

Wilderness Character Monitoring Ten Lakes Wilderness Study Area 2010

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INTRODUCTION

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

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

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

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

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

DATA MANAGEMENT

The following section describes the steps taken to collect and analyze indicators of wilderness character (attributes) in the Ten Lakes Wilderness Study Area: (1) protocol development, (2) field data collection, and (3) data analysis and mapping.

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 provided on the accompanying CD.

Data Collection

Data was collected between June and September 2010. 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 or line features. After each trip, GPS data were checked for quality control and uploaded to a network server. A list of the collected attributes is given in Appendix 1, along with brief descriptions. A Microsoft Excel database, as well as a geodatabase containing all attribute measures is also provided on the accompanying CD.

Data Analysis

GPS files were differentially corrected using Trimble Pathfinder Office software (Trimble Navigation Limited 2009). Differential correction is a process in which GPS coordinate data can be compared with a fixed spatial reference and adjusted to reduce any systematic error in position that often occurs with field GPS data. After this process was completed and data for each attribute group combined from individual GPS units, all data were imported into a spatial geodatabase using ArcGIS (ESRI 2009). All monitoring data was re-projected into North American Datum 1983 as Universal Transverse Mercator (UTM) grid coordinates in zone 11.

All spatial analyses were performed using ArcGIS (ESRI 2009). Monitoring attribute summaries are provided in a combination of tables, figures, and maps.

WILDERNESS CHARACTER MEASUREMENTS

The following sections describe indicators 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, above). 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 our crews to manage weed infestations diminish the untrammeled character of the Ten Lakes WSA. Agency actions that affect the untrammeled quality of the Ten Lakes 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 (Weed_Action attribute)

At each weed patch, any action taken to manage the infestation was recorded. Of the 32 weed patches encountered, 4 (13%) were hand pulled. Three of the pulled patches (Weed ID # 22, 23, and 25; see Figure 2) were located within the WSA boundary, while the remaining patch (Weed ID #1; see Figure 2) was on a trail leading into the Ten Lakes WSA.

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 indicators of naturalness appropriate and feasible to monitor with our 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), as summarized in the following sections.

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 our 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, but provide detailed tables of all data associated with each documented infestation in Appendix 2. Weed patches occurring on trails leading into the WSA but outside the boundary are included in this report since they contribute to overall trail conditions, and could be a source for future infestations if they are not treated.

Weed Species Recorded (Weed_Species attribute)

Nine weed patches consisting of 3 weed species were recorded within the WSA boundary. However, an additional 23 patches and 2 more species were observed on trails leading into the WSA. A count-based summary of the weed species indicated that Canada Thistle and Oxeye Daisy patches were mapped most often, representing 34% and 28% respectively of all weed patches (Figures 2 and 3). Within the Ten Lakes WSA, 5 patches were Canada Thistle, 2 were Oxeye Daisy, and 2 were Meadow Hawkweed.

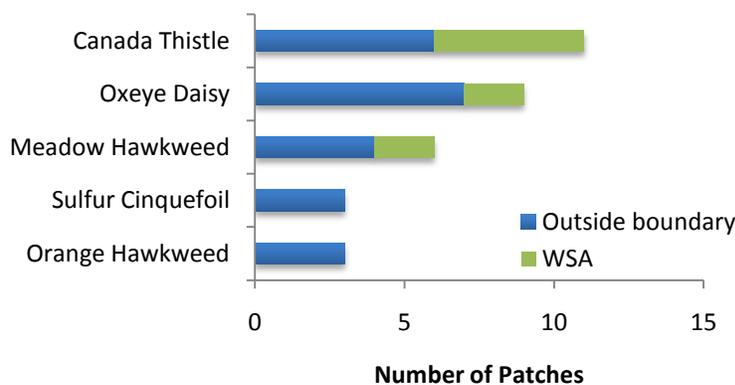


Figure 1. Number of weed patches by species.

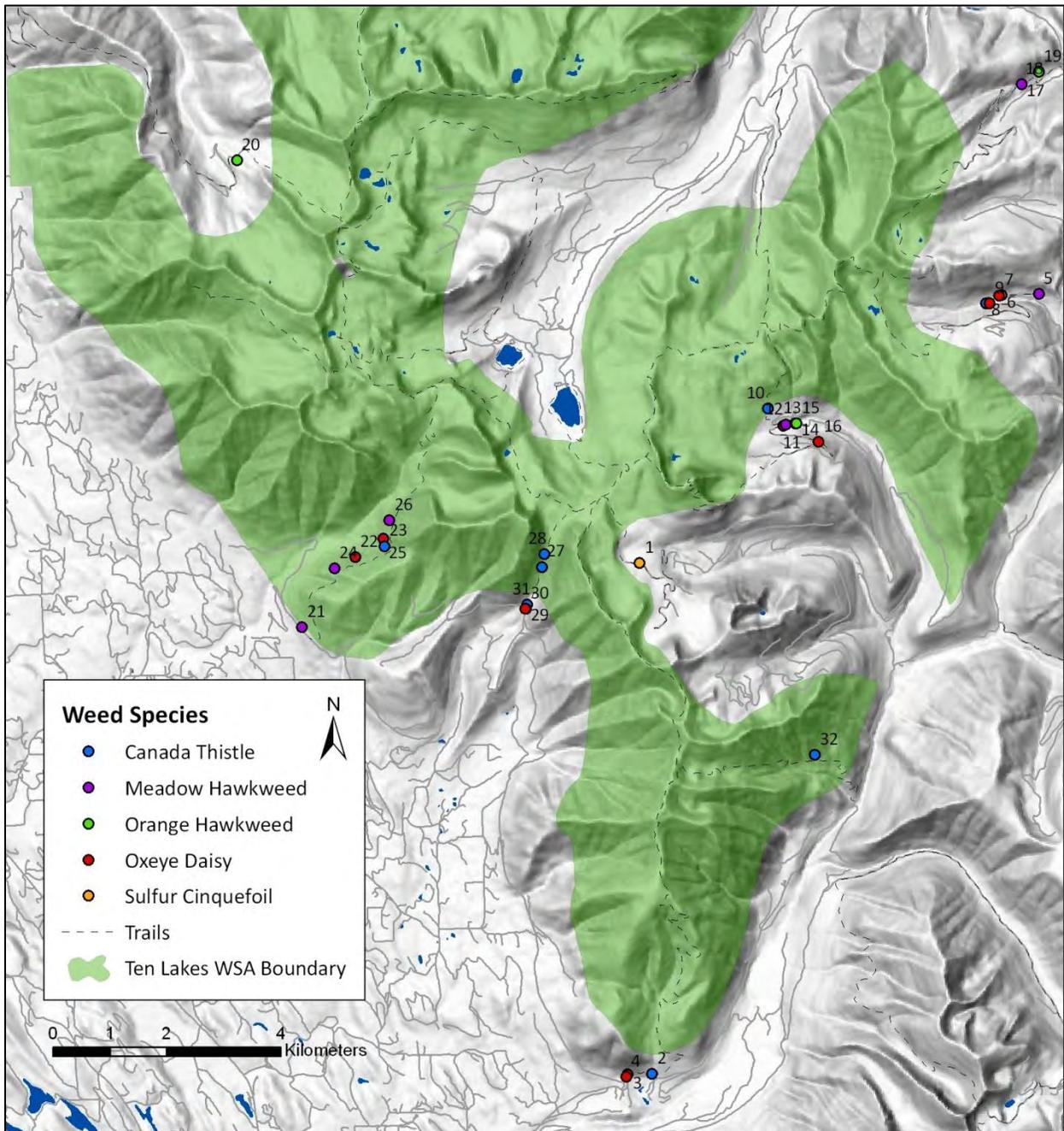


Figure 2. Locations of mapped weeds by species (numbers correspond to individual weed patches listed in Appendix 2)

Size of Infestation (Weed_Size attribute)

The size of each mapped weed patch was visually estimated as one of four classes (<0.1, 0.1-1.0, 1.0-5.0, and >5.0 acres). Twenty-one mapped patches (66%) were less than 1 acre in size, including 8 of the patches located inside the Ten Lakes WSA. The largest patch inside the WSA was 0.1 – 1.0 acres in size. The largest patches (> 5 acres) were made up of 3 species—Meadow Hawkweed, Orange Hawkweed, and Oxeye Daisy. This is shown both quantitatively and geographically in Figures 3 and 4.

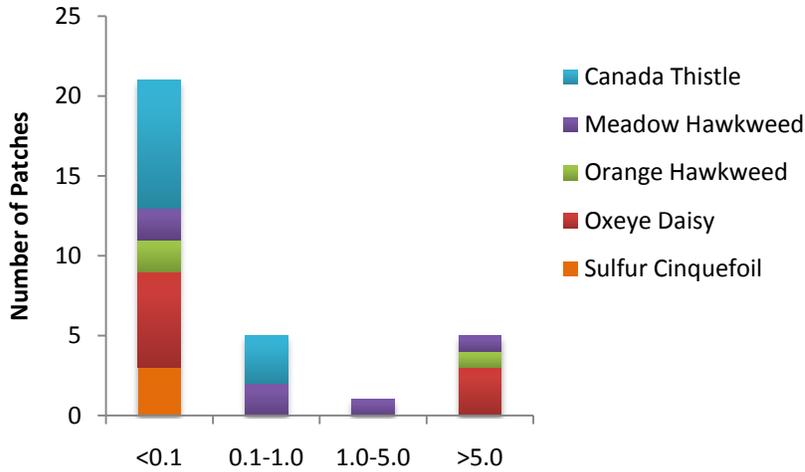


Figure 3. Number of patches by species in each infestation size class.

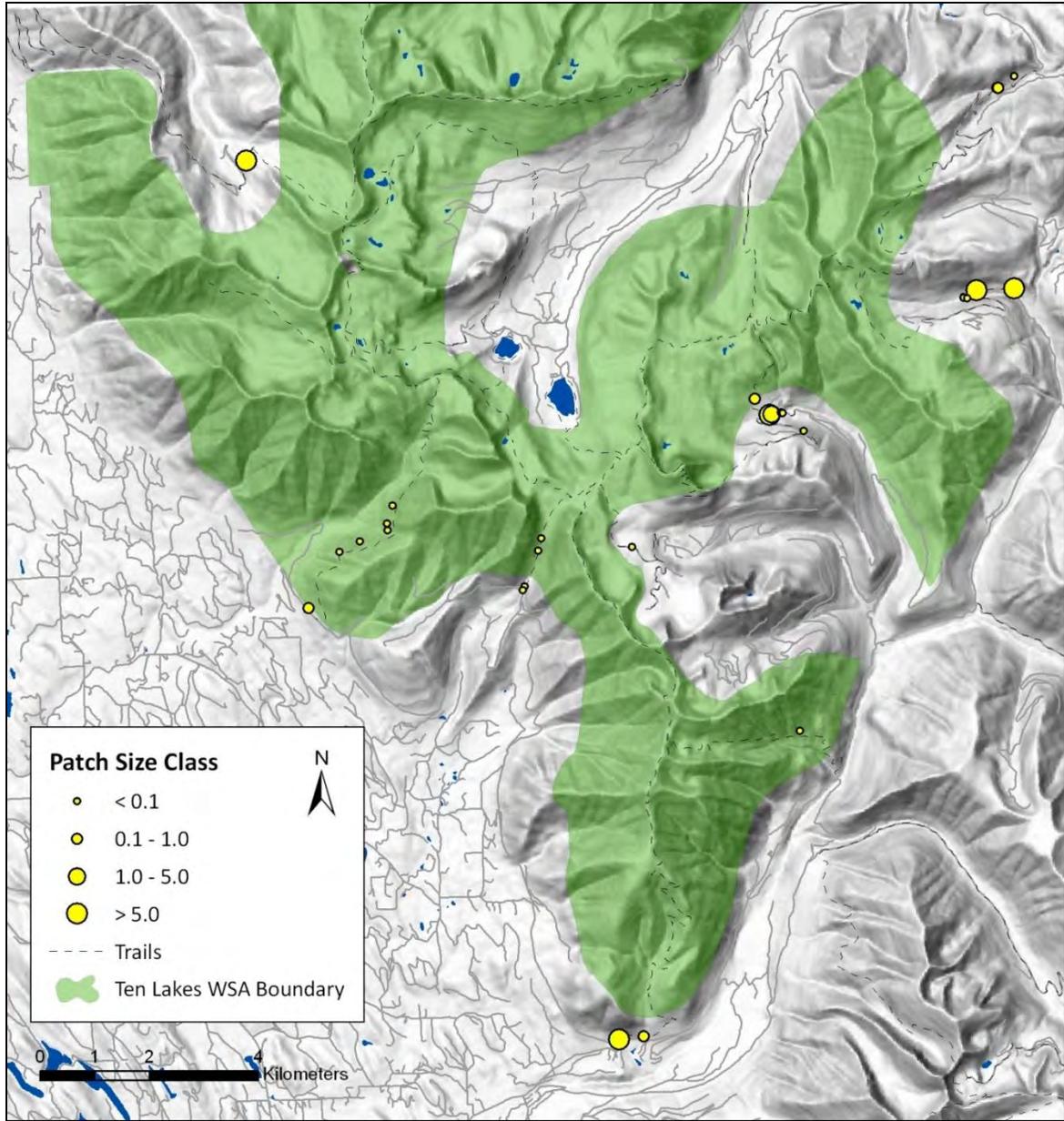


Figure 4. Locations of weed patches by size of infestation.

Spatial Distribution (Weed_Distribution attribute)

The spatial distribution of each weed patch was categorized as 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).

Most patches were linearly distributed (56%), including all 5 of the largest patches (Figure 5). Spatial distribution of patches was not specific to weed species, with the exception of Oxeye Daisy and Meadow Hawkweed, which were found linearly along the trail 80% and 86% of the time, respectively (Table 1).

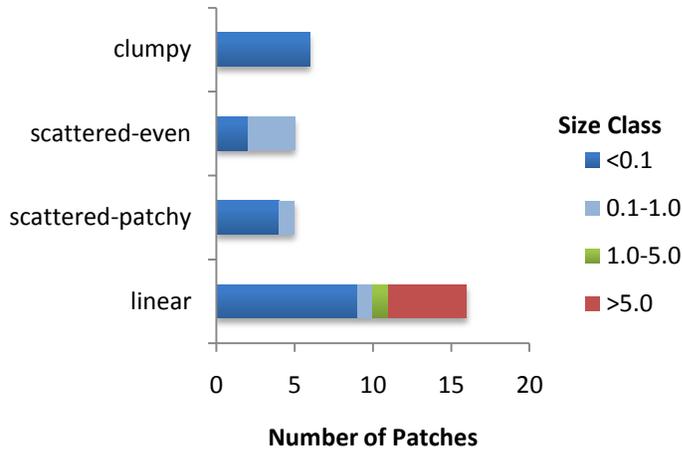


Figure 5. Spatial distribution of weed patches by size class.

Table 1. Spatial distribution of weed patches by species.

Weed Species	linear	clumpy	scattered-even	scattered-patchy
Canada Thistle	2	3	4	2
Meadow Hawkweed	5			1
Orange Hawkweed	2			1
Oxeye Daisy	7	1	1	
Sulfur Cinquefoil		2		1
Total	16	6	5	5

Weed Density (*Weed_Density attribute*)

To measure the density of weeds within each patch, the percentage of an area within an infestation that a species covered was visually estimated as: trace (<1%), low (1-5%), moderate (5-25%), or high (> 25%). Weed density was categorized as trace or low for 22 patches (69%), including all of the largest patches (>5 acres in size; Figure 6). All 10 patches with moderate or high weed density were small (<1 acre in size). Only two patches had densities > 25%, and both of these were Canada Thistle (Figure 6).

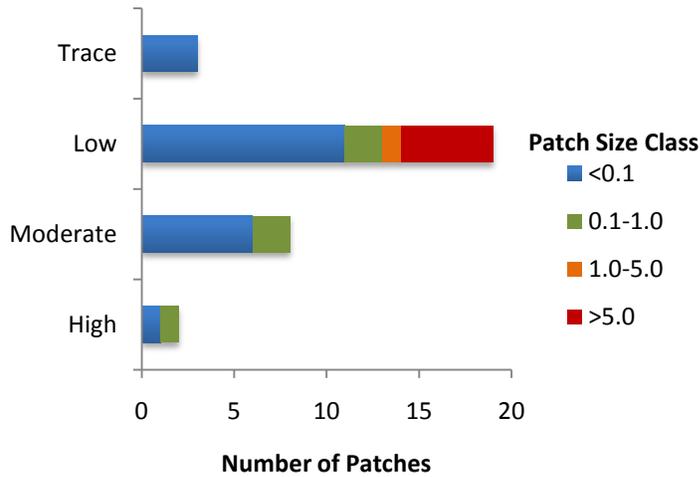


Figure 6. Number of recorded weed patches by patch size in each cover class.

Patch Phenology (*Weed_Phenology attribute*)

Phenological stage was reported for each weed patch observed using the following life history phases: 1) leaves/rosette present; 2) first flower (flower buds are visible with at least 3 plants flowering); 3) peak flowering (at least 50% of plants with open flowers); 4) end flowering (>50% of plants are flowering or have flowered); 5) fruit (any mature seed, capsule, or berry present) ; or 6) senescent (leaves and stems are dry and plants are no longer producing flowers or fruits).

Most weed patches were in early phenological stages, either with leaves present or first flowering (44% and 28%, respectively; Table 2). It is important to recognize that annual weather conditions and date of observation will impact phenological stage of the plant, as will physical factors such as elevation and aspect. Furthermore, phenological state will have a species-specific impact on chances of observation (e.g. a tall, flowering plant will be more conspicuous from the trail than the same individual not flowering; similarly, weeds that have, on average, a larger size, a longer flowering phase or very distinct leaves might be easier, on average, to spot).

Table 2. Phenological stage of weed patches by species.

