

Field Measures of Wilderness Character

Big Snowy Mountains
Wilderness Study Area

2012

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Executive Summary

This report summarizes field measures of wilderness character collected in the Big Snowy Mountains Wilderness Study Area (WSA) on the Lewis and Clark National Forest in central Montana. During summer 2012, Wilderness Institute crews hiked trails within and leading into the WSA and made detailed field observations of measures related to the qualities of wilderness character identified in the Wilderness Act of 1964: untrammelled, natural, undeveloped, and opportunities for solitude or primitive and unconfined recreation. Wilderness Institute field leaders led eight trips with 37 community volunteers and covered 116 miles of system trails and 1.5 miles of non-system trails.

Monitoring highlights include:

- **Trail Coverage:** Field crews encountered a number of challenges accessing some of the system trails displayed on Forest Service maps. As a result, only 75% of mapped system trails were monitored; conditions on-the-ground point to a need for better signage and labeled trail closures, as well as updated maps that accurately depict currently existing trails and address public/private trailhead access issues.
- **Weeds:** 105 weed patches were recorded, representing 5 species. Of these, 81 (77%) were recorded within the WSA boundary. Canada Thistle and Houndstongue represented 51% and 31% respectively of all weed patches. Estimated total acres infested were 1.7, with 0.6 acres occurring within the WSA boundary. Twenty-six (25%) of patches were pulled or partially pulled.
- **Wildlife:** A total of 29 wildlife encounters were reported. Canid species (e.g. coyote) were most prevalent (55%), followed by bear (41%). The majority (97%) of encounters were indirect (e.g. tracks, scat, or other sign), with a single visual observation of a bull elk.
- **Erosion:** Erosion due to recreation was documented at 8 stream sites. Four showed signs of moderate erosion, three had slight erosion, and one (located outside the WSA at the East Fork Cottonwood Creek (#489) trailhead) was severely eroded.
- **Installations and developments:** A total of 48 installations and developments were reported, 36 within the WSA boundary. Cairns and fences were most common (44% and 21%, respectively), but two latrines, a corral, bridge, and hitching post were also observed.
- **Signs:** A total of 101 signs were encountered along trails, 60 of which were within the WSA boundary. Most signs were trail junction/directions (54%), followed by recreational use (22%), and interpretive (4%). The majority (65%) were in good condition.
- **Trail Closure Devices:** No trail closures were recorded in the study area.
- **Trail width:** Deviation from single-track (e.g. braided or double-track) was recorded for 2.5 miles of trail within the WSA, but trip notes suggest this number is likely low due to incomplete start/stop data for this measure, and the existence of old road beds as trail foundations for some system trails.
- **Non-system trails:** 1.5 miles of non-system trails were surveyed, including 11 non-system trails or trail fragments. Time constraints in the field limited complete surveying of all non-system trails.

- **Mechanized and motorized use:** Evidence of motorized or mechanized use was recorded at 8 locations within the WSA, and included evidence from 5 ATVs, 2 bicycles, and 1 vehicle.
- **Trailheads and people encounters:** The highest vehicle and people numbers were documented near Crystal Cascades (#445) and Half Moon Creek (#493) trailheads, with no people encountered on most trails. The majority (81%) were hiker/backpackers, and 85% of groups consisted of 2 or fewer people.
- **Noise intrusions:** A total of 25 noise sampling sessions were completed (9 morning, 9 midday, and 7 evening). No noise was heard during 60% of noise sampling sessions. The majority of noises heard were airplanes (81%), followed by cows (13%), and a single intrusion by people. Outside of noise sampling sessions, an additional 206 noise intrusions were recorded within the WSA boundary during trail monitoring, 99% of which were airplanes.
- **Visual intrusions:** Visual intrusions were primarily limited to trails traversing the spine of the mountains, including cities or towns (38%), agriculture (23%), buildings (15%), and highways (15%).
- **Campsites:** 19 campsites were recorded. Most (74%) were located on the Uhlhorn trail (#493), with four clustered on Knife Blade Ridge. Of the campsites monitored, 42% were minimally impacted, 53% were moderately impacted, and one site was highly impacted.

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INTRODUCTION

This report summarizes field measures of wilderness character in the Big Snowy Mountains Wilderness Study Area on the Lewis and Clark National Forest in central Montana. This WSA, like other Forest Service Wilderness Study Areas in Montana, was designated by the U.S. Congress through the Montana Wilderness Study Area Act of 1977. The Act requires that the Forest Service maintain the wilderness character of WSAs as it existed in 1977. In 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, collaborated with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop field measures of the four qualities of wilderness character identified in the Wilderness Act of 1964 ([Pub.L. 88-577](#)) and described by Landres et al (2008) in *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System*. This report summarizes 2012 field monitoring data in the Big Snowy Mountains WSA for selected measures of these four wilderness character qualities: 1) untrammled, 2) natural, 3) undeveloped and 4) opportunities for solitude or primitive and unconfined recreation.

