

# INVENTORY AND MONITORING OF SENSITIVE SPECIES IN THE FORTIFICATION CREEK WILDERNESS STUDY AREA, WYOMING

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April 2015

Prepared for:

**BLM Buffalo Field Office**

1425 Fort Street  
Buffalo, WY 82834

**National Landscape Conservation System**

Research Support Program  
Bureau of Land Management  
Washington D.C. 20240



*Recommended Citation:*

Abernethy, I., L. Tronstad, W. Estes-Zumpf, and B. Heidel. 2015. Inventory and monitoring of sensitive species in the Fortification Creek Wilderness Study Area, Wyoming. Prepared for the National Landscape Conservation System Research Support Program and the Bureau of Land Management Buffalo Field Office by the Wyoming Natural Diversity Database, Laramie, Wyoming. April 2015.

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*Photo on this page by L. Tronstad*

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## Introduction

Wyoming has 42 Wilderness Study Areas (WSAs) on Bureau of Land Management (BLM) lands. As part of the National Landscape Conservation System (NLCS), these WSAs are currently managed to preserve their natural characteristics. However, basic knowledge of the natural resources within many of Wyoming's WSAs is severely limited, reducing BLM Wyoming's ability to manage these areas. As a result, BLM Wyoming drafted a strategy for its NLCS lands in order to identify and address information needs and develop cohesive goals and guidelines for managing NLCS lands across the state (BLM 2013).

The Fortification Creek WSA is one of Wyoming's more well-known WSA's, largely because it contains one of the last herds of Great Plains-dwelling elk (*Cervus elaphus*). Fortification Creek WSA, established in 1979 (USDI BLM 1979), is noted for being the largest roadless area in the Powder River Basin and for being largely unaltered by humans. Although surrounded by ranches and energy development, the WSA itself is a relatively pristine and undisturbed island rising above the surrounding sagebrush-steppe prairie and badlands, and is a haven for elk, deer, and other wildlife species. The WSA has exceptional opportunities for solitude and primitive unconfined recreation; however, lack of public access restricts recreational use of this WSA, as does the lack of potable water. Although much is known about the Fortification Creek elk herd, little is known about the rest of the biota in this isolated and rugged WSA. Many animal species on the BLM's Sensitive species list and Wyoming Game and Fish Department's (WGFD) Species of Greatest Conservation Need (SGCN) may occur in the WSA, but formal surveys have not been conducted to confirm species occurrence.

WYNDD is a service and research unit of the University of Wyoming dedicated to collecting and disseminating unbiased data on the biology and status of Sensitive species in Wyoming (<http://uwadmnweb.uwyo.edu/wyndd/>). Our mission is to generate information that helps organizations like the BLM make effective management decisions. Along these lines, WYNDD has worked with the Wyoming Game and Fish Department and other state and federal experts to develop revised range maps and predictive distribution maps for Sensitive species in Wyoming. These projects have allowed WYNDD to identify gaps in our knowledge of Sensitive species distributions across the state. The biota of the Fortification Creek WSA is one of those information gaps.

## Purpose & Objectives

The purpose of this project was to fill information gaps for Sensitive Species suspected to occur in the Fortification Creek WSA, assist the BLM Buffalo Field Office in designing and establishing a monitoring framework for key resources in the WSA, and provide NLCS Wyoming and the BLM Buffalo Field Office with public outreach materials. This was accomplished by conducting a targeted inventory of local biota using a suite of survey and monitoring methods at key locations across the WSA.

Specific objectives for the project were to:

- 1) Work with BLM Buffalo Field Office to develop a list of target species in order to fill gaps in our knowledge of the occurrence and status of these species in the Fortification Creek WSA.
- 2) Work with the BLM Buffalo Field Office to design and establish survey and monitoring protocols for target taxa and assessments of riparian areas.
- 3) Sample invertebrate assemblages to assess the ecosystem health of ephemeral creeks in the Fortification Creek WSA.
- 4) Inventory pollinators across different habitats within the Fortification Creek WSA.

- 5) Provide information about the biota of the Fortification Creek WSA for public education and outreach.
- 6) Provide the Buffalo Field Office and the Wyoming State Office of the BLM with a list of Sensitive species occurring in the Fortification Creek WSA, which can be used to support informed management decisions.
- 7) Provide BLM Wyoming with photo documentation of biological and aesthetic resources in the Fortification Creek WSA to be used in future public outreach efforts.
- 8) Use results to update species range maps and predictive distribution models in Wyoming.

## Methods

### Study Area

The Fortification Creek WSA encompasses 5,025 ha (12,419 acres) and straddles the border of Campbell and Johnson counties in north-central Wyoming (Figure 1). Fortification Creek WSA is located within the Powder River Basin and is part of the Great Plains ecoregion (Bailey et al. 1994). According to the National Gap Analysis Program Land Cover Data, two major habitat types occur within the WSA including Wyoming big sage steppe and mixed grass prairie (Davidson et al. 2009).

Fortification Creek WSA ranges in elevation from approximately 1,160 to 1,440 m (3,800 to 4,700 ft) above sea level. The WSA is a steep, highly dissected landscape composed of ridges and drainages. Some ridgetops are knifelike, while others are flat, resembling mesas or buttes. Many ridgetops and valley slopes contain rock outcrops, most of which are unconsolidated.

Three main drainages occur in the WSA: Deer Creek, Bull Creek and Little Bull Creek. These ephemeral streams drain to the northwest directly into the Powder River. Schoolhouse Draw drains to the east into Wildhorse Creek, a tributary of the Powder River. The only wetland feature identified by National Wetlands Inventory (NWI) data was a stock pond (0.08 ha; 0.2 acres), that was dry during our visit.

### Inventory and Monitoring

The Wyoming Natural Diversity Database worked closely with the Buffalo Field Office of the BLM to develop a list of taxa to target during inventory and monitoring efforts. Together, WYNDD and the Buffalo Field Office also developed repeatable survey methodologies for the different taxa. Due to the remoteness and ruggedness of the WSA, standard methodologies often had to be modified. During this study we established repeatable survey protocols and monitoring sites, and used these protocols to collect baseline data on all target taxa. All protocols and datasheets used are documented in Appendix 1 and locations of all monitoring sites are provided in associated supplemental GIS shapefiles.

Field surveys were conducted by four WYNDD and two BLM personnel during two trips to the WSA in the summer of 2014. We targeted birds, plants, amphibians, pollinators, riparian assessments and aquatic invertebrates from 9-13 June. We targeted bats, reptiles, pollinators, plants and raptor nests from 14-18 July. Copies of completed field datasheets are available in Appendix 2 and spreadsheets with results are also provided as supplemental material.

## Birds

### Site selection

Point count transects were established in a stratified random fashion in a Geographic Information System (GIS). First, we randomly placed three points within each GAP land-cover category polygon within the WSA boundary (Davidson et al. 2009). We then generated a 1,500m line transect oriented in a random direction. We placed 12 points spaced at 250m intervals along these lines. For surveys, we selected transects that would provide good spatial coverage across all habitat types within the WSA.

### Point count methodology

Point count methods were adapted from the Integrated Monitoring In Bird Conservation Regions land bird monitoring program (Hanni et al. 2014). Each point count survey consisted of a line transect with 12 points spaced at 250m. At each point, a three-minute point count was conducted. We attempted to complete all 12 points during each point count survey but were unable to in some cases due to time or terrain limitations. Point count surveys should begin one half hour before local sunrise. Due to terrain and difficulty accessing point count transects, however, we were not always able to start at the recommended time. Surveys ended no later than five hours after local sunrise. Surveyors recorded the start time for each point count conducted. For every bird detected during the three-minute point count, we recorded: species, sex, horizontal distance to the bird, minute of the point count during which the bird was detected, type of detection (i.e. call, song, visual), and whether or not the observer was able to visually identify the bird. We measured the distance to each bird detected using a laser rangefinder. If it was not possible to measure the distance to a bird, we estimated the distance by measuring the distance to an object near the bird. We also recorded any bird species not previously detected during a point count while traveling between points within a transect. At the start and end of each survey, we recorded time, ambient temperature, cloud cover, precipitation, and wind speed. Before beginning each three-minute count, we collected ocular vegetation data within a 50m radius of the point (Hanni et al. 2014). Vegetation data included: dominant habitat type; relative abundance, percent cover and mean height of trees and shrubs by species, and grass height and ground cover types. These vegetation data were recorded quietly before beginning each point count to allow birds time to return to their normal habits prior to beginning each count.

In addition to formal point count surveys for birds, we also recorded any bird species not previously detected during point count surveys while conducting surveys for other taxa within the Fortification Creek WSA.

## Mammals

### Bats

We conducted two types of bat surveys: active mist-netting and passive acoustic monitoring. Capturing live bats with mist nets allowed us to verify species presence, inspect individuals for disease, assess physical condition, and collect demographic information. Passive surveys allowed us to efficiently collect species presence information from multiple sites each night.

### Mist Net Surveys

At suitable mist net sites, 6m, 9m, and 12m mist nets<sup>1</sup> were suspended over water between aluminum poles in single-high arrangements to catch bats while feeding or drinking. Mist nets were

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<sup>1</sup> Avinet bat-specific mist nets, 38mm mesh, black polyester, Dryden, NY, [www.Avinet.com](http://www.Avinet.com)

opened at dusk unless nontarget taxa (e.g. birds) were active at the site. In this case, nets were opened as soon as bird activity ceased. Nets were checked for captures at least every 15 minutes and captures were removed from nets immediately to minimize injury or stress associated with being in the net. Surveyors removed bats from nets with great care to protect wing bones and patagia. All captures were removed from nets, processed and released within 30 minutes of capture. Nets were not set in high winds or temperatures below 40°F to minimize bat stress and injury. Once removed from the net, captures were placed in a paper bag for transport and processing to minimize stress. Captured bats were measured (forearm length, ear length), weighed, sexed, aged, identified to species, and released on site (see datasheet in Appendix 1A). Additionally, the membranes of both wings and the uropatagium of each captured bat were inspected following the methods presented by Reichard and Kunz (2009). After each survey, we decontaminated all survey equipment and supplies following the National White-Nose Syndrome Decontamination Protocol Version 06.25.2012 (2012). We also followed all guidelines laid out in the Wyoming White-Nose Strategic Plan (Abel and Grenier 2011).

### **Acoustic Surveys**

Acoustic surveys were conducted using Wildlife Acoustics Song Meter SM2BAT+<sup>2</sup> full-spectrum recording equipment (see datasheet in Appendix 1A). Units were programmed to begin recording one half hour before civil sunset and to stop recording one half hour after civil sunrise. On each recorder, one SMX-US<sup>3</sup> ultrasonic microphone was attached to a 3m cable and placed between 1m and 2m above the ground. All calls were analyzed using the Sonobatch automated call analysis algorithm in the SonoBat 3 Wyoming Species Package. We used an acceptable call quality threshold of 0.70 and a discriminate probability threshold of 0.90.

### **Small Mammals**

We live-trapped small mammals along the Bull Creek and Little Bull Creek drainages on the nights of July 14 and 15 and July 16 and 17, respectively. At each site, we placed 60 traps along the drainage. Additionally, we placed 30 traps running perpendicular to each drainage through sagebrush habitat and 30 traps through juniper habitat. Traps were arranged in transects with traps spaced approximately 5m apart. We used foldable metal small mammal live-traps<sup>4</sup> to capture animals. Traps were set and checked for two nights at each site. Each trap contained polyester bedding material and was baited with 3-way horse feed. Traps were opened at dusk and checked beginning at dawn the following morning. Captures were processed immediately at the site of capture. Traps were closed during the day so that no animals risked overheating inside traps during the day. Captured animals remained in traps until processed individually. To process small mammals, we gently shook each animal out of its trap into a heavy duty plastic bag, identified the individual to species, identified the sex, obtained mass, and measured tail length, body length, and total length. Once the animal was fully recovered and properly oriented, it was immediately released at the capture site. All live-trapping and capture processing procedures followed guidelines for trapping and handling small mammals published by the American Society of Mammalogists (Sikes et al. 2011) and were approved by the University of Wyoming's Institutional Animal Care and Use Committee.

### **Other Mammals**

In addition to bats and small mammals, we searched for evidence of other mammals in the Fortification Creek WSA. Animal scat and tracks were identified to species, when possible. In order to

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<sup>2</sup> Song Meter SM2Bat+ ultrasonic monitoring unit, Concord, MA, [www.wildlifeacoustics.com](http://www.wildlifeacoustics.com)

<sup>3</sup> SMX-US ultrasonic microphone, Concord, MA, [www.wildlifeacoustics.com](http://www.wildlifeacoustics.com)

<sup>4</sup> Sherman live traps; H. B. Sherman Traps, Inc., Tallahassee, Florida

document medium and large carnivores and other secretive species, we placed two digital infrared trail cameras<sup>5</sup> at different locations in the WSA. Trail cameras were placed along obvious animal trails near water sources during our first visit in June and retrieved during our second visit in July.

## Reptiles and Amphibians

We used three methods to inventory reptiles and amphibians in the Fortification Creek WSA: rock outcrop surveys for reptiles, riparian visual encounter surveys for amphibians, and incidental findings for both taxa. Target species were identified prior to surveys so that unique life history and behavioral traits (e.g. ephemeral puddle breeding by Great Plains Toads (*Anaxyrus cognatus*) and Plains Spadefoots (*Spea bombifrons*)) could guide survey placements and searches.

We surveyed for reptiles on south-facing rock outcrops, where lizards and snakes often concentrate. South facing rock outcrops provide thermal cover, cover from predators, and are often places with abundant invertebrate and small mammal prey items. Rock outcrop surveys consisted of walking along rocky slopes looking for basking reptiles in exposed areas as well as individuals resting on shaded ledges, in crevasses, or under rocks. Rocks lifted or flipped over during searching are replaced in their original position to minimize disturbance to habitat (Pike et al. 2010). Habitat, total survey time, and species detected were recorded. Datasheets and protocols are provided in Appendix 1B.

We used aerial photos and topographic maps in a GIS to locate potential amphibian habitat (ponds, streams, and areas likely to retain permanent or ephemeral water). We visited all accessible potential amphibian sites to see if they had water and supported amphibians. If water was present, we conducted visual encounter surveys of the water and surrounding moist habitat and recorded number and lifestage of all amphibians detected. We also recorded data on habitat, including water temperature and pH, shoreline characteristics, presence of predators (fish), etc., (see datasheet in Appendix 1B). Because tadpoles of most amphibian species are difficult to identify in the field, we also collected representative specimens of any tadpoles found. Tadpoles were later identified with a dissecting microscope.

## Pollinators

To estimate the abundance and diversity of pollinators in the Fortification Creek WSA, we collected insects using vane traps, bee cups and visual encounter surveys (Figure 2a, b). We placed vane traps and bee cups in different habitats for about 24 hours before collecting individuals. We used yellow, blue, and white bee cups filled with soapy water. We recorded location, vegetation type, and deployment on datasheets (Appendix 1C). Other pollinating insects encountered during our excursions were captured with nets (Figure 2f). All captured insects were preserved in ~75% ethanol until they could be processed in the laboratory.

In the laboratory, we hydrated bees in warm water for 30-60 minutes, washed specimens in soapy water using a stir plate and dried individuals using tubes with forced air. For butterflies and moths, we hydrated individuals in a container with humid air for ~24 hours and dried on a spreading board. All pollinating insects were pinned, labeled, and will be stored at the University of Wyoming Insect Museum. Insects were identified using available keys (Michener et al. 1994, Williams et al. 2014, Pickering 2015).

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<sup>5</sup> RECONYX PC800 HyperFire Professional Semi-Covert, Holmen, WI, <http://www.reconyx.com>

## Aquatic Invertebrates

We collected aquatic invertebrates from Deer Creek, Little Bull Creek and ponds in the WSA. At least three previously unmapped semi-permanent or permanent ponds existed in the WSA. One appeared to be a manmade stockpond along a tributary of Little Bull Creek and a second pond with emergent aquatic vegetation was farther down in the same drainage. The third pond was formed by a large landslide damming a tributary to Bull Creek. We collected aquatic invertebrates using a D-frame dipnet (250  $\mu\text{m}$  mesh; Figure 2c, d). We preserved samples with ~75% ethanol in the field to preserve them until they could be processed in a laboratory. Aquatic invertebrates were identified under a dissecting microscope using available keys (Merritt et al. 2008, Thorp and Covich 2010) and given a tolerance value (Barbour et al. 1999).

## Plants

To identify plant species to target during surveys, we searched the WYNDD database for Sensitive plant species known or expected to occur in the area. There were no BLM Sensitive plant species known from the central areas of the Powder River Basin and there were no other Wyoming plant species of concern known within the WSA boundaries or within a 10 mile radius. The nearest known species of concern included four upland species: Barr's milkvetch (*Astragalus barrii*), cut-leaved evening-primrose (*Oenothera laciniata*), small-flowered fame-flower (*Talinum parviflorum*), and slim-pod Venus' looking-glass (*Triodanis leptocarpa*) and three wetland species: Sartwell's sedge (*Carex sartwellii*), short-point flatsedge (*Cyperus acuminatus*), and slender bulrush (*Schoenoplectus heterochaetus*). Barr's milkvetch is designated as Sensitive by the U.S. Forest Service Rocky Mountain Region. In addition, woolly Twinpod (*Physaria lanata*) was sought because it is a Forest Service Sensitive species only known from one collection record in the Powder River Basin but is otherwise restricted to the Big Horn Mountains.

We searched the Rocky Mountain Herbarium (RMH) on-line database (2014) for any species collected in the WSA. No collections of vascular plant species have been made in the WSA. Therefore, we used a checklist for Campbell County that contained about 735 species. A Campbell County checklist was chosen as representative of the Powder River Basin rather than Johnson County, because Johnson County included the Big Horn Mountains. The BLM Buffalo Field Office provided datasheets for two range transects from the WSA, containing data on a total of 20 species.

