



# Mammal and Herpetological Inventory of Big Hole National Battlefield 2002

## *Upper Columbia Basin Network*

Natural Resource Technical Report NPS/UCBN/NRTR—2009/229



**ON THE COVER**

Big Hole National Battlefield landscape; herpetological and mammal specimen  
NPS Photos

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## Executive Summary

The mission of the National Park Service is “to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations” (National Park Service 1999). To uphold this goal, the Director of the NPS approved the Natural Resource Challenge to encourage national parks to focus on the preservation of the nation’s natural heritage through science, natural resource inventories, and expanded resource monitoring (National Park Service 1999). Through the Challenge, 270 parks in the national park system were organized into 32 inventory and monitoring networks.

This primary objective of the 2002 mammal and herpetological inventory was to document 90% of all mammals (excluding bats), amphibians, and reptiles that potentially occur within Big Hole National Battlefield. The University of Idaho Department of Fish and Wildlife Resources conducted the 2002 inventory under a cooperative agreement with the National Park Service Northern Semi-Arid Network (now the Upper Columbia Basin Network—UCBN). Additional goals of the inventory included development of baseline data for use in future monitoring, and the collection and dissemination of new information on the distribution, habitat association, and population status of the region’s biological resources.

Expected species lists were developed by reviewing range maps and interviewing park staff. This effort resulted in a list of 35 species of mammals and 4 species of herpetofauna expected to occur within the Big Hole National Battlefield. A total of 31 mammals, representing 88% of the expected list, were confirmed in the battlefield in 2002. A total of 4 herpetofauna, representing 100% of the expected list, were confirmed in 2002. Two confirmed species, the western toad (*Bufo boreas*) and the gray wolf (*Canis lupus*), are listed by the Montana Natural Heritage Program as “species of special concern”.

Big Hole National Battlefield was surveyed over 8 days on two separate periods during July and August, 2002. Sampling techniques used in the inventory included visual encounter surveys, dip netting, cover turning, road surveys, and trapping. Although bats were not included in the 2002 inventory due to logistical constraints, an effort was made to determine bat activity in the battlefield for future inventory work. No bats were observed during the sampling period in 2002.

The Columbia spotted frog (*Rana luteiventris*) was the most widely distributed and most abundant amphibian in the battlefield. The common garter snake (*Thamnophis elegans*) was the most widely distributed and most abundant reptile detected during these surveys. The mammals with the highest abundance at the battlefield were the Columbian ground squirrel (*Spermophilus columbianus*), the deer mouse (*Peromyscus maniculatus*), the meadow vole (*Microtus pennsylvanicus*), the red squirrel (*Tamiasciurus hudsonicus*), and the western jumping mouse (*Zapus princeps*).



## Acknowledgements

The 2002 Big Hole National Battlefield mammal and herpetological inventory was made possible through a cooperative agreement between the National Park Service Northern Semi-Arid Network (now the Upper Columbia Basin Network—UCBN) and University of Idaho Department of Fish and Wildlife Resources. We would like to thank Gerry Wright of USGS Idaho Cooperative Wildlife Research Unit and the Big Hole National Battlefield for providing leadership, direction, and enthusiasm for the project. Special thanks go also to Chuck Peterson, Dan Foster, Jason Lyon, and Jack Sullivan's Biology Laboratory for resource materials, species identification, and information regarding natural history of selected species. We would also like to thank the National Park Service personnel at Big Hole Battlefield for sharing species observation reports and providing field assistance.



## Introduction

This report summarizes the results of the 2002 mammal (excluding bats) and herpetological inventory for the Big Hole National Battlefield. The mammal inventory did not include bats within its scope due to logistical constraints. The University of Idaho Department of Fish and Wildlife Resources conducted the inventory under a cooperative agreement with the National Park Service Northern Semi-Arid Network (now the Upper Columbia Basin Network—UCBN). The inventory is part of a nationwide inventory and monitoring (I & M) program initiated by the National Park Service Natural Resource Challenge. This program seeks to increase the National Park Service's (NPS) capacity to assess the current state of natural resources within the NPS system and to enhance its ability to take a leading role in preserving the nation's biological diversity of plants and animals. Completing basic biological inventories is a crucial first step in achieving that goal.

In 2000, the Northern Semi-Arid Network (UCBN) parks began implementing the inventory phase of the I & M program in several network parks. Historic information available on the plant and animal populations within the network were assembled and an estimate was made of the percent of species expected to occur in each park. Significant vertebrate inventory work had been previously conducted in the battlefield by Van Sickle (1987) and Monello and Wright (1998). This work and information provided by NPS indicated that 54% of the expected mammals and over 90% of the expected herpetofauna were present and documented (Wright et al. unpublished). The mammal portion of the inventory was given the highest priority and the herpetological portion, with no anticipated documentation gaps, was conducted incidental to mammal work in 2002. Concern over the status of the western toad in the region was an important impetus in driving additional herpetological work in Big Hole NB. Fieldwork was conducted for the inventory during July 8-12 and August 22-24, 2002.

The objectives of the 2002 mammal and herpetological inventory at the Big Hole National Battlefield were to: (1) Document at least 90% of the mammal species and reconfirm the presence of amphibian and reptile species expected to occur in the battlefield; (2) Gather baseline data for use in future monitoring; and (3) Collect and disseminate new information on the distribution, habitat association, and population status of the mammal and herpetological species of the region.



## Study Area

Big Hole National Battlefield is located in western Montana 10 miles west of Wisdom, along Highway 43 (Figure 1, page 13). The battlefield was originally established as a national monument in 1910 and has grown from 5 acres to its current size of 655 acres. Elevations in the battlefield range from 1913 m to 2134 m (6276 ft - 7000 ft). Thirty-year (1971-2000) climate data collected in Wisdom show that the site is quite dry, with mean annual precipitation only totaling 30 cm (12 in) (Western Regional Climate Center 2003). January and July 30-year mean maximum and minimum temperatures are 27 and 1.5 degrees F° and 77 and 37 degrees F°, respectively (Western Regional Climate Center 2003). The battlefield is situated within a matrix of US Forest Service land and private ranches. The North Fork of the Big Hole River bisects the site, and it is flanked by Battle Mountain in the northwest and Ruby Bench along the southeast portion of the battlefield. These features create a diverse landscape in the battlefield. Vegetation consists of sagebrush uplands, grass and willow riparian areas, and coniferous forest. The Montana Land Cover Atlas (Fisher et al. 1998) shows five habitat types represented in Big Hole NB; (1) altered herbaceous, (2) low/moderate cover grasslands, (3) sagebrush, (4) Douglas fir/lodgepole pine, and (5) shrub riparian. These habitat types are further subdivided into categories and sub-categories, which are explained in detail in the following section.

