# Field Measures of Wilderness Character

## Big Snowy Mountains 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 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: untrammeled, 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.

# Table of Contents

## List of Tables



## List of Figures

# 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) 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 opportunistic weed pulling by Wilderness Institute crews (all other measures of untrammeled 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.

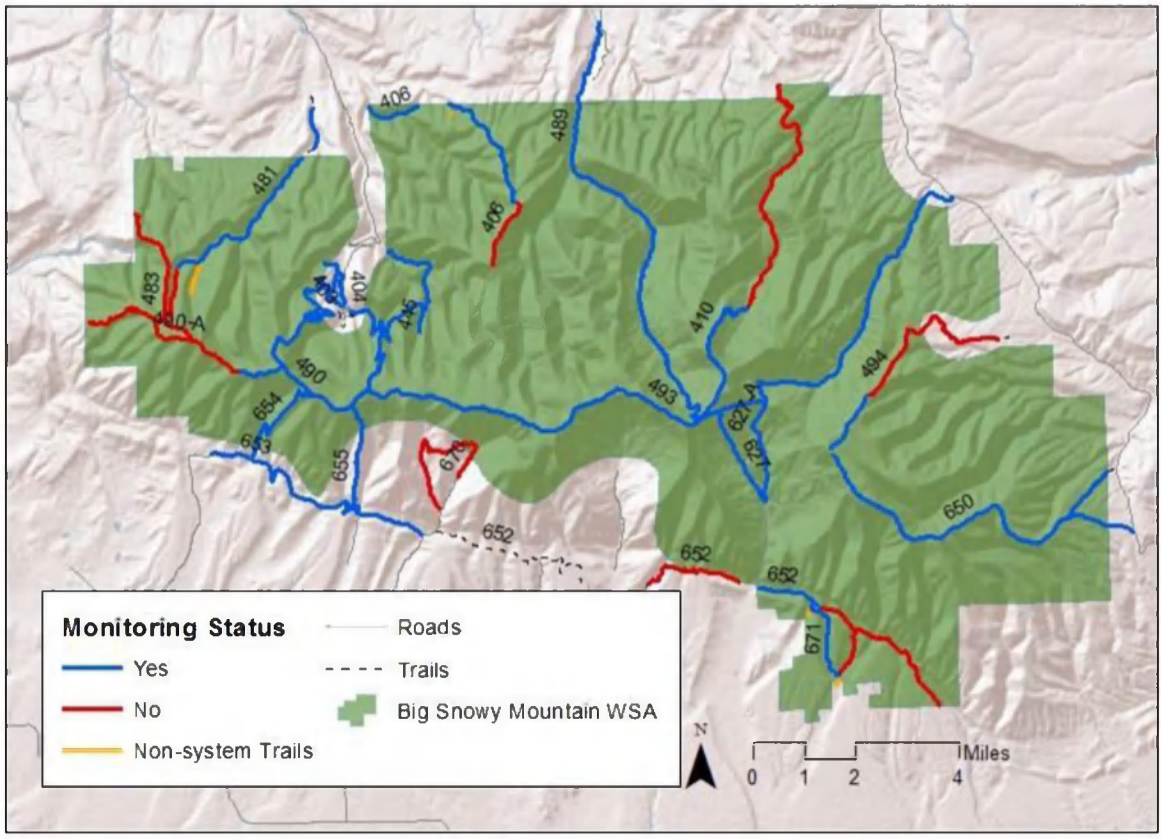



**Figure 1. System trails monitored within the Big Snowy Mountains WSA in 2012.**

## DATA MANAGEMENT

The following section describes the steps taken to collect and analyze field measures of wilderness character (attributes) in the Big Snowy Mountains WSA: (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.

### *Data Collection*

Data was collected between June and September 2012. 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. Back in the office, field leaders also wrote written reports summarizing additional observations not captured by data collection protocols. For example, snow cover, general trail conditions, route deviations, and any additional context were detailed in these reports. A summary of these qualitative findings, by trail number, is found in Appendix 2.

### *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 Tranverse Mercator (UTM) grid coordinates in zone 12. All spatial analyses were performed using ArcGIS (ESRI 2010). Travel route and special designated boundary information, including designated trails and roads, were imported from the Lewis and Clark National Forest Geospatial Library (http://www.fs.usda.gov/detail/lcnf/landmanagement/gis/?cid=stelprdb5346153). 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 all 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 which 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 Big Snowy Mountains WSA. Agency actions that affect the untrammeled quality of the WSA (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 26 of the 105 patches encountered. Twenty of the pulled patches were within the WSA 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, and proportion of patch pulled.**

| Control Action | No. Weed Patches |
|---|---|
| None | 74 |
| 0-10% pulled | 7 |
| 11-20% pulled | 1 |
| 91-100% pulled | 18 |
| **Total** | **101** |

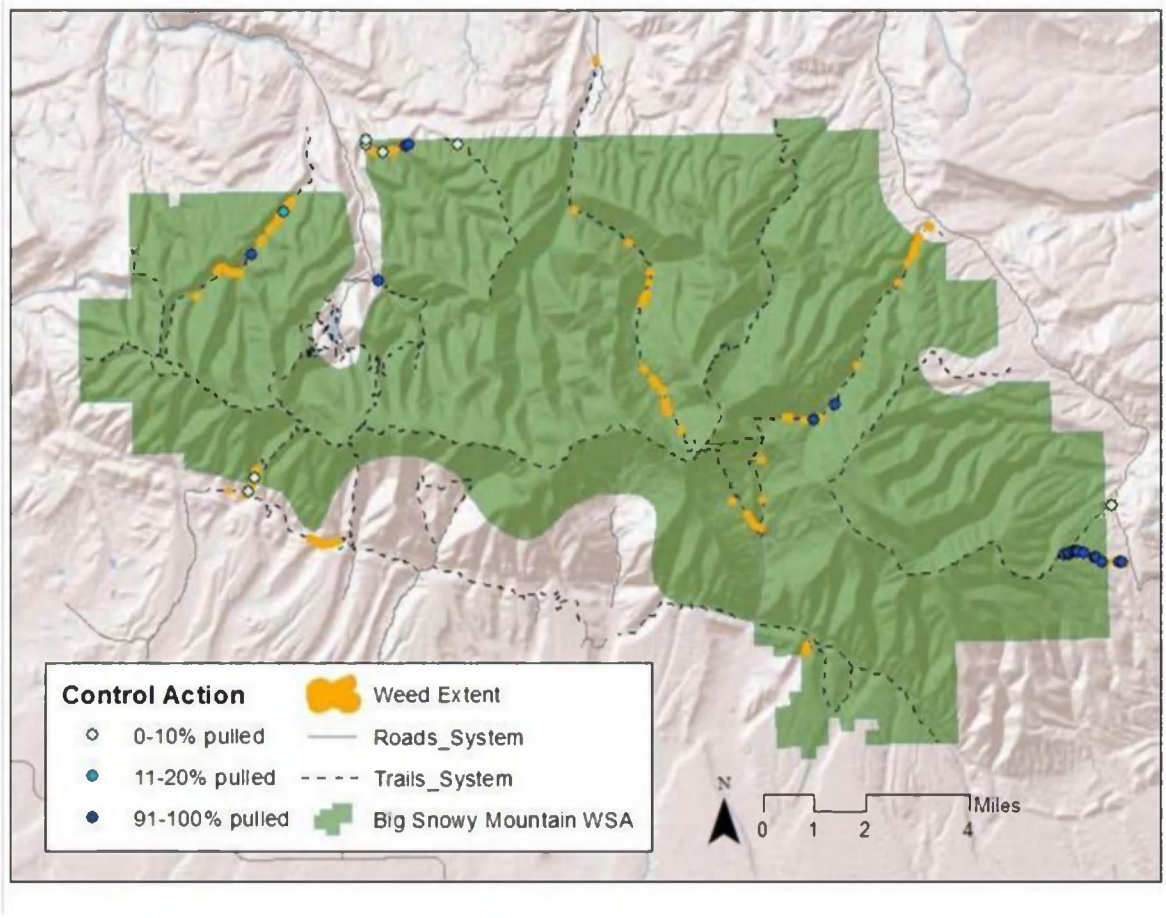



**Figure 2. Location of pulled weed patches and extent of mapped weed infestations.**

## 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 characteristics. 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) that capture the detail and context of weed infestations, wildlife signs, and erosion events. Please note that not all attributes are summarized in the following sections, but are available in the associated data files.

## 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 monitoring data; 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 WSA but outside the WSA boundary are included in this report since they contribute to overall trail conditions, and could be a source for future infestations if left untreated. Monitoring was focused along trails and therefore patches not visible from the trail may have gone undetected.

### *Weed Species*

A total of 105 weed patches were recorded, representing 5 species. Of these, 74% were recorded within the WSA boundary, while the remaining 26% were found on trails leading into the WSA. Canada Thistle and Houndstongue represented 51% and 31% respectively of all weed patches (Figures 3 and 4).

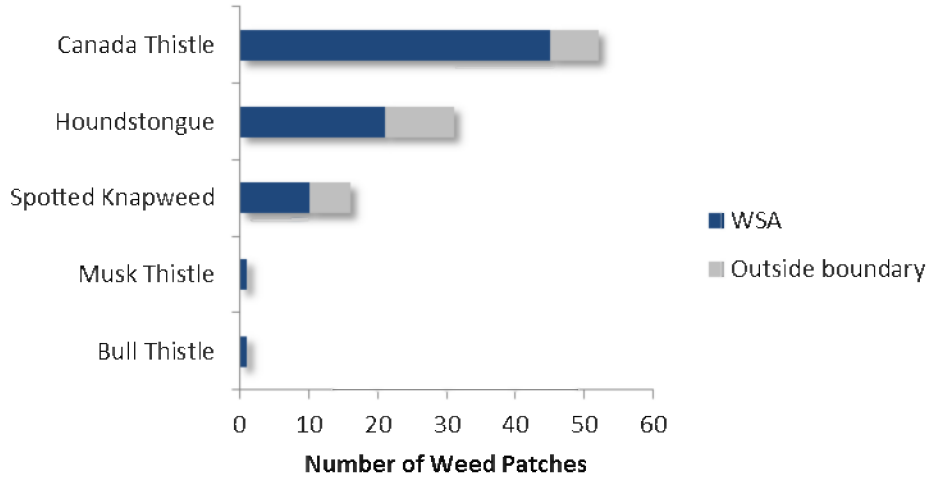



**Figure 3. Number of weed patches by species**

Weed infestations were primarily observed along system trails, with 5 patches (4 Houndstongue and 1 Canada Thistle) observed on non-system trails. Canada Thistle was most prevalent along the East Fork Cottonwood Creek (#489), east end of Uhlhorn (#493), and Dry Pole Creek (#481) trails. Houndstongue primarily occurred on Dry Pole Creek (#481), Jump Off Peak (#406), and Swimming Woman (#627) trails. Spotted Knapweed was only recorded on the closed southern spur of Big Snowy trail (#650). Two patches of Bull Thistle were observed, one at the Uhlhorn (#493) trailhead and another along Dry Pole Creek (#481). A single occurrence of Musk Thistle was observed on Jump Off Peak (#406). Please note that not all of the system and non-system trails were monitored across the southeastern portion of the WSA (#652, #671 and associated non-system trails). Presumably additional weed patches (particularly Houndstongue) are present throughout this network of trails.

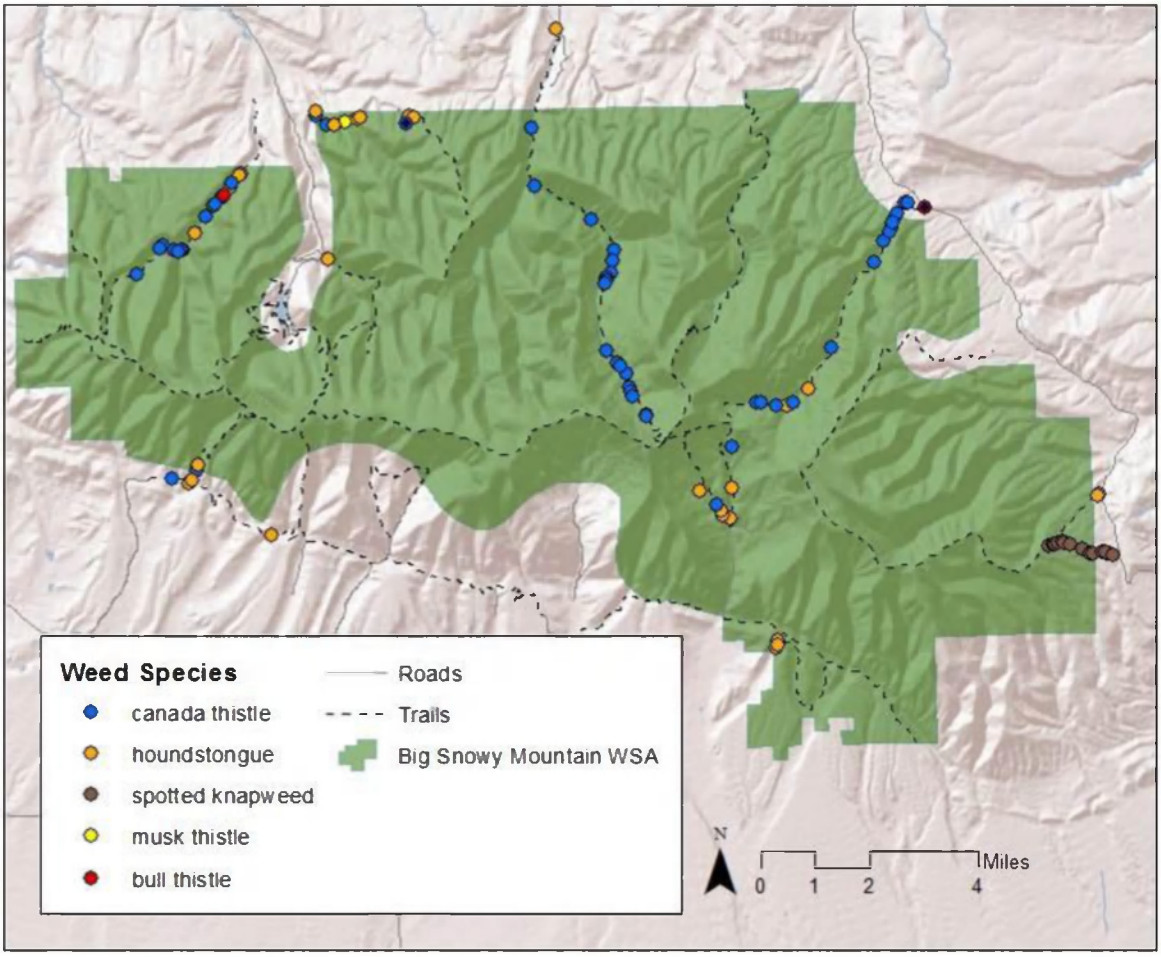



**Figure 4. Distribution of observed weed species.**

***Size of Infestation***

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 21.3 acres of weeds were mapped, with 8.1 acre (38%) s occurring inside the WSA boundary. While the majority of weed patches documented were within the WSA, the extent of weed infestations was larger outside the WSA boundary. It is important to note that for several larger patches, the entire extent of the infestation was not mapped, particularly when the terrain or distance from trail made walking the entire perimeter unfeasible. Therefore, area values should be considered a minimum. In addition, 4 patches were missing size data, and therefore are not included in these totals. Please see Appendix 2 for trail-specific information on weed infestations that were incompletely quantified.

