Field Measures of Wilderness Character

Middle Fork Judith River Wilderness Study Area

2012

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Executive Summary

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

Monitoring highlights include:

- **Trail Coverage:** 96% of system trails within the WSA boundary were monitored. Trail access and coverage was not always straight-forward, largely due to inconsistencies between visitor use maps, USGS quads, and available forest service geospatial layers.

- **Middle Fork Corridor Summary:** This high-use corridor contained a convoluted network of roads and trails with multiple stream crossings and human-mediated disturbance. Field crews documented 26% of the WSA's weed patches, 65% of erosion sites, and 73% of ATV sightings along this corridor.

- **Weeds:** 178 weed patches were recorded (84% of these within the WSA), representing seven species. Canada Thistle and Houndstongue were most prevalent (25% and 45%, respectively, of all weed patches).

- **Wildlife:** A total of 36 wildlife encounters were reported. Canid species (e.g. coyote) were most prevalent (50%), followed by bear (33%), elk (6%), and a single encounter with pika, mule deer, and moose. The majority (86%) of encounters were indirect (e.g. tracks, scat, or other sign).

- **Erosion:** Erosion due to recreation was documented at 51 stream crossings, 44 inside the WSA. All 23 sites with severe erosion were located within the first 5 miles of the Middle Fork Judith River trail (#437).

- **Installations and developments:** A total of 96 installations and developments were reported, 88 within the WSA boundary. Cairns and fences were most common (31% and 29%, respectively). Two outfitter camps contained 28% of developments.

- **Signs:** A total of 104 signs were encountered along trails, 72 of which were within the WSA. Most signs were trail junction/directions or recreational use (37% and 34%, respectively), with <5% trail markers or interpretive. Remaining signs included survey markers and missing signs (posts with no sign, on the ground, or in pieces). The majority (58%) were in good condition.

- **Non-system trails:** A total of 18 NSTs or trail fragments covering 6.7 miles were mapped; 33% were associated with motorcycles or ATVs. NST origin was predominantly reported as newly created by recreation (70%). In several areas, trail designations were not clear on the ground due to insufficient signage, regularly used non-system trails, and trails that appeared on visitor maps but not in current USFS GIS geospatial data for system trails.

- **Mechanized and motorized use:** Indirect evidence of mechanized use (e.g. tracks) were recorded at 24 locations, 17 of which were within the WSA boundary. The majority of documented use was by motorcycles (54%), followed by ATVs (33%). Bicycle tracks were

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

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

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INTRODUCTION

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

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

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

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

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

TRAIL COVERAGE

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

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

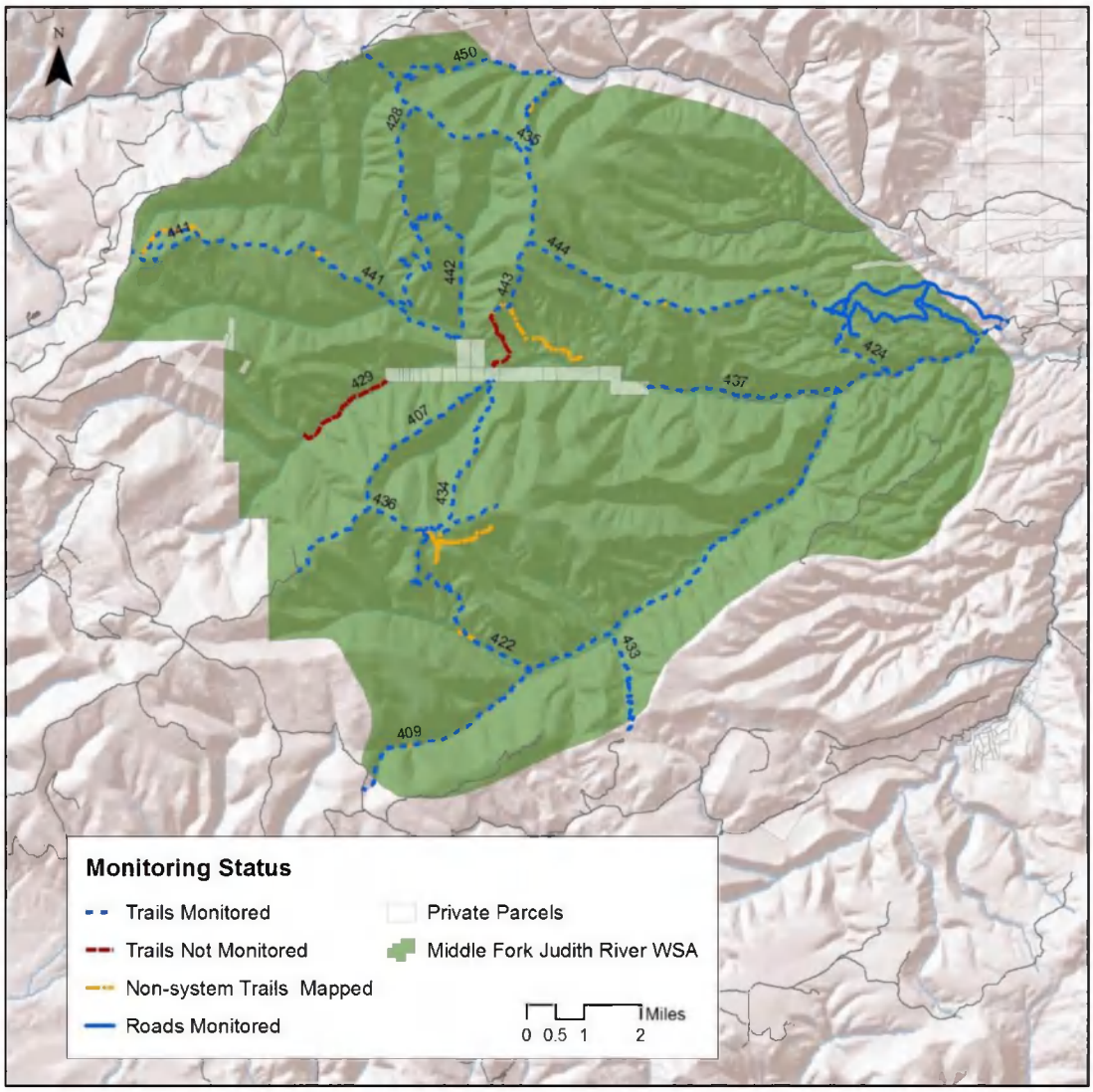

Figure 1. System trails monitored within the Middle Fork Judith River WSA in 2012.

DATA MANAGEMENT

The following section describes the steps taken to collect and analyze field measures of wilderness character (attributes) in the Middle Fork Judith River 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. A Microsoft Excel database, as well as a geodatabase containing all attribute data and photos is available upon request. Reports summarizing additional observations not captured by data collection protocols were written by field crew leaders following every trip. For example, snow cover, general trail conditions, route deviations, and any additional relevant 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 Middle Fork Judith River 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 71 of the 178 weed patches encountered. Fifty-seven of the pulled patches were within the WSA boundary, the remaining were on trails leading into the WSA. Patches with more than 90% of weeds pulled were small (<0.04 acres). Pulled patches included 7 weed species but 66% of pulled patches were Houndstongue (representing 58% of all Houndstongue patches found). 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	Number of Patches
0-10% pulled	18
11-20% pulled	7
21-30% pulled	3
31-40% pulled	1
51-60% pulled	4
71-80% pulled	1
81-90% pulled	5
91-100% pulled	30
seedheads collected	2
Total	**71**

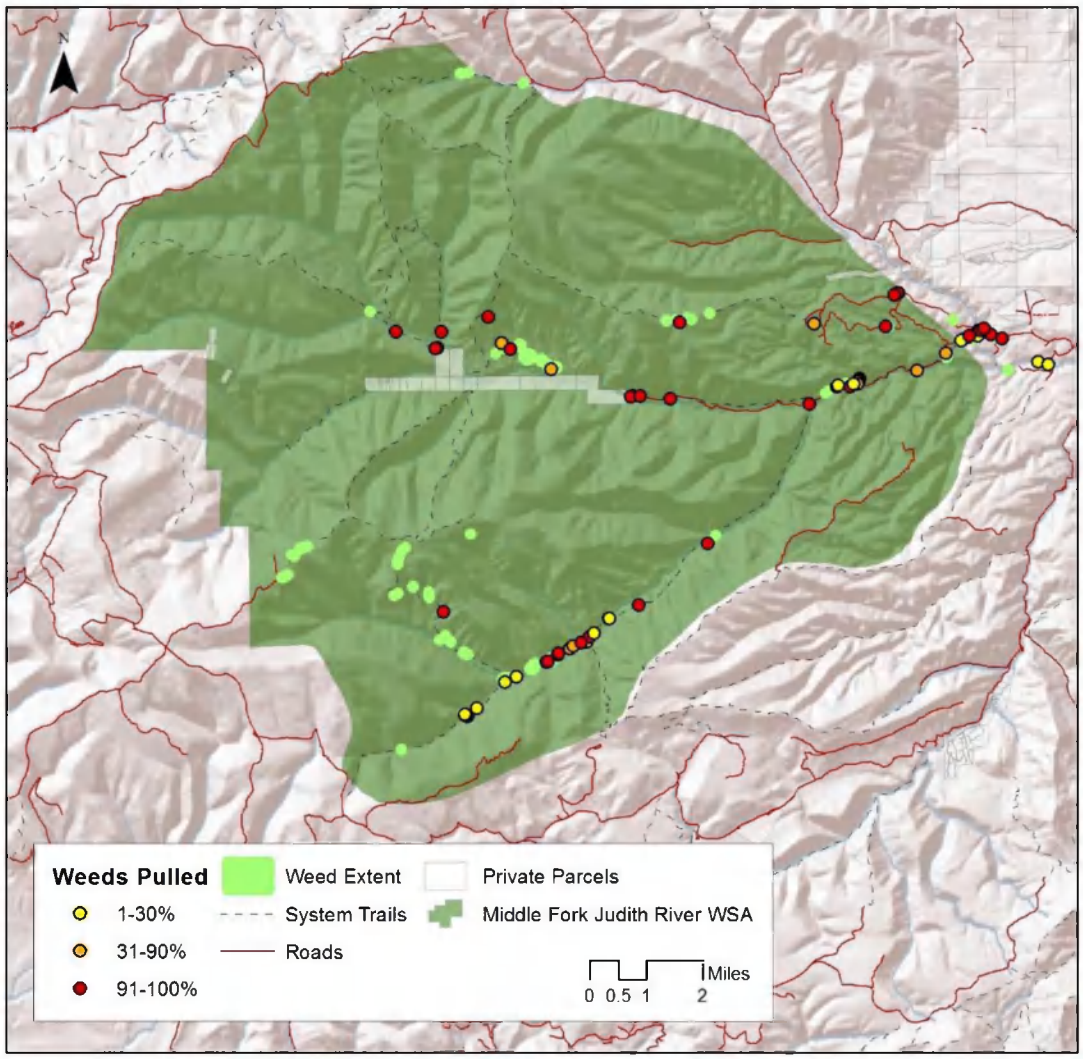

Figure 2. Location of pulled weed patches and extent of mapped weed infestations.

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 178 weed patches were recorded, representing 7 species. Of these, 84% were recorded within the WSA boundary, while the remaining 16% were found on trails leading into the WSA. Houndstongue and Canada Thistle were most common, representing 45% and 25% respectively of all weed patches (Figures 3 and 4).

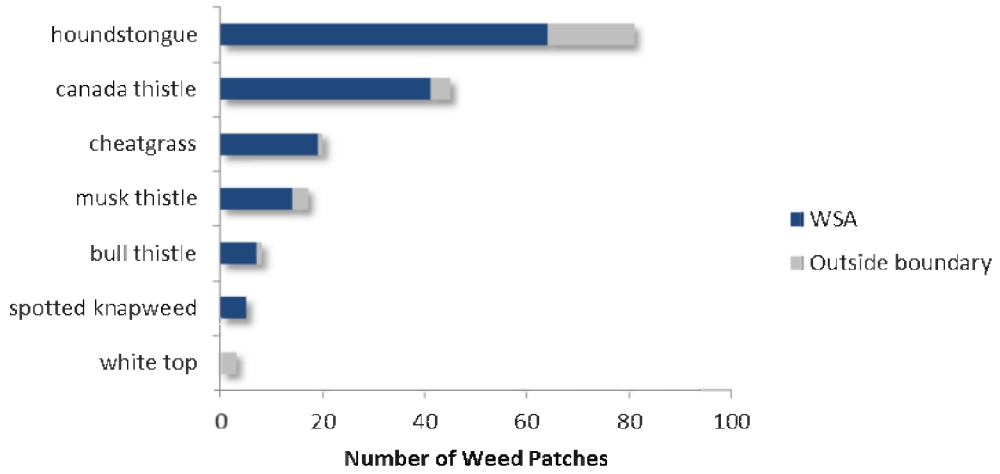

Figure 3. Number of weed patches by species

Weed infestations were primarily observed along system trails, particularly the Middle Fork Judith River (#437) and near the junction of the Lost Fork (#409) and the West Fork Lost Fork (#422), with 26 patches observed on 2 non-system trails. Canada Thistle was most prevalent in the southwest portion of the WSA, in the Lost Fork of the Judith area (#409 and #422). Cheatgrass was concentrated along a single non-system trail located just east of Schaeffer Ridge trail (#443) near the Middle Fork Ranch. All 5 patches of Spotted Knapweed were located on the Woodchopper Ridge Roads (#6529, #6531).

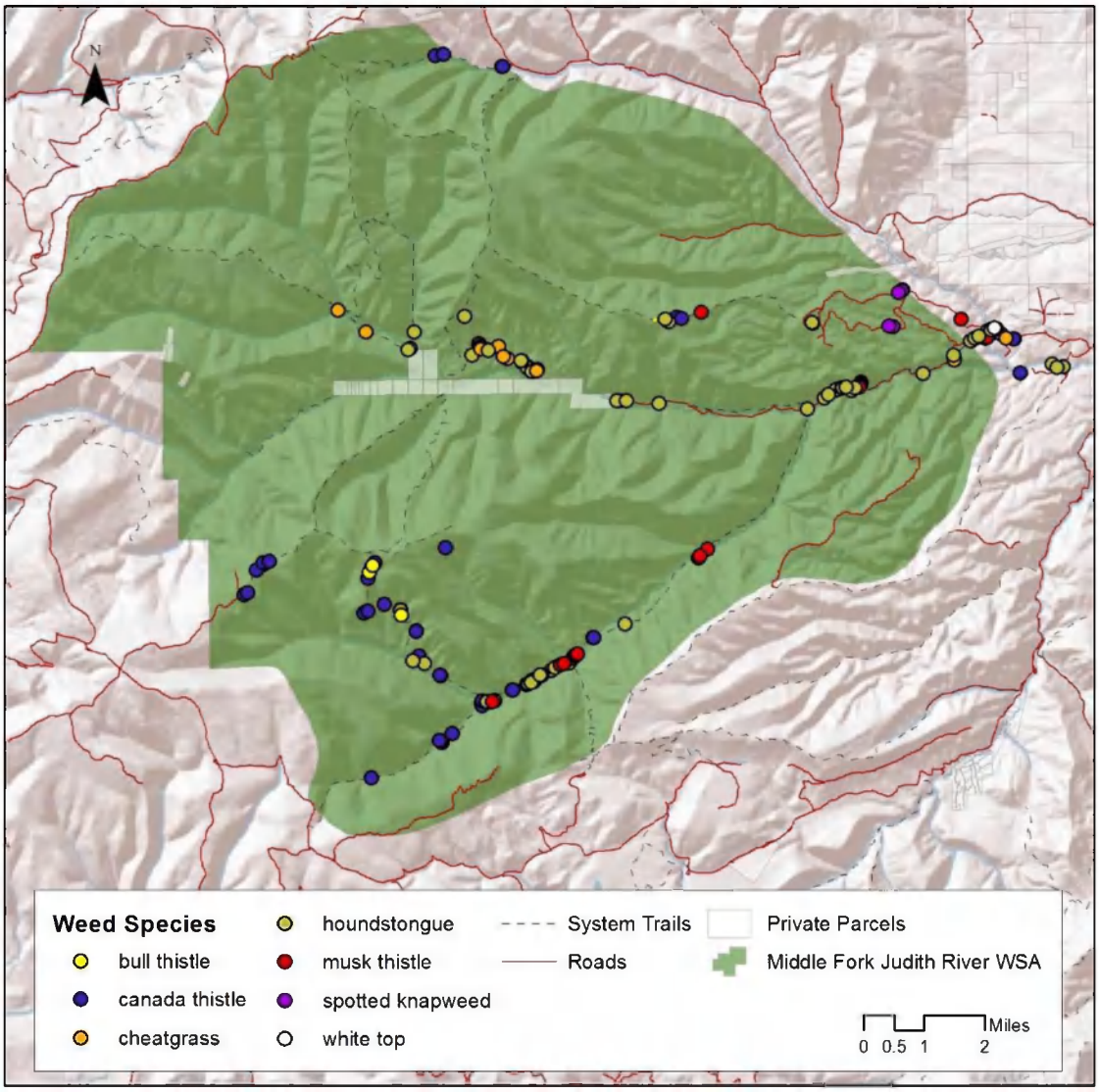

Figure 4. Distribution of observed weed species (note: not all locations are visible due to overlapping symbols).