The altered herbaceous community is dominated by the following species; cheatgrass (*Bromus tectorum*), spotted knapweed (*Centaurea maculosa*), yellow sweet-clover (*Melilotus officinalis*), common dandelion (*Taraxacum officinale*), smooth brome (*Bromus inermis*), yarrow (*Achillea millefolium*), and yellow star thistle (*Centaurea solstitialis*). The majority of the low/moderate cover grassland community consists of the following species; timothy (*Phleum pratense*), bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), slender wheatgrass (*Agropyron caninum*), great basin wildrye (*Elymus cinereus*), crested wheatgrass (*Agropyron cristatum*), and arrowleaf balsamroot (*Balsamorhiza sagittata*). The sagebrush community consists of the following species; mountain big sagebrush (*Artemisia tridentata vaseyana*), common bearberry (*Arctostaphylos uva-ursi*), gray rabbitbrush (*Chrysothamnus nauseosus*), and common snowberry (*Symphoricarpos albus*). The Douglas fir/lodgepole pine community consists of Douglas fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*). The shrub riparian community consists of species such as: willow (*Salix spp.*), prickly rose (*Rosa acicularis*), cottonwood (*Populus spp.*), currant (*Ribes spp.*), aspen (*Populus tremuloides*), creeping Oregon grape (*Mahonia repens*), and common horsetail (*Equisetum arvense*).



## Methods

The methods utilized in the 2002 Big Hole National Battlefield mammal and herpetological inventory generally follow those laid out in the Northern Semi-Arid Network (UCBN) Study Plan (Wright et al. unpublished) and a previous network herpetological inventory (Shive and Peterson 2002). Methods and procedures were adapted somewhat to accommodate logistical constraints.

All locations provided in this report were collected as Universal Transverse Mercator (UTM) coordinates (Zone 11 & 12) using a Garmin 12-channel Etrex hand-held GPS unit (Garmin International, Inc. Olathe, KS). The North American Datum of 1927 was used as the horizontal datum for all locations. Elevations were also collected using the GPS unit. UTM locations were collected at all of the survey sites including the starting points of small mammal transects, wire funnel trap deployment locations, wetland survey sites, and at points of incidental observations. All coordinates were collected with navigational accuracy of 18 meters or less. In a few instances locations could not be recorded within the desired accuracy due to topographical disruptions, and accuracy within 30 meters was accepted and recorded.

Scientific and common names used in this report follow the Integrated Taxonomic Information System (ITIS). The ITIS follows closely the USGS Biological Resource Division's unpublished and expanded update of the 1987 Checklist of Vertebrates of the United States, the U.S. Territories, and Canada (ITIS 2003). The NPSpecies database, to which species documentations made during the 2002 inventory will be added, also follows ITIS.

### Expected Species

Development of expected species lists was accomplished by reviewing historical inventory materials (i.e., Van Sickle 1987), interviewing NPS staff, and reviewing published range maps and distribution information. The following sources were reviewed for mammal and herpetofauna distributions: Montana Gap Analysis (1998), National Audubon Society Field Guide to North American Mammals (1998), A Field Guide to Western Reptiles and Amphibians (1985), Reptiles of the Northwest (2002), and Mammals of the Rocky Mountains (2000). The following four criteria were considered in determining expected species: (1) the species' predicted range overlaps with the study area; (2) suitable elevation exists within the study area; (3) suitable habitat exists within the study area; and (4) the species is likely to be detected through one or more of the inventory techniques. A species was classified as "expected" if at least three of the criteria were supported. A species was classified as "possible" if it only met two of the criteria and if the detectability was "variable". A species was classified as "unlikely" if only one of the criteria was supported and if the detectability was "low". Tables 1 and 2, pages 17 and 18, summarize these criteria for expected species and tables in Appendix A summarize these criteria for species considered unlikely for the 2002 inventory. Appendix C contains a key to the NPSpecies codes used in these tables.

## **Sampling Site Selection**

Sampling sites were non-randomly located in areas with suitable habitat for target species (i.e., lakes, ponds, riparian areas, forested areas, south-facing aspects), areas where animal activity was obvious, and areas where historic observations were made. Photo documentation of the various habitat types where sampling sites were located was taken with a Nikon Coolpix E995 digital camera. These photographs provide NPS staff with a visual description of the area and may also be used as photopoints to monitor future habitat changes. These photos are included in Appendix D.

Olson et al. (1997) recommended a minimum of two site visits for inventory objectives and a minimum of two site visits annually for monitoring to account for seasonal, weather, and life-stage influences on species detectability. Following this approach, field sampling was conducted during two separate occasions in 2002. Sampling session occurred over 8 days during July 8-12 and August 22-24.

## **Sampling Techniques**

A wide variety of sampling techniques were used in the 2002 inventory and included visual encounter surveys, dip netting, cover turning, road surveys, trapping, and incidental observations. The combination of methods was used to complement the overall objective of detecting as many species as possible and to increase the likelihood of detecting cryptic species. An array of environmental characteristics was collected at each sampling site as well. Each individual technique is described in further detail below.

## ***Site Characteristics and Environmental Measurements***

Each aquatic sampling site was classified according to the National Wetlands Inventory (NWI) classification criteria of wetland and deepwater habitats (Cowardin et al. 1979). The physical and biological characteristics of each oxbow or river site were described using a standard form (Peterson 1997; Appendix D). Environmental measurements collected included radiation, wind speed, cloud cover, precipitation, air, and water temperature. An Oakton TDSTestr High+ was used to measure conductivity and an Oakton pH Testr 2 with ATC (Forestry Supply, Jackson, MS) was used to measure pH.

Additional site characteristics were collected for aquatic sites, including origin, drainage, site type, length, width, maximum depth, color, and turbidity. Site width and length were visually estimated and the depth was ranked into one of three categories (<1 m, 1-2 m, >2 m). Water temperature was taken within the shade at a depth of 1 cm using a mercury thermometer. Air temperature was also taken in the shade at a height of 1 m on the edge of the watershed. Wetland habitat characteristics such as primary substrate, percent emergent vegetation, emergent vegetation species, north shore characteristics, distance to forest edge, and forest tree species were all recorded on the data sheets.

The calibration of pH and conductivity meters was done prior to each survey session using buffer solutions. Waders and dip nets were sterilized with a bleach solution (10-20%) after each site was surveyed. The cleaning of sampling gear was implemented to decrease the chances of spreading bacteria, pollutants, or disease throughout the study area.

The following site characteristics for terrestrial site where mammal and wire funnel traps were located included UTM, transect bearing, topographic position, location description, general habitat description, and weather during the trap period. Slope and aspect of each site were recorded where applicable. The moon phase was noted for mammal trapping. Sample data sheets are included in Appendix B. All traps were sterilized with a bleach solution (10-20%) after each trapping session.