Weed Species	Leaves/ Rosette	First Flower	Peak Flowering	End Flowering	Fruit	Senescent
Canada Thistle	9			2		
Meadow Hawkweed	1	2	1	1		1
Orange Hawkweed		3				
Oxeye Daisy	1	4	3	1		
Sulfur Cinquefoil	3					
Total	14	9	4	4	0	1

Primary and Secondary Disturbance Types (Weed_Disturb1/Disturb2 attributes)

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

The primary disturbances associated with most mapped weed patches were trails and roads (59% and 38% respectively; Figure 7). The remaining patches were associated with recent fire. Secondary associations were mostly from trails (38%), but also included stock, trailheads, roads, water, and recent fire (no secondary association was reported for one site; Figure 7). 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 our 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 and roads, and that these serve as important vectors for overall weed dissemination.

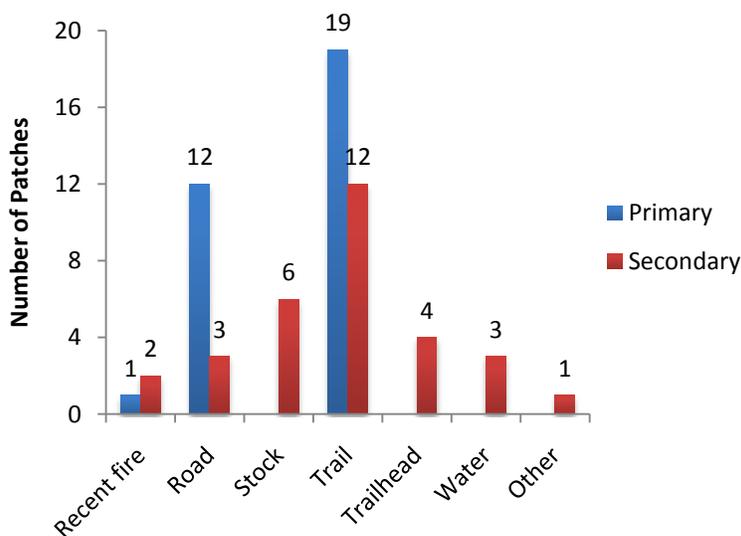


Figure 7. Primary and secondary disturbances associated with weed patches.

Ecological Associations (Weed_Ecotype, Weed_DomLife, Weed_HabSeries/Type/Phase)

The majority of weed infestations were encountered in forest ecosystems (91%; Figure 8). Within these forest ecosystems, the dominant lifeforms associated with weed patches were woody shrubs and forbs (38% and 32%, respectively; Figure 8). Weed species were distributed across lifeform categories, with the exception of Sulfur Cinquefoil, which was restricted to forb-dominated areas (see Appendix 2B for patch-specific ecological associations).

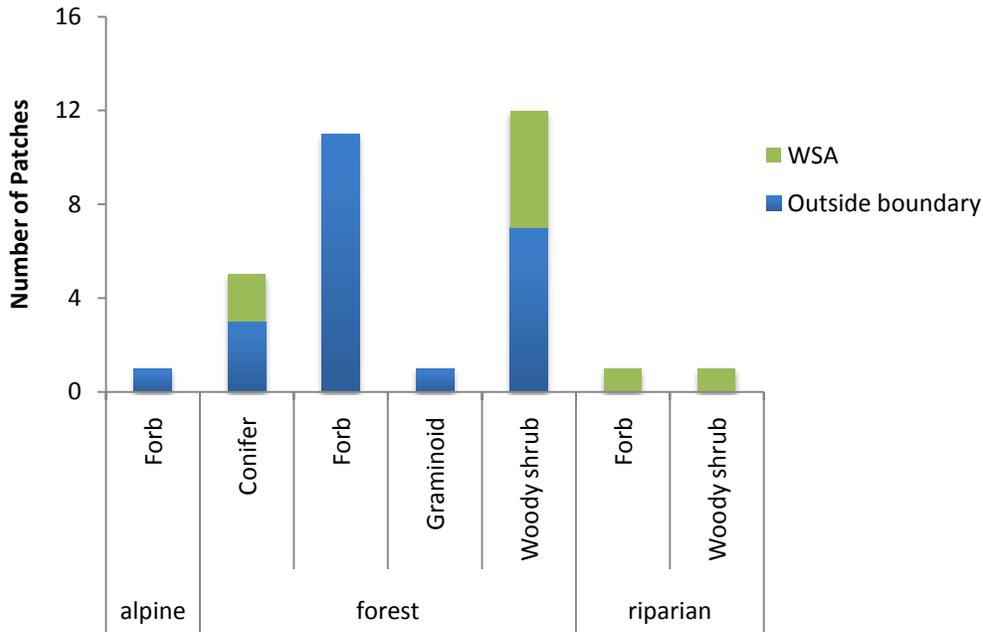


Figure 8. Ecosystem type and dominant lifeform associated with weed patches.

Habitat types associated with each infestation were identified based on the hierarchical classification system of series, type, and phase developed by Pfister et al (1977). This does not necessarily represent the most abundant or dominant species associated with the weed patches, but rather the species identified by Pfister et al. (1977) as potential climax. The majority of weed-affected patches (62%) were associated with Subalpine Fir (*Abies lasiocarpa*) climax series. The remaining patches were Douglas-fir (*Pseudotsuga menziesii*; 32%) and Western Red Cedar (*Thuja plicata*; <1%) climax series. Half of all patches were associated with the False-azalea (*Menziesia ferruginea*) habitat type within the Subalpine Fir series. A summary of habitat type classifications for all weed patches is provided in Figure 9. For habitat classifications for individual patches, see Appendix 2 B.

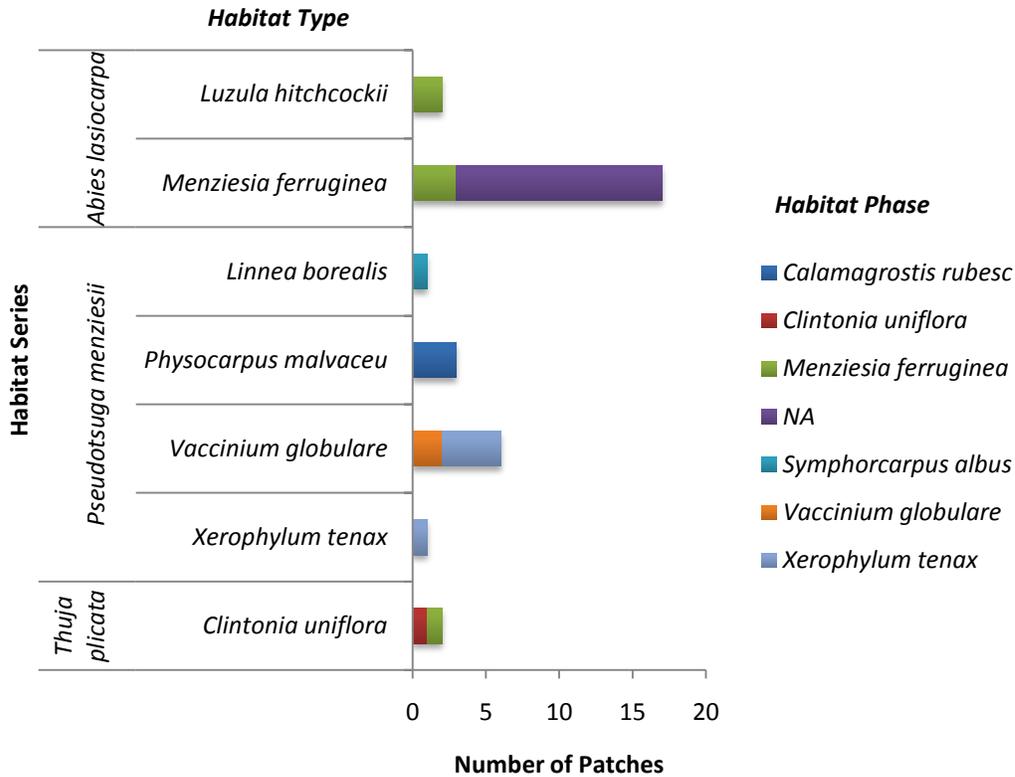


Figure 9. Habitat type classification associated with weed patches.

Current Vegetation Associations (Weed_DomOver/DomUnder, Weed_Treecov, Weed_Struct1/Struct2)

To describe the current vegetation associated with each weed infestation, up to 3 dominant Understory and understory species were recorded within an 11-m plot centered on each weed patch. Additionally, percent tree cover was visually estimated into 4 cover classes (<25%, 25-50%, 50-75%, and >75%). For each weed patch, the diameter at breast heights (DBH) of the largest Understory tree within 15 ft (Weed_Struct1 attribute) and within 50 feet (Weed_Struct2 attribute) was measured as 0-5, 5-9, or >9 inches. Attributes that describe current vegetation associations are presented by patch in Appendix 2B.

Physical and Topographic Associations (Weed_Water, Weed_Elev, Weed_Aspect)

To assess basic physical and topographic associations with mapped weed patches, we measured distance to water and derived elevation and aspect for each patch using the 1/3 arc second National Elevation Dataset (Gesch 2007). Distance to water was classified into 3 distance classes (0-10 ft., 10-50 ft., and greater than 50 ft.). The majority (81%) of weed patches were located over 50 feet from a water source; all of the patches within 10 feet of water were Canada Thistle, and constituted 54% of all Canada Thistle patches recorded. Patch-by-patch physical and topographic attributes are presented in Appendix 2B.

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. Wildlife was identified by species if possible, and otherwise was classified by family or into major groups (e.g. large carnivore). The type of encounter was recorded as a sighting (e.g. visual), auditory, track, or scat. 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, 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 particular trail may belong to one individual), or type of sign (e.g. one individual might leave both tracks and scat).

Wildlife Species & Encounter Type (Wild_Species and Wild_Type attributes)

A total of 121 wildlife encounters were reported of which 98 (96%) were within the WSA boundary (Figures 10 and 11). The majority (79%) of encounters were indirect (e.g. tracks, scat, or other sign), with large carnivores (including canid and felid species), being most prevalent (38%). Three of these were identified as Mountain Lion and one as a Grey Wolf based on tracks. Thirty-five bear encounters were recorded, including three black bear sightings (the remaining were scat observations). Eight Pika were detected by sound or sight. Two Mountain Goat and/or Big Horn Sheep scat were recorded; one at Wolverine Lakes and the other near St. Clair Peak. A single sighting of a Hoary Marmot was recorded near St. Clair Peak. Other wildlife groups, including birds, weasels, and other ungulates represented the remaining 24% of observations. Figures 10 and 11 numerically and spatially summarize these findings.

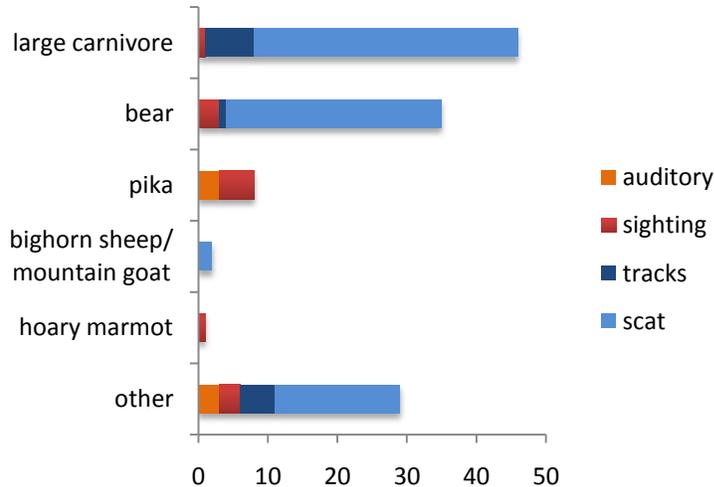


Figure 10. Number of wildlife encounters by wildlife group (large carnivore includes all canid and felid species).

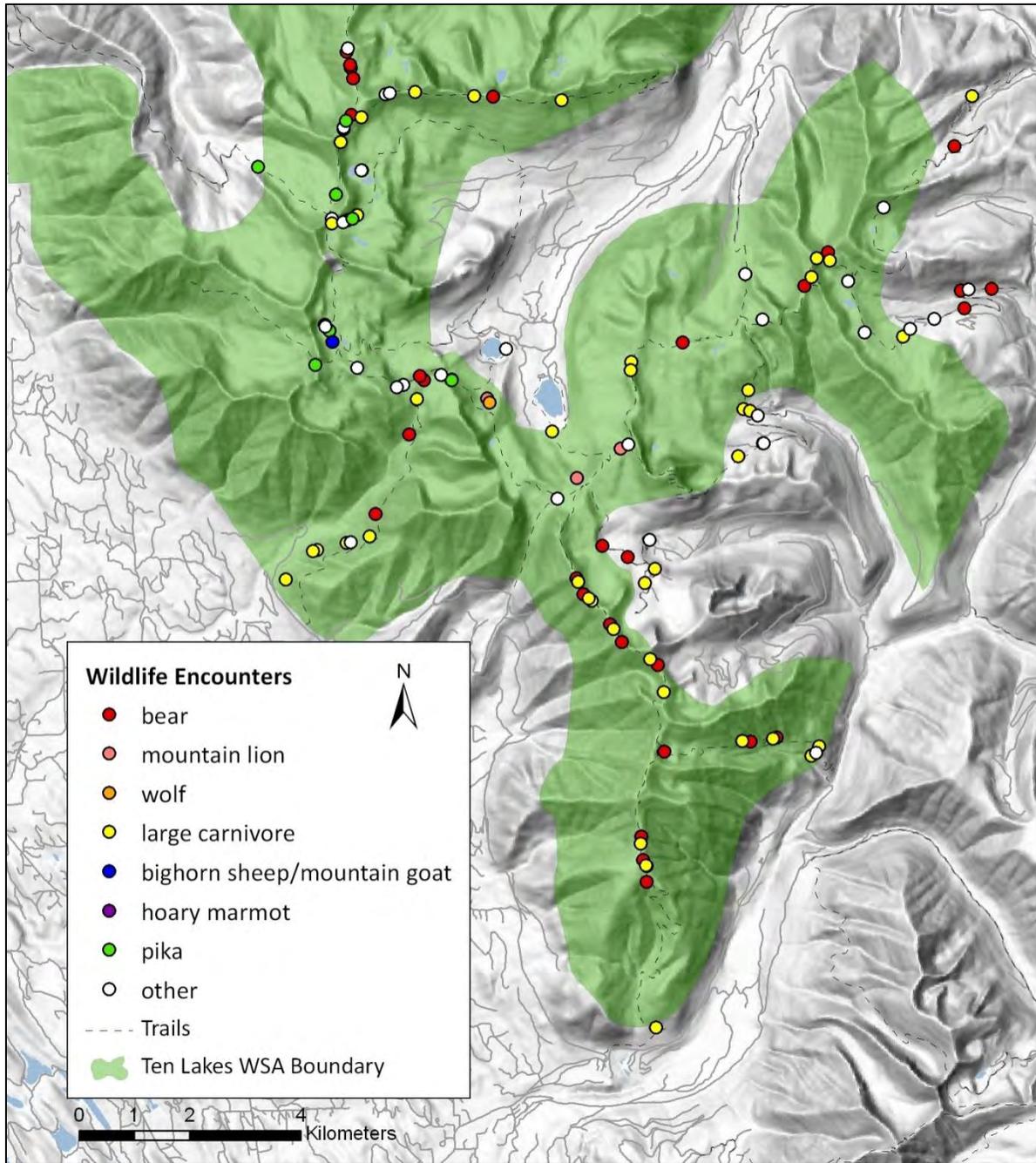


Figure 11. Location of wildlife encounters by species category.

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. Photos were taken of all documented erosion sites and are available upon request.

Landform, Width or Size, and Erosion Severity (Water_Landform, Water_Width, Water_Acres, Water_Severity)

A total of 5 waterbodies with signs of erosion due to recreation were documented, 4 of which were located near Big Therriault Lake and the other along Cat Creek (trail no. 333; Figure 12). Two springs with moderate erosion were found within the WSA boundary. Outside the WSA, 2 springs and 1 stream site were documented with slight erosion. No human-mediated erosion events were reports for wetlands, ponds, or lakes.

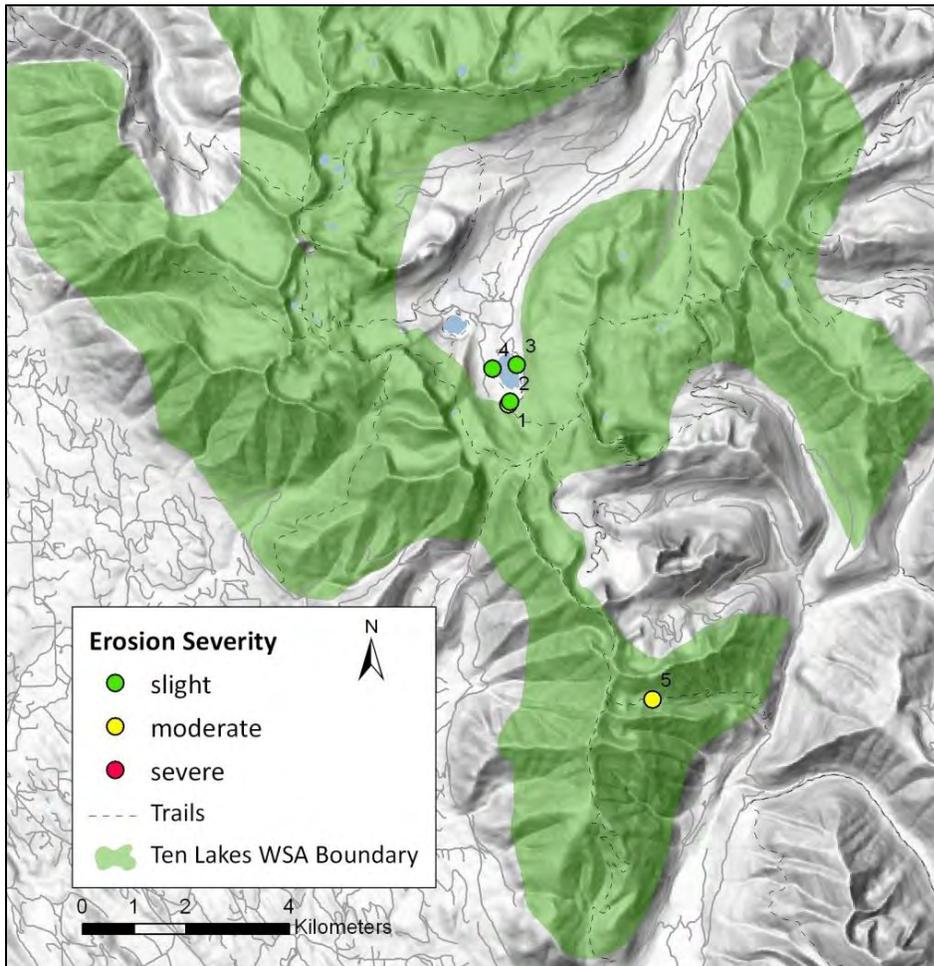


Figure 12. Location of water erosion sites by severity.