During summer 2012, Wilderness Institute crews hiked every trail in the WSA and made detailed observations related to these qualities. Measures of naturalness focused on invasive plants, wildlife, and lake and streambank erosion. Undeveloped measures included installations and developments (both recreational and non-recreational), signage, and trail closure devices. Measures of opportunities for solitude and primitive and unconfined recreation included trail conditions, non-system (user created) trails, campsite conditions, evidence of mechanized and motorized use, recreational use, motorized noise, and visual intrusions. The single measure of the untrammled quality of the area was opportunistic weed pulling by Wilderness Institute crews (all other measures of untrammled require non-field related work). Results for 16 features (attribute groups; see Appendix 1) are reported here, often accompanied by tables and figures.

Please note that this project emphasized collection of quantifiable field data appropriate for collection with GIS-based technology. Many aspects of wilderness character were not evaluated as part of this project, either because non-field measures were required (e.g. agency actions that impact trammeling or recreation opportunities) or because data collection was beyond the scope of this project (e.g. air and water quality data). This report represents a snap-shot of on-the-ground conditions within the Big Snowy Mountains WSA, and does not attempt to infer how measured qualities of wilderness character may be changing over time, or evaluate the efficacy of current management approaches. To do so would require repeated monitoring efforts over a period of years, and the inclusion of non-field measures of wilderness character as outlined in "Keeping it Wild." This report does, however, create a current baseline that will enable subsequent assessments to expose how certain measures of wilderness character are changing. For a detailed description of wilderness character monitoring, please see: <http://www.wilderness.net/index.cfm?fuse=WC>.

This project was conducted as part of the Wilderness Institute's Citizen Science Program, which has recruited community volunteers to help monitor selected components of wilderness character in designated Wilderness and WSAs since 2005. Wilderness Institute field leaders led small groups of volunteers on multi-day backcountry trips, surveying all mapped trails within the WSA as well as non-system (user-created) trails. Eight trips were conducted with xx volunteers. This program was founded on the belief that including community members in on-the-ground stewardship of public lands builds community capacity, increases public involvement in nearby public lands, and improves the dialogue between local communities and managing agencies.

This work was funded by the Forest Service, the National Forest Foundation, the University of Montana, and the Cinnabar Foundation. For more information please contact us at: citizenscience@cfc.umt.edu or (406) 243-6936.

TRAIL COVERAGE

The WSA has approximately 91 miles of system trails within the boundary. However, field crews repeatedly encountered mapped system trail segments that they were unable to traverse (see below). As a result, only 68.9 miles (75%) of system trails within the WSA boundary were monitored, along with 17.1 miles of trail leading into or adjacent to the WSA (Figure 1). An additional 1.4 mile decommissioned section of the Big Snowy trail (#650) was also monitored from the old trailhead because the closure was not apparent on site. Portions of the following system trails were not surveyed, as illustrated in Figure 1 (please also see Appendix 2 for additional information on these trails):

- #410: Monitoring northward from junction with #493, the trail became overgrown and very difficult to follow. The northern end of the trail (originating on private property) was scouted and appeared easy to follow, however time constraints prevented monitoring southward to establish where the trail degrades.
- #494: Northeastern portion of this trail was monitored from Old Baldy until trail turned into FS road 8956.
- #652: Extensive network of ATV trails come off of #652, making it arduous to monitor and difficult to distinguish between system and user-created trails. Only the portion of trail between forest road 6950 and Swimming Woman Creek was monitored.
- #671: Western side of this loop trail off of #652 was monitored. Locked gate was encountered at bottom of loop and eastern side of trail was not monitored.
- #406: Trail ends at Lime Cave Peak. Forest map indicates trail continues to Jump Off Peak, but no trail was found.
- Green Pole Canyon (spur off of #406): Trail not found.
- #481: Approaching from the north, trail deteriorates then disappears; southern portion to junction with #490 not found.
- #490: Trail deteriorates just west of junction with #403 and then disappears.
- #483 and western end of #490: Trails began on private land and were not surveyed.

Wilderness Character Monitoring Blue Joint Wilderness Study Area

2009

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INTRODUCTION

This report summarizes field measures of wilderness character in the Blue Joint Wilderness Study Area (WSA) on the Bitterroot National Forest in Montana. The Blue Joint WSA, like other Forest Service Wilderness Study Areas in Montana, was designated by the U.S. Congress through the Montana Wilderness Study Area Act of 1977. The Act requires that the Forest Service maintain wilderness character. During spring 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, worked with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop indicators of wilderness character related to the four qualities of wilderness character described by Landres and coauthors in *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System* (2008). The findings summarized here will be utilized by the Forest Service to understand different aspects of wilderness character in the Blue Joint WSA.