### ***Visual Encounter Surveys***

This method was used frequently with a great deal of success. Visual encounter surveys were conducted by walking and searching for signs of amphibians, reptiles and mammals. Areas of suitable habitat for target species were surveyed extensively. Some of the indicators of species presence were tracks, scat, shed antlers, calls, and evidence of den sites. Both diurnal and nocturnal surveys were conducted, since many of the target species are nocturnal.

### ***Dip netting***

Dip-nets were an effective tool for catching and observing all life stages of amphibians and some reptiles. Dip netting was particularly effective in areas with dense emergent vegetation. Palustrine (e.g., pools, marsh) areas were slowly searched by sweeping nets in front and alongside the path of travel every 2 meters.

### ***Cover Turning***

This method was helpful in detecting reptile and amphibian species. Large boulders, logs, and human-made structures are examples of objects that are often used by these animals as cover. Care was taken to replace cover objects in order to minimize disturbance. Likewise, the same cover objects were never flipped repeatedly (e.g., every day) in order to reduce disturbance.

### ***Road Surveys***

Road surveys were effective for both reptiles and mammals, although the park has a limited number of roads. These surveys were conducted during both day and twilight hours by slowly driving along roads within and adjacent to the study area. Both road kills and live animals moving across the road were detected using this technique.

### ***Trapping***

Several different types of trapping methods were used in the 2002 inventory that targeted both herpetofauna and mammals. Wire funnel traps were used to capture amphibian and reptile species and some mammals were captured in these traps as well. Sherman live traps (LFATDG, H.B. Sherman Traps, Inc.), museum special snap traps, and one wire cage mammal live trap (7 x 7 x 24) were used to capture mammals. Wire funnel traps were placed along objects present at the battlefield (e.g., downed trees, boulders) that had the potential of directing animals into traps. These traps were placed in all habitat types in the battlefield. Small mammals were frequently captured in these traps when placed near water. Sherman live traps were deployed in combination with Museum Special snap traps along transects in order to capture small mammals. Transects consisted of 5-10 trap stations spaced every 10 meters. Each station had one live trap and one snap trap. All traps were baited with rolled oats, black-oil sunflower seeds, and peanut butter. Transects were pre-baited for 1-2 nights prior to opening of the trap line to increase trapping success. Traps were checked, closed, and reopened daily. The trapping period consisted

of two consecutive trap nights. The wire cage small mammal live trap was baited with tuna and placed at tree line at the end of the Howitzer Trail. This trap was deployed for two nights, and checked and re-baited daily.

### ***Incidental Observations***

Incidental observations of animals were frequently made during the 2002 inventory. Incidental sightings of amphibian and reptile species were documented using a standard form for detection (Appendix B). Mammal sightings were recorded in a field notebook. A detailed description of the animal's location, topographic position, habitat type, and weather were all recorded when an animal was discovered. Air temperature and ground temperatures were collected for reptiles. Photographic documentation was also taken for representative species residing at the site.

### **Data Management**

All necessary information was entered into Microsoft Excel for storage and analysis. Geographic locations were stored and displayed using ArcMap and ArcView 3.2. All species data will be archived in the NPSpecies database, which houses information on species status, abundance, residency, nativity, management priority, and exploitation concern information for all plant and animal species documented on NPS lands.

## Results

### Confirmed Species

A total of four species of herpetofauna (2 amphibians and 2 reptiles) were expected to occur in the Big Hole National Battlefield and all four were confirmed in 2002. All four of these species were confirmed during a previous vertebrate inventory conducted by Van Sickle in 1987. Table 1, page 17, shows the list of herpetofauna present in the battlefield and their status. A total of 35 species of non-volant mammals were expected to occur in the battlefield and 31 species, representing 88% of the expected species, were confirmed during the 2002 inventory. Table 2, page 18, shows the list of expected mammals and their status in the battlefield.

There were nine small mammal transects, 10 wire funnel traps, and 1 wire cage mammal live trap used during the 8 days of the 2002 inventory. In addition to the vertebrates captured in the trapping effort, 11 incidental observations of vertebrates were also made. Both species with status as federal or state species of concern, the western toad and the gray wolf, were documented with incidental observations. One individual western toad was found in tall sedges near an oxbow of the Big Hole River. This species was observed twice during the 1987 inventory conducted by Van Sickle. This species appears to be rare in the battlefield. The gray wolf was detected in the battlefield through scat found in the conifer forest on the flank of Battle Mountain. Figure 3, page 15, shows the location of trapping locations and species observations. Tables 3 and 4, pages 21 and 22, show the total number of vertebrates detected through sign (tracks, den sites, scat, calls, etc.), trapping, and direct observation.

### Abundance

The species with the highest abundance during the survey were the Columbia spotted frog (*Rana luteiventris*), the common garter snake (*Thamnophis elegans*), the Columbian ground squirrel (*Spermophilus columbianus*), the deer mouse (*Peromyscus maniculatus*), the meadow vole (*Microtus pennsylvanicus*), the red squirrel (*Tamiasciurus hudsonicus*), and the western jumping mouse (*Zapus princeps*). Figure 2, page 14, shows the estimated number of herpetofauna in the battlefield during the 2002 inventory. The number of spotted frogs was estimated at over 2000 individuals, based on the presence of tadpoles and other life stages in wetlands adjacent to the Big Hole River. There were over thirty common garter snakes found on several occasions in the shrub riparian habitat type. Over 15 individuals, including both juveniles and adults, were present at one of these encounters, and this may have been a den site. The abundance of some mammals, such as the red squirrel, was difficult to estimate because they were observed rather than captured. Based on trapping results, deer mice were the most abundant small mammals, with 28 individuals captured. Meadow voles and western jumping mice were also quite abundant, with 10 and 8 individuals captured, respectively. Table 4, page 22, shows the estimated numbers of individuals observed in the battlefield during the 8 days of the 2002 inventory.

**Bats**

Although bats were not formally included in the 2002 inventory, several brief evening searches were made for bats in the battlefield in order to provide information for future bat surveys. Over the 8 days spent at the battlefield in 2002, no bats were observed. However, suitable riparian habitat and an abundance of potential roost sites exist in and near the battlefield. Future bat surveys are recommended.

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Figure 1. The 5 sites included in the 2002 Nez Perce National Historical Park mammal and herpetological inventory and the Big Hole Battlefield. The Nez Perce sites are shown on this map but are treated in a separate inventory report.

