Executive Summary

This report summarizes field measures of wilderness character in the Welcome Creek Wilderness on the Lolo National Forest in southwestern Montana. During summer 2013, Wilderness Institute crews hiked all trails within the Wilderness 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 three trips with 26 community volunteers and covered 35 miles of system trails and 0.4 miles of non-system trails.

Monitoring highlights include:

- **Trail Coverage**: Field crews covered 35 miles of system trails (90%), and 0.4 additional miles of non-system trails.

- **Weeds**: 76 weed patches from seven species were recorded. Meadow Hawkweed, Canada Thistle, Cheatgrass, and Spotted Knapweed each had over 10 patches; seven patches of Bull Thistle and a single patch of Common Mullein and Sulfur Cinquefoil were recorded. All weed infestations were observed along system trails, with 2.8 total infested acres for all species.

- **Wildlife**: 41 wildlife encounters were reported. The majority (90%) were indirect (e.g. tracks, scat, or other sign); canid species (e.g. coyote) were most prevalent (49%), followed by bear (27%). We recorded a single visual observation each of a Moose and a Bighorn sheep, and one aural and one visual record of pika.

- **Erosion**: No erosion due to recreation was documented in the Welcome Creek Wilderness.

- **Installations and Developments**: 25 installations and developments were reported within the Welcome Creek Wilderness, including insulated wire, bridges, cairns, one fence, two food caches, two mine trenches and two old cabins.

- **Signs**: 52 signs were recorded, including trail junction/directions (46%), boundary signs (46%), trailhead (4%), and recreational use (4%). Most (73%) were in good condition.

- **Trail Closure Devices**: No trail closures were recorded in the study area, although there was a closed gate at the junction of Forest Service Roads 4268 and 2129, 1.5 miles short of the trailhead for trail #93.

- **Trail width**: 1.1 miles of impacted trails were recorded along trail 323 (which follows the Wilderness boundary). Double tracks and braiding accounted for 72% and 28% of impacted trail locations.

- **Non-system trails**: Two non-system trails were recorded, but time constraints in the field precluded surveying these trails to their respective termini.

- **Mechanized and motorized use**: Evidence of a double ATV track was recorded at one location, on trail #313.

- **Trailheads and people encounters**: Only one hiker was encountered over the course of seven field days. A total of seven vehicles were reported at three trailheads.
• **Noise intrusions:** Eight standardized noise sampling sessions were completed, with no noise heard during three sessions, and with a total of 12 intrusions. 67 additional noise intrusions were opportunistically recorded, with 61 (94%) from airplanes, 4 (5%) from gunshots, and 1 unknown source.

• **Visual intrusions:** Eight visual intrusions were observed, including buildings, towns, clearcuts, roads, power lines and repeaters.

• **Campsites:** Eight campsites were identified and inventoried in 2013, including one new campsite with no pre-existing record. Nine additional pre-existing sites were not found (search effort unclear for four of these). Seven of the 8 campsites were minimally impacted, and all were found in close proximity to system trails.
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INTRODUCTION

This report summarizes field measures of wilderness character in the Welcome Creek Wilderness on the Lolo National Forest in southwestern Montana. Welcome Creek Wilderness was designated by Congress in the 1978 Endangered American Wilderness Act. The primary mandate of the original 1964 Wilderness Act, Section 4(b), states that “each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area.” Until recently, however, the lack of a consistent definition of wilderness character and standardized measures that can quantify its loss or preservation, precluded assessments of how stewardship decisions impacted wilderness character.

In 2009, in collaboration with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations, the Wilderness Institute developed protocols for selected field measures of the four qualities of wilderness character identified in the 1964 Act (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 (hereafter Keeping It Wild). Here, we summarizes 2013 field monitoring data in the Welcome Creek Wilderness for selected measures of the following four qualities: 1) untrammeled, 2) natural, 3) undeveloped and 4) opportunities for solitude or primitive and unconfined recreation.

During summer 2013, Wilderness Institute crews hiked nearly every trail in the Welcome Creek Wilderness 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 was opportunistic weed pulling by Wilderness Institute crews (all other measures of untrammeled require non-field related work). Results for 18 features (attribute groups; see Appendix 1) are reported here, accompanied by relevant tables and figures.

The Wilderness Institute, which is part of the College of Forestry and Conservation at the University of Montana, founded its Citizen Science Program 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. Furthermore, declining federal budgets have resulted in widespread reductions in on-the-ground staff capacity, and collaborative, community-based efforts are potentially an important way of helping wilderness managers meet wilderness character monitoring needs.

Since 2005, the Institute’s Citizen Science Program has recruited community volunteers to assist with field data collection. From June through August, 2013, 26 volunteers joined Wilderness Institute field leaders on three backcountry trips, surveying all mapped trails within the Welcome Creek Wilderness as well as non-system (user-created) trails.

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, 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 does not attempt to infer how measured qualities of wilderness character may be changing over time, nor 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 may be changing. For a detailed description of wilderness character monitoring, please see: http://www.wilderness.net/index.cfm?fuse=WC.

This work was funded by the USDA 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 Welcome Creek Wilderness has approximately 40 miles of system trails. Over the course of the 2013 field season, field crews traversed 35 miles (90%), not including 0.4 miles of non-system trails. A small handful of trails or trail segments were not monitored. These are illustrated in Figure 1 and detailed here:

- Southeastern end of Trail #93. About two miles south of the Wilderness boundary the trail disappears at a rocky outcropping. There was no evidence of a navigable trail from the confluence of Cinnamon Bear Creek and Rock Creek.

- Unnamed trail connecting #313 to #225 south of Cleveland Mountain was not found. Notably, this trail is on the 1999 quad but not on the visitor map, and thus may no longer be considered an open trail (not shown in Figure 1).

- Trail #179. All signs of the trail were quickly lost upon descent into Sawmill Creek drainage from #232. Ascending from Rock Creek, at the junction with #178 there is a “Trail Not Maintained” sign and the route is overgrown and difficult to follow. Thus, #179 was not monitored from the junction with #178 to the junction with #232.

- The trail segment of #232 that runs north to #142 from where #179 meets #232 was not found, despite searches from both terminus. It is shown on the 1999 quad but not on the visitor map (not shown in Figure 1).
Figure 1. System trails monitored within the Welcome Wilderness, 2013.

DATA MANAGEMENT

The following section describes steps taken to collect and analyze field measures of wilderness character (attributes) in the Welcome Creek Wilderness: (1) protocol development, (2) field data collection, (3) data analysis and mapping, and (4) data reporting.

Protocol Development

The Wilderness Institute has been involved in mapping wilderness attributes since 2005 and has developed standardized protocols for that purpose. In 2009, measurement protocols and database design were expanded to specifically monitor selected elements of wilderness character as described in Landres et al. (2008). These new and expanded measurement protocols were implemented within a
menu-based data file containing all of the desired attributes with predefined categories for data entry. This data dictionary file was then loaded onto Trimble GeoExplorer units, utilizing Trimble Pathfinder software. A full list of the collected attributes is given in Appendix 1, along with their descriptions. Detailed protocols are available upon request.

Protocols were designed to ensure that data collected was compatible with pre-existing agency databases. In particular, invasive species and recreation site data collection protocols were carefully cross-walked with agency database requirements.