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 26.3 acres of weeds were mapped, with 24.9 acres occurring inside 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. In particular, weed patches documented near the Middle Fork Ranch extended down slope from mapped boundaries. Therefore, area values should be considered a minimum.

The majority of patches (77%) were recorded as less than 1 acre in size, with 22% between 0.1 and 0.9 acres, and 3 patches estimated as larger than 1 acre (Figures 5 and 6). The largest weed patch was Cheatgrass, estimated at 6.1 acres, and occurred along with 27 other weed patches near the Middle Fork Ranch (Figure 6).

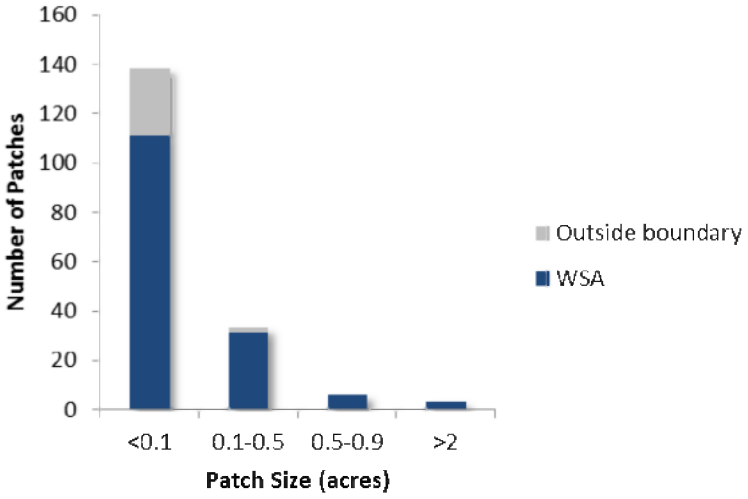

Figure 5. Number of weed patches by size class (acres).

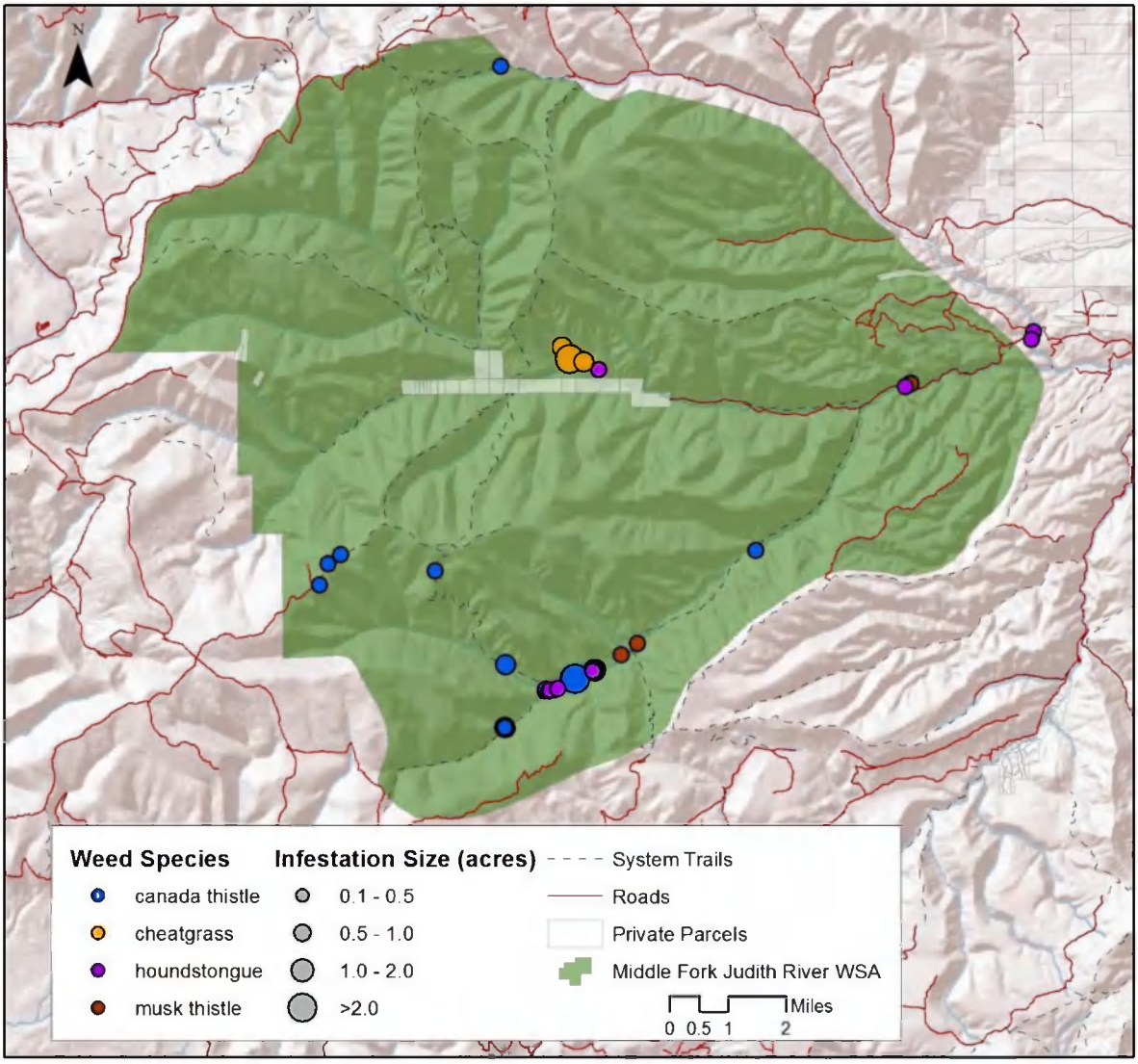

Figure 6. Distribution of large weed patches (>0.1 acres) by species and size class (note: not all patches are visible due to overlapping symbols).

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). 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.

A total of 32 weed patches were comprised of a single individual plant, including 19% of all Houndstongue patches. All patches with weed density over 50% were small (<0.1 acre in size), whereas

patches over 1 acre in size had densities of 15% or less. See Figure 7 for visual representation of weed density and patch size.

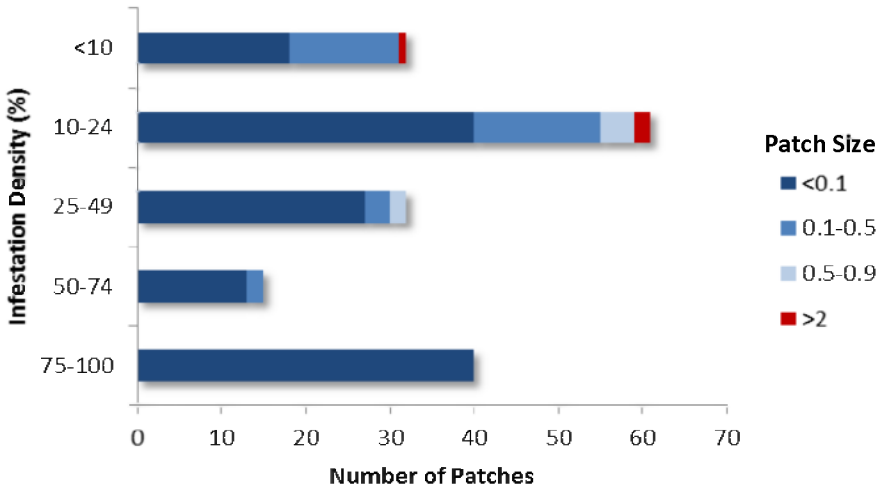

Figure 7. Number of weed patches by density and size.

Across all trails monitored, there were an estimated 3.5 total acres infested, including 3.2 acres infested inside the WSA. This includes 1.2 acres of Cheatgrass, and 1.1 acres of Houndstongue and Canada Thistle. All other weed species had infested areas < 0.2 acres (Figure 8). Please note that estimates of acres include patches found outside the WSA boundary.

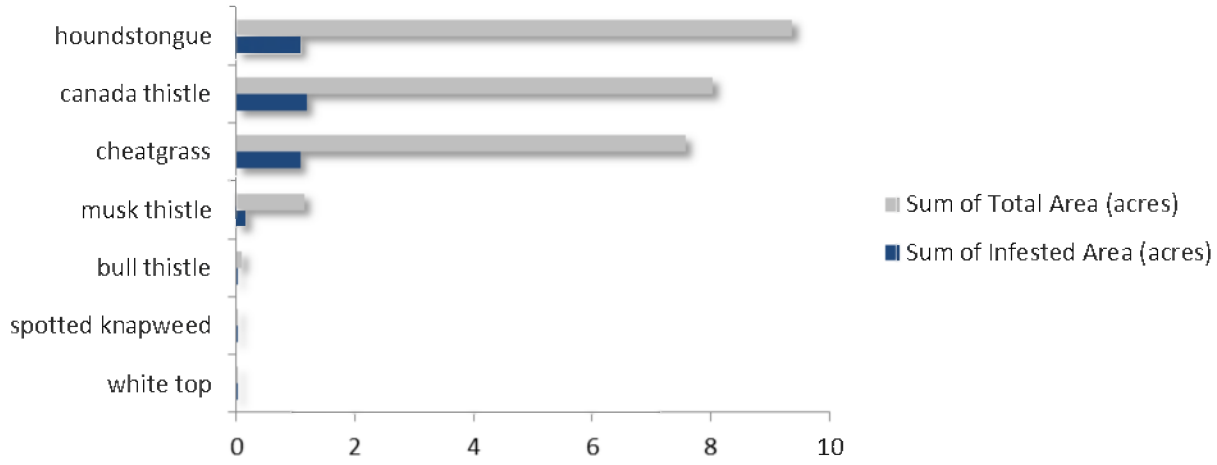

Figure 8. Total area of weed patches and estimated acres infested by species.

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.

Primary disturbance was recorded for 171 (of 178) patches, and a secondary association was reported for 113 weed patches. The primary disturbance associated with most mapped weed patches were trails (53%), followed by stock (27%), and roads (16%; Figure 9). The remaining patches were associated with a range of disturbances, including cabins, campsites, undisturbed areas, and other sources. Secondary associations were mostly trails (63%), but also included a wide variety of other sources (Figure 9).

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.

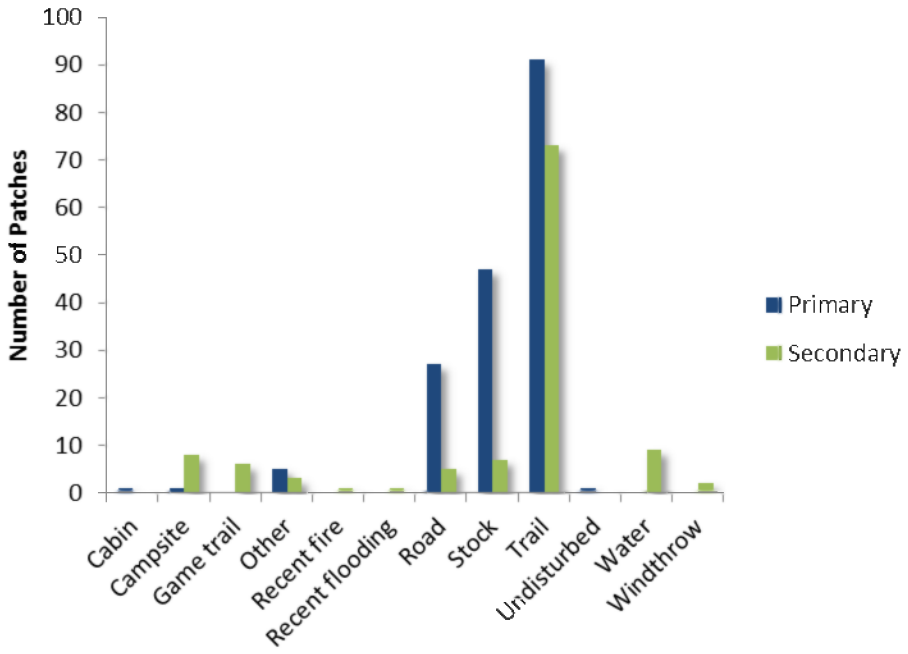

Figure 9. Primary and secondary disturbances associated with weed patches.

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 a 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 were encountered in forest (>10% tree cover) or grassland (51% and 41%, respectively), with 7% found in riparian, and a single patch in alpine ecosystem (Figure 10). Similarly, across ecosystem types, the dominant life forms within the area of infestation were conifer (41%), followed by forb and graminoid (24% and 20%, respectively), and woody shrubs (15%). Dominant life form information was missing for 23 patches. No associations were apparent between specific weed species and ecosystem types or life forms.

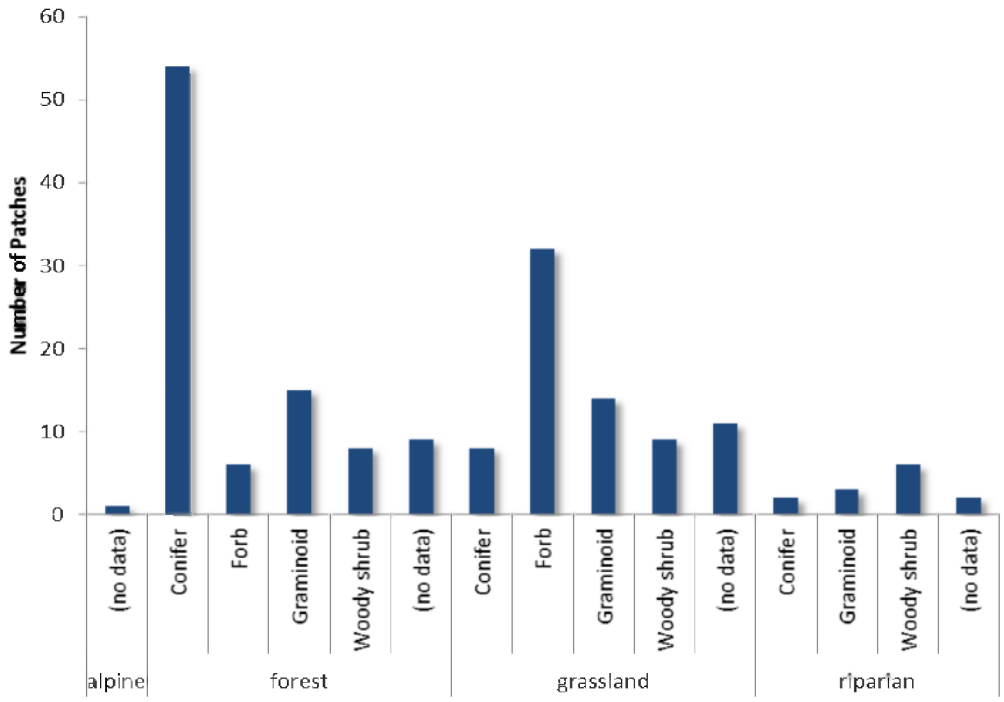

Figure 10. Ecosystem type and dominant lifeform associated with weed patches.

Habitat type associated with weed infestations found in forests (>10% tree cover) was identified based on the hierarchical classification system of series, type, and phase developed by Pfister et al (1977). A total of 92 weed patches occurred in the forest ecosystem type, and were associated with 5 climax series, including Douglas fir (48%), spruce (27%), subalpine fir (10%), limber pine (8%), and ponderosa pine (7%). Habitat type series, type, and phase for each patch are available in the associated database.

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 (77%) of weed patches were located > 50 feet from water (Figure 11). Weed patches less than 50 feet from water were Houndstongue (63%), Canada Thistle (20%), Musk Thistle (10%), with a single patch of White Top and Bull Thistle. Five patches had no water distance information recorded, including 60% of Spotted Knapweed patches.