Amphibian and Reptile Abundance

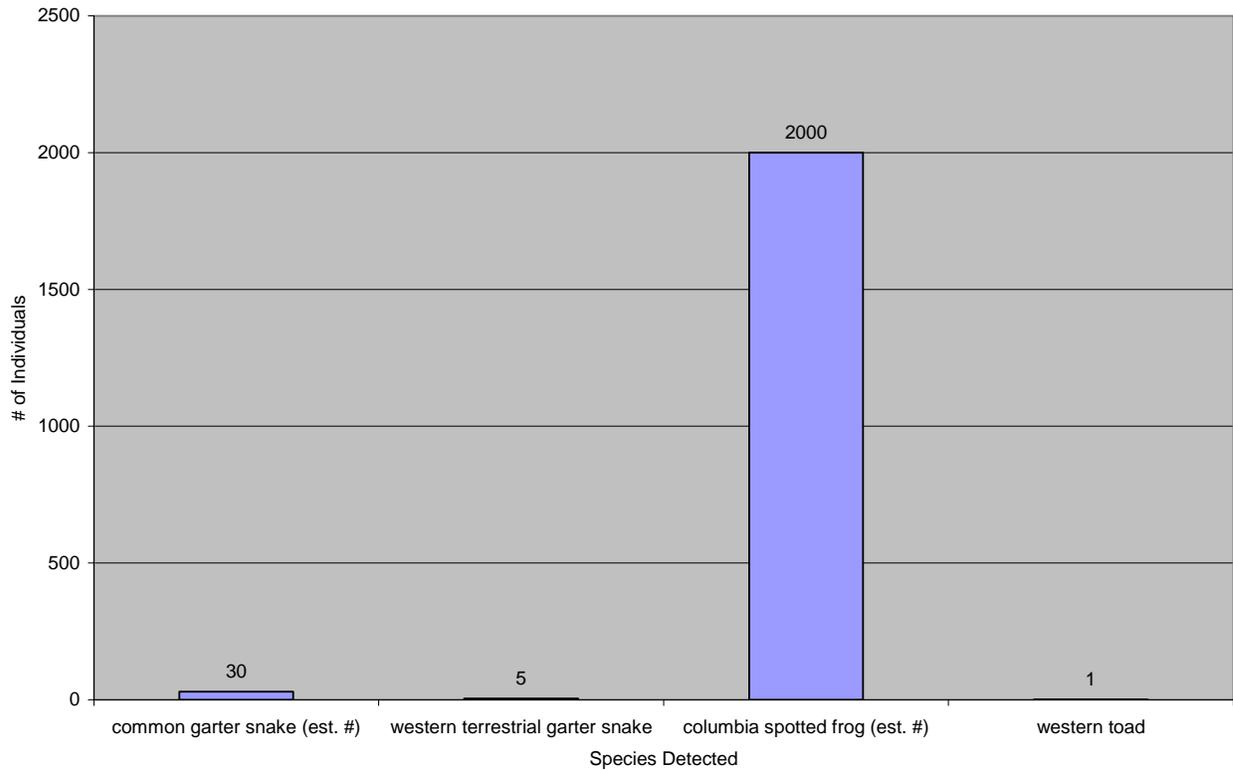


Figure 2. Amphibian and reptile species detected and the estimated number of individuals at Big Hole National Battlefield.

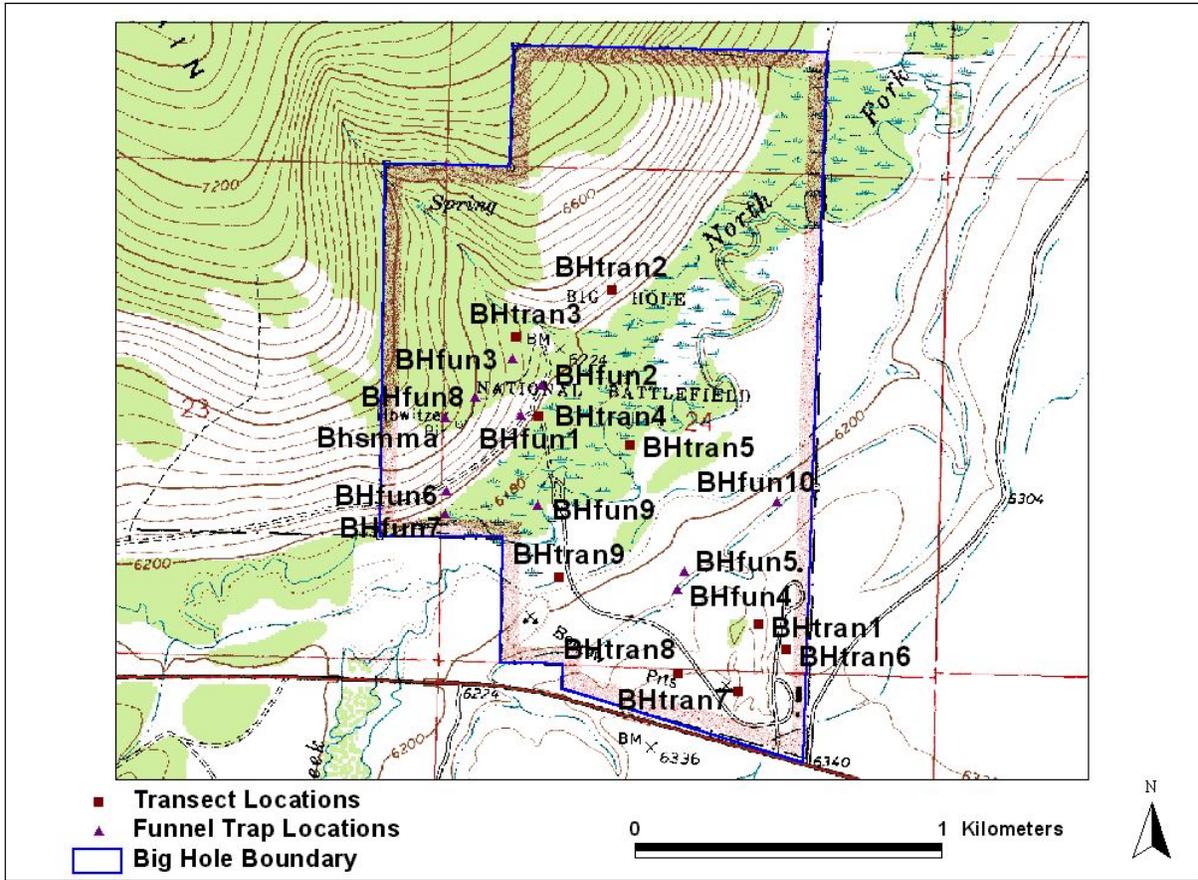


Figure 3. Sherman live trap transect and wire funnel trap locations for the 2002 inventory at Big Hole National Battlefield, Montana.