Nearly all patches (93%) were recorded as less than 1 acre in size, with 7 patches estimated as larger than 1 acre. All patches over 0.14 acres in size were either Canada Thistle or Houndstongue. The largest weed patch, Houndstongue, was estimated at 3.3 acres and occurred along with two other large weed patches in the meadow at the Jump Off Creek trailhead (#406), outside the WSA boundary. This is shown quantitatively and spatially in Figures 5 and 6.

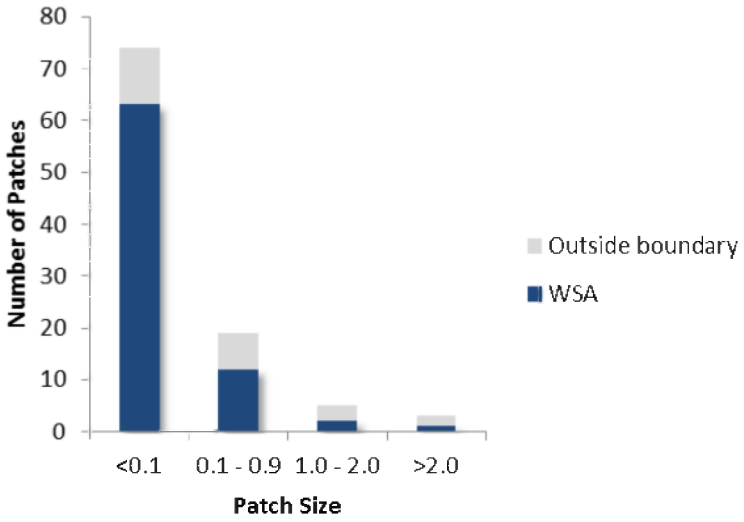



**Figure 5. Number of weed patches by size class (acres).**

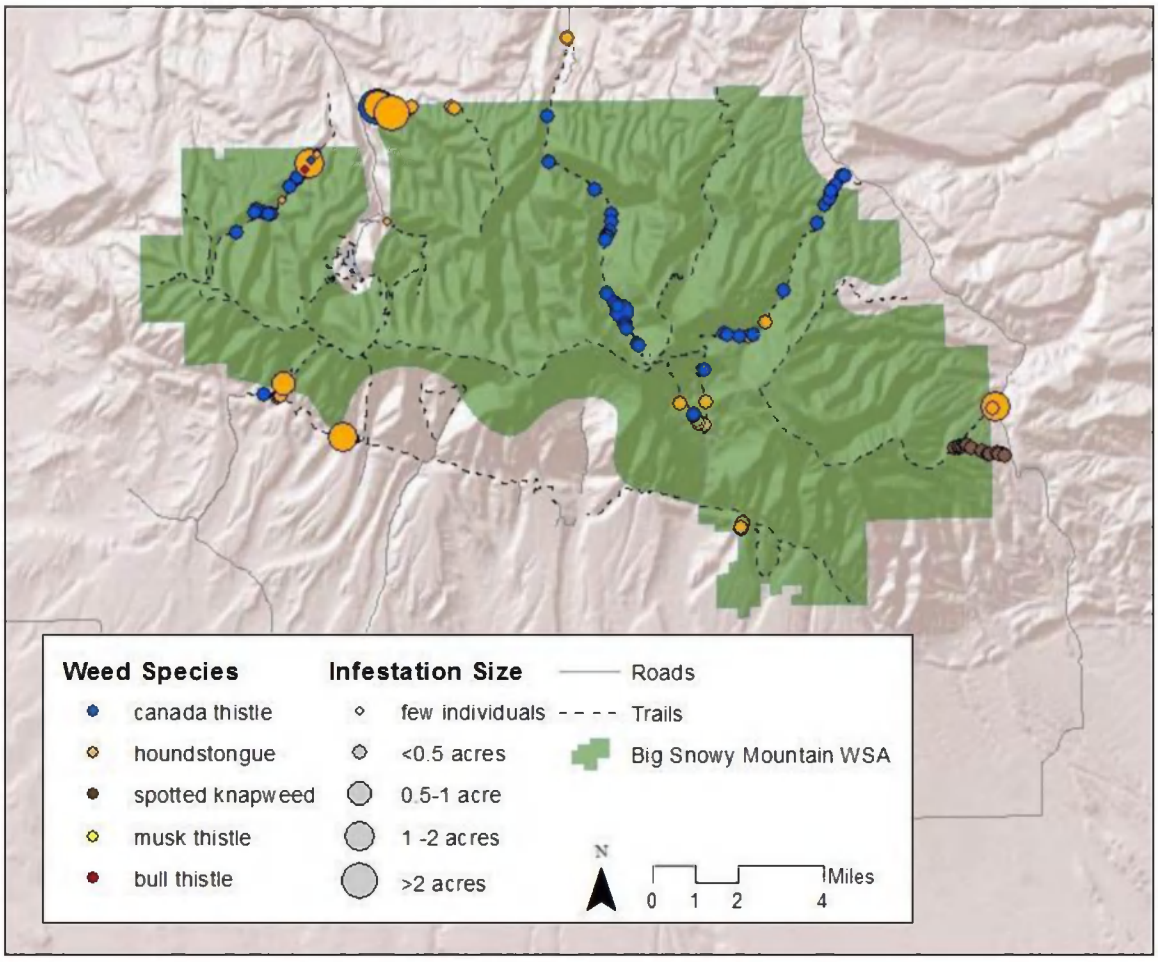



**Figure 6. Distribution of weed patches by species and size.**

### *Spatial Distribution, 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 (along a trail or stream). Spatial distribution was not recorded for 43% of patches, therefore results for this attribute were not summarized. The percent cover of weeds within each infestation 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 patch could also be recorded as several smaller distinct "clumpy" patches, but density estimates standardize the calculation of total infested area.

The majority of patches (85%) had weed densities <50%. All patches with weed density over 40% were small (<0.1 acre), whereas patches over 1 acre in size had densities of 25% or less. See Figure 7 for visual representation of weed density and patch size.

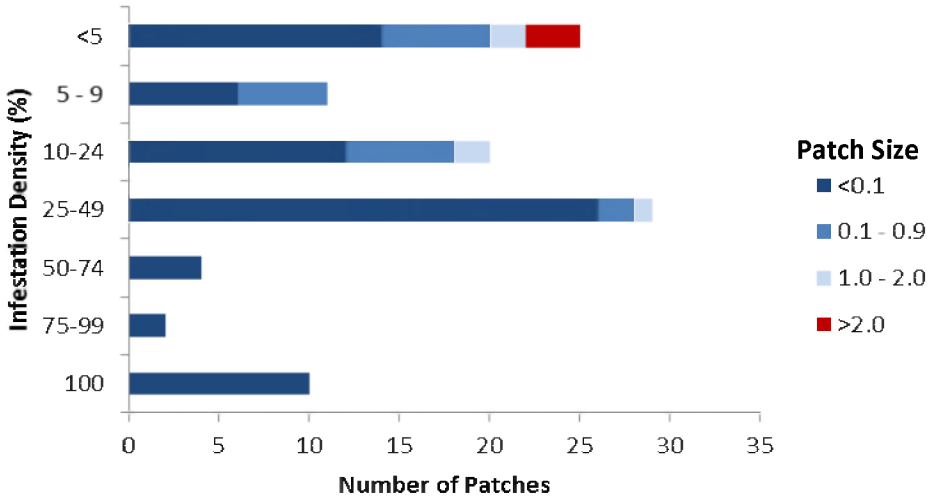



**Figure 7. Number of weed patches by density and size.**

After accounting for the density of weeds within documented infested areas, across all trails monitored, there were an estimated 1.7 total acres infested, including 0.6 acres infested inside the WSA. The majority of acres infested were Houndstongue (1.2 acres). All other weed species had infested areas of <1 acre (Figure 8). Please note that the majority of acres infested were located outside the WSA boundary.

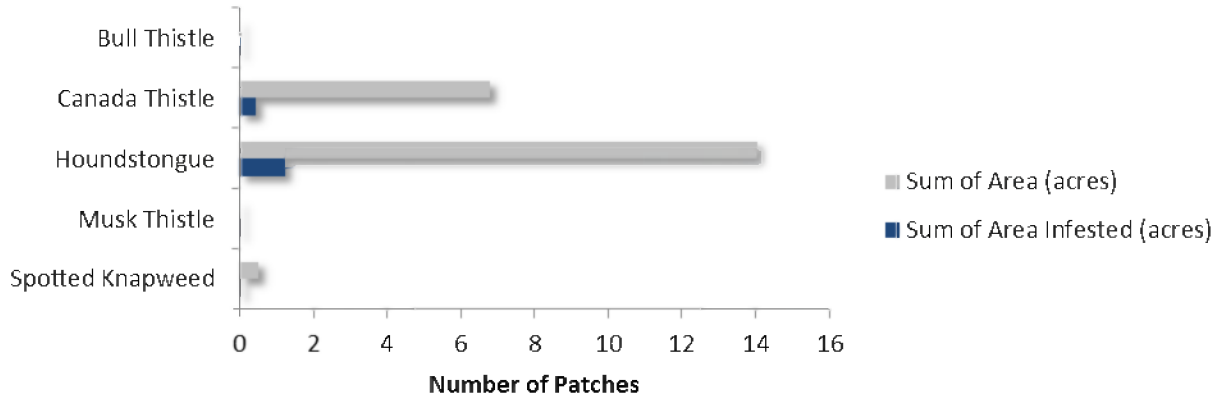



**Figure 8. Total area of weed patches and estimated acres infested by species.**

***Primary and Secondary Disturbance Types***

Weed patches are often associated with disturbance. We recorded the primary and secondary disturbances associated with each mapped weed patch. 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 most mapped weed patches were trails (81%; Figure 9). The remaining patches were associated with a range of disturbances, including campsites, game trails, flooding, roads, and stock. Secondary associations were also mostly trails (51%). Secondary association was reported for 69 weed patches.

Trails are the primary access routes through the WSA, and it is important to recognize that the high proportion of weeds associated with 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 WSA.

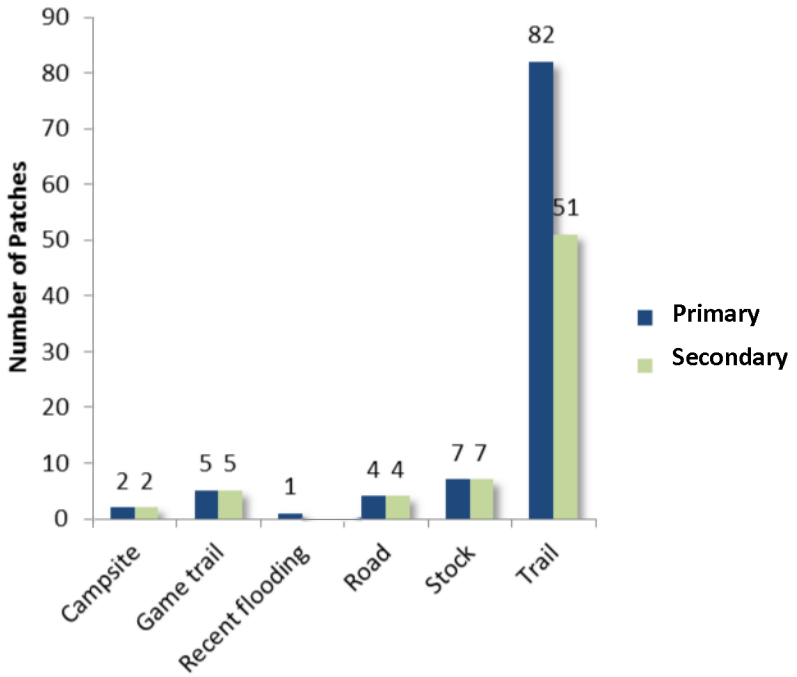



**Figure 9. Primary and secondary disturbances associated with weed patches.**

### *Ecological Associations*

Ecological associations, including ecosystem type, dominant life form, and habitat were recorded for each weed patch observed 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 (55%) were encountered in forest (>10% tree cover), with the remaining found in wet meadow (18%), grassland (12%), or riparian (7%; Figure 10). However, across ecosystem types, the dominant life forms within the area of infestation were graminoid (42%), conifer (29%), woody shrub (19%), and forb (4%). Dominant life form information was missing for 7 patches. Some weed species were associated with specific life forms, for example, Canada Thistle and Houndstongue with graminoids, and Spotted Knapweed with woody shrubs.

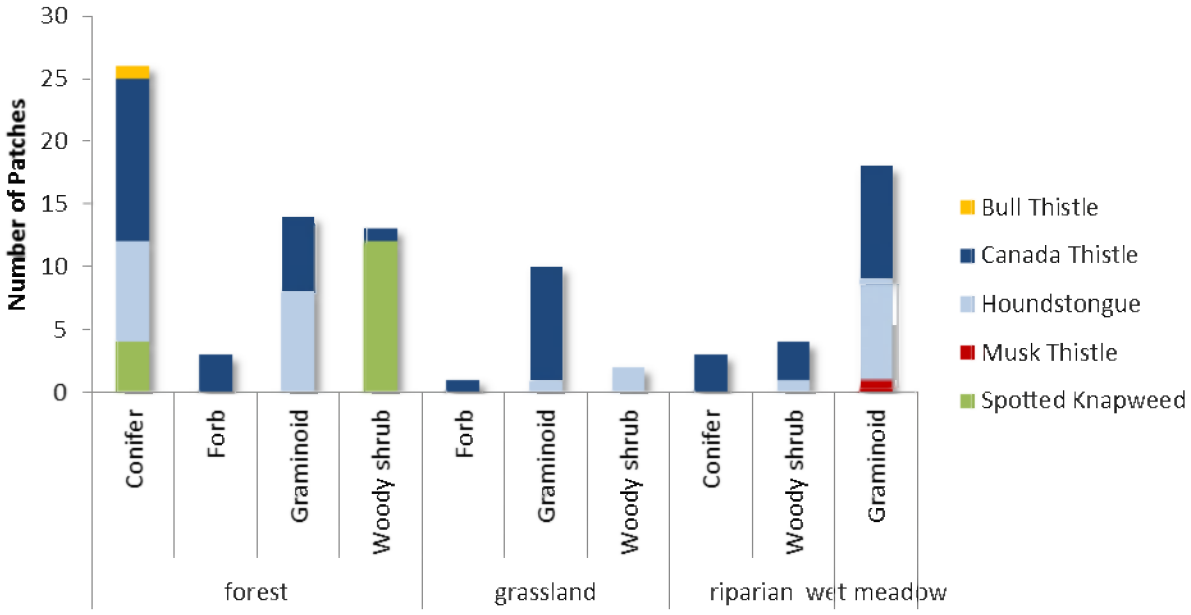



**Figure 10. Ecosystem type and dominant lifeform associated with weed species.**

Habitat types associated with weed infestations found in forests (>10% tree cover) were identified based on the hierarchical classification system of series, type, and phase developed by Pfister et al (1977). Sixty-six weed patches and four weed species occurred in the forest ecosystem type, and were associated with Douglas fir (35%), subalpine fir (27%), spruce (26%), and lodgepole pine (12%) climax series, and 9 habitat types (Figure 11). Habitat type series, type, and phase for each patch are available in the associated database.