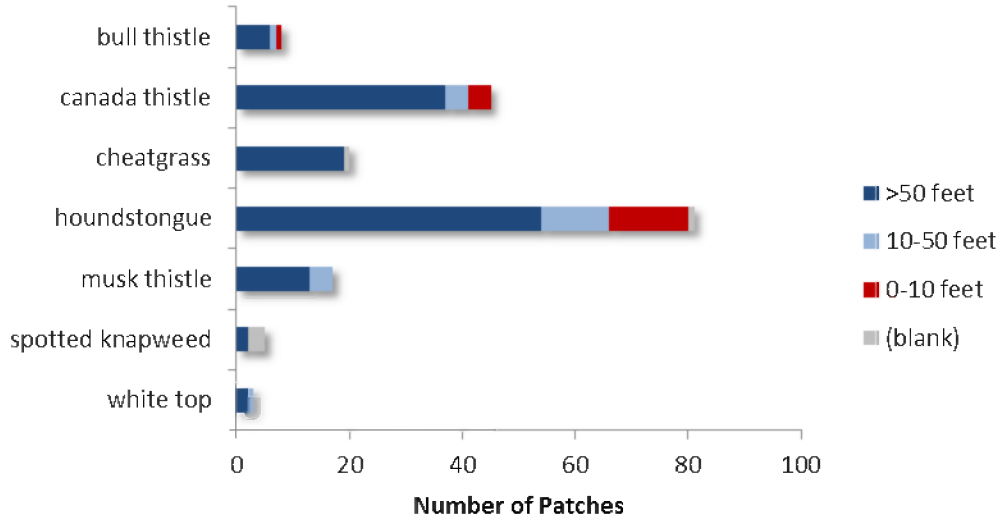

Figure 11. Distance of weed patches from water by species

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 collected 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 36 wildlife encounters were reported, all of which were within the WSA (Figure 12). Canid species (e.g. coyote) were most prevalent (50%), followed by bear (33%), elk (6%), and a single encounter with pika, mule deer, and moose. The majority (86%) of encounters were indirect (e.g.

tracks, scat, or other sign; Figure 13). Visual observations of two groups of elk totaling 16 individuals were reported, as well as a single sighting of a mule deer. A pika was identified visually and aurally on a scree slope adjacent to Stiner Creek trail (#442). A black bear was sighted on a non-system trail located off upper Sand Point Ridge trail (#436).

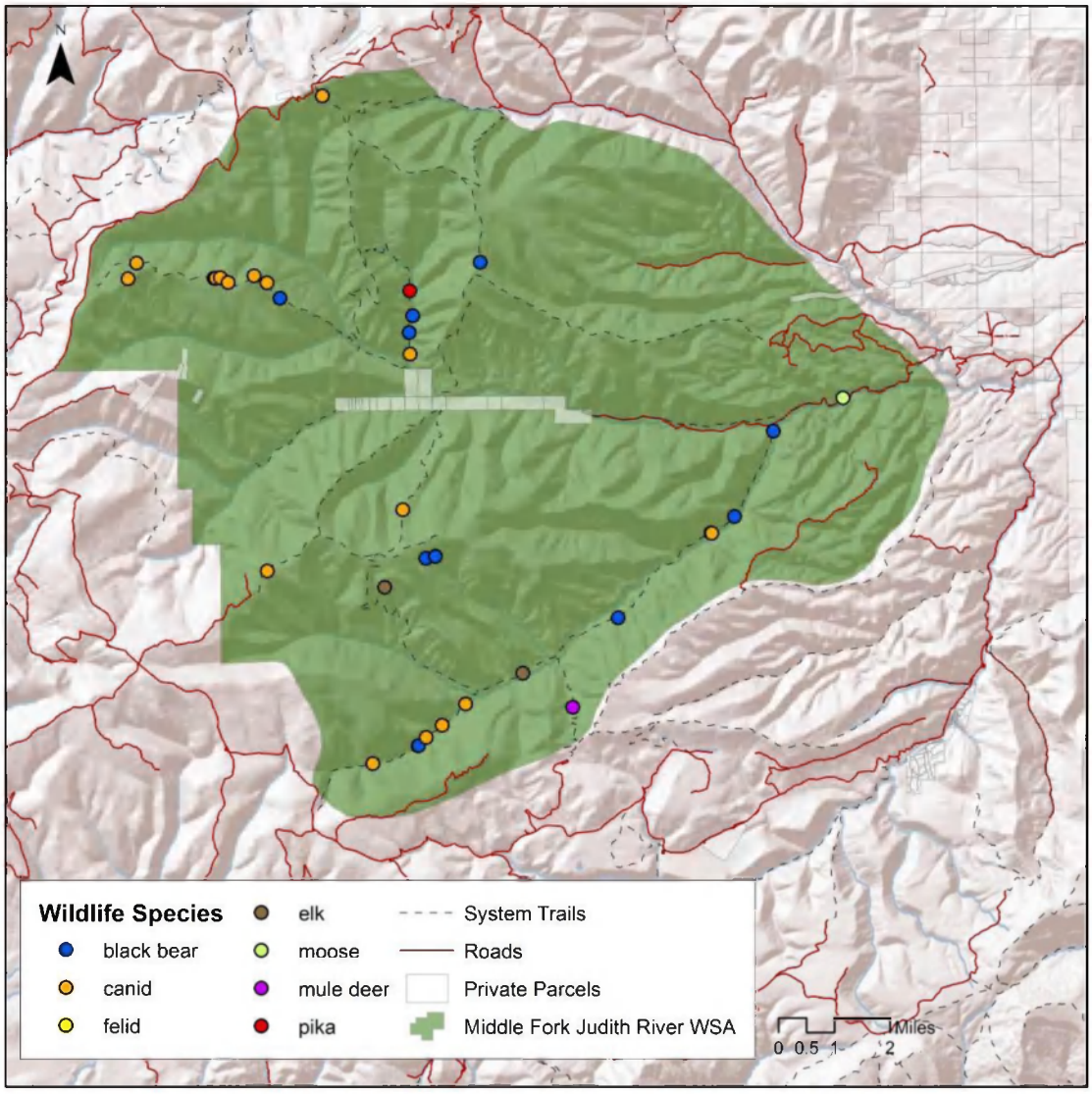

Figure 12. Location of wildlife encounters.

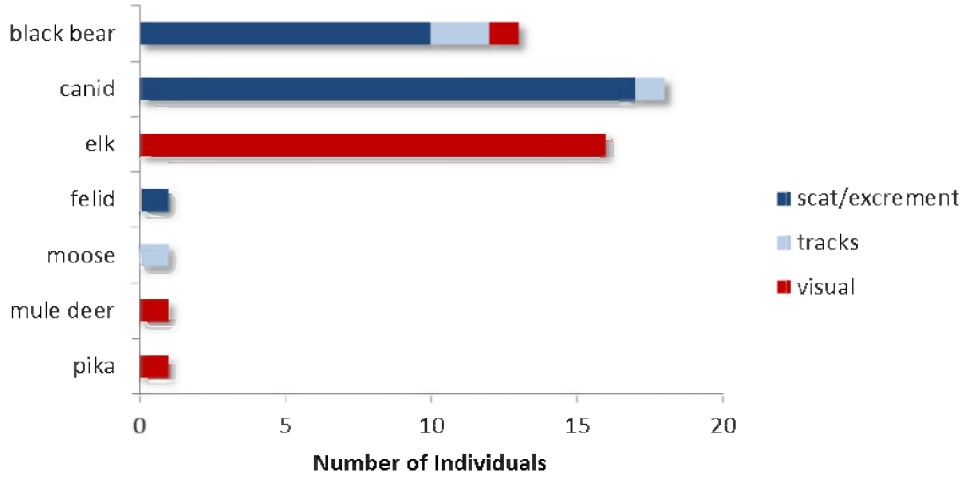

Figure 13. Number of wildlife encounters by species or family and detection type.

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 51 sites, 44 of which were located inside the WSA (Figure 14). All documented erosion sites were stream crossings. Erosion was severe at 45% of sites, moderate at 27% of sites, and slight at 27% of sites (Figure 15). The majority of erosion sites (59%), including all locations with signs of severe erosion, were located within the first 5 miles of Middle Fork Judith River trail (#437). Additional measurements, including estimated stream width, are available for each erosion point in the associated database.

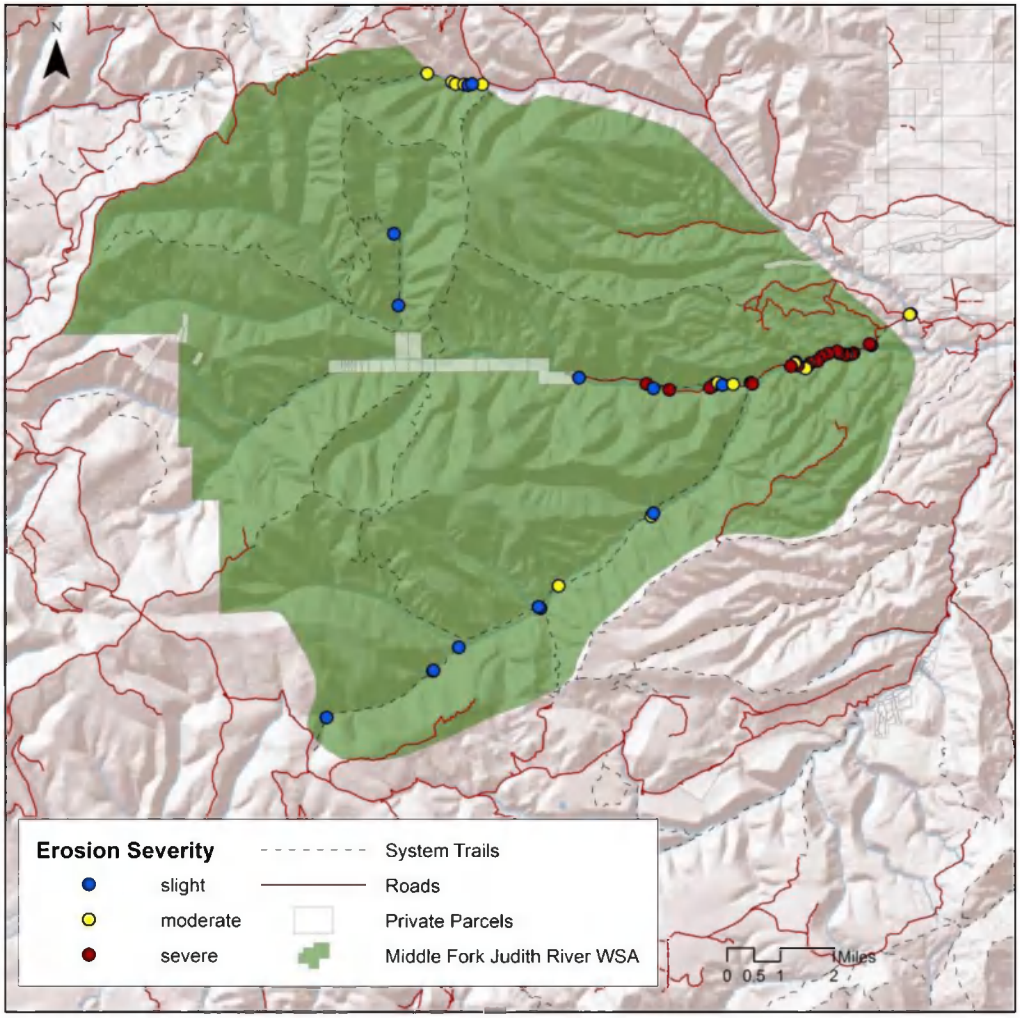

Figure 14. Location of erosion sites encountered and severity of erosion (all were streams).

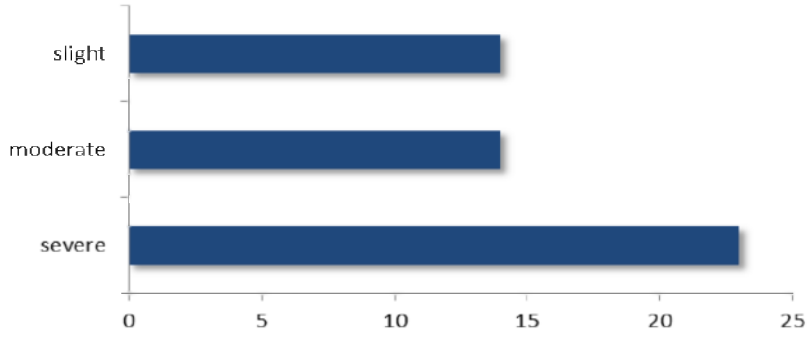

Figure 15. Number of waterbodies (all streams) with erosion, and severity of impact (slight, moderate, or severe).

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: bench, bridge, corral, dam, game hang, fence, latrine, old cabin, pole stash, cairn, hitch rail, or water trough. Photos were taken of all reported developments and are available upon request.

Development Type

A total of 96 installations and developments were reported, 88 within the WSA boundary (Figures 16 and 17). Cairns and fences were most common (31% and 29%, respectively). In addition, hitching posts, benches, corrals, game hangs, latrines, old cabins, water troughs, a pole stash, and a dam were documented. Two outfitter camps contained 28% of developments including both latrines, and all 10 developments classified as "other" (wall tent frames, tables, and other camp-related items).

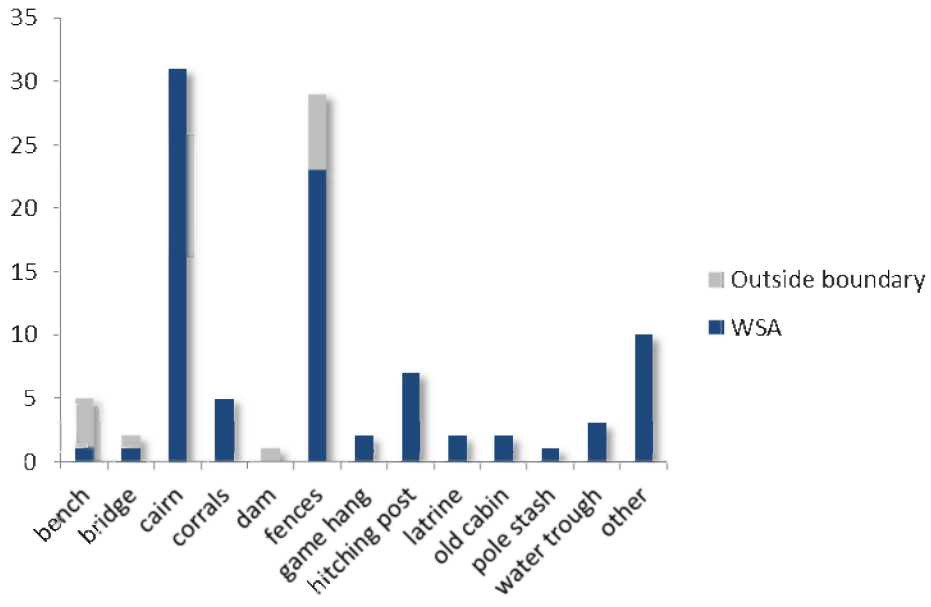

Figure 16. Number of installations and developments by type.

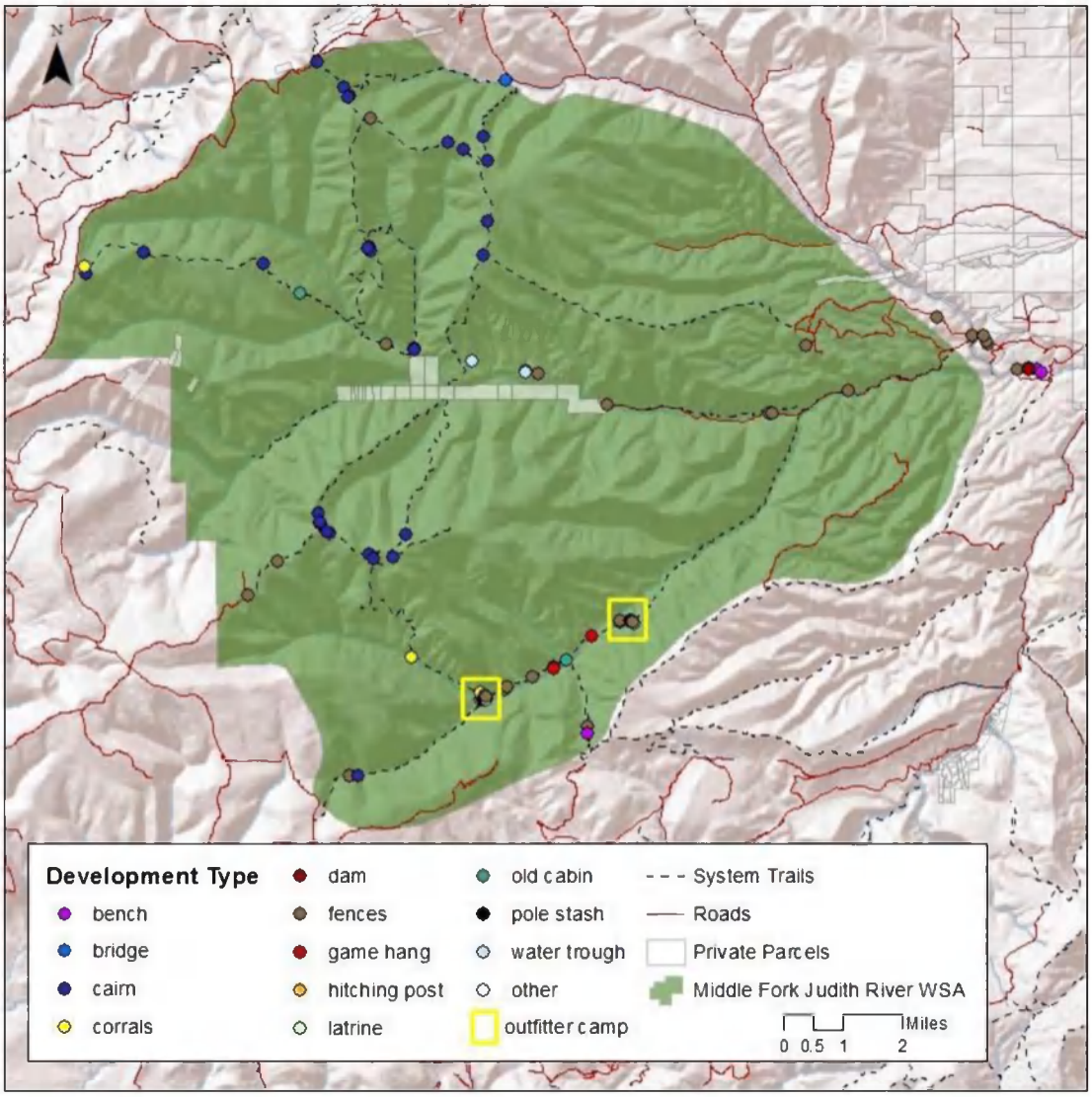

Figure 17. Locations of installations and developments by type (note: not all developments are visible due to overlapping symbols).