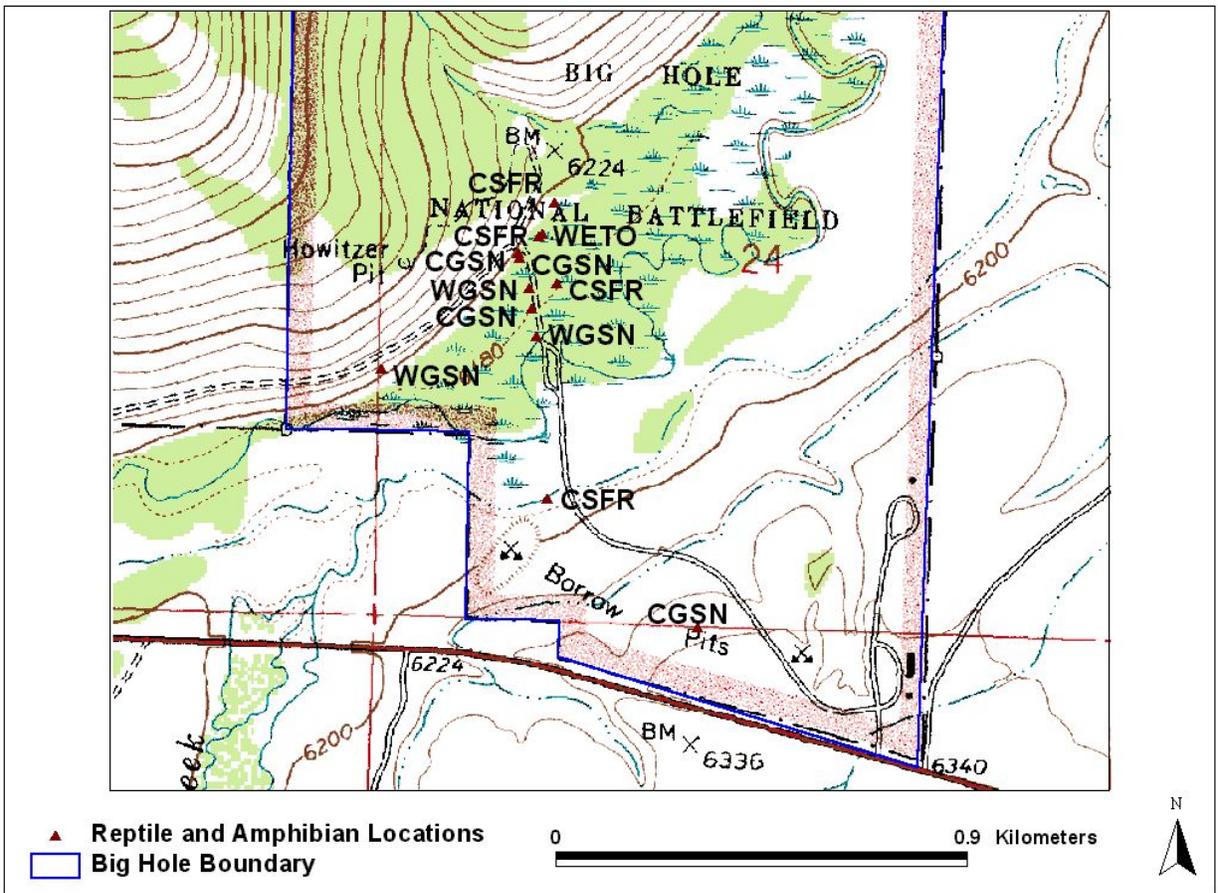


Figure 4. Incidental observation locations of reptiles and amphibians during the 2002 inventory at Big Hole National Battlefield, Montana.

Table 1. Big Hole Battlefield amphibian and reptile species summary table. This table provides concise information about potential and observed amphibian and reptile species with their corresponding legal status, and summarizes the study results by distribution, estimated abundance, type of voucher taken, successful survey techniques, and the observed life stages. See Appendix A for other species that may occur but researchers on this project judged not likely to occur.

Scientific Name	Common Name	Conservation Status <sup>1</sup>	Distribution <sup>2</sup>	Estimated Abundance <sup>3</sup>	Voucher: museum specimen/ photograph	Successful Sampling Techniques <sup>4</sup>	Comments	Park Species Status
<i>Bufo boreas</i>	Western toad	S	Limited	Rare		Incidental Observation	Adult	Present, confirmed
<i>Rana luteiventris</i>	Columbia spotted frog		Widespread	Abundant	Photograph, Museum Specimen	Visual Encounters, Incidental Observation, Funnel Traps	Juvenile, Adult	Present, confirmed
<i>Thamnophis elegans</i>	Western terrestrial garter snake		Widespread	Abundant	Photograph	Visual Encounters, Incidental Observation	Juvenile, Adult	Present, confirmed reptile
<i>Thamnophis sirtalis</i>	Common garter snake		Widespread	Abundant	Photograph	Visual Encounters, Incidental Observation	Juvenile, Adult	Present, confirmed reptile

<sup>1</sup> Based on ranking from the Montana Natural Heritage Program 2002. S = Species of Special Concern.

<sup>2</sup> Based on this survey. Widespread = 3 locations; Intermediate = 2 locations; Limited = 1 location.

<sup>3</sup> Based on this survey. Abundant (>10); Common (6-10); Uncommon (3-5); Rare (1-2).

<sup>4</sup> Techniques employed: visual encounters, road driving, funnel traps, incidental observation and contributed observation (ranked by success in this survey)

Table 2. Big Hole Battlefield mammal species summary table. This table provides concise information about potential and observed species with their corresponding legal status, and summarizes the study results by distribution, estimated abundance, type of voucher taken, successful survey techniques, and the observed life stages. See Appendix A for other species that may occur, but researchers on this project judged not likely to occur.

Scientific Name	Common Name	Conservation Status <sup>5</sup>	Distribution <sup>6</sup>	Estimated Abundance <sup>7</sup>	Voucher: museum specimen/ photograph	Successful Sampling Techniques <sup>8</sup>	Comments	Park Species Status
<i>Alces alces</i>	Moose		Widespread	Common	Photograph	Incidental Observation	Juvenile, Adult	Present, confirmed
<i>Canis latrans</i>	Coyote		Intermediate	Abundant		Tracks/dens/scat		Present, confirmed
<i>Canis lupus</i>	Gray wolf	E				Tracks/dens/scat		Present, confirmed
<i>Castor canadensis</i>	American beaver		Widespread	Common		Visual Encounter	Juvenile, Adult	Present, confirmed
<i>Cervus elaphus</i>	Elk		Widespread	Common		Incidental Observation	Adult	Present, confirmed
<i>Erethizon dorsatum</i>	Common porcupine		Intermediate	Uncommon		Incidental Observation	Adult	Present, confirmed
<i>Lemniscus curtatus</i>	Sagebrush vole		Limited	Rare		Trapping, Funnel Traps	Adult	Present, confirmed
<i>Lepus americanus</i>	Snowshoe hare		Widespread	Abundant	Photograph	Visual Encounter	Juvenile, Adult	Present, confirmed
<i>Lepus townsendii</i>	White-tailed jack rabbit		Intermediate	Common		Visual Encounter	Adult	Present, confirmed
<i>Martes americana</i>	American marten					Tracks/dens/scat		Present, confirmed
<i>Mephitis mephitis</i>	Striped skunk		Widespread	Common		Visual Encounter	Juvenile, Adult	Present, confirmed

<sup>5</sup> Based on ranking from the Montana Natural Heritage Program 2002. E = Endangered.