Fieldwork involved identifying and collecting plant specimens. All species observations were recorded and determined whether they were: 1) among the eight species on the target list, 2) prevalent or else abundant in some given segment of the landscape, 3) noxious weeds, 4) not previously known from the Powder River Basin, or 5) not possible/practical to identify without closer examination. We used several keys to identify plants (Dorn 2001, Great Plains Flora Association 1986). Plants were collected to document the distinctive parts of the flora. The species on the target list could occupy all topographic positions on the landscape, so we surveyed many different ridge and valley settings across the WSA. Aerial photographs were referenced for unique features (e.g., the largest woodlands, wetlands, and outcrops). We collected and photographed specimens to document species.

We collected both typical and uncommon species. Voucher specimens were deposited at the RMH, where they will also be scanned and posted on-line. Any plants on the noxious weed list of Campbell County were recorded and reported to the BLM Buffalo Field Office during the field season. Nonvascular plants were not target species, but occurrences were recorded and bryophytes were collected in one juniper woodland stand.

## Riparian Assessments

We assessed the riparian habitat using Proper Functioning Condition (PFC; Prichard et al. 1998). PFC uses hydrologic, vegetation, erosion, and deposition to assess the condition of riparian areas. We filled out the PFC standard checklist (Appendix 1D) for each major drainage in the Fortification Creek WSA after discussing each statement with the group of observers.

## Results

### Geology and Vegetation Characterization of the Fortification Creek WSA

#### Geology

The Powder River Basin is a large asymmetrical syncline dipping to the west that is filled by a thick sequence of sedimentary rock. The basin is bounded on the east by the Black Hills uplift, on the west by the Big Horn uplift and Casper Arch, on the south by the Laramie and Hartville uplifts and, on the north, it is separated from the Williston Basin by the Miles City Arch and the Cedar Creek Anticline. Sediments range from Paleozoic at the bottom through Mesozoic to Tertiary at the top (DeBruin et al. 2000). All of the Fortification Creek WSA and much of the Powder River Basin is covered by the Wasatch Formation, an Eocene formation of fluvial-deltaic sediments. The geology is generally described as drab sandstone and drab to variegated claystone with numerous coal beds in the lower section (Love and Christianson 1985); however, we observed prevalent loosely consolidated siltstone grading to fine, powdery sandstone in the WSA. Hard rock outcrops were present as scattered fragments of fine sandstone and baked siltstone (Figure 3d). We observed clinker, or red-colored baked siltstone, on some ridges (Figure 3c).

#### Soils

The sedimentary deposits comprising the Wasatch Formation are well-sorted in the study area. Almost the entire area is mapped as a single soil association, the Theedle-Shingle-Samday Association (NRCS STATSGO), representing calcareous, mesic, ustic torriorthents. They are predominantly fine-loamy texture, ranging from clayey to loamy with little or no coarse grain size. The northern portion of the east side of the WSA also has fine, smectitic, mesic ustic haplargid, a unit comprised of the Ulm-Theedle-Shingle (and five additional) soil associations.

#### Vegetation Characterization

Field notes were compiled to characterize patterns of plant composition and distribution in the WSA according to the U.S. National Vegetation Classification (<http://usnvc.org/explore-classification/>) system (Table 1). Steppe vegetation was composed of sagebrushes and wheatgrasses prevailed across the entire landscape. Mesas and flat ridgetops contained Great Basin and intermountain tall sagebrush shrubland and steppe vegetation dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *Vaseyana*; Figure 3a) in combination with thickspike wheatgrass (*Elymus lancolatus*). The extensive ridges and ridge slopes were covered by Wyoming big sagebrush (*A. t.* ssp. *wyomingensis*) in combination with bluebunch wheatgrass (*E. spicatus*) on the steeper well-drained slopes or *E. lanceolatus* on benches and gentle slopes. Needle-and-thread (*Hesperostipa comata*) was sometimes prevalent with blue grama (*Bouteloua gracilis*) on ridge crests, sandier ridge slopes and other sparsely-vegetated upland areas (Figure 3e). Greasewood (*Sarcobatus vermiculatus*) was common along south-

facing valley slopes of Bull and Little Bull Creeks and saltgrass (*Distichlis stricta*) was common on the toeslope.

Rocky Mountain foothills woodland characterized by Rocky Mountain juniper (*Juniperus scopulorum*) was scattered throughout the WSA, forming woodland vegetation in sheltered settings on north-facing slopes and draws (Figure 3b). They tended to appear even-aged, whereas a few large, presumably old trees were noted at isolated rim and draw locations. Almost no other tree species were present except isolated individuals of boxelder (*Acer negundo*) in the valleys and Douglas fir (*Pseudotsuga menziesii*) in the uplands. The latter is a county record.

Valley bottoms were covered by Great Plains shrub, and riparian vegetation was dominated by Basin silver sage (*A. cana ssp. cana*), western wheatgrass (*E. smithii*) and Basin wildrye (*E. cinereus*). Green needlegrass (*Nasella viridula*) also was common from valley bottoms to ridge tops. The WSA had deep rooting zones throughout most of the landscape and there were few sharp gradients despite the topographic relief. The three common wheatgrasses and three common sagebrushes had considerable ecological amplitude with no sharp boundaries in their distributions. A few of the species that are typical of moisture-collecting settings were found on ridgetops and valley bottom where moisture was retained by localized substrate conditions (e.g., wild licorice (*Glycyrrhiza lepidota*) and chokecherry (*Prunus virginiana*)). Plants more typical of alkali flats elsewhere in the state, such as greasewood, were on steep valley south-facing walls.

The riparian corridor mainly was meadow, vegetated in places by Basin silver sage (mentioned above). Stream beds were vegetated with meadow barley (*Hordeum brachyantherum*) and stream banks were lined by bands of prairie cordgrass (*Spartina pectinata*). Mesic species, such as *Nasella viridula* and *Artemisia tridentata ssp. vaseyanal*, were common despite the lack of surface water.

## Birds

We surveyed a total of 15 transects and conducted a total of 164 point counts (Figure 4). During point counts, we detected 1,515 birds representing 65 bird species (Table 2). The most frequently detected bird species was Spotted Towhee (*Pipilo maculatus*) followed by Western Meadowlark (*Sternella neglecta*). We documented two bird species listed as Sensitive by Wyoming BLM. These included Sage Thrasher (*Oreoscoptes montanus*) and Brewer's Sparrow (*Spizella breweri*). In addition, we documented three bird species listed as Species of Greatest Conservation Need (SGCN) by the WGFD. These included Brewer's Sparrow, Grasshopper Sparrow (*Ammodramus savenarum*), and Sage Thrasher. While not a Sensitive or SGCN species, Field Sparrow (*Spizella pusilla*) was detected in abundance across the WSA. Field Sparrow is considered a very rare summer resident in Wyoming and very few records of the species in Wyoming exist (Faulkner 2010, Orabona et al. 2012). Observations of the species within the WSA may change the status of the species in Wyoming. This highlights the value of inventorying WSA's across the state for which little information regarding biological resources exist. A total of six raptor species were observed within the WSA including American Kestrel (*Falco sparverius*), Golden Eagle (*Aquila chrysaetos*), Great-horned Owl (*Bubo virginianus*), Long-eared Owl (*Asio otus*), Red-tailed Hawk (*Buteo jamaicensis*), and Sharp-shinned Hawk (*Accipiter striatus*). We observed several raptor nests including three Red-tail Hawk nests, one Great-horned Owl nest, and one Long-eared Owl nesting location (Figure 5). It should be noted that we did not locate the nest of the Long-eared Owls but we observed six individual Long-eared Owls including two adults and four fledglings within a 10m radius.

## Mammals

### Bats

A total of five nights of acoustic recordings were conducted at two sites (Figure 6). From these recordings, we were able to identify a total of five bat species (Table 3). The most frequently detected species was the Western Small-footed Myotis (*Myotis ciliolabrum*), followed by the Little Brown Myotis (*Myotis lucifugus*). Four species, Little Brown Myotis, Western Small-footed Myotis, Hoary Bat (*Lasiurus cinereus*), and Silver-haired Bat (*Lasionycteris noctivagans*), were documented from acoustic recordings alone. While echolocation calls of Hoary Bat are very distinctive, echolocation calls of the remaining species should be viewed with caution as they may overlap with other bat species (Adams 2003). As a result, we are unable to confirm species presence of Little Brown Myotis, Western Small-footed Myotis, and Silver-haired Bat in the Fortification Creek WSA.

A total of three mist-net surveys were conducted (Figure 6). Despite many bats seen flying over ponds, we captured only one bat. The only captured species was Big Brown Bat (*Eptesicus fuscus*) (Table 3). Inspection of the wing and tail membranes of the captured bat did not reveal any signs of White-nose Syndrome (WNS). The only Sensitive bat species documented was the Big Brown Bat, which is listed as SGCN by the WGFDD.

### Small Mammals

We live-trapped two sites (Figure 7) for two nights each resulting in 480 raw trap-nights and 461.5 trap-nights after accounting for closed traps (Beauvais and Buskirk 1999). We captured a total of 24 small mammals representing two species (Table 4). We captured 23 Deer Mice (*Peromyscus maniculatus*) and one Least Chipmunk (*Tamias minimus*). Overall, we had a capture rate of 5.2 captures per 100 trap-nights. Capture rates were much higher at the Little Bull Creek site than at the Bull Creek site with 9.76 and 0.85 captures per 100 trap-nights respectively. It is unclear why we observed this difference in capture rates. Regardless, these rates are very low when compared to other live-trapping conducted across Wyoming. One potential explanation is the high abundance of potential predators of small mammals including raptors and snakes observed within Fortification Creek WSA and in proximity to our live-trapping sites.

### Other Mammals

In addition to mammals detected using targeted surveys for bats and small mammals, we documented several additional mammal species (Table 5) using remote camera (Figure 8) and incidental observations. Elk (*Cervus canadensis*) were abundant and ubiquitous throughout the WSA and were the most common species recorded by remote cameras (Figure 9a, b). We encountered many large and small herds of cows with calves and individual or small groups of bull elk. Mule deer (*Odocoileus hemionus*; Figure 9c, d) and pronghorn (*Antilocapra americana*) also were common in the WSA. Coyotes (*Canis latrans*), woodrats (*Neotoma cinerea*), and cottontail rabbits (*Sylvilagus* sp.) also were detected.

### Reptiles and Amphibians

We detected 4 species of reptiles (1 lizard, 3 snake) in the Fortification Creek WSA (Figure 10; Table 6). The Northern Sagebrush Lizard (*Sceloporus graciosus graciosus*) was the only lizard species detected in the WSA (Figure 11e). This species was detected during rock outcrop surveys. Prairie Rattlesnakes (*Crotalus viridis*) were the most common snake species detected. Rattlesnakes were only detected in

July and were detected both incidentally and during rock outcrop surveys. Incidental detections of rattlesnakes primarily occurred in ephemeral drainage bottoms. We also detected Bullsnares (*Pituophis catenifer sayi*) under rock ledges (Figure 11f) and an Eastern Yellowbellied Racer (*Coluber constrictor flaviventris*) along an ephemeral drainage.

Despite the general lack of permanent water in the Fortification Creek WSA, we detected extremely high densities of tadpoles (Figure 11b) from 2 amphibian species, Rocky Mountain Toads (*Anaxyrus woodhousii*) and Boreal Chorus Frogs (*Pseudacris maculate*; Figure 11c; Table 6). Tadpoles and Tiger Salamander (Figure 11d) (*Ambystoma mavortium*) larvae were detected primarily in June and were found in many isolated pools along Deer Creek, Little Bull Creek, and Bull Creek and in two of the permanent ponds found (Figure 10). We also detected toad tadpoles at one site along Schoolhouse Draw on the southeast side of the WSA. In addition to tadpoles, we detected several adult Rocky Mountain Toads (Figure 11a) incidentally during other field surveys. Although some were found along ephemeral drainages, others were found on ridges and slopes high above drainages.

## Pollinators

We collected 79 taxa of pollinating insects at Fortification Creek WSA (Figure 12; Table 7) and 17 other invertebrates (Table 8). Sampling locations are in Appendix 2A. We collected 1.8 insects/hr in traps; however, we collected far more insects in July (3.1 insects/hr) than June (0.5 insects/hr). Most of the pollinators we collected were bees (69%), but beetles (23%), and butterflies and moths (9%) also were abundant. *Halictus tripartitus* (57% of bees collected) and *Lasioglossum* (subgenus *Dialictus*; 10% of bees collected) were the most abundant bees collected (Figure 13). Blister beetles and long-horned beetles also were abundant in pollinator traps and on flowers. Most of the Lepidoptera we collected were butterflies (94%). The brush-footed butterflies were the most abundant family and *Speyeria callippe* were the most abundant species in the family. Gossamer-wing, white, and sulphur butterflies also were abundant. *Callophrys gryneus*, *Plebejus saepiolus*, and *Colia philodice* were the most common species in these families. *Hyles lineata*, *Sphinx vashti* and *Speyeria atlantis* complex had not previously been collected in the counties. Bees are poorly collected in the state, especially in the northeastern part Wyoming, and our surveys revealed that Fortification Creek WSA has high diversity and abundance of bees.

## Aquatic Invertebrates

We collected at least 43 taxa of aquatic invertebrates in streams and ponds of Fortification Creek WSA (Figure 14). Most taxa were insects from 5 orders (true flies, mayflies, damselflies, beetles and true bugs; Table 9). We also collected crustaceans, annelids and horsehair worms. Few invertebrates were collected in the streams, probably because the streams were drying to small pools when we visited in June (Figures 12 and 15). Conversely, we collected many aquatic invertebrates from ponds within the WSA that appeared to hold water year round. All of the invertebrates that we collected had moderate to high tolerance values (>5). The absence of sensitive taxa from streams and ponds often indicates poor ecosystem quality; however, their absence from water bodies in Fortification Creek WSA likely is the result of harsh, ephemeral conditions in the WSA rather than poor ecosystem quality. Taxa in the orders mayflies, caddisflies and stoneflies are generally considered sensitive and many taxa in these orders do not have strategies to survive drying. Many of the taxa we collected do have survival strategies for drying. For example adult beetles, damselflies and true bugs can disperse and fly to new habitats.

## Plants

A total of 257 vascular plant taxa were observed in the WSA, of which 47 have voucher specimens at RMH (Figure 16). The WSA flora included 221 native species and 36 non-native species (14%; Figure 17; Table 10). They represented 48 families and about 34% of the Campbell County flora. Twelve of the species (noted with an asterisk in Table 10) were not previously known in the Campbell County flora.

We discovered sprangle-top (*Scolochloa festuacea*), which is a Wyoming species of concern. The plant is a wetland species that is widespread in the northern Great Plains, but the only two previously known occurrences for Wyoming were in Yellowstone National Park, where it might be introduced. This finding highlights the value of inventorying WSA's across the state for rare species collectively despite what little information they have regarding biological resources. Sprangle-top typically occupies habitats that are at least seasonally inundated; in the Great Plains it occupies "potholes, ditches, sloughs, marshes, ponds and wet meadows, often in standing water" (Great Plains Flora Association 1986). There was surprisingly little of such habitat in valley bottoms in the WSA. Sprangle-top might be associated with prairie cordgrass (*Spartina pectinata*), the only other tall grass found in the WSA valley bottoms. Despite our discovery, timing might not have been ideal for surveying *Scolochloa festuacea*. The grass is extremely tall and matures late in the growing season. The only other grass of similar stature was prairie cordgrass, which was beginning to head out during our July fieldwork. Additional details about *Scolochloa festuacea* are in the state species abstract (Appendix 2B). The WSA supports other species that had some limits to geographic distribution or were once considered rare, including contracted Indian ricegrass (*Achnatherum contractum*; syn. *Oryzopsis contracta*) which had its center of distribution in Wyoming (Fertig 1994), and *Physaria brassicoides* with its center of distribution in the western Great Plains from Nebraska to North Dakota and was more common in Wyoming than the other states.

The state plants of concern that seemed most likely to be present in the broken landscape were *Astragalus barrii* and *Physaria lanata*. However, only the widespread plains species of milkvetches and twinpods were found in surveys, including *Astragalus gilviflorus*, *Physaria brassicoides* and *P. acutifolia*. The timing of fieldwork was suited for identifying all eight of the target species, and they appeared absent from the WSA.

Three non-native annuals were ubiquitous and abundant throughout the uplands including cheatgrass (*Bromus tectorum*), Japanese brome (*B. japonicus*), and desert alyssum (*Alyssum desertorum*; Table 9). These plants have different phenology but are equally pervasive and tend to overlap in distribution with one another. Additionally, hairy false flax (*Camelina microcarpa*) was common on all sparsely-vegetated slopes. We observed several noxious weeds including Canada thistle (*Cirsium arvense*; occasional), musk thistle (*Carduus nutans*; rare), absinthium (*Artemisia absinthium*; rare) and tamarisk (*Tamarisk chinensis*; rare).

We observed that biological soil crusts were scant and mostly restricted to isolated ridgetops, and that the mossy groundcover often associated with juniper woodlands was almost absent (Figure 2f). Five bryophyte species were collected from one juniper woodland stand and Yelena Kosovich-Anderson identified these specimens. They included one species that has not been recognized as part of the state flora for Wyoming (*Syntrichia papillosissima*; Mishler 2007) although it was previously collected twice in Park County. *Syntrichia papillosissima* is a species of western North America, more typical of the Great Basin (Mishler 2007), and though not a state record our observation is among the easternmost records for this species. We also collected four low-growing, mat-forming bryophytes (*S. ruralis*, *Brachythecium albicans*, *B. collinum* and *Hypnum revolutum* var. *revolutum*), most of which are common in Wyoming (Kosovich-Anderson, personal communication). Specimens were deposited at RMH. There is not yet a list of bryophyte species of concern but a checklist of bryophytes in the state was compiled by Patricia Eckel in 2007. The state bryophyte flora is being expanded and revised through the research and

inventory of a bryologist in collaboration with WYNDD. Bryophyte records from this study will contribute to this effort.