III. UNDEVELOPED QUALITY

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

Installations and Developments

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

Types (Dev_Type attribute)

A total of 36 installations and developments were reported, 28 of which were within the WSA boundary (Figures 13 and 14). Seventeen (47%) were bridges, 5 (14%) were cairns, and 5 (14%) were cabins. The remaining 25% consisted of 2 fences, a lookout, old machinery, and metal scrap. Figures 13 and 14 numerically and spatially summarize these findings.

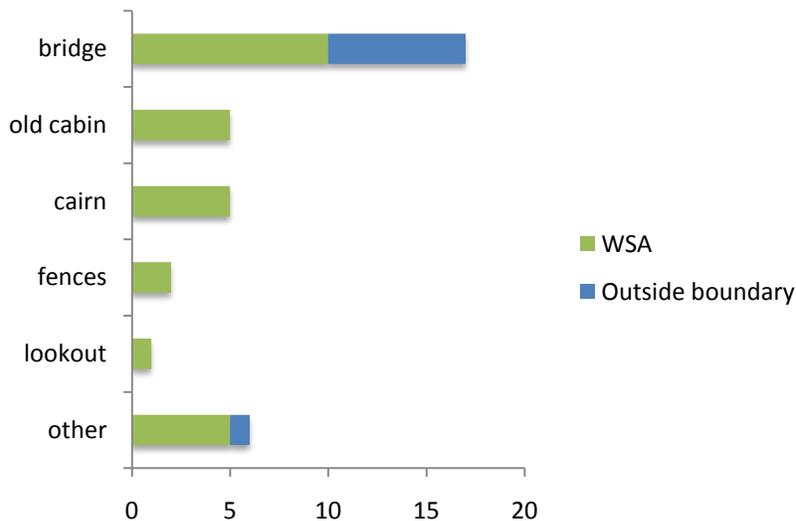


Figure 13. Number of installations and developments by type.

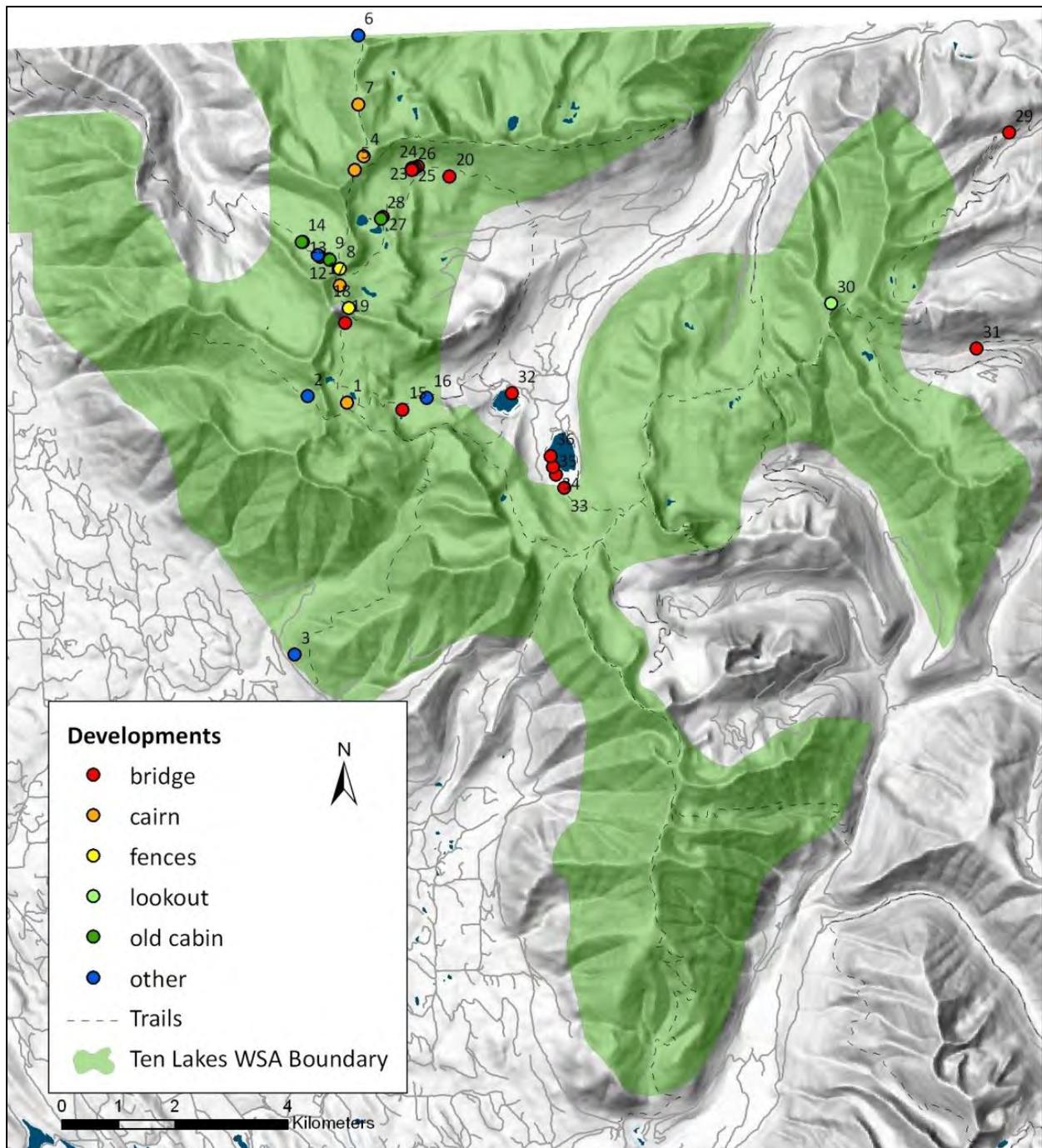


Figure 14. Locations and types of installations and developments.

Mine Prospects

Locations of old mining activity along trails were recorded by prospect type (adit, pit, or trench) and photographed (photographs available on request). Any safety issues or cave-ins were noted.

Mine Type (Mine_Type attribute)

All mine prospects encountered were located in a single area of the WSA, near Green Mountain, on trail #92 (Figure 15). Four pit mines, 1 trench, and 1 adit were documented. The entrance to the adit was noted as collapsed.

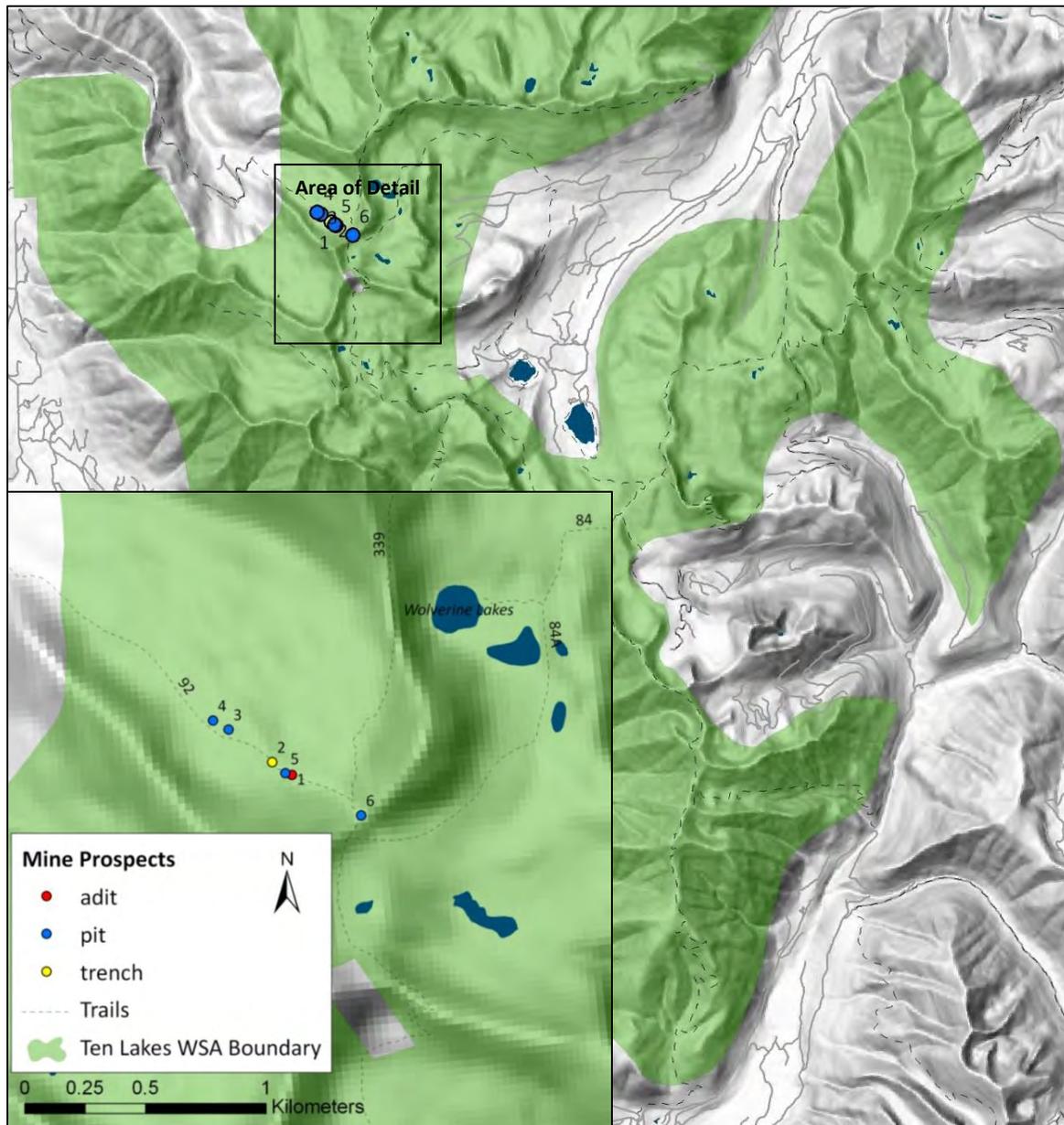


Figure 15. Location and type of mine prospects.

Signs

Signs were recorded throughout the field season and noted by type and condition. Sign types included: trail junction, interpretive, snowmobile marker, and recreational use sign (i.e. allowable uses/closures). Sign condition was categorized as: vandalized-legible, vandalized-illegible, missing (post with no sign), faded-illegible, faded-legible, or good condition. Signs with words were photographed for reference (see Appendix 3 for detailed sign inventory and associated pictures).

Sign Type and Condition (Sign_Type and Sign_Cond attributes)

A total of 81 signs were encountered along trails, 68 (84%) of which were at trail junctions. Most signs (68%) were in good condition overall, while 16% were faded-legible, 7% were vandalized-legible, and <5% were missing. Figures 16 and 17 numerically and spatially depict these attributes.

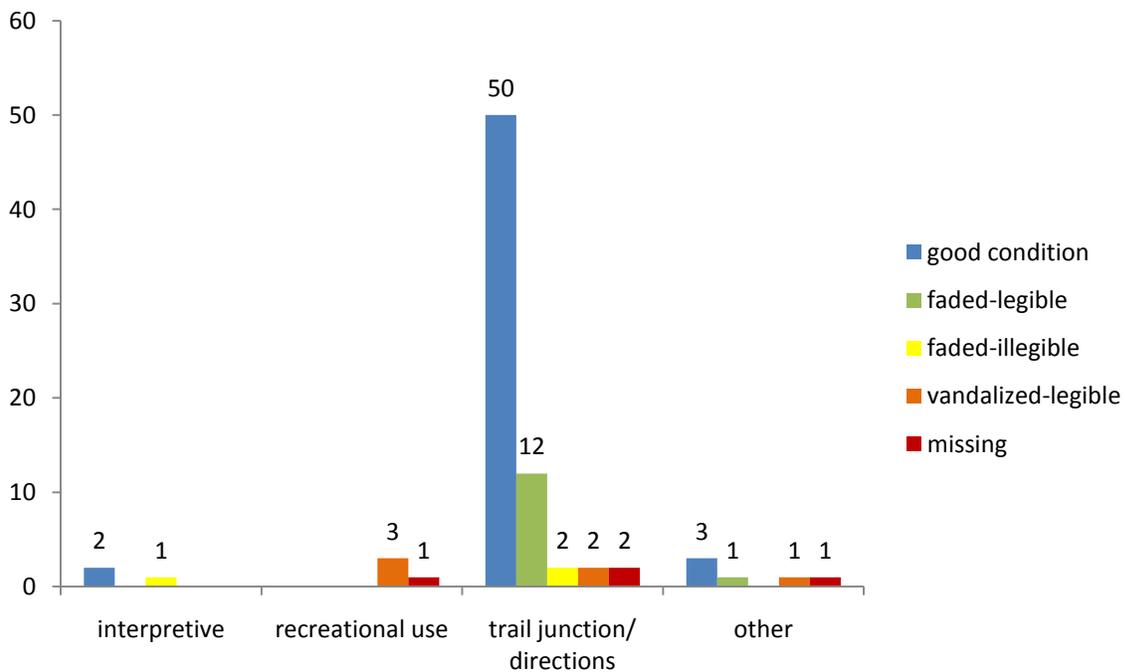


Figure 16. Number of signs by type and condition.

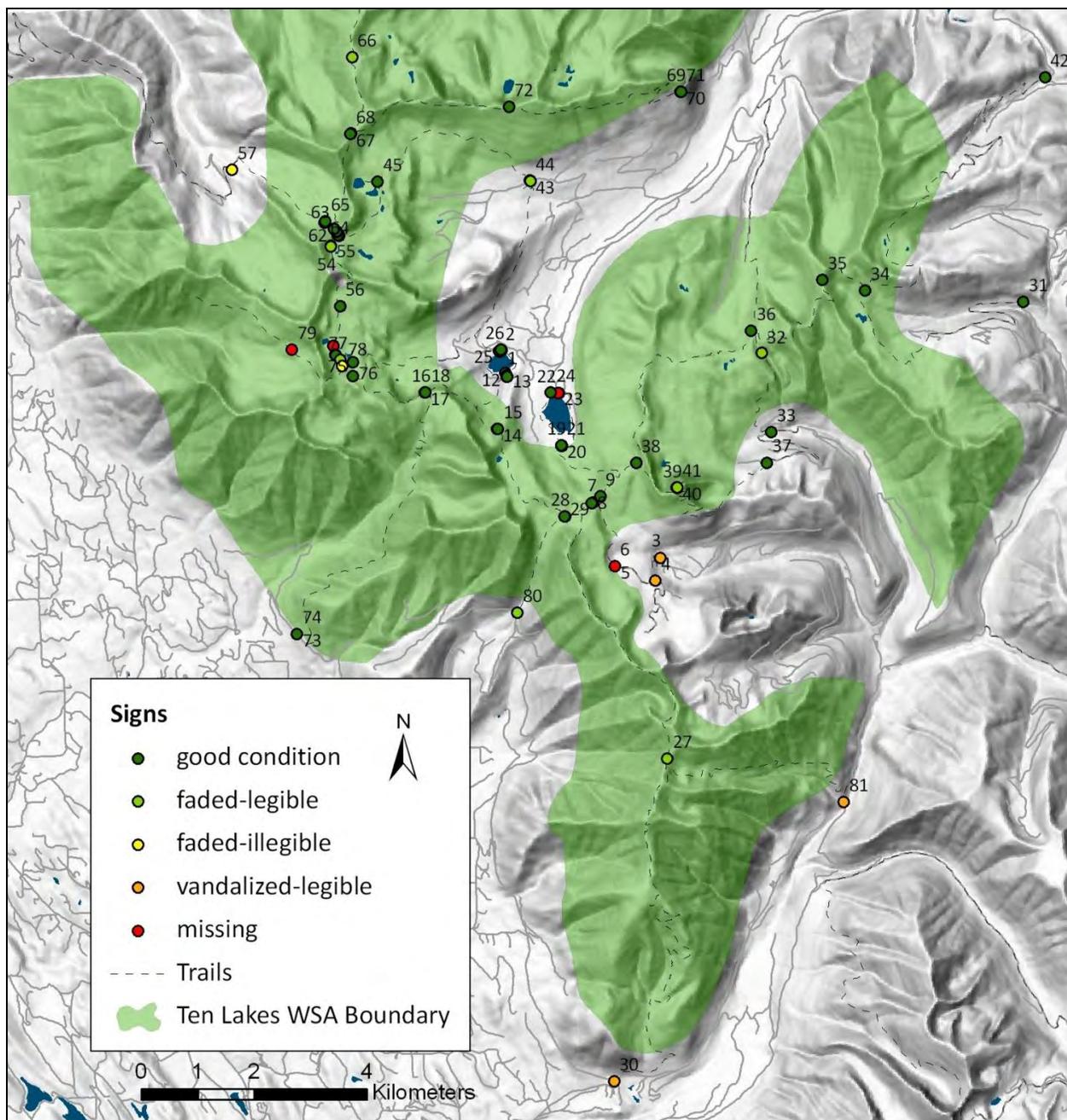


Figure 17. Locations of signs by condition (numbers correspond with individual signs listed in Appendix 3).