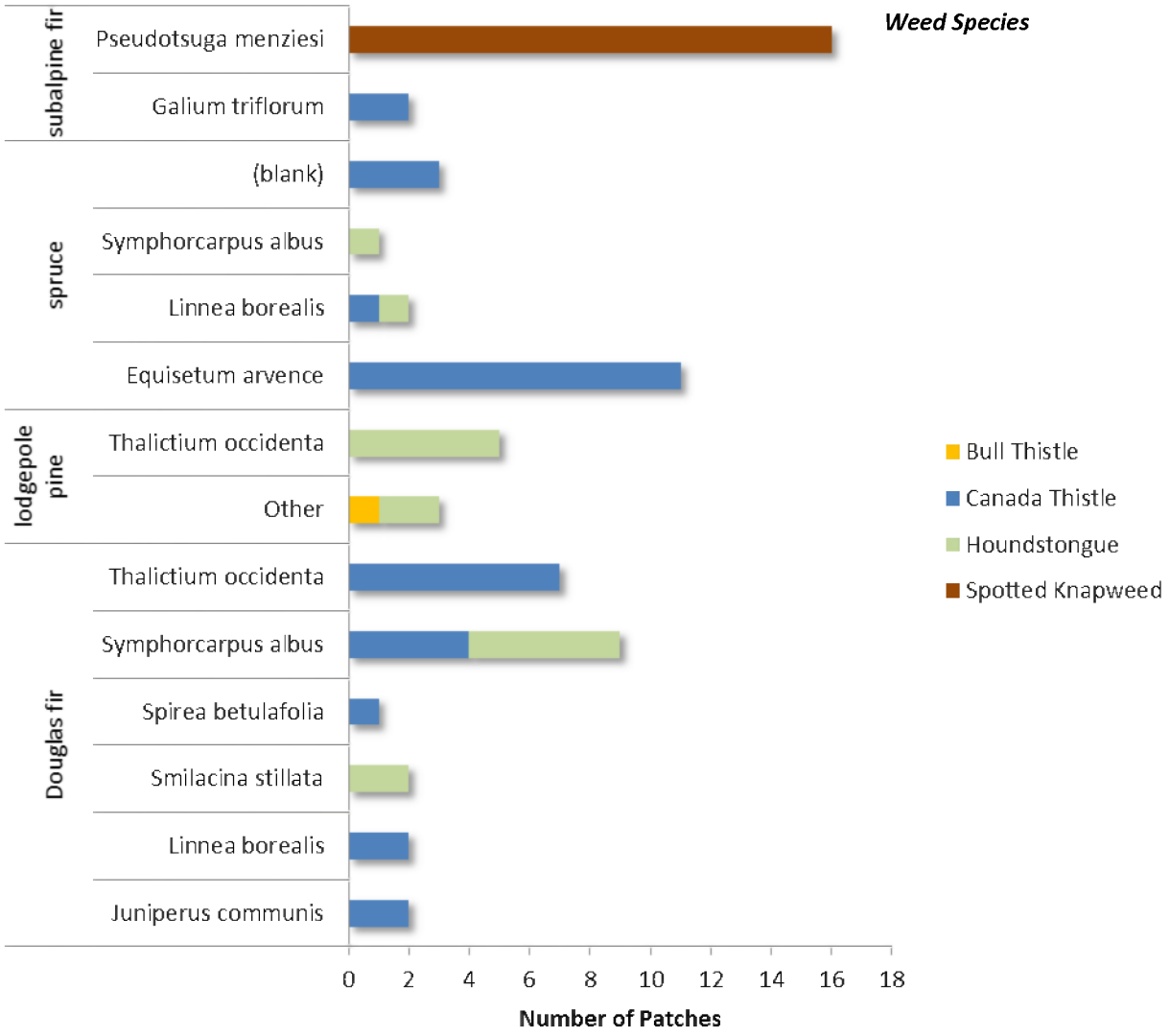



**Figure 11. Habitat type classification associated with weed species in forest.**

### *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 (73%) of weed patches were located > 50 feet from water (Figure 12). Consistent with observed water-mediated disturbance, most patches <50 feet from water were Canada Thistle (88%), and the remaining 12% were Houndstongue. Four patches had no water distance information recorded.

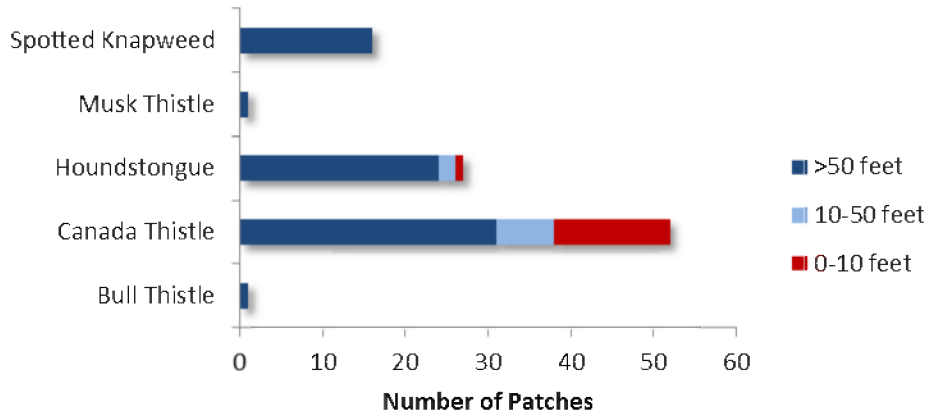



**Figure 12. Distance of weed patches from water by species.**

## Wildlife Encounters

Trails represent important corridors of travel for many wildlife species. We documented wildlife use of all trails within the WSA by recording direct and indirect wildlife encounters with focal species. Wildlife was identified by species if possible, and otherwise classified by family or major group (e.g. bear, large carnivore, or furbearer). The type of encounter was recorded as a sighting (e.g. visual), auditory, track, or scat. Scat and track data were only recorded if they could be identified to family. 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 WSA. 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 29 wildlife encounters were reported (Figure 13); 27 (93%) of these were within the WSA (Figure 14). 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; Figure 13).

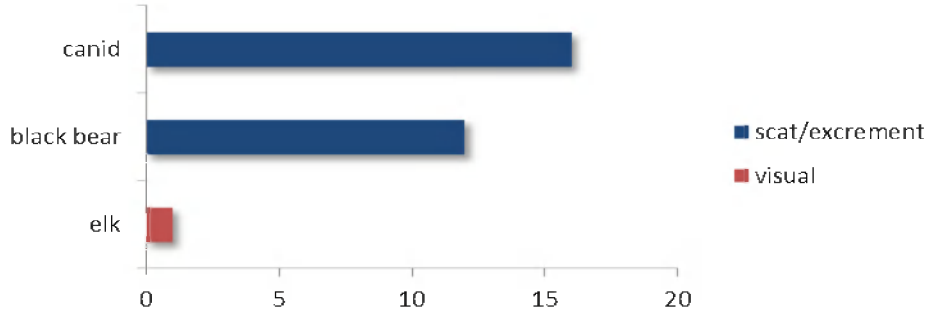



**Figure 13. Number of wildlife encounters by species or family and detection type.**

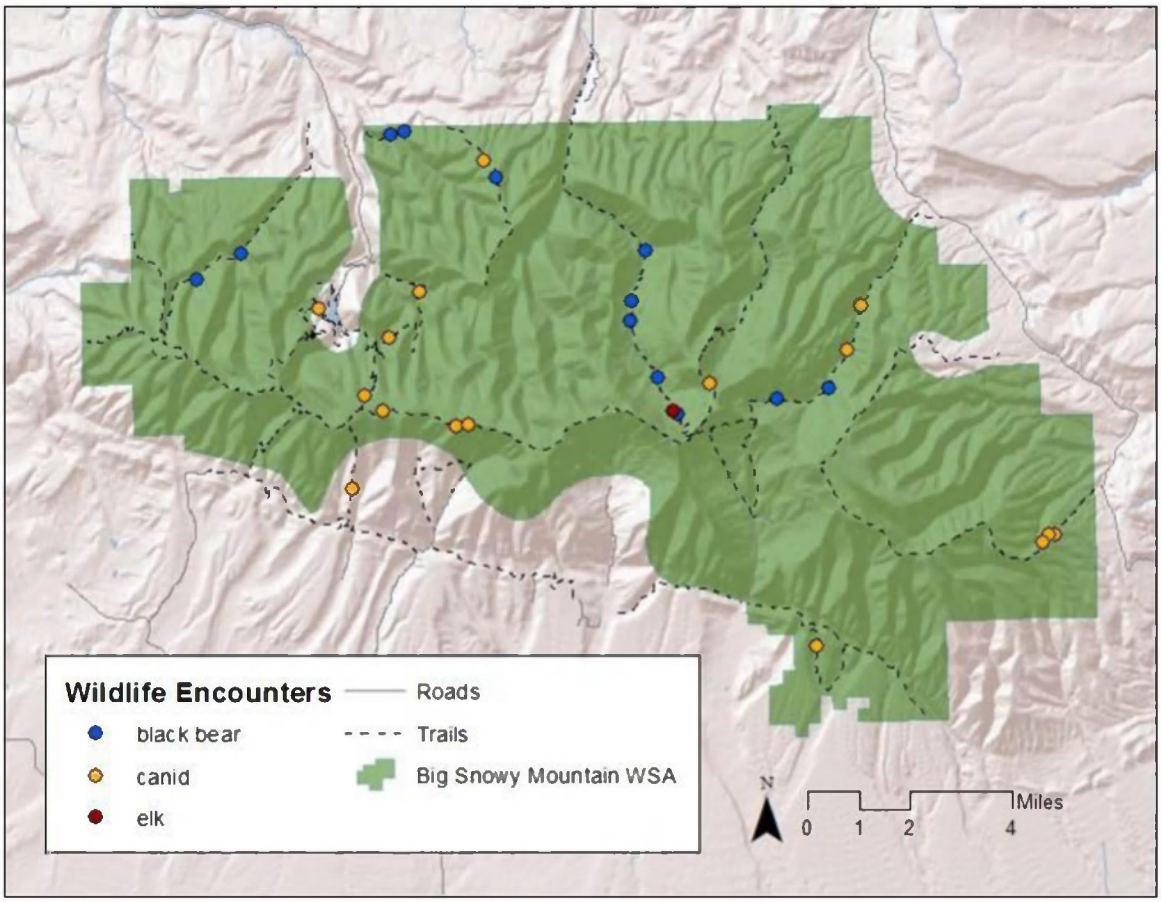



**Figure 14. Location of wildlife encounters.**

## 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). 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*

Erosion due to recreation was documented at 8 sites, one of which was located outside the WSA (Figure 15). All documented erosion sites were streams. 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. Additional measurements, including stream width, are available for each erosion point in the associated database.

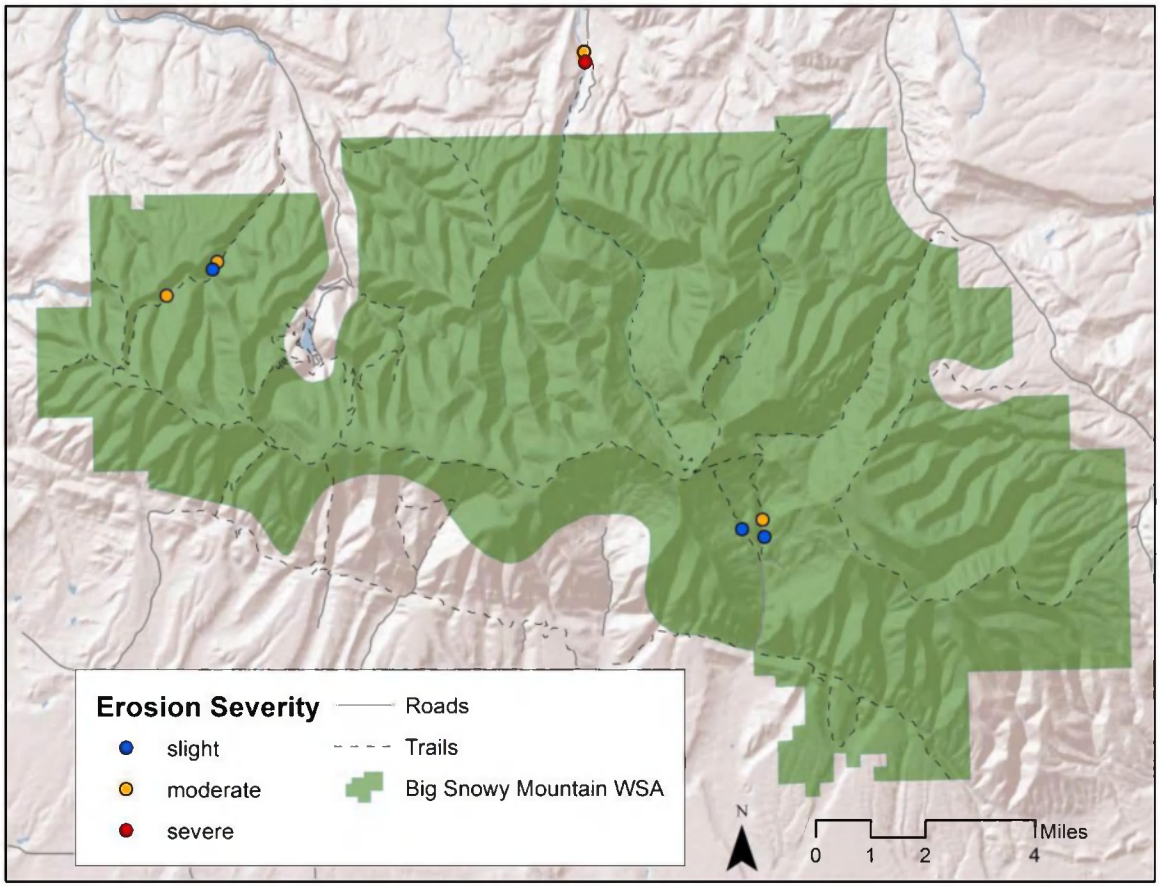



**Figure 15. Location of erosion sites encountered and severity of erosion (all were streams).**

## 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, campsites, shelters, etc. 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, corral, dam, repeater, fence, old mine, old cabin, lookout, pole stash, cairn, or hitch rail. Photos were taken of all reported developments and are available upon request.

### *Development Type*

A total of 48 installations and developments were reported, 36 within the WSA boundary (Figures 16 and 17). Cairns and fences were most common (44% and 21%, respectively), but two latrines, a corral, bridge, and hitching post were also observed. An additional 5 developments were classified as "other", including a bench, water pipe, well, abandoned trailer, and swimming hole.