## Riparian Assessments

We assessed the riparian habitat of Deer Creek, Little Bull Creek and Bull Creek (Appendix 2C). The landscape of Fortification Creek WSA is erosional. The soils in the drainages are composed of fine sediments and the streams reflected this. The soils had sloughed into the streams channel in several locations including a large landslide in the Bull Creek drainage. The stream channels were incised in some locations. Riparian vegetation was dominated by grasses and sagebrush. Cheatgrass dominated the riparian vegetation in the many areas. The streams are ephemeral and were a series of pools when we visited.

## Conclusion

The Fortification Creek WSA is a relatively pristine and undisturbed island in the prairie-breaks of the Powder River Basin. The rugged terrain and difficult access have protected the WSA from regular human use, but also have prevented detailed scientific investigation into the area's biodiversity. The biological inventory conducted during this study, though not exhaustive, was the first of its kind in the Fortification Creek WSA. Results of our survey not only provide data on numerous taxa never documented in the area, but also baseline monitoring data collected in a repeatable framework should the BLM have the resources and desire to continue monitoring various taxa in the WSA.

We documented 473 taxa in the Fortification Creek WSA during our visits. Seventy-two of these taxa were vertebrates, 262 taxa were plants, and 139 taxa were invertebrates. We surveyed the different habitat types within the WSA to record the diversity of life occupying the area. Several interesting discoveries were made, including finding *Scolochloa festuacea*, the observation of numerous singing Field Sparrows, a new beetle for the state a Wyoming, and the amazing abundance of pollinators in the area. All these observations will be added to the WYNDD database and used to update range maps for use by land managers.

The discovery of a rare wetland species in a landscape with little wetland habitat indicated that these habitats are under-surveyed and that isolated populations can disperse and persist. The distribution of *Scolochloa festuacea* may be more limited by the availability of habitat than by the habitat quality. The discovery of sprangle-top in the Powder River Basin fills a large and perplexing gap in our understanding of its distribution. Furthermore, the local abundance of mountain big sagebrush in the Powder River Basin has not been previously reported, and there is only one prior collection of this taxon from Campbell County. These observations support the uniqueness and overall ecological significance of the WSA.

The Fortification Creek WSA harbors an enormous abundance of pollinator species. We collected 79 taxa of pollinators alone. Pollinators were especially abundant in July when we collected 3.1 insect/hr. Pollinators were much more abundant at Fortification Creek WSA compared to Gardner Mountain WSA where we collected 0.33 insects/hour the previous year; however, we collected a similar diversity of pollinators in each WSA. These pollinators help maintain the flowering plant populations that grow on the WSA. We know little about the pollinator assemblages in northeastern Wyoming and the information is an excellent step to more fully describing the insects of Wyoming.



## Acknowledgements

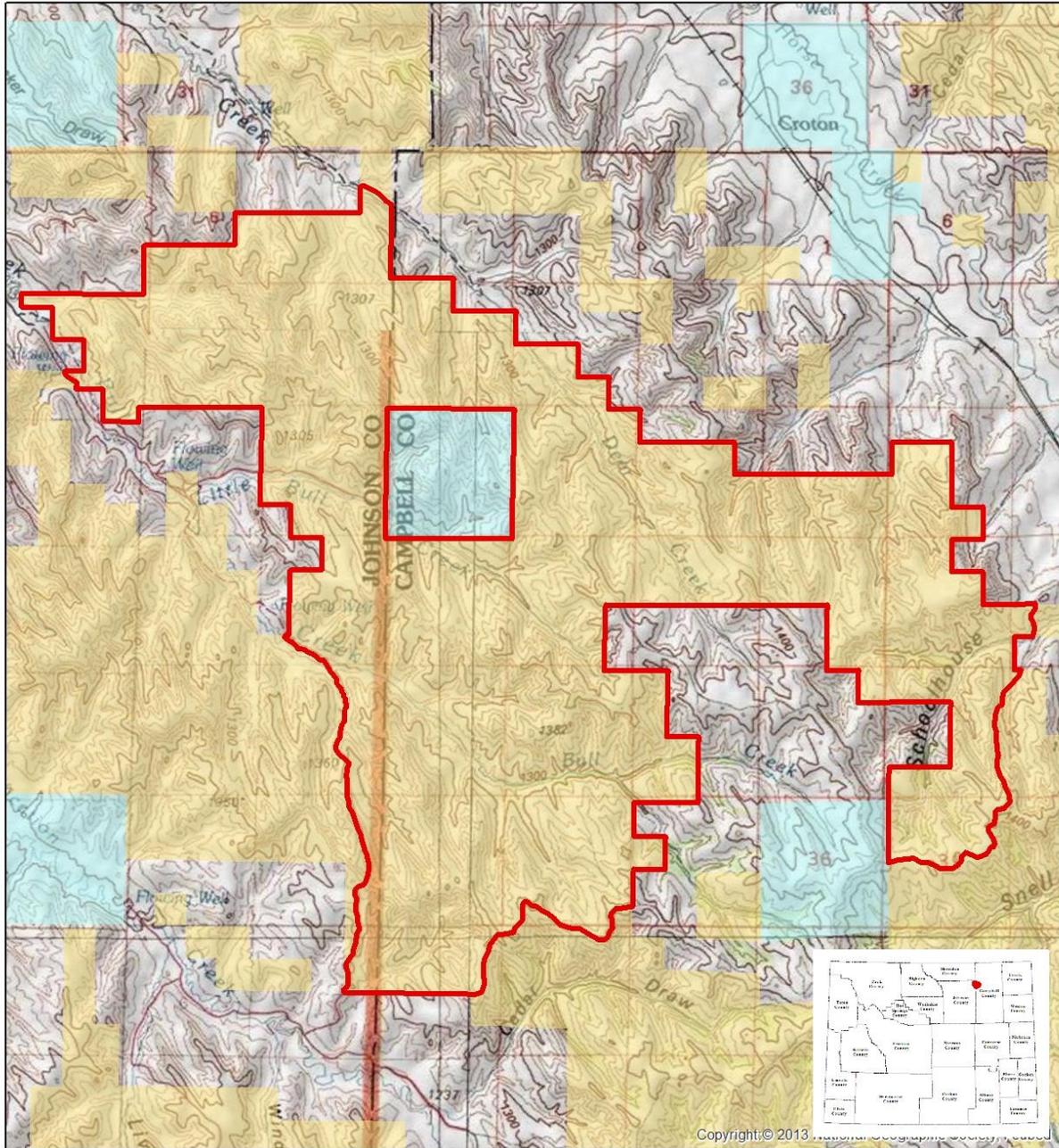
We sincerely thank the NLCS Research Support Program for funding this project. Dennis Saville, Allison Ginn, Bill Ostheimer, Sherry Lahti, and a number of other Wyoming BLM personnel were integral in obtaining support and access for this project, as well as organizing logistics. We sincerely thank the Floyd and Hollcroft Ranches for allowing us access through their land to the WSA. Chris Sheets, Justin Chappelle, and Scott Jawors (BLM) were invaluable help in the field. We are grateful to Christy Bell, Delina Dority, and Hunter McFarland of WYNDD for help processing and identifying invertebrates. We appreciate the expertise of Yelena Kosovich-Anderson in providing bryophyte determinations. The resources of the Rocky Mountain Herbarium, including both on-line resources and herbarium resources, are acknowledged with gratitude. Lastly, we thank WYNDD ecologist George Jones for classifying the vegetation types that occur in the Fortification Creek WSA.

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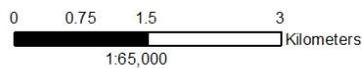
# Figures



**Figure 1.** Map of the Fortification Creek Wilderness Study Area in Wyoming.

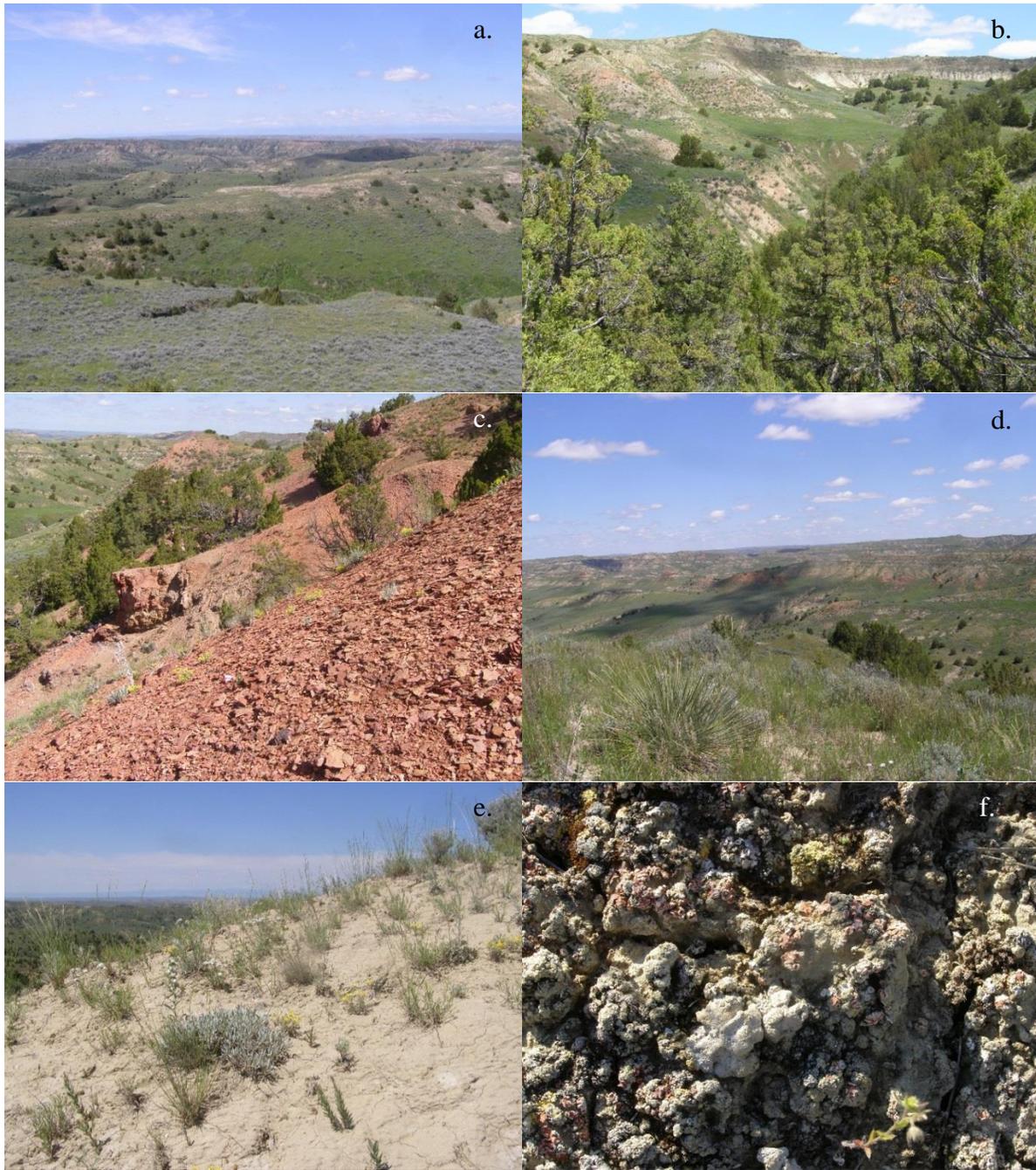
**Legend**

- Fortification Creek WSA
- Bureau of Land Management
- Private
- State

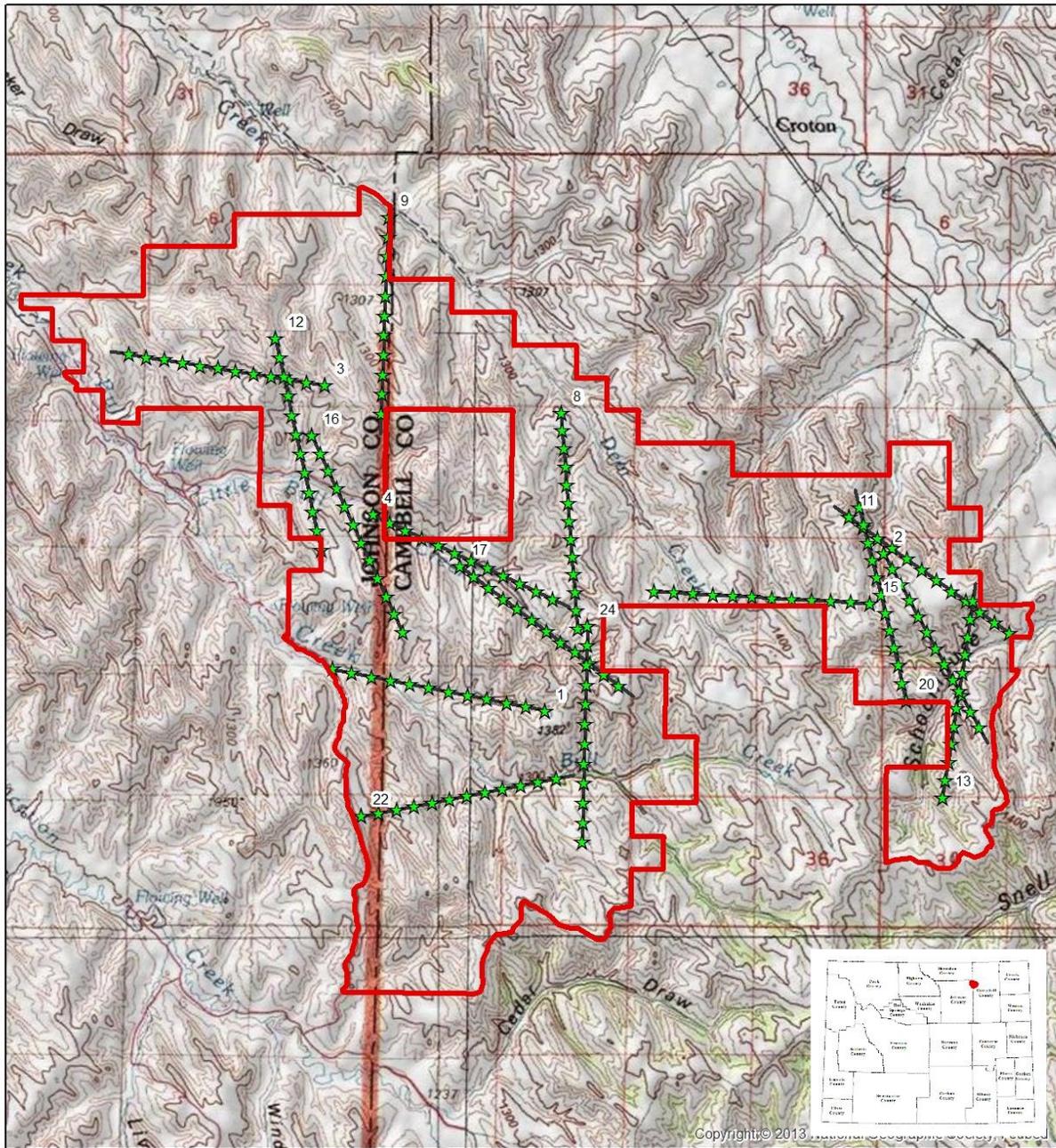




**Figure 2.** Photo of a vane trap (top portion) and bee cups (bottom portion) used to collect pollinators (a, b). We collected aquatic invertebrates using a D-frame dipnet in streams and ponds (c, d, e). We captured pollinators and other insects using a sweep net (f).



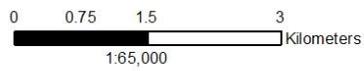
**Figure 3.** Well-vegetated sagebrush steppe, looking west (a.), juniper woodlands on north slopes (b), baked siltstone (clinker) is erosion-resistant (c), most outcrops are on south aspects, looking north (d), sparse ridgetops have relatively high local diversity (e), and biological soil crusts are on isolated ridgetops (f).

