Field Measures of Wilderness Character for Bitterroot Recommended Wilderness, Bitterroot National Forest

2018

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Executive Summary

This report summarizes field measures of wilderness character collected in the Recommend Wilderness on the Bitterroot National Forest in southwestern Montana in summer 2017.

Monitoring highlights include:

- **Weeds:** A total of 153 weed patches were recorded representing nine species – bull thistle, Canada thistle, cheatgrass, common mullein, hoary alyssum, houndstongue, oxeye daisy, spotted knapweed, and sulfur cinquefoil. Spotted knapweed (49%) was the most abundant followed by cheatgrass (18%), sulfur cinquefoil (14%), and oxeye daisy (10%).

- **Water Erosion:** Erosion due to recreation was documented at 14 sites. Six sites showed signs of slight erosion, 5 had moderate erosion, and 3 were severely eroded.

- **Installations and developments:** Twenty-nine installations and developments were recorded. The majority (59%) of the installations and developments were reported as other and included a bird house, a memorial, benches, climbing anchors, irrigation diversion and pipes.

- **Signs:** Sixty signs points were recorded with 39 of the signs located within the recommended wilderness boundary. The three most common sign points were recreational use (30%), boundary (28%) and trail junction/direction (18%). Sixty percent of the signs recorded as in good condition, 18% as faded-legible, 8% in poor condition, 12% as vandalized - legible, and 2% as vandalized-illegible.

- **Evidence of Mechanized and Motorized Use:** Three locations of single track - bicycle were recorded. All tracks were made by a bicycle.

- **Trail Width and Condition:** Thirty deviations from single track trail were reported, mostly in the southern region of the Bitterroots.

- **Non-system Trails:** Ten non-system trails were mapped – all due to foot travel.

- **Trailheads:** Information on recreation use was recorded at 22 trailheads.

- **Encounters with people:** A total of 80 separate encounters were recorded totaling 207 peoples. The majority (92%) were hikers/backpackers.

- **Noise Intrusions:** Eighty-nine intrusions were opportunistically recorded across the area. All noises recorded were from airplanes except for 3 automobiles.

- **Visual Intrusion:** Four visual intrusions were documented – rural/agricultural, cities/towns, and dirt roads.

- **Campsites:** A total of 58 campsites were recorded and inventoried. Only one campsite was occupied at the time it was recorded. Based on the summary impact evaluation scores, 38% of the campsites were rated as not a site, 40% were lightly impacted, 17% were moderately impacted, and 2% were heavily impacted.
A: Bass Creek and Kootenai Creek

B: Bear Creek

C: Mill Creek, Blodgett Creek and Sawtooth Creek

D: Tenmile Creek, North Lost Horse Creek and South Lost Horse Creek
E: Tin Cup Creek
F: Chaffin Creek, Trapper Creek and Baker Lake
G: Boulder Creek and Nelson Lake
H: Watchtower Creek and Sheephead Creek
# Table of Contents

Executive Summary ................................................................................................................................. i  
INTRODUCTION ............................................................................................................................................. 6  
Data Management ........................................................................................................................................... 7  
I. UNTRAMMELED QUALITY .................................................................................................................... 10  
II. NATURAL QUALITY .............................................................................................................................. 11  
  
  Weeds ................................................................................................................................................. 11  
  Water Erosion ..................................................................................................................................... 18  
III. UNDEVELOPED QUALITY .................................................................................................................... 21  
  
  Installations and Developments ......................................................................................................... 21  
  Signs .................................................................................................................................................... 24  
  Evidence of Mechanized and Motorized Use on Trails ....................................................................... 30  
IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY ................................................ 30  
  
  Trail Width and Condition ................................................................................................................... 31  
  Non-system Trails ............................................................................................................................... 32  
  Trailheads ............................................................................................................................................ 35  
  Encounters with People ...................................................................................................................... 36  
  Noise ................................................................................................................................................... 36  
  Visual Intrusions .................................................................................................................................. 37  
  Campsites ............................................................................................................................................ 38  
LITERATURE CITED ...................................................................................................................................... 42  
APPENDIX 1. MONITORING ATTRIBUTES ............................................................................................... 43  
APPENDIX 2. CAMPSITE INVENTORY & CONDITION .................................................................................. 47  
APPENDIX 3. CAMPSITE CONDITION EVALUATION WORKSHEET ................................................................. ??
List of Tables

Table 1.  Number of weed patches where control action was taken and proportion of patch pulled ..... 28
Table 2.  Summary of vehicles at trailheads .................................................................35
Table 3.  Number of people encountered on trails by recreational activity ..................36
Table 4.  Duration and intensity of noise intrusions .....................................................37
Table 5.  Visual intrusion types and location. ...............................................................37
Table 6.  Number of campsites by impact evaluation score ........................................38