As wilderness character monitoring gains increasing traction across agencies that manage wilderness, we continuously refine and improve our protocols to reflect emerging standards. With the help of our agency partners, we have attempted to stay abreast of both emerging standards and regional priorities, and modify our field data collection accordingly. For example, in 2013 our data collection included a second year of standardized soundscape monitoring.

We have a strong interest in maximizing the impact of our on-the-ground presence, and have incorporated specific data collection protocols in response to partner research interests or needs. For example, researchers at the Craighead Institute (http://www.craigheadresearch.org/pika-research.html) are compiling observations of pika across their native range in an effort to understand possible long-term impacts of climate change on this high-elevation species. Since 2011 we have incorporated pika observations into our wildlife protocols, and provide the Craighead Institute with pika data at the end of the field season. Engaging volunteers in supplementary citizen science projects further corroborates the importance of community-powered contributions to wilderness stewardship.

**Data Collection**

Data was collected between June and September 2013. Field crews recorded observations of each attribute when encountered and entered them into GPS units using the data dictionary. All attributes were mapped as point, line, or area features. Photos were taken of attributes, where relevant. After each trip, GPS data and digital photos were checked for quality control and uploaded to a network server. A Microsoft Excel database, as well as a geodatabase containing all attribute data and photos is also available upon request. Field leaders summarized additional observations not captured by data collection protocols in trip reports. For example, snow cover, general trail conditions, route deviations, and any additional qualitative observations were detailed in these reports. A summary of these findings, by trail number, is found in Appendix 2.

Attempts were made to revisit recreation sites that had been previously inventoried, and field leaders carried detailed maps with site locations and identification numbers. In addition to GPS data collection, field leaders filled out recreation site inventory forms in accordance with Forest Service procedures. Please see recreation site sections (below) for additional detail.

**Data Analysis**

GPS files were differentially corrected using Trimble Pathfinder Office software (Trimble Navigation Limited 2009). Differential correction is a process in which GPS coordinate data can be compared with a fixed spatial reference and adjusted to reduce any systematic error in position that often occurs with field GPS data. After this process was completed and data for each attribute group combined from individual GPS units, all data were imported into a spatial geodatabase using ArcGIS (ESRI 2009). All monitoring data was re-projected into North American Datum 1983 as Universal Transverse Mercator.
(UTM) grid coordinates in zone 12. All spatial analyses were performed using ArcGIS (ESRI 2010). Trail, boundary, and road layers were imported from the National Forest Geospatial Library (http://www.fs.usda.gov/main/r1/landmanagement/gis). Monitoring attribute summaries are provided in a combination of tables, figures, and maps.

**Data Reporting**

This report presents visual and/or numerical summary data from attribute groups related to the four primary qualities of wilderness character (see Appendix 1). Note that this report does not summarize every attribute collected; for example, much more detail was collected for weeds, campsites, and wildlife observations than is summarized here (see Appendix 1). Furthermore, many attributes have associated pictures that are not compiled in this report. A comprehensive dataset and photographs of collected attributes are available upon request.
FIELD MEASURES OF WILDERNESS CHARACTER

The following sections describe field measures used to assess the four primary qualities of wilderness character identified in the Wilderness Act of 1964: untrammeled, natural, undeveloped, and opportunity for solitude or primitive and unconfined recreation. After a brief explanation of each wilderness character quality, the data collected for each indicator is summarized. Please note that some aspects of wilderness character were not evaluated as part of this project (see introduction). A comprehensive list of database attributes and the associated qualities of wilderness character can be found in Appendix 1.

I. UNTRAMMELED QUALITY

Wilderness is “an area where the earth and its community of life are untrammeled by man” (Wilderness Act, 1964). Untrammeled wilderness has come to signify areas free from modern human control and actions that manipulate nature, even when taken to restore natural systems (Landres et al., 2008). For this project, weed control action constituted the only trammeling data collected. Actions taken by field crews to manage weed infestations diminish the untrammeled character of the Welcome Creek Wilderness. Agency actions that affect the untrammeled quality of the Wilderness (e.g. any action that disrupts the naturally functioning ecosystem or the unencumbered nature of the area, such as fire suppression, herbicide treatment of invasives, and fish stocking) are beyond the scope of this field-based study and are not reported here.

Weed Control Action

Hand pulling was undertaken on 14 of the 69 patches encountered. All of the pulled patches were within the Wilderness boundary. Patches with more than 90% of weeds pulled were small (<0.07 acres). All pulled patches were Houndstongue (54%) or Spotted Knapweed (46%). Table 1 summarizes weed action and Figure 2 shows locations of patches where weed control actions were conducted.

Table 1. Number of weed patches where weed control action was taken.

<table>
<thead>
<tr>
<th>Control Action</th>
<th>Number of Weed Patches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-10% pulled</td>
<td>2</td>
</tr>
<tr>
<td>11-20% pulled</td>
<td>5</td>
</tr>
<tr>
<td>81-90% pulled</td>
<td>1</td>
</tr>
<tr>
<td>91-100% pulled</td>
<td>6</td>
</tr>
<tr>
<td>none pulled</td>
<td>62</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>76</strong></td>
</tr>
</tbody>
</table>
II. NATURAL QUALITY

Natural quality reflects the extent “wilderness ecological systems are substantially free from the effects of modern civilization” (Landres et al., 2008). Natural quality is assessed by monitoring attributes that reflect the integrity of ecological systems, such as species composition and physical alterations. For this project, we identified three measures of naturalness appropriate and feasible to monitor with field protocols: 1) distribution and prevalence of non-indigenous plant species (weeds) along trail systems; 2) visible sign of select wildlife populations (scat and/or other signs of carnivores, bears, other megafauna); and 3) user-created erosion associated with lakes and streambanks. Within these indicator categories, multiple attributes were recorded (see Appendix 1). Please note that not all attributes are summarized in the following sections, but are available in the associated data files.

Figure 2. Location of pulled weed patches and extent of mapped weed infestations.
**Weeds**

The invasion and spread of non-native weeds is a growing problem across western landscapes, and poses a serious threat to native biodiversity. Weeds have few, if any, natural controls on their reproduction and distribution, and occurrences closely follow areas of highest use and disturbance. By recording weed type, location, size and intensity of the infestation land managers can identify priority areas for treatment and eradication. Furthermore, ecological, topographic and physical associations of weed patches can expose patterns of invasion and further understanding of the multiple factors that influence the spread of weeds in remote areas.

In the following section we highlight and summarize weed data collected in 2013; please note that we do not provide visual or graphical summaries of all attributes collected. Patch-specific information, as well as additional attribute data, is located in the associated electronic database. Weed patches occurring on trails leading into the Welcome Creek Wilderness but outside the Wilderness boundary are included (when collected) since they contribute to overall trail conditions, and could be a source for future infestations if left untreated. Please note that monitoring was focused along trails and therefore patches not visible from the trail may have gone undetected.

**Weed Species & Infestation Size**

A total of 76 weed patches were recorded, representing 7 species (Figure 3). 100% of these were recorded within the Wilderness boundary (Figure 4). Meadow Hawkweed, Canada Thistle, Cheatgrass, and Spotted Knapweed represented 24%, 21%, 25%, and 18% respectively of all weed patches (Figures 3 and 4). Seven patches of Bull Thistle and a single small patch of Common Mullein and Sulfur Cinquefoil were recorded.

