC Staff
Number of inholdings	M	Determine the number of inholdings within wilderness. Currently there are no inholdings within wilderness. Data Source: SHMNWRC Staff
Authorized use motor vehicles, motorized equipment, and mechanical transport for management index	H	Assign scores to all of the management activities within wilderness over the previous 5 years that required the use of motor vehicles, motorized equipment, and mechanical transport based on table 26. Sum those scores to arrive at the final index value. Assign a category based on table 27. Data Source: SHMNWRC Staff
Number of emergency uses of motor vehicles, motorized equipment, and mechanical transport	H	Count the number of emergency uses of motor vehicles, motorized equipment, and mechanical transport mechanical transport or equipment that occurred within wilderness over the previous 5 years Data Source: SHMNWRC staff
Solitude or Primitive and Unconfined Quality		
Structure visual impact index	H	Assign a visual impact score to each structure visible within the wilderness based on table 30. Sum these scores to arrive at the final index value. Data Source: Photo survey photos (awaiting data), SHMNWRC staff judgment
Number of survey flight days	H	Count the number of days on which survey flights have occurred in the previous 5 years. Data Source: Annual aerial survey reports and flight plans

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
Percentage of wilderness covered by a Military Operations Area	H	Calculate the percentage of wilderness that falls beneath a MOA. Geo-referenced maps of MOAs are available from the Federal Aviation Administration. Polygons can then be drawn using these maps as a guide to facilitate calculations of percentages within GIS. Data Source: FAA MOA data
Roads on wilderness boundary index	H	Create a line feature of the wilderness boundary and then create a 50 meter buffer on either side of this boundary (see the link at the end of this table to access such a layer). Use this buffer to determine the length of primitive, improved gravel, and paved roads along the wilderness boundary. Roads categories are assigned based on table 33. Using the buffer on both sides of the boundary corrects for small inaccuracies in the GIS data. The identity tool can be used to identify specific portions of different types of roads within this boundary buffer. The lengths of these portions can then be calculated in the resulting identity layer attribute table. These lengths can be summed for specific wilderness areas using the summary statistics tool. A tutorial of this process can be found on the S drive S:\Wilderness\Wilderness Character landM\Tutorials . Assign a score based on the equation within the measure description. Due to the unlikelihood of new roads being built along the wilderness boundary it may be easier to simply add the length of new roads into the existing roads index calculations spreadsheet rather than doing an entire spatial analysis. Data Source: Roads GIS layer, roads index calculations spreadsheet
Light pollution	M	After obtaining the most up to date light pollution raster extract the files (the data comes in a compressed form). A number of files will be extracted, all of which are also compressed. Extract file from the compressed file with a name that ends in _web.stable_lights.avg_vis.tif.gz. This will result in a raster that can be opened in GIS. Also, create a 3 mile buffer around the Poker Jim Ridge WSA. From here using the zonal statistics tool to calculate the average value of the raster within PJR WSA 3 mile buffer would be the most logical next step. However, that tool was not available during the writing of this report. Thus the clip (data management) tool was used to clip the raster to the 3 mile buffer boundary, making it clear the raster value was 0 throughout the wilderness and its 3 mile buffer. If any measurable values appear within the refuge it would be in 30 arc second squares. The value would then be the average value of all the 30 arc second squares that fall completely within the 3 mile wilderness buffer. Data Source: DMSP remote sensing data http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html#AVSLCFC

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
Number of facilities that decrease self-reliant recreations	H	Determine the number of facilities that decrease self-reliant recreation within the wilderness. Currently there are no facilities that decrease sel
Number of restrictions on backcountry camping permit	H	Count the number of restrictions on the most up to date backcountry camping permit. Data Source: Backcountry camping permit
Other Features of Value Quality		
Degradation of Poker Jim Ridge Research Natural Area quality index	H	Through staff judgment determine the quality of the Poker Jim Ridge Research Natural area and assign a score based on table 38. Data Source: SHMNWRC Staff
<p>Note: wilderness border line features, border 50m buffers, 3 mile buffers, and 50m interior buffers have already been created</p> <p>V:\Hart\BaseData\Wilderness\Wilderness character monitoring project_wilderness</p>		