During summer 2009, we hiked every trail in the Blue Joint WSA and made detailed observations related to the untrammeled, natural and undeveloped qualities of the area, and opportunities for solitude and primitive unconfined recreation. Our naturalness measures focused on invasive plants, wildlife, and lake and streambank erosion. Our undeveloped measures included installations and developments (both recreational and non-recreational), signage, and trail closure devices. Our measures of opportunities for solitude and primitive and unconfined recreation included trail conditions, non-system (user created) trails, campsite conditions, evidence of motorized use in places that are not designated for motorized use, recreational use, motorized noise, and visual intrusions. Our only measure of the untrammeled quality of the area was weed pulling by our own crews (all other measures of untrammeled require non-field related work). Results for more than 50 field measures are reported here, often accompanied by tables and maps. The field data was combined with GIS-derived measures such as elevation and longitude and latitude. Please note that sampling of recreational users and wildlife (items that are not stationary) was opportunistic (recorded if field crews happened to encounter people or wildlife), but that all other indicators were comprehensively monitored from all system trails.

Monitoring was conducted by Wilderness Institute field leaders and small groups of community volunteers on multi-day backcountry trips. Four trips were conducted with 25 volunteers who covered 86 trail miles and worked 980 hours total. These trips were open to anyone who wished to participate. In addition to data collection, crews also hand-pulled weeds and conducted other restoration activities related to the maintenance and propagation of native plants. This project was conducted as part of our Citizen Science Program and built on five years of monitoring invasives and campsites in designated wilderness in Montana and Idaho. The Citizen Science Program was founded on the belief that including community members in on-the-ground stewardship of public lands builds community capacity, increases public involvement in nearby public lands, and improves the dialogue between local communities and managing agencies.

This work was funded by the Forest Service, the National Forest Foundation, and the Cinnabar Foundation. For more information on monitoring protocols or results, or on the Wilderness Institute, please contact us at: wi@cfc.umt.edu or (406) 243-5361.

EXECUTIVE SUMMARY

- Seventy-three weed infestations containing seven known noxious weed species and covering more than 70 acres were reported. Knapweed and sulfur cinquefoil were most prevalent (62%). Most weed patches (67%) were mapped in Douglas-fir and lodgepole pine climax series types dominated by beargrass, bluejoint, and snowberry understories. Most patches (77%) were more than 10 feet from water, and less than or equal to 0.1 acres in size (71%). Weed patches were primarily associated with trails (74%), but also associated with burned areas (68%).
- Three bears and four pikas were observed and 180 carnivore scat piles recorded.
- Areas along twenty-two streambanks were identified as being slightly or moderately impacted by recreational use.
- Fifty-three installations and developments (both recreational and non-recreational) were observed. These included 23 water bars, 7 cairns, 5 bridges, 2 water diversions, 2 lookouts, 1 cabin, and 1 corral.
- Twenty-two signs were observed. Most (59%) were in good condition. One was missing and two were illegible.
- Only one trail closure device was encountered (a berm near the trailhead of Trail #223/Little Blue Joint Trail on the eastern Wilderness Study Area boundary).
- Ninety-three percent of the trails were single-track width.
- Evidence of motorized use on trails included motorbike tracks on over 35 km of trail.
- Nineteen non-system trails were identified and 10 were fully surveyed. Most (68%) were new routes created by recreational use (type of use usually unclear, but one route appeared to be created by an ATV and eight appeared to be created by foot travel) as opposed to older, preexisting road beds from mining or other historic activities (27%).
- Three separate groups were encountered with two people each (two mountain bikers and four hikers/backpackers).
- Six motorized noises were recorded. One was an ATV and one was a vehicle on a nearby road. Sources for the other four were not identified. Half were less than one minute in duration and half were far in the distance.
- Twelve visual intrusions were recorded (all dirt roads outside the WSA visible from within the WSA).
- Twenty-six campsites were inventoried and mapped. Impacts to campsites included: social trails (58%), exposed roots (65%), remnant trash and/or fire rings/scars (58%), at least one damaged tree (84%), and at least ten damaged trees (44%). More than half (68%) had little or no development. Nearly half (46%) were lightly impacted overall and nearly a quarter (23%) were not impacted at all.

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**Wilderness Character Monitoring Report
Hyalite Porcupine Buffalo Horn
Wilderness Study Area**

U.S. Forest Service, Region 1
Gallatin National Forest



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EXECUTIVE SUMMARY

The Gallatin National Forest, in cooperation with the University of Montana, recently completed an updated wilderness character monitoring report for the Hyalite Porcupine Buffalo Horn Wilderness Study Area (HPBH WSA). The Forest has been engaged in documenting changes to wilderness character for over a decade, in preparation for revisions to the Gallatin National Forest Travel Management Plan. This report builds on Schlenker (2003) to better articulate baseline data describing wilderness character in the HPBH WSA.