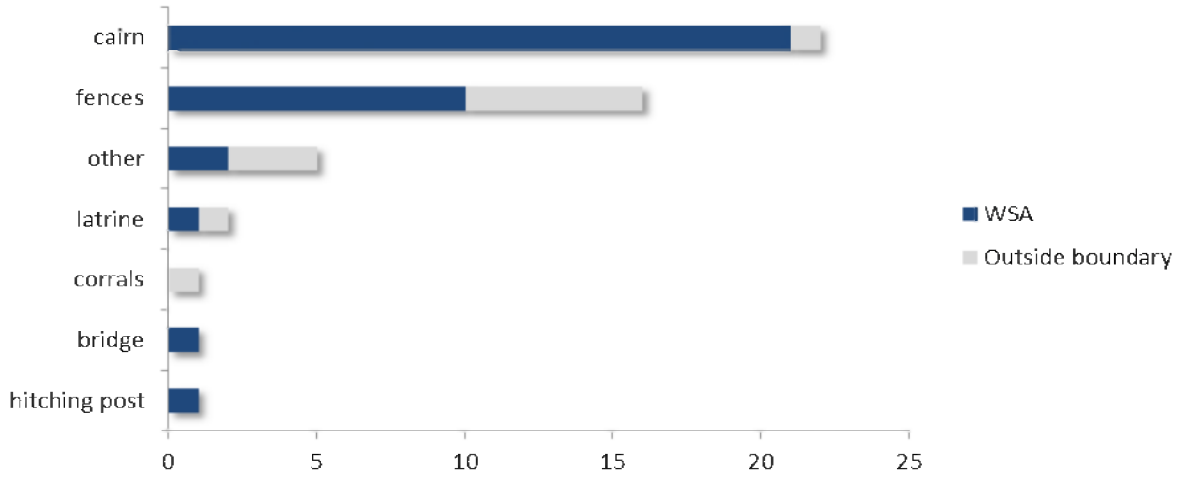



**Figure 16. Number of installations and developments by type.**

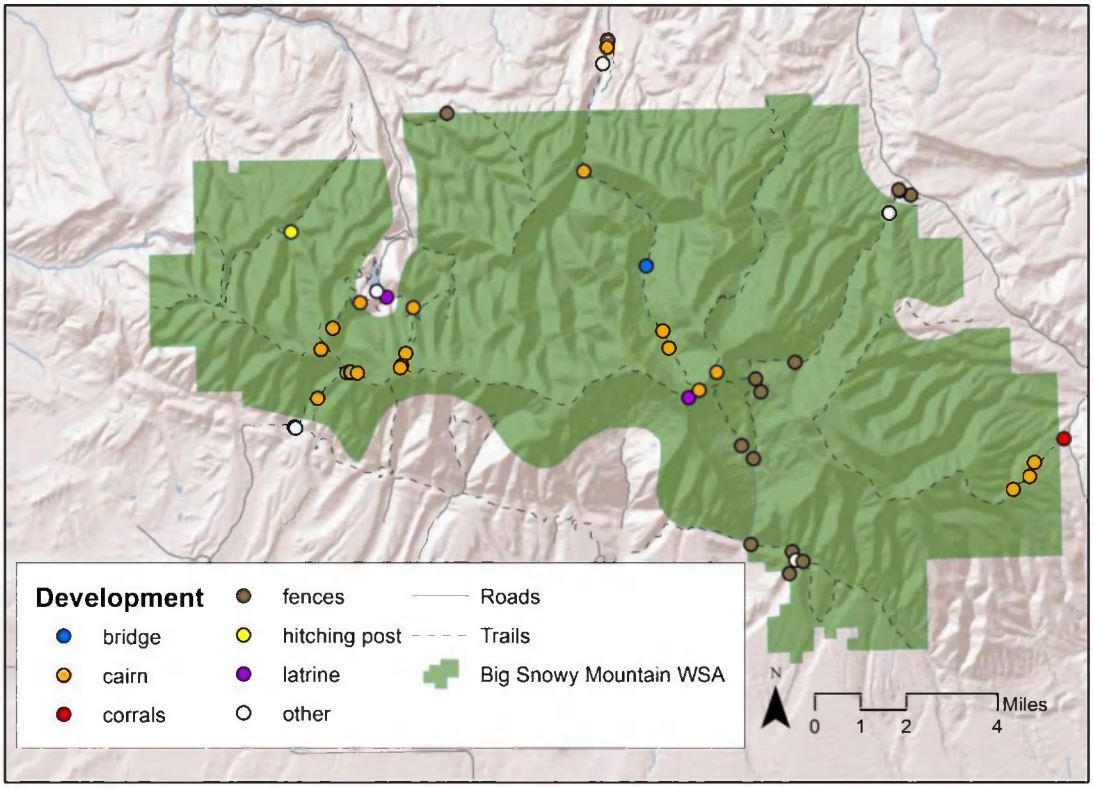



**Figure 17. Locations and types of installations and developments.**

## Mine Prospects

There was no documented evidence of mining activity along monitored trails.

## Signs

All signs were noted by type and condition. Sign types included: trail junction, interpretive, snowmobile marker, and recreational use sign (i.e. allowable uses/closures). Sign condition was categorized as: vandalized-legible, vandalized-illegible, missing (post with no sign), faded-illegible, faded-legible, or good condition. Signs with words were photographed for reference (digital files of sign photographs are available upon request).

### *Sign Type and Condition*

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 remaining 20% of signs classified as "other" included boundary and private property signs, closure notices, survey markers, and temporary flagging. Most signs (65%) were in good condition, while 16% were faded-legible, 5% faded-illegible, 2% vandalized-legible, 2% vandalized-illegible, and 5% missing. Figures 18 and 19 numerically and spatially depict these attributes.

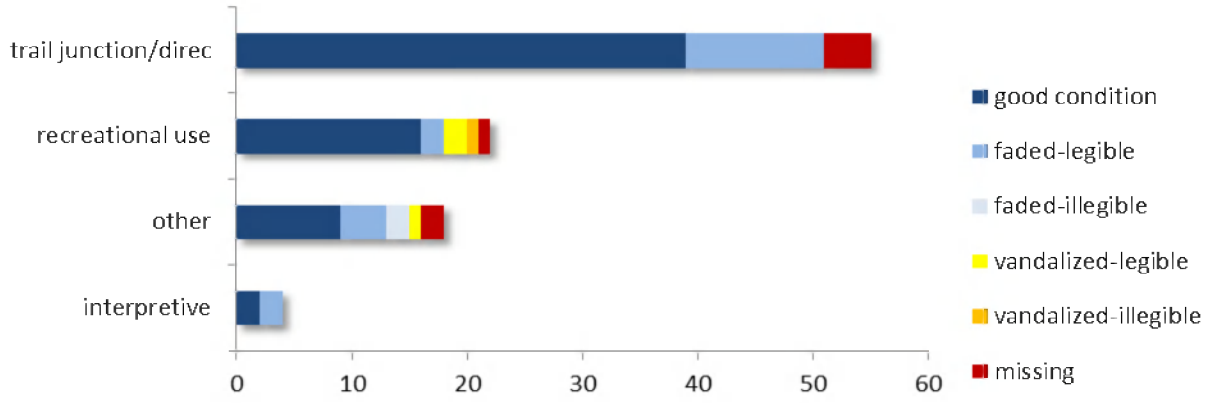



**Figure 18. Number of signs by type and condition.**

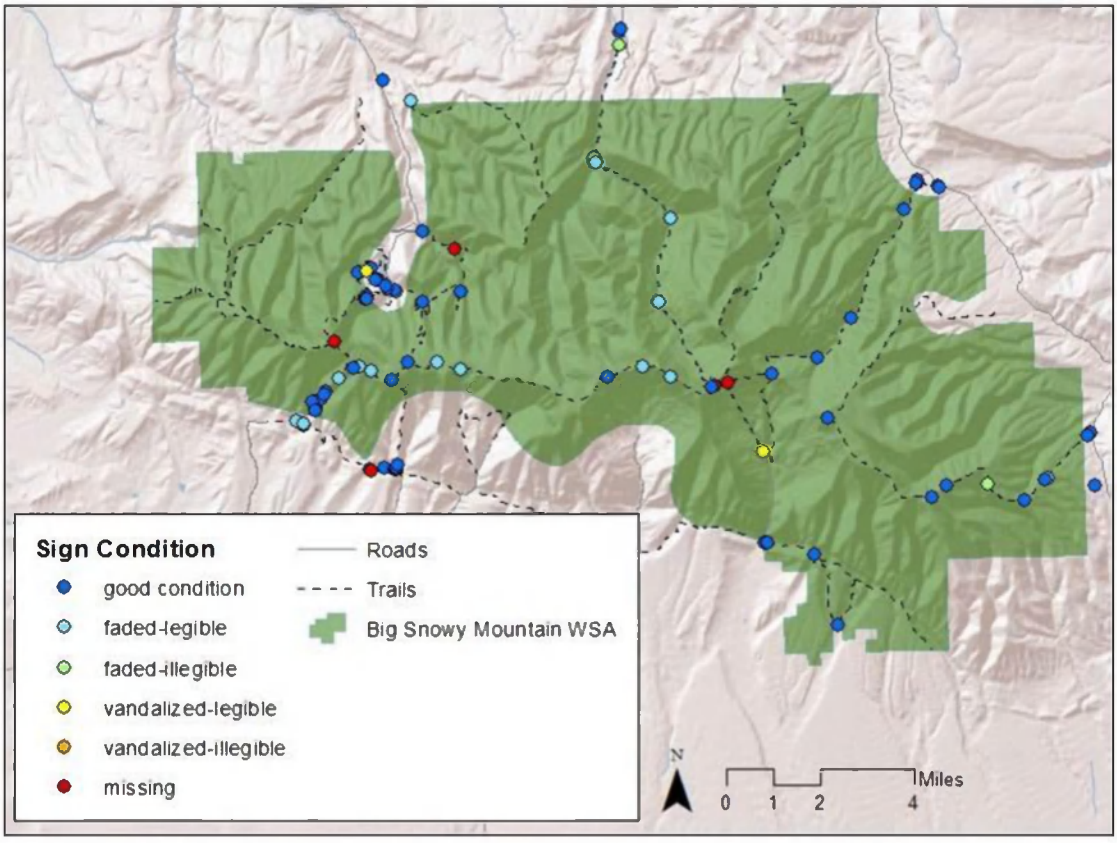



**Figure 19. Location and condition of signs.**

## 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.

# 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 WSA, and campsite characteristics and impacts.

## Trail Width

Trail conditions were recorded for all trails leading into and within the WSA. Observations were made documenting places on trails where recreational use appeared to be impacting trail conditions. Certain portions of system trails were historic roadbeds (depicted on quads and selectively on forest visitor maps, but not on current Forest Service GIS layers), with trail widths that varied from the expected single track conditions. Field crews did not record deviations from single-track trails when the original trail structure was double-track or an old road bed, noting only places where recreational use appeared responsible for deviations from the underlying trail structure. When possible, the length of impacted trail was measured from point and line data recorded in the field. Trail lengths reported represent minimum distances, since locations of impacted trail were incomplete due to missing finish point data, and several records noted that trail conditions extended far beyond recorded trail section (see bullets, below; also see additional trail condition details provided in qualitative trail data summarized in Appendix 2).

### *Trail Width*

A total of 2.1 miles of impacted trails were recorded, representing 2% of all system trails monitored. An additional 4 locations of trail impacts were documented as points. Most impacted trails (94%) were within the WSA. Double tracks accounted for 59% of impacted trail locations, braiding was recorded at 37% of locations. A single old road bed was documented on the Jump Off Peak trail (#406). Figure 20 shows the location of impacted trails.

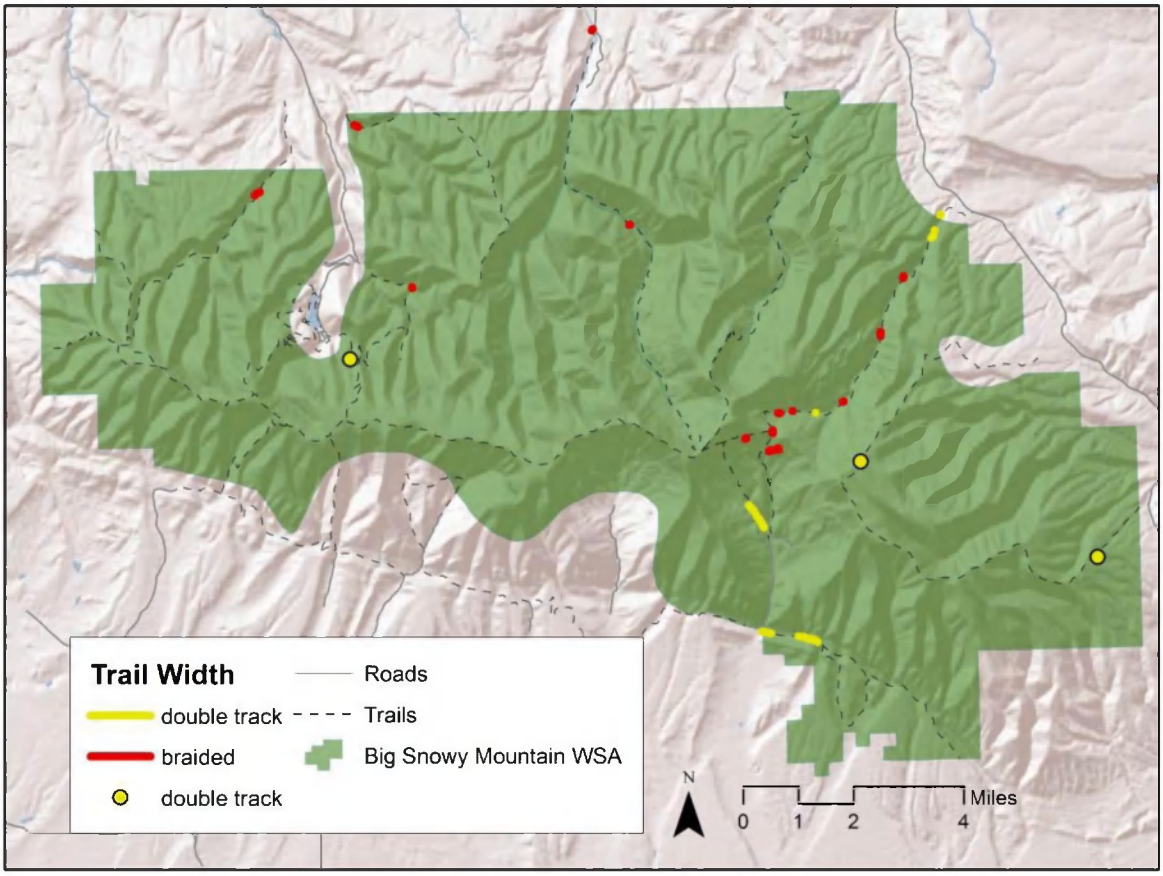



**Figure 20. Trail width by category (lines represent sections of impacted trails, while points are specific locations of impact). All other trails were single track.**

## Evidence of Mechanized and Motorized Use on Trails

Wilderness character monitoring protocols (Landres et al., 2008) were designed for use in Wilderness Areas, where recreational motorized or mechanized vehicle use is prohibited. The Wilderness Institute added this attribute to record motorized or mechanized use in Wilderness Study Areas in Montana (where motorized and mechanized use may be permitted on designated trails). 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 WSA. This measure cannot account for the timing of use, and therefore does not include violations of daily restrictions or use after seasonal closure dates.