List of Figures

Figure 1.  Number of weed patches by species ..........................................................11
Figure 2.  Distribution of observed weed species, North Bitterroot Recommended Wilderness ..........12
Figure 3.  Distribution of observed weed species, South Bitterroot Recommended Wilderness ........13
Figure 4.  Spatial distribution of weed species .............................................................15
Figure 5.  Radius and cover of weed patches .............................................................15
Figure 6.  Primary and secondary disturbances associated with weed patches ................16
Figure 7.  Ecosystem type and dominant lifeform associated with weed species .............17
Figure 8.  Distance of weed patches from water by species .......................................18
Figure 9.  Location of erosions sites encountered and severity of erosion within North Bitterroot Recommended Wilderness .................................................................19
Figure 10.  Location of erosions sites encountered and severity of erosion within South Bitterroot Recommended Wilderness .................................................................20
Figure 11.  Number of installations and developments by type, condition and source, ........21
Figure 12.  Location of Installations and developments by type, North Bitterroot Recommended Wilderness .................................................................................. 22
Figure 13.  Location of Installations and developments by type, South Bitterroot Recommended Wilderness .................................................................................. 23
Figure 14.  Number of signs by type and condition .....................................................24
Figure 15.  Location and type of signs, North Bitterroot Recommended Wilderness ........25
Figure 16.  Location and type of signs, South Bitterroot Recommended Wilderness ........26
Figure 17.  Location and condition of signs, North Bitterroot Recommended Wilderness ....27
Figure 18.  Location and condition of signs, South Bitterroot Recommended Wilderness ....28
Figure 19.  Deviations from single track trail .................................................................31
Figure 20.  Location of non-system trail by type, North Bitterroot Recommended Wilderness ....33
Figure 21.  Location of non-system trail by type, South Bitterroot Recommended Wilderness ....34
Figure 22.  Location and impact class of documented campsites, North Bitterroot Recommended Wilderness .................................................................................. 39
Figure 23.  Location and impact class of documented campsites, South Bitterroot Recommended Wilderness .................................................................................. 39
Figure 24.  Proportion of campsites with impact ranking of 0=none, 1=low, 2=moderate, or 3=high for each impact attribute. .................................................................40
Figure 25.  Number of campsites by landform category and impact class .......................41
List of Photos

Photo 1. Sulfur cinquefoil, Kootenai Creek (53) ......................................................................................... 14
Photo 2. Cheatgrass, Sawtooth Creek (123) .............................................................................................. 14
Photo 3. Spotted knapweed, Sheephead Creek (142) .................................................................................. 14
Photo 4. Oxeye daisy, Watchtower Creek (699) ........................................................................................ 14
Photo 5. Memorial cairn, Bear Creek ......................................................................................................... 24
Photo 6. Bridge, Watchtower Creek .......................................................................................................... 24
Photo 7. Boundary; agency created; good condition .................................................................................. 29
Photo 8. Trail junction/dir; agency created; good condition ..................................................................... 29
Photo 9. User created; vandalized-legible ................................................................................................. 29
Photo 10. Recreational use; agency created; on the ground ...................................................................... 29
Photo 11. Trail marker; unclear; unclear; vandalized - illegible ................................................................. 29
Photo 12. Survey marker; agency created; good condition ...................................................................... 29
Photo 13. Bicycle tracks, Boulder Creek (617) .......................................................................................... 30
Photo 14. Bicycle tracks, Watchtower Creek (699) .................................................................................... 30
Photo 15. Erosion on trail, Stateline Trail (16) ........................................................................................... 31
Photo 16. Standing water on trail, Tin Cup Creek (96) .............................................................................. 31
Photo 17. NST in Mill Creek (364) .............................................................................................................. 32
Photo 18. NST off of Nelson Lake Trail (135) ............................................................................................ 32
Photo 19. Visual intrusion – rural/agricultural, Bass Creek Overlook (126) .............................................. 37
Photo 20. Visual intrusion – dirt roads, Fales Flats (12) ............................................................................. 37
Photo 21. Campsite – heavily impacted, Baker Lake (264) ..................................................................... 38
Photo 22. Campsite – not a site, Kootenai Creek (53) ................................................................................ 38
INTRODUCTION

This report summarizes field measures of wilderness character in the Recommended Wilderness Areas on the Bitterroot National Forest in Montana. In 2009, the Wilderness Institute, part of the College of Forestry and Conservation at the University of Montana, collaborated with the Aldo Leopold Wilderness Research Institute, the Forest Service, and several local non-governmental organizations to develop field measures of the 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. While field measure used during this project were based primarily on the original Keeping it Wild; the recently published Keeping it Wild 2: An Updated Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System (Landres et al. 2015) was reviewed for additional guidance. This report summarizes 2017 field monitoring data in the Bitterroot Recommended Wilderness Area for selected attributes of the five wilderness character qualities: 1) untrammeled, 2) natural, 3) undeveloped, 4) opportunities for solitude or primitive and unconfined recreation, and 5) other features of value.