All weed infestations were observed along system trails (Figure 4). Significantly, there was a striking species-trail association, with the vast majority of the four most prevalent species associated with specific trail segments (86% of Cheatgrass patches on trail # 178; 89% of Meadow Hawkweed patches on trail #142; 75% of Spotted Knapweed patches on trail #232; 100% of Canada Thistle patches on trail #225; Figure 4).

Whenever possible, the spatial extent of weed patches was measured in the field by walking the patch perimeter with a GPS. For patches recorded as a point or line, an ocular estimate of patch width was recorded and the total patch area was calculated using GIS analyses. A total of 8.6 acres of weeds were mapped. Most patches (75%) were recorded as less than 0.1 acre in size, with 5 patches estimated as larger than 0.5 acre (Figure 3). All patches over 0.25 acres in size were Canada Thistle, Cheatgrass, or Spotted Knapweed; the largest weed patch, Cheatgrass, was estimated at 1.2 acres (see Figs. 3 and 4).
Figure 3. Weed patches by species and patch size (acres)

Figure 4. Location of weed patches by species and patch size.
**Weed Density and Acres Infested**

The spatial distribution of each weed patch was categorized as individual (a single plant), clumpy (one dense patch), scattered-even (evenly distributed across the infestation area), scattered-patchy (distinct patches scattered across the infestation area), or linear (data not shown). Additionally, weed density (the percent cover of weeds within each patch) was visually estimated from 0-100%. To account for any differences in how spatial parameters were collected in the field, the acres infested was estimated as the patch size multiplied by patch density. For example, a large scattered-patchy infestation could also be recorded as several smaller distinct “clumpy” patches, but density estimates standardize the calculation of total infested area.

The majority of patches (86%) had weed densities < 50% and patches with weed density > 50% were small (< 0.1 acre; see Figure 5). After accounting for the density of weeds within infested areas across all trails monitored, there were an estimated 2.8 total acres infested. All but one weed species had total infested areas of < 1 acre, with Cheatgrass just over 2 acres (Figure 6).

![Figure 5. Number of weed patches by density and patch size.](image-url)
Primary and Secondary Disturbance Types

Weed patches are often associated with disturbance. We recorded up to two disturbance types that were present in the area and likely vectors of the infestation. The primary disturbance is the most likely vector for infestation, and the secondary disturbance reflects the broader disturbance matrix that may be present. For example, a weed patch found along a trail that passes through a burned area would have “trail” and “fire” listed as the respective primary and secondary disturbances.

The primary disturbances associated with all mapped weed patches were trails (data not shown). No secondary association was reported for any of the recorded weed patches.

Trails are the primary access routes through Welcome Creek Wilderness, and it is important to recognize that the direct association between weeds and trails is partly a reflection of sampling bias, although off-trail areas were sampled if any weed patches were opportunistically encountered. Nonetheless, the data clearly show that weeds commonly occur in close proximity to trails, trailheads, and areas of livestock use, and that these serve as important vectors for overall weed dissemination within the Wilderness.

Ecological Associations

Ecological associations, including ecosystem type, dominant life form, and habitat were recorded for each weed patch to provide an ecological context for understanding weed distributions. Please see Appendix 1 for comprehensive list of ecological attributes collected and the associated database for detailed data on ecological attributes not covered in this report.

The majority of weed infestations (62%) were encountered in forest ecosystems (> 10% tree cover), with the remaining found in grassland (19%), riparian ecosystems (17%), and a single patch in scree (Figure 6).
While forest ecosystems had 6 of 7 weed species, other ecosystem types had stronger associations with specific species (Figure 7). For example, the majority of Cheatgrass and Sulfur Cinquefoil were found in grassland areas, while most patches of Canada Thistle were found in riparian areas (Figure 7).

![Figure 7. Ecosystem type associated with weed species.](image)

**Distance to Water**

To assess basic physical associations with mapped weed patches, we measured distance to water in 3 classes (0-10 ft., 10-50 ft., and > 50 ft.). The majority (78%) of weed patches were located > 50 feet from water (Figure 8). Consistent with observed riparian ecosystem associations, all patches < 10 feet from water and the majority of patches < 50 feet from water were Canada Thistle. One patch had no water distance information recorded.

![Figure 8. Distance of weed patches from water by species](image)
Wildlife Encounters

Trails represent important corridors of travel for many wildlife species. We documented wildlife use of all trails within the Welcome Creek Wilderness by recording direct and indirect wildlife encounters with focal species (wolves, mountain lions, lynx, bobcat, wolverine, fisher, marten, bear, bighorn sheep, mountain goats, porcupine, hoary marmots, pikas, mule deer, elk, moose, and owls). Wildlife was identified by species if possible, and otherwise classified by family or major group (e.g. bear, canid, felid). The type of encounter was recorded as a sighting (e.g. visual), auditory, track, or scat. Scat and track data were only recorded for canids, felids and moose when they could be identified. Photos were taken when possible to verify identification, and are available upon request.

Given that nearly all monitoring occurred on trails, this attribute documents relative use along trails, not wildlife distributions across the Welcome Creek Wilderness. Also, sampling is opportunistic, and the number of encounters does not equate to the number of individuals, since one individual is capable of more than one sign (e.g. multiple scats along a trail segment may belong to one individual), or type of sign (e.g. tracks and scat).

Wildlife Species & Encounter Type

A total of 41 wildlife encounters were reported (Figure 9). Canid species (e.g. coyote) were most prevalent (39%), followed by bear (27%). The majority (90%) of encounters were indirect (e.g. tracks, scat, or other sign), with a single visual observation each of a Moose and a Bighorn sheep, and one aural and one visual record of pika (Figure 9).

![Figure 9. Number of wildlife encounters by species or family and detection type](image-url)
Water Erosion

Wilderness character monitoring included documenting erosion events along waterbodies that were a result of recreational use (please note that erosion mediated by uncontrolled run-off along the trail was not monitored here, but is captured in Trail Width and Condition, below). Impacted areas were categorized by landform as stream, spring, wetland, pond, or lake. The width of streams was measured at bankfull height. For wetlands, ponds, and lakes, size was estimated in acres. For each impacted waterbody, erosion severity was categorized as slight, moderate, or severe (please refer to protocols...
available with supplementary materials for detailed descriptions of categories). Photos were taken of all documented erosion sites and are available upon request.

**Landform and Erosion Severity**

No erosion due to recreation was documented in the Welcome Creek Wilderness.

**III. UNDEVELOPED QUALITY**

Undeveloped quality is the third of four primary elements of wilderness character found within the language of the 1964 Wilderness Act. This quality refers to the extent in which “wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern occupation” (Landres et al., 2008). Non-recreational developments such as installations and signs are considered to affect the undeveloped quality of wilderness character. It is important to note that recreationally-focused developments, such as trails and campsites are considered in the next section, under the solitude or primitive and unconfined quality of wilderness character. This distinction is made so that developments are not double-counted under both qualities (Landres et al., 2008).

**Installations and Developments**

Types of human installations and developments were reported in the following categories: bridge, restroom, corral, dam, repeater, fence, old mine, old cabin, lookout, pole stash, cairn, hitch rail, cache, insulated wire, mine adit, mine pit, mine trench. Photos were taken of all reported developments and are available upon request.