Amount of evidence was subject to trail conditions, and locating the start and/or finish of tracks was not always possible. Therefore this measure represents a minimum measure of use, since in some cases access may have occurred via adjacent trails but was not documented.

### *Type of Mechanized or Motorized Tracks*

Evidence of mechanized and motorized use on trails was recorded at 11 locations, 8 within the WSA. All roads and trails within the WSA boundary are closed to motorized use, therefore any vehicle and/or ATV use is in violation of the Lewis & Clark National Forest designation (36 CFR 261.13). Evidence of ATV use was observed at 6 locations, including near the Crystal Lake trailhead on the Uhlhorn trail (#493), the Big Snowy trail (#650), the Swimming Woman trails (#627 and 627-A) and at the beginning of the Southside trail (#652). Evidence of mountain bike use was noted at 4 locations, including the Grand View (#403), and the east end of Uhlhorn (#493). A truck was sighted on the Sleeping Woman Alt trail (#627-A), approximately 250 m beyond the barrier on USFS road #8954. Outside the WSA, evidence of ATV and bicycle use was observed on the East Fork Cottonwood Creek (#489), and a bicycle on the Neil Connection trail (#653). Findings are summarized in Table 2, and Figure 21 shows locations where evidence of use was noted. Please note that the southeastern portion of the WSA was incompletely surveyed, in part due to the extensive networks of user-created ATV trails stemming from #652 and #671. Please see Appendix 2 for additional evidence of motorized use not quantified by monitoring.

**Table 2. Evidence of mechanized and motorized use (indirect evidence for all but vehicle siting).**

| Evidence | WSA | Outside Boundary |
|---|---|---|
| Bicycle | 2 | 2 |
| ATV | 5 | 1 |
| Vehicle | 1 | 0 |
| **Total** | **8** | **3** |

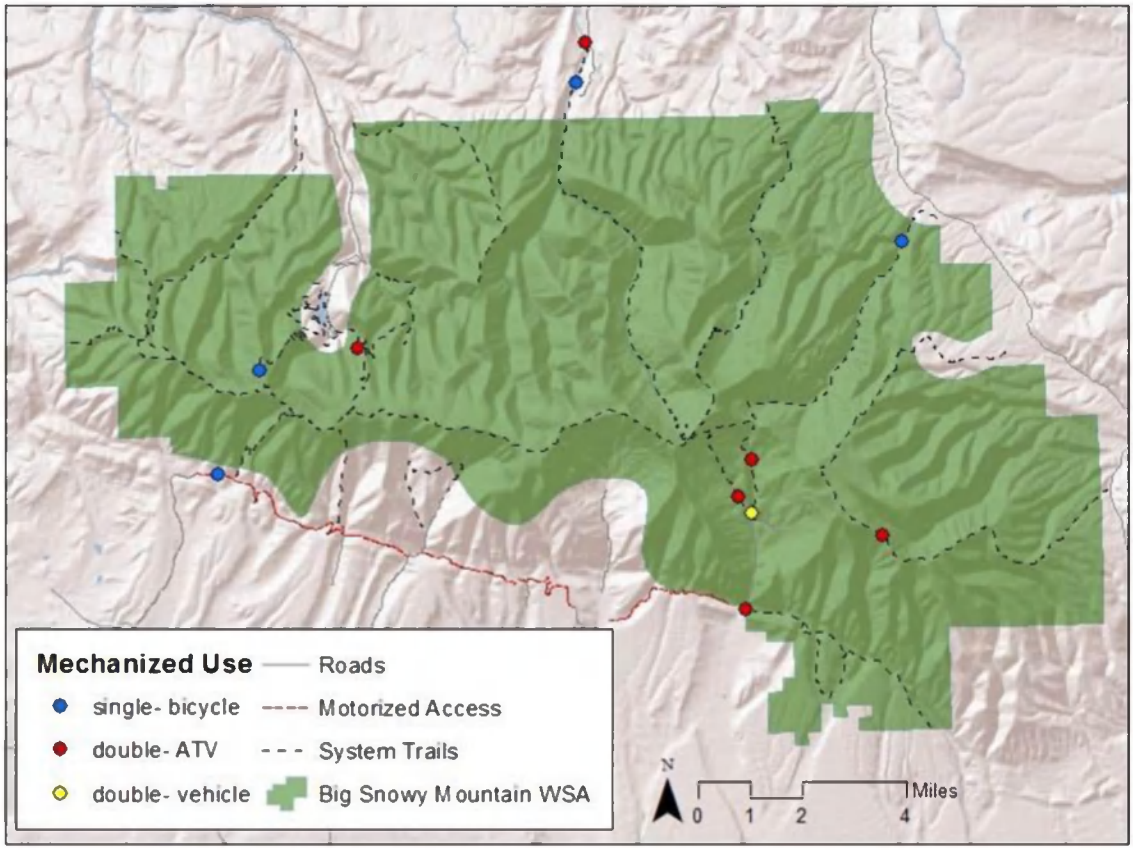



**Figure 21. Location of evidence of mechanized and motorized use by type.**

## 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 length of non-system trails was mapped to the trail end, or as far as time constraints allowed.

### *Non-system Trail Type, Origin, and Monitoring Status*

A total of 11 NSTs or trail fragments covering 1.5 miles were mapped in the field (Figures 22 and 23). The majority (76%) of these were within the WSA. Six NSTs were used for foot travel (0.9 miles total), 2 were associated with ATV/UTV use (0.6 miles total), and 3 were unclear (0.02 miles total; Figure 23). NST origin was reported as an old route (45%) or newly created by recreation (18%), with 4 trails unclassified. The two ATV/UTV trails extended from the Bad Canyon trail (#671) to private properties at the southeast corner of the WSA. Two of the foot travel trails cut switchbacks on Grand View trail (#403). The purpose of remaining trails was uncertain.

Time constraints in the field limited complete surveying of the non-system trails. Of the 11 new trails located, 7 (64%) did not have their entire lengths measured (Figure 23). Effort was focused on well-developed trails which ranged in length from 0.2 to 0.7 miles. The longest of these extended from Dry Pole Creek trail (#481) up a tributary to an unknown destination. Please note that an extensive network of ATV trails criss-crossed #652 in the southeast portion of the WSA, making it arduous to monitor and difficult to distinguish between system and user-created trails. Many of these NSTs are not included in data presentation here (but please see Appendix 2 for qualitative description of NSTs in this area).

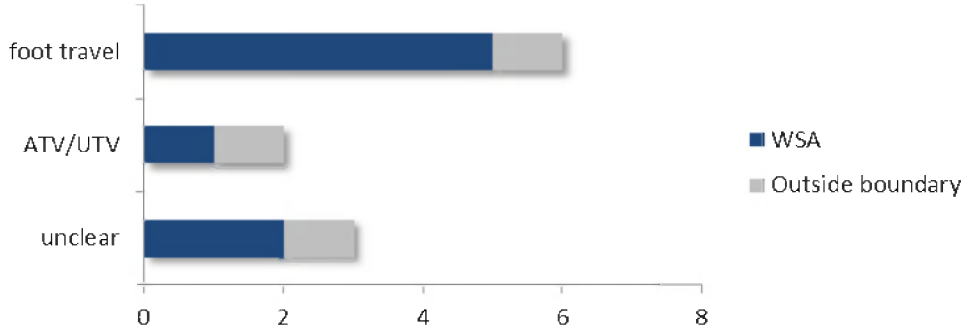



**Figure 22. Number of non-system trails by trail type and location.**

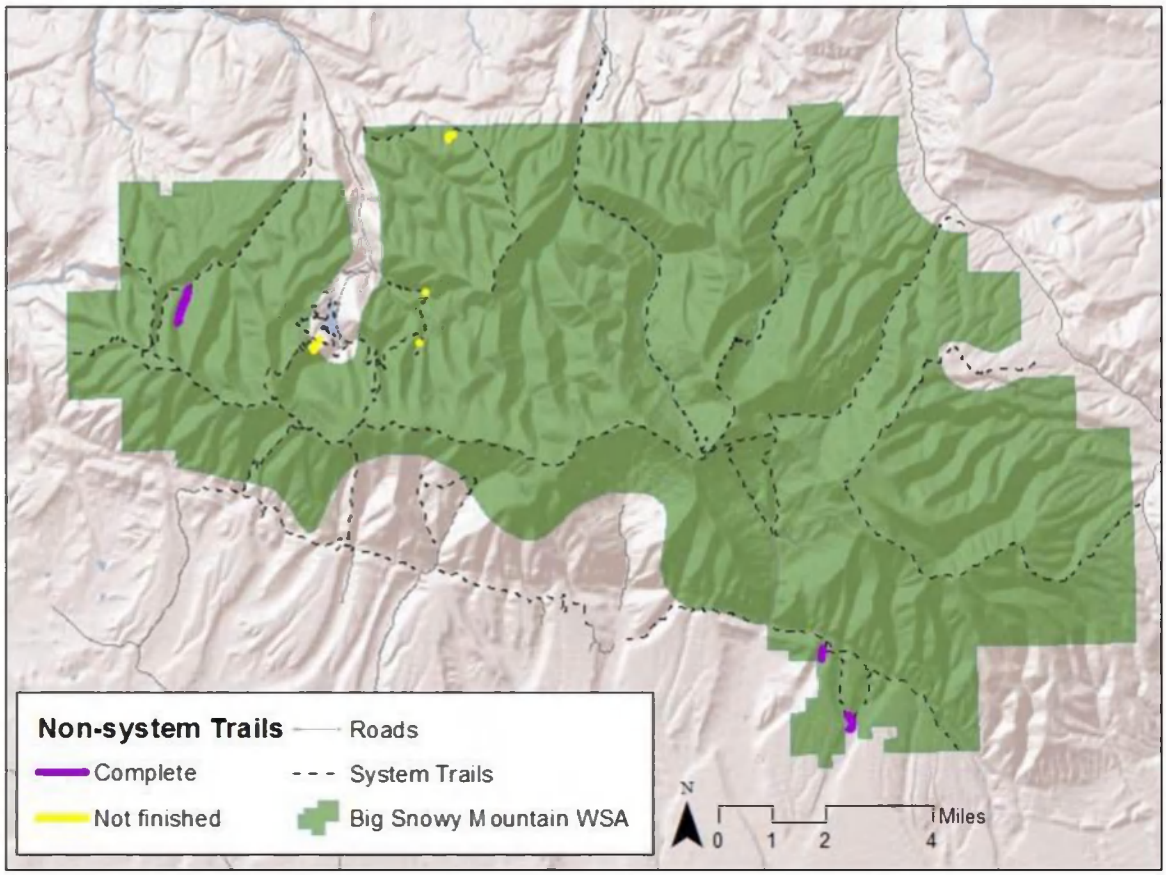



**Figure 23. Locations of non-system trails and monitoring status (e.g. complete or not finished).**

## Trailheads

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

### *Vehicles and Trailers at Trailhead*

Information on recreation use was recorded for 5 trailheads (Table 3). Vehicles occurred at 4 (80%) of visited trailheads, excluding the van used by the field team. The highest vehicle numbers were documented at Crystal Cascades (#445) and Half Moon Creek (#493) trailheads. The only horse trailer was observed at Half Moon Creek (#493). No ORV trailers were observed at any trailheads during the monitoring period. Trailhead use is variable and influenced by time of day and week. All vehicles were observed on either a Saturday or Sunday in July or August. These numbers are based on a single count, and therefore do not necessarily reflect use across the season.

**Table 3. Summary of vehicles at trailheads.**

| Trail # | Trailhead Name | Date Visited | Vehicles | Horse Trailers | ORV Trailers |
|---|---|---|---|---|---|
| 445 | Crystal Cascades | 8/3/2012 | 3 | - | - |
| 493 | Crystal Lake | 8/5/2012 | 0 | - | - |
| 489 | Cottonwood Creek | 7/20/2012 | 1 | - | - |
| 493 | Half Moon Creek (Jct Rd 238) | 7/20/2012 | 3 | 1 | - |
| 650 | Red Hill (Jct Rd 238) | 8/10/2012 | 1 | - | - |

## Encounters with People

Encounters with people on trails were recorded during a single-pass survey of all monitored trails. Both the number of people and the type of activity (hiker/backpacker, mountain bike, horse, ATV, motorbike, UTVs, or Forest Service staff) were documented.

### *Activity Type and Number*

A total of 13 separate encounters (e.g. groups) were recorded, totaling 27 people. The majority (81%) were hiker/backpackers. Most groups consisted of 2 or fewer people (85%), but a group of 4 day hikers was encountered on the east end of the Uhlhorn trail (#493), and 3 overnight backpackers were encountered on the West Peak trail (#490). Three USFS hydrologists were documented outside the WSA on the East Fork Cottonwood Creek trail (#489), and a single group of 2 horse riders were encountered on the Uhlhorn trail (#490). Most encounters occurred on the east end of the Uhlhorn trail and near the Crystal Lakes area, with no people encountered on most trails monitored. Findings are summarized in Table 4 and Figure 24.

**Table 4. Number of people encountered on trails by recreational activity.**

| Activity | Number of Groups | Total People | Total Horse/ Pack Stock |
|---|---|---|---|
| hiker/backpacker | 10 | 22 | 0 |
| horse packers | 1 | 2 | 2 |
| forest service staff | 2 | 3 | 0 |
| **Total** | **13** | **27** | **2** |

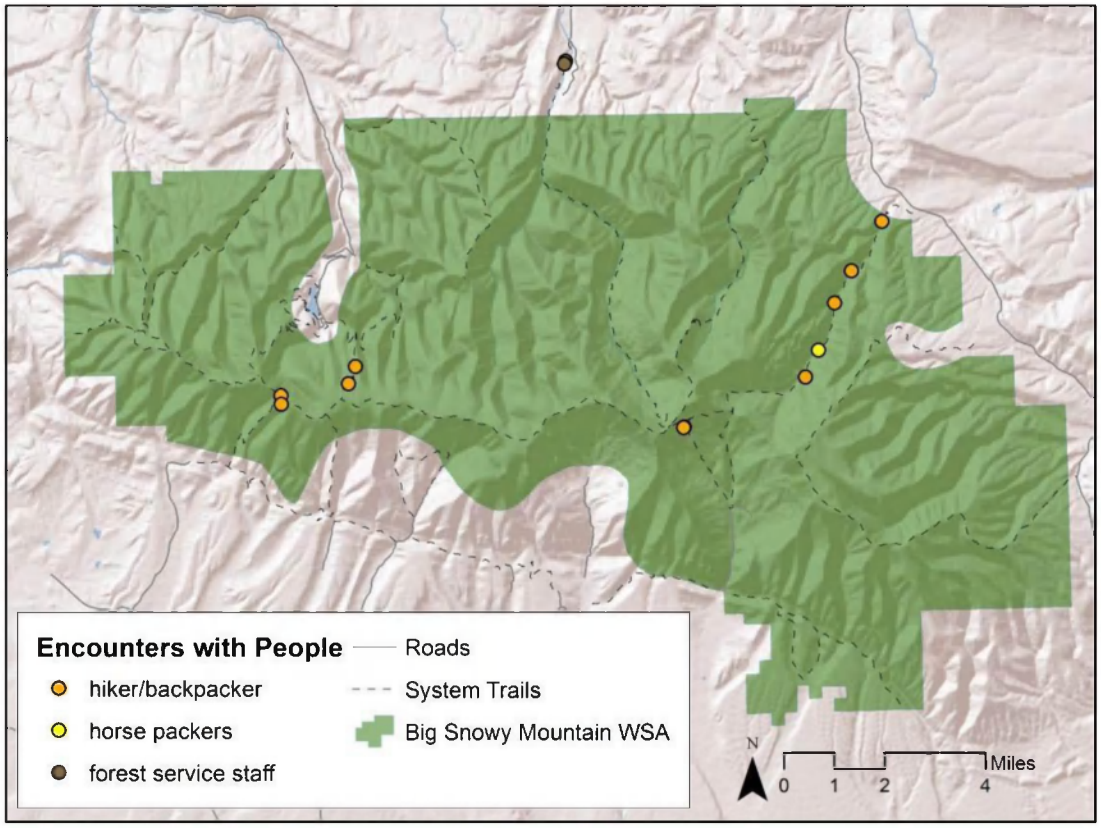



**Figure 24. Location of encounters with people along trails.**

## 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 within the WSA were also recorded. During sampling sessions, the duration of noise was recorded in seconds, 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.