Recent efforts to standardize wilderness character monitoring (e.g. Landres et al. 2005; Landres et al. 2008) have provided an improved structure and template for building wilderness character monitoring assessments. These efforts are guided by the 1964 Wilderness Act itself, using the statutory language of the Act to identify four qualities of wilderness: "untrammeled", "natural", "undeveloped" and "solitude or a primitive and unconfined type of recreation". These four qualities, with associated indicators and measures, structured and informed the wilderness character monitoring efforts reported here for the HPBH WSA. Additionally, the Forest Service Northern Region recently provided an interpretation of "baseline" wilderness character measures appropriate for designated Wilderness in the Northern Region that are largely applicable to the Region's WSAs as well. This interpretation was also used to identify measures and structure reporting for the HPBH WSA. The ultimate intent of this assessment is to employ standardized monitoring protocols for a set of measures that address each monitoring question and indicator, are easily replicated, and capitalize on readily available data from ongoing monitoring efforts across the Greater Yellowstone Area.

This report makes no attempt to characterize trend. Rather, this effort clearly establishes a "baseline" of wilderness conditions in the HPBH WSA as a snapshot in time. Historic data that mirrors this protocol is largely lacking for most elements, so trend assessments are not yet possible. Additionally, prior to assessing trend following the next round of monitoring, the Forest will need to establish what constitutes "significant change" thresholds, and assign weights for each measure that reflect local and regional importance. Table 3 in this report sets up the format for aggregating data following subsequent monitoring efforts. Please refer to Table 8 in *Keeping it Wild* (Landres et al. 2008) for an example of a populated wilderness character monitoring trend summary.

This monitoring effort makes no decisions, but rather is simply an aggregation of what was learned through on-the-ground monitoring efforts in 2011, combined with existing data relevant to the specific measures. This report provides a solid basis for documenting future changes in wilderness character across this landscape, and can help inform proposed managerial actions and quantify their impact on the wilderness character of the HPBH WSA.

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INTRODUCTION

BIOPHYSICAL BACKGROUND

The Hyalite Porcupine Buffalo Horn (HPBH) Wilderness Study Area (WSA) is located on the Gallatin National Forest in south-central Montana. The HPBH WSA consists of approximately 155,000 acres of the northern Gallatin Range between the Gallatin and Yellowstone Rivers. It extends southward from the Hyalite Peaks area along the Gallatin crest to the northwestern corner of Yellowstone National Park. The HPBH WSA is approximately 36 miles in length and between four and 12 miles in width.

The HPBH WSA's topography is highly variable. The northern portion of the study area contains jagged peaks, U-shaped valleys, and cirque basins. A more moderate topography is found in the remainder of the WSA. Elevations range from approximately 5,500 feet to over 10,300 feet. Prominent peaks include Mount Blackmore, Mount Bole, Hyalite Peak, Eaglehead Mountain, and Fortress Mountain. Major streams include the headwaters of Hyalite, Bozeman, Trail, Eightmile, Big, Rock, Tom Miner, Buffalo Horn, Porcupine, Portal, Moose, Swan, Squaw, and South Cottonwood creeks. The City of Bozeman is dependent on the Bozeman and Hyalite drainages for municipal water, and the headwaters of both are partially contained within the HPBH WSA.

The HPBH WSA supports diverse vegetation communities. At the lowest elevations grasslands are found, which then transition into Douglas fir (*Pseudotsuga menziesii*) and/or limber pine (*Pinus flexilis*) stands. At higher elevations, lodgepole pine (*Pinus contorta*), spruce, and subalpine forests are found. The highest elevations contain whitebark pine (*Pinus albicaulis*) and, beyond the timberline, alpine tundra or alpine turf. Forested portions of the HPBH WSA are affected by mountain pine beetle epidemics, dwarf mistletoe, spruce budworm, and white pine blister rust. Riparian areas within the HPBH WSA support wetland vegetation and are influenced by high soil moisture. These areas are highly productive and provide protection against erosional forces.

The variety of HPBH WSA habitats provide for a wide range of wildlife species. Important species found within the WSA include bighorn sheep (*Ovis canadensis*), Rocky Mountain elk (*Cervus canadensis*), grizzly bear (*Ursus arctos horribilis*), moose (*Alces alces*), wolverine (*Gulo gulo*), Arctic grayling (*Thymallus arcticus*), westslope cutthroat trout (*Oncorhynchus clarkia lewisi*), Yellowstone cutthroat trout (*Oncorhynchus clarkia bouvieri*), and whitebark pine. The HPBH WSA falls within the purview of interagency efforts to manage and study grizzly bear and whitebark pine communities.