Observations of the following attributes were used to monitor wilderness character:

<table>
<thead>
<tr>
<th>Untrammeled</th>
<th>Natural</th>
<th>Undeveloped</th>
<th>Opportunities for solitude or primitive and unconfined recreation</th>
<th>Other features of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulling weeds</td>
<td>invasive plants</td>
<td>installations &amp; developments</td>
<td>non-system trails</td>
<td>cultural</td>
</tr>
<tr>
<td>wildlife</td>
<td>range improvements</td>
<td>signs</td>
<td>campsite conditions</td>
<td></td>
</tr>
<tr>
<td>water erosion</td>
<td>signs</td>
<td>recreation use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mechanized or motorized use</td>
<td></td>
<td>auditory intrusions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>trail closures</td>
<td></td>
<td>visual intrusions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From late June to mid-August, 2017, two Wilderness Institute Interns hiked the trails in the recommended wilderness on the Bitterroot National Forest 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, evidence of mechanized and motorized use, and trail closure devices. Measures of opportunities for solitude and primitive and unconfined recreation included trail conditions, non-system (user created) trails, campsite conditions, recreational use, motorized noise, and visual intrusions. The other feature of value identified by the FS for this study was cultural resources. The single measure of the untrammeled quality of the area was weed pulling by crews (all other measures of untrammeled...
require non-field related work). Results for measures (attribute groups; see Appendix 1) are reported here, often accompanied by tables and maps.

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

This work was funded by the Forest Service. For more information please contact us at: citizenscience@cfc.umt.edu or (406) 243-6936.

DATA MANAGEMENT

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

Protocol Development

The Wilderness Institute has been monitoring wilderness attributes since 2005, and developed a list of standardized protocols for this purpose. In 2009, these protocols were updated to specifically monitor selected measures of wilderness character described in Landres et al. (2008). These new protocols were implemented within a menu-based form containing predefined categories for data entry, which could be loaded onto Trimble GeoExplorer units utilizing Trimble Pathfinder software. A full list of the collected attributes, and their descriptions, are provided in Appendix 1. Detailed protocols are available upon request.

Data Collection

Data was collected in the summer 2017. Field crews recorded observations of each attribute when encountered and entered them into GPS units using the data dictionary. All attributes were mapped as point, line, or area features. Photos were taken of attributes, where relevant. After each trip, GPS data and digital photos were checked for quality control. A Microsoft Excel database, as well as a geodatabase containing all attribute data and photos is available upon request.

Data Analysis

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

**Data Reporting**

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

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

I. UNTRAMMELED QUALITY

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

Weed Control Action

Hand pulling was undertaken on 42 of the 153 weed patches encountered. All patches with hand pulling were spotted knapweed.

Table 1. Number of weed patches where control action was taken and proportion of patch pulled.

<table>
<thead>
<tr>
<th>CONTROL ACTION</th>
<th>NUMBER OF PATCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10% pulled</td>
<td>2</td>
</tr>
<tr>
<td>11-20% pulled</td>
<td>2</td>
</tr>
<tr>
<td>31-40% pulled</td>
<td>1</td>
</tr>
<tr>
<td>41-50% pulled</td>
<td>1</td>
</tr>
<tr>
<td>51-60% pulled</td>
<td>1</td>
</tr>
<tr>
<td>71-80% pulled</td>
<td>1</td>
</tr>
<tr>
<td>91-100% pulled</td>
<td>34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>
II. NATURAL QUALITY

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

**Weeds**

The invasion and spread of non-native weeds is a growing problem across western landscapes, and poses a serious threat to native biodiversity. Weeds have few, if any, natural controls on their reproduction and distribution, and occurrences closely follow areas of highest use and disturbance. By recording weed type, location, size and intensity of the infestation, land managers can identify priority areas for treatment and eradication. Furthermore, ecological, topographic and physical associations of weed patches can expose patterns of invasion and further understanding of the multiple factors that influence the spread of weeds in remote areas. In the following section we highlight and summarize weed monitoring data; please note that we do not provide visual or graphical summaries of all attributes collected. Patch-specific information, as well as additional attribute data, is located in the associated electronic database. Monitoring was focused along boundary roads, interior roads, system trails, and non-system trails and therefore patches not visible from the trail may have gone undetected.

**Weed Species**

A total of 153 weed patches were recorded, representing 9 species (Figures 1, 2 and 3). Spotted knapweed (49%) was the most abundant followed by cheatgrass (18%), sulfur cinquefoil (14%), and oxeye daisy (10%). It is possible the sulfur cinquefoil is the native type.