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/directions, interpretive, trail 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 104 signs were encountered along trails, 72 of which were within the WSA boundary. Most signs were trail junction/directions or recreational use (37% and 34%, respectively), with less than 5 % trail markers or interpretive. The remaining 23% of signs classified as "other/unknown" included survey markers and missing signs (posts with no sign, posts on the ground or in pieces). Most signs (58%) were in good condition, while 18% were faded or vandalized-legible, 9% were faded or vandalized-illegible, and 14% were missing. Figures 18 and 19 numerically and spatially depict these attributes.

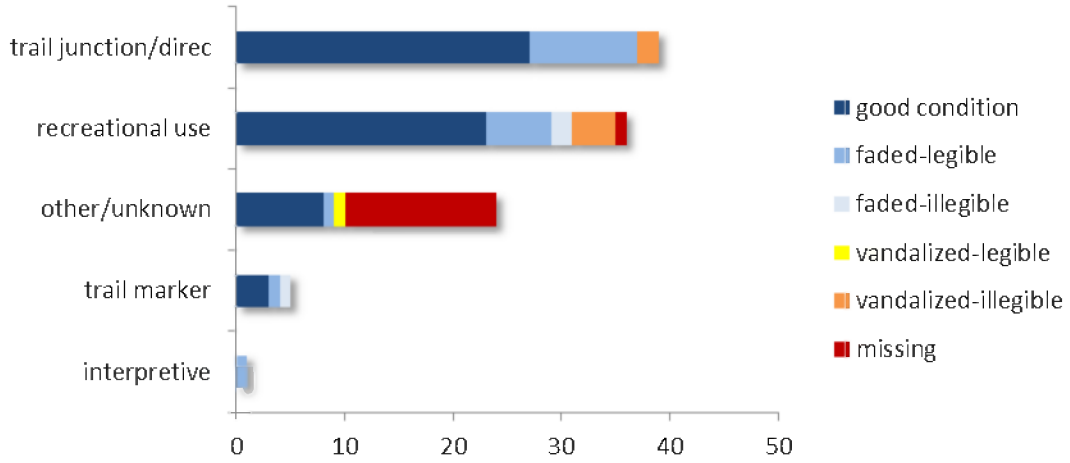

Figure 18. Number of signs by type and condition.

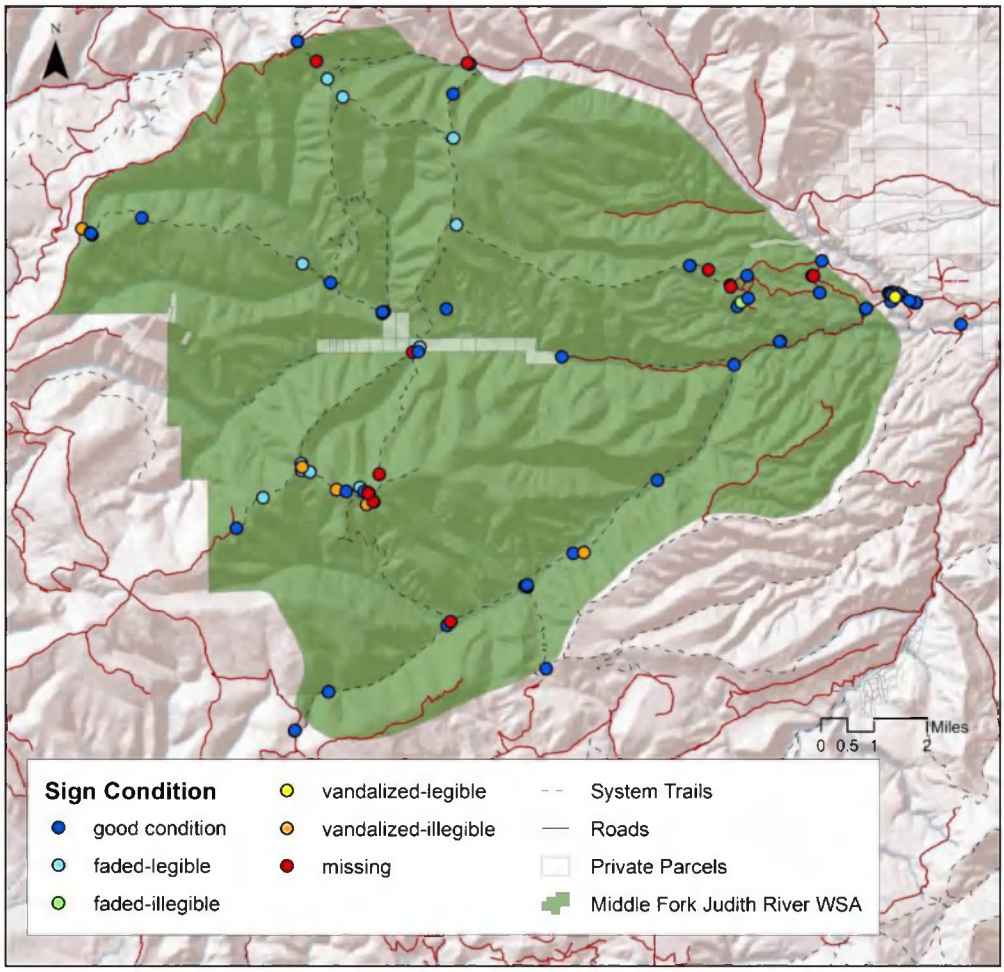

Figure 19. Location and condition of signs.

Trail Closure Devices

Trail closure devices were recorded for all trails leading into and within the WSA when encountered. Closure type and any evidence of violations were recorded. Photographs were taken for reference and are available upon request.

Trail Closure Type and Evidence of Violations

A total of 4 trail closures were recorded in the study area (Figure 20). Evidence of violation was noted at two locations. Tracks circumvented a fence across Woodchopper Ridge trail (#444), as well as a metal barrier at junction of Middle Fork Judith trail (#437) and Arch Coulee. Additional closure devices included a log with trail restriction sign on USFS road #6529, and a sign marking an abandoned trail on Lost Fork Judith River trail (#409) at Burris Creek.

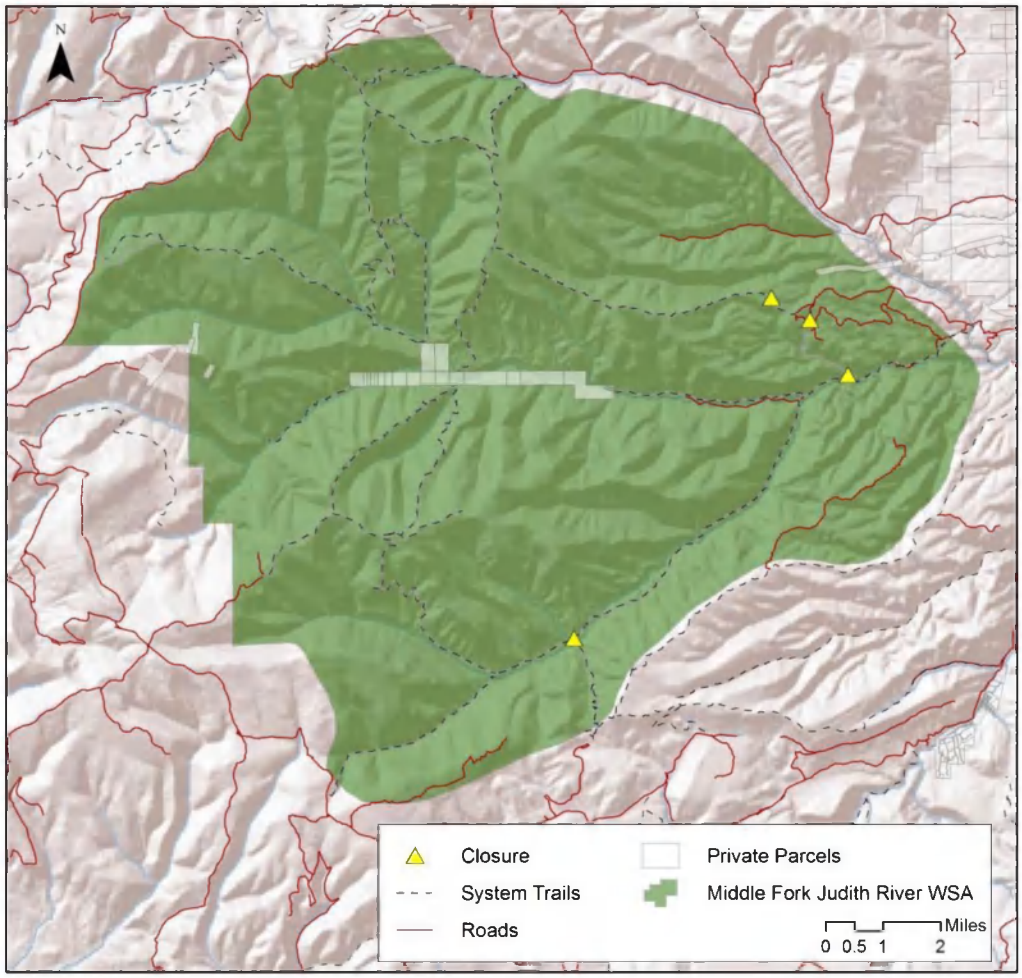

Figure 20. Location of trail closure devices.

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. Additionally, the location of system trails was not always clear on the ground, therefore trail conditions may also have been recorded for non-system trails, especially along old road beds that intersect with designated trails. 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 some impacted trails were incomplete due to missing finish point data, and several records noted that trail conditions extended beyond recorded trail section (please see additional trail condition details provided in qualitative trail data summarized in Appendix 2).

Trail Width

A total of 4.2 miles of impacted trails were recorded, representing 26% of all non-motorized system trails monitored. An additional 4 locations of trail impacts were documented as points. Most impacts were noted on the Yogo Creek trail (#450) and the Lost Fork Judith River trail (#409), totaling 1.8 miles and 2.0 miles, respectively. Double tracks accounted for 57% of impacted trail sections, braiding was recorded at 43% of locations. Figure 21 shows the location of impacted trails.

Please note that there was some confusion between system and non-system trails, based on conflicts between visitor maps, quads, available USFS geospacial layers, as well as on-the-ground conditions. For details please see trail coverage section (above).

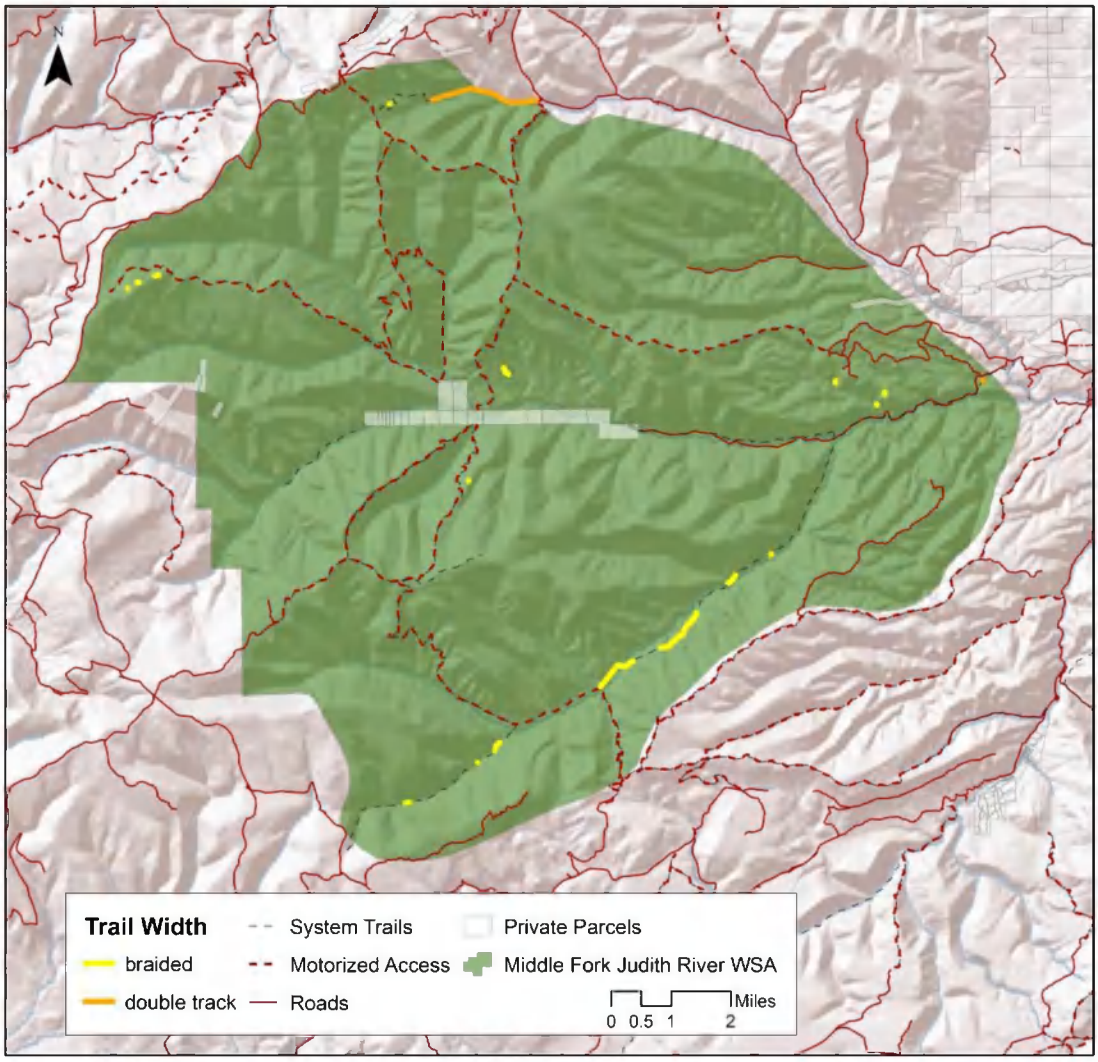

Figure 21. Trail width by category for non-motorized trails. All other trails were single track. Note: areas where trail conditions are reported outside of mapped system trails represent areas where trail designations were unclear in the field or available geospatial data did not match USFS visitor maps (see trail coverage section, above).

Evidence of Mechanized and Motorized Use on Trails

Wilderness character monitoring protocols (Landres et al., 2008) were designed for use in designated Wilderness, 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). Indirect evidence (e.g. tracks) of mechanized or motorized use was monitored on all trails. Presence was recorded for trail segments as a point and the type of track (bicycle, motorcycle, ATV, or vehicle) was recorded. This measure is not designed to capture volume of use, but indicates presence of evidence on a trail segment 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.

Evidence of motorized use was mapped on all trails, regardless of whether or not motorized use was allowed. Trails where summer motorized use was authorized in 2012 are illustrated in Figure 22 (source: Lewis and Clark National Forest System Motorized Trails geodatabase). Please note that subsequent to monitoring in 2012, a new Motor Vehicle Use Map was issued, altering designated motorized trails.

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. Also, some trails displayed clear evidence of heavy use not fully captured by evidence points: these qualitative observations are noted by trail number in Appendix 2. Please see "Encounters with People" section (below) for direct evidence of mechanized use.

Type of Mechanized or Motorized Tracks

Indirect evidence of mechanized and motorized use on trail segments was recorded at 24 locations, 17 within the WSA (Table 2). The majority of tracks documented were motorcycles (54%), followed by ATVs (33%), with bicycle observed on 3 trail segments (these were all outside the WSA boundary).