Field Measures of Wilderness Character

**Middle Fork Judith River
Wilderness Study Area**

2012

**Wilderness Institute
College of Forestry and Conservation
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Executive Summary

This report summarizes field measures of wilderness character collected in 2012 in the Middle Fork Judith River Wilderness Study Area on the Lewis and Clark National Forest in central Montana. During summer 2012, Wilderness Institute crews hiked every trail in the WSA and made detailed field observations of measures related to the qualities of wilderness character identified in the Wilderness Act of 1964: untrammeled, natural, undeveloped, and opportunities for solitude or primitive and unconfined recreation. Wilderness Institute field leaders led eight trips with 23 community volunteers and covered 77.1 miles of system trails and 6.7 miles of non-system trails (NSTs).

Monitoring highlights include:

- **Trail Coverage:** 96% of system trails within the WSA boundary were monitored. Trail access and coverage was not always straight-forward, largely due to inconsistencies between visitor use maps, USGS quads, and available forest service geospatial layers.
- **Middle Fork Corridor Summary:** This high-use corridor contained a convoluted network of roads and trails with multiple stream crossings and human-mediated disturbance. Field crews documented 26% of the WSA's weed patches, 65% of erosion sites, and 73% of ATV sightings along this corridor.
- **Weeds:** 178 weed patches were recorded (84% of these within the WSA), representing seven species. Canada Thistle and Houndstongue were most prevalent (25% and 45%, respectively, of all weed patches).
- **Wildlife:** A total of 36 wildlife encounters were reported. Canid species (e.g. coyote) were most prevalent (50%), followed by bear (33%), elk (6%), and a single encounter with pika, mule deer, and moose. The majority (86%) of encounters were indirect (e.g. tracks, scat, or other sign).
- **Erosion:** Erosion due to recreation was documented at 51 stream crossings, 44 inside the WSA. All 23 sites with severe erosion were located within the first 5 miles of the Middle Fork Judith River trail (#437).
- **Installations and developments:** A total of 96 installations and developments were reported, 88 within the WSA boundary. Cairns and fences were most common (31% and 29%, respectively). Two outfitter camps contained 28% of developments.
- **Signs:** A total of 104 signs were encountered along trails, 72 of which were within the WSA. Most signs were trail junction/directions or recreational use (37% and 34%, respectively), with <5% trail markers or interpretive. Remaining signs included survey markers and missing signs (posts with no sign, on the ground, or in pieces). The majority (58%) were in good condition.
- **Non-system trails:** A total of 18 NSTs or trail fragments covering 6.7 miles were mapped; 33% were associated with motorcycles or ATVs. NST origin was predominantly reported as newly created by recreation (70%). In several areas, trail designations were not clear on the ground due to insufficient signage, regularly used non-system trails, and trails that appeared on visitor maps but not in current USFS GIS geospatial data for system trails.
- **Mechanized and motorized use:** Indirect evidence of mechanized use (e.g. tracks) were recorded at 24 locations, 17 of which were within the WSA boundary. The majority of documented use was by motorcycles (54%), followed by ATVs (33%). Bicycle tracks were

observed on 3 trail segments outside the WSA boundary. Evidence of heavy use along the Middle Fork Judith River corridor was noted in trip reports.

- **People encounters:** The majority of the 91 people encountered were on ATV or motorcycle (42% and 35%, respectively), with ATV encounters clustered along the Middle Fork Judith River trail.
- **Noise intrusions:** A total of 29 noise-sampling sessions were completed (11 morning, 9 midday, and 11 evening). A noise intrusion was documented during 78% of sessions. The majority of noises heard were airplanes (74%), followed by motorized vehicles (17%), and a single intrusion by people. Outside of noise sampling sessions, an additional 230 noise intrusions were recorded within the WSA boundary during trail monitoring, 92% of which were airplanes.
- **Visual intrusions:** Five visual intrusions were observed from within the WSA, including buildings visible on a private inholding, the Showdown Ski Area, and cities/towns in the far distance.
- **Campsites:** 32 campsites were recorded within the WSA boundary. Based on the summary impact evaluation scores, 13% were minimally impacted, 44% were moderately impacted, 34% were highly impacted, and 6% were extremely impacted.

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INTRODUCTION

This report summarizes field measures of wilderness character in the Middle Fork Judith River Wilderness Study Area on the Lewis and Clark National Forest in central Montana. This WSA, like other Forest Service Wilderness Study Areas in Montana, was designated by U.S. Congress through the Montana Wilderness Study Area Act of 1977. The Act requires that the Forest Service maintain the wilderness character of WSAs as it existed in 1977. In 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, collaborated with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop field measures of the four qualities of wilderness character identified in the Wilderness Act of 1964 ([Pub.L. 88-577](#)) and described by Landres et al (2008) in *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System*. This report summarizes 2012 field monitoring data in the Middle Fork Judith River WSA for selected measures of these four wilderness character qualities: 1) untrammeled, 2) natural, 3) undeveloped and 4) opportunities for solitude or primitive and unconfined recreation.