APPENDIX D – Framework for Wilderness Character Monitoring

Framework for Wilderness Character Monitoring

Overview

This interagency monitoring Framework is based on hierarchically dividing wilderness character into successively finer elements. These elements, starting from wilderness character, are:

- **Qualities**—primary elements of wilderness character that link directly to the statutory language of the 1964 Wilderness Act. In this Framework, all [five] qualities are necessary to assess trends in wilderness character and each wilderness would be required to report the trend for each quality.
- **Monitoring questions**—major elements under each quality that are significantly different from one another. Monitoring questions frame this monitoring to answer particular management questions. In this context, monitoring questions are similar to monitoring goals. Each wilderness and agency would be responsible for reporting on the trend for all eight monitoring questions.
- **Indicators**—distinct and important elements within each monitoring question. In nearly all cases, there is more than one indicator under a monitoring question. Each wilderness and agency would be responsible for reporting on the trend for all 13 indicators.
- **Measures**—a specific aspect of wilderness on which data are collected to assess trend of an indicator. In nearly all cases, there is more than one measure to provide each agency (and potentially each wilderness within an agency) a range of options for assessing trend in the indicator. Some of these measures are more accurate and precise but costly, while others are less accurate and precise but easier and less expensive to monitor. For example, under the indicator “Remoteness from sights and sounds of people inside wilderness” (see page 28 table 7), the measure “amount of visitor use” requires substantial effort and cost but is fairly precise. On the other hand, the measure “area of wilderness affected by access or travel routes” is fairly easy to compute in a Geographic Information System, but is not very precise because it doesn’t assess the number of people inside the wilderness. This range of measures allows different agencies and wildernesses to choose the measure(s) that are relevant and practical. We recommend monitoring all the measures for which data are available to give the most accurate assessment possible and, if two or more measures are monitored, that they be equally weighted to prevent giving a biased trend in the indicator.

For a few measures, the use of an “index” is recommended. In these cases, several attributes are considered simultaneously to assess trend and the different attributes may be weighted differently. For example, the index of physical development would combine the type and number of structures. Developing an index typically requires subjective judgments about the types of attributes to include, their relative weighting (for example, a dam has more impact than an outhouse), and how they would be mathematically combined. In the detailed descriptions of the measures given in Appendix A, only the types of attributes are suggested—if this interagency strategy is implemented, each agency would need to develop these indexes based on their data capabilities and needs.

Each measure is used only once, under the quality that was deemed most relevant given the broad interagency perspective of this monitoring strategy. This approach avoids problems of double-counting some measures and the bias this would introduce. However, some measures

are clearly relevant to more than one quality. Agency provided system trails, shelters, and toilets, for example, are relevant to both the undeveloped quality and the solitude or primitive and unconfined recreation quality. In such cases, different agencies (and different wildernesses if allowed by their home agency) may assign the measure to a different quality than what is presented in this framework. These differences are not nearly as important as consistency over time within an agency or wilderness because this monitoring strategy is based on assessing how wilderness character is changing only within a single wilderness.

If none of the recommended measures under a particular indicator are relevant to an agency or wilderness, other measures may be used or developed as long as the rationale is made clear for how the new measure is relevant to the indicator and how it is measurable, credible, and repeatable. For example, a wilderness may develop a measure that is relevant for assessing place-based aspects or other special features. We recommend that a wilderness character monitoring team within each agency be tasked to approve the use of such measures and communicate this use with the other wilderness management agencies.

APPENDIX E – What is a trammeling action

What is a trammeling action?

Peter Landres, Aldo Leopold Wilderness Research Institute

This appendix provides guidelines and examples to clarify what is and is not a trammeling action. These guidelines and examples are intended to capture about 90% of the cases and provide sufficient guidance for local staff to figure out the novel and rarer cases as they occur. This appendix does not discuss how to weight such actions, how to find or record the data for these actions, or any other aspect of using this information in wilderness character monitoring.