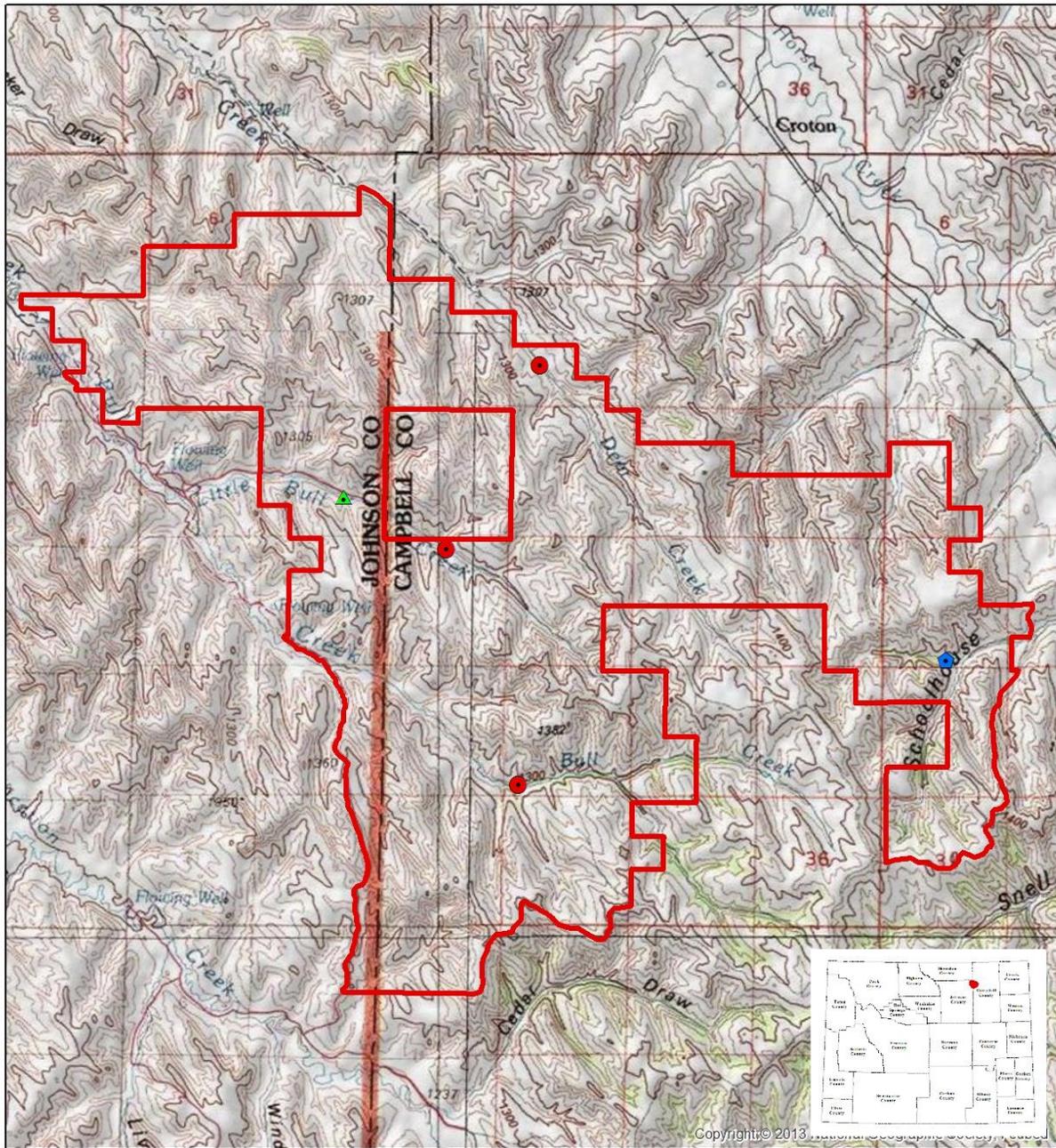


**Figure 4.** Locations of songbird point count transects surveyed in 2014 in the Fortification Creek WSA.

**Legend**

- Fortification Creek WSA
- ★ Point Count Transects

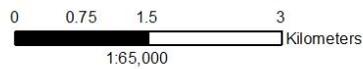


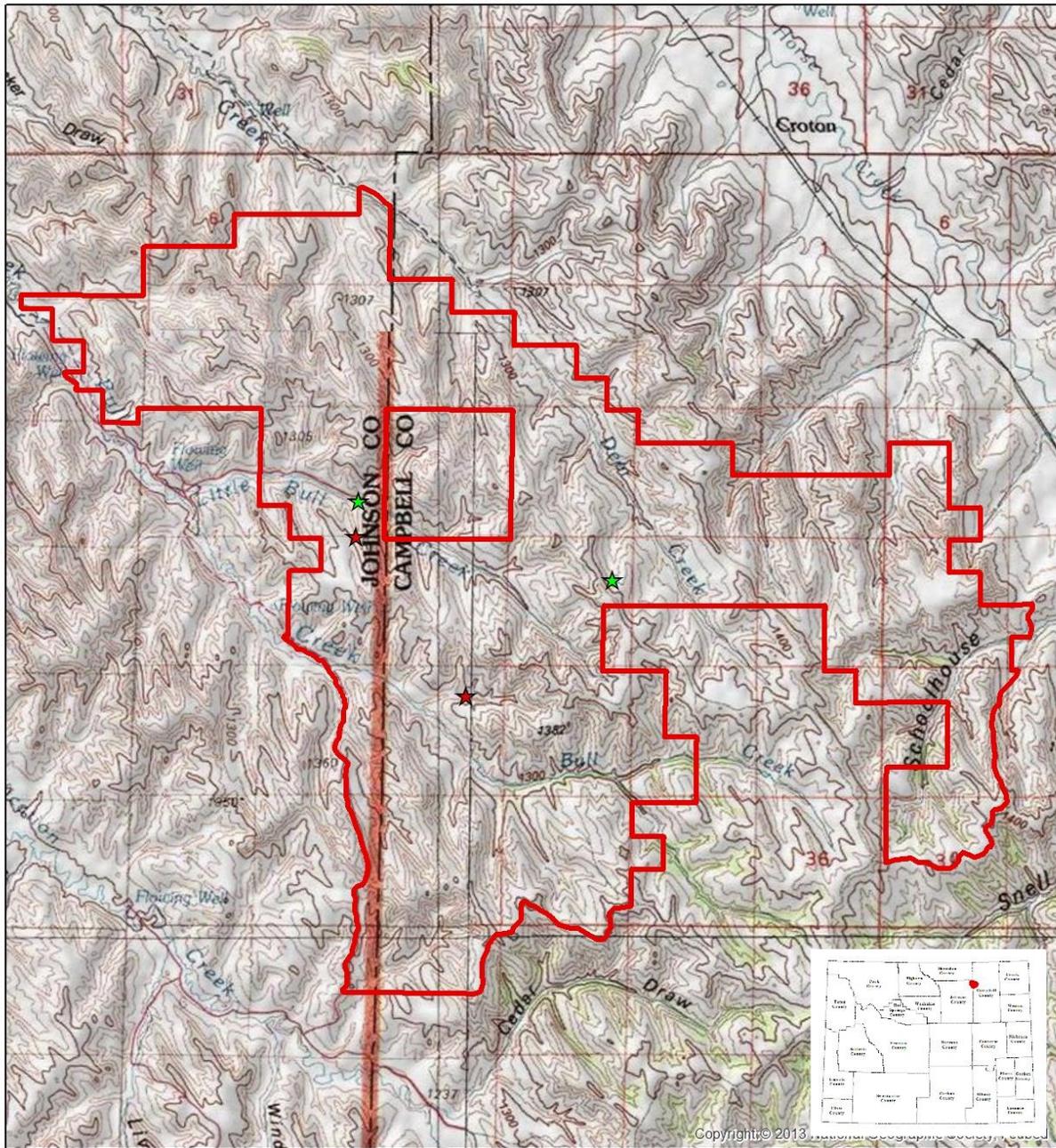


**Figure 5.** Locations of raptor nests located in 2014 within Fortification Creek WSA.

**Legend**

- Fortification Creek WSA
- ◆ Great-horned Owl Nest
- ▲ Long-Eared Owl Nest
- Red-tailed Hawk Nest





**Figure 6.** Locations of acoustic and mist net surveys for bats in the Fortification Creek WSA in 2014.

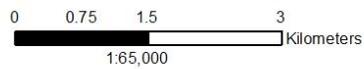
**Legend**

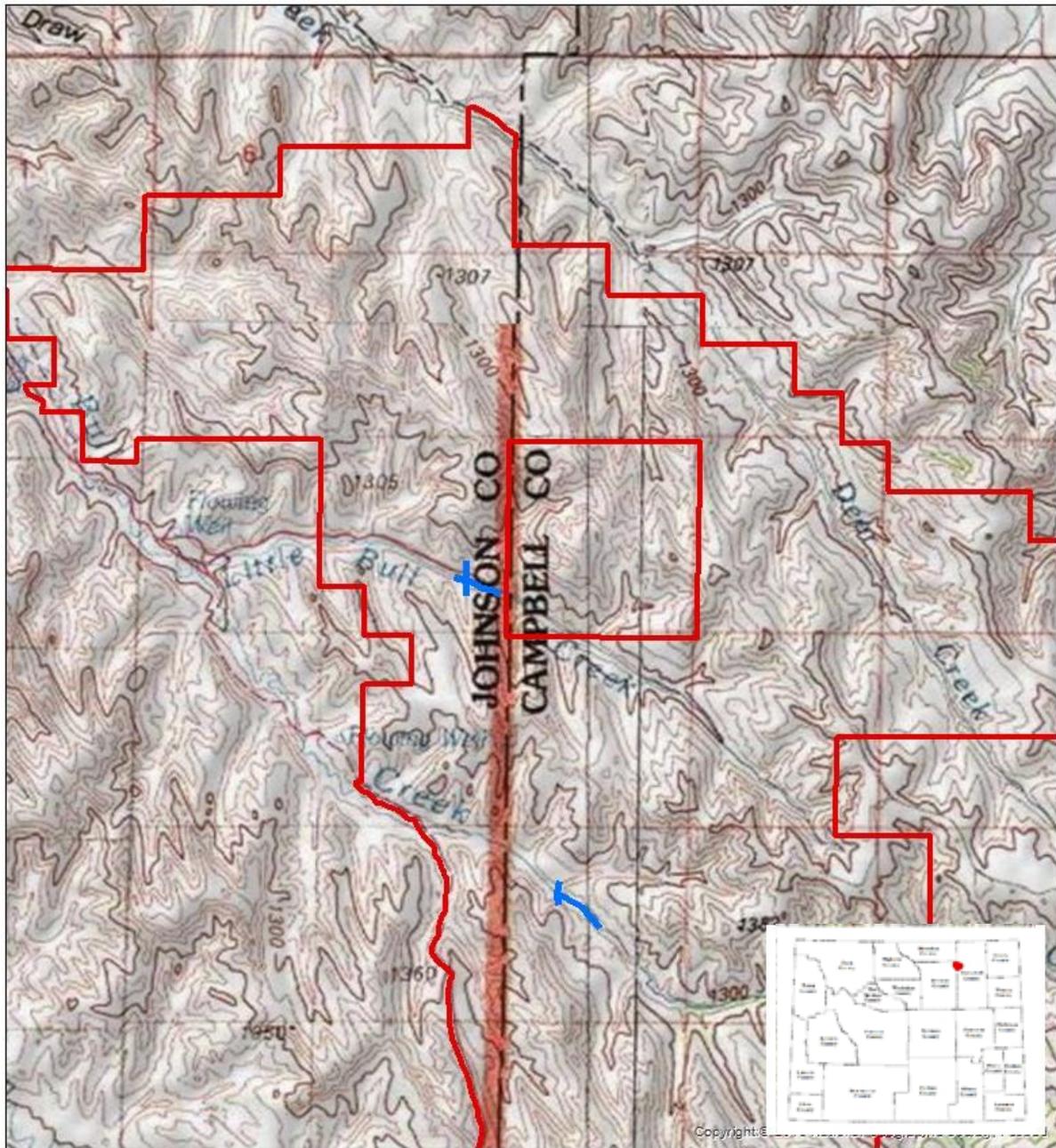
Fortification Creek WSA

**Survey Type**

★ Acoustic

★ Mistnet

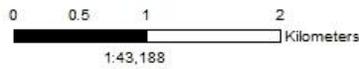


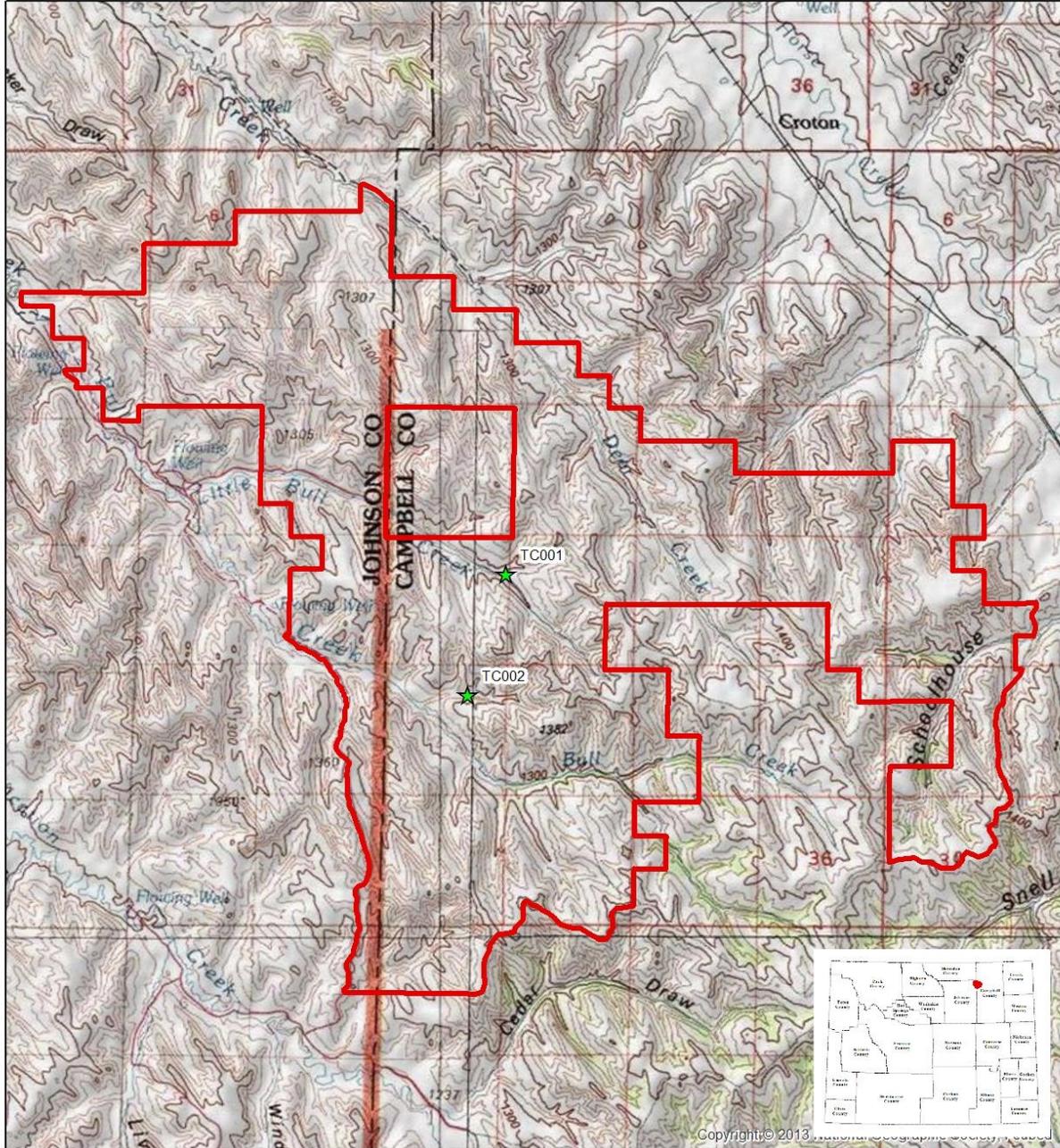


**Figure 7.** Locations of small mammal live-trapping transects in the Fortification Creek WSA in 2014.

**Legend**

- Small Mammal Transect
- Fortification Creek WSA

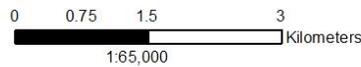




**Figure 8.** Locations of remote wildlife trail cameras set for approximately 30 days from June to July, 2014 in the Fortification Creek WSA.

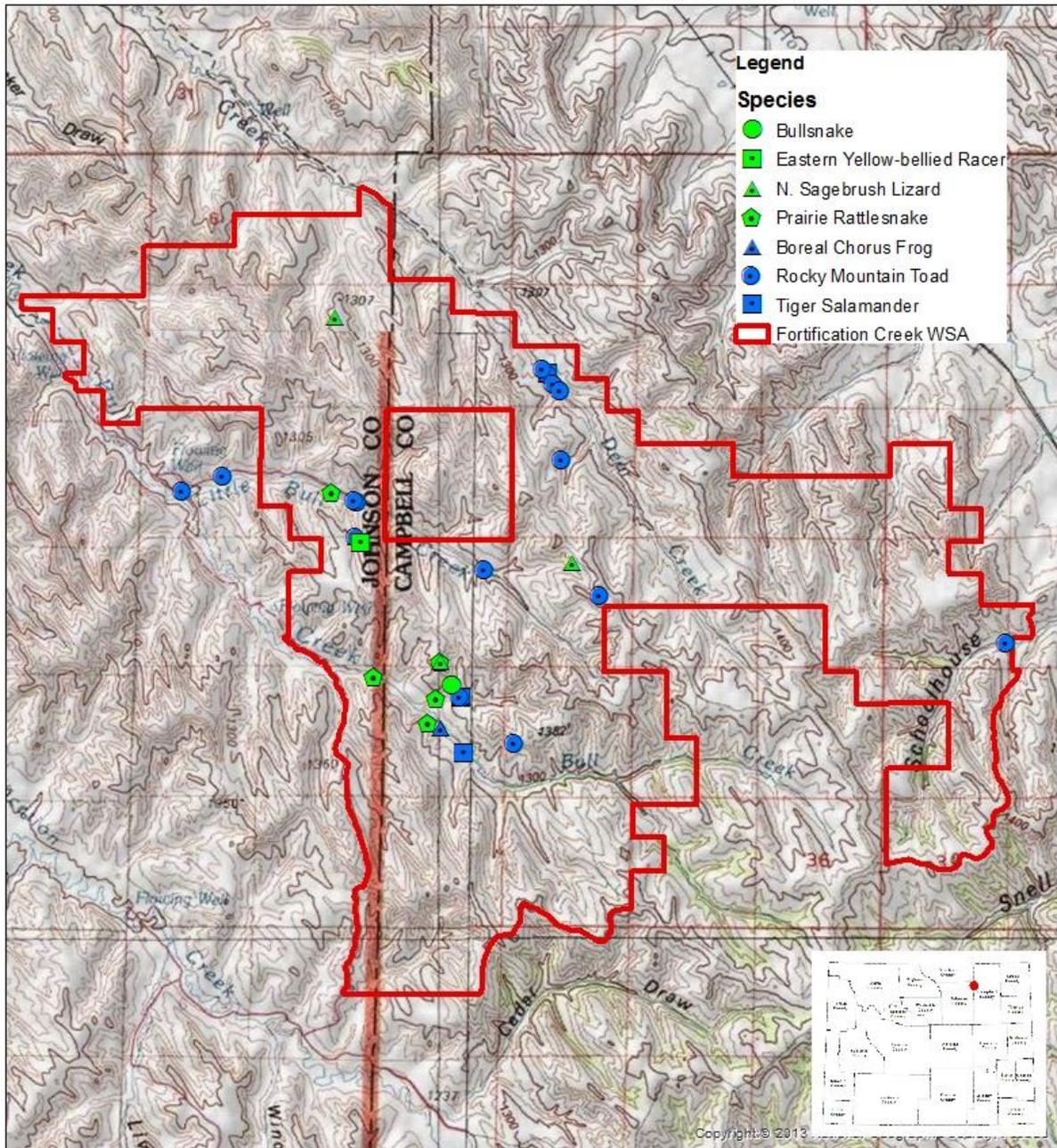
**Legend**

- Fortification Creek WSA
- ★ Trail Camera

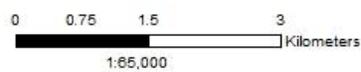




**Figure 9.** Trail camera photos documenting elk (*Cervus canadensis*) (a,b) and mule deer (*Odocoileus hemionus*) (c,d) in the Fortification Creek WSA in 2014.