During summer 2012, Wilderness Institute crews hiked every trail in the WSA and made detailed observations related to these qualities. Measures of naturalness focused on invasive plants, wildlife, and lake and streambank erosion. Undeveloped measures included installations and developments (both recreational and non-recreational), signage, and trail closure devices. Measures of opportunities for solitude and primitive and unconfined recreation included trail conditions, non-system (user created) trails, campsite conditions, evidence of mechanized and motorized use, recreational use, motorized noise, and visual intrusions. The single measure of the untrammeled quality of the area was weed pulling by Wilderness Institute crews (all other measures of untrammeled require non-field related work). Crews opportunistically hand-pulled weeds and conducted other restoration activities related to the maintenance and propagation of native plants. Results for 16 features (attribute groups; see Appendix 1) are reported here, often accompanied by tables and maps.

Please note that this project emphasized collection of quantifiable field data appropriate for collection with GIS-based technology. Many aspects of wilderness character were not evaluated as part of this project, either because non-field measures were required (e.g. agency actions that impact trammeling or recreation opportunities) or because data collection was beyond the scope of this project (e.g. air and water quality data). This report represents a snap-shot of on-the-ground conditions within the Middle Fork Judith River WSA, and does not attempt to infer how measured qualities of wilderness character may be changing over time, or evaluate the efficacy of current management approaches. To do so would require repeated monitoring efforts over a period of years, and the inclusion of non-field measures of wilderness character as outlined in "Keeping it Wild." This report does, however, create a current baseline that will enable subsequent assessments to expose how certain measures of wilderness character are changing. For a detailed description of wilderness character monitoring, please see: <http://www.wilderness.net/index.cfm?fuse=WC>.)

This project was conducted as part of the Wilderness Institute's Citizen Science Program, which has recruited community volunteers to help monitor selected components of wilderness character in designated Wilderness and WSAs since 2005. Wilderness Institute field leaders led small groups of volunteers on multi-day backcountry trips, surveying all mapped trails within the WSA as well as non-system (user-created) trails. Eight trips were conducted with 23 volunteers. This program was founded on the belief that including community members in on-the-ground stewardship of public lands builds community capacity, increases public involvement in nearby public lands, and improves the dialogue between local communities and managing agencies.

This work was funded by the Forest Service, the National Forest Foundation, the University of Montana, and the Cinnabar Foundation. For more information please contact us at: citizenscience@cfc.umt.edu or (406) 243-6936.

TRAIL COVERAGE

A total of 77.1 miles of system trails, 8.8 miles of roads, and 1.5 miles of non-system trails were covered by field crews. In all, 96% of system trails within the WSA boundary were monitored (Figure 1). Trail access and coverage was not always straight-forward, largely due to inconsistencies between visitor use maps, USGS quads, and available forest service geospatial layers. These instances are detailed by trail number here (please also see Appendix 2 for additional contextual information on all trails surveyed and additional evidence of non-system trails incompletely captured by data-collection protocols):

- Trail #424 is not depicted on current Forest Service trail layers, but is on the visitor map. This trail was surveyed and included in system trail analyses.
- From Big Deer Point westwards, two trails were monitored: the western end of trail #441 and forest road 2088 that travels north of #441. Available trail layers, quads and the visitor use map give conflicting information about which is the system trail. Both are included in our analyses.
- A 1.3 mile portion of the southern section of trail #443 was not surveyed. Approaching from the north, field crews followed what they thought was the main trail but was in fact a non-system trail descending southeast of the system trail.
- Trail #429 totaling 2.0 miles was accessible only from private inholdings and therefore was not surveyed.

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INTRODUCTION

This report summarizes field measures of wilderness character in the Sapphire Wilderness Study Area (WSA) on the Bitterroot and Beaverhead-Deerlodge National Forests in Montana. The Sapphire WSA, like other Forest Service Wilderness Study Areas in Montana, was designated by the U.S. Congress through the Montana Wilderness Study Area Act of 1977. The Act requires that the Forest Service maintain wilderness character. During spring 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, worked with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop indicators of wilderness character related to the four qualities of wilderness character described by Landres and coauthors in *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System* (2008). The findings summarized here will be utilized by the Forest Service to understand different aspects of wilderness character in the Sapphire WSA.

During summer 2009, we hiked every trail in the Sapphire WSA and made detailed observations related to the untrammeled, natural and undeveloped qualities of the area, and opportunities for solitude and primitive unconfined recreation. Our naturalness measures focused on invasive plants, wildlife, and lake and stream bank erosion. Our undeveloped measures included installations and developments (both recreational and non-recreational), signage, and trail closure devices. Our measures of opportunities for solitude and primitive and unconfined recreation include trail conditions, non-system (user created) trails, campsite conditions, evidence of motorized use in places that are not designated for motorized use, recreational use, motorized noise, and visual intrusions. Our only measure of the untrammeled quality of the area was weed pulling by our own crews (all other measures of untrammeled require non-field related work). Results for more than 50 field measures are reported here, often accompanied by tables and maps. The field data was combined with GIS-derived measures such as elevation and longitude and latitude. Please note that sampling of recreational users and wildlife (items that are not stationary) was opportunistic (recorded if field crews happened to encounter people or wildlife), but that all other indicators were comprehensively monitored from all system trails.