**Development Type**

A total of 25 installations and developments were reported, all within the Welcome Creek Wilderness (Figure 11). Insulated wire and bridges were most common (32% and 20%, respectively), but three cairns, one fence, two food caches, two mine trenches and two old cabins were also observed. Two developments classified as “other” were a stacked rock shelter and an old pile of split wood. Eight (32%) developments were assumed to be agency-created, three appeared user-created, and the source of origin for 14 was unclear (Figure 12).
Figure 11. Location of installations and developments by type.
Signs

All signs were noted by type and condition. Sign types included: trailhead, trail junction, interpretive, trail markers, flagging, survey marker, recreational use (i.e. allowable uses/closures), boundary, user-created, other, and unclear. Sign condition was categorized as: poor condition, vandalized-legible, vandalized-illegible, missing (post with no sign), faded-illegible, faded-legible, or good condition. Sign source was also assigned as user-created, agency-created or unclear. Signs with words were photographed for reference (digital files of sign photographs are available upon request).

Sign Type and Condition

A total of 52 signs were encountered. Most signs were trail junction/directions (46%) and boundary signs (46%), with 2 each for both recreational use and trailhead markers. One of the recreational use signs was a vacant post marking a peak, and was the only sign assumed to be user-created. Most signs (73%) were in good condition. Figures 13 and 14 numerically and spatially depict these attributes.

Figure 12. Installations and developments by type and origin.

Figure 13. Number of signs by type and condition.
Figure 14. Location and condition of signs.
Trail Closure Devices

Devices used to implement trail closures were reported according to the following categories: locked gates, unlocked gates, berms, boulders, or fences.

Trail Closure Type and Evidence of Violations

No trail closures were recorded in the study area, although there was a closed gate at the junction of Forest Service Roads 4268 and 2129, 1.5 miles short of the trailhead for trail #93.

IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY

Solitude or primitive and unconfined recreation quality is the last of four primary elements of wilderness character found within the language of the 1964 Wilderness Act. This quality refers to the extent to which “wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation” (Landres et al., 2008), and assesses recreationally-focused developments, such as trails, restrooms, shelters and campsites. Measured attributes that reflect this quality are: trail width, non-system trails, evidence of motorized or mechanized vehicle use, encounters with other users on trails, trailhead use, motorized noise, visual intrusions from developments outside of the Wilderness, and campsite characteristics and impacts.

Trail Width and Condition

Trail conditions were recorded for trails leading into and within the Welcome Creek Wilderness (see trail coverage map, Figure 1, above). Observations were made documenting places on trails where recreational use appeared to be impacting trail conditions. This field was also used to capture severe trail erosion events that result in significant impacts to either user experience (e.g. deep gullies make trail navigation difficult) or the natural environment surrounding the trail corridor (e.g. erosion is significantly impacting adjacent areas). When possible, the length of impacted trail was measured from point and line data recorded in the field. Please also see additional trail condition details provided in qualitative trail data summarized in Appendix 2.

Trail Width

A total of 1.1 mi of impacted trails was recorded, representing 3% of all system trails monitored. All trails were along the edge of the Wilderness boundary, on trail 313, with one 232 m section of braided trail outside the boundary (Figure 15). Double tracks and braiding accounted for 72% and 28% of impacted trail locations, respectively. Figure 15 shows the location of impacted trails.
Evidence of Mechanized and Motorized Use on Trails

Mechanized and motorized use are prohibited in designated Wilderness, but violations do occur. The type and amount of motor vehicle, equipment, or mechanical transport use impacts the undeveloped quality of wilderness character (Landres et al., 2008). Evidence of mechanized or motorized use was monitored on all trails. Each event was recorded as a point or line, and the type of track (motorcycle, bike, ATV, or vehicle) was recorded. This measure is not designed to capture volume of use, but indicates presence of evidence (e.g. tracks) from a single survey of system and non-system trails in the Welcome Creek Wilderness. This data represents a minimum measure of use since the amount of evidence was subject to trail conditions and locating the start and/or finish of tracks was not always possible.

Type of Mechanized or Motorized Tracks

Evidence of mechanized and motorized use on trails was recorded at one location. A single double ATV track was observed on the Easthouse trail (#313.1-BNF) as shown in Figure 15, above.

Figure 15. Location of impacted trails and evidence of motor/mechanized use.
Non-system Trails

Non-system trails (NSTs) are generally user-created and are not part of the official Forest Service trail system. When NSTs were encountered, the trail type was categorized as: motorbike, ATV/UTV, horse travel, foot travel, or unclear. The origin of each NST was classified as either a new route created by recreational use, or an old road from historic mining, fire access, or logging activities. The start of each NST was recorded and, when possible, the entirety of the trail was mapped (however, time constraints in the field commonly limited full documentation of NSTs).

Non-system Trail Type, Origin, and Monitoring Status

Two NSTs or trail fragments were recorded. Time constraints in the field limited complete surveying of these non-system trails, neither of which were surveyed to their respective termini. One trail, heading SW off of the Welcome-Sawmill Saddle trail (#232), appeared to be an old route used for foot travel and was in good condition and well-blazed (Figure 16). The other, heading NE off of Sawmill Ridge trail (#178), was also created by foot travel and appeared to go towards the east end of Solomon Mountain (Figure 16).

Figure 16. Locations of non-system trails.
**Trailheads**

Recreational use at trailheads was documented by recording the number of vehicles and horse trailers parked at the trailhead.

**Vehicles and Trailers at Trailhead**

Information on vehicle presence was recorded for three trailheads (Table 2), and included the vehicle used by field crews. No horse trailers were recorded and all vehicles were observed on either a Saturday or Sunday in June or July. These numbers are based on a single count, and therefore do not necessarily reflect use across the season.

### Table 2. Summary of vehicles at trailheads, including Wilderness Institute vehicle.

<table>
<thead>
<tr>
<th>Trailhead Name</th>
<th>Date</th>
<th>Number of Vehicles</th>
<th>Number of Horse Trailers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cinnamon Bear #93</td>
<td>Saturday, July 13, 2013</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Welcome Creek #225</td>
<td>Sunday, July 07, 2013</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Solomon Ridge #142</td>
<td>Sunday, June 23, 2013</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>

**Solitude Samples and Encounters with People**

In the spring of 2013, the forest service finalized and distributed a new national minimum protocol for monitoring solitude in wilderness. The new protocol provides a consistent process for monitoring opportunities for solitude and is based on the assumption that encounters – specifically, the number of people seen or heard – is the best available indicator for this quality. However, the small size of Welcome Creek Wilderness makes the implementation of this protocol impractical. With input from Lolo National Forest wilderness managers we implemented pre-existing protocols appropriate to an area of that small size. Over the course of seven days in the Welcome Creek Wilderness, we recorded encounters with distinct groups of people on all trails covered. Both the number of people and the type of activity (hiker/backpacker, mountain bike, horse, or Forest Service staff) were documented, and these numbers compared with designated opportunity class standards across the Wilderness.

**Activity Type and Number**

Only one hiker was encountered over the course of seven field days in the Welcome Creek Wilderness. This hiker was encountered on July 7th along trail 178 just east of Solomon Mountain.