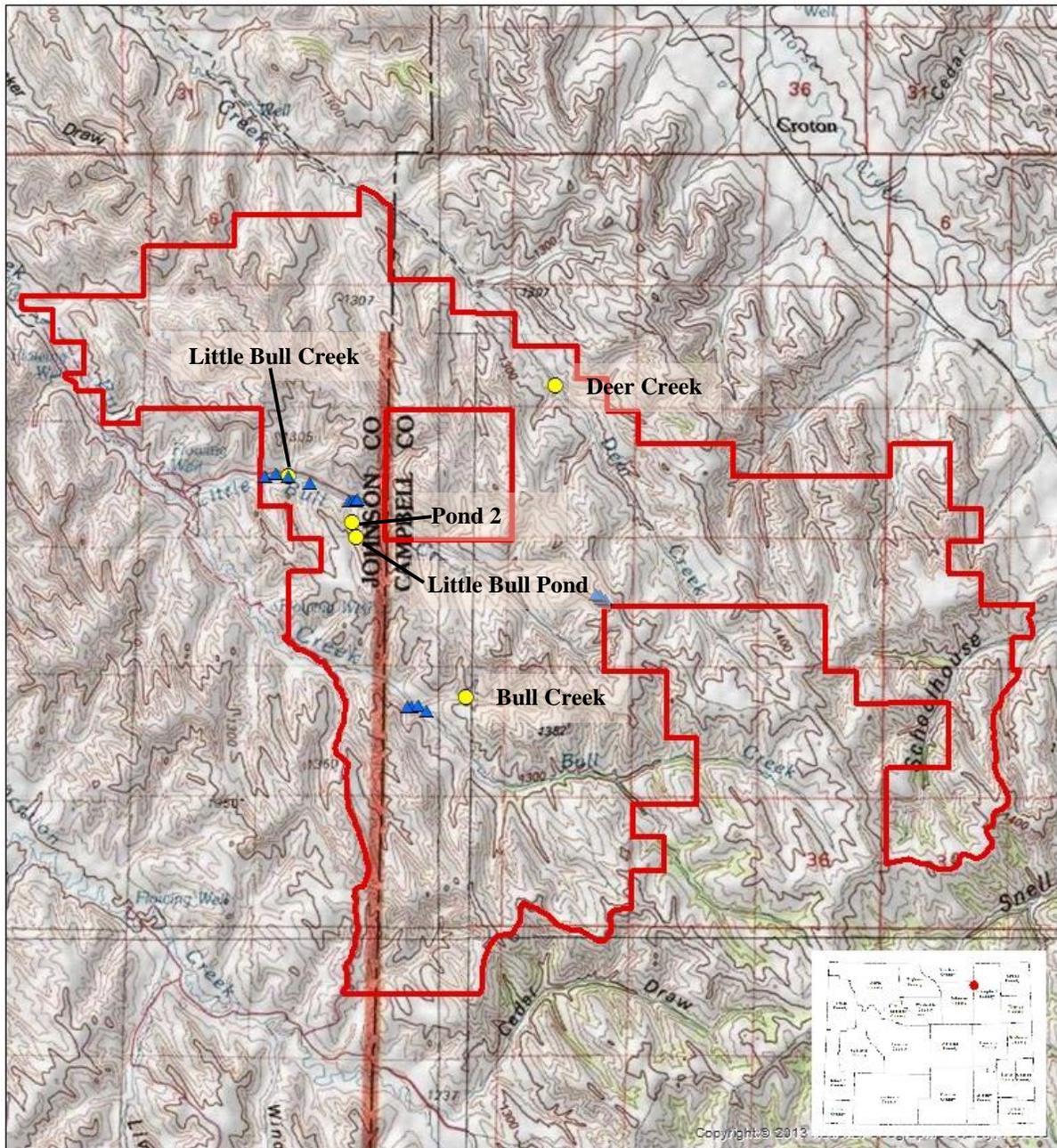


**Figure 10.** Locations of all reptile and amphibians detected in June and July, 2014, in the Fortification Creek WSA.





**Figure 11.** Example of reptiles and amphibian species detected at Fortification Creek WSA in June and July 2014. Species included a) Rocky Mountain Toad (adult), b) Rocky Mountain Toad (tadpole), c) Boreal Chorus Frog, d) Tiger Salamander (larva), e) Northern Sagebrush Lizard, and f) Bullsnake.

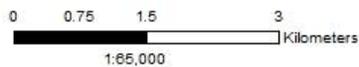


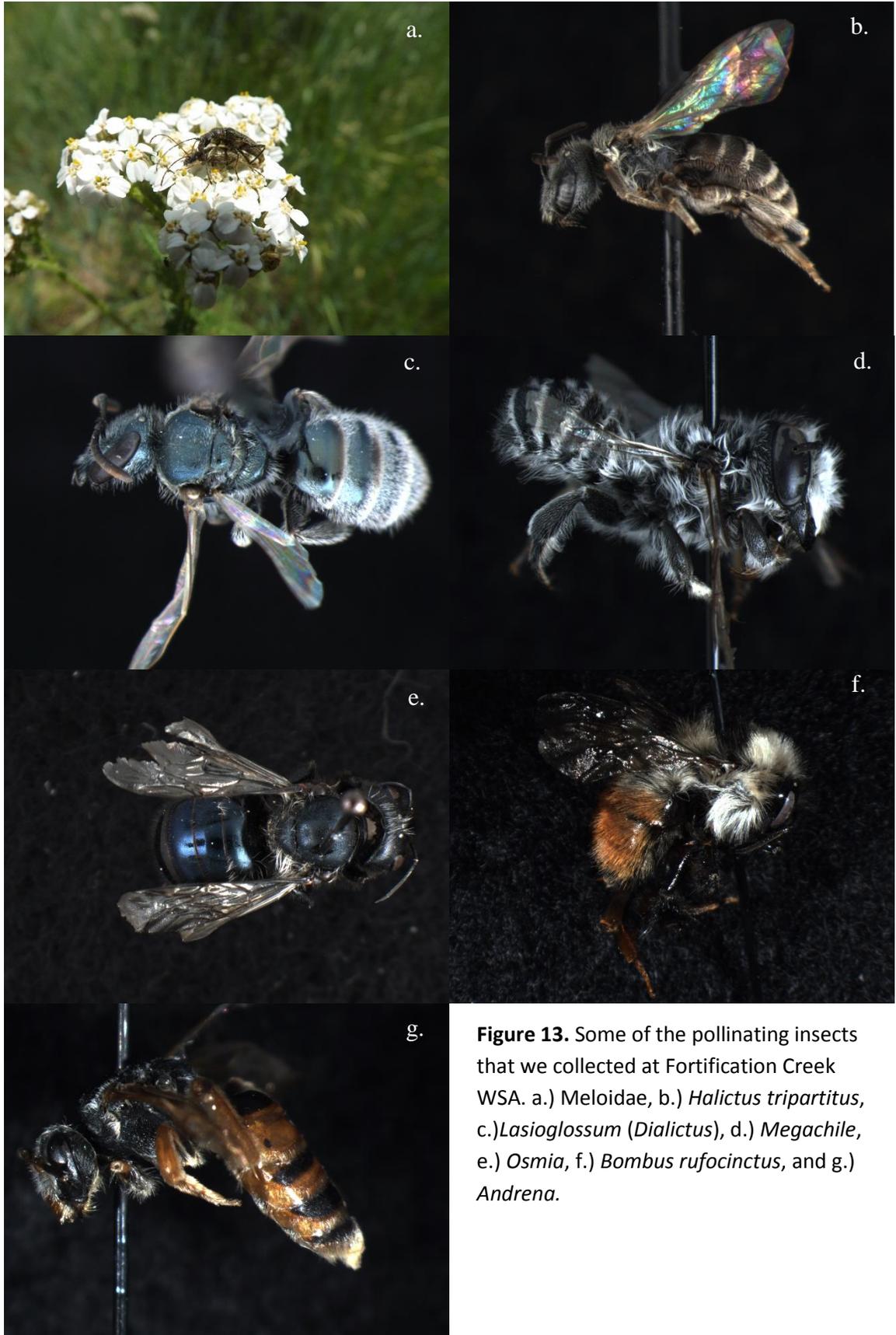
**Figure 12.** Map of aquatic invertebrate and pollinator sampling points in the Fortification Creek WSA.

**Legend**

**Type**

- Aquatic
- ▲ Pollinator
- Fortification Creek WSA





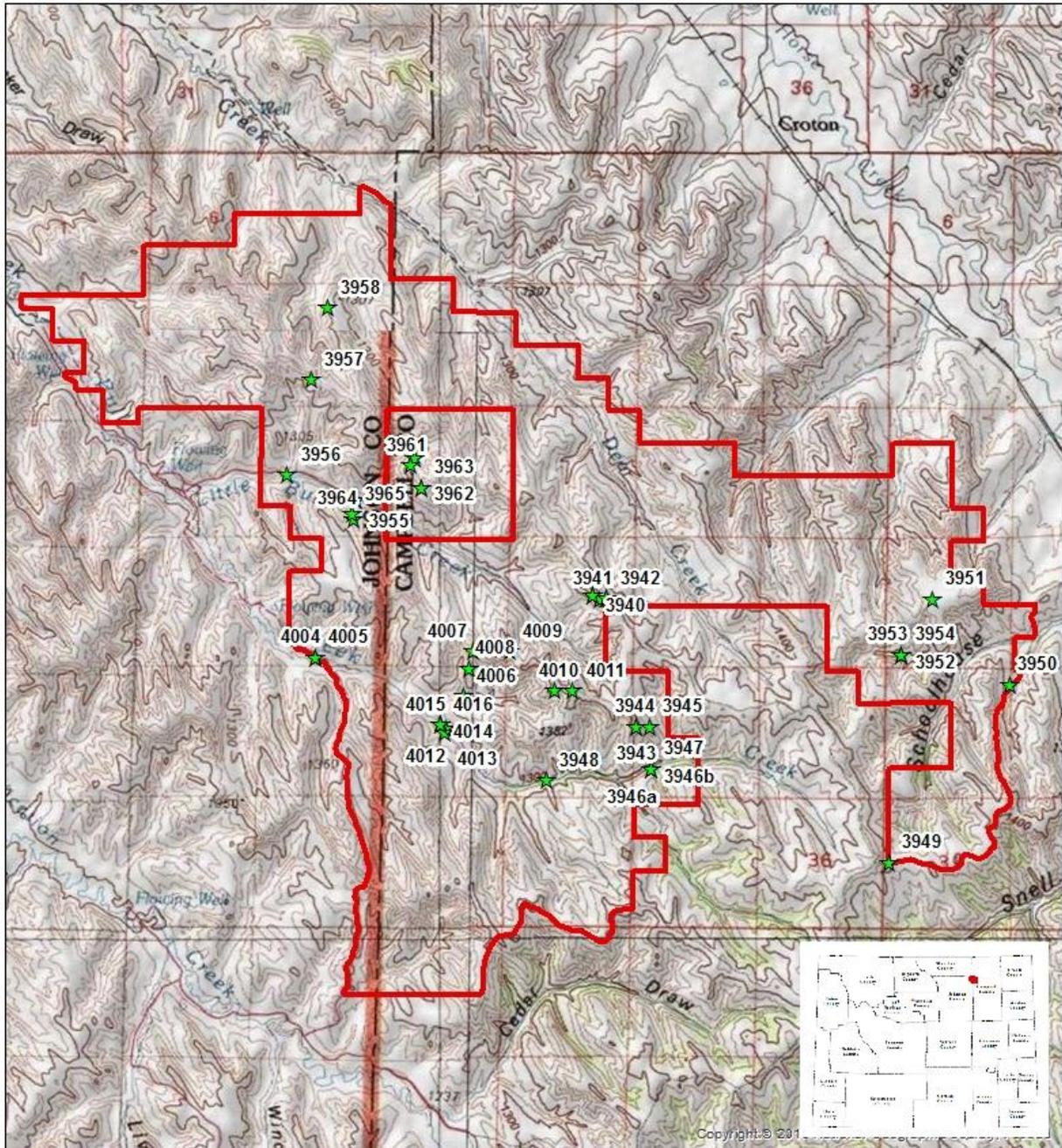
**Figure 13.** Some of the pollinating insects that we collected at Fortification Creek WSA. a.) Meloidae, b.) *Halictus tripartitus*, c.) *Lasioglossum (Dialictus)*, d.) *Megachile*, e.) *Osmia*, f.) *Bombus rufocinctus*, and g.) *Andrena*.



**Figure 14.** We collected at least 42 taxa of aquatic invertebrates including a.) *Agabus*, b.) *Berosus*, c.) *Callibaetis*, d.) *Chaoborus*, e.) *Coptotomus*, f.) *Haliphus fulvus*, g.) *Trepobates* and f.) *Hygrotus acaroides* (new state record).



**Figure 15.** Deer Creek (a), Little Bull Creek (b), manmade pond in the Little Bull Creek drainage (c), small pond with emergent vegetation below the manmade pond (d) and a landslide formed a pond in the Bull Creek drainage (d).



**Figure 16.** Map of plant collection locations with plant collection number for all plants submitted to the Rocky Mountain Herbarium collection. Map does not reflect the full scope of locations surveys and plants identified in the Fortification Creek WSA during this study.

**Legend**

- ★ Plant Collection Number
- Fortification Creek WSA

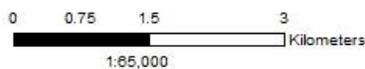




Figure 17. a) Mountain big sagebrush, prevalent on butte tops. b) Green needlegrass, a ubiquitous mesic grass. c) Smoothstem blazing star, one of four blazing stars present. d) Old-growth Rocky Mountain juniper. e) Desert prince's-plume is a magnet for pollinators. f) Petrified wood marks vegetation of earlier eras.

## Tables

**Table 1.** Bold type-face shows the two general vegetation types from Fortification Creek WSA. Below each general vegetation type are shown the types from first six levels of the National Vegetation Classification. These national classification types were assigned based on information obtained January 31, 2014 from: The U.S. National Vegetation Classification Hierarchy Explorer (<http://usnvc.org/explore-classification/>).

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## **UPLAND RIDGES AND SLOPES**

### **A. Steppe Vegetation of Sagebrushes and Wheatgrass on Ridges and Mesas**

1. Mesas and flat ridge tops with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and thickspike wheatgrass (*Elymus lanceolatus*)

*CLASS:* 3 - Xeromorphic Woodland, Scrub & Herb Vegetation Class

*SUBCLASS:* 3.B - Cool Semi-Desert Scrub & Grassland Subclass

*FORMATION:* 3.B.1 - Cool Semi-Desert Scrub & Grassland Formation

*DIVISION:* 3.B.1.Ne - Western North American Cool Semi-Desert Scrub & Grassland Division

*MACROGROUP:* M169 - Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup

*GROUP:* G304 - *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* spp. *vaseyana* - *Artemisia cana* ssp. *viscidula* Tall Shrubland & Steppe Group

2. Ridge tops and slopes with Wyoming big sagebrush (*A. t.* ssp. *wyomingensis*) and bluebunch wheatgrass (*E. spicatus*) or thickspike wheatgrass (*E. lanceolatus*)

*CLASS:* 3 - Xeromorphic Woodland, Scrub & Herb Vegetation Class

*SUBCLASS:* 3.B - Cool Semi-Desert Scrub & Grassland Subclass

*FORMATION:* 3.B.1 - Cool Semi-Desert Scrub & Grassland Formation

*DIVISION:* 3.B.1.Ne - Western North American Cool Semi-Desert Scrub & Grassland Division

*MACROGROUP:* M169 - Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup

*GROUP:* G302 - *Artemisia tridentata* - *Artemisia tripartita* - *Purshia tridentata* Big Sagebrush Steppe Group

### **B. Grass Vegetation On Sandy Slopes & Ridge Crests**

*CLASS:* 2 - Mesomorphic Shrub & Herb Vegetation Class

*SUBCLASS:* 2.B - Temperate & Boreal Grassland & Shrubland Subclass

*FORMATION:* 2.B.2 - Temperate Grassland, Meadow & Shrubland Formation

*DIVISION:* 2.B.2.Na - Western North American Grassland & Shrubland Division

*MACROGROUP:* M048 - Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup

*GROUP:* G273 - *Festuca campestris* - *Festuca Idahoensis* - *Pseudoroegneria spicata* Central Rocky Mountain Foothill Grassland Group

### **C. Rocky Mountain Juniper (*Juniperus scopulorum*) Woodlands On North-Facing Slopes and In Draws**

*CLASS:* 1 - Mesomorphic Tree Vegetation Class

*SUBCLASS:* 1.B - Temperate & Boreal Forest Subclass

**FORMATION:** 1.B.2 - Cool Temperate Forest Formation  
**DIVISION:** 1.B.2.Nb - Rocky Mountain Cool Temperate Forest Division  
**MACROGROUP:** M501 - Central Rocky Mountain Dry Lower Montane-Foothill Forest  
Macrogroup  
**GROUP:** G209 - *Pinus flexilis* - *Juniperus scopulorum* Rocky Mountain Foothill Woodland  
Group

## **VALLEY BOTTOMS**

### A. Valley Bottoms of Western Wheatgrass (*Pascopyrum smithii*)

**CLASS:** 2 - Mesomorphic Shrub & Herb Vegetation Class

**SUBCLASS:** 2.B - Temperate & Boreal Grassland & Shrubland Subclass

**FORMATION:** 2.B.6 - Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland  
Formation

**DIVISION:** 2.B.6.Na - *Alnus* spp. / *Typha* spp. - *Carex* spp. Eastern North American Freshwater  
Wet Meadow, Riparian & Marsh Division

**MACROGROUP:** M071 - Great Plains Wet Meadow & Marsh Macrogroup

**GROUP:** G337 - *Cornus* spp. - *Prunus virginiana* / *Pascopyrum smithii* Great Plains Shrub &  
Herb Riparian Group

### B. Narrow Riparian Fringe

**CLASS:** 2 - Mesomorphic Shrub & Herb Vegetation Class

**SUBCLASS:** 2.B - Temperate & Boreal Grassland & Shrubland Subclass

**FORMATION:** 2.B.6 - Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland  
Formation

**DIVISION:** 2.B.6.Na - *Alnus* spp. / *Typha* spp. - *Carex* spp. Eastern North American Freshwater  
Wet Meadow, Riparian & Marsh Division

**MACROGROUP:** M071 - Great Plains Wet Meadow & Marsh Macrogroup

**GROUP:** G336 - *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Great Plains Wet  
Prairie & Wet Meadow Group

**Table 2.** All birds detected in 2014 during formal point count surveys as well as opportunistic sightings in the Fortification Creek WSA, Wyoming.