The Sapphire WSA spans the boundary of the Bitterroot National Forest and the Beaverhead-Deerlodge National Forest. Monitoring on the Bitterroot National Forest side was conducted by Wilderness Institute field leaders and small groups of community volunteers on multi-day backcountry trips. Three trips were conducted with 12 volunteers who covered approximately 63 trail miles and worked 400 hours total. These trips were open to anyone who wished to participate. Monitoring of the Beaverhead-Deerlodge National Forest was conducted by Montana Conservation Corps (MCC) crews trained by Wilderness Institute staff. These crews covered approximately 54 trail miles, making for a total of 117 miles covered in the Sapphire WSA. In addition to data collection, crews hand-pulled weeds and conducted other restoration activities related to the maintenance and propagation of native plants. This project was conducted as part of our Citizen Science Program and built on five years of monitoring invasives and campsites in designated wilderness in Montana and Idaho. The Citizen Science Program was founded on the belief that including community members in on-the-ground stewardship of public lands builds community capacity, increases public involvement in nearby public lands, and improves the dialogue between local communities and managing agencies.

This work was funded by the Forest Service, the National Forest Foundation, and the Cinnabar Foundation. For more information on monitoring protocols or results, or on the Wilderness Institute, please contact us at: wi@cfc.umt.edu or (406) 243-5361.

EXECUTIVE SUMMARY

- One hundred-fourteen weed infestations containing eight known noxious weed species and covering nearly 33 acres were reported. Knapweed and sulfur cinquefoil were most prevalent (54%). Most weed patches (82%) were mapped in Douglas-fir and subalpine fir climax series types dominated by beargrass and ninebark understories. Most patches (65%) were more than 50 feet from water, less than or equal to 0.1 acres in size (82%), and low density (82%). Weed patches were primarily associated with roads (58%) and trails (34%).
- Eleven bears, four pikas, and one mountain goat were observed, and 359 carnivore scat piles were recorded.
- Sixty stream banks were identified as being slightly or moderately impacted by recreational use.
- Sixty-six installations and developments (both recreational and non-recreational) were observed. These include 37 bridges, 12 cairns, 7 cabins, 4 fences, 2 lookouts, 3 latrines, and 1 dam, water bar, and corral.
- Eight-two signs were observed. Most (65%) were in good condition. One was missing and 4 were vandalized-illegible.
- Only one fence and one boulder closure berm were reported with no evidence of violation to their closure.
- Eight-six percent of the trails were single-track width (Bitterroot National Forest portion only).
- Most evidence of motorized use on trails was from ATVs on nearly 3.6 km of trail.
- Seventy-two non-system trails were identified and at least 39 were fully surveyed. Most (81%) were routes created by foot travel and represented nearly 83% of the total length of all non-system trails recorded.
- Eighteen groups or people were encountered during the field season, with 1 to 6 individuals per encounter and totaling 55 people. ATV users represented over half (55%) of all persons encountered.
- Seven motorized noises were recorded, almost all ATV in origin. Most were heard within a mile and moderately near.
- Eleven visual intrusions were recorded (mostly dirt roads outside the WSA visible from within the WSA).
- Forty-four campsites were inventoried and mapped. Specific impacts to campsites included: social trails (61%), exposed roots (65%), remnant trash and/or fire rings/scars (91%), at least one damaged tree (82%), and at least ten damaged trees (25%). More than half (55%) had moderate to significant development. Overall, close to half (41%) of all campsites were lightly impacted and over two-thirds (36%) were not impacted at all.

Wilderness Character Monitoring Ten Lakes Wilderness Study Area 2010

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INTRODUCTION

This report summarizes field measures of wilderness character in the Ten Lakes Wilderness Study Area (WSA) on the Kootenai National Forest in northwest Montana. The Ten Lakes WSA, like other Forest Service Wilderness Study Areas in Montana, was designated by the U.S. Congress through the Montana Wilderness Study Area Act of 1977. The Act requires that the Forest Service maintain the wilderness character of the WSA as it existed in 1977. In 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, collaborated with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop measurable field indicators of the four qualities of wilderness character identified in the Wilderness Act of 1964 (Pub.L. 88-577) and described by Landres et al (2008) in *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System*. This report summarizes field monitoring data in the Ten Lakes WSA for selected elements of these four wilderness character qualities: 1) untrammeled, 2) natural, 3) undeveloped and 4) opportunities for solitude or primitive and unconfined recreation. During summer 2010, we hiked every trail in the Ten Lakes WSA and made detailed observations related to these qualities.