Trail Closure Devices

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

Trail Closure Type and Evidence of Violations (Closure_Type and Closure_Evidence)

All old roads leading into the WSA have been permanently closed with a berm or tank trap. No additional closure devices were noted in the area.

IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY

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

Trail Width

Trail conditions were recorded for all trails leading into and within the WSA. When trail conditions varied from a single track, the trail width was categorized as double-track, braided/multiple trails, or old road bed. The length of impacted trail was measured from start and finish points recorded in the field. Planar trail distances were measured between points, not accounting for elevation.

Trail Width (Trailwidth_Width, Trailwidth_Start/Finish attribute)

Single track trails accounted for 94% of trails monitored. A total of 7.5 km of trails with double tracks were documented, making up nearly 6% of all trails sampled. Trails with braided or old road beds accounted for <1% of trails. The majority of impacted trails were outside the WSA boundary (Figure 18). On trails within the boundary, a total of 525 m of trail (<1% of trails within the WSA) were impacted by braided or double tracks. Figure 18 shows the location of impacted trails.

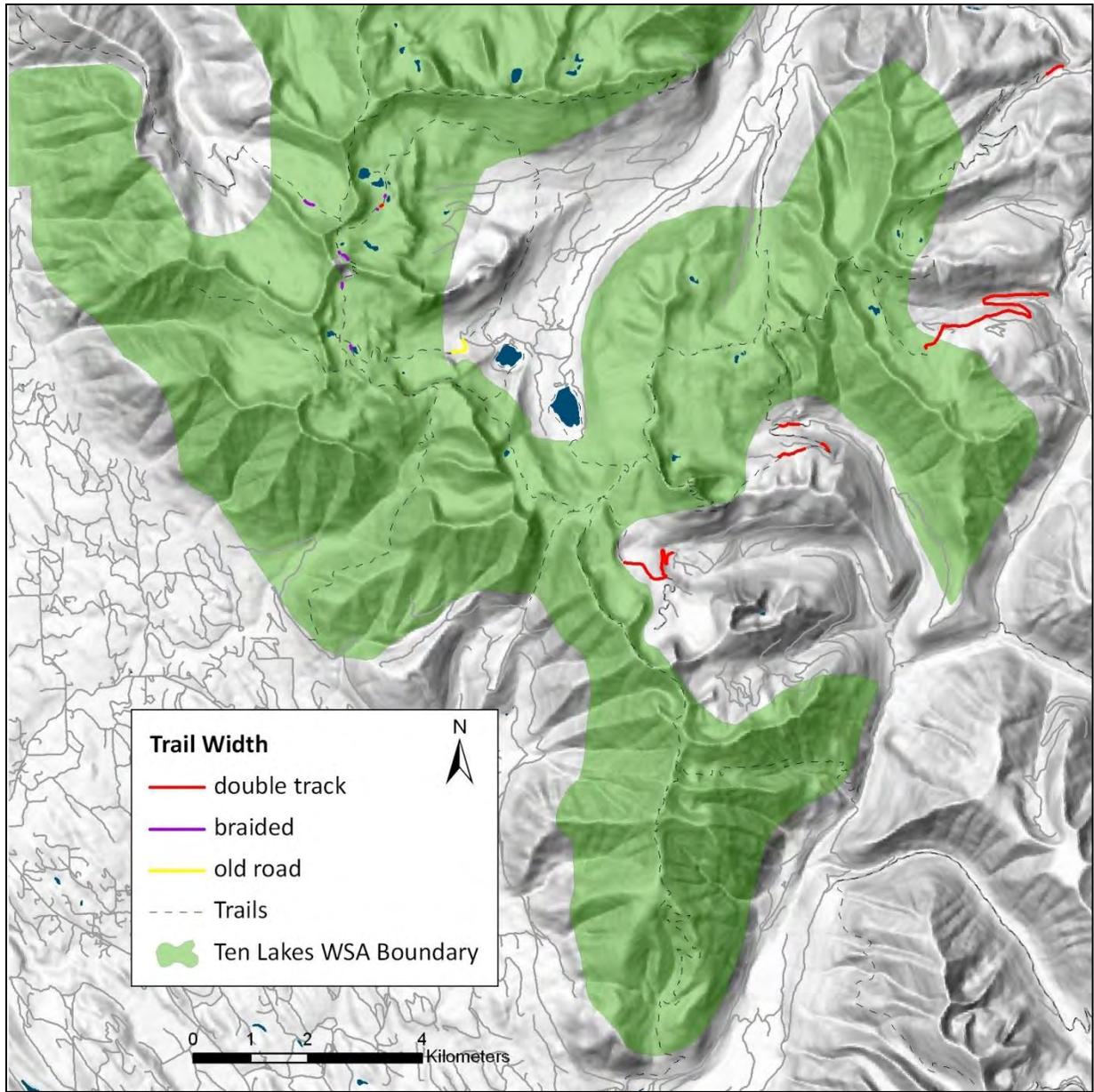


Figure 18. Impacted trail width by category. All other trails were single track.

Evidence of Mechanized Use on Trails

Wilderness character monitoring protocols (Landres et al., 2008) were designed for use in Wilderness Areas, where recreational motorized or mechanized vehicle use is prohibited. The Wilderness Institute added this attribute to record motorized or mechanized use in Wilderness Study Areas in Montana (where motorized and mechanized use may be permitted on designated trails). As such, the following section details areas where physical evidence of motorized vehicles (tire tracks) on trails was recorded. Each event was assigned a start and finishing point, and the type of track (motorcycle, bike, or ATV) was recorded. Points recorded along trails had lengths calculated using the existing trail system while points located off-trail used straight line lengths.

Type of Mechanized Tracks (Motoruse_Width, Motoruse_Start/Finish attribute)

Three instances of motorized use were recorded within the WSA boundary during the monitoring period. All were identified as single track motorbike. A single record of non-motorized bicycle use was observed on a trail leading into the WSA. Total length of trail with evidence of mechanized use was short (564 m; Table 3). However, distances traveled along trails are likely far longer.

Table 3. Summary of evidence of mechanized use.

Type	Length of Evidence (m)	Locations (Trail no.)
single bicycle	125	Tr. 80
single motorbike	439	Tr. 87,88,339,341
double ATV	0	
Total	564	

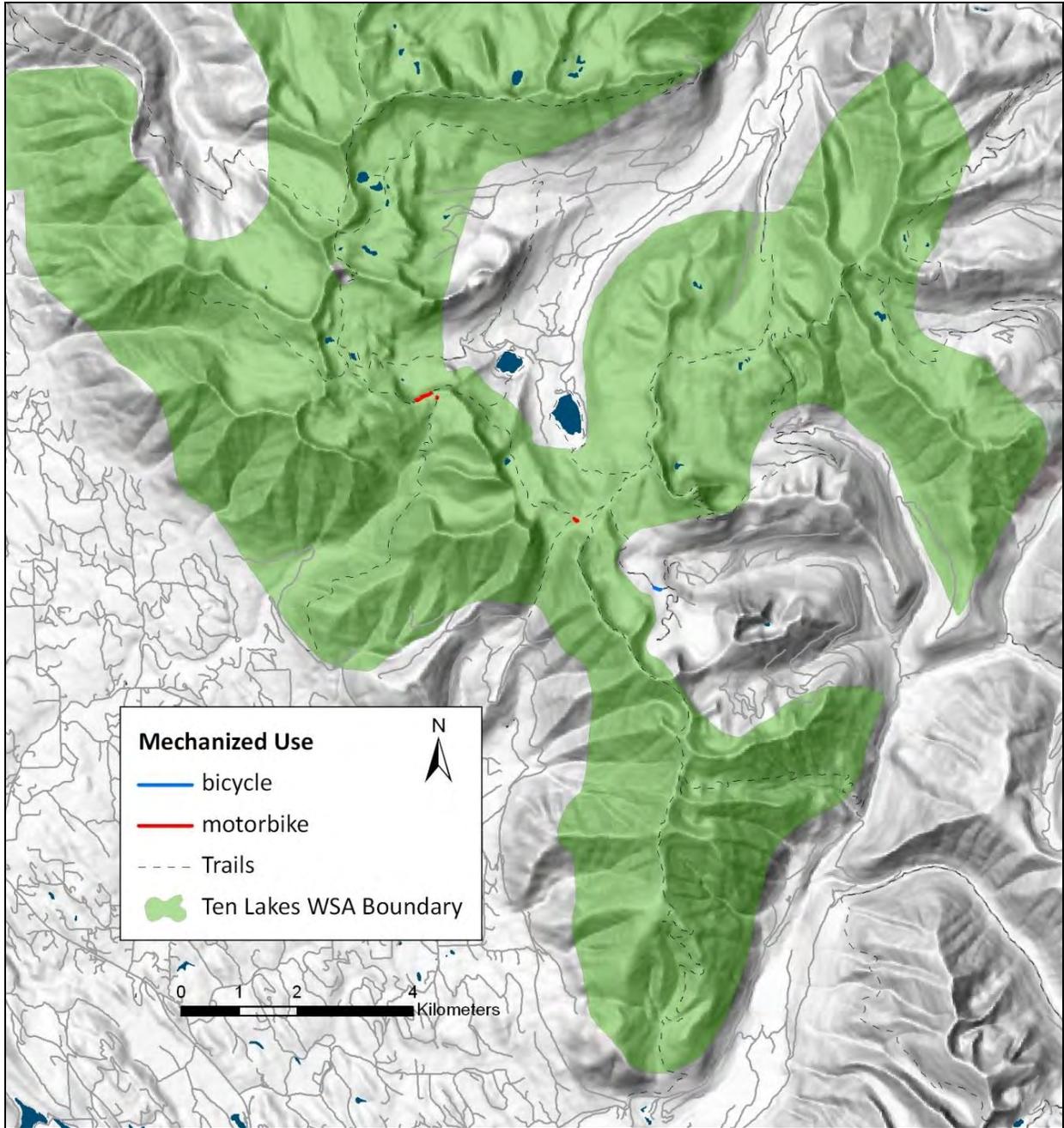


Figure 19. Location of evidence of mechanized use on trails.

Non-system Trails

Non-system trails are trails that are not part of the official Forest Service trail system. When non-system trails were encountered, the trail type was categorized as: motorbike, ATV/UTV, horse travel, foot travel, or unclear. The origin of each trail 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 (Nst_Type, Nst_Vector and Nst_Start/Finish attributes)

Twenty-two non-system trails were recorded, of which 17 were located inside the Ten Lakes WSA boundary. Seventeen were created by foot travel (77%), 3 were primarily horse travel (14%), and the remaining 2 were unclear as to their type (Figure 20). There was no evidence of non-system trails originating from motorbike or ATV use. Fourteen (64%) of the non-system trails surveyed were a result of new routes created by recreational use, while the remaining originated from old routes for mining, fire access, or logging activities (Figure 20). Time constraints in the field limited complete surveying of non-system trails, and as a result only 7 (31%) of the shortest trails had their entire lengths measured, while the remaining 15 did not (Figure 21). Completed trails ranged in length from 14.5 meters to 220.8 meters, and typically were short-cuts or short social trails. Unfinished trails tended to be longer, including alternate routes to peaks, and access to creeks and around lakes.

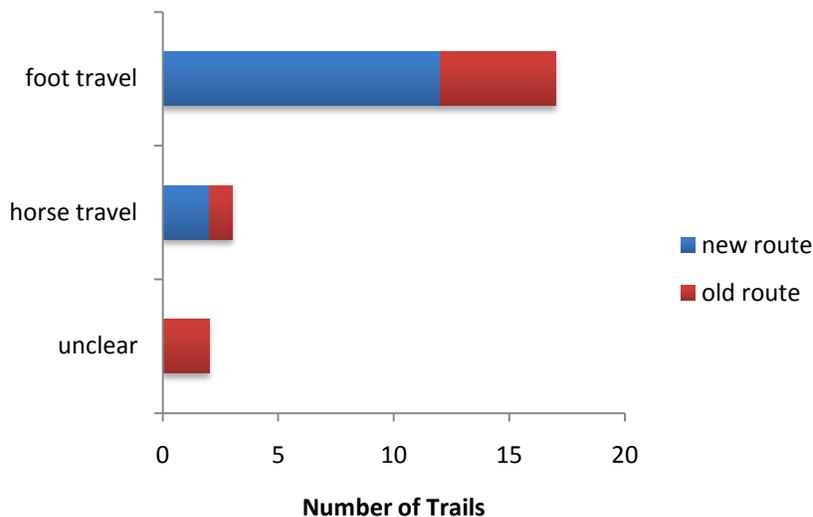


Figure 20. Number of non-system trails by trail type and origin (e.g. new or old route).

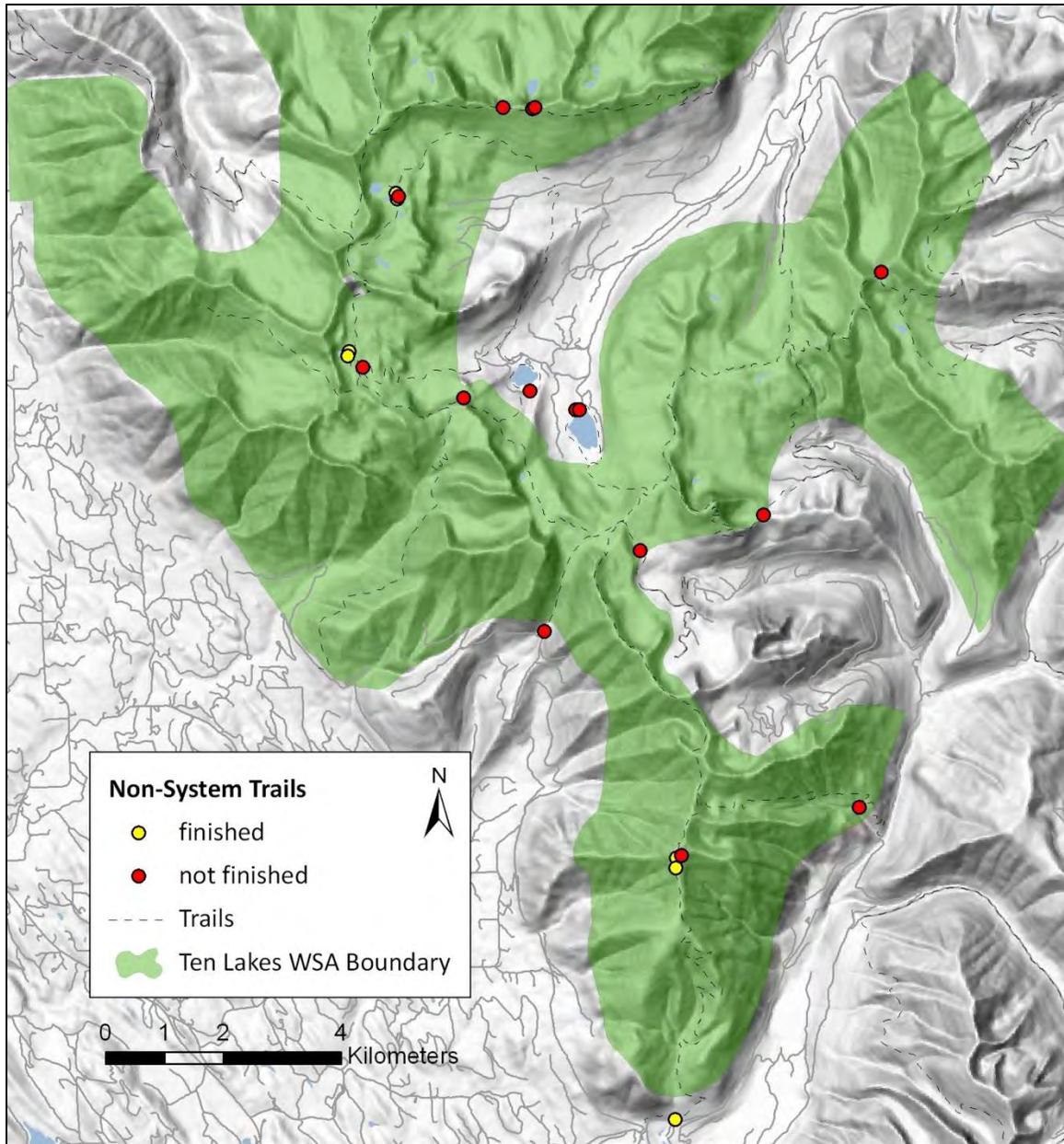


Figure 21. Locations of non-system trails and monitoring status (finished/ not finished).

Trailheads

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

Vehicles, Horse Trailers, and ORV Trailers at Trailheads (TH_TotNumber, TH_HorseNumber, TH_ORVNumber attributes)

Of the 11 trailheads documented, the majority had 2 or fewer vehicles (91%; Table 4). The Horse Camp trailhead (trail #306) was the only exception, with 10 vehicles. There were no horse trailers or ORV trailers observed at any trailheads during the monitoring period.

Table 4. Summary of vehicles at trailheads. Note: vehicle counts included the van used by the field team.