<b>Common Name</b>	<b>Scientific Name</b>	<b>Detections</b>
American Crow	<i>Corvus brachyrhynchos</i>	1
American Goldfinch	<i>Spinus tristis</i>	38
American Kestrel	<i>Falco sparverius</i>	7
American Robin	<i>Turdus migratorius</i>	94
Black-billed Magpie	<i>Pica hudsonia</i>	23
Black-capped Chickadee	<i>Poecile atricapillus</i>	36
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	7
Brown-headed Cowbird	<i>Molothrus ater</i>	93
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	2
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	22
Brewer's Sparrow	<i>Spizella breweri</i>	100
Bullock's Oriole	<i>Icterus bullockii</i>	1
Cedar Waxwing	<i>Bombycilla cedrorum</i>	5
Chipping Sparrow	<i>Spizella passerina</i>	80
Common Grackle	<i>Quiscalus quiscula</i>	5
Common Nighthawk	<i>Chordeiles minor</i>	1
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	1
Dusky Flycatcher	<i>Empidonax oberholseri</i>	2
Eastern Kingbird	<i>Tyrannus tyrannus</i>	1
Field Sparrow	<i>Spizella pusilla</i>	60
Golden Eagle	<i>Aquila chrysaetos</i>	1
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	4
Great Horned Owl	<i>Bubo virginianus</i>	4
Green-tailed Towhee	<i>Pipilo chlorurus</i>	3
House Wren	<i>Troglodytes aedon</i>	65
Lark Sparrow	<i>Chondestes grammacus</i>	19
Lazuli Bunting	<i>Passerina amoena</i>	25
Long-eared Owl	<i>Asio otus</i>	5
Mountain Bluebird	<i>Sialia currucoides</i>	58
Mourning Dove	<i>Zenaida macroura</i>	50
Northern Flicker	<i>Colaptes auratus</i>	1
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	4
Pine Siskin	<i>Spinus pinus</i>	1
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	3
Rock Wren	<i>Salpinctes obsoletus</i>	64
Red-tailed Hawk	<i>Buteo jamaicensis</i>	16
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	4
Say's Phoebe	<i>Sayornis saya</i>	22

<b>Common Name</b>	<b>Scientific Name</b>	<b>Detections</b>
Sage Thrasher	<i>Oreoscoptes montanus</i>	3
Sharp-shinned Hawk	<i>Accipiter striatus</i>	1
Spotted Towhee	<i>Pipilo maculatus</i>	232
Tree Swallow	<i>Tachycineta bicolor</i>	2
Vesper Sparrow	<i>Pooecetes gramineus</i>	84
Violet-green Swallow	<i>Tachycineta thalassina</i>	4
Western Kingbird	<i>Tyrannus verticalis</i>	2
Western Meadowlark	<i>Sturnella neglecta</i>	114
Western Tanager	<i>Piranga ludoviciana</i>	1
Western Wood-Pewee	<i>Contopus sordidulus</i>	11
Yellow-breasted Chat	<i>Icteria virens</i>	2
Yellow Warbler	<i>Setophaga petechia</i>	13
Yellow-rumped Warbler	<i>Setophaga coronata</i>	24

**Table 3.** Number of mist-net captures and acoustic recordings for bat species in the Fortification Creek WSA in 2014.

<b>Common Name</b>	<b>Scientific Name</b>	<b>Mist-net Captures</b>	<b>Acoustic Recordings</b>
<b>Big Brown Bat</b>	<i>Eptesicus fuscus</i>	1	1
<b>Hoary Bat</b>	<i>Lasiurus cinereus</i>	0	7
<b>Western Small-footed Myotis</b>	<i>Myotis ciliolabrum</i>	0	133
<b>Little Brown Myotis</b>	<i>Myotis lucifugus</i>	0	12
<b>Silver-haired Bat</b>	<i>Lasionycteris noctivagans</i>	0	11
<b>Total</b>	<b>5</b>	<b>1</b>	<b>164</b>

**Table 4.** Small mammal captures in the Fortification Creek WSA in 2014.

<b>Common Name</b>	<b>Scientific Name</b>	<b>Sex</b>	<b>Age</b>	<b>Reproductive Status*</b>	<b>Site</b>
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	D	Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	N	Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	P	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	D	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	D	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	PL	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Juvenile	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	P	Little Bull Creek
Least Chipmunk	<i>Tamias minimus</i>	Male	Adult	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Juvenile	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Juvenile	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Juvenile	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Juvenile	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	P	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	PL	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	P	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	D	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	N	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Female	Adult	PL	Little Bull Creek
Deer Mouse	<i>Peromyscus maniculatus</i>	Male	Adult	N	Little Bull Creek

\*D=Descended Testis, N=Non-reproductive, P=Pregnant, PL-Post Lactating

**Table 5.** All mammal species detected in the Fortification Creek WSA in June and July 2014. Detections included visual detections as well as species-specific sign (e.g., scat, nests, etc.).

<b>Common Name</b>	<b>Scientific Name</b>	<b>How detected</b>
<b>Big Brown Bat</b>	<i>Eptesicus fuscus</i>	Visual, Acoustic
<b>Hoary Bat</b>	<i>Lasiurus cinereus</i>	Acoustic
<b>Western Small-footed Myotis</b>	<i>Myotis ciliolabrum</i>	Acoustic
<b>Little Brown Myotis</b>	<i>Myotis lucifugus</i>	Acoustic
<b>Silver-haired Bat</b>	<i>Lasionycteris noctivagans</i>	Acoustic
<b>Least Chipmunk</b>	<i>Tamias minimus</i>	Visual
<b>Deer Mouse</b>	<i>Peromyscus maniculatus</i>	Visual
<b>Bushy-tailed Woodrat</b>	<i>Neotoma cinerea</i>	Visual, Sign (nests)
<b>Cottontail</b>	<i>Sylvilagus sp.</i>	Scat
<b>Coyote</b>	<i>Canis latrans</i>	Visual
<b>Bobcat</b>	<i>Lynx rufus</i>	Track
<b>Elk</b>	<i>Cervus canadensis</i>	Visual, Remote Camera
<b>Mule Deer</b>	<i>Odocoileus hemionus</i>	Visual, Remote Camera
<b>Pronghorn</b>	<i>Antilocapra americana</i>	Visual

**Table 6.** Reptiles and amphibians detected in the Fortification Creek WSA in June and July 2014.

<b>Common Name</b>	<b>Scientific Name</b>	<b>Lifestage</b>
<b><i>Reptiles</i></b>		
<b>Northern Sagebrush Lizard</b>	<i>Sceloporus graciosus graciosus</i>	Adult
<b>Bullsnake</b>	<i>Pituophis catenifer sayi</i>	Adult
<b>Eastern Yellow-bellied racer</b>	<i>Coluber constrictor flaviventris</i>	Adult
<b>Prairie Rattlesnake</b>	<i>Crotalus viridis</i>	Adult
<b><i>Amphibians</i></b>		
<b>Tiger Salamander</b>	<i>Ambystoma mavortium</i>	Larva
<b>Boreal Chorus Frog</b>	<i>Pseudacris maculata</i>	Adult, Tadpole
<b>Rocky Mountain Toad</b>	<i>Anaxyrus woodhousii</i>	Adult, Sub-adult, Metamorph, Tadpole

**Table 7.** We identified 79 taxa of pollinators at Fortification Creek Wilderness Study Area.

<b>Scientific Name</b>	<b>Common Name</b>	<b>Number Collected</b>
<b>Coleoptera</b>	Beetles	284
<b>Meloidae</b>	Blister beetles	104
<b>Cerambycidae</b>	Long-horned beetles	2
<b>Strangalia</b>	Long-horned beetles	2
<b>Hymenoptera</b>	Bees	847
<b>Andrenidae</b>	Mining bees	8
<b>Andrena</b>	Mining bees	4
<b>Calliopsis</b>	Mining bees	2
<b>Panurginus</b>	Mining bees	1
<b>Perdita</b>	Mining bees	1
<b>Apidae</b>	Bees	97
<b>Anthophora</b>	Bees	7
<b>Anthophora bomboides</b>	Bees	3
<b>Bombus</b>	Bumblebees	6
<b>Bombus</b>	Bumblebees	1
<b>Bombus centralis</b>	Bumblebees	41
<b>Bombus fervidus</b>	Bumblebees	14
<b>Bombus huntii</b>	Bumblebees	1
<b>Bombus insularis</b>	Bumblebees	1
<b>Bombus nevadensis</b>	Bumblebees	1
<b>Bombus rufocinctus</b>	Bumblebees	2
<b>Bombus sylvicola</b>	Bumblebees	6
<b>Diadasia</b>	Chimney bees	6
<b>Eucera</b>	Long-horned bees	6
<b>Habropoda</b>	Anthophorine bees	1
<b>Melissodes</b>	Long-horned bees	1
<b>Halictidae</b>	Sweat bees	700
<b>Agapostemon femoratus</b>	Sweat bees	3
<b>Agapostemon melliventris</b>	Sweat bees	2
<b>Agapostemon obliquus/sericeus</b>	Sweat bees	1
<b>Agapostemon texanus/angelicus</b>	Sweat bees	6
<b>Agapostemon virescens</b>	Sweat bees	63
<b>Dufourea</b>	Sweat bees	4
<b>Halictus</b>	Sweat bees	1
<b>Halictus ligatus</b>	Sweat bees	35
<b>Halictus parallelus</b>	Sweat bees	6
<b>Halictus rubicundus</b>	Sweat bees	2
<b>Halictus tripartitus</b>	Sweat bees	486

Scientific Name	Common Name	Number Collected
<b>Lasioglossum (Dialictus)</b>	Sweat bees	83
<b>Lasioglossum (Evylaeus)</b>	Sweat bees	2
<b>Lasioglossum (Lasioglossum)</b>	Sweat bees	4
<b>Lasioglossum (Sphecodogastra)</b>	Sweat bees	1
<b>Lasioglossum (Dialictus)</b>	Sweat bees	1
<b>Megachilidae</b>	Leafcutter bees	16
<b>Coelioxys</b>	Leafcutter bees	1
<b>Dianthidium</b>	Leafcutter bees	1
<b>Heriades carinata</b>	Leafcutter bees	2
<b>Megachile</b>	Leafcutter bees	2
<b>Megachile latimanus</b>	Leafcutter bees	1
<b>Megachile melanophaea</b>	Leafcutter bees	1
<b>Osmia</b>	Mason bees	8
<b>Lepidoptera</b>	Butterflies and moths	108
<b>Erebidae</b>	Tiger moths	1
<b>Grammia parthenice</b>	Pathenice tiger moths	1
<b>Hesperiidae</b>	Skippers	8
<b>Erynnis persius</b>	Persius duskywing	1
<b>Hesperia</b>	Skippers	7
<b>Lycaenidae</b>	Gossamer-wing butterflies	23
<b>Callophrys gryneus</b>	Juniper hairstreak	9
<b>Lycaena rubidus</b>	Ruddy copper	1
<b>Plebejus melissa</b>	Melissa blue	2
<b>Plebejus saepiolus</b>	Greenish blue	9
<b>Noctuidae</b>	Owlet and miller moths	1
<b>Anagrapha falcifera</b>	Celery looper moth	1
<b>Nymphalidae</b>	Brush-footed butterflies	42
<b>Cercyonis oetus</b>	Small wood-nymph	1
<b>Cercyonis pegala</b>	Common wood-nymph	4
<b>Chlosyne acastus</b>	Sagebrush checkerspot	1
<b>Chlosyne gorgone</b>	Gorgone checkerspott	2
<b>Euphydryas anicia</b>	Anicia checkerspot	1
<b>Limnitis weidemeyerii</b>	Weidemeyer's admiral	1
<b>Phyciodes tharos complex</b>	Pearl crescent group	4
<b>Polygonia gracilis</b>	Hoary comma	1
<b>Speyeria atlantis complex</b>	Atlantis fritillary complex	1
<b>Speyeria callippe</b>	Callippe fritillary	23
<b>Vanessa atalanta</b>	Red admiral	1
<b>Vanessa cardui</b>	Painted lady	1
<b>Papilionidae</b>	Parnassians and swallowtails	2

<b>Scientific Name</b>	<b>Common Name</b>	<b>Number Collected</b>
<b>Papilio machaon</b>	Old world swallowtail	1
<b>Papilio zelicaon</b>	Anise swallowtail	1
<b>Pieridae</b>	Whites and sulphurs	19
<b>Callophrys gryneus</b>	Juniper hairstreak	2
<b>Colias alexandra</b>	Queen Alexandra's sulphur	4
<b>Colias philodice</b>	Clouded sulphur	12
<b>Pontia beckerii</b>	Becker's white	1
<b>Pyralidae</b>	Snout moths	1
<b>Sphingidae</b>	Spinx and hawkmoths	3
<b>Hyles lineata</b>	White-lined sphinx	2
<b>Sphinx vashti</b>	Vashti sphinx	1

**Table 8.** Other invertebrates observed at Fortification Creek WSA.

<b>Scientific Name</b>	<b>Common Name</b>	<b>Location</b>
<b><i>Cicindela decemnotata</i></b>	Badlands tiger beetle	Little Bull Creek and Softwater Draw
<b><i>Cicindela denverensis</i></b>	Green claybank tiger beetle	Bull Creek
<b>Tenebrionidae</b>	Darkling beetle	Softwater Draw
<b><i>Paruroctonus boreus</i></b>	Scorpion	Softwater Draw
<b>Tetragnathidae</b>	Long-jawed orb weaver	Landslide pond
<b>Carabidae</b>	Ground beetles	Many locations
<b>Scarabaeidae</b>	Scarab beetles	Little Bull Creek
<b>Asilidae</b>	Robber flies	Many locations
<b>Apiomerus</b>	Bee hunter	Many locations
<b>Cicadidae</b>	Cicadids	Many locations
<b>Strangalia</b>	Long-horned beetles	Many locations
<b>Vespidae</b>	Paper wasps	Many locations
<b>Sphecidae</b>	Thread-waisted wasps	Little Bull Creek and Softwater Draw
<b>Chrysididae</b>	Cuckoo wasp	Many locations
<b>Formicidae</b>	Ants	Many locations
<b>Orthoptera</b>	Crickets	Many Locations
<b><i>Climaciella brunnea</i></b>	Mantis fly	Bull and Little Bull Creeks

**Table 9.** Aquatic invertebrates collected from 2 streams and 3 ponds in the Fortification Creek Wilderness Study Area. Invertebrate tolerance values to ecosystem quality range from 0 (intolerant) to 10 (tolerant). The presence of a taxa is represented by an X. See Figure 12 for locations of sampling sites.