![Figure 1. Number of weed patches by species.](image-url)
Figure 2. Distribution of observed weed species, North Bitterroot Recommended Wilderness. All points may not be visible due to overlap. Numbered points correspond to photos on page 14.
**Weed Species**

- Canada Thistle
- Oxeye Daisy
- Streams
- Cheatgrass
- Spotted Knapweed
- Recommended Wilderness
- Common Mullein
- Roads
- Wilderness
- Houndstongue
- Trails

**Figure 3.** Distribution of observed weed species, South Bitterroot Recommended Wilderness. All points may not be visible due to overlap.
**Spatial Distribution, Weed Width/Radius, and Weed Cover**

The spatial distribution of each weed patch was categorized as individual (a single plant), clumpy (one dense patch), scattered-even (evenly distributed across the infestation area), or scattered-patchy (distinct patches scattered across the infestation area). Width of linear patch or radius of non-linear patch was recorded in feet. The percent cover of weeds within each infestation was visually categorized as low (0-5% cover), medium (5-25% cover), or high (26% or more cover).

The spatial distribution of the weed patches were recorded as 68% scattered-patchy, 24% single individuals, 4% clumpy, and 3% scattered-even (Figure 4). The spatial distribution for 2 weed patches were not recorded.
Figure 4. Spatial distribution of weed species.

The majority (76%) of the weed patches had a radius within 1-25 ft. Sixty-eight percent the patches had low (0-5%) cover (Figure 5).

Figure 5. Radius and cover of weed patches.
Primary and Secondary Disturbance Type

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 disturbance associated with 93% of mapped weed patches was trails. Other primary disturbances were identified as campsite, recent fire, stock and trailhead (Figure 6). The most common secondary association recorded for the weed patches was stock (50%), followed by trail (17%), recent fire (15%) and trailhead (10%).

![Primary and secondary disturbances associated with weed patches](image)

Figure 6. Primary and secondary disturbances associated with weed patches

Trails are the primary access routes through the area, and it is important to recognize that the high proportion of weeds associated with trails is partly a reflection of sampling bias. Nonetheless, the data clearly show that weeds commonly occur in close proximity to trails, areas of stock use, trailheads, recent fires, and campsites, and that these serve as important vectors for overall weed dissemination within the area.

Ecological Associations

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

Seven-five percent of weed infestations were encountered in forest (>10% trees), with the other two located in wet meadow (Figure 7). Conifers (55%), followed by woody shrubs (18%) and forbs (12%), were recorded as the most dominant lifeform within the area of infestations. Seventeen weed patches did not have the dominant lifeform recorded.
Distance to Water

To assess basic physical associations with mapped weed patches, we measured distance to water in 3 classes (0-10 ft., 10-50 ft., and > 50 ft.).

The majority (71%) of weed patches were located > 50 feet from water (Figure 8). Most patches > 50 feet from water were spotted knapweed (51%), sulfur cinquefoil (18%), and cheatgrass (17%).
Wilderness character monitoring included documenting erosion events along waterbodies that were a result of recreational use (please note that erosion mediated by uncontrolled run-off along the trail was not monitored here, but is captured in Trail Width and Condition, below). Impacted areas were categorized by landform as stream, spring, wetland, pond, or lake. The width of streams was measured at bankfull height. For wetlands, ponds, and lakes, size was estimated in acres. For each impacted waterbody, erosion severity was categorized as slight, moderate, or severe (please refer to protocols available with supplementary materials for detailed descriptions of categories). Photos are taken of all documented erosion sites and are available upon request.

**Landform and Erosion Severity**

Erosion due to recreation was documented at 14 sites (Figures 9 and 10). Six sites showed signs of slight erosion, five had moderate erosion, and three were severely eroded. Eight sites were documented along streams, five at spring, and one along a wetland. Two of the sites were located outside of recommended wilderness.
**Erosion Severity**

- **Severe**
- **Moderate**
- **Slight**
- **Trails**
- **Streams**
- **Roads**
- **Recommended Wilderness**
- **Wilderness**

**Figure 9.** Location of erosion sites encountered and severity of erosion within North Bitterroot Recommended Wilderness. Numbered points correspond to previous photos.
Erosion Severity

- **Yellow**: Moderate
- **Green**: Slight
- **Streams**: Blue
- **Recommended Wilderness**: Green
- **Wilderness**: Light Green
- **Roads**: Dashed Black
- **Trails**: Dashed Grey

**Figure 10.** Location of erosion sites encountered and severity of erosion within South Bitterroot Recommended Wilderness. Numbered points correspond to previous photos.
III. UNDEVELOPED QUALITY

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

Installations and Developments

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

Development Type

A total of 29 installations and developments were recorded (Figures 11). Twenty-two of the 29 installations and developments are located with the recommended wilderness boundary (Figures 12-13). The majority (59%) of the installations and developments were reported as other and included a bird house, a memorial, benches, climbing anchors, irrigation diversion and pipes.