Trail No.	Trail Name	Vehicles	Horse Trailers	ORV Trailers
77	Foundation Creek	2	0	0
77	Camp Creek	1	0	0
80	Stahl Creek	2	0	0
82,84	Clarence Ness, Wolverine Lakes	2	0	0
87	Therriault Pass	1	0	0
88	Sinclair Creek	1	0	0
89	Rainbow	2	0	0
306	Horse Camp	10	0	0
333	Cat Creek	1	0	0
335	Gibraltar Ridge	2	0	0
	Total	24	0	0

Encounters with People

Any encounters with people on trails were recorded throughout the field season. Both the number of persons and the type of activity (hiker/backpacker, mountain bike, horse, ATV, motorbike, UTVs, or Forest Service staff) were documented.

Activity Type and Number (People_Activity, People_Number attributes)

Twenty-eight separate encounters were recorded during the monitoring period, totaling 68 people. Most groups consisted of 2 or fewer people (71%), and the largest group size was 8. The majority of people encountered were hiker/backpackers (78%), 5 (7%) were USFS staff, and the remaining were horsepackers, mountain bikers, boaters, and fishermen (Table 5). The majority of encounters with people were clustered around Big Therriault Lake, Bluebird Lakes, and Wolverine Lakes (Figure 22).

Table 5. Number of people encountered on trails by recreational activity.

Activity	Number of Groups	Total People
forest service staff	3	5
hiker/backpacker	20	53
horse packers	2	3
mountain bike	1	2
other	2	5
Total	28	68

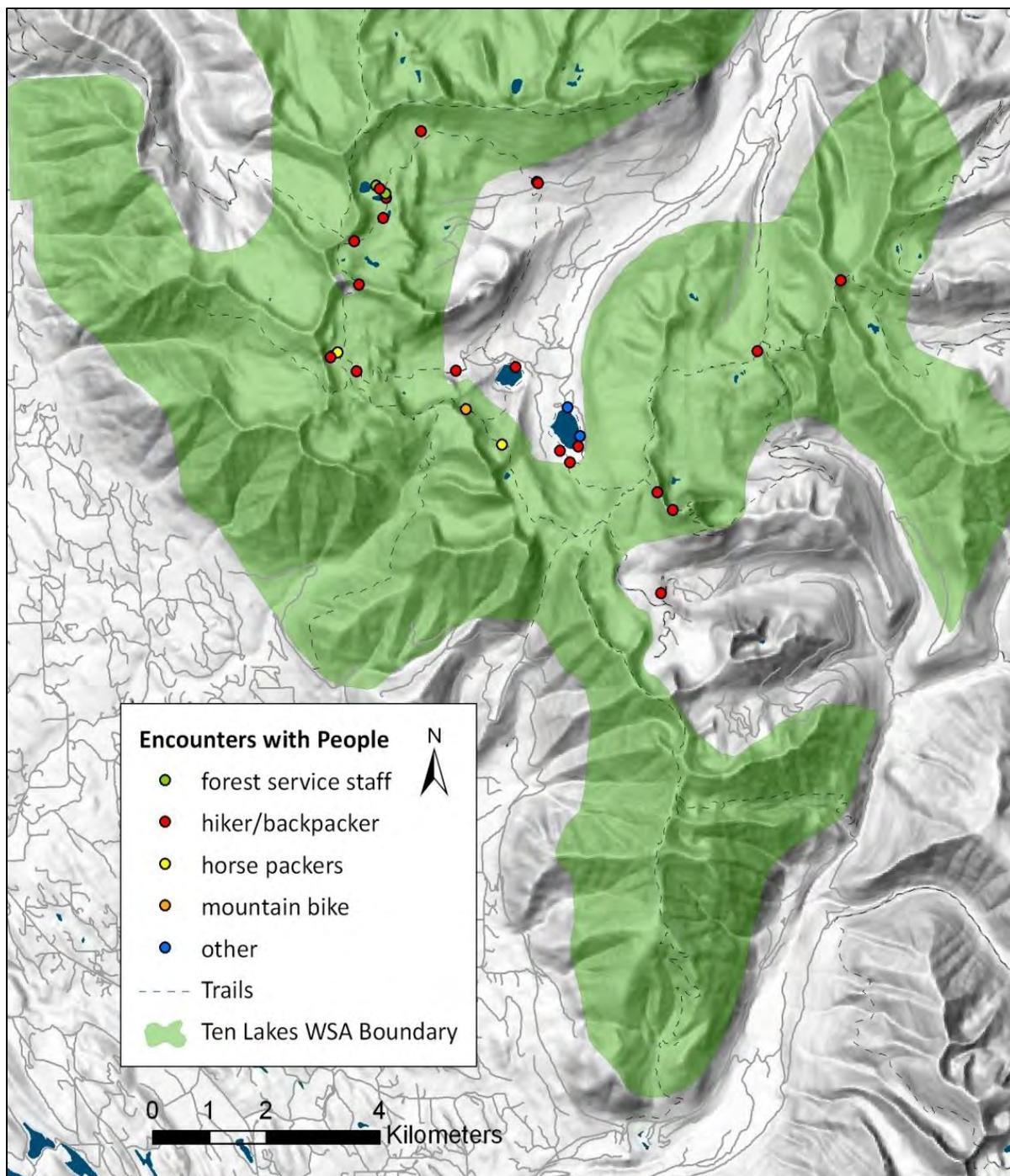


Figure 22. Location of people encounters along trails.

Noise

Motorized noise was monitored throughout the field season. Duration of the noise from start to finish was recorded. 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 (Noise_Duration, Noise_Intensity, Noise_Visconf attributes)

A total of 17 motorized noise intrusions were recorded. The majority of noises recorded were from airplanes (59%), followed by gunshots (18%). Visual confirmation was not possible for 10 detections, so the source of these noises was based on auditory identification only. Most noises were heard clearly or were loud and close (65%), while the remaining 35% were barely audible or variable. Gunshots and chainsaws were the only types of noise that lasted more than 10 minutes, with the majority of intrusions lasting for 1-5 minutes (53%). See figures 23 and 24.

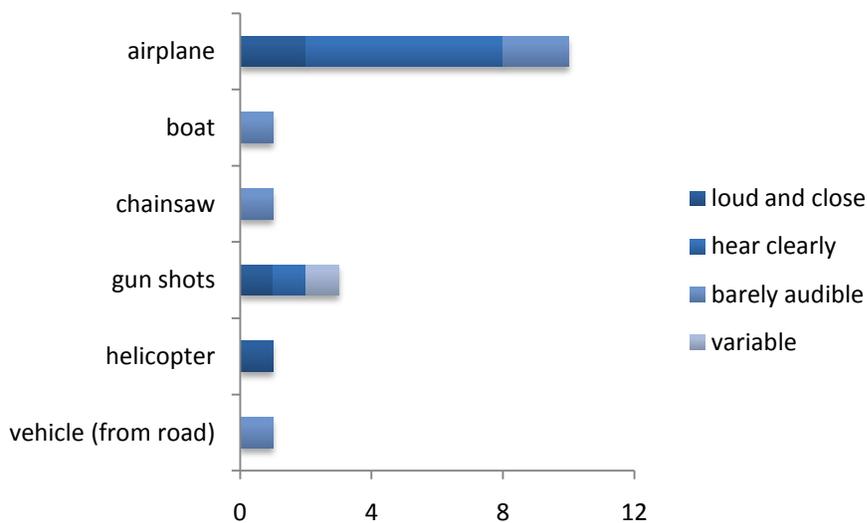


Figure 23. Noise intrusions by source and intensity

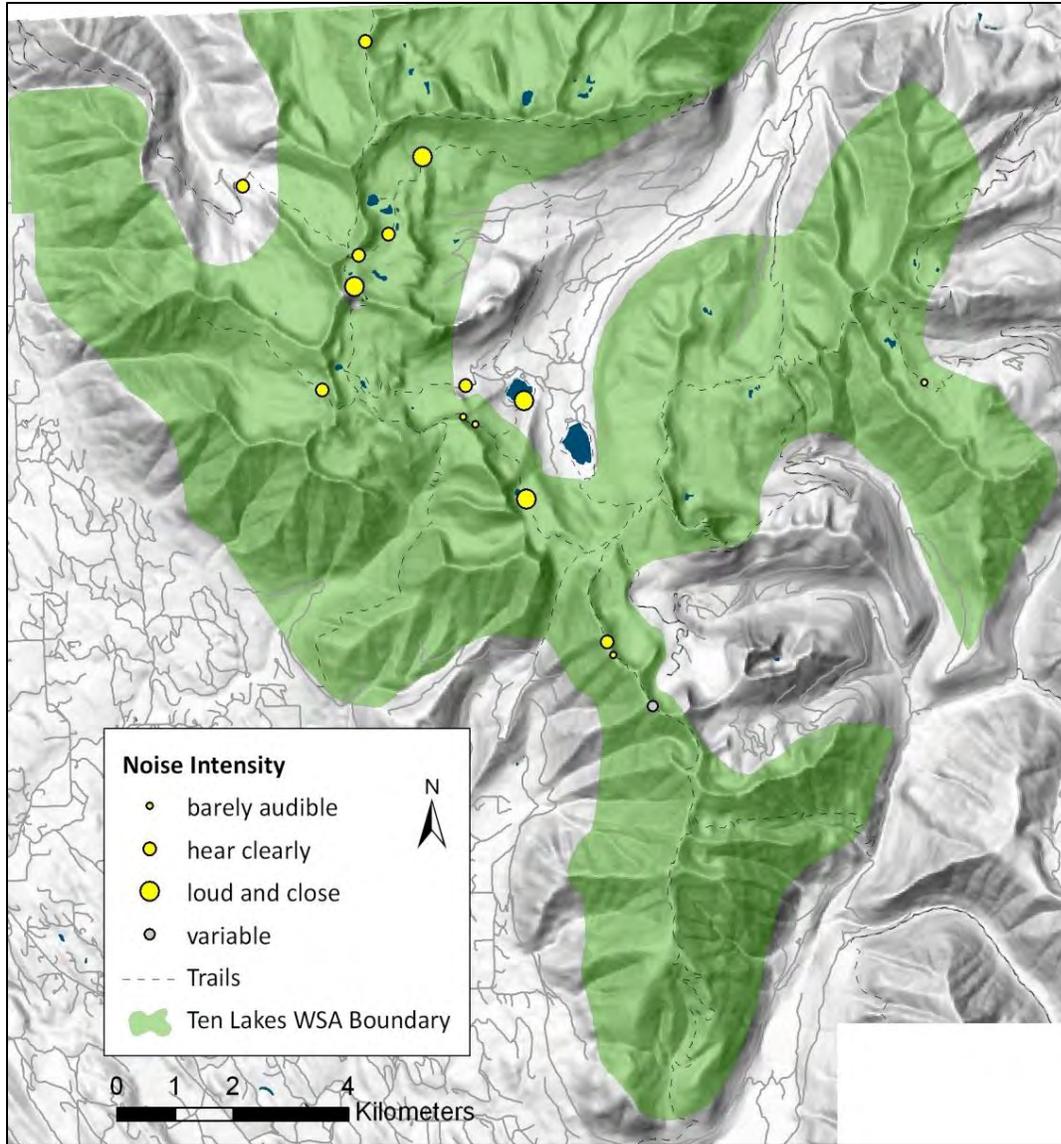


Figure 24. Locations and intensity of motorized noise intrusions.

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, or railways.

Type (VI_Type attribute)

Twenty visual intrusions were observed from within the WSA, 8 (40%) of which were dirt roads, 5 (25%) were cities or towns, and 2 (10%) were clearcuts. The remaining 5 were trailside human intrusions located within the WSA, including graffiti and vandalism (25%). Cities and towns were visible to the west from trails along ridgelines, while dirt roads were primarily visible from trails in the eastern portion of the WSA (Figure 25).

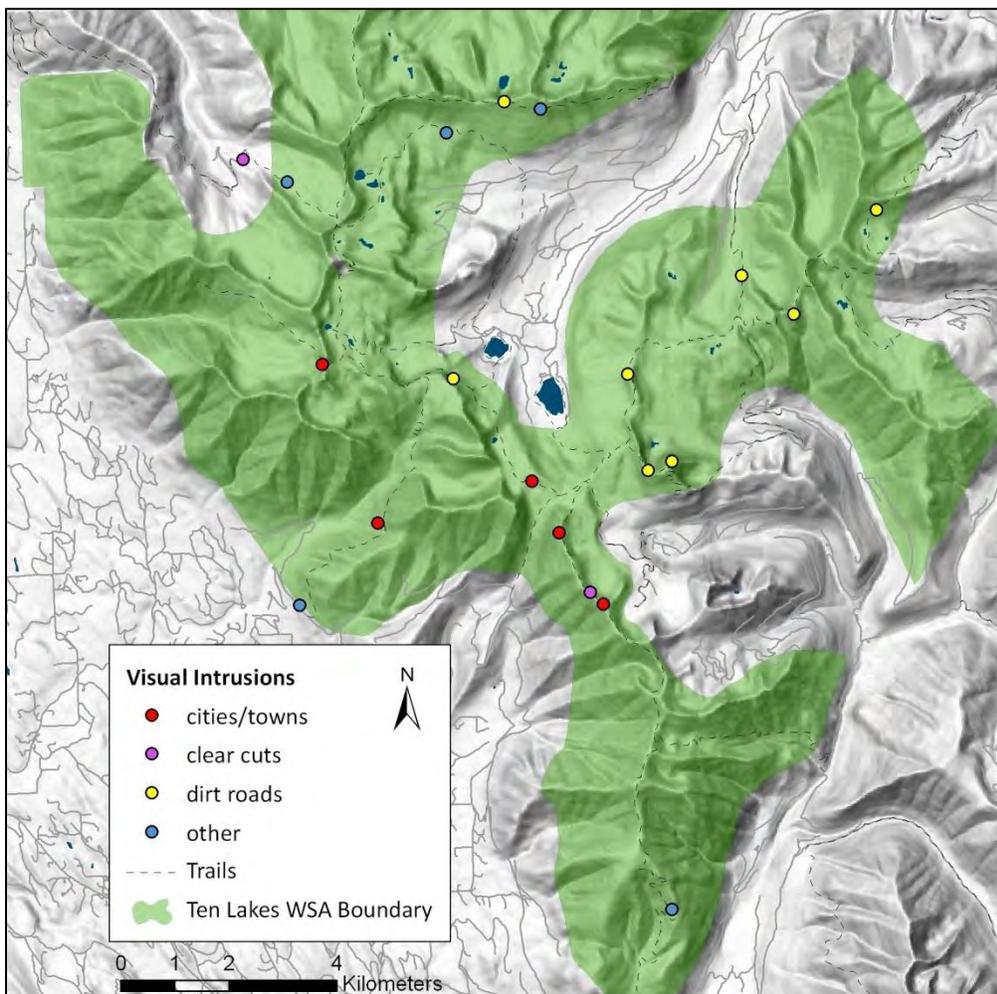


Figure 25. Visual intrusions seen from within the WSA (“other” includes trailside human intrusions such as vandalism).

Campsites

Attributes recorded at each campsite reflect campsite conditions and human impacts, and were based on the Kootenai National Forest Wilderness Campsite Inventory & Condition Evaluation protocols (see Appendix 5). 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 each impact attribute were combined to generate a summary impact index score (see Appendix 5). To provide an ecological context for camp site 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 4.

Impact Evaluation

Twenty-seven campsites were recorded and inventoried during the 2010 field season. Most campsites (67%) were located around Wolverine Lakes and Bluebird Lake (Figure 27).

The campsites encountered tended to be in good condition based on the summary impact evaluation scores (Table 6). Nearly half of campsites (48%) were rated as minimally impacted (score ≤ 23). Five campsites were considered highly or extremely impacted (score of 35 or more). No impact index score was computed for one campsite because the site was missing data for some attributes due to the campsite being occupied by campers at the time of the survey.

Note: Camp area (Camp_AreaEst attribute) was misclassified using the barren core camp area categories (<50 , $50-500$, and >500 ft²) instead of <500 , $500-2,000$, or $>2,000$ ft². However, only 3 campsites were classified as >500 ft². These were assigned to the camp area class of $500-2000$ ft². Therefore, no campsites received the highest impact rating for camp areas $>2,000$ ft².