Scientific Name	Common Name	Tolerance Value	Deer Creek	Landslide Pond	Little Bull Creek	Little Bull Pond	Pond 2
<b>Amphipoda</b>	Scuds						
<i>Hyalella</i>	Scud	8		X			
<b>Annelida</b>							
Oligochaeta	Worms	5				X	
<b>Nematomorpha</b>	Horsehair worm	-	X				
<b>Coleoptera</b>	Beetles						
<i>Acilius</i>	Predaceous diving beetle	-		X			
<i>Agabus</i> <sup>1</sup>	Predaceous diving beetle	6.5	X		X	X	
<i>Berosus</i>	Water scavenger beetle	6.8				X	
<i>Coptotomus</i>	Predaceous diving beetle	9				X	
Curculionidae	Snout beetle	-		X			
<i>Desmopachria</i>	Predaceous diving beetle	5				X	
<i>Elodes</i>	Marsh beetle	-		X			X
<i>Graphoderus</i>	Predaceous diving beetle	-				X	
<i>Halipus fulvus</i>	Crawling water beetle	7		X		X	X
<i>Helophorus</i>	Water scavenger beetle	7.9		X		X	X
Hydraenidae	Minute moss beetles	5				X	
<i>Hygrotus acaroides</i> <sup>2</sup>	Predaceous diving beetle	-				X	
<i>Laccophilus</i>	Predaceous diving beetle	7				X	
<i>Sanfilippodytes vilis</i>	Predaceous diving beetle	-				X	
Scirtidae	Marsh beetle	-		X			
Sphaeridiinae	Water scavenger beetle	8					X
<i>Stictotarsus striatellus</i>	Predaceous diving beetle	-		X			
<i>Suphisellus</i>	Burrowing water beetles	-		X			
<b>Diptera</b>	True Flies						
Chaoborus	Phantom midge	-		X			

Scientific Name	Common Name	Tolerance Value	Deer Creek	Landslide Pond	Little Bull Creek	Little Bull Pond	Pond 2
Chironomidae	Non-biting midge	6		X			X
Culicidae	Mosquito	8		X	X		
Culicoides	No-see-um	8.8	X				
Culiseta	Mosquito	-	X				
Dasyhelea	No-see-um	-	X				
Non-Tanyptodinae	Non-biting midge	6		X		X	
<b>Ephemeroptera</b>	Mayflies						
Callibaetis	Speckled dun	8.4		X		X	
<b>Hemiptera</b>	True Bugs						
<i>Aquarius</i>	Water strider	-		X		X	
<i>Gerris</i>	Water strider	5		X		X	
<i>Hesperocorixa laevigata</i>	Water boatman	-		X			
<i>Limnoporus</i>	Water strider	-		X		X	
<i>Notonecta</i>	Backswimmer	-		X		X	X
<i>Palmarcorixa</i>	Water boatman	5				X	
<i>Sigara</i>	Water boatman	9		X			
<i>Trepobates</i>	Water strider	10		X			X
<b>Odonata</b>	Dragonflies & Damselflies						
<i>Coenagrion/Enallagma</i>	Blue damsels	8.8		X			
<i>Lestes congener</i>	Spotted spreadwing	9					X
<b><i>Lestes unguiculatus</i></b>	Lyre-tipped spreadwing	<b>9</b>				<b>X</b>	

<sup>1</sup>At least 3 species of *Agabus* were collected; however, many species cannot be identified as larvae

<sup>2</sup>First record of this species in Wyoming

**Table 10.** Plant species observed within boundary of Fortification Creek WSA, Wyoming in 2014.

Scientific Name (Dorn 2001)	Family	Common Name	Form	Native (N) Introduced(I)	Collected
<i>Acer negundo</i> L. var. <i>interius</i> (Britt.) Sarg.	Aceraceae	Box elder	Tree	N	
<i>Achillea millefolium</i> L. var. <i>lanulosa</i> (Nutt.) Piper	Asteraceae	Common yarrow	Perennial Forb	N	
<i>Achnatherum</i> <i>contractum</i> (Johnson) Barkw.	Poaceae	Contracted ricegrass	Perennial Graminoid	N	Collected
<i>Achnatherum</i> <i>hymenoides</i> (R. & S.) Barkw.	Poaceae	Indian ricegrass	Perennial Graminoid	N	
<i>Agropyron cristatum</i> (L.) Gaertn. var. <i>cristatum</i>	Poaceae	Crested wheatgrass	Perennial Graminoid	I	
<i>Allium textile</i> Nels. & Macbr.	Alliaceae	Textile onion	Perennial Forb	N	
<i>Alyssum desertorum</i> Stapf	Brassicaceae	Desert madwort	Annual Forb	I	
<i>Amaranthus albus</i> L.	Amaranthaceae	Tumbleweed	Annual Forb	N	
<i>Amaranthus blitoides</i> Wats.	Amaranthaceae	Mat amaranth	Annual Forb	N	
<i>Ambrosia psilostachya</i> DC.	Asteraceae	Perennial ragweed	Perennial Forb	N	
<i>Ambrosia tomentosa</i> Nutt.	Asteraceae	Skeleton-leaf burr-ragweed	Perennial Forb	N	
<i>Ambrosia trifida</i> L.	Asteraceae	Giant ragweed	Annual Forb	N	
<i>Androsace</i> <i>occidentalis</i> Pursh	Primulaceae	Western rock- jasmine	Annual Forb	N	
<i>Antennaria dimorpha</i> (Nutt.) T. & G.	Asteraceae	Cushion pussytoes	Perennial Forb	N	Collected
<i>Antennaria howellii</i> Greene	Asteraceae	Small pussytoes	Perennial Forb	N	
<i>Antennaria</i> <i>microphylla</i> Rydb.	Asteraceae	Small-leaf pussyoes	Perennial Forb	N	
<i>Antennaria parvifolia</i> Nutt.	Asteraceae	Little leaf pussytoes	Perennial Forb	N	
<i>Antennaria rosea</i> Greene	Asteraceae	Rosy pussytoes	Perennial Forb	N	
<i>Arabis glabra</i> (L.) Bernh.	Brassicaceae	Tower-mustard	Perennial Forb	N	Collected

Scientific Name (Dorn 2001)	Family	Common Name	Form	Native (N) Introduced(I)	Collected
<b><i>Arctium minus</i> Bernh.</b>	Asteraceae	Lesser burdock	Perennial Forb	I	
<b><i>Aristida purpurea</i> Nutt. var. <i>fendleriana</i> (Steuel) Vasey</b>	Poaceae	Purple three- awn	Perennial Graminoid	N	
<b><i>Arnica sororia</i> Greene</b>	Asteraceae	Twin leopardbane	Perennial Forb	N	
<b>*<i>Artemisia</i> <i>absinthium</i> L.</b>	Asteraceae	Oldman	Perennial Forb	N	Collected
<b><i>Artemisia campestris</i> L. var. <i>scouleriana</i> (Bess.) Cronq.</b>	Asteraceae	Pacific wormwood	Perennial Forb	N	
<b><i>Artemisia cana</i> Pursh var. <i>cana</i></b>	Asteraceae	Silver sagebrush	Shrub	N	
<b><i>Artemisia dracunculus</i> L.</b>	Asteraceae	Tarragon	Perennial Forb	N	
<b><i>Artemisia frigida</i> Willd.</b>	Asteraceae	Fringed sagebrush	Shrub	N	
<b><i>Artemisia longifolia</i> Nutt.</b>	Asteraceae	Long-leaf wormwood	Shrub	N	
<b><i>Artemisia ludoviciana</i> Nutt. var. <i>ludoviciana</i></b>	Asteraceae	White sagebrush	Perennial Forb	N	
<b><i>Artemisia tridentata</i> Nutt. var. <i>vaseyana</i> (Rydb.) Boivin</b>	Asteraceae	Mountain big sagebrush	Shrub	N	Collected
<b><i>Artemisia tridentata</i> Nutt. var. <i>wyomingensis</i> (Beetle &amp; Young (Welsh)</b>	Asteraceae	Wyoming big sagebrush	Shrub	N	
<b><i>Asclepias speciosa</i> Torrey</b>	Asclepiadaceae	Showy milkweed	Perennial Forb	N	
<b><i>Asclepias viridiflora</i> Raf.</b>	Asclepiadaceae	Green comet milkweed	Perennial Forb	N	
<b><i>Astragalus agrestis</i> Dougl. ex G. Don</b>	Fabaceae	Field milkvetch	Perennial Forb	N	
<b><i>Astragalus bisulcatus</i> (Hook.) Gray var. <i>bisulcatus</i></b>	Fabaceae	Two-groove milkvetch	Perennial Forb	N	
<b><i>Astragalus</i> <i>crassicaulus</i> Nutt. var. <i>paysonii</i> (Kelso) Barneby</b>	Fabaceae	Ground plum	Perennial Forb	N	
<b><i>Astragalus</i> <i>drummondii</i> Dougl. ex Hook.</b>	Fabaceae	Drummond's milkvetch	Perennial Forb	N	

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<b><i>Astragalus gilviflorus</i></b> <b>Sheld. var. <i>gilviflorus</i></b>	Fabaceae	Plains milkvetch	Perennial Forb	N	Collected
<b><i>Astragalus lotiflorus</i></b> <b>Hook.</b>	Fabaceae	Lotus milkvetch	Perennial Forb	N	
<b><i>Astragalus missouriensis</i></b> <b>Nutt.</b>	Fabaceae	Missouri milkvetch	Perennial Forb	N	
<b><i>Astragalus purshii</i></b> <b>Dougl. ex Hook.</b>	Fabaceae	Pursh's milkvetch	Perennial Forb	N	
<b><i>Astragalus spatulatus</i></b> <b>Sheld.</b>	Fabaceae	Spoonleaf milkvetch	Perennial Forb	N	
<b><i>Astragalus tenellus</i></b> <b>Pursh</b>	Fabaceae	Loose-flower milkvetch	Perennial Forb	N	
<b><i>Astragalus vexilliflexus</i></b> <b>Sheld.</b>	Fabaceae	Bent-flower milkvetch	Perennial Forb	N	Collected
<b><i>Atriplex canescens</i></b> <b>(Pursh) Nutt. var.</b> <b><i>canescens</i></b>	Chenopodiaceae	Four-wing saltbush	Shrub	N	
<b>*<i>Atriplex patula</i></b> <b>L.</b>	Chenopodiaceae	Halberd-leaf orache	Annual Forb	N	
<b><i>Besseyia wyomingensis</i></b> <b>(A. Nels.) Rydb.</b>	Scrophulariaceae	Wyoming kittentails	Perennial Forb	N	
<b><i>Boechera holboellii</i></b> <b>(Hornem.) Love &amp;</b> <b>Love var. <i>collinsii</i></b> <b>(Fern.) Dorn</b>	Brassicaceae	Holboell's rockcross	Perennial Forb	N	
<b><i>Bolboschoenus</i></b> <b><i>maritimus</i> (L.) Palla</b> <b>var. <i>paludosus</i> (A.</b> <b>Nels.) Dorn</b>	Cyperaceae	Seacoast bulrush	Perennial Graminoid	N	Collected
<b><i>Bouteloua gracilis</i></b> <b>(H.B.K.) Lag. ex</b> <b>Griffiths</b>	Poaceae	Blue grama	Perennial Graminoid	N	
<b><i>Brickellia eupatorioides</i></b> <b>(L.)</b> <b>Shinners var.</b> <b><i>corymbulosa</i> (T. &amp; G.)</b> <b>Shinners</b>	Asteraceae	False boneset	Perennial Forb	N	
<b>*<i>Bromus brizaeformis</i></b> <b>Fisch. &amp; Meyer</b>	Poaceae	Rattlesnake brome	Annual Graminoid	I	Collected
<b><i>Bromus carinatus</i></b> <b>H. &amp;</b> <b>A.</b>	Poaceae	California brome	Perennial Graminoid	N	
<b><i>Bromus commutatus</i></b> <b>Schrad.</b>	Poaceae	Meadow brome	Annual Graminoid	I	Collected

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<b><i>Bromus inermis</i> Leyss. var. <i>inermis</i></b>	Poaceae	Smooth brome	Perennial Graminoid	I	
<b><i>Bromus tectorum</i> L.</b>	Poaceae	Cheatgrass	Annual Graminoid	I	Collected
<b>*<i>Calamagrostis stricta</i> (Timm) Koeler</b>	Poaceae	Slim-stem reedgrass	Perennial Graminoid	N	
<b><i>Calamovilfa longifolia</i> (Hook.) Scribn.</b>	Poaceae	Prairie sandreed	Perennial Graminoid	N	
<b><i>Calochortus nuttallii</i> T. &amp; G.</b>	Calochortaceae	Sego-lily	Perennial Forb	N	
<b><i>Camelina microcarpa</i> Anrdz. ex DC.</b>	Brassicaceae	Little-pod false flax	Annual Forb	I	
<b><i>Campanula rotundifolia</i> L.</b>	Campanulaceae	Harebell	Perennial Forb	N	
<b><i>Carduus nutans</i> L.</b>	Asteraceae	Nodding plumeless thistle	Perennial Forb	I	
<b><i>Carex filifolia</i> Nutt.</b>	Cyperaceae	Thread-leaf sedge	Perennial Graminoid	N	
<b><i>Carex nebrascensis</i> Dewey</b>	Cyperaceae	Nebraska sedge	Perennial Graminoid	N	
<b><i>Carex pensylvanica</i> Lam. var. <i>digyna</i> Boeckl.</b>	Cyperaceae	Pennsylvania sedge	Perennial Graminoid	N	
<b><i>Carex petasata</i> Dewey</b>	Cyperaceae	Liddon sedge	Perennial Graminoid	n	Collected
<b><i>Cerastium arvense</i> L.</b>	Caryophyllaceae	Field mouse- ear chickweed	Perennial Forb	N	
<b><i>Chaenactis douglasii</i> (Hook.) H. &amp; A. var. <i>montana</i> Jones</b>	Asteraceae	Hoary dusty- maiden	Perennial Forb	N	
<b><i>Chamaesyce missurica</i> (Raf.) Shinnars var. <i>petaloidea</i> (Engelm.) Dorn</b>	Euphorbiaceae	Prairie sandmat	Annual Forb	N	
<b><i>Chenopodium album</i> L.</b>	Chenopodiaceae	Lamb's- quarters	Annual Forb	I	
<b><i>Chenopodium berlandieri</i> Moq. var. <i>zschackei</i> (Murr) Murr ex Asch.</b>	Chenopodiaceae	Pitseed goosefoot	Annual Forb	N	
<b><i>Chenopodium fremontii</i> Wats.</b>	Chenopodiaceae	Fremont's goosefoot	Annual Forb	N	
<b><i>Chorispora tenella</i> (Pallas) DC.</b>	Brassicaceae	Blue mustard	Annual Forb	I	Collected

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<b><i>Chrysothamnus viscidiflorus</i> (Hook.) Nutt. var. <i>viscidiflorus</i></b>	Asteraceae	Green rabbitbrush	Shrub	N	
<b><i>Cirsium arvense</i> (L.) Scop.</b>	Asteraceae	Canada thistle	Perennial Forb	I	
<b><i>Cirsium undulatum</i> (Nutt.) Spreng.</b>	Asteraceae	Wavy-leaf thistle	Perennial Forb	N	
<b><i>Collinsia parviflora</i> Lindl.</b>	Scrophulariaceae	Small-flower blue-eyed Mary	Annual Forb	N	
<b><i>Collomia linearis</i> Nutt.</b>	Polemoniaceae	Narrowleaf mountain-trumpet	Annual Forb	N	
<b><i>Comandra umbellata</i> (L.) Nutt. var. <i>pallida</i> (A. DC.) Jones</b>	Santalaceae	Bastard toadflax	Perennial Forb	N	
<b><i>Convolvulus arvensis</i> L.</b>	Convolvulaceae	Field bindweed	Perennial Forb	I	
<b><i>Crepis acuminata</i> Nutt.</b>	Asteraceae	Long-leaf hawk's-beard	Perennial Forb	N	Collected
<b><i>Crepis occidentalis</i> Nutt. var. <i>costata</i> Gray</b>	Asteraceae	Large-flower hawk's-beard	Perennial Forb	N	
<b><i>Cryptantha celosioides</i> (Eastw.) Payson</b>	Boraginaceae	Cockscomb cryptantha	Perennial Forb	N	
<b><i>Cryptantha torreyana</i> (Gray) Greene</b>	Boraginaceae	Torrey's cat's-eye	Annual Forb	N	
<b><i>Cymopterus montanus</i> T. &amp; G.</b>	Apiaceae	Mountain spring-parsley	Perennial Forb	N	
<b><i>Cystopteris fragilis</i> (L.) Bernh.</b>	Aspleniaceae	Brittle bladder-fern	Ferns/Fern Allies	N	
<b><i>Dalea candida</i> Willd. var. <i>oligophylla</i> (Torrey) Shinnery</b>	Fabaceae	White prairie-clover	Perennial Forb	N	
<b><i>Delphinium geyeri</i> Greene</b>	Ranunculaceae	Geyer's larkspur	Perennial Forb	N	
<b><i>Descurainia incana</i> (Bernh. ex Fisch. &amp; Meyer) Dorn var. <i>incana</i></b>	Brassicaceae	Mountain tansy-mustard	Annual Forb	N	
<b><i>Descurainia sophia</i> (L.) Webb ex Prantl</b>	Brassicaceae	Flixweed	Annual Forb	I	
<b><i>Distichlis stricta</i> (Torrey) Rydb.</b>	Poaceae	Alkali saltgrass	Perennial Graminoid	N	

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<b><i>Draba reptans</i> (Lam.) Fern.</b>	Brassicaceae	Carolina whitlow-grass	Annual Forb	N	
<b><i>Dyssodia papposa</i> (Vent.) Hitchc.</b>	Asteraceae	Fetid marigold	Annual Forb	N	
<b><i>Ellisia nyctelea</i> (L.) L.</b>	Hydrophyllaceae	Waterpod	Annual Forb	N	Collected
<b>*<i>Elyhordeum macounii</i> (Vasey) Barkworth &amp; D.R. Dewey [<i>Elymus trachycaulus</i> × <i>Hordeum jubatum</i>]</b>	Poaceae	McCoun's barley	Perennial Graminoid	N	Collected
<b><i>Elymus canadensis</i> L. var. <i>canadensis</i></b>	Poaceae	Canada wildrye	Perennial Graminoid	N	
<b><i>Elymus cinereus</i> Scribn. &amp; Merr.</b>	Poaceae	Great Basin wildrye	Perennial Graminoid	N	
<b><i>Elymus elymoides</i> (Raf.) Swezey var. <i>brevifolius</i> (Smith) Dorn</b>	Poaceae	Bottlebrush squirreltail	Perennial Graminoid	N	
<b><i>Elymus lanceolatus</i> (Scribn. &amp; Sm.) Gould var. <i>lanceolatus</i></b>	Poaceae	Thickspike wheatgrass	Perennial Graminoid	I	Collected
<b><i>Elymus repens</i> (L.) Gould</b>	Poaceae	Common quackgrass	Perennial Graminoid	N	
<b><i>Elymus smithii</i> (Rydb.) Gould</b>	Poaceae	Western wheatgrass	Perennial Graminoid	N	Collected
<b><i>Elymus spicatus</i> (Pursh) Gould</b>	Poaceae	Bluebunch wheatgrass	Perennial Graminoid	N	
<b><i>Elymus trachycaulus</i> (Link) Gould ex Shinners var. <i>trachycaulus</i></b>	Poaceae	Slender wheatgrass	Perennial Graminoid	N	
<b><i>Eremogone hookeri</i> (Nutt.) Weber var. <i>pinetorum</i> (A. Nels.) Dorn</b>	Caryophyllaceae	Hooker's sandwort	Perennial Forb	N	
<b><i>Ericameria nauseosa</i> (Pallas ex Pursh) Nesom &amp; Baird var. <i>nauseosa</i></b>	Asteraceae	Rubber- rabbitbrush	Shrub	N	
<b><i>Erigeron compositus</i> Pursh var. <i>discoideus</i> Gray</b>	Asteraceae	Cut-leaved fleabane	Perennial Forb	N	