Figure 11. Number of installations and developments by type and source.
Figure 12. Location of installations and developments by type, North Bitterroot Recommended Wilderness.
Figure 13. Location of Installations and developments by type, South Bitterroot Recommended Wilderness.
Signs

All signs were noted by type and condition. Sign types included: trail junction/directions, interpretive, trail marker, and recreational use sign (i.e. allowable uses/closures). Sign condition was categorized as: vandalized-legible, vandalized-illegible, missing (post with no sign), faded-illegible, faded-legible, or good condition.

Sign Type and Condition

Sixty signs points were recorded with 39 of the signs located within the recommended wilderness boundary. The three most common sign points were recreational use (30%), boundary (28%) and trail junction/direction (18%). Sixty percent of the signs recorded as in good condition, 18% as faded-legible, 8% in poor condition, 12% as vandalized-legible, and 2% as vandalized-illegible. Figures 14-18 numerically and spatially depict these attributes. Forty-six of the signs were recorded agency created (recreational use, boundary, trail junction/direction and survey markers), 5 were identified as user created and 9 were labeled as unclear.

Figure 14. Number of signs by type and condition.
Figure 15. Location and type of signs, North Bitterroot Recommended Wilderness. Numbered points correspond to photos on page 29.
Figure 16. Location and type of signs, South Bitterroot Recommended Wilderness. Numbered points correspond to photos on page 29.
Figure 17. Location and condition of signs, North Bitterroot Recommended Wilderness.
Figure 18. Location and condition of signs, South Bitterroot Recommended Wilderness.
Photo 7. Boundary; agency created; good condition

Photo 8. Trail junction/dir; agency created; good condition

Photo 9. User created; vandalized - legible

Photo 10. Recreational use; agency created; on the ground

Photo 11. Trail marker; unclear; vandalized - illegible

Photo 12. Survey marker; agency created; good condition
Evidence of Mechanized and Motorized Use on Trails

Both mechanized and motorized use is prohibited in designated Wilderness, but violations do occur. The type and amount of motor vehicle, equipment, or mechanical transport use impacts the undeveloped quality of wilderness character (Landres et al., 2008). Evidence of mechanized or motorized use was monitored on all trails.

Type of Mechanized or Motorized Tracks

Three locations (Bass Creek, Boulder Creek and Watchtower Creek) of mechanized vehicle tracks were recorded during the monitoring period. All tracks were made by a bicycle.

Photo 13. Bicycle tracks, Boulder Creek (617)  
Photo 14. Bicycle track, Watchtower Creek (699)

IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY

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

Trail conditions were recorded within and bordering the Blue Joint Recommended Wilderness. Observations were made documenting places on trails where recreational use appeared to be impacting trail conditions. This field was also used to capture severe trail erosion events that result in significant impacts to either user experience (e.g. deep gullies make trail navigation difficult) or the natural environment surrounding the trail corridor (e.g. erosion is significantly impacting adjacent areas).

Trail Width

A total of 30 deviations (7 points and 23 lines) were recorded (Figure 19), mostly in the southern region of the Bitterroots. Standing water and erosion on trail accounted for 43% and 40% of the impacted trail conditions respectively. Figure 19 and 20 shows the location of impacted trails.

![Bar Chart](image)

**Figure 19.** Deviations from single track trail.

**Photo 15:** Erosion on trail, Stateline Trail (16)  
**Photo 16:** Standing water on trail, Tin Cup Creek (96)
Non-system Trails

Non-system trails (NSTs) are generally user-created and are not part of the official Forest Service trail system. When NSTs were encountered, the trail type was categorized as: motorcycle, ATV/UTV, horse travel, foot travel, or unclear. The origin of each NST was classified as either a new route created by recreational use, or an old road from historic mining, fire access, or logging activities. The length of non-system trails was mapped to the trail end, or as far as time constraints allowed.

Non-system Trail Type, Origin, and Monitoring Status

Ten non-system trails (NST) were mapped in the field (Figures 20-21). All NSTs were recorded as due to foot travel. Eight of the 10 NSTs were documented as new routes. Also, 60% were recorded as finished (the length of the NST fully mapped). Two of the NSTs in Mill Creek led to areas where people rock climb.

Photo 17. NST in Mill Creek

Photo 18. NST off of Nelson Lake Trail
Figure 16. Locations of non-system trail by type, North Bitterroot Recommended Wilderness. Numbers correspond to photos on page 32.
Figure 16. Locations of non-system trail by type, South Bitterroot Recommended Wilderness. Numbers correspond to photos on page 32.
Trailheads
Recreational use at trailheads was documented by recording the number of vehicles and horse trailers parked at the trailhead. These numbers are based on a single count, and therefore do not necessarily reflect use across the season.

Vehicles and Trailers at Trailhead
Information on recreation use was recorded for 22 trailheads (Table 1).

Table 2. Summary of vehicles at trailheads.