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

Impact Index Score Class	Impact Index Score Range	Number of Campsites
Minimum	≤ 23	13
Moderate	24-34	7
High	35-45	3
Extreme	>45	2
Total		25

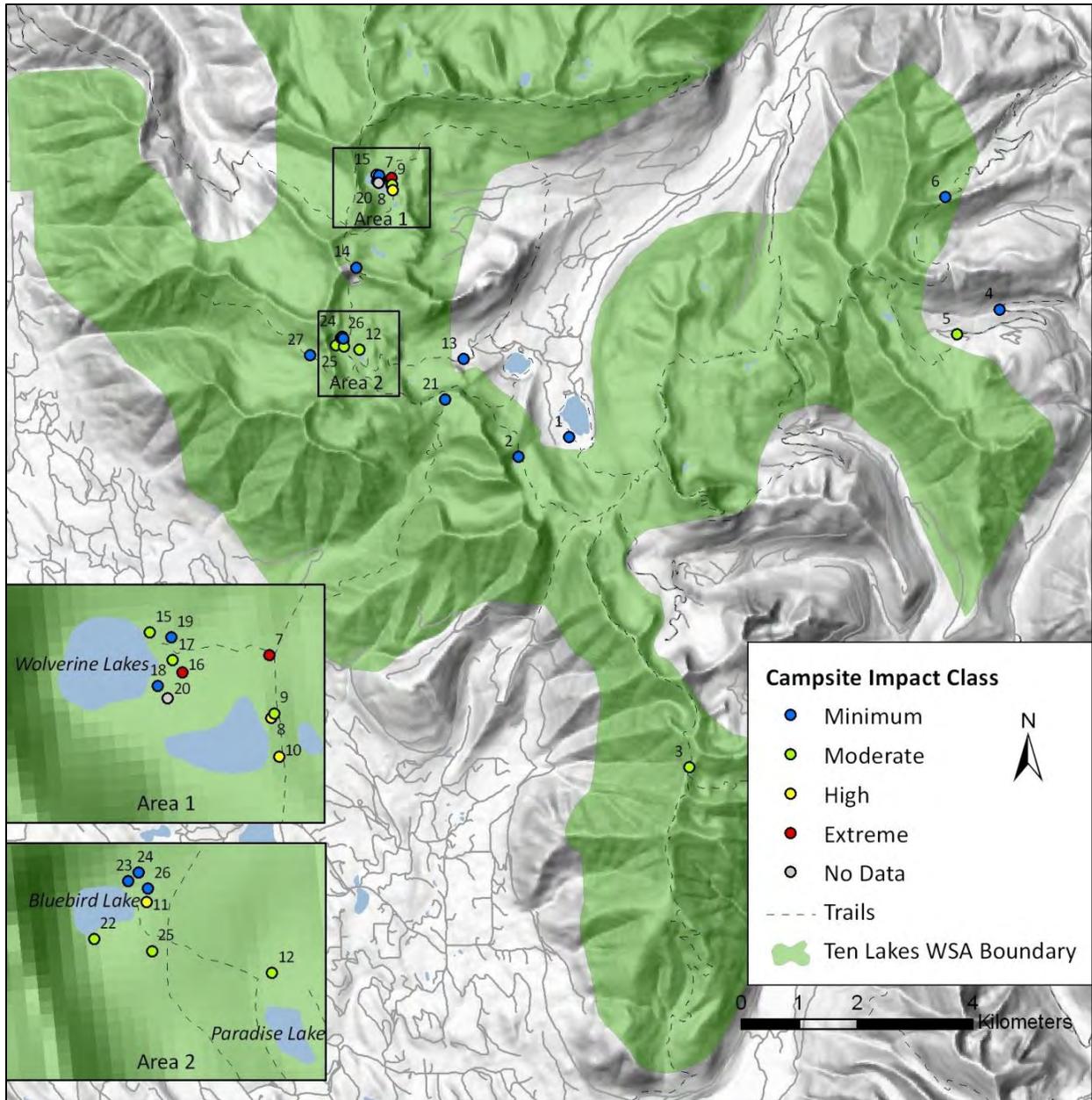


Figure 27. Spatial distribution of campsites and campsite impact classes (numbers correspond to individual campsites listed in Appendix 4).

Ecological Associations

The majority of campsites were associated with lakeshores (59%), followed by saddles and streamsidess (15% and 11%, respectively). The remaining campsites were in forest or meadow, and one campsite was associated with none of the categories. Tree cover was <25% at the majority of campsites (74%), but all campsites had at least some trees present. Subalpine fir was the most dominant tree species at 96% of campsites, with a single campsite dominated by Larch. Beargrass (*Xerophyllum tenax*) was the most common dominant understory species (22% of campsites). However, dominant understory was

represented by a diversity of plant species (e.g. 14 different species were most dominant within at least one campsite). Campsite-specific ecological attributes are detailed in Appendix 4.

Campsite location and landform was associated with the level of impact observed. Only campsites located <200 ft from the trail had extreme impact scores. All high and extreme impact campsites were within 500 ft of another campsite. In addition, all 3 high and 1 of 2 extreme impact sites were along lake shores, and most of the impacted campsites were located at Wolverine Lakes, including both of the sites classified as extreme (Figures 27 and 28).

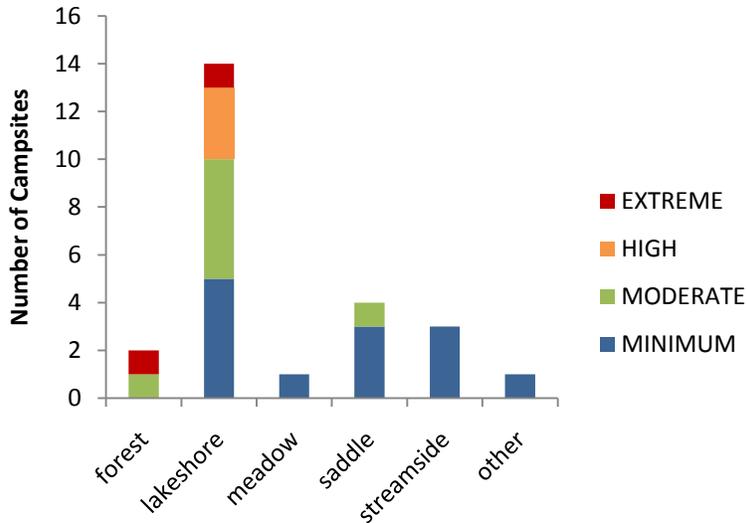


Figure 28. Number of campsites by landform category and impact class.

V. FOREST SPECIFIC ATTRIBUTES

Sensitive Plants

Sensitive Plants and Population (Sensitive_Name, Sensitive_Pop attributes)

The location of Kootenai National Forest sensitive plant species were documented when encountered, and classified by population size as <10, 10-100, or >100.

A single population of Wood Lily (*Lilium philadelphicum*) containing 10-100 individuals was recorded in the southern portion of the WSA on the Gibraltar Ridge trail (Figure 26). No other sensitive species from the Kootenai National Forest list were observed during the monitoring period.

Pine Tree Health

Pine Tree Species, Disease, & Reproductive Health (Pine_Spp, Pine_Disease/Health attributes)

The location of all White Bark Pine and Western White Pine were recorded along with disease status and reproductive health. Nine stands of White Bark Pine were observed within the WSA, 3 of which showed signs of disease (Figure 26). Only one stand had no evidence of successful reproduction, the remaining had either cones present or sapling growth. No Western White Bark Pine stands were encountered.

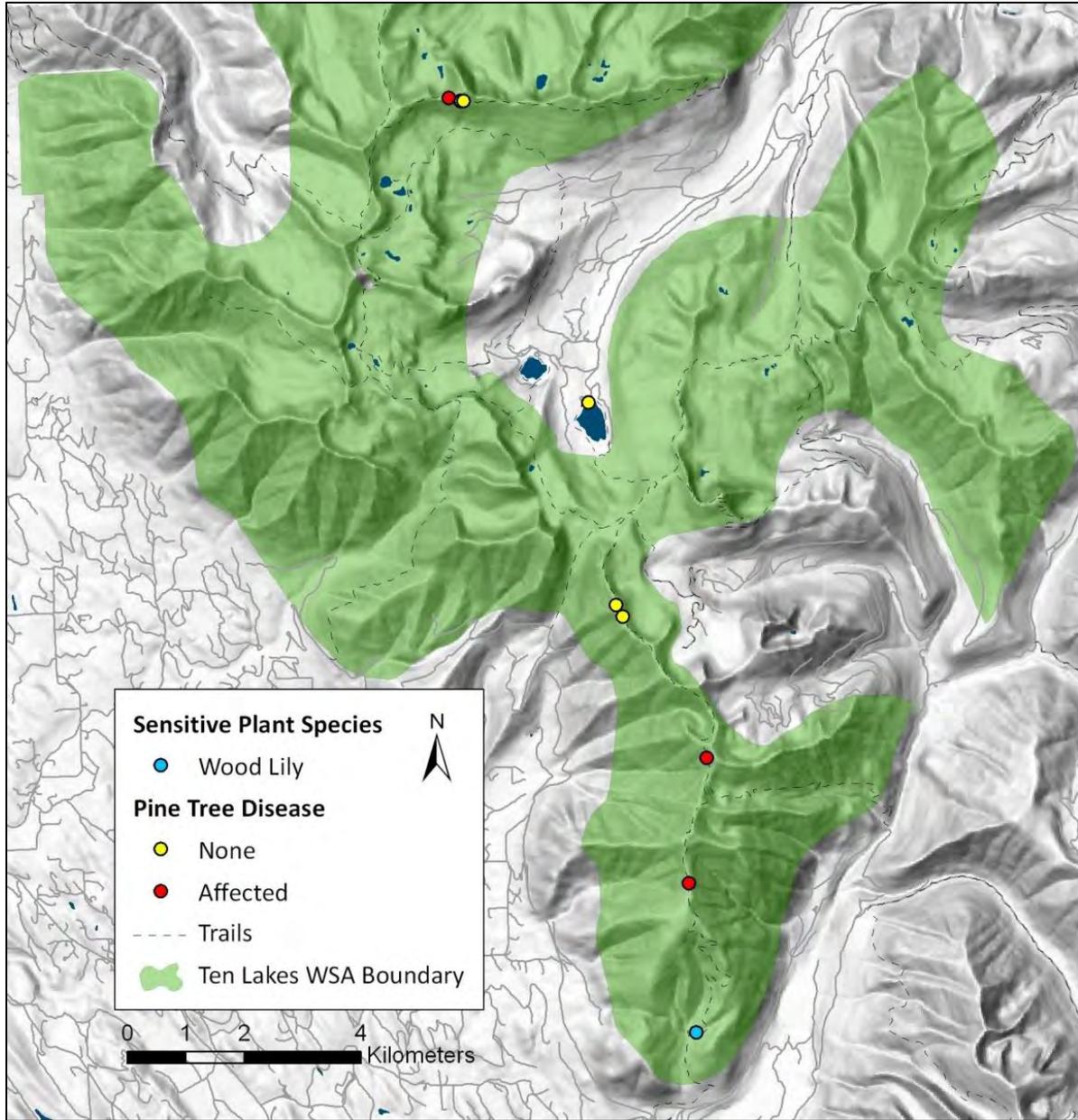


Figure 26. Location of sensitive plant species and White Bark Pines. White Bark Pine stands are categorized by evidence of disease.

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APPENDIX 1. MONITORING ATTRIBUTES

Detailed protocols are included with the digital database.

I. UNTRAMMELED QUALITY

Attribute group: Weed Point

Weed_Action: Action taken to manage infestation

II. NATURAL QUALITY

Attribute group: Weed Point

Weed_Species	Common name of weed species
Weed_Size	Area (in acres) of infestation
Weed_Distribution	Distribution of weeds in patch (e.g. clumpy, scattered, linear)
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_TreecovPhoto	Photo number 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_Biocontrol	Presence or absence of biocontrol notes
Weed_Elev	Derived elevation from GPS locations and digital elevation model
Weed_Aspect	Derived aspect from GPS locations and digital elevation model

Attribute group: Wildlife Point

Wild_Species	Species of wildlife encountered
Wild_Type	Type of wildlife sign encountered
Wild_Notes	Description or additional details of siting
Wild_Photo	Corresponding photo number from camera
Wild_Photodir	Photo direction

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_Photodir1/2	Photo direction 1/2

III. UNDEVELOPED QUALITY

Attribute group: Development Point

Dev_Type	Type of installation or development encountered
Dev_Photo	Corresponding photo number
Dev_Phodir	Photo direction

Attribute group: Sign Point

Sign_Type	Sign type
Sign_Condition	Sign condition
Sign_Photo	Corresponding photo number
Sign_Phodir	Photo direction

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_Phodir1/2	Photo direction 1/2

IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY

Attribute groups: Trail Width Point

TrailWidth_Name	Name of trail point
TrailWidth_Width	Width class of trail
TrailWidth_Start/Finish	Start/Finish of trail

Attribute group: Motorized Use Point

Motoruse_Name	Name of evidence for motorized use on trails
Motoruse_Start/Finish	Beginning or endpoint of evidence
Motoruse_Width	Track width of evidence

Attribute group: Nonsystem Trails Line

Nst_Type	Type of nonsystem trail encountered
Nst_Vector	Age and source of non-system trail
Nst_Finish	Non system trail surveyed to its end or not

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_Treecover	Percentage tree cover over campsite
Camp_Treecoverphoto	Photo of campsite treecover
Camp_DomTree1/2/3	Up to 3 dominant tree species (if >10% plot cover)
Camp_DomUnder1/2/3	Up to 3 dominant understory species (if >10% plot cover)
Camp_TreeDam	Rating of tree damage (see detailed protocols)
Camp_RootExp	Number of trees with exposed/damaged roots within 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_Photodir1/2	Photo direction 1/2

Attribute group: People Point

People_Activity	Type of user encountered
People_Number	Number of people seen in encounter

Attribute group: Trailhead Point

TH_TotNumber	Total number of vehicles
TH_HorseNumber	Total number of horse trailers
TH_ORVNumber	Total number of ORV trailers

Attribute group: Noise Point

Noise_Duration	Duration of noise (select from categories)
Noise_Intensity	Intensity rating of noise (select from categories)
Noise_VisConf	Indicate of source was seen

Attribute group: Visual Intrusion Point

VI_type	Visible evidence of human impact outside area
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V. FOREST SPECIFIC ATTRIBUTES

Attribute group: Sensitive Plant Species

Sensitive_Name	Species name of plant identified
Sensitive_Pop	Population size class

Attribute group: Pine Data

Pine_Species	Indicate White Bark Pine or Western White Pine
Pine_Disease	yes/no for disease evidence
Pine_Health	Indicate if not reproducing/cones present or saplings present

APPENDIX 2. WEED ATTRIBUTES BY PATCH

Table A. Patch characteristics of all recorded weed infestations in the Ten Lakes Wilderness Study Area. Patches within the WSA boundary have an asterisk (*); all others were located on trails leading into the WSA.

PATCH ID	SPECIES	SIZE	DISTRIBUTION	DENSITY	PHENOLOGY	DISTURBANCE (primary/secondary)	ACTION
1	Sulfur Cinquefoil	<0.1	scattered-patchy	Trace	leaves/rosette	Trail/Road	patch pulled
2	Canada Thistle	0.1-1.0	scattered-even	Moderate	leaves/rosette	Trail/Water	none
3	Oxeye Daisy	<0.1	scattered-even	Moderate	peak flowering	Trail/Trail	none
4	Oxeye Daisy	>5.0	linear	Low	first flower	Trail/Stock	none
5	Meadow Hawkweed	>5.0	linear	Low	leaves/rosette	Road/Trail	none
6	Sulfur Cinquefoil	<0.1	clumpy	Low	leaves/rosette	Road/Trail	none
7	Oxeye Daisy	>5.0	linear	Low	first flower	Road/Trail	none
8	Canada Thistle	<0.1	scattered-patchy	Trace	leaves/rosette	Trail/Water	none
9	Oxeye Daisy	<0.1	clumpy	Low	leaves/rosette	Trail/Stock	none
10*	Canada Thistle	0.1-1.0	scattered-even	Low	leaves/rosette	Trail/Water	none
11	Oxeye Daisy	>5.0	linear	Low	first flower	Trail/Trailhead	none
12	Meadow Hawkweed	1.0-5.0	linear	Low	first flower	Road/Trail	none
13	Canada Thistle	<0.1	clumpy	Moderate	leaves/rosette	Trail/Road	none
14	Sulfur Cinquefoil	<0.1	clumpy	Low	leaves/rosette	Road/Trail	none
15	Orange Hawkweed	<0.1	linear	Low	first flower	Road/Trail	none
16	Oxeye Daisy	<0.1	linear	Low	first flower	Trail/Stock	none
17	Canada Thistle	0.1-1.0	scattered-even	High	leaves/rosette	Road/Trail	none
18	Meadow Hawkweed	0.1-1.0	scattered-patchy	Moderate	first flower	Road/Trail	none
19	Orange Hawkweed	<0.1	scattered-patchy	Moderate	first flower	Road/Trail	none
20	Orange Hawkweed	>5.0	linear	Low	first flower	Road/Trail	none
21	Meadow Hawkweed	0.1-1.0	linear	Low	senescent	Trail/Road	none
22*	Oxeye Daisy	<0.1	linear	Low	peak flowering	Trail/Stock	patch pulled
23*	Canada Thistle	<0.1	clumpy	Low	leaves/rosette	Trail/Recent fire	patch pulled

PATCH ID	SPECIES	SIZE	DISTRIBUTION	DENSITY	PHENOLOGY	DISTURBANCE (primary/secondary)	ACTION
24*	Meadow Hawkweed	<0.1	linear	Low	peak flowering	Recent fire/Trail	none
25*	Oxeye Daisy	<0.1	linear	Low	end flowering	Trail	Other
26*	Meadow Hawkweed	<0.1	linear	Low	end flowering	Trail	Recent fire
27*	Canada Thistle	<0.1	clumpy	Moderate	leaves/rosette	Trail	Stock
28*	Canada Thistle	<0.1	scattered-patchy	Moderate	leaves/rosette	Trail	Stock
29	Canada Thistle	<0.1	scattered-even	High	leaves/rosette	Road	Trailhead
30	Oxeye Daisy	<0.1	linear	Trace	peak flowering	Road	Trailhead
31	Canada Thistle	<0.1	linear	Low	end flowering	Trail	Trailhead
32*	Canada Thistle	<0.1	linear	Moderate	end flowering	Trail	NA

Table B. Ecological and physical associations of all recorded weed infestations in the Ten Lakes Wilderness Study Area. Patches within the WSA boundary have an asterisk (*); all others were located on trails leading into the WSA.