The following definitions are used in this appendix:

- ***Trammeling action:*** an action that intentionally manipulates “the earth and its community of life” inside a designated wilderness or inside an area that by agency policy is managed as wilderness.
- ***Intentional:*** done on purpose; deliberate; willful
- ***Manipulation:*** an action that alters, hinders, restricts, controls, or manipulates “the earth and its community of life” including the type, amount, or distribution of plants, animals, or physical resources inside a designated wilderness or inside an area that by agency policy is managed as wilderness.
- ***Intentional manipulation:*** an action that purposefully alters, hinders, restricts, controls, or manipulates “the earth and its community of life.”

Based on these definitions, trammeling occurs when a manager makes a decision and takes action that intentionally manipulates the Natural Quality. Once action is taken the effect on the Natural Quality cannot typically be halted or stopped or reversed, and therefore the effect typically persists from the moment of the action onwards over time. Because of this persistent or permanent effect on “the earth and its community of life,” managers need to think long and hard about these types of decisions.

Trammeling actions are often considered only in terms of how they degrade the Untrammeling Quality, but the agencies take such actions for many different reasons that support or sustain the other qualities of wilderness character. For example, actions taken to protect and sustain the Natural Quality include controlling or eradicating non-native species, restoring degraded habitat, or protecting species from harm such as installing gates across caves to prevent people from entering. Resource management actions in wilderness almost always involve tradeoffs, and while there may be valid and good reasons for taking trammeling actions, these actions nonetheless degrade the Untrammeling Quality. The framework of wilderness character simply allows agency staff to be transparent about these tradeoffs that might be involved in actions taken to improve the Natural Quality that degrade the Untrammeling Quality. The goal of using the framework of wilderness character is to help agency staff make the decision that is deemed best overall for preserving wilderness character.

The following sections describe three types of activities: those that are not trammeling actions, those that are trammeling actions, and those that may be trammeling actions.

Activities that are not trammeling actions

There are several types of activities that have caused considerable discussion about whether they are trammeling actions. Examples that have been discussed as possible trammeling actions include climate change, air pollutants that drift into a wilderness, escaped camp fires the burn in wilderness, and non-native species that disperse into a wilderness. Intentionality and the opportunity for management restraint are central tenets of the Untrammeled Quality, so if there is no opportunity for management restraint and no intention to manipulate the earth and its community of life, there is no impact on the Untrammeled Quality. In all of the examples cited above, there is no opportunity for management restraint and no intention to manipulate, so none of these examples would be counted as trammeling actions. There are certainly effects on the Natural Quality from these, and monitoring could track these effects.

Another group of examples have also caused lots of discussion, including installing meteorological or other science instrumentation, landing a helicopter for search and rescue operations, and removing trash. In each of these cases there is an opportunity for management restraint, but because there is no intention to manipulate the earth and its community of life, these are not considered trammeling actions. One last group of examples, including camping violations and unauthorized motorized incursions, are not considered trammeling actions because there is no opportunity for management restraint and there was no intention to manipulate the ecological system. In all of these examples there may be impacts to the other qualities of wilderness character, but not to the Untrammeled Quality.

Sport hunting has provoked an enormous amount of discussion about whether it degrades the Untrammeled Quality. The consensus view is that sport hunting is not a trammeling action because individual hunters are taking individual animals without the intention to manipulate the wildlife population. Like the other examples above, however, sport hunting, by affecting the abundance, distribution, and sex ratio of wildlife populations, may affect the Natural Quality; the presence of hunters may affect the Solitude or Primitive and Unconfined Recreation Quality; and structures built by hunters may affect the Undeveloped Quality.

Activities that are trammeling actions

There are two broad classes of activities that are trammeling actions, those that are authorized by the federal wilderness manager and those that are not. Under each of these broad classes there are several subclasses that reflect whether the action is taken on a biological resource or a physical resource, and whether the effect of the action is on a biological or physical resource. (This might seem like an unnecessary nuance but experience has shown that these distinctions help staff understand what trammeling actions are.) Almost always the concern is for actions that occur inside a designated wilderness, but one subclass provides examples of actions taken outside a designated wilderness that would be included as a trammeling action because the intention is to affect biological or physical resources inside the wilderness.