<sup>6</sup> Based on this survey. Widespread = 3 locations; Intermediate = 2 locations; Limited = 1 location.

<sup>7</sup> Based on this survey. Abundant (>10); Common (6-10); Uncommon (3-5); Rare (1-2).

<sup>8</sup> Techniques employed: visual encounters, road driving, funnel traps, incidental observation and contributed observation (ranked by success in this survey)

Table 2. Big Hole Battlefield mammal species summary table (continued).

Scientific Name	Common Name	Conservation Status	Distribution	Estimated Abundance	Voucher	Successful Sampling Techniques	Comments	Park Species Status
<i>Microtus longicaudus</i>	Long-tailed vole		Limited	Rare		Trapping	Adult	Present, confirmed
<i>Microtus montanus</i>	Montane vole		Widespread	Common	Photograph	Trapping	Juvenile, Adult	Present, confirmed
<i>Microtus pennsylvanicus</i>	meadow vole		Widespread	Common		Trapping	Juvenile, Adult	Present, confirmed
<i>Mustela erminea</i>	short-tailed weasel					Tracks/dens/scat		Present, confirmed
<i>Neotoma cinerea</i>	bushy-tailed woodrat		Limited	Rare		Incidental Observation	Adult	Present, confirmed
<i>Odocoileus hemionus</i>	mule deer		Intermediate	Common		Visual Encounter	Adult	Present, confirmed
<i>Odocoileus virginianus</i>	white-tailed deer		Intermediate	Common		Visual Encounter	Juvenile, Adult	Present, confirmed
<i>Ondatra zibethicus</i>	common muskrat		Limited	Rare		Incidental Observation	Adult	Present, confirmed
<i>Peromyscus maniculatus</i>	deer mouse		Widespread	Abundant		Trapping	Juvenile, Adult	Present, confirmed
<i>Sorex cinereus</i>	masked shrew		Intermediate	Rare		Trapping		Present, confirmed
<i>Sorex monticolus</i>	dusky shrew		Intermediate	Rare		Trapping		Present, confirmed
<i>Sorex vagrans</i>	vagrant shrew		Limited	Rare		Trapping		Present, confirmed
<i>Spermophilus columbianus</i>	columbian ground squirrel		Widespread	Abundant		Visual Encounter, Trapping	Juvenile, Adult	Present, confirmed
<i>Spermophilus lateralis</i>	golden-mantled ground squirrel		Intermediate	Common		Incidental Observation	Adult	Present, confirmed

Table 2. Big Hole Battlefield mammal species summary table (continued).

Scientific Name	Common Name	Conservation Status	Distribution	Estimated Abundance	Voucher	Successful Sampling Techniques	Comments	Park Species Status
<i>Sylvilagus nuttallii</i>	nuttall's/ mountain cottontail		Limited	Uncommon		Visual Encounter	Juvenile, Adult	Present, confirmed
<i>Tamias amoenus</i>	yellow- pine chipmunk		Widespread	Uncommon		Visual Encounter, Trapping	Juvenile, Adult	Present, confirmed
<i>Tamias ruficaudus</i>	red-tailed chipmunk		Widespread	Uncommon		Visual Encounter, Trapping	Juvenile, Adult	Present, confirmed
<i>Tamiasciurus hudsonicus</i>	red squirrel		Widespread	Common		Incidental Observation	Juvenile, Adult	Present, confirmed
<i>Taxidea taxus</i>	american badger		Intermediate	Uncommon		Tracks/dens/scat		Present, confirmed
<i>Thomomys talpoides</i>	northern pocket gopher		Widespread	Abundant		Tracks/dens/scat		Present, confirmed
<i>Zapus princeps</i>	western jumping mouse		Widespread	Common		Trapping	Juvenile, Adult	Present, confirmed
<i>Clethrionomys gapperi</i>	southern red-backed vole							Unconfirmed but expected
<i>Mustela frenata</i>	long-tailed weasel							Unconfirmed but expected
<i>Ursus americanus</i>	american black bear							Unconfirmed but expected
<i>Vulpes fulva</i>	red fox							Unconfirmed but expected

Table 3. The number of amphibian and reptile species detected at Big Hole Battlefield through sign (tracks, den sites, scat, calls, etc.), trapping, and/or direct observation.

		<b>Big Hole Battlefield</b>
<b>Amphibians</b>	western toad	1
	columbia spotted frog (est. #)	>2000
<b>Reptiles</b>	western terrestrial garter snake	5
	common garter snake (est. #)	>30

Table 4. The number of mammal species detected at Big Hole Battlefield through sign (tracks, den sites, scat, calls, etc.), trapping, and/or direct observation. Species in bold were most frequently detected.

Species	Sign
American badger	sign
American beaver	direct observation
American marten	sign
Bushy-tailed woodrat	1
<b>Columbian ground squirrel</b>	3, direct observation
Common muskrat	1
Common porcupine	sign
Coyote	direct observation
<b>Deer mouse</b>	28
Dusky shrew	2
Elk	direct observation
Golden-mantled ground squirrel	direct observation
Gray wolf	sign
Long-tailed vole	1
Masked shrew	2
<b>Meadow vole</b>	10
Montane vole	7
Moose	direct observation
Mule deer	direct observation
Northern pocket gopher	sign
Nuttall's/mountain cottontail	direct observation
<b>Red squirrel</b>	direct observation
Red-tailed chipmunk	3
Sagebrush vole	1
Short-tailed weasel	direct observation
Snowshoe hare	direct observation
Striped skunk	direct observation
Vagrant shrew	1
<b>Western jumping mouse</b>	8
White-tailed deer	direct observation
White-tailed jack rabbit	direct observation
Yellow pine chipmunk	5

## Appendix A. Additional tables.

Table A-1. Summary of information for determining park status of amphibian and reptile species not detected at Big Hole National Historic Battlefield.

Scientific Name	Common Name	Within Range	Elevation	Habitat	Detectability	Remarks	Status
<i>Charina</i>							Not
<i>bottae</i>	rubber boa	Yes	Yes	Yes	Low	Possible	Present
<i>Coluber</i>							Not
<i>constrictor</i>	racer	Possible	Yes	Yes	Variable	Unlikely	Present

## Appendix A. Additional tables (continued).

Table A-2. Summary of information for determining park status of mammal species not detected at Big Hole Battlefield.