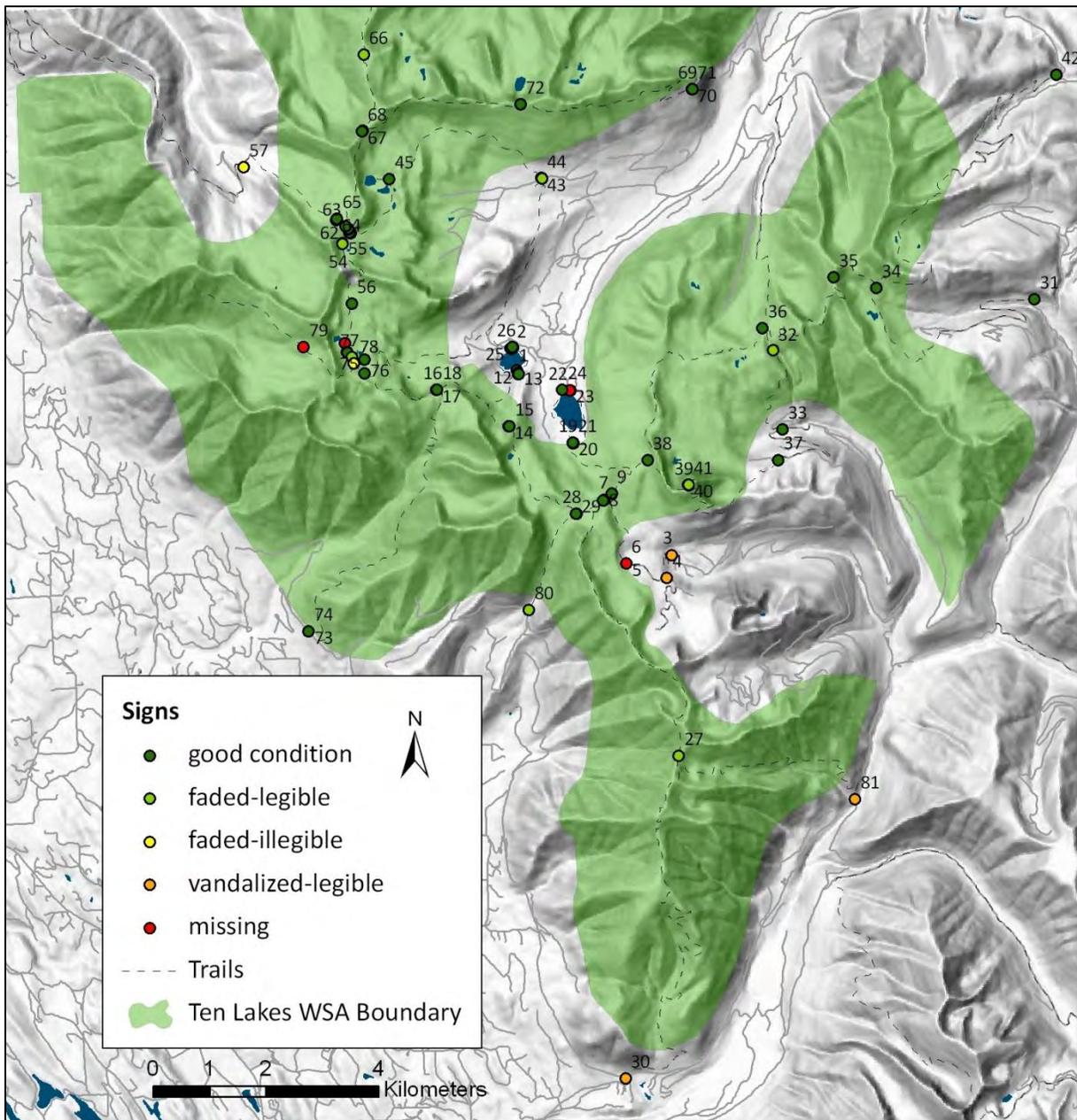
Patch ID	Ecotype	Dom. Lifeform	Tree Cover	Habitat Series	Habitat Type	Habitat Phase	Dominant Understory (1 st -3 rd)	Dominant Understory (1 st -3 rd) ^a	Structure	Dist. to Water	Elev.	Aspect
1	forest	forb	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/douglas fir	setr/vive/mefr	15 ft: 0-5, 50 ft: >9	>50	1030	N
2	forest	forb	>75%	<i>Pseudotsuga menziesii</i>	<i>Physocarpus malvaceu</i>	<i>C. rubesc</i>	douglas fir/ larch/birch/alder	rosa spp/ syal/acgl	15 ft: >9, 50 ft: >9	0-10	1033	N
3	forest	forb	50-75%	<i>Pseudotsuga menziesii</i>	<i>Physocarpus malvaceu</i>	<i>C. rubesc</i>	douglas fir/ larch/ponderosa pine	phma5/acgl/ caru	15 ft: >9, 50 ft: >9	>50	1037	N
4	forest	forb	25-50%	<i>Pseudotsuga menziesii</i>	<i>Physocarpus malvaceu</i>	<i>C. rubesc</i>	douglas fir/ birch/alder/larch	apan2/phma5/ mare11	15 ft: >9, 50 ft: >9	>50	1198	SE
5	forest	woody shrub	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/lodgepole pine	alvi5/xete/vame	15 ft: 5-9, 50 ft: 5-9	>50	1440	W
6	forest	forb	25-50%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ lodgepole pine/spruce	alvi5/mepa/xete	15 ft: >9, 50 ft: >9	>50	1448	W
7	forest	forb	25-50%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	<i>Menziesia ferruginea</i>	spruce/subalpine fir/ lodgepole pine	alvi5/xete/ chan9	15 ft: 5-9, 50 ft: 5-9	>50	1448	W
8	forest	graminoid	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	<i>Menziesia ferruginea</i>	subalpine fir/ spruce/lodgepole pine	setr/alvi5/ fern spp.	15 ft: 5-9, 50 ft: >9	10-50	1451	SW
9	forest	forb	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/NA	alvi5/sara2/ chan9	15 ft: >9, 50 ft: >9	>50	1457	SE
10*	riparian	forb	>75%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	spruce/subalpine fir/ NA	alvi5/rupa/vame	15 ft: >9, 50 ft: >9	0-10	1473	W
11	forest	forb	50-75%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	spruce/subalpine fir/ NA	alvi5/rupa/vagl	15 ft: 5-9, 50 ft: >9	>50	1537	SE
12	alpine	forb	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	spruce/subalpine fir/ NA	alvi5/rupa/vame	15 ft: 0-5, 50 ft: 5-9	10-50	1544	SW

Patch ID	Ecotype	Dom. Lifeform	Tree Cover	Habitat Series	Habitat Type	Habitat Phase	Dominant Understory (1 st -3 rd)	Dominant Understory (1 st -3 rd) ^a	Structure	Dist. to Water	Elev.	Aspect
13	forest	forb	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	spruce/subalpine fir/ NA	alvi5/rupa/vame	15 ft: 5-9, 50 ft: >9	0-10	1552	S
14	forest	forb	25-50%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	spruce/subalpine fir/ NA	alvi5/vame/rupa	15 ft: >9, 50 ft: >9	>50	1557	N
15	forest	forb	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	spruce/subalpine fir/ NA	alvi5/rupa/vame	15 ft: 5-9, 50 ft: 5-9	>50	1560	S
16	forest	woody shrub	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/NA	avi5/mepa/sara 2	15 ft: 5-9, 50 ft: >9	>50	1562	S
17	forest	woody shrub	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/NA	alvi5/hespl/rupa	15 ft: >9, 50 ft: >9	>50	1574	NW
18	forest	woody shrub	<25%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/NA	alvi5/rupa/hespl	15 ft: >9, 50 ft: >9	>50	1575	NW
19	forest	woody shrub	25-50%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	NA	subalpine fir/ spruce/NA	alvi5/arco9/NA	15 ft: >9, 50 ft: >9	>50	1593	SE
20	forest	conifer	25-50%	<i>Abies lasiocarpa</i>	<i>Menziesia ferruginea</i>	<i>Menziesia ferruginea</i>	subalpine fir/ spruce/white bark pine	alvi5/mefe/ arco9	15 ft: 0-5, 50 ft: 0-5	>50	1594	SW
21	forest	conifer	50-75%	<i>Pseudotsuga menziesii</i>	<i>Linnaea borealis</i>	<i>Symphoricarpos albus</i>	ponderosa pine/douglas fir/ larch	acgl/shca/syal	15 ft: 5-9, 50 ft: >9	>50	1594	N
22*	forest	woody shrub	25-50%	<i>Thuja plicata</i>	<i>Clintonia uniflora</i>	<i>Clintonia uniflora</i>	douglas fir/ larch/cedar	acgl/spbe2/ amal2	15 ft: >9, 50 ft: >9	>50	1601	N
23*	forest	woody shrub	25-50%	<i>Pseudotsuga menziesii</i>	<i>Vaccinium globulare</i>	<i>Xerophyllum teNax</i>	larch/douglas fir/ subalpine fir	alvi5/salix/acgl	15 ft: >9, 50 ft: >9	>50	1616	N
24*	forest	woody shrub	<25%	<i>Pseudotsuga menziesii</i>	<i>Vaccinium globulare</i>	<i>Xerophyllum teNax</i>	subalpine fir/ larch/douglas fir	acgl/vame/xete	15 ft: >9, 50 ft: >9	>50	1616	S
25*	forest	conifer	25-50%	<i>Pseudotsuga menziesii</i>	<i>Vaccinium globulare</i>	<i>Xerophyllum teNax</i>	douglas fir/ larch/subalpine fir	alvi5/acgl/salix	15 ft: >9, 50 ft: >9	>50	1616	N
26*	forest	conifer	<25%	<i>Pseudotsuga menziesii</i>	<i>Vaccinium globulare</i>	<i>Xerophyllum teNax</i>	douglas fir/ larch/NA	acgl/salix/rupa	15 ft: >9, 50 ft: >9	>50	1618	S
27*	forest	woody shrub	<25%	<i>Abies lasiocarpa</i>	<i>Luzula hitchcockii</i>	<i>Menziesia ferruginea</i>	subalpine fir/ spruce/NA	alvi5/rimo2/ vame	15 ft: >9, 50 ft: >9	>50	1649	N

Patch ID	Ecotype	Dom. Lifeform	Tree Cover	Habitat Series	Habitat Type	Habitat Phase	Dominant Understory (1 st -3 rd)	Dominant Understory (1 st -3 rd) ^a	Structure	Dist. to Water	Elev.	Aspect
28*	forest	woody shrub	<25%	<i>Abies lasiocarpa</i>	<i>Luzula hitchcockii</i>	<i>Menziesia ferruginea</i>	subalpine fir/spruce/NA	alvi5/rimo2/vame	15 ft: 5-9, 50 ft: >9	>50	1660	S
29	forest	woody shrub	<25%	<i>Pseudotsuga menziesii</i>	<i>Vaccinium globulare</i>	<i>Vaccinium globulare</i>	larch/douglas fir/NA	alvi5/rupa/acgl	15 ft: 0-5, 50 ft: 5-9	>50	1682	W
30	forest	woody shrub	<25%	<i>Pseudotsuga menziesii</i>	<i>Vaccinium globulare</i>	<i>Vaccinium globulare</i>	douglas fir/larch/NA	alvi5/rupa/acgl	15 ft: 0-5, 50 ft: >9	>50	1763	W
31	forest	conifer	25-50%	<i>Thuja plicata</i>	<i>Clintonia uniflora</i>	<i>Menziesia ferruginea</i>	larch/douglas fir/cedar	alvi4/rupa/acgl	15 ft: 5-9, 50 ft: >9	>50	1848	E
32*	riparian	woody shrub	50-75%	<i>Pseudotsuga menziesii</i>	<i>Xerophyllum teNax</i>	<i>Xerophyllum teNax</i>	NA/birch/alder/NA	rupa/stam/syal	15 ft: 0-5, 50 ft: >9	0-10	1852	SE

^a Plant codes are from the USDA National List of Scientific Plant Names (NLSPN)

APPENDIX 3. SIGNS



Spatial distribution and conditions of all signs encountered within the Ten Lakes WSA in 2010.

Table A. Type, condition, coordinates, and GPS precision for all signs located on trails within the Ten Lakes Wilderness Study Area.

ID	Sign Type	Condition	Easting (m)	Northing (m)	GPS Precision (m)
1	trail junction/ directions	good condition	654,517	5,423,290	2.3
2	trail junction/ directions	faded-legible	654,481	5,423,272	2.5
3	recreational use	vandalized-legible	657,335	5,419,599	2.1
4	trail junction/ directions	vandalized-legible	657,251	5,419,188	2.3
5	trail junction/ directions	good condition	656,532	5,419,443	2.0
6	trail junction/ directions	missing	656,527	5,419,447	1.9
7	trail junction/ directions	good condition	656,143	5,420,583	2.8
8	trail junction/ directions	good condition	656,118	5,420,568	2.2
9	trail junction/ directions	good condition	656,270	5,420,694	2.7
10	trail junction/ directions	good condition	654,581	5,422,888	2.1
11	trail junction/ directions	good condition	654,602	5,422,840	6.7
12	trail junction/ directions	good condition	654,611	5,422,822	2.5
13	trail junction/ directions	good condition	654,614	5,422,814	2.0
14	trail junction/ directions	good condition	654,443	5,421,890	2.2
15	trail junction/ directions	good condition	654,449	5,421,887	2.0
16	trail junction/ directions	good condition	653,155	5,422,539	2.3
17	trail junction/ directions	good condition	653,151	5,422,541	1.8
18	trail junction/ directions	good condition	653,160	5,422,539	2.0
19	trail junction/ directions	good condition	655,582	5,421,591	2.2
20	trail junction/ directions	good condition	655,587	5,421,591	2.7
21	trail junction/ directions	good condition	655,576	5,421,595	3.1
22	trail junction/ directions	good condition	655,540	5,422,525	2.4
23	recreational use	missing	655,527	5,422,523	2.1
24	interpretive	good condition	655,389	5,422,541	2.4
25	trail junction/ directions	good condition	654,478	5,423,272	2.9
26	trail junction/ directions	good condition	654,509	5,423,296	3.3
27	trail junction/ directions	faded-legible	657,465	5,416,025	2.6
28	trail junction/ directions	good condition	655,646	5,420,336	2.0
29	trail junction/ directions	good condition	655,641	5,420,334	2.3
30	recreational use	vandalized-legible	656,518	5,410,278	2.1
31	trail junction/ directions	good condition	663,792	5,424,147	2.4
32	trail junction/ directions	faded-legible	659,138	5,423,244	1.7
33	trail junction/ directions	good condition	659,312	5,421,833	2.8
34	trail junction/ directions	good condition	660,981	5,424,350	2.5
35	trail junction/ directions	good condition	660,219	5,424,540	2.1
36	trail junction/ directions	good condition	658,956	5,423,633	6.1
37	trail junction/ directions	good condition	659,233	5,421,289	1.8
38	trail junction/ directions	good condition	656,908	5,421,281	3.0
39	trail junction/ directions	good condition	657,641	5,420,832	7.6
40	trail junction/ directions	good condition	657,634	5,420,848	1.7
41	trail junction/ directions	faded-legible	657,637	5,420,850	1.7
42	trail junction/ directions	good condition	664,178	5,428,152	1.7
43	trail junction/ directions	good condition	655,025	5,426,313	2.3
44	trail junction/ directions	faded-legible	655,027	5,426,300	1.9
45	trail junction/ directions	good condition	652,312	5,426,288	1.6
46	trail junction/ directions	missing	651,531	5,423,372	2.0

47	trail junction/ directions	good condition	651,565	5,423,206	2.0
48	trail junction/ directions	good condition	651,568	5,423,205	1.9
49	trail junction/ directions	good condition	651,870	5,423,077	1.9
50	trail junction/ directions	good condition	651,631	5,425,323	1.8
51	trail junction/ directions	faded-legible	651,611	5,425,334	2.0
52	trail junction/ directions	good condition	651,611	5,425,340	1.9
53	trail junction/ directions	good condition	651,487	5,425,150	2.2
54	trail junction/ directions	good condition	651,485	5,425,137	1.7
55	trail junction/ directions	faded-legible	651,485	5,425,136	1.5
56	trail junction/ directions	good condition	651,645	5,424,073	2.0
57	interpretive	faded-illegible	649,728	5,426,498	1.8
58	other	good condition	651,370	5,425,567	2.6
59	trail junction/ directions	good condition	651,583	5,425,393	1.7
60	trail junction/ directions	good condition	651,582	5,425,407	1.6
61	trail junction/ directions	faded-legible	651,535	5,425,447	1.7
62	trail junction/ directions	faded-legible	651,536	5,425,447	1.7
63	trail junction/ directions	good condition	651,535	5,425,449	1.9
64	other	good condition	651,371	5,425,564	2.4
65	other	good condition	651,385	5,425,585	2.1
66	other	faded-legible	651,859	5,428,502	2.6
67	trail junction/ directions	faded-illegible	651,837	5,427,148	2.1
68	trail junction/ directions	good condition	651,830	5,427,144	2.3
69	trail junction/ directions	faded-legible	657,700	5,427,889	2.1
70	recreational use	vandalized-legible	657,701	5,427,888	1.9
71	interpretive	good condition	657,703	5,427,892	1.9
72	trail junction/ directions	good condition	654,647	5,427,618	3.2
73	trail junction/ directions	vandalized-legible	650,878	5,418,238	2.4
74	trail junction/ directions	good condition	650,877	5,418,239	2.0
75	trail junction/ directions	good condition	651,877	5,422,827	3.0
76	trail junction/ directions	good condition	651,879	5,422,830	2.6
77	trail junction/ directions	faded-legible	651,647	5,423,117	2.6
78	trail junction/ directions	faded-illegible	651,688	5,423,004	2.5
79	other	missing	650,787	5,423,299	2.2
80	trail junction/ directions	faded-legible	654,796	5,418,617	2.5
81	other	vandalized-legible	660,596	5,415,245	1.8

Sign #1 (photo 15)



Sign #2 (photo 16)



Sign #3 (photo 170)



Sign #4 (photo 172)



Sign #5 (photo 178)



Sign #6 (photo 179)



Sign #7 (photo 180)



Sign #8 (photo 181)



Sign #9 (photo 182)



Sign #10 (photo 646)



Sign #11 (photo 206)



Sign #12 (photo 647)



Sign #13 (photo 648)



Sign #14 (photo 214)



Sign #15 (photo 213)



Sign #16 (photo 215)



Sign #17 (photo 216)



Sign #18 (photo 217)



Sign #19 (photo 192)



Sign #20 (photo 193)



Sign #21 (photo 194)



Sign #22 (photo 641)



Sign #23 (photo 642)



Sign #24 (photo 202)



Sign #31 (photo 303)



Sign #32 (photo 89?)