### *Duration, Intensity and Visual Confirmation of 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 sessions. The majority of noises heard were airplanes (81%), followed by cows (13%), and a single intrusion by people. Mean duration of noise intrusion was longest for cows (8.0 min), with only 1.4 minutes by airplanes, and 0.8 minutes by people (Figure 25a). Average duration of noise intrusions were longest during evening sampling sessions (3.9 min), followed by morning (0.6 min), and midday (0.3 min; Figure 25b). A single evening session included 15 minutes of variable intensity cow noise heard from Knife Blade Ridge on trail #493. The majority of noise intrusions were barely audible (44%), followed by variable (31%), and 19% were heard clearly. No noise intrusions detected during sample sessions were considered "loud and close." Visual confirmation was recorded for 25% of noise intrusions.

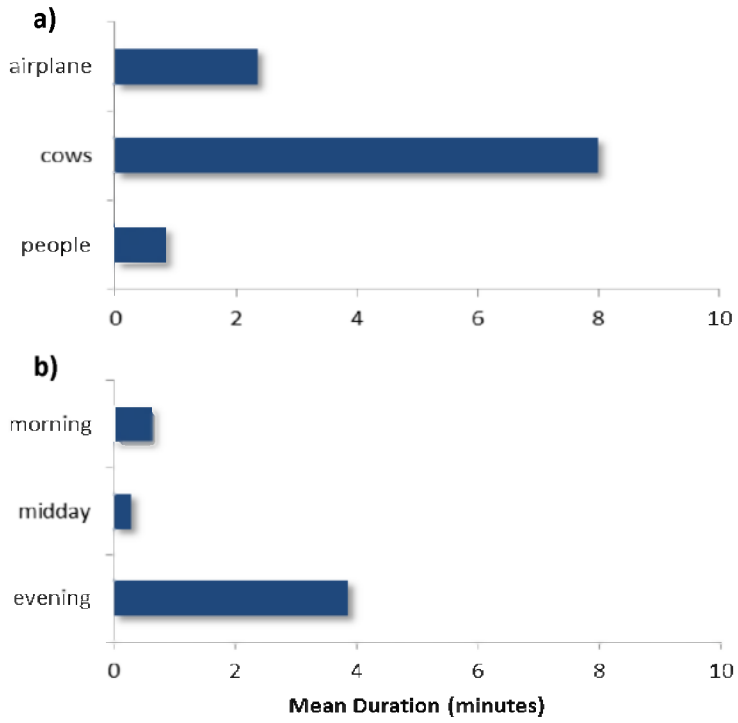



**Figure 25. Mean duration of noise intrusions by a) source, and b) time of day. Note: results depict noise intrusions only from standardized sampling sessions.**

Outside of noise sampling sessions, an additional 206 noise intrusions were recorded within the WSA boundary during trail monitoring. The majority were airplane noise (99%), with a single helicopter and chainsaw documented. Visual confirmation was not possible for 148 detections, so the source of these noises was based on auditory identification only. All recorded noise intrusions lasted for 5 minutes or less, with 45% under a minute in duration. The helicopter and four airplanes were loud and close, and the remaining were either heard clearly (62%) or barely audible (33%). Noise intrusions were distributed throughout the WSA (Figure 26).

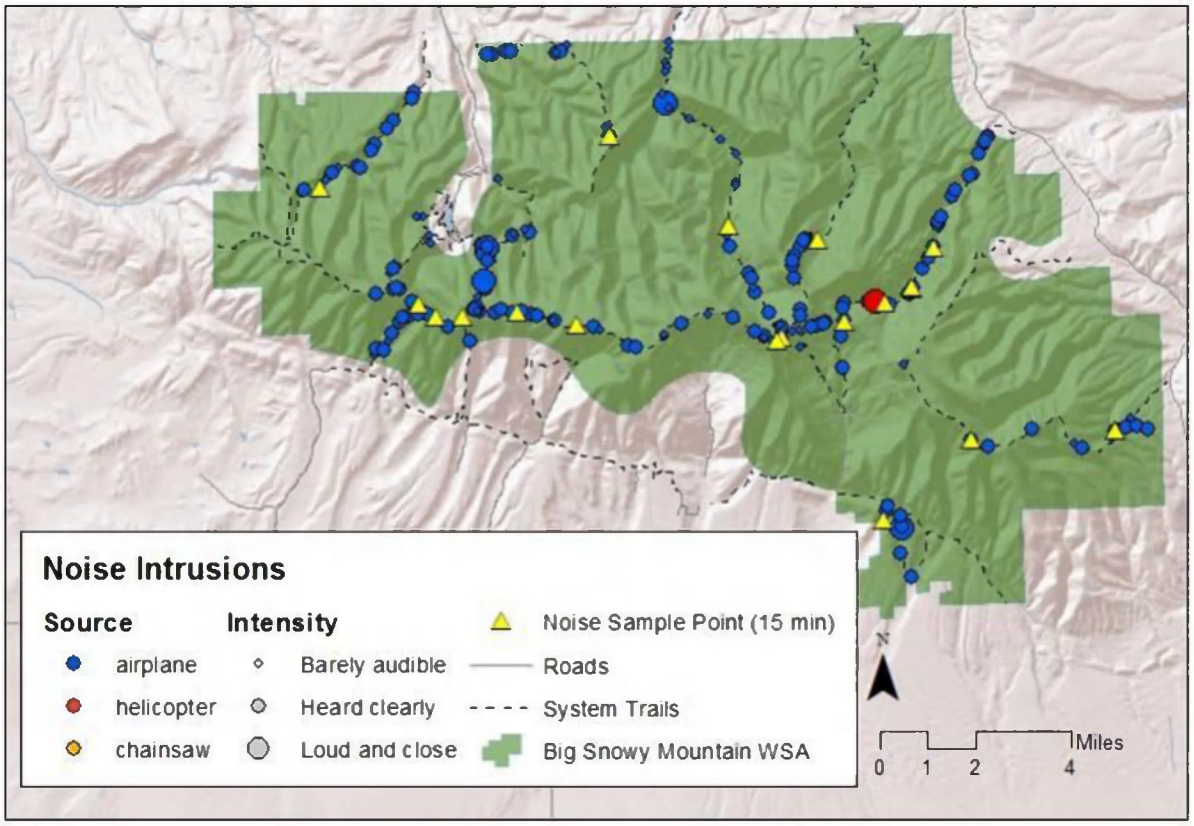



**Figure 26. Location, source, and intensity of all opportunistic noise intrusions heard within the WSA.**

## Visual Intrusions

Human development that was visible from within the Wilderness Study Area (but is outside the WSA) 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*

Thirteen visual intrusions were observed from within the WSA, including cities or towns (38%), agriculture (23%), buildings (15%), and highways (15%). The only "other" visible intrusion was a wind farm. Visual intrusions were primarily limited to trails traversing the spine of the mountains (e.g. #493 and #653). This data is shown in Table 5 and Figure 27.

**Table 5. Summary of visual intrusions by type.**

| Type | No. |
|---|---|
| buildings | 2 |
| cities/towns | 5 |
| highways | 2 |
| rural/agricultural | 3 |
| other | 1 |
| **Total** | **13** |

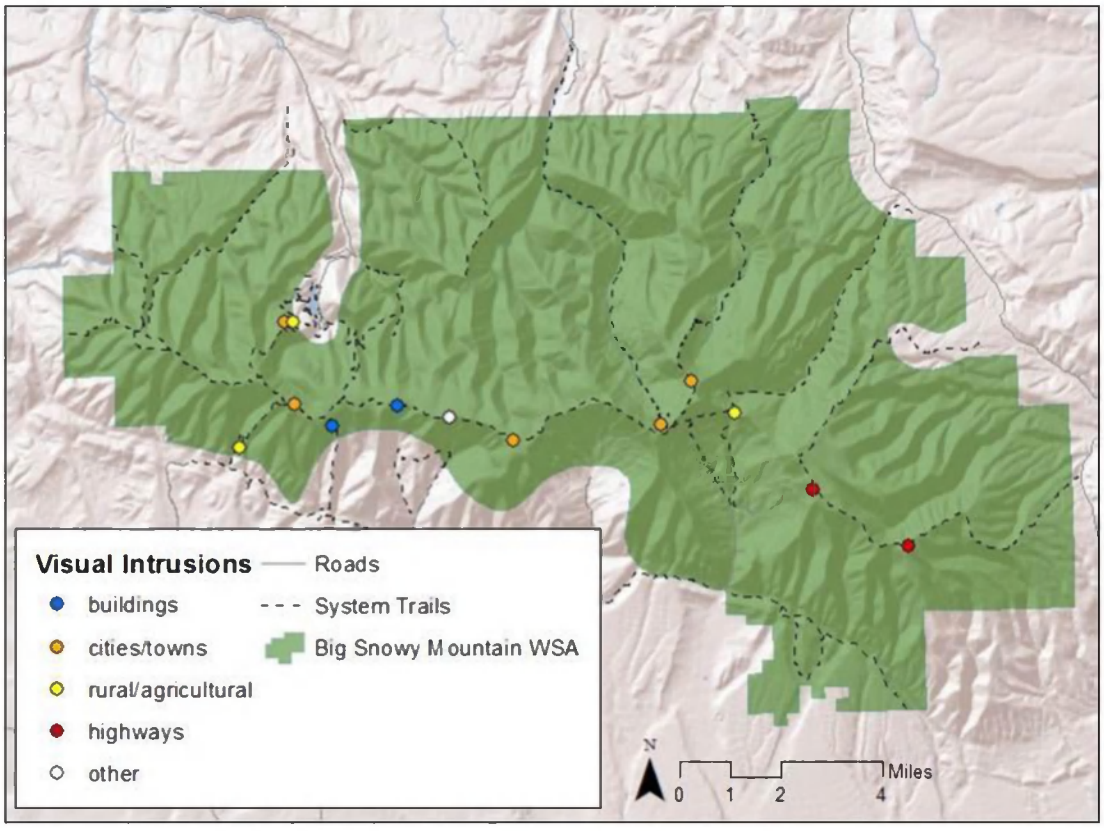



**Figure 27. Visual intrusions by type seen from within the WSA.**

## 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 Appendix 4). Human impacts at each campsite were evaluated based on 1) vegetative loss, 2) mineral soil exposure, 3) damage to trees, 4) number of trees with exposed roots, 5) the type and number of developments, 6) cleanliness, 7) the number of social trails, 8) camp area, and 9) barren core camp area. For each campsite, the ratings assigned to individual impact attributes were combined to generate a summary impact index score (see Appendix 4). To provide an ecological context for campsite conditions, information on campsite location and habitat associations was also collected. Here, we briefly summarize impact evaluation and ecological associations. For individual campsite attribute measures and photographs, see Appendix 3.

### *Impact Evaluation*

A total of 19 campsites were recorded, all of which were inside the WSA (Figure 28). Most campsites (74%) were located on the Uhlhorn trail (#493), with four clustered on Knife Blade Ridge near the junction with East Fork Cottonwood Creek trail (#48).

Based on the summary impact evaluation scores, 42% of campsites were minimally impacted, 53% were moderately impacted, and one site was highly impacted (Table 6). Six campsites were missing data for one or more impact attribute. For these campsites an impact evaluation score was calculated using data averages for any missing values. The most highly impacted campsite was located midway up the East Fork of Cottonwood Creek trail (#489). Vegetation loss and soil exposure were ranked as highly impacted more often than any other condition attribute (Figure 29).

**Table 6. Number of campsites by impact evaluation score class.**

| Impact Index Score Class | Impact Index Score Range | Number of Campsites |
|---|---|---|
| Minimum | ≤23 | 8 |
| Moderate | 24-34 | 10 |
| High | 35-44 | 1 |
| **Total** | | **19** |