<table>
<thead>
<tr>
<th>TRAILHEAD NUMBER/NAME</th>
<th>NUMBER OF VEHICLES</th>
<th>NUMBER OF HORSE TRAILERS</th>
<th>NUMBER OF ORV TRAILERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trail #4/Bass Creek</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #392/Bass Creek Overlook</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #53/Kootenai Creek 6/26/2017</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #53/Kootenai Creek 6/27/2017</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #126/Bear Creek Overlook</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #5/Bear Creek</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #364/Mill Creek 6/22/2017</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #364/Mill Creek 6/26/2017</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #19/Blodgett Canyon</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #123/Sawtooth</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #59/North Lost Horse</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #128/South Lost Horse</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #96/Tin Cup Creek</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #528/Chaffin Creek</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #598/Trapper Creek</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #247/Boulder Point</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #264/Baker Lake</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #133/Trapper Peak</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #135/Nelson Lake</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #12/Fales Flats</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #699/Watchtower</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail #142/ Sheephead</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
**Encounters with People**

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

**Activity Type and Number**

A total of 80 separate encounters (e.g. groups) were recorded, totaling 207 people (Table 3). The majority (92%) were hikers/backpackers. The encounters recorded as other included 6 trail crew members, 5 climbers, and 1 game warden. Of the 73 hikers/backpackers groups, 68 were on day trips, 4 were overnight, and 1 group the length of trip was not recorded. Sixty-six of the encounters occurred in the northern Bitterroots (north of Lake Como).

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TOTAL PEOPLE</th>
<th>TOTAL GROUPS</th>
<th>TOTAL HORSE/PACKSTOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>hiker/backpacker</td>
<td>191</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>horseback</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>mountain bike</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td>12</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>207</strong></td>
<td><strong>80</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

**Noise**

Noise intrusions were monitored opportunistically. The duration of noises were classified as under 1 minute, 1-5 minutes, 5-10 minutes or >10 minutes. The source of noise was recorded, and noise intensity was categorized as barely audible (far in the distance), clearly heard (moderately near), loud (<1 mile), or variable. When possible, a visual confirmation of the noise source was recorded.

**Duration, Intensity and Visual Confirmation**

Eighty-nine noise intrusions were opportunistically recorded during the monitoring period. All noises recorded were from airplanes except for three automobiles. Visual confirmation was documented for only ten noise intrusions. Sixty-nine recorded noise intrusions lasted 1-5 minutes, the remaining 20 were under 1 minute in duration (Table 4). The noise intensity was recorded 66% barely audible, 28% can hear clearly, and 6% loud and close. Noise intrusions were distributed throughout the monitored areas.
Table 4. Duration and intensity of noise intrusions

<table>
<thead>
<tr>
<th>NOISE DURATION</th>
<th>NOISE INTENSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 minutes</td>
<td>69</td>
</tr>
<tr>
<td>under 1 minute</td>
<td>20</td>
</tr>
</tbody>
</table>

Visual Intrusions

Visual intrusions were signs of human development located outside the Wilderness Study Area that can be seen from within the Wilderness Study Area. Intrusions were categorized as: buildings, highways, power lines, lights at night, cities/towns, dirt roads, clear cuts, or railways.

Type

Four visual intrusion were recorded (Table 5).

Table 5. Visual intrusion types and location.

<table>
<thead>
<tr>
<th>VISUAL INTRUSION TYPE</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>rural/agricultural</td>
<td>Bass Creek Overlook – Trail 392</td>
</tr>
<tr>
<td>cities/towns</td>
<td>Bear Creek Overlook – Trail 126</td>
</tr>
<tr>
<td>dirt roads</td>
<td>Fales Flats – Trail 12</td>
</tr>
<tr>
<td>dirt roads</td>
<td>Stateline – Trail 16</td>
</tr>
</tbody>
</table>

Photo 19. Visual intrusion – rural/agricultural Bass Creek Overlook (392)

Photo 20. Visual intrusion – dirt roads Fales Flats (12)
**Campsites**

Attributes recorded at each campsite reflect campsite conditions and human impacts, and were based on standard Forest Service Campsite Inventory & Condition Evaluation protocols (see Appendix 3). Human impacts at each campsite were evaluated based on 1) damage to trees, 2) number of trees with exposed roots, 3) types and number of development, 4) cleanliness, 5) number of social trails, 6) barren area estimate, 7), and estimate of exposed mineral soil. For each campsite, the ratings assigned to individual impact attributes were combined to generate a summary impact index score (see Appendix 3). To provide an ecological context for campsite conditions, information on campsite location and habitat associations was also collected. Here, we briefly summarize impact evaluation and ecological associations. For individual campsite attribute measures and photographs, see Appendix 2.

**Impact Evaluation**

A total of 58 campsites were recorded and inventoried during the 2017 field season. Only one campsite was occupied at the time it was recorded. Based on the summary impact evaluation scores, 38% of the campsites were rated as not a site, 40% were lightly impacted, 17% were moderately impacted, and 2% were heavily impacted (Table 6; Figure 17-18).