Most evidence was documented on roads and trails designated for motor vehicle use based on the Lewis and Clark National Forest system trails geodatabase (see Figure 22). However, evidence of motorized use was observed on several apparently undesignated trails, including:

- ATV tracks on a section of Yogo Creek Trail (#450)
- Motorcycle tracks on a non-system trail adjacent to Sand Point Ridge trail (#436)
- ATV tracks on a non-system trail adjacent to private inholding east of the Schaeffer Ridge trail (#443).
- ATV tracks on trails designated for motorcycles only, including Schaeffer Ridge (#443), and Sand Point Ridge (#436).

On certain portions of some trails, trail conditions indicated a high volume of motorized use that is incompletely captured by data collection protocols. These descriptive details are recorded by trail number in Appendix 2. For example, #437 emerges from private inholdings and follows the Middle Fork Judith River eastward, crossing both the river and Forest Road 825 numerous times. Heavy ATV use has resulted in a convoluted network of alternate routes, and at times the road and the trail were difficult to distinguish from one another. Documenting all evidence of motorized use on this trail was not feasible.

Table 2. Evidence of mechanized and motorized use.

Motorized/Mechanized Evidence	WSA	Outside Boundary
ATV	5	3
Bicycle	-	3
Motorcycle	12	1
Total	**17**	**7**

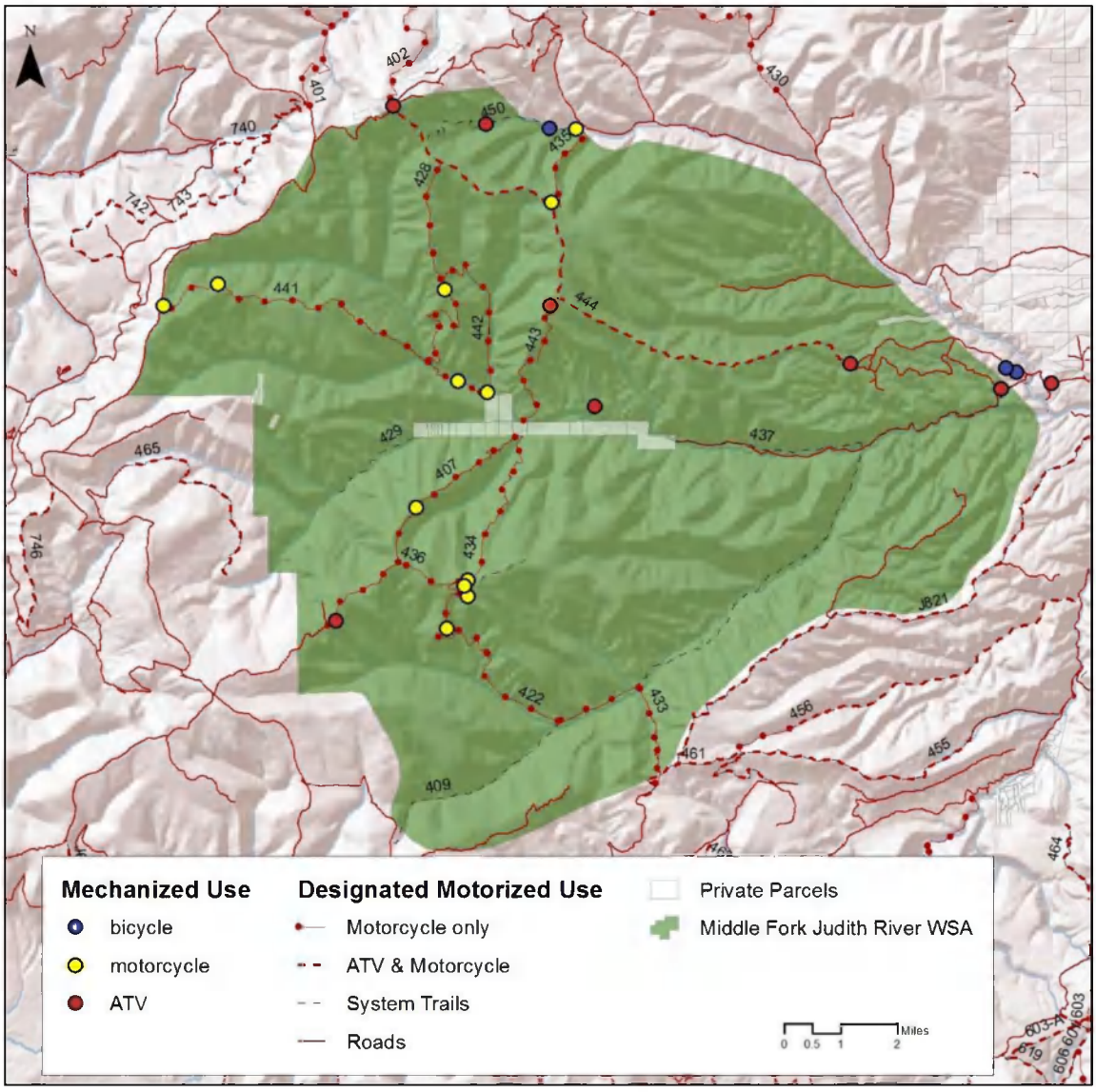

Figure 22. Trail segments with indirect evidence of mechanized and motorized use by type (Note: direct encounters are reported in Figure 25).

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: motorcycle, 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 18 NSTs or trail fragments covering 6.7 miles were mapped in the field (Figures 23 and 24). Dominant trail use was unclear for 44% of mapped NSTs, 33% were associated with motorcycles or ATVs, 11% were from foot travel, and 11% showed sign of horse travel. NST origin was predominantly reported as newly created by recreation (70%), with 2 trails along old roads, and 3 trails unclassified.

In several areas within the WSA, trail designations were not clear on the ground due to insufficient signage and regularly used non-system trails. In addition, trails that appeared on the most recent USFS visitor maps are not all included as system trails in the available GIS geospatial data from the USFS. Therefore, some mapped non-system trail sections may actually be system trails, while some trails sections that were monitored as system trails may actually be undesignated routes. These locations represent areas on the ground where trail designations are unclear. Specifically:

- Spur trail at western start of Cleveland Creek trail (#441) following old road bed (labeled as #2088 on quad map). Designated route was mapped as a non-system trail and a southern spur was monitored as the designated route.

- 1.7 mile section of Shaeffer Ridge trail (#443) to termination at Middle Fork Ranch was thought to be a non-system trail and only monitored for 600 m. Forest Service GIS layers show this to be part of the system trail network. Crews instead followed what they thought was the system trail (but is in fact a user-created NST) paralleling this trail to the east until is disappeared on a bench above the valley bottom. See Trail #443 notes in Appendix 2 for details on this route.

Time constraints in the field, as well as unclear trail designations limited complete surveying of all non-system trails. Of the 18 trails recorded, 11 were mapped along their entire length (Figure 24). The longest mapped NST (1.1 mi) was used by motorcycles, and accessed an outfitter camp located off Sand Point Ridge trail (#436). While not completely surveyed, a complex of NSTs with evidence of motorized use appeared to circumvent the private inholding at Middle Judith Ranch, connecting the Middle Fork of the Judith River (#437) to Schaeffer Ridge (#443). The two horse trails accessed camp or hunting sites. Two trails cut switchbacks. The purpose of remaining trails was uncertain.

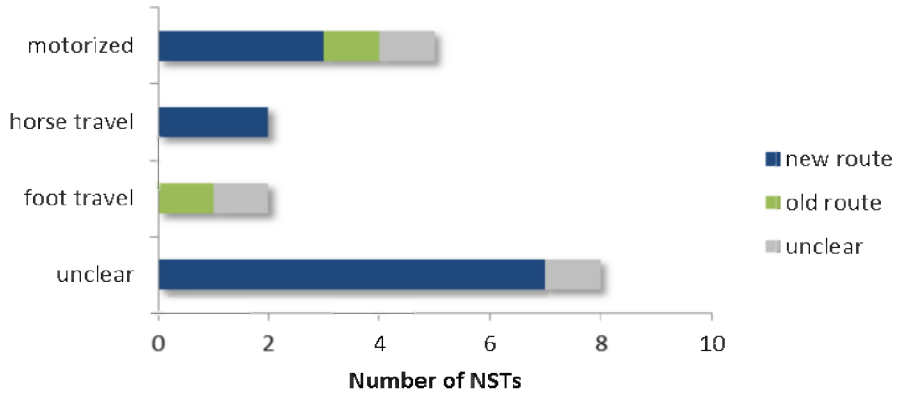

Figure 23. Number of non-system trails by trail type and origin.

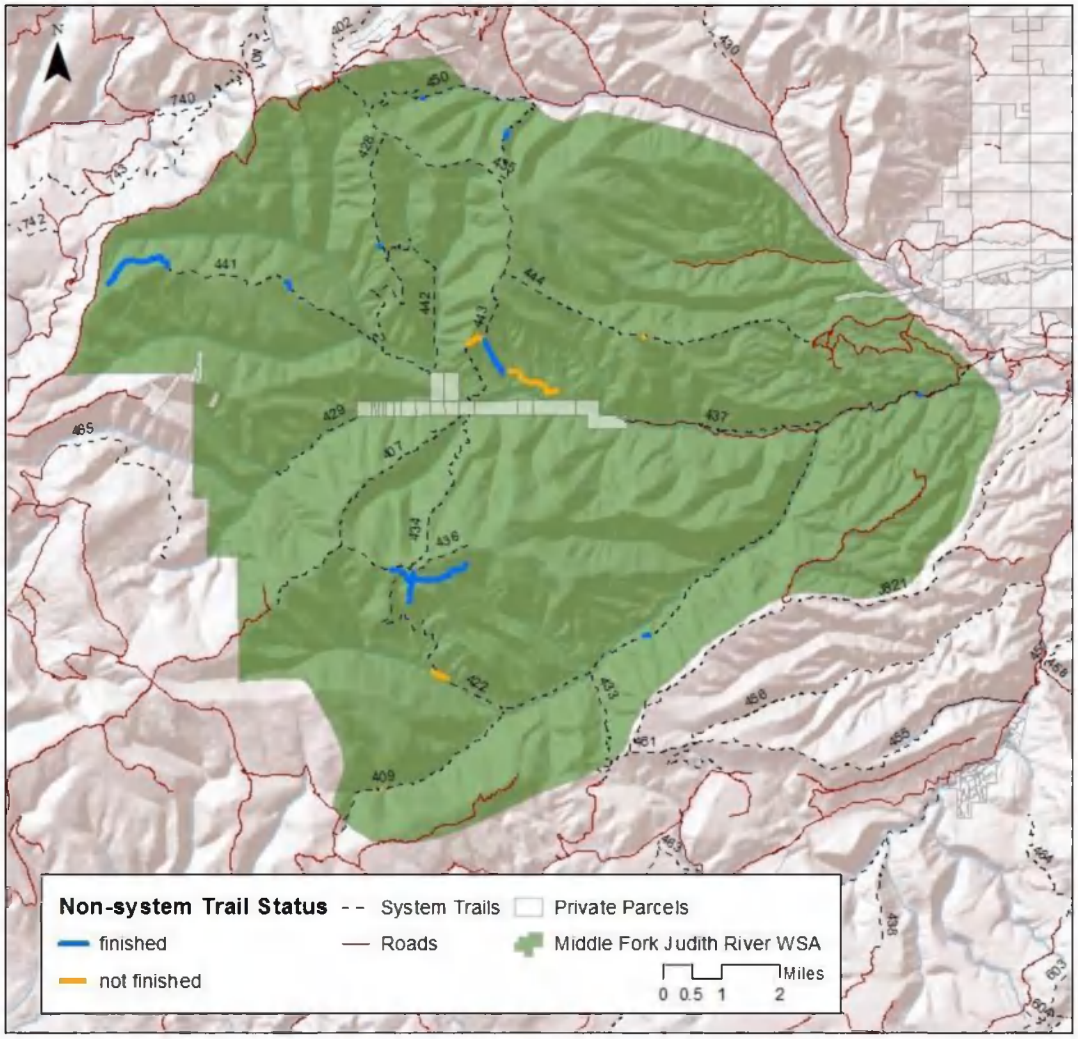

Figure 24. Locations of non-system trails and monitoring status (e.g. complete or not finished).

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 7 trailheads (Table 3). Vehicles occurred at 3 (43%) of visited trailheads, excluding the van used by the field team. The highest vehicle numbers were documented at Judith Guard Station (Forest Road 822) and Lost Fork Judith River (#409) trailheads. The only ORV trailer was observed at Judith Guard Station. No horse trailers were observed at any trailheads during the monitoring period. Trailhead use is variable and influenced by time of day and week. 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/Road No.	Trail/Road Name	Date	Vehicles	Horse Trailers	ORV Trailers
409	Lost Fork Judith River	6/29/2012	2	-	-
435	Yogo Ck.	7/23/2012	-	-	-
441	Cleveland Ck.	7/7/2012	-	-	-
444	Woodchopper Ridge	7/13/2012	-	-	-
433/J821	Burris-Ettien	6/30/2012	-	-	-
Rd822	Judith Guard Station	6/29/2012	3	-	1
Rd825	Middle Fork Judith River	6/19/2012	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, motorcycle, or Forest Service staff) were documented.

Activity Type and Number

A total of 29 separate encounters (e.g. groups) were recorded totaling 91 people. The majority of people encountered were on ATV or motorcycle (44% and 35%, respectively). Five groups of hikers were encountered, including 2 bow hunters and one overnight backpacker. Two groups of horse packers were documented on day trips along the Lost Fork of the Judith River (#409). The majority of groups (56%) consisted of 2 or fewer people. All groups containing over 5 people were on ATVs or motorcycles, with the largest group (10 ATVs) encountered on the Middle Fork Judith River trail (#437). The majority of ATV encounters (73%) were clustered near the Middle Fork Judith trailhead. Findings are summarized in Table 4 and Figure 25.

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

Activity	No. Groups	Total People	Total Horse/ Pack Stock
hiker/backpacker	5	12	-
horse packer	2	7	7
Motorcycle	11	32	-
ATV	11	40	-
Total	**29**	**91**	**7**

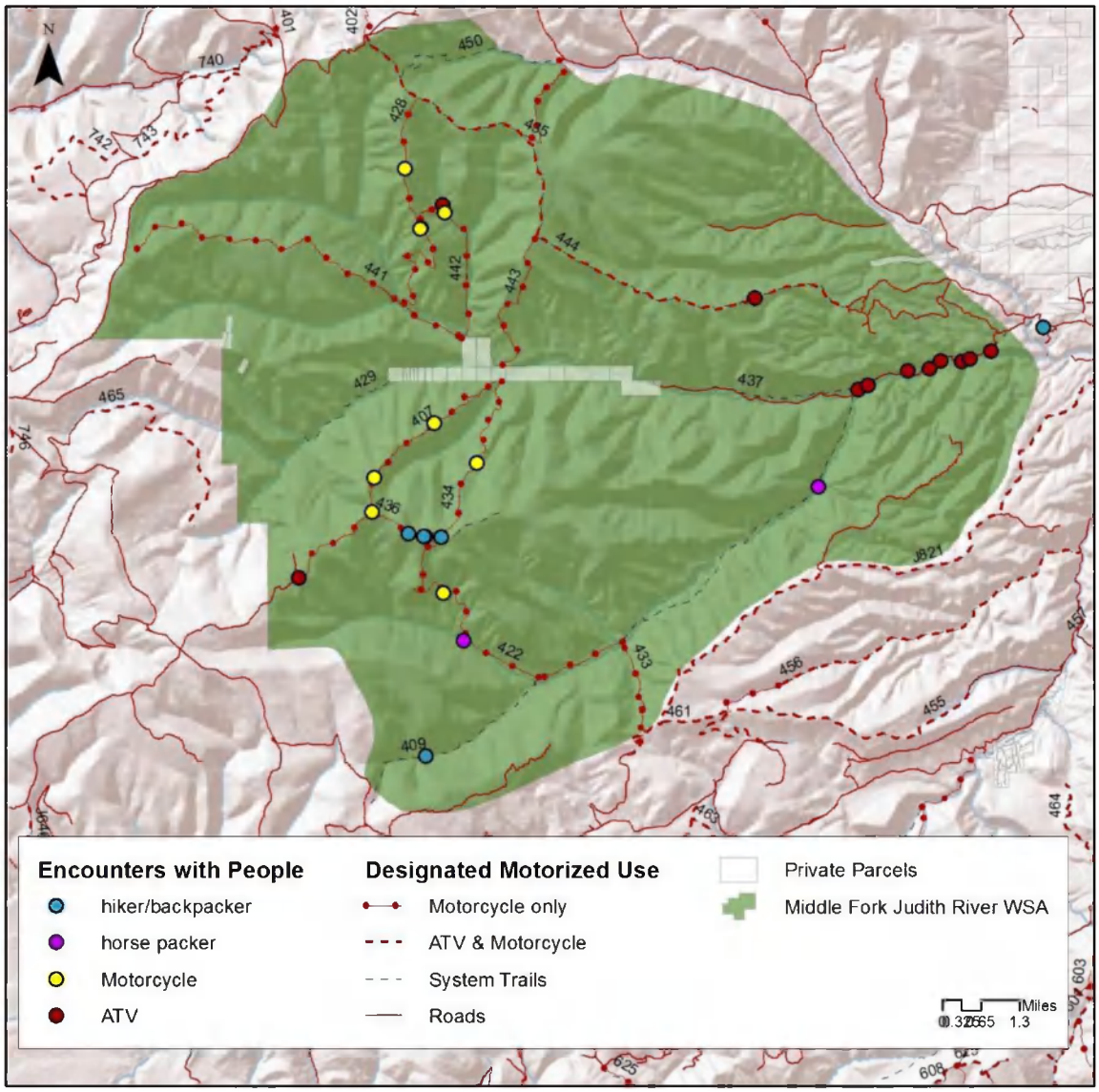

Figure 25. Location of groups and activity of people encountered along trails.