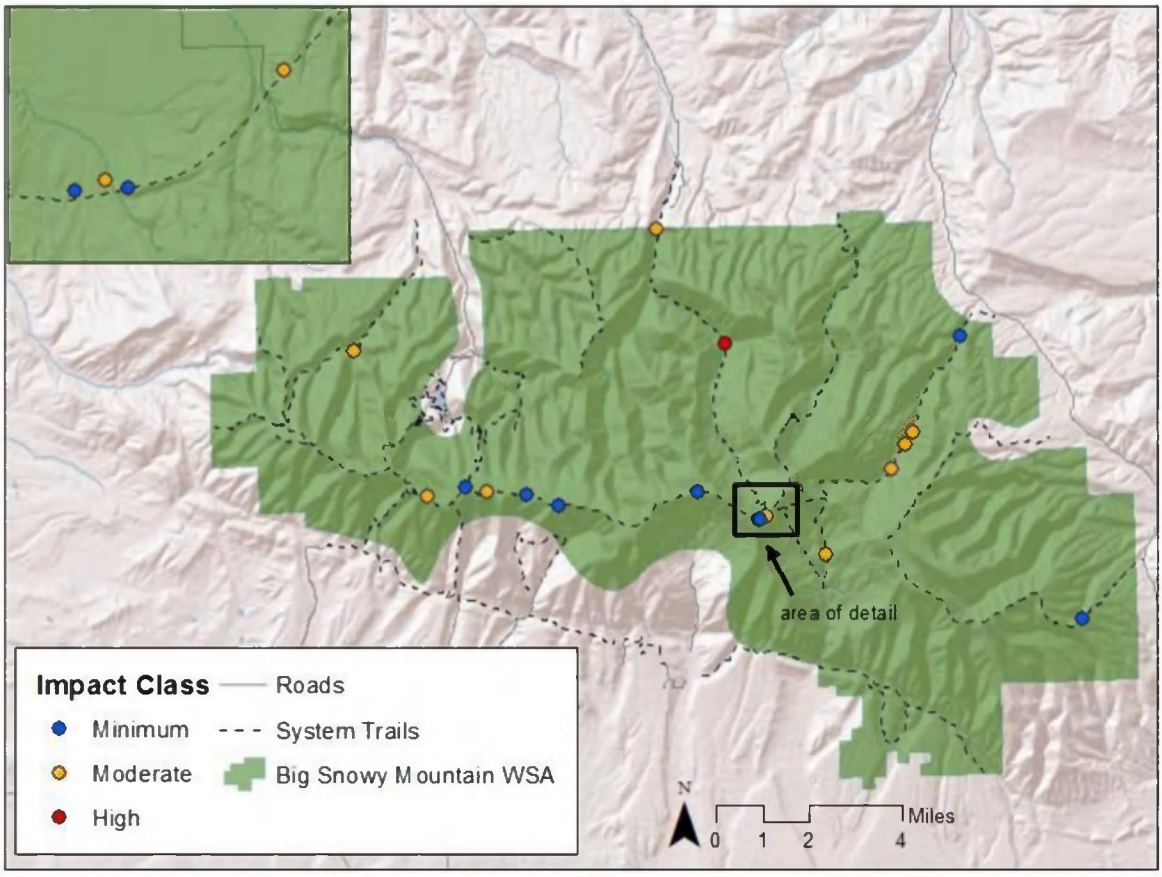



**Figure 28. Location and impact class of campsites (area of detail shows cluster of campsites on Knife Blade Ridge).**

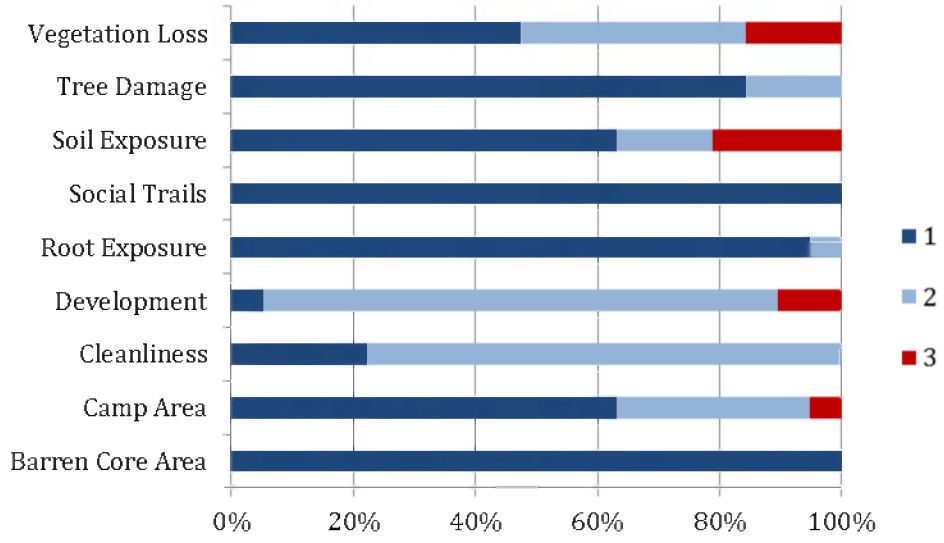



**Figure 29. Proportion of campsites with impact ranking of 1=low, 2=moderate, or 3=high for each impact attribute (shows the relative contribution of each attribute).**

***Location***

The majority of campsites were associated with streams or saddles/ridgelines (42% and 37%, respectively), followed by forests (11%). One campsite was located inside Devil's Chute cave. Campsite-specific ecological attributes are detailed in Appendix 3.

Campsite location and landform was associated with the level of impact observed (Figure 30). The majority of campsites with moderate or high impact scores (64%) were <200 feet from water and were located along streams.

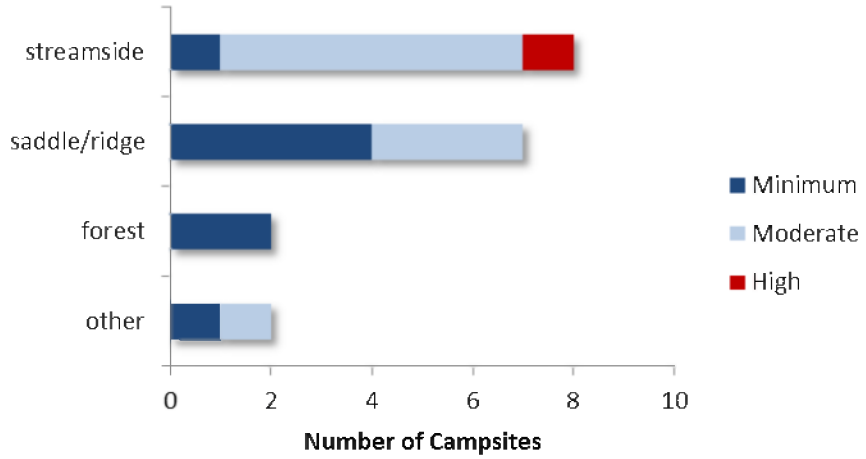



**Figure 30. Number of campsites by landform category and impact class.**

## V. FOREST SPECIFIC ATTRIBUTES

No forest specific attributes, such as sensitive plant species, were recorded within the WSA.

# LITERATURE CITED

ESRI. 2010. ArcGIS software version 10.0. Redlands, CA.

Gesch, D.B., 2007, The National Elevation Dataset, in Maune, D., ed., Digital Elevation Model Technologies and Applications: The DEM Users Manual, 2nd Edition: Bethesda, Maryland, American Society for Photogrammetry and Remote Sensing, p. 99-118.

Landres, Peter; Barns, Chris; Dennis, John G.; Devine, Tim; Geissler, Paul; McCasland, Curtis S.; Merigliano, Linda; Seastrand, Justin; Swain, Ralph. 2008. Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation

System. Gen. Tech. Rep. RMRS-GTR-212. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 77 p.

Pfister, Robert D.; Kovalchik, Bernard L.; Arno, Stephen F.; Presby, Richard C. 1977. Forest habitat types of Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report, INT-34. 174 p.

Trimble Navigation Limited. 2009. Trimble Pathfinder software version 4.20. Westminster, CO.

Wilderness Act. 1964. Public Law 88-577.

APPENDIX 1. MONITORING ATTRIBUTES

List of monitoring attributes recorded in the field in 2012. 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_Width | 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_Treecov | Estimate of % treecover 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_Actions | Action taken to manage infestation |
| 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 groups: Trail Width Point

| | |
|---|---|
| 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 | Age and source of non-system trail |
| Nst_Finish | Non system trail surveyed to its end or not |
| Nst_Notes | Additional notes |

Attribute group: Campsite Point

| | |
|---|---|
| Camp_Landform | Associated landform (e.g. lakeshore, streamside, meadow) |
| Camp_Area | Area class in square feet |
| Camp_Traildist | Distance from trail |
| Camp_Waterdist | Distance from nearest water |
| Camp_Campdist | Distance from adjacent campsites |
| Camp_TreeDam | Rating of tree damage (see detailed protocols) |
| Camp_RootExp | Number of trees with exposed/damaged roots in campsite |
| Camp_Develop | Level of development observed within and around campsite |
| Camp_Clean | Level of cleanliness observed within and around campsite |
| Camp_Trails | Number of social trails observed within and around campsite |
| Camp_Barren | Barren area estimate within and around campsite |
| Camp_VegCover | Estimate of ground cover canopy coverage on core area |

| | |
|---|---|
| Camp_MinExp | Estimate of exposed mineral soil in core area |
| Camp_VegCoverOffsite | Offsite estimate of ground cover canopy coverage |
| Camp_MinExpOffsite | Offsite estimate of exposed mineral soil |
| Camp_Photo1/2 | Photo number 1/2 |
| Camp_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_ORVNumber | Total number of ORV 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_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_Photo | Photograph |
| VI_Notes | Additional notes |

## V. FOREST SPECIFIC ATTRIBUTES

Attribute group: Sensitive Plant Species

| | |
|---|---|
| Sensitive_Name | Species name of plant identified |
| Sensitive_Pop | Population size class |
| Sensitive_Photo | Photograph |
| Sensitive _Notes | Additional notes |

## 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, moving west to east across the Big Snowy Mountains WSA, and includes notes on trail conditions, weed distributions, and other observations that provide additional context to monitoring data collected.

Trail #481 (Dry Pole Creek): This trail originates on private property, and trail conditions suggest heavy use by cows. About 3.5 miles south of Simmental Ranch, the trail dissolves and does not appear to connect to the ridge.

Trail #483: This trail originates on private property and was not monitored.

Trail #490 (Knifeblade Ridge, west half to #493 junction): No additional information available.

Trail #403 (Crystal Lake National Recreation Trail): This trail leaves #404, gradually ascends Woodchopper Ridge where it intersects with #490. #403 is very well signed and showed no evidence of motorized use or invasive weeds. A couple of non-system trails either cut the switchbacks or simply faded out after a short distance. #403 appears to get a good amount of use.

Trail #404 (Crystal Lake Loop): No additional information available.

Trail #406 (Green Pole Canyon and Lime Cave Peak): #406 begins at a parking area along forest service road 275 and cuts through private property before crossing the forest boundary. The private property is used for grazing; the section of trail through the cow pastures is very muddy and convoluted by cow trails. Even when the trail dips back into wooded areas, evidence of cows is apparent. We found Houndstongue and Canada Thistle in the meadows, tapering off in wooded areas. A cross-country ski loop along this trail is well-signed with orange markers. Without public access, evidence suggests minimal use; coupled with the presence of cows, this trail is hard to follow. After gaining some elevation, this trail intersects with old FS road 8836. Although a double track on the map, 8836 is effectively a single track. It stays high in elevation, cutting through rocky meadows and a large burn area with many downed trees. #406 continues to Lime Cave Peak, but not beyond to Jump Off Peak (as indicated on trail map).

#654 (Neil Creek) and West Fork Blake Creek: This trail has been re-routed to start at Neil Creek. The old route follows the West Fork of Blake Creek for a couple of miles through a thick riparian zone where most of the trail tread has been washed out or overgrown. The trail turns west and goes up to the ridge directly south of the ice cave. The trail climbs very steeply along the spine of this ridge and is crisscrossed by the newer, more hiker friendly Neil Creek route. It seems that this trail gets very little use and the tread is disappearing, although the route is easy to follow using blazes. There are many downed trees along the entire route, and extensive evidence of cattle-grazing and Houndstongue along the trail throughout the drainage.

#655: (East Fork Blake Creek): This trail is not shown on the forest map but does appear on the quads. It turns north from #653 and gains the ridge quickly and steeply. The trail is posted as open to motorbikes and we saw evidence of motorbike use along this steep and rocky trail. This trail is very well signed and easy to follow. We saw no evidence of weeds.

#445/445A (Crystal Cascades): Trail #445 starts off of the Crystal Lake road with a good trailhead with an outhouse. This trail was in good condition and with recently cleared downed trees. There was a section

about two miles up where the trail seemed to exist on both sides of the creek for about a quarter mile. #445 was well-signed with signs in good condition and few weeds. Trail #445A seemed to be in good condition for the first hundred yards or so but was not hiked to its terminus due to time constraints.

#493 (Half Moon Canyon, Woodchopper Ridge, down to Crystal Lake): This trail begins at the newly created Ulhorn trailhead off Red Hill Road (which is not on forest maps or quads). The old trailhead (about ¼ mile north on Red Hill Road) is on private property (Half Moon Ranch). The first couple of trail miles along the dry streambed of Half Moon Creek, are quite torn up due to work being done by the Half Moon Ranch. At the time of this work, they were repairing a water pipe damaged in floods two years ago. This pipe is buried underground and carries water across Red Hill Road to the ranch. The trail shows evidence of machinery being used to repair the pipe. Additionally, much of the trail had been washed out, and the newly rerouted trail is marked with flagging and crosses the creek ~10 times. There is some Houndstongue along the first mile of trail, and a good deal of Canada Thistle in the open areas along the first five miles of trail. The weeds disappear once the trail begins climbing to Half Moon Pass. The trail is easy to follow from the pass, where it ascends Woodchopper Ridge and traverses west until the junction with #490. The trail along the ridge is weed-free and marked with large cairns. At the #490 junction, the trail cuts down on the north side of the ridge and returns to the Crystal Lake campground. This section of trail is well-signed, easy to follow, weed-free, and appears to get a good amount of use.

#489 (Cottonwood Creek): Portions of the road to the Cottonwood Creek trailhead are washed out, but passable by taking the eastern most route. The double-track trail is on private property for the first quarter mile but turns to a single-track once on Forest Service land. #489 is hard to follow and totally washed out for the first three miles. Cairns mark the general route along the creek bottom but the severe recent flooding makes this trail difficult to follow. After about 3 miles the trail continues up the Cottonwood Creek drainage and is more identifiable but there are numerous downed logs and creek crossings along the trail. About 6 miles from the trailhead there was a severe landslide that completely wiped out the trail for about a quarter mile along a steep slope. This section of trail was very difficult to traverse due to piles of trees and dirt. After the landslide the trail is a little easier to follow but missing blazes and unworn tread make it easy to get off track. From the switchbacks to the top of the ridge the trail is in good condition aside from some large downed trees. There was a lot of Canada thistle in the entire Cottonwood Creek drainage, especially near water seeps and springs.

#410 (East Fork Big Creek): This trail virtually disappears approximately 3 miles north of its junction with #493, and requires difficult bushwhacking to attempt to follow. It seems evident that people access this trail very infrequently, if at all. Crews did scout out the northern end of this trail, which begins on private property. It appears easy to follow, is well-defined, and has several fresh cuts. However, time constraints prevented full exploration of this trail to determine where it begins to degrade and whether a through hike to #493 is possible.

#627 (Swimming Woman Creek): #627 was very hard to follow for its entirety. The south end of the trail is well marked with motorized use closure signs, but some evidence of motorized use was recorded for the first mile or so. The trail began as a two-track then turned to braided single-track, and eventually disappeared on the rolling hills below Knifeblade Ridge. This trail had a couple of cairns up high but it was nearly impossible to determine the difference between trail #627 and the numerous intersecting cattle trails. The trail was also littered with Houndstongue and Canada Thistle until about 7500 feet.

#627A/Forest Road 8954: From Halfmoon Pass, 627A/Road #8954 starts as a single-track and the upper section is severely braided due to water runoff and use by game and cattle. The trail disappears for a

section about a mile down the trail and crews bushwacked through a dry, Ponderosa Pine forest until finding a two-track trail (#8954) that descended to the junction with trail #627.