**Noise**

Noise intrusions were monitored throughout the field season using two methods. Standardized noise samples were collected daily during 15 minute sampling sessions conducted at the same time in the
morning (8:00 am), midday (1:00pm), and evening (7:00 pm). Noises opportunistically encountered while traversing trails within the Welcome Creek Wilderness were also recorded. During sampling sessions, the duration of noise was recorded in seconds (for up to three sources), while noises heard outside sampling sessions were classified as under 1 minute, 1-5 minutes, 5-10 minutes or > 10 minutes. For both methods, the source of noise was recorded, and noise intensity was categorized as barely audible (far in the distance), clearly heard (moderately near), loud (< 1 mile), or variable. When possible, a visual confirmation of the noise source was recorded.

Standardized Noise Sampling Sessions: Duration, Intensity and Visual Confirmation

A total of 8 noise-sampling sessions were completed (2 morning, 5 midday, and 1 evening; see Figure 19 for locations). A total of 12 intrusions were heard across 5 sampling sessions, with no noises during the remaining 3 sessions. The majority were airplanes (66%), with 2 automobiles, 1 ATV, and 1 unknown motor. Average duration of noise intrusions across all sample periods was 18 seconds. Airplane intrusions had the longest average duration (48 seconds; Figure 17a) and the longest single noise intrusion (240 seconds; data not shown). Duration of intrusions was longest during mid-day sessions than other time periods (48 seconds, versus 2 seconds for morning and evening; Figure 17b). Five of 12 intrusions were barely audible, 5 were heard clearly, and two were variable in intensity (data not shown). No visual confirmations were recorded for noise intrusions, and no intrusions were considered “loud and close.”

Figure 17. Mean duration of noise intrusions by a) source, and b) time of day.
**Opportunistic Noise Sampling**

Outside of noise sampling sessions, an additional 65 noise intrusions were recorded within the Welcome Creek Wilderness over the course of seven days of trail monitoring. Sixty-one (94%) were from airplanes, with the remaining four intrusions from gunshots (Figure 18). Only one airplane had visual confirmation; otherwise, sources were identified by sound only. All recorded noise intrusions lasted for 5 minutes or less, with 43% under a minute in duration (data not shown). Two gunshots were loud and close as well as two airplane noises. The remaining intrusions were barely audible (40%) or heard clearly (54%; Figure 19). Noise intrusions from airplanes were distributed across the trail system, but gunshots were concentrated along a small portion of the western boundary (Figure 19).

![Number of Intrusions](image)

**Figure 18.** Source and duration of opportunistic noise intrusions.
Figure 19. Location, source, and intensity of opportunistic noise intrusions heard within Welcome Creek Wilderness. Locations of standardized noise-sampling sessions (sample points) are also shown.
**Visual Intrusions**

Human development visible from within the Welcome Creek Wilderness (but located outside the Wilderness) was documented as a visual intrusion. The location where intrusions were visible was recorded, and the type of intrusion was categorized as: buildings, highways, power lines, lights at night, cities/towns, dirt roads, clear cuts, repeaters/towers, or railways. Photos were taken of visual intrusions and are available upon request.

**Type of Visual Intrusion**

Eight visual intrusions were observed from within the Welcome Creek Wilderness (Table 3), including buildings, towns, clearcuts, roads, power lines and repeaters (Figure 20).

**Table 3. Summary of visual intrusions by type.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>buildings</td>
<td>2</td>
</tr>
<tr>
<td>cities/towns</td>
<td>1</td>
</tr>
<tr>
<td>clear cuts</td>
<td>1</td>
</tr>
<tr>
<td>dirt roads</td>
<td>1</td>
</tr>
<tr>
<td>power lines</td>
<td>2</td>
</tr>
<tr>
<td>towers/repeaters</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>
Figure 20. Visual intrusions by type seen from within the Welcome Creek Wilderness.

**Campsites**

Attributes recorded at each campsite reflect campsite conditions and human impacts, and were based on standard Forest Service Campsite Inventory & Condition Evaluation protocols (see Anaconda Pintler Wilderness Site Impact Worksheet – 2013 Edition; Appendix 4). We also reviewed inventory protocols utilized in 2005, and ensured that 2013 protocols would enable comparison with data collected in 2005. Human impacts at each campsite were evaluated based on 1) number of damaged trees, 2) number of trees with exposed roots, 3) type and number of developments, 4) cleanliness, 5) the number of social trails, 6) barren area estimate, and 7) estimate of exposed mineral soil. For each campsite, the ratings assigned to individual impact attributes were combined to generate a summary impact index score (also see Appendix 4). For individual campsite attribute measures and photographs, see Appendix 3.
Location

We had pre-existing records for 16 campsites in the Welcome Creek Wilderness. Seven of these were identified and inventoried in 2013, five were searched for and not found, and four were not inventoried (trails were traversed but search effort was unclear). One new campsite was identified. All campsites were found in close proximity to system trails (Figure 21). Seven campsites were associated with streams and one with a saddle. Campsite-specific ecological attributes are detailed in Appendix 3.

Figure 21. Location and monitoring status of campsites inventoried in 2013.
Impact Evaluation

Based on the site impact evaluation scores, 7 of the 8 campsites were minimally impacted (impact scores ranging from 11-20), and one (TR225T-6) received a score of 8, which classifies it as “not a site.” Development and cleanliness were the only condition attributes rated as highly impacted at inventoried sites (Figure 22). Campsite inventory details are provided in Appendix 3.

![Figure 22. Proportion of campsites with impact rating of 0=none, 1=low, 2=moderate, or 3=high for each impact attribute (shows the relative contribution of each attribute).](image)

V. FOREST SPECIFIC ATTRIBUTES

No forest specific attributes, such as sensitive plant species, were recorded within the Welcome Creek Wilderness.

LITERATURE CITED


APPENDIX 1. MONITORING ATTRIBUTES

List of monitoring attributes recorded in the field in 2013. Detailed protocols are available upon request.

I. UNTRAMMELED QUALITY

Attribute group: Weed Point

Weed_Action Action taken to manage infestation

II. NATURAL QUALITY

Attribute group: Weed Point

Weed_Collector Wilderness Institute default
Weed_Landowner USFS default
Weed_Unit Gallatin National Forest (0258)
Weed_Species Common name of weed species
Weed_Distribution Distribution of weeds in patch (e.g. clumpy, scattered, linear)
Weed_Radius Width of linear patch or radius of non-linear patch (in feet)
Weed_Density Percent coverage of weeds within area of infestation
Weed_Phenology Life history phase of weeds in infestation
Weed_Disturb1/Disturb2 Primary and secondary disturbance/vector of infestation
Weed_DomLife Dominant lifeform within area of infestation
Weed_Ecotype Ecosystem type (e.g. wet meadow, grassland, forest, riparian)
Weed_Treecover Estimate of % tree cover over infestation
Weed_HabSeries/Type/Phase Forest habitat series, type and phase (Pfister et. al 1977)
Weed_DomOver1/2/3 Up to three Understory species if >10% plot representation
Weed_DomUnder1/2/3 Up to three understory species if >10% plot representation
Weed_Struct1/Struct2 DBH class of largest tree <15 ft/ <50 ft from infestation
Weed_Water Distance (ft) of infestation from nearest water
Weed_Biocontrol Presence or absence of biocontrol notes
Weed_Photo Photograph of infestation
Weed_Notes Additional notes