Measures of naturalness focused on invasive plants, wildlife, and lake and streambank erosion. Undeveloped measures included installations and developments (both recreational and non-recreational), signage, and trail closure devices. Our measures of opportunities for solitude and primitive and unconfined recreation included trail conditions, non-system (user created) trails, campsite conditions, evidence of motorized use in places that are not designated for motorized use, recreational use, motorized noise, and visual intrusions. Our single measure of the untrammeled quality of the area was weed pulling by our own crews (all other measures of untrammeled require non-field related work). Results for more than 50 field measures are reported here, often accompanied by tables and maps. The field data was combined with GIS-derived measures such as elevation and longitude and latitude.

Please note that some aspects of wilderness character were not evaluated as part of this project, either because non-field measures were required (e.g., assessing the untrammeled quality of the Ten Lakes WSA requires examining agency and non-agency actions that disrupt the naturally functioning ecosystem, such as fish stocking, fire suppression, or herbicide treatment), or because data collection was beyond the scope of this project (e.g., agencies are already collecting air quality data, which requires sophisticated instruments). Furthermore, these protocols were developed to monitor wilderness character in Wilderness Study Areas in Montana, and thus some of the monitoring conducted may not be applicable to designated wilderness (e.g., monitoring evidence of motorized use in areas not designated for motorized travel). For a detailed description of wilderness character monitoring for designated wilderness, please see: <http://www.wilderness.net/index.cfm?fuse=WC>.

Monitoring was conducted by Wilderness Institute field leaders and small groups of community volunteers on multi-day backcountry trips. Four trips were conducted with 22 volunteers who covered 79 trail miles and worked over 700 hours. Approximately 9 of these trail miles were on trails leading into the WSA but were outside the WSA boundary. These trips were open to anyone who wished to participate. In addition to data collection, crews also hand-pulled weeds and conducted other restoration activities related to the maintenance and propagation of native plants. This project was conducted as part of our Citizen Science Program and built on six years of monitoring invasives and campsites in designated wilderness in Montana and Idaho. The Citizen Science Program was founded on the belief that including community members in on-the-ground stewardship of public lands builds community capacity, increases public involvement in nearby public lands, and improves the dialogue between local communities and managing agencies.

This work was funded by the Forest Service, the National Forest Foundation, and the Cinnabar Foundation. For more information on monitoring protocols or results, or on the Wilderness Institute, please contact us at: wi@cfc.umt.edu or (406) 243-5361.

Wilderness Character Monitoring West Pioneer Wilderness Study Area

2009

Wilderness Institute

College of Forestry and Conservation

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INTRODUCTION

This report summarizes field measures of wilderness character in the Pioneer Wilderness Study Area (WSA) on the Beaverhead-Deerlodge National Forest in Montana. The Pioneer WSA, like other Forest Service Wilderness Study Areas in Montana, was designated by the U.S. Congress through the Montana Wilderness Study Area Act of 1977. The Act requires that the Forest Service maintain wilderness character. During spring 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, worked with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop indicators of wilderness character related to the four qualities of wilderness character described by Landres and coauthors in *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System* (2008). The findings summarized here will be utilized by the Forest Service to understand different aspects of wilderness character in the Pioneer WSA.

During summer 2009, we hiked every trail in the West Pioneer WSA and made detailed observations related to the untrammeled, natural and undeveloped qualities of the area, and opportunities for solitude and primitive unconfined recreation. Our naturalness measures focused on invasive plants, wildlife, and lake and streambank erosion. Our undeveloped measures included installations and developments (both recreational and non-recreational), signage, and trail closure devices. Our measures of opportunities for solitude and primitive and unconfined recreation include trail conditions, non-system (user created) trails, campsite conditions, evidence of motorized use in places that are not designated for motorized use, recreational use, motorized noise, and visual intrusions. Our only measure of the untrammeled quality of the area was weed pulling by our own crews (all other measures of untrammeled require non-field related work). Results for more than 50 field measures are reported here, often accompanied by tables and maps. The field data was combined with GIS-derived measures such as elevation and longitude and latitude. Please note that sampling of recreational users and wildlife (items that are not stationary) was opportunistic (recorded if field crews happened to encounter people or wildlife), but that all other indicators were comprehensively monitored from all system trails.

Monitoring was conducted by a Montana Conservation Corps (MCC) crew trained by Wilderness Institute staff. MCC crews spent 39 days in the field, covering approximately 180 trail miles in the West Pioneer WSA. An MCC crew also spent three days monitoring the Mussigbrod Lake area, approximately 30km northwest of the West Pioneer WSA (see Appendix 5 for data from this area). In addition to data collection, crews also hand-pulled weeds and conducted other restoration activities related to the maintenance and propagation of native plants. This project was conducted as part of our Citizen Science Program and built on five years of monitoring invasives and campsites in designated wilderness in Montana and Idaho. The Citizen Science Program was founded on the belief that including community members in on-the-ground stewardship of public lands builds community capacity, increases public involvement in nearby public lands, and improves the dialogue between local communities and managing agencies.

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