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

<table>
<thead>
<tr>
<th>IMPACT INDEX SCORE CLASS</th>
<th>IMPACT INDEX SCORE RANGE</th>
<th>NUMBER OF CAMPSITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not a site</td>
<td>0-10</td>
<td>22</td>
</tr>
<tr>
<td>Light</td>
<td>11-20</td>
<td>23</td>
</tr>
<tr>
<td>Moderate</td>
<td>21-30</td>
<td>9</td>
</tr>
<tr>
<td>Heavy</td>
<td>31-39</td>
<td>4</td>
</tr>
<tr>
<td>Extreme</td>
<td>40-48</td>
<td>0</td>
</tr>
</tbody>
</table>

**Photo 21.** Campsite – heavily impacted, Baker Lake (264)

**Photo 22.** Campsite – not a site, Kootenai Creek (53)
Figure 17. Location and impact class of documented campsites, North Bitterroot Recommended Wilderness.
Figure 18. Location and impact class of documented campsites, South Bitterroot Recommended Wilderness.
The relative contribution of individual impact attributes varied, with social trails, barren core, and developments as most often affecting the impact score (Figure 19).

**Figure 19.** Proportion of campsites with impact ranking of 0=none, 1=low, 2=moderate, or 3=high for each impact attribute (shows the relative contribution of each attribute to impact index score).

**Location**

The majority of campsites were associated with streams (59%), followed by lake (21%) and ridgetops (16%). Campsite-specific ecological attributes are detailed in Appendix 2. Campsite location and landform varied with the level of impact observed (Figure 20). The most heavily impacted sites were located along streams and lakes.

**Figure 20.** Number of campsites by landform category and impact class.
LITERATURE CITED


APPENDIX 1. MONITORING ATTRIBUTES

I. UNTRAMMELED QUALITY
Attribute group: Weed Point
- Weed_Action: Action taken to manage infestation
- Weed_COLLECTOR: Wilderness Institute default
- Weed_LANDOWNER: Bitterroot National Forest default
- Weed_UNIT: Rec_Wild
- Weed_SPECIES: Common name of weed species
- Weed_DISTRIBUTION: Distribution of weeds in patch (e.g. clumpy, scattered, linear)
- Weed_Width_or_Radius: Width of linear patch or radius of non-linear patch (in feet)
- Weed_DENSITY: Percent coverage of weeds within area of infestation
- Weed_PHENOLOGY: Life history phase of weeds in infestation
- Weed_Disturb1/Disturb2: Primary and secondary disturbance/vector of infestation
- Weed_DomLife: Dominant lifeform within area of infestation
- Weed_Ecotype: Ecosystem type (e.g. wet meadow, grassland, forest, riparian)
- Weed_Treecover: Estimate of % 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_Water: Distance (ft) of infestation from nearest water
- Weed_Actions: Action taken to manage infestation
- Weed_Biocontrol: Presence or absence of biocontrol notes
- Weed_Photo: Photograph of infestation
- Weed_Notes: Additional notes

Attribute group: Livestock Point
- Livestock_Species: Species of livestock encountered (common name)
- Livestock_Total: Numeric total of individuals detected
- Livestock_Brand: Description of brand or ear tag
- Livestock_Notes: Additional notes
- Livestock_Photography: Photograph of livestock

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

Attribute group: Water Erosion (human-caused)
III. UNDEVELOPED QUALITY

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

**Attribute group: Range Development Point**
- **Range_Type**: Type of range installation or development encountered
- **Range_Cond**: Select condition class from drop-down menu
- **Range_Source**: Choose from user or agency created, or unclear
- **Range_Photo**: Corresponding photo number
- **Range_Notes**: Additional notes

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

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

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

IV. SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY

**Attribute groups: Trail Width Point**
- **TrailWidth_Name**: Name of trail point
- **TrailWidth_Type**: Select type of trail from drop-down menu
- **TrailWidth_Start/Finish**: Start/Finish of trail
- **TrailWidth_Notes**: Additional notes

**Attribute group: Non-system Trails Line**
- **Nst_Type**: Type of non-system trail encountered
- **Nst_Vector**: Age and source of non-system trail
- **Nst_Finish**: Non system trail surveyed to its end or not
- **Nst_Notes**: Additional notes
### Attribute group: Campsite Point