Scientific Name	Common Name	Within Range	Elevation	Habitat	Detectability	Remarks	Status
<i>Antilocapra americana</i>	Pronghorn Antelope	No	Too High	Yes	High	Unlikely	Unconfirmed
<i>Clethrionomys gapperi</i>	Southern red-backed vole	Yes		Yes		Likely	Probably Present
<i>Glaucomys sabrinus</i>	Northern flying squirrel	Yes	Yes	Yes	Low	Possible	Unconfirmed
<i>Gulo gulo</i>	Wolverine	Yes	Yes	Limited	Low	Unlikely	Not Present
<i>Lontra canadensis</i>	Northern river otter	Yes	Yes	Limited	Variable	Possible	Not Present
<i>Lynx canadensis</i>	Lynx	Yes	Yes	Limited	Low	Possible	Unconfirmed
<i>Lynx rufus</i>	Bobcat	Yes	Yes	Yes	Low	Possible	Not Present
<i>Marmota caligata</i>	Hoary marmot	Yes		Limited	Variable	Unlikely	Not Present
<i>Marmota flaviventris</i>	Yellow-bellied marmot	Yes	Yes	Limited	High	Unlikely	Not Present
<i>Martes pennanti</i>	Fisher	Possible	Yes	Yes	Low	Possible	Not Present
<i>Microtus richardsoni</i>	Water vole	Yes		Yes	Variable	Possible	Not Present
<i>Mustela frenata</i>	Long-tailed weasel	Yes	Yes	Yes	Variable	Likely	Probably Present
<i>Mustela vision</i>	Mink	Yes	Yes	Yes	Variable	Possible	Unconfirmed
<i>Ochotona princeps</i>	American pika	Yes		Limited	Variable	Unlikely	Not Present
<i>Phenacomys intermedius</i>	Heather vole	Yes	Yes	Yes		Possible	Unconfirmed
<i>Procyon lotor</i>	Common raccoon	Yes		Yes	High	Possible	Not Present
<i>Puma concolor</i>	Mountain lion	Yes	Yes	Yes	Low	Possible	Not Present
<i>Sorex hoyi</i>	Pygmy shrew	Yes	Yes	Yes	Low	Possible	Unconfirmed
<i>Sorex palustris</i>	Common water shrew	Yes	Yes	Yes	Low	Possible	Not Present
<i>Sorex preblei</i>	Preble's shrew	Yes	Yes	Yes	Low	Possible	Unconfirmed
<i>Tamias minimus</i>	Least chipmunk	No	Yes	Yes	High	Possible	Unconfirmed
<i>Ursus americanus</i>	American black bear	Yes	Yes	Yes	Variable	Likely	Probably Present
<i>Vulpes fulva</i>	Red fox	Yes	Yes	Yes	Low	Likely	Probably Present

# Appendix B. Forms.

Form 1. Amphibian and reptile individual observations form used at the Big Hole National Battlefield.

## AMPHIBIAN AND REPTILE INDIVIDUAL OBSERVATION FORM

(April 2002)

Please provide whatever information you can, even if you are unsure of the species.

Species: \_\_\_\_\_ Number of Animals: \_\_\_\_\_

Observation Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ am pm (circle one)

Observer Name(s): \_\_\_\_\_

Affiliation: \_\_\_\_\_

Address: \_\_\_\_\_

Phone No: \_\_\_\_\_ Have you seen this species before? \_\_\_\_\_

Description of Animal (sex, color, pattern, pupil shape, skin texture, etc.): \_\_\_\_\_

Did you photograph the animal? \_\_\_\_\_

Description of Animal's Behavior: \_\_\_\_\_

Animal's Location: (Be as accurate as possible; e.g., 4.5 miles north and 3.3 miles east of known landmark; Latitude and Longitude; UTM coordinates; or Range, Township, and Section): \_\_\_\_\_

County: \_\_\_\_\_ State: \_\_\_\_\_

Habitat: \_\_\_\_\_

Weather: (temperature, cloud cover, wind, etc.): \_\_\_\_\_

Remarks: \_\_\_\_\_

Please return to:

Dr. Chuck Peterson  
Idaho Museum of Natural History  
Box 8007, Idaho State University  
Pocatello, Idaho 83209

(208) 282-3922 office 2824570 FAX E-mail: [petchar@isu.edu](mailto:petchar@isu.edu) Website: [www.isu.edu/~petchar](http://www.isu.edu/~petchar)

# Appendix B. Forms (continued)

## Form 2. Amphibian and reptile survey data sheet used for all wetland sites.

AMPHIBIAN SURVEY DATA SHEET - modified after S.P. Corn, NBS, Fort Collins, CO

(ver. 1 May 1996)

Herpetology Laboratory, Idaho State University and Idaho Museum of Natural History, Box 8007, Pocatello, ID 83209

(208) 236-3922 voice 236-4570 FAX e-mail: petechar@isu.edu

DATE		BEGIN TIME		END TIME		OBSERVERS																																																
LOCALITY																																																						
STATE		COUNTY		MAP NAME		OWNER		ELEVATION																																														
T	R	S		UTM ZONE/DATUM		NORTHING		EASTING																																														
AMPHIBIAN AND REPTILE SPECIES PRESENT (INDICATE NUMBERS IN CATEGORIES IF POSSIBLE)																																																						
<table border="1"> <thead> <tr> <th>SPECIES</th> <th>ADULT</th> <th>JUVENILE</th> <th>METAM.</th> <th>LARVAE</th> <th>EGGS</th> <th>CALLING</th> <th>TECHNIQUE(S)</th> <th>VOUCHER</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>										SPECIES	ADULT	JUVENILE	METAM.	LARVAE	EGGS	CALLING	TECHNIQUE(S)	VOUCHER																																				
SPECIES	ADULT	JUVENILE	METAM.	LARVAE	EGGS	CALLING	TECHNIQUE(S)	VOUCHER																																														
FISH PRESENT		YES ??? NO		FISH SPECIES:																																																		
ENTIRE SITE SEARCHED?		YES NO		IF NO, INDICATE AREA: meters of shoreline habitat																																																		
WEATHER:		RADIATION: CLEAR PARTIAL OVERCAST		WIND: CALM LIGHT MEDIUM HEAVY																																																		
AIR TEMPERATURE (1 M SHADED)		°C OR F		% CLOUD COVER:		PRECIPITATION: SNOW RAIN																																																
WATER TEMPERATURE (1CM)		pH:		CONDUCTIVITY		SAMPLE?																																																
COLOR		CLEAR STAINED		TURBIDITY		CLEAR CLOUDY																																																
SITE DESCRIPTION		PUT SKETCH AND ADDITIONAL COMMENTS ON BACK OF SHEET																																																				
ORIGIN		NATURAL MAN-MADE MAN-MODIFIED		DRAINAGE		PERMANENT OCCASIONAL NONE																																																
SITE TYPE TEMPORARY or PERMANENT LAKE/POND MARSH BOG STREAM SPRING/SEEP ACTIVE or INACTIVE BEAVER POND																																																						
NATIONAL WETLAND INVENTORY CLASSIFICATION					GAP ANALYSIS COVER TYPE (IF KNOWN)																																																	
STREAM ORDER 1 2 3 4 5 6																																																						
SITE LENGTH m		SITE WIDTH m		MAXIMUM DEPTH		< 1M 1 - 2 M > 2 M																																																
PRIMARY SUBSTRATE SILT/MUD SAND/GRAVEL COBBLE BOULDER/BEDROCK OTHER:																																																						
% OF LAKE MARGIN WITH EMERGENT VEGETATION 0 1 - 25 25 - 50 >50																																																						
EMERGENT VEGETATION SPECIES (IN ORDER OF ABUNDANCE)																																																						
NORTH SHORELINE CHARACTERISTICS			SHALLOWS PRESENT		SHALLOWS ABSENT		EMERGENT VEG PRESENT		EMERGENT VEG ABSENT																																													
DISTANCE TO FOREST EDGE m			FOREST TREE SPECIES																																																			