Attribute group: Wildlife Point

Wild_Species Species of wildlife encountered
Wild_ObsType Type of wildlife sign encountered
Wild_Group Individual, family, pair, etc.
Wild_Repro Reproductive status, if evident
Observ_Qual Degree of observer expertise
Wild_Total Numeric total of individuals detected
Wild_Notes Description or additional details of siting
Wild_Photo Corresponding photo number from camera
Pika_Behavior Select behavior category
Pika_Habitat Select habitat category
Pika_Notes Note presence and # of green haystacks

Attribute group: Water Erosion (human-caused)

Water_Landform Landform (stream/lake) associated with erosion point
Water_Width Width class at erosion point (streams only; high water mark)
Water_Acres Acre estimate of all non-stream water features
Water_Severity Severity rating of erosion (see protocols for details)
Water_Photo1/2 Corresponding photo1/2
Water_Notes Describe site and any concerns identified
### III. UNDEVELOPED QUALITY

#### Attribute group: Development Point
- **Dev_Type**: Type of installation or development encountered
- **Dev_Cond**: Select condition class from drop-down menu
- **Dev_Source**: Choose from user or agency created, or unclear
- **Dev_Photo**: Corresponding photo number
- **Dev_Notes**: Additional notes

#### Attribute group: Sign Point
- **Sign_Type**: Sign type
- **Sign_Condition**: Sign condition
- **Sign_Photo**: Corresponding photo number
- **Sign_Source**: Choose from user or agency created, or unclear
- **Sign_Notes**: Additional notes

#### Attribute group: Trail Closure Point
- **Closure_Type**: Type of trail closure device encountered
- **Closure_Violation**: Description of evidence that closure is violated
- **Closure_Photo1/2**: Corresponding photo 1/2
- **Closure_Notes**: Additional notes

### IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY

#### Attribute group: Trail Width and Condition Point or Line
- **TrailWidth_Name**: Name of trail point
- **TrailWidth_Type**: Select type of trail from drop-down menu
- **TrailWidth_Start/Finish**: Start/Finish of trail
- **TrailWidth_Notes**: Additional notes

#### Attribute group: Motorized or Mechanized Use Point
- **MotorMech_Point**: Name evidence with trail number and ID
- **MotorMech_Width**: Select track width from drop-down menu
- **MotorMech_Photo**: Indicate if photo is taken
- **MotorMech_Notes**: Additional notes

#### Attribute group: Non-system Trails Line
- **Nst_Type**: Type of non-system trail encountered
- **Nst_Vector**: Source of non-system trail (e.g. recreation, old logging road)
- **Nst_Finish**: Non system trail surveyed to its end or not
- **Nst_Notes**: Additional notes

#### Attribute group: Campsite Point
- **Camp_ID**: Enter pre-existing site ID, or “new”
- **Camp_Class**: Summary description of user impact (e.g. high, low, naturalized)
- **Camp_Occupied**: Choose yes or no from drop-down menu
- **Camp_Solitude**: For occupied camp, enter # of occupied camps within sight or sound
- **Camp_Landform**: Associated landform (e.g. lakeshore, streamside, meadow)
- **Camp_Type**: Choose from foot, river, stock, outfitter, multiple, or other
- **Camp_Watersource**: Choose from creek, river, lake, other
- **Camp_Waterdist**: Numeric estimate in feet of distance to watersource
- **Camp_Dam_Trees**: Rating of tree damage (see detailed protocols)
- **Camp_Root_Exp**: Number of trees with exposed/damaged roots in campsite
- **Camp_Develop**: Level of development; select category from drop-down menu
- **Camp_Clean**: Level of cleanliness within and around campsite; select category
Camp_Trails Number of social trails associated with campsites
Camp_Barren Barren area estimate within and around campsite
Camp_Veg_Off Offsite estimate of ground cover canopy coverage
Camp_Min_On Estimate of exposed mineral soil in core area
Camp_Min_Off Offsite estimate of exposed mineral soil
Camp_Photonumber 1/2 Photo number 1/2
Camp_Notes Additional notes

Attribute group: Solitude Sample (used to record data within pre-specified sampling area)
Sample_Start Start time of sample using 24h clock
Sample_Stop End time of sample using 24h clock
Sample_Notes Additional notes

Attribute group: People Point
People_Activity Type of user encountered
People_Number Number of people seen in encounter
Packstock_Number Number of packstock in party
Ridingstock_Number Number of riding stock in party
Trip_Length Select overnight or day trip
People_Notes Additional notes

Attribute group: Trailhead Point
TH_Name Assigned name and/or number
TH_TotNumber Total number of vehicles
TH_HorseNumber Total number of horse trailers
TH_Notes Additional notes

Attribute group: Noise Roving Point
Noise_Source Select source from drop-down menu
Noise_Duration Duration of noise (select from categories)
Noise_Intensity Intensity rating of noise (select from categories)
Noise_VisConf Indicate if source was seen
Noise_Notes Additional notes

Attribute group: Noise Sample Point
Noise_Session Select morning, mid-day or evening
Noise_Sample_Start Start time for 15-minute sample on 24h clock
Noise_Heard? Select Yes/No; if yes continue, below
Noise_Source_1 Select source from drop-down menu
Noise_Duration_1 Enter numerical value in seconds
Noise_Intensity_1 Intensity rating of noise (select from categories)
Noise_Vis_Conf_1 Indicate if source was seen
Noise_Notes_1 Additional notes
**REPEAT above attributes for up to 2 additional noises recorded**

Attribute group: Visual Intrusion Point
VI_Type Visible evidence of human impact outside WSA
VI_Photograph Photograph
VI_Notes Additional notes

V. FOREST SPECIFIC ATTRIBUTES
Attribute group: Sensitive Plant Species
Sensitive_Name Species name of plant identified
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sensitive_Pop</td>
<td>Population size class</td>
</tr>
<tr>
<td>Sensitive_Phenology</td>
<td>Life-history phase of plant from drop-down menu</td>
</tr>
<tr>
<td>Sensitive_Ecotype</td>
<td>Ecosystem type (e.g. wet meadow, grassland, forest, riparian)</td>
</tr>
<tr>
<td>Sensitive_Treecov</td>
<td>Estimate of % treecover over infestation</td>
</tr>
<tr>
<td>Sensitive_HabSeries/Type/Phase</td>
<td>Forest habitat series, type and phase (Pfister et. al 1977)</td>
</tr>
<tr>
<td>Sensitive_Photo</td>
<td>Photograph</td>
</tr>
<tr>
<td>Sensitive_Notes</td>
<td>Additional notes</td>
</tr>
</tbody>
</table>
APPENDIX 2. SUMMARY OF FIELD NOTES AND TRAIL CONDITIONS

This appendix summarizes relevant field information from trip reports written by field leaders following each monitoring trip. Information is organized by trail number generally from south to north, and includes notes on trail conditions, weed distributions, and other observations that provide additional context to monitoring data collected.