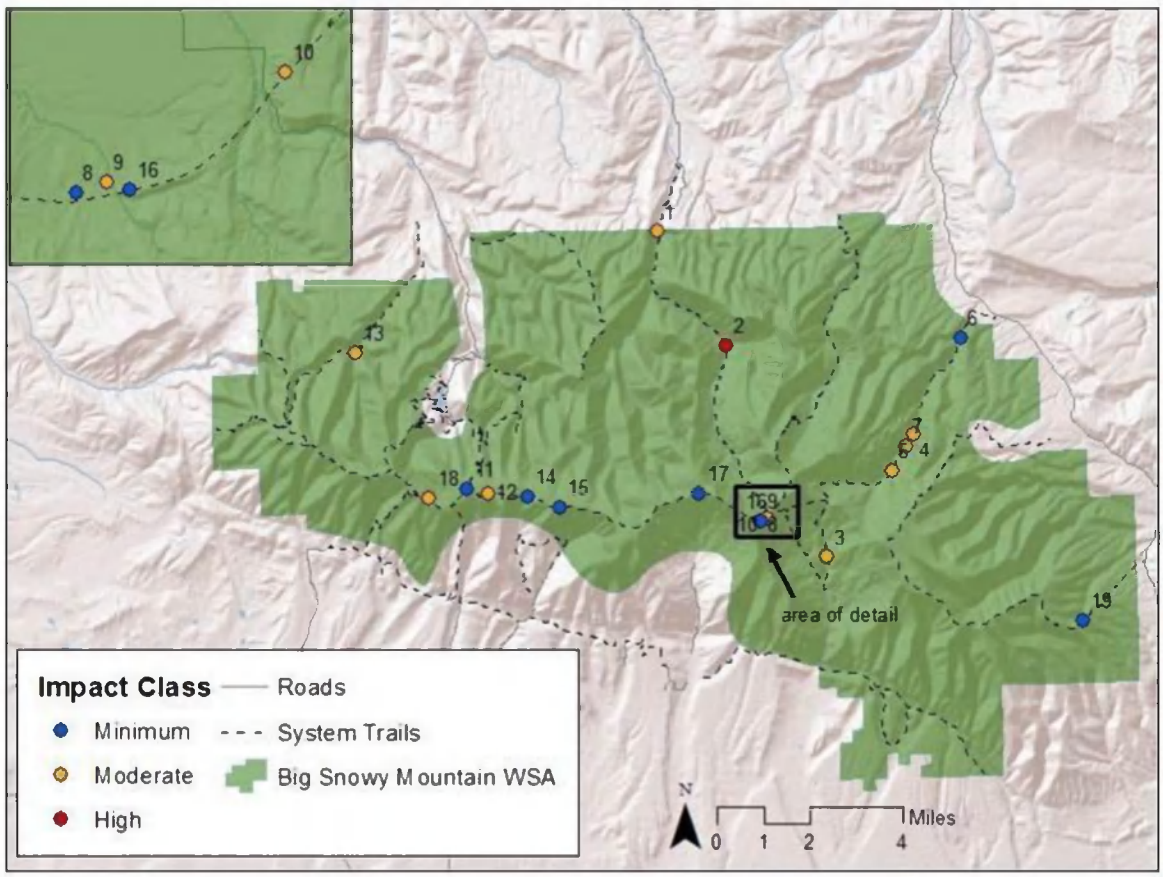
#494: #494 exists as a continuation of #650, after #650 passes Old Baldy and turns northeast. #494 was monitored until it became a 2-track where Forest Road 8956 began. Approximately 1.5 miles of #8956 within the WSA were not monitored.

#650 (Lost Peak): Trail #650 was signed at the east end, in good condition, and well-marked with blazes and cairns up to Lost Peak. It is difficult to determine where this trail ends and where trail #494 begins because they form a connected loop. No visible trail existed between Lost Peak and Big Snowy Mountain, but route-finding along the ridge to Big Snowy Peak appeared straight-forward.

#652: #652 is a connection trail that spans the width of the WSA south of Knifeblade Ridge. At Swimming Woman Creek #652 enters the WSA and continues southeastward to exit the WSA along Ashley Gulch. From Swimming Woman Creek eastwards, this is a double track road which is posted as closed to motorized use, yet clearly receives a lot of use from ATVs and motorbikes. There is a good deal of Houndstongue along the length of this trail, especially in the open and sunny meadows. As there are private landowners scattered along the southern border of #652, there are many user-created ATV trails leading towards private lands. There is also evidence of recreational off-trail ATV use with no particular destination. Time constraints prevented full monitoring of these networks of user-created trails. Also, we did not cover the easternmost 2.4 miles of #652 in the WSA, as the various user-created ATV trails made navigation convoluted and difficult. #652 is virtually indistinguishable from networks of user-created ATV trails, with some sections essentially a maze.

#671: #671 is a ~2 mile loop trail off of #652 with evidence of use similar to #652. The eastern side was monitored, but the western side of this trail was not covered.

## APPENDIX 3. CAMPSITE INVENTORY & CONDITION




*Location of inventoried campsites and assigned number (1-19). Numbered campsites correspond to inventory analyses, below.*

## Campsite #1

| **Location** | |
|---|---|
| Easting (m) | 620,885 |
| Northing (m) | 5,189,846 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 26-50%/51-75% |
| Mineral Soil Exposure At Site/Off Site | 51-75%/0-5% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | (missing data) |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | (missing data) |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 29* |
| Impact Class | Moderate |

* missing inventory information for 1 or more measure, therefore the average of all sites was used to calculate the total impact score.

## Campsite #2

| **Location** | |
|---|---|
| Easting (m) | 623,318 |
| Northing (m) | 5,185,887 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 51-75%/0-5% |
| Tree Damage | 1-8 scarred, or 1-3 badly scarred or felled |
| Root Exposure | (missing data) |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | 500-2000 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 38* |
| Impact Class | High |

* missing inventory information for 1 or more measure, therefore the average of all sites was used to calculate the total impact score.

## Campsite #3

| **Location** | |
|---|---|
| Easting (m) | 626,796 |
| Northing (m) | 5,178,572 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 0-5%/0-5% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | 500-2000 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 27 |
| Impact Class | Moderate |

## Campsite #4

| **Location** | |
|---|---|
| Easting (m) | 629,809 |
| Northing (m) | 5,182,833 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | <500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 6-25%/51-75% |
| Mineral Soil Exposure At Site/Off Site | 51-75%/26-50% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | (missing data) |
| Social Trails | No more than 1 discernible trail |
| Camp Area | 500-2000 sq ft |
| Barren Core Area | (missing data) |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 32* |
| Impact Class | Moderate |

* missing inventory information for 1 or more measure, therefore the average of all sites was used to calculate the total impact score.

## Campsite #5

**Location**

| | |
|---|---|
| Easting (m) | 629,065 |
| Northing (m) | 5,181,551 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | <500 ft |

**Conditions**

| | |
|---|---|
| Veg. Cover At Site/Off Site | 76-100%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 0-5%/0-5% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | >1 firering or other major development |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | 500-2000 sq ft |
| Barren Core Area | < 50 sq ft |

**Impact Evaluation**

| | |
|---|---|
| Impact Score | 26 |
| Impact Class | Moderate |

## Campsite #6

| **Location** | |
|---|---|
| Easting (m) | 631,442 |
| Northing (m) | 5,186,185 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 26-50%/26-50% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 21 |
| Impact Class | Minimum |

## Campsite #7

| **Location** | |
|---|---|
| Easting (m) | 629,525 |
| Northing (m) | 5,182,426 |
| Landform | Streamside |
| Distance to Trail | |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | <500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 76-100%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 0-5%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | >2,000 sq ft |
| Barren Core Area | (missing data) |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 32* |
| Impact Class | Moderate |

* missing inventory information for 1 or more measure, therefore the average of all sites was used to calculate the total impact score.

## Campsite #8

| **Location** | |
|---|---|
| Easting (m) | 624,480 |
| Northing (m) | 5,179,803 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/51-75% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | No more than scattered charcoal from 1 fire ring |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 20 |
| Impact Class | Minimum |

## Campsite #9

| **Location** | |
|---|---|
| Easting (m) | 624,512 |
| Northing (m) | 5,179,813 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | <500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 6-25%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 51-75%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 31 |
| Impact Class | Moderate |

## Campsite #10

| **Location** | |
|---|---|
| Easting (m) | 624,698 |
| Northing (m) | 5,179,928 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 6-25%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 51-75%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 31 |
| Impact Class | Moderate |

## Campsite #11

| **Location** | |
|---|---|
| Easting (m) | 614,319 |
| Northing (m) | 5,180,936 |
| Landform | Forest |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 23 |
| Impact Class | Minimum |

## Campsite #12

| **Location** | |
|---|---|
| Easting (m) | 615,015 |
| Northing (m) | 5,180,782 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 26-50%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 0-5%/0-5% |
| Tree Damage | 1-8 scarred, or 1-3 badly scarred or felled |
| Root Exposure | None |
| Development | (missing data) |
| Cleanliness | No more than scattered charcoal from 1 fire ring |
| Social Trails | No more than 1 discernible trail |
| Camp Area | 500-2000 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 28* |
| Impact Class | Moderate |

## Campsite #13

| **Location** | |
|---|---|
| Easting (m) | 610,443 |
| Northing (m) | 5,185,645 |
| Landform | Streamside |
| Distance to Trail | <200 ft |
| Distance to Water | <200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 76-100%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 0-5%/0-5% |
| Tree Damage | 1-8 scarred, or 1-3 badly scarred or felled |
| Root Exposure | None |
| Development | >1 firering or other major development |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | 500-2000 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 28 |
| Impact Class | Moderate |

## Campsite #14

| **Location** | |
|---|---|
| Easting (m) | 616,432 |
| Northing (m) | 5,180,679 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 23 |
| Impact Class | Minimum |

## Campsite #15

| **Location** | |
|---|---|
| Easting (m) | 617,508 |
| Northing (m) | 5,180,292 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/51-75% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | No more than scattered charcoal from 1 fire ring |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 20 |
| Impact Class | Minimum |

## Campsite #16

| **Location** | |
|---|---|
| Easting (m) | 624,536 |
| Northing (m) | 5,179,805 |
| Landform | saddle/ridge |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | <500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 51-75%/51-75% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | (missing data) |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 21* |
| Impact Class | Minimum |

* missing inventory information for 1 or more measure, therefore the average of all sites was used to calculate the total impact score.

## Campsite #17

| **Location** | |
|---|---|
| Easting (m) | 622,367 |
| Northing (m) | 5,180,753 |
| Landform | Other |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 76-100%/76-100% |
| Mineral Soil Exposure At Site/Off Site | 6-25%/6-25% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 21 |
| Impact Class | Minimum |

## Campsite #18

| **Location** | |
|---|---|
| Easting (m) | 612,997 |
| Northing (m) | 5,180,611 |
| Landform | Other |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 0-5%/6-25% |
| Mineral Soil Exposure At Site/Off Site | 76-100%/51-75% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | 1 fire ring |
| Cleanliness | Remnants of >1 fire ring, some litter or manure |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 26 |
| Impact Class | Moderate |

**Note**: Campsite was located inside Devil's Chute cave.

## Campsite #19

| **Location** | |
|---|---|
| Easting (m) | 635,691 |
| Northing (m) | 5,176,377 |
| Landform | forest |
| Distance to Trail | <200 ft |
| Distance to Water | >200 ft |
| Distance to Nearest Campsite | >500 ft |

| **Conditions** | |
|---|---|
| Veg. Cover At Site/Off Site | 26-50%/26-50% |
| Mineral Soil Exposure At Site/Off Site | 26-50%/26-50% |
| Tree Damage | No more than broken lower branches |
| Root Exposure | None |
| Development | None |
| Cleanliness | No more than scattered charcoal from 1 fire ring |
| Social Trails | No more than 1 discernible trail |
| Camp Area | <500 sq ft |
| Barren Core Area | < 50 sq ft |

| **Impact Evaluation** | |
|---|---|
| Impact Score | 19 |
| Impact Class | Minimum |

# APPENDIX 4. CAMPSITE CONDITION EVALUATION WORKSHEET

**Wilderness Campsite Inventory & Condition Evaluation**

Date Evaluated:_____

Evaluated by:_____

*Objectives:*

1. Find out how many and where the campsites are
2. Create a GPS waypoint for each site
3. Evaluate changing campsite conditions (trend) over time
4. Photo record each site

**PART 1**: General Site Description

1. SITE NUMBER (Tr. #-campsite #): _____
2. Lat/Long _____
3. Elevation _____
4. DISTANCE TO CONSTRUCTED TRAIL: <200 ft **OR** >200ft
5. DISTANCE TO WATER: <200ft **OR** >200ft
6. DISTANCE TO CLOSEST CAMPSITE: <500ft **OR** >500ft
7. TWO PHOTOS from photo points that best describe the site. Note the compass bearing from the center of camp to the photo point for future replication.

**PART 2**: Wilderness Challenge Survey

A. Evaluate disturbance to **ground cover of core camp only!**
**Choose one:**
**1**....flattened vegetation but still alive, minimal physical change
**2**....vegetation worn away around center of activity
**3**....vegetation lost on most of site, but humus and litter still present
**4**....bare mineral soil widespread over most of site

B. Evaluate severe damage to trees at site. A severely damaged tree has one of the following:
- been felled and is at least 4 inches in diameter
- scarring that exceeds 1 square foot in total area
- highly exposed roots totaling three linear feet

**Choose one:**
**0**....0-5 severely damaged trees
**1**....6-10 severely damaged trees
**2**....>10 severely damaged trees

C. Quantify **total disturbed area** for site, adding satellite areas to core area:
**Choose one:**
**0**....Sum of disturbed areas equals 0 – 250 ft square
**1**....Sum of disturbed areas equals 251 – 1000 ft square
**2**....Sum of disturbed areas is greater than 1000 ft square

## **PART 3:** Impact Evaluation

| | | |
|---|---|---|
| 1. VEGETATIVE COVER: | **ON CAMPSITE**<br>1 – 0-5% 3 – 26-50% 5 – 76-100%<br>2 – 6-25% 4 – 51-75% | **ON UNUSED COMPARATIVE AREA**<br>1 – 0-5% 3 – 26-50% 5 – 76-100%<br>2 – 6-25% 4 – 51-75% |
| 2. MINERAL SOIL EXPOSURE | 1 – 0-5% 3 – 26-50% 5 – 76-100%<br>2 – 6-25% 4 – 51-75% | 1 – 0-5% 3 – 26-50% 5 – 76-100%<br>2 – 6-25% 4 – 51-75% |

| | **Rating (Circle one category)** | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **SCORE WEIGHT TOTAL** |
| 3. VEGETATIVE LOSS | (No difference in cover class) | (Difference of one cover class) | (Difference of two or more coverage classes) | x2 |
| 4. MINERAL SOIL EXPOSURE | (No difference in cover class) | (Difference of one cover class) | (Difference of two or more coverage classes) | x3 |
| 5. TREE DAMAGE<br># of trees damaged ____ | (No more than broken lower branches) | (1-8 scarred trees, or 1-3 badly scarred or felled) | ( > 8 scarred trees, or >3 badly scarred or felled) | x2 |
| 6. ROOT EXPOSURE<br># of trees with exposed roots ____ | (None) | (1-6 trees with roots exposed) | ( > 6 trees with roots exposed) | x3 |
| 7. DEVELOPMENT | (None) | (1 fire ring with or without primitive log seat) | ( > 1fire ring or other major development) | x1 |
| 8. CLEANLINESS<br>No. of fire scars _____ | (No more than scattered charcoal from 1 fire ring) | (Remnants of > 1 fire ring, some litter or manure) | (Human waste, much litter or manure) | x1 |
| 9. SOCIAL TRAILS<br>No. of trails _____ | (No more than 1 discernible trail) | (2-3 discernible, max. 1 well-worn) | ( > 3 discernible or more than 1 well worn) | x2 |
| 10. CAMP AREA<br>Estimated camp area _____ | ( < 500 ft square) | (500-2000 ft square) | ( > 2000 ft square) | x4 |
| 11. BARREN CORE CAMP AREA<br>Estimated camp area _____ | ( < 50 ft square) | (50 – 500 ft square) | ( > 500 ft square) | x2 |

IMPACT INDEX _____

*Impact index scores: ≤23 minimum, 24 to 34 moderate, 35 to 45 high, >45 extreme