## Appendix B. Forms (continued)

Form 3. Data form used for all small mammal transects deployed.

### Small Mammal Transect Form

ID #: \_\_\_\_\_

Observer: \_\_\_\_\_ Origin UTM: \_\_\_\_\_

Prebait

Date: \_\_\_\_\_ Transect Bearing: \_\_\_\_\_

Open

Date: \_\_\_\_\_ Check Date: \_\_\_\_\_

Slope: \_\_\_\_\_ Aspect: \_\_\_\_\_ Elevation: \_\_\_\_\_

Location Description: \_\_\_\_\_

\_\_\_\_\_

Habitat Description: \_\_\_\_\_

Weather During Trap Period: \_\_\_\_\_

Trp	Species	Cap #	Age/Sex	Wgt	Location	Microhabitat	Voucher #	UTM	L	T	HF
1											
2											
3											
4											

## Appendix B. Forms (continued)

Form 4. Data form used for all wire funnel traps and small mammal live traps deployed.

### Wire Funnel Trap Capture Form

**ID#** \_\_\_\_\_

Observer: \_\_\_\_\_ Open Date: \_\_\_\_\_ Close Date: \_\_\_\_\_

Center UTM: \_\_\_\_\_ Elevation: \_\_\_\_\_

Capture Period Weather: \_\_\_\_\_ Slope: \_\_\_\_\_ Aspect: \_\_\_\_\_

Location Description: \_\_\_\_\_  
\_\_\_\_\_

Habitat Description: \_\_\_\_\_

Capture #	Capture Date	Species	Age/Sex	L	T	HF Voucher #
-----------	--------------	---------	---------	---	---	--------------

**ID#** \_\_\_\_\_

Observer: \_\_\_\_\_ Open Date: \_\_\_\_\_ Close Date: \_\_\_\_\_

Center UTM: \_\_\_\_\_ Elevation: \_\_\_\_\_

Capture Period Weather: \_\_\_\_\_ Slope: \_\_\_\_\_ Aspect: \_\_\_\_\_

Location Description: \_\_\_\_\_

Habitat Description: \_\_\_\_\_

Capture #	Capture Date	Species	Age/Sex	L	T	HF Voucher #
-----------	--------------	---------	---------	---	---	--------------

## Appendix C. NPSpecies codes developed for all National Park Service species present.

### PARK STATUS

- **(P) Present:**  
*Species occurrence in park is documented and assumed to be extant.*
- **(H) Historic:**  
*Species historical occurrence in the park is documented, but recent investigations indicate that the species is now probably absent.*
- **(PP) Probably Present:**  
*Park is within species range and contains appropriate habitat. Documented occurrences of the species in the adjoining region of the park give reason to suspect that it probably occurs within the park. The degree of probability may vary within this category, including species that range from common to rare.*
- **(E) Encroaching**  
*The species is not documented in the park, but is documented as being adjacent to the park and has potential to occur in the park.*
- **(U) Unconfirmed:**  
*Included for the park based on weak (unconfirmed) record or no evidence, giving minimal indication of the species occurrence in the park.*
- **(FR) False Report:**  
*Species previously reported to occur within the park, but current evidence indicates that the report was based on a misidentification, a taxonomic concept no longer accepted, or some other similar problem of interpretation.*

### SPECIES ABUNDANCE

- **(A) Abundant:**  
*Animals: May be seen daily, in suitable habitat and season, and counted in relatively large numbers.*
- **(C) Common:**  
*Animals: May be seen daily, in suitable habitat and season, but not in large numbers.*
- **(U) Uncommon:**  
*Animals: Likely to be seen monthly in appropriate season/habitat. May be locally common.*
- **(R) Rare:**  
*Animals: Present, but usually seen only a few times each year.*
- **(O) Occasional:**  
*Occurs in the park at least once every few years, but not necessarily every year. Applicable to animals only.*
- **(UNK) Unknown:**  
*Abundance unknown.*

### RESIDENCY

- **(B) Breeder:**  
*Population reproduces in the park.*
- **(R) Resident:**  
*A significant population is maintained in the park for more than two months each year, but it is not known to breed there.*
- **(M) Migratory:**  
*Migratory species that occurs in park approximately two months or less each year and does not breed there.*
- **(V) Vagrant:**  
*Park is outside of the species usual range.*
- **(UNK) Unknown:**  
*Residency status in park is unknown.*

## **Appendix C.** NPSpecies codes developed for all National Park Service species present (continued).

### **SPECIES NATIVITY**

- **(N) Native:**  
*The species is native to the park (either endemic or indigenous), or if the Park Status is Probably Present as defined above, the species would be native to the park if it were eventually confirmed in the park.*
- **(E) Non-Native (EXOTIC):**  
*The species is not native to the park (neither endemic nor indigenous), or if the Park Status is Probably Present as defined above, the species would not be native to the park if it were eventually confirmed in the park. Persistent plant populations (as defined below) that reproduce are also considered non-native.*
- **(UNK) Unknown:**  
*Nativity classification in park is unknown.*

### **SPECIES OF MANAGEMENT PRIORITY**

**(Y) YES or (N) NO**

IF YES: Write Management Priority Details on a separate sheet of paper.

### **SPECIES OF EXPLOITATION CONCERN**

**(Y) YES or (N) NO**

IF YES: Write Exploitation Concern Details on a separate sheet of paper.

## Appendix D. Digital Photographs.



Representative Photos: Oxbows and an overview of Big Hole National Battlefield (Wisdom), Montana.



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 341/100169, July 2009

**National Park Service**  
**U.S. Department of the Interior**



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**Natural Resource Program Center**  
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Fort Collins, Colorado 80525

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