In some situations, staff may assume that they do not have the opportunity for restraint and therefore assume that their actions do not degrade the Untrammeled Quality. Examples of such situations include restoring habitat for a listed endangered species, spraying herbicides to eradicate an invasive non-native plant that is degrading wildlife habitat, transplanting an extirpated species back into the wilderness, or suppressing a naturally-ignited fire to save timber or homes adjacent to the wilderness. However, even in these situations, staff are deciding to take action as well as the type and intensity of action. In some of the examples above, staff are taking an action that supports one law (such as the Endangered Species Act) that degrades another (in this case the Wilderness Act).

Agency authorized trammeling actions. These are actions that are authorized by the federal wilderness manager as well as actions by other agencies, organizations, or individuals that have been approved or permitted by the federal land manager.

1. Actions taken inside the wilderness on vegetation or fish and wildlife to intentionally and directly affect this vegetation or fish and wildlife. Examples include:
 - a. Removing or killing native vegetation or fish and wildlife
 - b. Adding or restoring native vegetation or fish and wildlife
 - c. Adding non-native vegetation for erosion control
 - d. Adding non-native fish and wildlife
 - e. Spraying chemicals to control non-native vegetation or fish and wildlife
 - f. Releasing biocontrol agents to control non-native vegetation or fish and wildlife
 - g. Collecting vegetation for scientific study
 - h. Collecting or capturing and releasing fish and wildlife for scientific study
 - i. Collecting vegetation or fish and wildlife for commercial purposes
 - j. Enclosing or excluding fish and wildlife from an area to protect vegetation or to study the effects of enclosing or excluding fish and wildlife on protecting vegetation or animals
 - k. Adding piscicides to water to eliminate non-native fish
2. Actions taken inside the wilderness on a physical resource to intentionally and directly affect this physical resource. Examples include:
 - a. Suppressing naturally-ignited fire
 - b. Lighting fire (under management prescription) to reduce fuels or for other purposes
 - c. Constructing or maintaining a dam or diversion structure to alter the quantity or seasonal flow of water
 - d. Constructing a road to allow access to mineral, oil, or gas leases; communication sites; or inholdings
3. Actions taken inside the wilderness on a physical resource that intentionally affects the physical resource to directly or indirectly affect vegetation or fish and wildlife. Examples include:
 - a. Installing a gate across a cave that will protect bats but exclude other animals from using the cave
 - b. Constructing or maintaining a range allotment fence
 - c. Constructing a dam to exclude non-native species from moving up or down a stream
 - d. Installing guzzlers to provide water for wildlife
 - e. Lighting fire (under management prescription) or any other vegetation manipulation to improve wildlife habitat
 - f. Adding acid-buffering limestone to water to neutralize the effects of acid deposition on aquatic flora and fauna
4. Actions taken outside the wilderness on a physical or biological resource to intentionally and directly affect that resource inside a wilderness. Examples include:
 - a. Cloud seeding that occurs above the wilderness, and is therefore outside it, to intentionally increase precipitation inside the wilderness
 - b. Damming a river outside a wilderness to intentionally create a lake or water storage area inside the wilderness
 - c. Killing fish and wildlife outside the wilderness to intentionally affect the population or distribution of this species inside the wilderness

- d. Planting or stocking fish and wildlife outside the wilderness to intentionally or foreseeably affect the population or distribution of this species inside the wilderness because of known habitat inside the wilderness

Not authorized trammeling actions. These are citable and other actions taken by other agencies, organizations, or individuals that have not been authorized, approved, or permitted by the federal wilderness land manager.

1. Actions taken inside the wilderness on vegetation or fish and wildlife to intentionally and directly affect this vegetation or fish and wildlife. Examples include:
 - a. Adding vegetation or fish and wildlife by a federal agency (other than the federal land managing agency), a state agency, or the public
 - b. Removing vegetation or fish and wildlife by a federal or state agency or the public
 - c. Inclosing or excluding fish and wildlife to study the effects of inclosing or excluding on vegetation or fish and wildlife
2. Actions taken inside the wilderness on a physical resource to intentionally and directly affect this resource. Examples include:
 - a. Modifying water flow to store water or alter the timing of water flow
 - b. Setting arson fire
3. Actions taken inside the wilderness on a physical resource that intentionally affects the physical resource to intentionally (either directly or indirectly) affect vegetation or fish and wildlife. Examples include:
 - a. Modifying water resources to provide water for wildlife
4. Actions taken outside the wilderness on vegetation or fish and wildlife to intentionally and directly affect the occurrence or distribution of these or other species inside a wilderness. Examples include:
 - a. Releasing species outside a wilderness with the intention to affect a population whose range expands into the wilderness
 - b. Killing wildlife outside of the wilderness with the intention to affect populations whose ranges expand into the wilderness