**Trail 93** – FS 4268 was gated at the junction with 2129, necessitating a 1.5 mile hike on the road to get to the TH for 93. From FS road 4268 to the Wilderness boundary, the trail is easy to follow. Starting at the boundary, the trail has a significant amount of downed trees and can be difficult to follow in places. About two miles south of the Wilderness boundary the trail disappears at a rocky outcropping. A subsequent attempt was made to monitor 93 from the southern terminus, where it meets Rock Creek Road. A trail was found connecting Rock Creek Road to Rock Creek itself. After fording the creek, however, there is no evidence of a navigable trail, although there is a Wilderness boundary sign.

**Trail 346T and 351W** – These spurs showed little evidence of recent use and were covered with downed trees and sometimes difficult to follow.

**Trail 225** needs clearing. From the junction of trail 342 to the suspension bridge at Rock Creek, #225 varies drastically in terms of maintenance, vegetative overgrowth, and clarity. Close to the trailhead after the suspension bridge the trail is navigable, but soon becomes overgrown. Continuing up trail to Cinnabar Cabin it improves slightly. It appears as though the trail may be hiked near the trailhead, but is less used further into the Wilderness.

**Trail 313** is cluttered with downed logs from burns and windfall. The junction with 142T was not obvious. Unnamed trail connecting 313 to 225 (south of Cleveland Mountain) was not found.

**Trail 342** is almost nonexistent save for old blazes and cuts. The junction with 225 cannot be said to exist since hiking to 225 from 342 degraded to bushwhacking. This trail is very difficult to follow.

**Trail 142 T** – Heading west from the Solomon Ridge trailhead, the first half-mile of trail has been burned recently and the trail is difficult to follow due to numerous downed trees. The rest of the trail has not been maintained in a while and was overgrown with many downed logs. Heading east from the trailhead, Trail 142 has some blowdown and logs from past fires and could use trail work, though is reasonably easy to follow and quite clear otherwise. Further east, approaching Rock Creek, the trail is faint but in pretty good condition going up the ridge. There are very few downed trees but there are some brushy sections. There are huge patches of Spotted Knapweed and Cheatgrass on the lower exposed slopes, as well as smaller patches of both at the higher elevations.

**Trail 178** is fairly well-established especially from its northern terminus where it meets trail 232 to the forest edge south of the peak of Solomon Mountain. There are some downed logs, but it is easily navigable. As the trail descends from Solomon Mountain to the southeast, it becomes difficult to follow and is overgrown by grasses, Ceonothus, and Arrowleaf Balsamroot. At the lower elevation portions of the trail, the switchbacks are better defined especially where they cut through talus. In some areas, the tread is lacking and the trail overall needs work. The trail becomes very overgrown in the riparian zone near Sawmill Creek and there is no obvious physical junction with trail 179 other than the sign indicating the junction off of trail 179 if you can locate it. We found trail 178 from 179 by following the topography, not a trail. There are extensive patches of Cheatgrass in the open, grassy hillsides both along and northwest of the switchbacks.
Trail 179 is not maintained and is difficult to follow. It’s northwestern junction with 232 was identified by an old blaze and evidence of old switchbacks, but all signs of the trail were quickly lost upon descent into Sawmill Creek drainage. Subsequently, attempts were made to monitor 179 from its eastern junction with 178; at this junction there is a “Trail Not Maintained” sign, and 179 is overgrown and very difficult to follow. There are still enough cut logs to locate the trail at this point, but following it was challenging and thus 179 was not monitored from it’s junction with 178 to its junction with 232.

Trail 232 is well-established and follows an old roadbed for its entirety. The trail is mostly single-track although it is on a roadbed. It is overgrown in some areas with alder, notably near the trailhead and near the point where it crosses Sawmill Creek. The trail segment of 232 that runs north to 142 from where 179 meets 232 was not found, despite searches from both terminus.

Registry box at TH off of 4249 is vandalized and contains no registration forms.
### APPENDIX 3. CAMPSITE INVENTORY & CONDITION

#### TR225T-NEW1

<table>
<thead>
<tr>
<th>Location</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easting (m)</td>
<td>Damaged Trees</td>
</tr>
<tr>
<td>288,095</td>
<td>no more than broken branches</td>
</tr>
<tr>
<td>Northing (m)</td>
<td>Root Exposure</td>
</tr>
<tr>
<td>5,163,200</td>
<td>None</td>
</tr>
<tr>
<td>Landform</td>
<td>Class_Root</td>
</tr>
<tr>
<td>Stream</td>
<td>0</td>
</tr>
<tr>
<td>Type of Use</td>
<td>Development</td>
</tr>
<tr>
<td>Foot</td>
<td>primitive seat(s) present, or other facilities</td>
</tr>
<tr>
<td>Closest Water Source</td>
<td>Cleanliness</td>
</tr>
<tr>
<td>Creek</td>
<td>1 fire ring/scar, some trash, or manure present.</td>
</tr>
<tr>
<td>Distance to Water</td>
<td>Social Trails</td>
</tr>
<tr>
<td>250 ft</td>
<td>1 discernible</td>
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#### Impact Evaluation

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<tr>
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<th>Site Condition Class</th>
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<td>11</td>
<td>Light</td>
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**Location**

<table>
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<tr>
<th>Location</th>
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<tbody>
<tr>
<td>Easting (m)</td>
<td>287,149</td>
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<tr>
<td>Northing (m)</td>
<td>5,165,447</td>
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<tr>
<td>Landform</td>
<td>Stream</td>
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<tr>
<td>Type of Use</td>
<td>Foot</td>
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<tr>
<td>Closest Water Source</td>
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**Conditions**

<table>
<thead>
<tr>
<th>Conditions</th>
<th>1-9 damaged trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damaged Trees</td>
<td>1-9 damaged trees</td>
</tr>
<tr>
<td>Root Exposure</td>
<td>1 - 4 trees with exposed roots</td>
</tr>
<tr>
<td>Class_Root</td>
<td>1</td>
</tr>
<tr>
<td>Development</td>
<td>more than 2 facilities present</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 fire rings/scars, trash prevalent, human</td>
</tr>
<tr>
<td></td>
<td>waste, or manure prevalent</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>1 discernable</td>
</tr>
<tr>
<td>Social Trails</td>
<td>300-1499 sq ft.</td>
</tr>
<tr>
<td>Barren Area Estimate</td>
<td>0 sq ft.</td>
</tr>
<tr>
<td>Mineral Soil Exposed Area</td>
<td>0 sq ft.</td>
</tr>
<tr>
<td>Off-site Ground Cover Vegetation</td>
<td>51-75%</td>
</tr>
<tr>
<td>Off-site Mineral Soil Exposure</td>
<td>0-5%</td>
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**Impact Evaluation**

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<th>20</th>
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<tbody>
<tr>
<td>Impact Index</td>
<td>20</td>
</tr>
<tr>
<td>Site Condition Class</td>
<td>Light</td>
</tr>
</tbody>
</table>
### Location
- **Easting (m)**: 287,183
- **Northing (m)**: 5,165,392
- **Landform**: Stream
- **Type of Use**: Foot
- **Closest Water Source**: Creek
- **Distance to Water**: 20 ft