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camp_ID</td>
<td>Site number</td>
</tr>
<tr>
<td>Camp_Class</td>
<td>Summary description of level of user impact</td>
</tr>
<tr>
<td>Camp_Occupied?</td>
<td>Is campsite occupied?</td>
</tr>
<tr>
<td>Camp_Solitute</td>
<td>If campsite is occupied, the number of other occupied camps within sight or continuous sound</td>
</tr>
<tr>
<td>Camp_Landform</td>
<td>Associated landform (e.g. lakeshore, streamside, meadow)</td>
</tr>
<tr>
<td>Camp_Type</td>
<td>Associated camp type (e.g. foot, river, stock, outfitter, multiple, other)</td>
</tr>
<tr>
<td>Camp_WaterSource</td>
<td>Closest water source (e.g. creek, river, lake, other)</td>
</tr>
<tr>
<td>Camp_WaterDist</td>
<td>Distance to water source in feet</td>
</tr>
<tr>
<td>Camp_Dam_Trees</td>
<td>Number of damaged trees by humans or stock</td>
</tr>
<tr>
<td>Camp_Root_Exp</td>
<td>Number of trees with exposed/damaged roots in campsite</td>
</tr>
<tr>
<td>Camp_Develop</td>
<td>Level of development observed within and around campsite</td>
</tr>
<tr>
<td>Camp_Clean</td>
<td>Level of cleanliness observed within and around campsite</td>
</tr>
<tr>
<td>Camp_Trails</td>
<td>Number of social trails observed within and around campsite</td>
</tr>
<tr>
<td>Camp_Barren</td>
<td>Barren area estimate within and around campsite</td>
</tr>
<tr>
<td>Camp_Veg_On</td>
<td>Onsite estimate of ground cover canopy coverage</td>
</tr>
<tr>
<td>Camp_Veg_Off</td>
<td>Offsite estimate of ground cover canopy coverage</td>
</tr>
<tr>
<td>Camp_Min_On</td>
<td>Estimate of exposed mineral soil in core area</td>
</tr>
<tr>
<td>Camp_Min_Off</td>
<td>Offsite estimate of exposed mineral soil</td>
</tr>
<tr>
<td>Camp_Photo1/2</td>
<td>Photo number 1/2</td>
</tr>
<tr>
<td>Camp_Notes</td>
<td>Additional notes</td>
</tr>
</tbody>
</table>

### Attribute group: People Point

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>People_Activity</td>
<td>Type of user encountered</td>
</tr>
<tr>
<td>People_Number</td>
<td>Number of people seen in encounter</td>
</tr>
<tr>
<td>Packstock_Number</td>
<td>Number of packstock in party</td>
</tr>
<tr>
<td>Ridingstock_Number</td>
<td>Number of riding stock in party</td>
</tr>
<tr>
<td>Trip_Length</td>
<td>Select overnight or day trip</td>
</tr>
<tr>
<td>People_Notes</td>
<td>Additional notes</td>
</tr>
</tbody>
</table>

### Attribute group: Trailhead Point

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TH_Name</td>
<td>Assigned name and/or number</td>
</tr>
<tr>
<td>TH_TotNumber</td>
<td>Total number of vehicles</td>
</tr>
<tr>
<td>TH_HorseNumber</td>
<td>Total number of horse trailers</td>
</tr>
<tr>
<td>TH_ORVNumber</td>
<td>Total number of ORV trailers</td>
</tr>
<tr>
<td>TH_Notes</td>
<td>Additional notes</td>
</tr>
</tbody>
</table>

### Attribute group: Noise Roving Point

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise_Source</td>
<td>Select source from drop-down menu</td>
</tr>
<tr>
<td>Noise_Duration</td>
<td>Duration of noise (select from categories)</td>
</tr>
<tr>
<td>Noise_Intensity</td>
<td>Intensity rating of noise (select from categories)</td>
</tr>
<tr>
<td>Noise_VisConf</td>
<td>Indicate if source was seen</td>
</tr>
<tr>
<td>Noise_Notes</td>
<td>Additional notes</td>
</tr>
</tbody>
</table>

### Attribute group: Noise Sample Point

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise_Sample_Start</td>
<td>Start time for 15-minute sample on 24h clock</td>
</tr>
<tr>
<td>Noise_Heard?</td>
<td>Select Yes/No; if yes continue, below</td>
</tr>
<tr>
<td>Noise_Source_1</td>
<td>Select source from drop-down menu</td>
</tr>
<tr>
<td>Noise_Duration_1</td>
<td>Enter numerical value in seconds</td>
</tr>
<tr>
<td>Noise_Intensity_1</td>
<td>Intensity rating of noise (select from categories)</td>
</tr>
</tbody>
</table>
**Noise_Vis_Conf_1** Indicate if source was seen
**Noise_Notes_1** Additional notes
***REPEAT above attributes for up to 2 additional noises recorded***

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

**IV. OTHER FEATURES OF VALUE QUALITY**
**Attribute group: Cultural Resources**
- **Cultural_Type** Select from Historic (cabins, mining, trapping), Prehistoric (teepee rings, culturally scarred trees, rock art), Paleo (fossils)
- **Cultural.Condition** Record condition as excellent, good, fair, or poor
- **Cultural_Source** If human created, choose user-created, agency-created, unclear
- **Cultural_Photo** Photograph
- **Cultural_Notes** Note additional interesting information