Sign #33 (photo 99)



Sign #34 (photo 339)



Sign #35 (photo 343)



Sign #36 (photo 348)



Sign #37 (photo 355)



Sign #38 (photo 122?)



Sign #39 (photo 357)



Sign #40 (photo 140?)



Sign #41 (photo 141)



Sign #42 (photo 385)



Sign #43 (photo 489)



Sign #44 (photo 3912)



Sign #45 (photo 495)



Sign #46 (photo 3929)



Sign #47 (photo 527)



Sign #48 (photo 3930)



Sign #49 (photo 528)



Sign #50 (photo 504)



Sign #51 (photo 3923)



Sign #52 (photo 505)



Sign #53 (photo 3925)



Sign #54 (photo 517)



Sign #55 (photo 518)



Sign #56 (photo 3928)



Sign #57 (photo 546)



Sign #58 (photo 547)



Sign #59 (photo missing)

Sign #60 (photo 532)



Sign #61 (photo 534)



Sign #62 (photo 3941)



Sign #63 (photo 535)



Sign #64 (photo 3944)



Sign #65 (photo 3947)



Sign #66 (photo 3966)



Sign #67 (photo 561)



Sign #68 (photo 3959)



Sign #69 (photo 578)



Sign #70 (photo 579)



Sign #71 (photo 580)



Sign #72 (photo 576)



Sign #73 (photo 3977)



Sign #74 (photo 3978)



Sign #75 (photo 3992)



Sign #76 (photo 605)



Sign #77 (photo 615)



Sign #78 (photo 4002)



Sign #79 (photo missing)

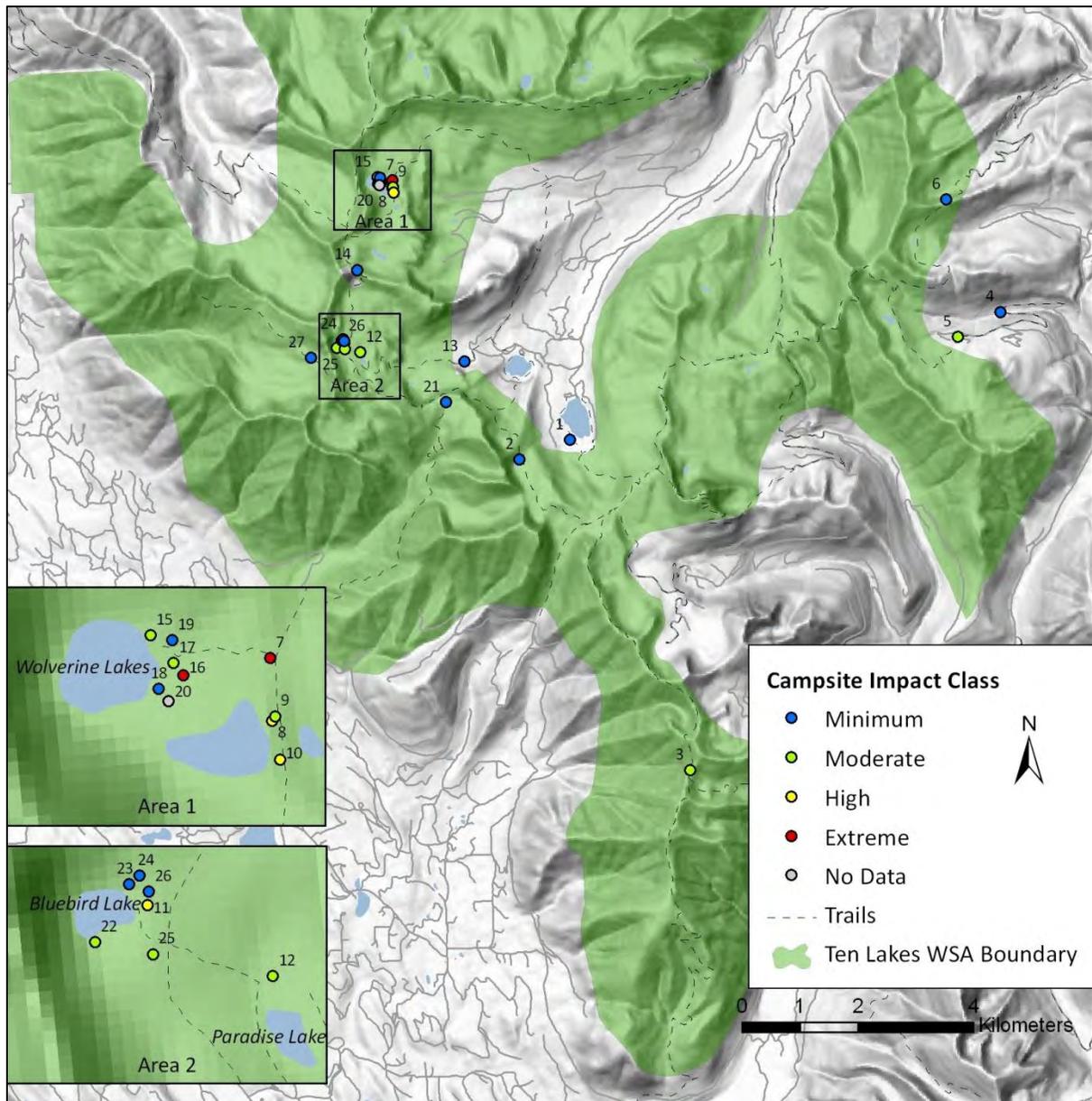
Sign #80 (photo 623)



Sign #81 (photo 4020)



APPENDIX 4. CAMPSITE INVENTORY & CONDITION



Spatial distribution and impact class of all campsites encountered in the Ten Lakes WSA in 2010.

Campsite #1



Photo #196, azimuth: 288

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	streamside
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, douglas fir
Dominant Understory (1-3)	rusty menziesia, thinleaf huckleberry, common beargrass

Conditions

Veg. Cover at Site/Off Site	76-100%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/0-5%
Tree Damage	None
Root Exposure	None
Development	None
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	16
Impact Class	Minimum

Campsite #2



Photo #219, azimuth: 274



Photo #220, azimuth: 290

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	streamside
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	yellow avalanche lily, green false hellebore, common beargrass

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	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	None
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	21
Impact Class	Minimum

Campsite #3



Photo #262, azimuth: 360



Photo #263, azimuth: 180

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	saddle
Tree Cover	25%- 50%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	common beargrass, sickletop lousewort, dwarf bilberry

Conditions

Veg. Cover at Site/Off Site	6-25%/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 with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	None
Camp Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	25
Impact Class	Moderate

Campsite #4



Photo #310, azimuth: 145



Photo #312, azimuth: 260

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	streamside
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	green alder, heartleaf arnica, Virginia strawberry

Conditions

Veg. Cover at Site/Off Site	26-50%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/0-5%
Tree Damage	None
Root Exposure	None
Development	None
Cleanliness	No more than scattered charcoal from 1 fire ring
Social Trails	None
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	19
Impact Class	Minimum

Campsite #5



Photo #331, azimuth: 112



Photo #332, azimuth: 190

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	forest
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	rusty menziesia, dwarf bilberry, green alder

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 with or without primitive log seat
Cleanliness	No more than scattered charcoal from 1 fire ring
Social Trails	None
Camp Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	26
Impact Class	Moderate

Campsite #6



Photo #377, azimuth: 305

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	common beargrass, dwarf bilberry, Sitka valerian

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 with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	2-3 discernable max, or 1 well-worn trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	21
Impact Class	Minimum

Campsite #7



Photo #496, azimuth: 100



Photo #498, azimuth: 265

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	forest
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, white bark pine
Dominant Understory (1-3)	Sitka valerian, arrowleaf ragwort, white pasqueflower

Conditions

Veg. Cover at Site/Off Site	6-25%/76-100%
Mineral Soil Exposure at Site/Off Site	51-75%/0-5%
Tree Damage	>8 scarred trees, or >3 badly scarred or felled trees
Root Exposure	>6 trees with roots exposed
Development	>1 fire ring or other major development
Cleanliness	Human waste, much litter or manure
Social Trails	>3 discernable or more than 1 well worn
Camp Area	>500 sq. ft.
Barren Core Camp Area	>500 sq. ft.

Impact Evaluation

Impact Index Score	56
Impact Class	Extreme

Campsite #8



Photo #3921, azimuth: 230

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	25%- 50%
Dominant Trees (1-3)	subalpine fir, white bark pine, larch
Dominant Understory (1-3)	rusty menziesia, common beargrass, thinleaf huckleberry

Conditions

Veg. Cover at Site/Off Site	0-5%/76-100%
Mineral Soil Exposure at Site/Off Site	76-100%/0-5%
Tree Damage	1-8 scarred trees, or 1-3 badly scarred or felled trees
Root Exposure	1-6 trees with roots exposed
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	42
Impact Class	High

Campsite #9



Photo #499, azimuth: 320

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	saddle
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, larch, white bark pine
Dominant Understory (1-3)	common beargrass, dwarf bilberry

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	None
Cleanliness	No more than scattered charcoal from 1 fire ring
Social Trails	None
Camp Area	<50 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	26
Impact Class	Moderate

Campsite #10



Photo #501, azimuth: 275



Photo #503, azimuth: 95

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	common beargrass, white pasqueflower, dwarf bilberry

Conditions

Veg. Cover at Site/Off Site	6-25%/51-75%
Mineral Soil Exposure at Site/Off Site	6-25%/0-5%
Tree Damage	>8 scarred trees, or >3 badly scarred or felled trees
Root Exposure	>6 trees with roots exposed
Development	>1 fire ring or other major development
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	37
Impact Class	High

Campsite #11



Photo #524, azimuth: 280



Photo #525, azimuth: 280

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	Sitka valerian, subalpine fleabane, white pasq.ueflower

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 trees, or 1-3 badly scarred or felled trees
Root Exposure	>6 trees with roots exposed
Development	>1 fire ring or other major development
Cleanliness	Human waste, much litter or manure
Social Trails	>3 discernable or more than 1 well worn
Camp Area	>500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	42
Impact Class	High

Campsite #12



Photo #529, azimuth: 280



Photo #530, azimuth: 360

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	50%- 75%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	arrowleaf ragwort, white pasqueflower, smallflowered woodrush

Conditions

Veg. Cover at Site/Off Site	0-5%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/0-5%
Tree Damage	1-8 scarred trees, or 1-3 badly scarred or felled trees
Root Exposure	1-6 trees with roots exposed
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	32
Impact Class	Moderate

Campsite #13



Photo #3933, azimuth: 288

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	other
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, mountain hemlock
Dominant Understory (1-3)	Western pearly everlasting, Virginia strawberry, common cowparsnip

Conditions

Veg. Cover at Site/Off Site	26-50%/76-100%
Mineral Soil Exposure at Site/Off Site	6-25%/0-5%
Tree Damage	None
Root Exposure	None
Development	None
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	None
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	23
Impact Class	Minimum

Campsite #14



Photo #3935, azimuth: 10

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	saddle
Tree Cover	<25%
Dominant Trees (1-3)	larch, subalpine fir
Dominant Understory (1-3)	raceme pussytoes, Geyer's sedge, smallflowered woodrush

Conditions

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

Impact Evaluation

Impact Index Score	16
Impact Class	Minimum

Campsite #15



Photo #548, azimuth: 340



Photo #549, azimuth: 170

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	common beargrass, nodding onion, potentilla fruticosa

Conditions

Veg. Cover at Site/Off Site	6-25%/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 or other major development
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	2-3 discernable max, or 1 well-worn trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	29
Impact Class	Moderate

Campsite #16



Photo #552, azimuth: 170



Photo #553, azimuth: 40

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	25%- 50%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	smallflowered woodrush, saxifrage sp., green false hellebore

Conditions

Veg. Cover at Site/Off Site	26-50%/76-100%
Mineral Soil Exposure at Site/Off Site	26-50%/0-5%
Tree Damage	>8 scarred trees, or >3 badly scarred or felled trees
Root Exposure	>6 trees with roots exposed
Development	>1 fire ring or other major development
Cleanliness	Human waste, much litter or manure
Social Trails	>3 discernable or more than 1 well worn
Camp Area	>500 sq. ft.
Barren Core Camp Area	50-500 sq. ft.

Impact Evaluation

Impact Index Score	49
Impact Class	Extreme

Campsite #17



Photo #3951, azimuth: 147



Photo #3953, azimuth: 190

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, white bark pine
Dominant Understory (1-3)	Geyer's sedge, white pasqueflower, Sitka valerian

Conditions

Veg. Cover at Site/Off Site	51-75%/76-100%
Mineral Soil Exposure at Site/Off Site	6-25%/0-5%
Tree Damage	No more than broken lower branches
Root Exposure	1-6 trees with roots exposed
Development	>1 fire ring or other major development
Cleanliness	Human waste, much litter or manure
Social Trails	2-3 discernable max, or 1 well-worn trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	29
Impact Class	Moderate

Campsite #18



Photo #555, azimuth: 270



Photo #557, azimuth: 340

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	25%- 50%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, larch
Dominant Understory (1-3)	thinleaf huckleberry, smallflowered woodrush, green false hellebore

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 trees, or 1-3 badly scarred or felled trees
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	21
Impact Class	Minimum

Campsite #19



Photo #3954, azimuth: 140



Photo #3956, azimuth: 260

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	50%- 75%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, white bark pine
Dominant Understory (1-3)	white pasqueflower, Sitka valerian, common beargrass

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 trees, or 1-3 badly scarred or felled trees
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Human waste, much litter or manure
Social Trails	1 discernable trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	20
Impact Class	Minimum

Campsite #20

(No photos)

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	25%- 50%
Dominant Trees (1-3)	subalpine fir, Englemann spruce, larch
Dominant Understory (1-3)	smallflowered woodrush, green false hellebore, sickletop lousewort

Conditions

Veg. Cover at Site/Off Site	No Data/76-100%
Mineral Soil Exposure at Site/Off Site	No Data/0-5%
Tree Damage	No Data
Root Exposure	No Data
Development	>1 fire ring or other major development
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	2-3 discernable max, or 1 well-worn trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	No Data

Impact Evaluation

Impact Index Score	No Data
Impact Class	No Data

Campsite #21



Photo #601, azimuth: 117

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	saddle
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, Englemann spruce
Dominant Understory (1-3)	common beargrass, grouse whortleberry, Virginia strawberry

Conditions

Veg. Cover at Site/Off Site	51-75%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/0-5%
Tree Damage	None
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	None

Impact Evaluation

Impact Index Score	19
Impact Class	Minimum

Campsite #22



Photo #3993, azimuth: 198



Photo #3995, azimuth: 290

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, larch
Dominant Understory (1-3)	dwarf bilberry, smallflowered woodrush, common beargrass

Conditions

Veg. Cover at Site/Off Site	76-100%/76-100%
Mineral Soil Exposure at Site/Off Site	6-25%/0-5%
Tree Damage	>8 scarred trees, or >3 badly scarred or felled trees
Root Exposure	1-6 trees with roots exposed
Development	>1 fire ring or other major development
Cleanliness	Human waste, much litter or manure
Social Trails	>3 discernable or more than 1 well worn
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	33
Impact Class	Moderate

Campsite #23



Photo #608, azimuth: 360

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir
Dominant Understory (1-3)	Geyer's sedge, white pasqueflower, Woodland strawberry

Conditions

Veg. Cover at Site/Off Site	76-100%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/0-5%
Tree Damage	None
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	17
Impact Class	Minimum

Campsite #24



Photo #610, azimuth: 300

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir
Dominant Understory (1-3)	Geyer's sedge, Woodland strawberry, smallflowered woodrush

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 trees, or 1-3 badly scarred or felled trees
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	19
Impact Class	Minimum

Campsite #25



Photo #3996, azimuth: 302



Photo #3997, azimuth: 16

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, larch
Dominant Understory (1-3)	raceme pussytoes, smallflowered woodrush, Geyer's sedge

Conditions

Veg. Cover at Site/Off Site	51-75%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/76-100%
Tree Damage	1-8 scarred trees, or 1-3 badly scarred or felled trees
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	50-500 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	33
Impact Class	Moderate

Campsite #26



Photo #612, azimuth: 180

Attribute Data

Location

Distance to Trail	>200 ft.
Distance to Water	<200 ft.
Distance to Closest Campsite	<500 ft.

Ecological Associations

Landform	lakeshore
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir
Dominant Understory (1-3)	raceme pussytoes, smallflowered woodrush, Geyer's sedge

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 trees, or 1-3 badly scarred or felled trees
Root Exposure	None
Development	1 fire ring with or without primitive log seat
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	1 discernable trail
Camp Area	<50 sq. ft.
Barren Core Camp Area	< 50 sq. ft.

Impact Evaluation

Impact Index Score	19
Impact Class	Minimum

Campsite #27



Photo #618, azimuth: 80

Attribute Data

Location

Distance to Trail	<200 ft.
Distance to Water	>200 ft.
Distance to Closest Campsite	>500 ft.

Ecological Associations

Landform	meadow
Tree Cover	<25%
Dominant Trees (1-3)	subalpine fir, white bark pine
Dominant Understory (1-3)	tufted alpine saxifrage, common beargrass, grouse whortleberry

Conditions

Veg. Cover at Site/Off Site	76-100%/76-100%
Mineral Soil Exposure at Site/Off Site	0-5%/0-5%
Tree Damage	None
Root Exposure	None
Development	>1 fire ring or other major development
Cleanliness	Remnants of >1 fire ring, some litter or manure
Social Trails	None
Camp Area	50-500 sq. ft.
Barren Core Camp Area	None

Impact Evaluation

Impact Index Score	18
Impact Class	Minimum

APPENDIX 5. CAMPSITE CONDITION EVALUATION WORKSHEET

Wilderness Campsite Inventory & Condition Evaluation (KNF, 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