### Conditions
- **Damaged Trees**: 1-9 damaged trees
- **Root Exposure**: 1-4 trees with exposed roots
- **Class_Root**: 1
- **Development**: All facilities dismantled but remnants visible
- **Cleanliness**: 1 fire ring/scar, some trash, or manure present.
- **Social Trails**: 1 discernable
- **Barren Area Estimate**: 300-1499 sq ft.
- **Mineral Soil Exposed Area**: 1-36 sq ft.
- **Off-site Ground Cover Vegetation**: 76-100%
- **Off-site Mineral Soil Exposure**: 0-5%

### Impact Evaluation
- **Impact Index**: 19
- **Site Condition Class**: Light
TR225T-4

Location
Easting (m) 289,773
Northing (m) 5,161,174
Landform Stream
Type of Use Foot
Closest Water Source Creek
Distance to Water 5 ft

Conditions
Damaged Trees 1-9 damaged trees
Root Exposure 5-10 trees with exposed roots
Class_ROOT 2
Development no facilities
Cleanliness 1 fire ring/scar, some trash, or manure present.
Social Trails 1 discernable
Barren Area Estimate <300 sq ft.
Mineral Soil Exposed Area 1-36 sq ft.
Off-site Ground Cover Vegetation 76-100%
Off-site Mineral Soil Exposure 0-5%

Impact Evaluation
Impact Index 18
Site Condition Class Light
TR225T-5

Location
Easting (m) 289,782
Northing (m) 5,161,114
Landform Stream
Type of Use Foot
Closest Water Source Creek
Distance to Water <1 ft

Conditions
Damaged Trees 1-9 damaged trees
Root Exposure 5-10 trees with exposed roots
Class_Root 2
Development no facilities
Cleanliness 1 fire ring/scar, some trash, or manure present.
Social Trails None
Barren Area Estimate <300 sq ft.
Mineral Soil Exposed Area 0 sq ft.
Off-site Ground Cover Vegetation 76-100%
Off-site Mineral Soil Exposure 0-5%

Impact Evaluation
Impact Index 13
Site Condition Class Light
### Location
- Easting (m): 287,973
- Northing (m): 5,163,453
- Landform: Stream
- Type of Use: Foot
- Closest Water Source: Creek
- Distance to Water: 30 ft

### Conditions
- Damaged Trees: no more than broken branches
- Root Exposure: None
- Class_Root: 0
- Development: primitive seat(s) present, or other facilities
- Cleanliness: 1 fire ring/scar, some trash, or manure present.
- Social Trails: 1 discernable
- Barren Area Estimate: <300 sq ft.
- Mineral Soil Exposed Area: 0 sq ft.
- Off-site Ground Cover Vegetation: 76-100%
- Off-site Mineral Soil Exposure: 0-5%

### Impact Evaluation
- Impact Index: 8
- Site Condition Class: Not a site
TR232T-1

Location
Easting (m) 289,604
Northing (m) 5,165,279
Landform saddle
Type of Use foot
Closest Water Source (no data)
Distance to Water 1 ft

Conditions
Damaged Trees 1-9 damaged trees
Root Exposure 1 - 4 trees with exposed roots
Class_ROOT 1
Development no facilities
Cleanliness 1 fire ring/scar, some trash, or manure present.
Social Trails 1 discernable
Barren Area Estimate <300 sq ft.
Mineral Soil Exposed Area 1-36 sq ft.
Off-site Ground Cover Vegetation 76-100%
Off-site Mineral Soil Exposure 0-5%

Impact Evaluation
Impact Index 15
Site Condition Class Light
**TR342-1**

**Location**
- Easting (m): 285,014
- Northing (m): 5,166,001
- Landform: stream
- Type of Use: foot
- Closest Water Source: creek
- Distance to Water: 25 ft

**Conditions**
- Damaged Trees: 1-9 damaged trees
- Root Exposure: 1-4 trees with exposed roots
- Class_Root: 1
- Development: primitive seat(s) present, or other facilities
- Cleanliness: >1 fire ring/scar, some trash, or manure present
- Social Trails: 1 discernable
- Barren Area Estimate: <300 sq ft.
- Off-site Ground Cover Vegetation: (no data)
- Off-site Mineral Soil Exposure: 0-5%

**Impact Evaluation**
- Impact Index: 18
- Site Condition Class: Light
APPENDIX 4. ANACONDA PINTLER WILDERNESS SITE IMPACT WORKSHEET

Site #: ____________________________    Anaconda-Pintler Wilderness Site Impact Worksheet - 2013 Edition

Date: Inventoried: ____________________
Elevation: __________________________
(decimal minutes) LAT: ____________________
LONG: ________________________

Site Description, Location, and Comments: ____________________________

<table>
<thead>
<tr>
<th>Rating: circle one category</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Rate x Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damaged Trees: # associated with site</td>
<td>No more than broken branches</td>
<td>1-9 damaged trees associated with site</td>
<td>10-25 damaged trees associated with site</td>
<td>&gt;25 damaged trees associated with site</td>
<td>... x 2</td>
</tr>
<tr>
<td>Root Exposure: # associated with site</td>
<td>None</td>
<td>1-4 trees with exposed roots</td>
<td>5-10 trees with exposed roots</td>
<td>&gt;10 trees with exposed roots</td>
<td>... x 3</td>
</tr>
<tr>
<td>Development: (before naturalizing, exclude fire ring)</td>
<td>No facilities</td>
<td>All facilities damaged but remnants may be visible</td>
<td>Primitive vegetation present, and/or facilities such as hitching post, trail poles, etc.</td>
<td>Many facilities present, than #2</td>
<td>... x 1</td>
</tr>
<tr>
<td>Cleanliness: (Before naturalizing)</td>
<td>No waste, manure or trash or fire scar</td>
<td>1 fire ring/scar, or microtrash present, or human waste not obvious, or manure not obvious</td>
<td>&gt;1 fire ring/scar, or microtrash and some trash present, or human waste not obvious, or manure present</td>
<td>&gt;2 fire rings/scar, or trash prevalent, or microtrash persistent, or human waste obvious, or manure is prevalent</td>
<td>... x 1</td>
</tr>
<tr>
<td>Social Trails:</td>
<td>None</td>
<td>1 discernible (count any trail passing through the site as 1 trail)</td>
<td>2-3 discernable (count additional trails crossing the other trail as 1 trail not 2)</td>
<td>&gt;3 discernable (count a trail that forks off another trail as 1 trail)</td>
<td>... x 2</td>
</tr>
<tr>
<td>Barren Area Estimate: (Main and associated camp areas)</td>
<td>None</td>
<td>&lt;300 sq ft</td>
<td>301-1499 sq ft</td>
<td>&gt;1500 sq ft</td>
<td>... x 3</td>
</tr>
<tr>
<td>Mineral Soil Exposed Estimate: for main camp and associated areas</td>
<td>0 sq ft</td>
<td>1-36 sq ft</td>
<td>37-150 sq ft</td>
<td>&gt;150 sq ft</td>
<td>... x 3</td>
</tr>
</tbody>
</table>

0-10 Not a site  | 11-20 Light  | 21-39 Moderate  | 31-39 Heavy  | 40-48 Extreme |

IMPACT INDEX SUM = ________________________

Off-site ground cover vegetation %, Off-site mineral soil exposure %, Site condition class

Take a digital photo at each site, print it and attach to this sheet. Take a previous SW with you when remonitoring this site.

Convert 1993 edition SW data to 2006 edition while in the field paying special attention to sq ft of mineral soil. Document the results.