Noise

Noise intrusions were monitored throughout the field season using two methods. Standardized noise samples were collected daily during 15 minute sampling sessions conducted in the morning, afternoon, and evening. Surveys were conducted as close to the same time each morning (8:00 am), midday (1:00pm), and evening (7:00 pm) as possible, given logistical constraints. Opportunistic sampling of any other noises heard within the WSA was 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 29 noise-sampling sessions were completed (11 morning, 9 midday, and 11 evening). Surveys were started within the target hour, with the exception of evening surveys which were started 1-3 hours late for 6 sessions. A noise intrusion was documented during 78% of sessions. The majority of noises heard were airplanes (74%), followed by motorized vehicles (17%), and a single intrusion by people. Noise intrusions listed as "other" were gunshots.

Average duration of noise intrusions heard across all sample periods was 1.6 minutes. Average noise intrusion was longest for motorized vehicles (2.2 min), followed by airplanes (1.1 min), and people (0.3 min; Figure 26a). Noise intrusions were longest during midday sampling sessions (2.8 min), followed by evening (1.3 min), and morning (1.0 min; Figure 26b). The longest single noise intrusion was recorded was 5 minutes of loud and close noise from 3 motorcycles on Woodchopper Ridge (#444) during an evening sampling period. The majority of noise intrusions were barely audible (46%), followed by heard clearly (26%), and loud and close (20%). The majority of the loudest noise intrusions came from motorized vehicles (72%). Visual confirmation was recorded for 29% of noise intrusions. Figure 27 shows location of sampling sessions.

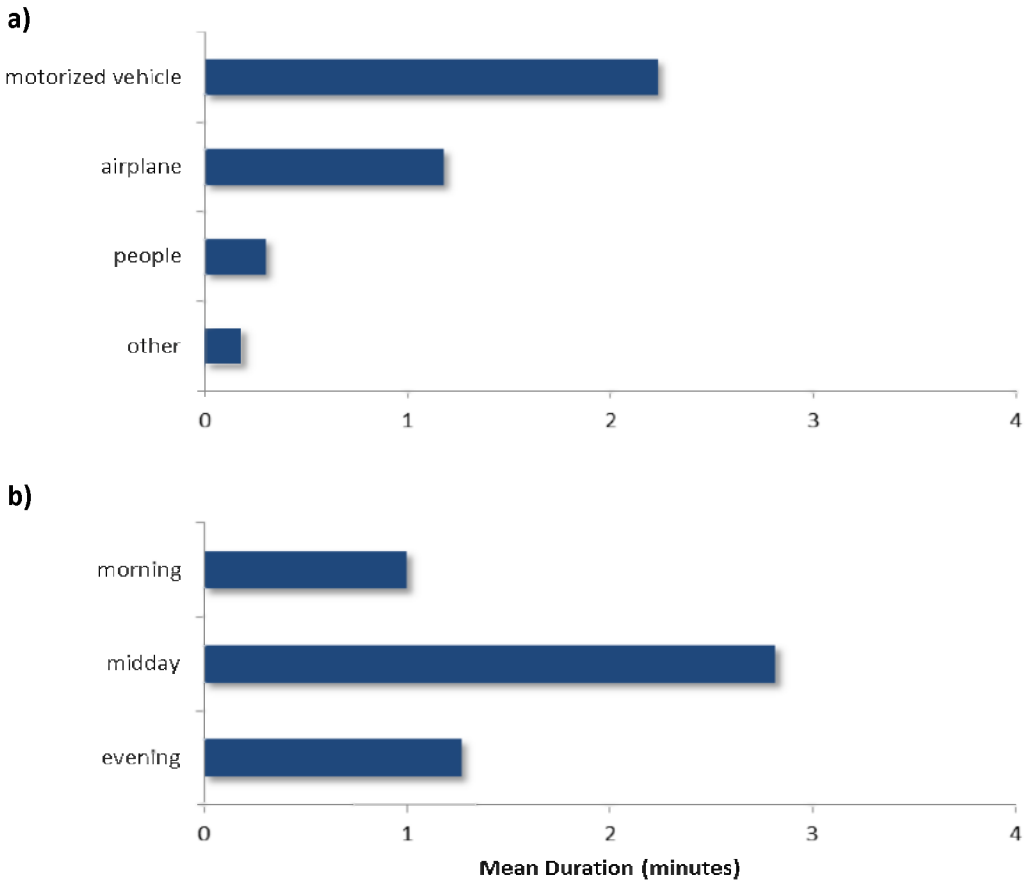

Figure 26. Mean duration of noise intrusions by a) source, and b) time of day.

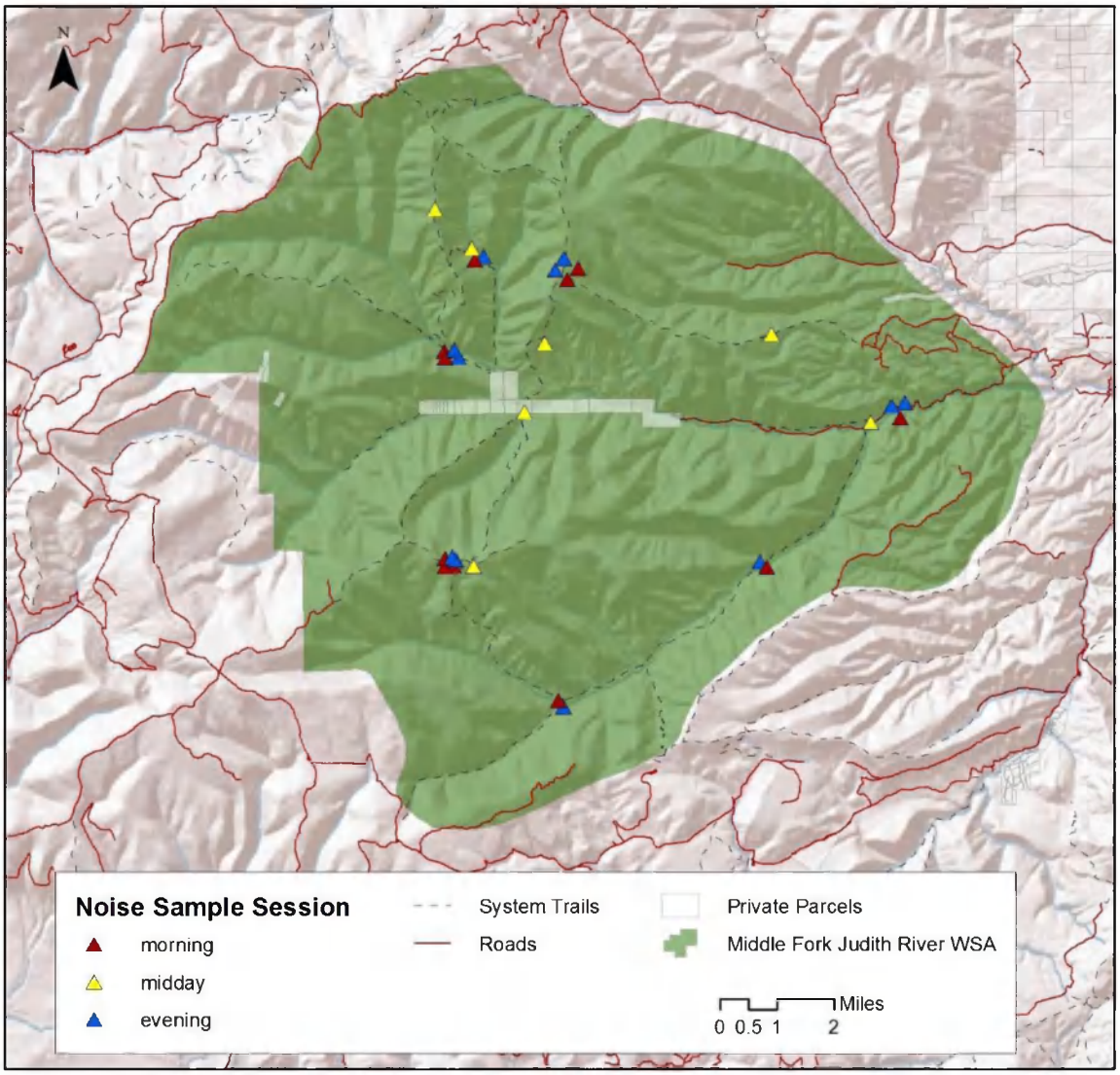

Figure 27. Location of standardized noise sampling sessions.

Outside of noise sampling sessions, an additional 230 noise intrusions were opportunistically recorded within the WSA boundary during trail monitoring. The majority of noises recorded were from airplanes (92%), with motorized vehicles, helicopters, cows, people, gunshots, and chainsaw noise comprising the remaining 8%. Visual confirmation was not possible for 188 detections, so the source of these noises was based on auditory identification only. Two recorded noise intrusions lasted >10 minutes (vehicle and cows), the remaining were less than 5 minutes in duration, with 54% under a minute. Five airplanes, a helicopter, and gunshots were loud and close, and the remaining were either heard clearly (48%) or barely audible (48%). Noise intrusions were distributed throughout the WSA (Figure 28).

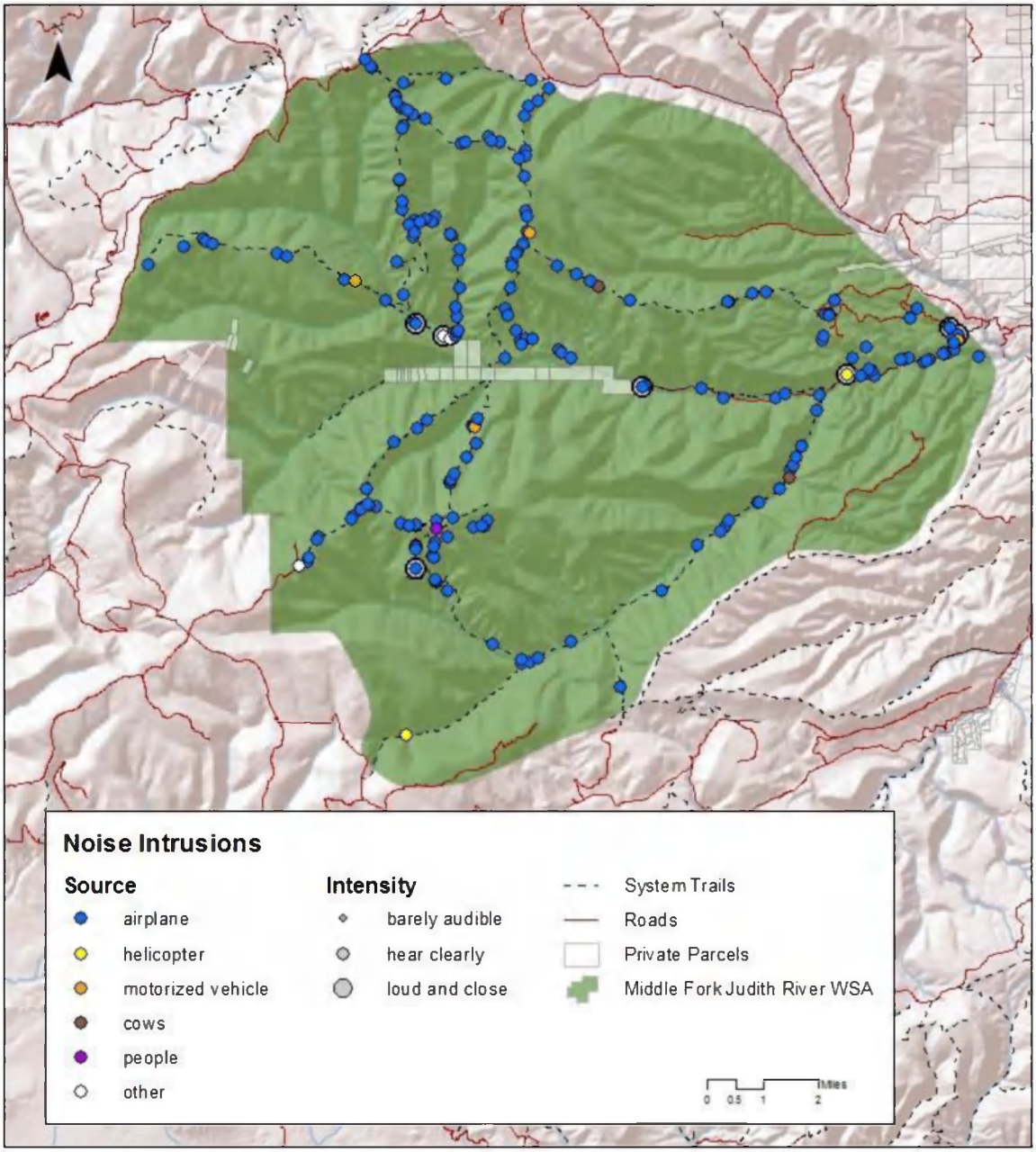

Figure 28. Location, source, and intensity of all opportunistic noise intrusions heard within the WSA.

Visual Intrusions

Human development that was visible from within the Wilderness Study Area 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

Five visual intrusions were observed from within the WSA, including buildings visible on a private inholding and cities/towns in the far distance. The "other" visible intrusion was the Showdown ski area. Visual intrusions were primarily limited to Sand Point and trails along ridgelines (e.g. Prospect Ridge and Woodchopper Ridge). This data is shown in Table 5 and Figure 29.

Table 5. Summary of visual intrusions by type.

Type	No.
buildings	2
cities/towns	1
other	2
Total	**5**

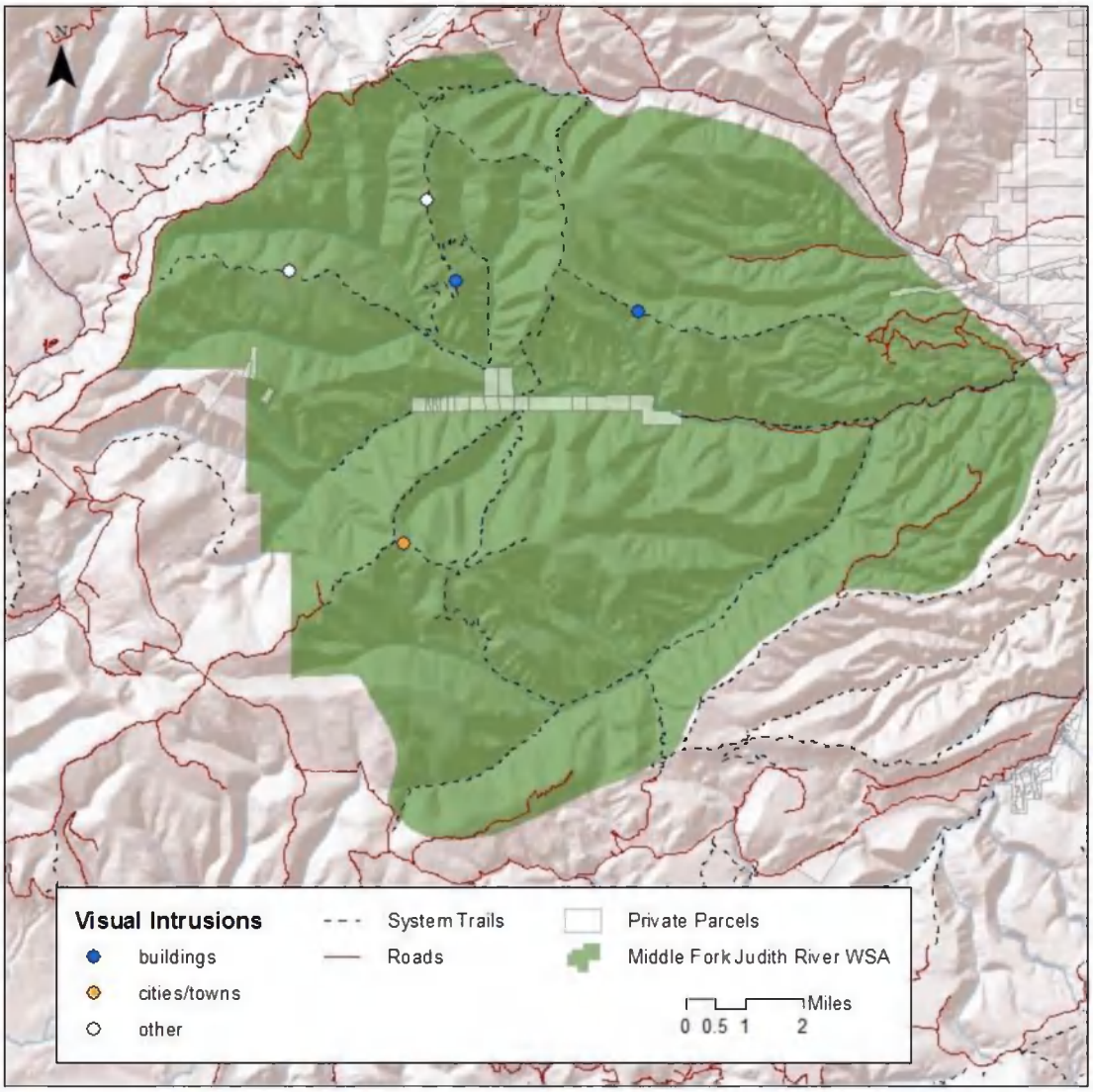

Figure 29. Visual intrusions by type seen from within the WSA.