Activities that may be trammeling actions

In many cases deciding whether an activity is a trammeling action is straightforward, but in other cases this decision is more complex and nuanced. These nuanced cases typically involve some type of action where the intent is not to manipulate the “earth and its community of life” but some manipulation of the environment is required to produce a desired outcome, such as building a trail. These nuanced cases may be confusing because even though the primary intent is not to manipulate species or physical resources, action is intentionally being taken and this action may have a foreseeable and substantial effect on “the earth and its community of life.”

In Table 18 below, several hypothetical situations illustrate how an action may or may not be a trammeling depending on the scope and scale of the action and its effects. Each bullet in the table presents a situation where the action being taken likely would, or would not, be considered a trammeling. For every real situation, agency staff need to think through whether the proposed action will have a foreseeable and substantial effect on “the earth and its community of life” and if their answer is “yes” then it’s a trammeling action, and if the answer is “no” then it’s not a trammeling action. Also, in this table an action may not be a trammeling but it still may affect other qualities of wilderness

character. For example, installing rebar monumentation for a science project would likely not be a trammeling, but such installations would likely degrade the Undeveloped Quality.

Examples of actions that likely are, and likely are not, trammeling actions:

ACTION	LIKELY NOT A TRAMMELING	LIKELY A TRAMMELING
Building system trail	<ul style="list-style-type: none"> • Routing a trail needs around a rock slide that obliterated the former trail • Building a bridge across a stream to prevent stream bank erosion • Installing a small section of corduroy across a wet area to prevent trenching • Installing in water bars • Removing rock in a trail • Building rock-cribbing to support a trail 	<ul style="list-style-type: none"> • Routing a trail through an area of endangered alpine butterfly habitat • Building a large amount of new trail to go around a section of a river or a cliff • Building a trail that requires extensive earth movement or tree cutting
Obliterating non-system trail	<ul style="list-style-type: none"> • Piling vegetation or rocks at the beginning and end of trail sections that cut a switchback • Piling vegetation or rocks to block social trails around campsites 	<ul style="list-style-type: none"> • Obliterating a large section of non-system trail that requires extensive earth movement
Restoring campsites	<ul style="list-style-type: none"> • Restoring a single, isolated campsite • Restoring a number of campsites (e.g., that are clustered around a lake) that doesn't require degrading the soil or vegetation in the surrounding area 	<ul style="list-style-type: none"> • Restoring a number of campsites that does require moving a significant amount of soil or number of plants in the surrounding area
Closing caves	<ul style="list-style-type: none"> • Installing a bat gate across one or a few caves of many in the area 	<ul style="list-style-type: none"> • Installing bat gates across all the caves in an area
Removing hazard trees	<ul style="list-style-type: none"> • Removing one or a few hazard trees that threaten designated campsites or that are along a trail 	<ul style="list-style-type: none"> • Removing all of the hazard trees over a large area
Treating non-native invasive plants	<ul style="list-style-type: none"> • Hand pulling a small area of non-native invasive plants 	<ul style="list-style-type: none"> • Spraying any herbicide
Permitting scientific activities	<ul style="list-style-type: none"> • Installing research plot monumentation, such as rebar stakes or nails • Installing most scientific instrumentation • Collecting a limited number of voucher specimens with no impact species distribution or abundance 	<ul style="list-style-type: none"> • Installing enclosures or exclosures that affect the movement of fish and wildlife • Installing instrumentation that disrupts the movement or behavior of plants, or fish and wildlife • Collecting voucher specimens that does affect the species distribution or abundance