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 32 campsites were recorded, all of which were inside the WSA (Figure 30). Most campsites were located along the Middle Fork Judith River (#437) and the Lost Fork Judith River (#409; 32% and 28% respectively).

Based on the summary impact evaluation scores, 13% of campsites were minimally impacted, 44% were moderately impacted, 34% were highly impacted, and two sites were extremely impacted (Table 6). Five campsites were missing data for one or more impact attribute. For all but one of these campsites an impact evaluation score was calculated using data averages for any missing values. The campsite with a missing score was occupied by campers, so no impact attributes were evaluated. The two most highly impacted campsites were a large camp with multiple fire rings located on the Middle Fork Judith River (#437) and an outfitter camp midway up the Lost Fork Judith (#409). Vegetation loss and cleanliness were ranked as highly impacted more often than any other condition attribute at campsites evaluated, (52% and 42% of campsites, respectively; Figure 31). Barren core area was given the lowest impact ranking at the majority (81%) of campsites evaluated.

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

Impact Index Score Class	Impact Index Score Range	Number of Campsites
minimum	≤23	4
moderate	24-34	14
high	35-44	11
extreme	≥45	2
-	(missing data)	1
Total		**32**

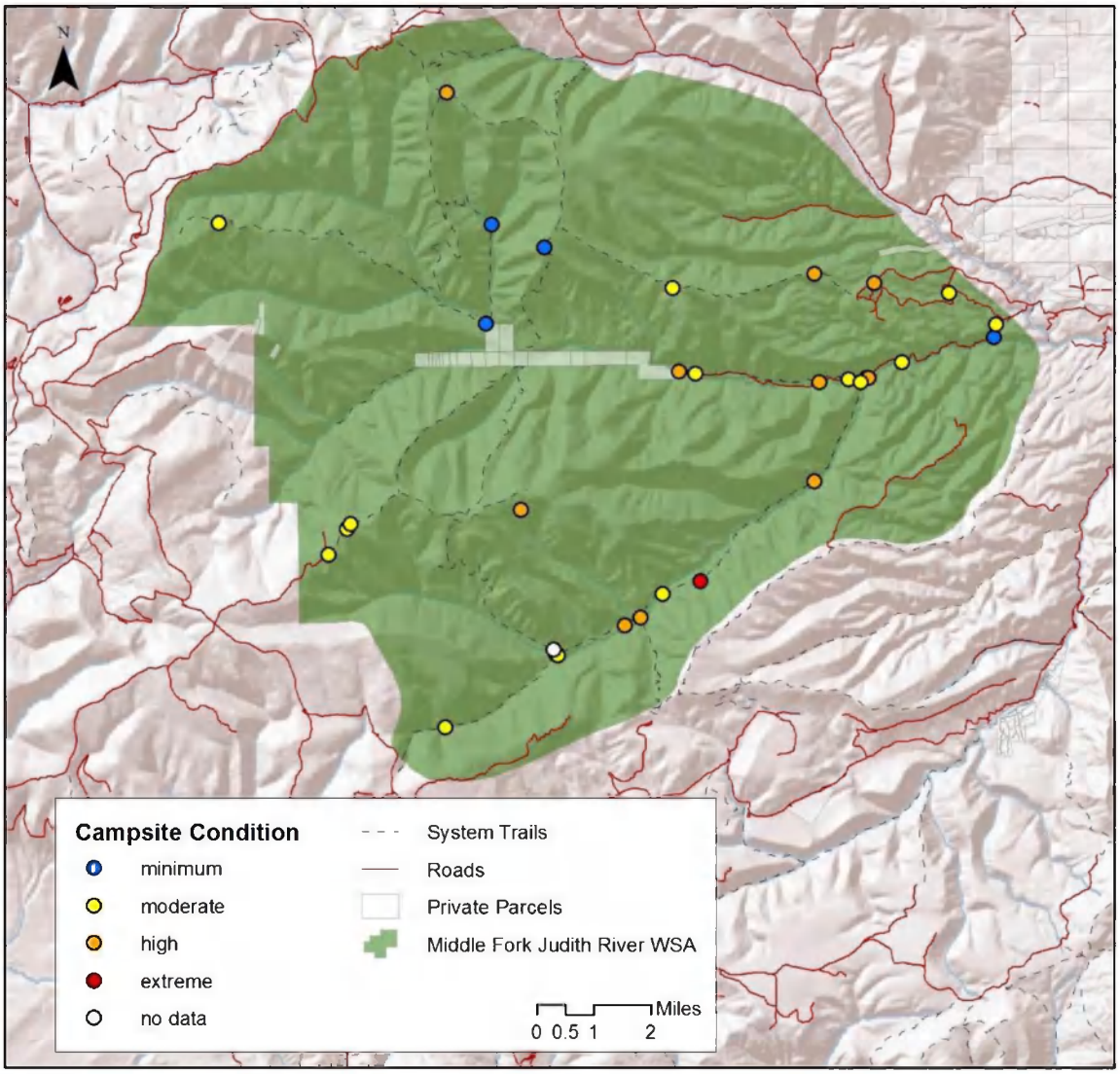

Figure 30. Location and impact class of documented campsites.

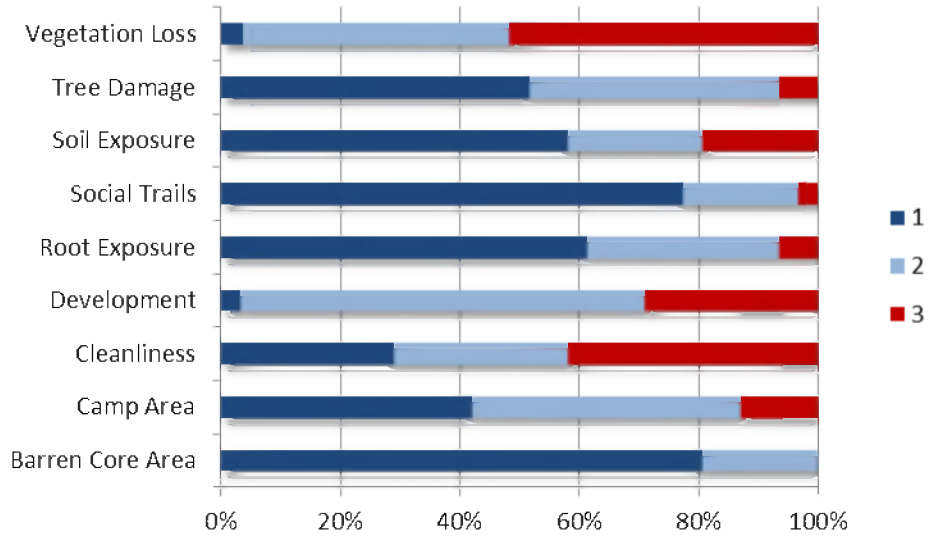

Figure 31. Proportion of campsites with impact ranking of 1=low, 2=moderate, or 3=high for each impact attribute (shows the relative contribution of each attribute).

Location

The majority of campsites were associated with streams or forests (44% and 31%, respectively), followed by meadows (19%), and saddles (6%). Campsite-specific ecological attributes are detailed in Appendix 3.

Campsite location and landform was associated with the level of impact observed (Figure 32). The majority of campsites with high or extreme impact scores (62%) were located along streams and were <200 feet from water.

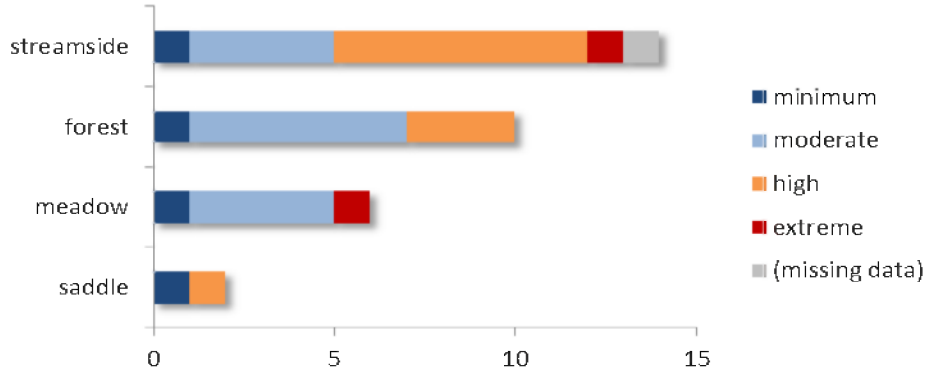

Figure 32. Number of campsites by landform category and impact class.

V. FOREST SPECIFIC ATTRIBUTES

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

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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

APPENDIX 2. SUMMARY OF FIELD NOTES AND TRAIL CONDITIONS

This appendix summarizes relevant field information from the "Trip Reports" written by field leaders following each monitoring trip. Information is organized by trail number, divided into trails north and south of the Middle Fork River, and includes notes on trail conditions, weed distributions, and other observations that provide additional context to monitoring data collected.

Trails North of Middle Fork River: Yogo Peak area, Prospect Ridge, Kelly Mountain, Coyote Peak area, Woodchopper Ridge

#435 (Morris Creek): The Morris Creek trail is well established and in good condition. It is a wide single-track from the clearly-marked trailhead to the junction with #444. Unlike other trails in the Middle Fork region, it is nicely graded for use by hikers with long switchbacks and gradual climbing.

#450 (Yogo Creek): Trail #450 is marked with cairns as it descends east from #444. It drops into Yogo Creek drainage farther south (lower elevation) than denoted on the USGS quadrangle. It is well-established and single track the length of its descent until the lower, flat 2-mile section where it becomes double-track and crosses Yogo Creek repeatedly. This trail has numerous downed logs, most of which seemed around 9 inches dbh as the upper drainage was forested almost entirely with similarly-sized Lodgepole Pines.

Trail #442 (Stiner Creek, north half of Prospect Ridge): Starting from the junction with #441, #442 follows Stiner Creek very closely for the first two miles, crossing this creek about a dozen times. This trail segment appears on the forest map but does not appear on the quads. There was evidence of motorbike use along this trail, but we encountered only one significant stretch of erosion due to motorized use. After two miles, the trail cuts west and climbs up to Prospect Ridge via steep, heavily used switchbacks. This section of the trail had evidence of frequent motorbike use, and many of the switchbacks were either truncated or ignored, resulting in a much steeper trail. Once it gains the ridge, the trail is rockier and drier, widens to ATV width and had more evidence of motorized use. Weeds are sparse along this trail.

Trail #428 (South half of Prospect Ridge): This trail is wide and rocky along the ridge, becoming narrower and wetter as it descends into the Cleveland Creek drainage. There is a good deal of evidence of motorized use, especially along the ridge. The descent into the drainage is quite steep. We encountered no weeds along this trail.

Trail #441 (Big Deer Point to Cleveland Creek): The first five miles of this trail (until the steep descent into Cleveland Creek) are very wide and seem to have been an ATV trail in the recent past. A number of felled trees appear to block the path of ATVs, but there is still room for motorbikes and hikers to pass. The trail consists of very loose mineral soil and dislodged loose rocks on the steep descent down into Cleveland Creek. Water diversions could greatly improve this trail. Motorbike use was evident from confluence of Cleveland and Warm Springs Creek until the private property boundary. We encountered only two small weed patches on this trail (both Cheatgrass).

Forest Roads #6531 and #6529 (from Yogo Crossing): Road 6531 is well-established from Yogo Crossing and ascends a steep hill before flattening out into a gradual climb. After a couple miles, it connects with a small spur trail that runs north-south and adjoins 6531 and 6529. The spur trail, although clearly a

two-track, seems to receive less use than the roads as it is still grass-covered and runs through open parkland. Road 6531 eventually curves south-southeast and turns into 6529. The section curving south-southeast just north of Arch Coulee is not signed clearly. It additionally appears a section of the trail is closed to motorized travel to prevent the spread of noxious weeds (according to a USFS sign at the roads' intersection). Road 6529 is well-established and continues eastward back to the intersection with Trail 437 and eventually connects back at Yogo Crossing. The roads are gravelly and there are some sections of exposed limestone rock that would make travel in anything but a high-clearance 4WD vehicle challenging. There do not seem to be any significant problems with erosion. This is the only section in the middle fork where we found Spotted Knapweed (*Centaurea maculosa*).

Trail #424 (Arch Coulee): Splitting north off of #437, #424 begins in a narrow gully. It heads sharply uphill north through a gully, and is well defined, narrow (single-track) and only moderately worn. Until its junction with Forest Road 6529 the trail width could only accommodate foot traffic. #424 technically ends at this junction, however any hike would most likely continue on 6529, which is much wider and worn from ATV usage.

Trail #443 (Kelly Mountain to Middle Fork Ranch): This trail descends steeply from the junction of Trail #444 (Woodchopper Ridge) down to the property boundary of the Middle Fork Ranch. This section of trail is steep, visibly channeled from erosion, and heavily braided, changing several times from single track to double track. It appears to get a good deal of motorized use. It is easy to follow until it enters a meadow on a bench above the valley bottom, where it disappears. Since the valley floor and Middle Fork drainage are visible from this point, it is not too difficult to bushwhack across the meadow and down to the junction with #437. We saw a large amount of Houndstongue and Cheat Grass in the meadow on this bench. Interestingly, the Cheat Grass grew mainly in small, circular patches 5-10 feet in diameter. The Houndstongue was more widespread throughout the meadow and we were unable to monitor it all, choosing instead to make note of a heavy, meadow-wide infestation.

#444 (Woodchopper Ridge): #444 is an indistinguishable continuation of Forest Road 6527. Heading west from its gradual origin along Woodchopper Ridge, it is well defined and worn from regular ATV use. In several places temporary trail braiding was used to skirt downed trees. There appears to be regular chainsaw use in keeping the downed trees off the trail. #444 continues north from its junction with #443 to Kelly Mountain. On this trail segment #444 motorized use appears heavy, especially from motorbikes. The trail is single-track for a quarter-mile after Kelly Mountain, and then a well-worn two-track north to Yogo Peak. Portions of the trail are covered with large rocks, making walking slow. The trail occasionally splits into two braids, a wider, steeper one for motorized use, and a flatter-grade single track for hikers. No weeds were found along this high elevation section.

Trails South of Middle Fork Ranch and Middle Fork Judith River (Sand Point Area, South Fork Lost Fork Judith River, and Middle Fork Trail)

Trail #409 (South Fork Lost Fork Judith River): A small sign displaying a hiker marks the origin of #409 off of forest road 487. No clear trail was found, but a few blazes delineate a route down into the Lost Fork drainage. The USGS quadrangle shows the trail at approximately the same elevation as the creek bed, but for the first two miles or so, no trail was found in the dry, brushy drainage bottom. As the drainage becomes wetter, a trail emerges, consistent with where it is located on the map. Just east of the Burris Cabin, #409 becomes a faint double-track that continues to the junction with the #437 on the Middle Fork River. After crossing to the south side of the Lost Fork east of Burris Cabin, approximately 20-25 downed logs were encountered throughout forested patches. A quarter mile section of the trail one mile south of the junction with #437 is steeply angled and requires re-treading as it has been churned up and widened by a cattle drive on July 1, 2012.

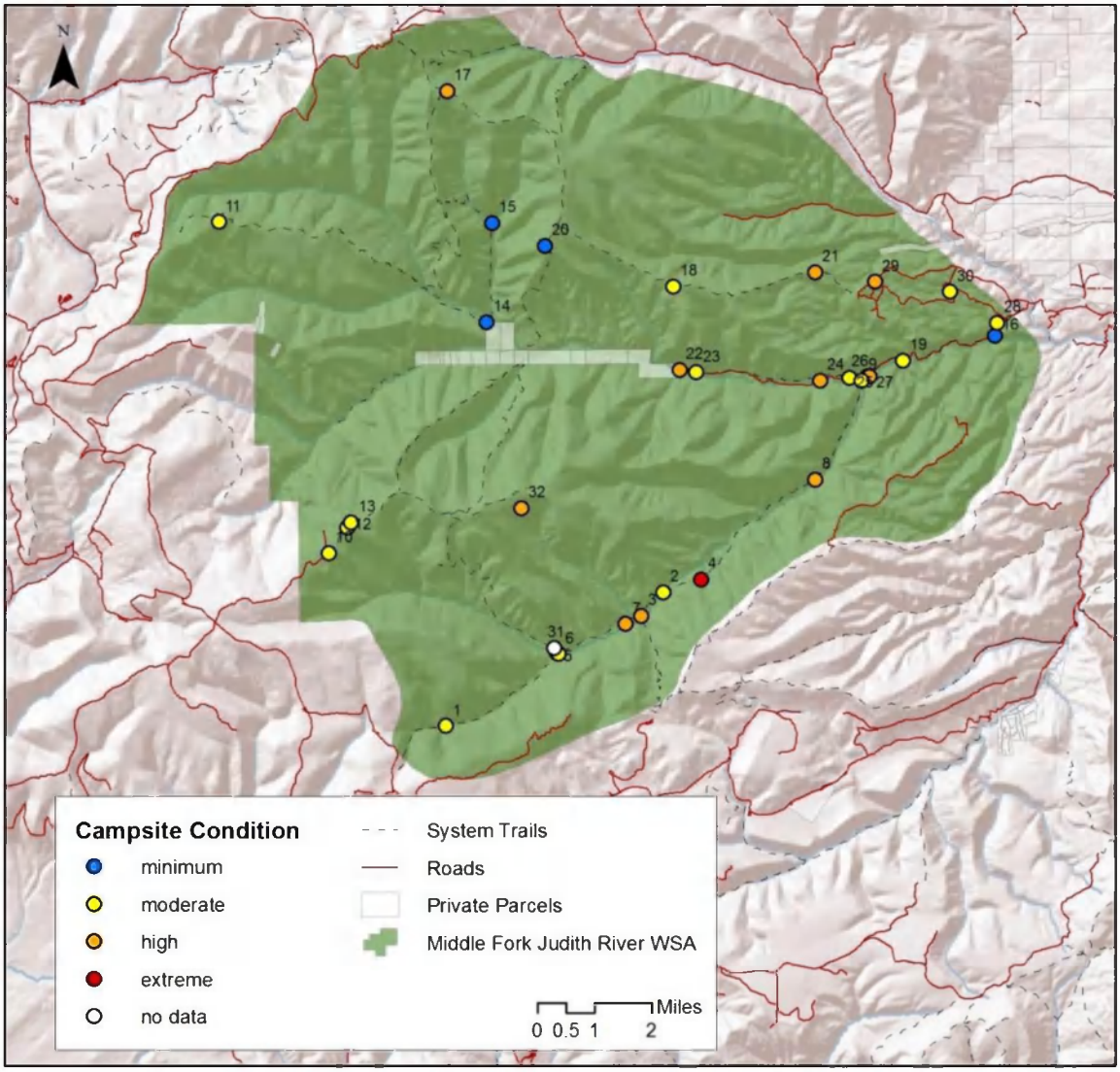
Trail #436 (Sand Point): #436 is a two-track for approximately 1 mile from the trailhead to an un-gated fence opening. Beyond this fence, the USFS appears to have cut numerous trees and laid them down over half of a double track for about one quarter mile to discourage use of ATVs and to restrict usage to a single-track trail. Where #436 joins #407, the trail begins to show signs of ATV usage; trails #436, #422, and #407 form a popular dirt-biking loop.

Trail #422 and #434 (Sand Point to Middle Fork Judith): Originating at its junction with #409, #422 meanders northwesterly towards Sand Point then becomes #434 as it turns northeasterly down to the Middle Fork Ranch inholding. From the junction with #436, #434 is well worn from regular dirt bike use. The winding trail through the high elevation fields near Sand Point is worn down to small rocks and sandy soil. As #434 descends in the direction of the ranch the many turns are widened out for dirt bike passage. These trail segments are heavily influenced by dirt bike use, with trails that shoot straight up hills with fewer switchbacks, and exaggerated corners.

#407 (Middle Fork Judith to Sand Point): With its physical path originating inside private property, #407 technically begins to the south and uphill from the river and connects the ranch to Sand Point. Approximately three miles in length, #407 is well-defined route and worn heavily by dirt bikes.

#437 (Middle Fork Judith to Yogo Crossing): #437 emerges from private inholdings and follows the Middle Fork Judith River eastward, crossing it numerous times. The trail also crisscrosses Forest Road 825 (effectively an ATV route), and at times the two are difficult to distinguish. Frequent river crossings by the trail and road have resulted in many incidents of user-created erosion, as well as convoluted networks of alternate routes, and braided hiking paths sometimes on both sides of the river. Numerous patches of houndstongue and thistle were recorded.

APPENDIX 3. CAMPSITE INVENTORY & CONDITION



Location of inventoried campsites and assigned number (1-32). Numbered campsites correspond to inventory analyses, below.

Campsite #1

Location	
Easting (m)	535,429
Northing (m)	5,177,349
Landform	meadow
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	1-8 scarred, or 1-3 badly scarred or felled
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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	27
Class	moderate

Campsite #2

Location	
Easting (m)	541,586
Northing (m)	5,181,129
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%/76-100%
Mineral Soil Exposure At Site/Off Site	0-5%/0-5%
Tree Damage	No more than broken lower branches
Root Exposure	1-6 trees with roots exposed
Development	1 fire ring
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	34
Class	moderate

Campsites #3

Location	
Easting (m)	540,971
Northing (m)	5,180,467
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%/76-100%
Mineral Soil Exposure At Site/Off Site	26-50%/0-5%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	>6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	<500 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	42
Class	high

Campsite #4

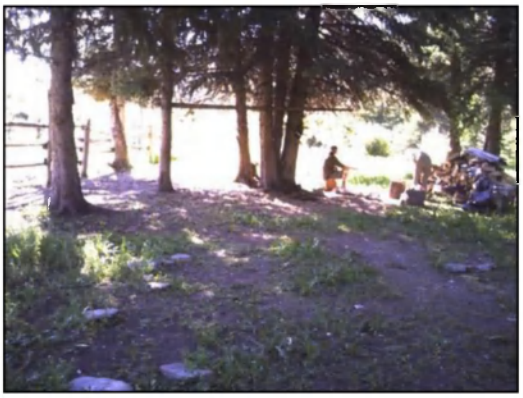
Location	
Easting (m)	542,666
Northing (m)	5,181,505
Landform	meadow
Distance to Trail	>200 ft.
Distance to Water	>200 ft.
Distance To Nearest Campsite	>500 ft.

Conditions	
Veg. Cover At Site/Off Site	51-75%/76-100%
Mineral Soil Exposure At Site/Off Site	0-5%/0-5%
Tree Damage	>8scarred, or >3 scarred or felled
Root Exposure	>6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	Human waste, much litter, or manure
Social Trails	>3 discernible trails, or >1 well worn
Camp Area	>2,000 sq. ft.
Barren Core Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation	
Score	52
Class	extreme
CAMP_NOTES	outfitter camp

Note: outfitter camp

Campsite #5



Location	
Easting (m)	538,575
Northing (m)	5,179,426
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	0-5%/76-100%
Mineral Soil Exposure At Site/Off Site	0-5%/0-5%
Tree Damage	No more than broken lower branches
Root Exposure	1-6 trees with roots exposed
Development	(missing data)
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	>2,000 sq. ft.
Barren Core Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation	
Score	40*
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 #6

Location

Easting (m)	538,614
Northing (m)	5,179,387
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 fire ring
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	<500 sq. ft.
Barren Core Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Score	26
Class	moderate

Campsite #7

Location	
Easting (m)	540,519
Northing (m)	5,180,235
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	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	None
Development	1 fire ring
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	>2,000 sq. ft.
Barren Core Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation	
Score	39
Class	high

Campsite #8

Location	
Easting (m)	545,893
Northing (m)	5,184,323
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%/76-100%
Mineral Soil Exposure At Site/Off Site	6-25%/0-5%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	1-6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	(missing data)
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	39*
Class	high

Note: Campsite was inaccessible, located on far side of river.

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

Campsite #9

Location

Easting (m)	547,207
Northing (m)	5,187,141
Landform	meadow
Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance To Nearest Campsite	(missing data)

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 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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Score	24
Class	moderate

Campsite #10

Location	
Easting (m)	532,110
Northing (m)	5,182,244
Landform	meadow
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%/26-50%
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	(missing data)
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	31*
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 #11

Location	
Easting (m)	529,002
Northing (m)	5,191,630
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	76-100%/76-100%
Mineral Soil Exposure At Site/Off Site	6-25%/76-100%
Tree Damage	No more than broken lower branches
Root Exposure	None
Development	1 fire ring
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	<500 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.
Impact Evaluation	
Score	25
Class	moderate

Campsite #12

Location	
Easting (m)	532,632
Northing (m)	5,182,981
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%/76-100%
Mineral Soil Exposure At Site/Off Site	6-25%/0-5%
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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	28
Class	moderate

Campsite #13

Location	
Easting (m)	532,747
Northing (m)	5,183,115
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	0-5%/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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	30
Class	moderate

Campsite #14

Location	
Easting (m)	536,572
Northing (m)	5,188,799
Landform	meadow
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 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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	23
Class	minimum

Campsite #15

Location	
Easting (m)	536,737
Northing (m)	5,191,595
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	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 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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	23
Class	minimum

Campsite #16

Location	
Easting (m)	550,971
Northing (m)	5,188,396
Landform	streamside
Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance To Nearest Campsite	

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 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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	23
Class	minimum

Campsite #17

Location

Easting (m)	535,468
Northing (m)	5,195,334
Landform	saddle
Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance To Nearest Campsite	>500 ft.

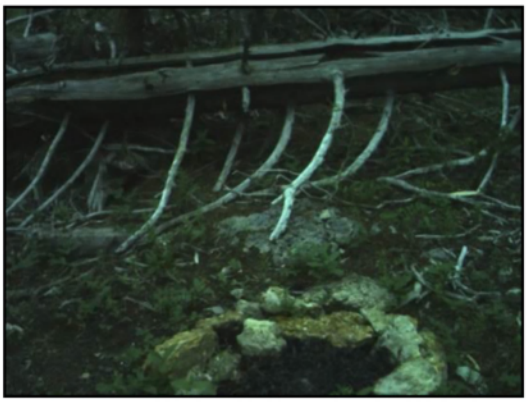
Conditions

Veg. Cover At Site/Off Site	26-50%/51-75%
Mineral Soil Exposure At Site/Off Site	0-5%/0-5%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	1-6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Score	37
Class	high

Campsite #18



Location	
Easting (m)	541,866
Northing (m)	5,189,800
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%/51-75%
Mineral Soil Exposure At Site/Off Site	6-25%/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 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	27
Class	moderate

Note: Fire ring located on the trail. Campsite was naturalized.

Campsite #19

Location	
Easting (m)	548,382
Northing (m)	5,187,705
Landform	streamside
Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance To Nearest Campsite	

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 fire ring
Cleanliness	No more than scattered charcoal from 1 fire ring
Social Trails	2-3 discernible trails, or 1 well worn
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	31
Class	moderate

Note: Campsite was naturalized.

Campsite #20

Location	
Easting (m)	538,225
Northing (m)	5,190,952
Landform	saddle
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%/0-5%
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 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	22
Class	minimum

Note: Campsite located on a rocky nob.

Campsite #21

Location	
Easting (m)	545,896
Northing (m)	5,190,200
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	76-100%/76-100%
Mineral Soil Exposure At Site/Off Site	6-25%/0-5%
Tree Damage	>8scarred, or >3 scarred or felled
Root Exposure	1-6 trees with roots exposed
Development	1 fire ring
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	39
Class	high

Campsite #22

Location	
Easting (m)	542,061
Northing (m)	5,187,433
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%/76-100%
Mineral Soil Exposure At Site/Off Site	51-75%/6-25%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	1-6 trees with roots exposed
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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	42
Class	high

Campsite #23

Location	
Easting (m)	542,523
Northing (m)	5,187,371
Landform	meadow
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%/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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	26
Class	moderate

Campsite #24

Location	
Easting (m)	546,040
Northing (m)	5,187,139
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	0-5%/76-100%
Mineral Soil Exposure At Site/Off Site	76-100%/6-25%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	None
Development	1 fire ring
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	2-3 discernible trails, or 1 well worn
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	40
Class	high

Campsite #25

Location	
Easting (m)	546,853
Northing (m)	5,187,223
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	6-25%/0-5%
Tree Damage	No more than broken lower branches
Root Exposure	None
Development	1 fire ring
Cleanliness	Human waste, much litter, or manure
Social Trails	2-3 discernible trails, or 1 well worn
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	34
Class	moderate

Campsite #26

Location	
Easting (m)	547,370
Northing (m)	5,187,246
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%/76-100%
Mineral Soil Exposure At Site/Off Site	26-50%/0-5%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	1-6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	Human waste, much litter, or manure
Social Trails	2-3 discernible trails, or 1 well worn
Camp Area	>2,000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	49
Class	extreme

Campsite #27

Location	
Easting (m)	547,416
Northing (m)	5,187,255
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%/76-100%
Mineral Soil Exposure At Site/Off Site	26-50%/0-5%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	1-6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	Human waste, much litter, or manure
Social Trails	2-3 discernible trails, or 1 well worn
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	45
Class	high

Note: Included 4 fire rings and a pole stash.

Campsite #28

Location	
Easting (m)	551,046
Northing (m)	5,188,779
Landform	forest
Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance To Nearest Campsite	

Conditions	
Veg. Cover At Site/Off Site	76-100%/76-100%
Mineral Soil Exposure At Site/Off Site	0-5%/51-75%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	None
Development	1 fire ring
Cleanliness	No more than scattered charcoal from 1 fire ring
Social Trails	2-3 discernible trails, or 1 well worn
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	31
Class	moderate

Note: Campsite was naturalized.

Campsite #29

Location	
Easting (m)	547,588
Northing (m)	5,189,932
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%/0-5%
Tree Damage	1-8 scarred, or 1-3 badly scarred or felled
Root Exposure	1-6 trees with roots exposed
Development	>1 firering or other major development
Cleanliness	Human waste, much litter, or manure
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	< 50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	40
Class	high

Campsite #30

Location	
Easting (m)	549,708
Northing (m)	5,189,650
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	76-100%/76-100%
Mineral Soil Exposure At Site/Off Site	6-25%/0-5%
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.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation	
Score	26
Class	moderate

Campsite #31

Location	
Easting (m)	538,498
Northing (m)	5,179,568
Landform	streamside
Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance To Nearest Campsite	(missing data)

Conditions	
Veg. Cover At Site/Off Site	(missing data)
Mineral Soil Exposure At Site/Off Site	(missing data)
Tree Damage	(missing data)
Root Exposure	
Development	>1 firering or other major development
Cleanliness	(missing data)
Social Trails	(missing data)
Camp Area	>2,000 sq. ft.
Barren Core Area	(missing data)
Barren Core Camp Area	(missing data)

Impact Evaluation	
Score	(Insufficient data to calculate)
Class	

Note: Impact measures were not collected because campsite was occupied.

Campsite #32

Location	
Easting (m)	537,563
Northing (m)	5,183,525
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	6-25%/51-75%
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	1-6 trees with roots exposed
Development	1 fire ring
Cleanliness	No more than scattered charcoal from 1 fire ring
Social Trails	No more than 1 discernible trail
Camp Area	500-2000 sq. ft.
Barren Core Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation	
Score	42
Class	high

APPENDIX 4. CAMPSITE CONDITION EVALUATION WORKSHEET

Wilderness Campsite Inventory & Condition Evaluation (TLWSA 2010)

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** 1 – 0-5% 3 – 26-50% 5 – 76-100% 2 – 6-25% 4 – 51-75%	**ON UNUSED COMPARATIVE AREA** 1 – 0-5% 3 – 26-50% 5 – 76-100% 2 – 6-25% 4 – 51-75%
2. MINERAL SOIL EXPOSURE	1 – 0-5% 3 – 26-50% 5 – 76-100% 2 – 6-25% 4 – 51-75%	1 – 0-5% 3 – 26-50% 5 – 76-100% 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 # 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 # 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 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 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 Estimated camp area _____	(< 500 ft square)	(500-2000 ft square)	(> 2000 ft square)		x4	
11. BARREN CORE CAMP AREA 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