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<b><i>Erigeron ochroleucus</i> Nutt. var. <i>ochroleucus</i></b>	Asteraceae	Buff fleabane	Perennial Forb	N	Collected
<b><i>Eriogonum flavum</i> Nutt. var. <i>flavum</i></b>	Polygonaceae	Yellow buckwheat	Perennial Forb	N	
<b><i>Eriogonum pauciflorum</i> Pursh var. <i>pauciflorum</i></b>	Polygonaceae	Few-flower wild buckwheat	Perennial Forb	N	
<b><i>Erysimum asperum</i> (Nutt.) DC. var. <i>asperum</i></b>	Brassicaceae	Sand dune wallflower	Perennial Forb	N	
<b><i>Euclidium syriacum</i> (L.) R. Br.</b>	Brassicaceae	Syrian-mustard	Annual Forb	I	Collected
<b><i>Euphorbia brachycera</i> Engelm. var. <i>robusta</i> (Engelm.) Dorn</b>	Euphorbiaceae	Horned spurge	Perennial Forb	N	
<b><i>Fritillaria atropurpurea</i> Nutt.</b>	Liliaceae	Checker lily	Perennial Forb	N	
<b><i>Galium aparine</i> L. var. <i>aparine</i></b>	Rubiaceae	Cleavers	Annual Forb	N	
<b><i>Galium boreale</i> L.</b>	Rubiaceae	Northern bedstraw	Perennial Forb	N	
<b><i>Geranium carolinianum</i> L.</b>	Geraniaceae	Carolina crane's-bill	Annual Forb	N	
<b><i>Geum triflorum</i> Pursh var. <i>triflorum</i></b>	Rosaceae	Prairie smoke	Perennial Forb	N	
<b><i>Glycyrrhiza lepidota</i> Pursh var. <i>glutinosa</i> (Nutt.) Wats.</b>	Fabaceae	Licorice-root	Perennial Forb	N	
<b><i>Grindelia squarrosa</i> (Pursh) Dunal var. <i>squarrosa</i></b>	Asteraceae	Curly-cup gumweed	Perennial Forb	N	
<b><i>Gutierrezia sarothrae</i> (Pursh) Britt. &amp; Rusby</b>	Asteraceae	Broom snakeweed	Shrub	N	
<b><i>Hedeoma drummondii</i> Benth.</b>	Lamiaceae	Drummond's false pennyroyal	Perennial Forb	N	
<b><i>Hedeoma hispidum</i> Pursh</b>	Lamiaceae	Rough false pennyroyal	Perennial Forb	I	
<b><i>Hedysarum boreale</i> Nutt. var. <i>pabulare</i> (A. Nels.) Dorn</b>	Fabaceae	Boreal sweet- vetch	Perennial Forb	N	Collected
<b><i>Helianthus nuttallii</i> T. &amp; G.</b>	Asteraceae	Nuttall's sunflower	Perennial Forb	N	
<b><i>Helianthus petiolaris</i> Nutt.</b>	Asteraceae	Prairie sunflower	Annual Forb	N	

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<b><i>Hesperostipa comata</i></b> (Trin. & Rupr.) var. <b><i>comata</i></b>	Poaceae	Needle-and- thread	Perennial Graminoid	N	
<b><i>Heterotheca villosa</i></b> (Pursh) Shinnery var. <b><i>villosa</i></b>	Asteraceae	Hairy false golden-aster	Perennial Forb	N	
<b>*<i>Hordeum</i></b> <b><i>brachyantherum</i></b> Nevski	Poaceae	Meadow barley	Perennial Graminoid	N	
<b><i>Hymenopappus</i></b> <b><i>polycephalus</i></b> Osterh.	Asteraceae	Fine-leaf woollywhite	Perennial Forb	N	Collected
<b><i>Ipomopsis congesta</i></b> (Hook.) Grant var. <b><i>congesta</i></b>	Polemoniaceae	Ball-head skyrocket	Perennial Forb	N	Collected
<b><i>Iva axillaris</i></b> Nutt. var. <b><i>axillaris</i></b>	Asteraceae	Poverty-weed	Perennial Forb	N	
<b><i>Juncus bufonius</i></b> L.	Juncaceae	Toad rush	Annual Graminoid	N	Collected
<b><i>Juncus interior</i></b> Wieg.	Juncaceae	Inland rush	Perennial Graminoid	N	
<b><i>Juniperus communis</i></b> L. var. <b><i>depressa</i></b> Pursh	Cupressaceae	Common juniper	Shrub	N	
<b><i>Juniperus scopulorum</i></b> Sarg.	Cupressaceae	Rocky Mountain juniper	Tree	N	
<b><i>Koeleria macrantha</i></b> (Ledeb.) Schultes	Poaceae	Prairie junegrass	Perennial Graminoid	N	
<b><i>Krascheninnikovia</i></b> <b><i>lanata</i></b> (Pursh) Meeuse & Smit	Chenopodiaceae	Winterfat	Shrub	N	
<b><i>Lactuca serriola</i></b> L.	Asteraceae	Prickly lettuce	Annual Forb	I	
<b><i>Lappula redowskii</i></b> (Hornem.) Greene var. <b><i>cupulata</i></b> (Gray) Jones	Boraginaceae	Cupseed stickseed	Annual Forb	N	
<b><i>Lepidium densiflorum</i></b> Schrad. var. <b><i>densiflorum</i></b>	Brassicaceae	Miner's pepperwort	Annual Forb	N	
<b><i>Lesquerella alpina</i></b> (Nutt.) Wats.	Brassicaceae	Alpine bladderpod	Perennial Forb	N	Collected
<b><i>Liatris punctata</i></b> Hook.	Asteraceae	Dotted gayfeather	Perennial Forb	N	
<b><i>Linanthus pungens</i></b> (Torrey) Porter & Johnson	Polemoniaceae	Granite prickly- phlox	Shrub	N	

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<i>Linum lewisii</i> Pursh	Linaceae	Blue flax	Perennial Forb	N	
<i>Linum rigidum</i> Pursh var. <i>rigidum</i>	Linaceae	Large-flower yellow flax	Annual Forb	N	
<i>Lithophragma parviflorum</i> (Hook.) Nutt. ex T. & G.	Saxifragaceae	Prairie woodlandstar	Perennial Forb	N	
<i>Lithospermum incisum</i> Lehm.	Boraginaceae	Fringed gromwell	Perennial Forb	N	
<i>Logfia arvensis</i> (L.) Holub	Asteraceae	Field cotton- rose	Annual Forb	N	Collected
<i>Lomatium foeniculaceum</i> (Nutt.) Coul. & Rose	Apiaceae	Carrot-leaf desert-parsley	Perennial Forb	N	
<i>Lomatium orientale</i> Coul. & Rose	Apiaceae	Oriental desert-parsley	Perennial Forb	N	
<i>Lupinus argenteus</i> Pursh var. <i>argenteus</i>	Fabaceae	Silver-stem lupine	Perennial Forb	N	
<i>Lupinus pusillus</i> Pursh var. <i>pusillus</i>	Fabaceae	Rusty lupine	Annual Forb	N	
<i>Lygodesmia juncea</i> (Pursh) D. Don ex Hook.	Asteraceae	Rush skeleton- plant	Perennial Forb	N	
<i>Machaeranthera pinnatifida</i> (Hook.) Shinners var. <i>glaberrima</i> (Rydb.) Turner & Hartm.	Asteraceae	Spiny goldenweed	Perennial Forb	N	
<i>Machaeranthera tanacetifolia</i> (H.B.K.) Nees	Asteraceae	Tansy aster	Annual Forb	N	
<i>Maianthemum stellatum</i> (L.) Link	Convallariaceae	Starry false Solomon's-seal	Perennial Forb	N	
<i>Medicago lupulina</i> L.	Fabaceae	Black medick	Annual Forb	I	
<i>Melilotus officinalis</i> (L.) Pallas	Fabaceae	Yellow sweet- clover	Perennial Forb	I	
<i>Mentzelia decapatela</i> (Pursh ex Sims) Urban & Gilg ex Gilg	Loasaceae	Evening star	Perennial Forb	N	Collected
<i>Mentzelia dispersa</i> Wats.	Loasaceae	Nevada blazingstar	Annual Forb	N	
<i>Mentzelia laevicaulis</i> (Dougl. ex Hook.) T. & G.	Loasaceae	Giant blazingstar	Perennial Forb	N	Collected

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<b><i>Mentzelia pumila</i> T. &amp; G.</b>	Loasaceae	Golden blazingstar	Perennial Forb	N	Collected
<b><i>Mertensia lanceolata</i> (Pursh) DC.</b>	Boraginaceae	Prairie bluebells	Perennial Forb	N	
<b><i>Mirabilis linearis</i> (Pursh) Heimerl</b>	Nyctaginaceae	Narrow-leaf four-o'clock	Perennial Forb	N	
<b><i>Monarda fistulosa</i> L. var. <i>menthifolia</i> (Grah.) Fern.</b>	Lamiaceae	Oswego-tea	Perennial Forb	N	
<b><i>Monolepis nuttalliana</i> (Schultes) Greene</b>	Chenopodiaceae	Nuttall's poverty-weed	Annual Forb	N	
<b>*<i>Montia chamissoi</i> (Ledeb. ex Spreng.) Greene</b>	Portulacaceae	Chamisso's candy-flower	Perennial Forb	N	
<b><i>Muhlenbergia asperifolia</i> (Nees &amp; Mey. ex Trin.) Parodi</b>	Poaceae	Alkali muhly	Perennial Graminoid	N	
<b><i>Musineon divaricatum</i> (Pursh) Nutt. ex T. &amp; G.</b>	Apiaceae	Leafy wild parsley	Perennial Forb	N	
<b>*<i>Myosotis micrantha</i> Pallas ex Lehm.</b>	Boraginaceae	Blue scorpion-grass	Annual Forb	N	Collected
<b><i>Nassella viridula</i> (Trin.) Barkw.</b>	Poaceae	Green needlegrass	Perennial Graminoid	N	Collected
<b><i>Oenothera cespitosa</i> Nutt. var. <i>cespitosa</i></b>	Onagraceae	Tufted evening-primrose	Perennial Forb	N	
<b><i>Oenothera nuttallii</i> Sweet</b>	Onagraceae	Nuttall's evening-primrose	Perennial Forb	N	Collected
<b><i>Opuntia polyacantha</i> Haw. var. <i>polyacantha</i></b>	Cactaceae	Plains prickly-pear	Perennial Forb	N	
<b><i>Orobanche fasciculata</i> Nutt.</b>	Orobanchaceae	Clustered broomrape	Perennial Forb	N	
<b><i>Orobanche ludoviciana</i> Nutt. var. <i>ludoviciana</i></b>	Orobanchaceae	Louisiana broomrape	Perennial Forb	N	
<b><i>Oxytropis besseyi</i> (Rydb.) Blank. var. <i>besseyi</i></b>	Fabaceae	Bessey's locoweed	Perennial Forb	N	
<b>*<i>Oxytropis campestris</i> (L.) DC. var. <i>spicata</i> Hook.</b>	Fabaceae	Northern yellow locoweed	Perennial Forb	N	Collected
<b><i>Oxytropis lambertii</i> Pursh</b>	Fabaceae	Lambert's locoweed	Perennial Forb	N	Collected

Scientific Name (Dorn 2001)	Family	Common Name	Form	Native (N) Introduced(I)	Collected
<b><i>Oxytropis sericea</i> Nutt. var. <i>sericea</i></b>	Fabaceae	White locoweed	Perennial Forb	N	
<b><i>Packera cana</i> (Hook.) Weber &amp; Love</b>	Asteraceae	Silver-woolly groundsel	Perennial Forb	N	
<b><i>Parietaria</i> <i>pensylvanica</i> Muhl. ex Willd.</b>	Urticaceae	Pennsylvania pellitory	Annual Forb	N	
<b><i>Pediomelum</i> <i>argophyllum</i> (Pursh) Grimes</b>	Fabaceae	Silver-leaf Indian- breadroot	Perennial Forb	N	
<b><i>Pediomelum</i> <i>esculentum</i> (Pursh) Rydb.</b>	Fabaceae	Large Indian- breadroot	Perennial Forb	N	
<b><i>Penstemon albidus</i> Nutt.</b>	Scrophulariaceae	Red-line beardtongue	Perennial Forb	N	
<b><i>Penstemon</i> <i>eriantherus</i> Pursh var. <i>eriantherus</i></b>	Scrophulariaceae	Fuzzy-tongue beardtongue	Perennial Forb	N	
<b><i>Penstemon glaber</i> Pursh var. <i>glaber</i></b>	Scrophulariaceae	Western smooth beardtongue	Perennial Forb	N	
<b><i>Phacelia hastata</i> Dougl. ex Lehm.</b>	Hydrophyllaceae	Silver-leaf scorpion-weed	Perennial Forb	N	
<b><i>Phacelia linearis</i> (Pursh) Holz</b>	Hydrophyllaceae	Thread-leaf scorpion-weed	Annual Forb	N	
<b><i>Phleum pratense</i> L.</b>	Poaceae	Common timothy	Perennial Graminoid	I	
<b><i>Phlox hoodii</i> Richardson</b>	Polemoniaceae	Hood's phlox	Perennial Forb	N	
<b><i>Phlox longifolia</i> Nutt.</b>	Polemoniaceae	Long-leaf phlox	Perennial Forb	N	
<b>*<i>Physaria acutifolia</i> Rydb.</b>	Brassicaceae	Sharp-leaf twinpod	Perennial Forb	N	Collected
<b><i>Physaria brassicoides</i> Rydb.</b>	Brassicaceae	Double twinpod	Perennial Forb	N	Collected
<b><i>Picradeniopsis</i> <i>oppositifolia</i> (Nutt.) Rydb. ex Britt.</b>	Asteraceae	Opposite-leaf false bahia	Perennial Forb	N	
<b><i>Plantago patagonica</i> Jacq. var. <i>patagonica</i></b>	Plantaginaceae	Woolly plantain	Annual Forb	N	
<b><i>Poa arida</i> Vasey</b>	Poaceae	Prairie bluegrass	Perennial Graminoid	N	Collected
<b><i>Poa bulbosa</i> L.</b>	Poaceae	Bulbous bluegrass	Perennial Graminoid	I	

Scientific Name (Dorn 2001)	Family	Common Name	Form	Native (N) Introduced(I)	Collected
<i>Poa compressa</i> L.	Poaceae	Canada bluegrass	Perennial Graminoid	I	
<i>Poa cusickii</i> Vasey var. <i>epilis</i> (Scribn.) Hitchc.	Poaceae	Skyline bluegrass	Perennial Graminoid	N	
<i>Poa palustris</i> L.	Poaceae	Fowl bluegrass	Perennial Graminoid	I	Collected
<i>Poa pratensis</i> L.	Poaceae	Kentucky bluegrass	Perennial Graminoid	I	
<i>Poa secunda</i> Presl var. <i>secunda</i>	Poaceae	Sandberg bluegrass	Perennial Graminoid	N	Collected
<i>Polanisia trachysperma</i> T. & G.	Capparaceae	Red-whisker clammy-weed	Annual Forb	N	
<i>Polygonum convolvulus</i> L.	Polygonaceae	Black-bindweed	Annual Forb	I	
* <i>Polygonum sawatchense</i> Small	Polygonaceae	Sawatch knotweed	Annual Forb	N	
<i>Polypogon monspeliensis</i> (L.) Desf.	Poaceae	Annual rabbit's-foot-grass	Annual Graminoid	I	Collected
<i>Populus deltoides</i> Bartr. ex Marsh. var. <i>occidentalis</i> Rydb.	Salicaceae	Plains cottonwood	Tree	N	
<i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nels.) Sarg.	Rosaceae	Choke cherry	Shrub	N	
* <i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco	Pinaceae	Douglas-fir	Tree	N	Collected
<i>Psilocarphus brevissimus</i> Nutt.	Asteraceae	Dwarf woollyheads	Annual Forb	N	
<i>Psoralidium lanceolatum</i> (Pursh) Rydb.	Fabaceae	Lemon scurf-pea	Perennial Forb	N	
<i>Psoralidium tenuiflorum</i> (Pursh) Rydb.	Fabaceae	Slender-flowered scurf-pea	Perennial Forb	N	
<i>Puccinellia nuttalliana</i> (Schultes) Hitchc.	Poaceae	Nuttall's alkali-grass	Perennial Graminoid	N	
<i>Ranunculus cymbalaria</i> Pursh var. <i>cymbalaria</i>	Ranunculaceae	Shore buttercup	Perennial Forb	N	
<i>Ratibida columnifera</i> (Nutt.) Wooton & Standley	Asteraceae	Prairie coneflower	Perennial Forb	N	

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<b><i>Rhus aromatica</i> Aiton var. <i>trilobata</i> (Nutt.) Gray</b>	Anacardiaceae	Ill-scented sumac	Shrub	N	
<b><i>Ribes americanum</i> Miller</b>	Grossulariaceae	Wild black currant	Shrub	N	
<b><i>Ribes aureum</i> Pursh var. <i>villosum</i> DC.</b>	Grossulariaceae	Buffalo currant	Shrub	N	
<b><i>Ribes oxycanthoides</i> L. var. <i>setosum</i> (Lindl.) Dorn</b>	Grossulariaceae	Canadian gooseberry	Shrub	N	
<b><i>Rosa arkansana</i> Porter</b>	Rosaceae	Prairie rose	Shrub	N	
<b><i>Rosa woodsii</i> Lindl.</b>	Rosaceae	Woods' rose	Shrub	N	
<b><i>Rumex</i> spp.</b>	Polygonaceae		Perennial Forb	N	
<b><i>Salsola tragus</i> L.</b>	Chenopodiaceae	Prickly Russian- thistle	Annual Forb	I	
<b><i>Schizachyrium scoparium</i> (Michx.) Nash</b>	Poaceae	Little bluestem	Perennial Graminoid	N	
<b><i>Schoenoplectus pungens</i> (Vahl) Palla var. <i>polyphyllus</i> (Boeckler) Dorn</b>	Cyperaceae	Three-square bulrush	Perennial Graminoid	N	
<b>*<i>Scolochloa festucacea</i> (Willd.) Link</b>	Poaceae	Sprangletop	Perennial Graminoid	N	
<b><i>Sedum lanceolatum</i> Torrey</b>	Crassulaceae	Lance-leaf stonecrop	Perennial Forb	N	
<b><i>Senecio integerrimus</i> Nutt. var. <i>exaltatus</i> (Nutt.) Cronq.</b>	Asteraceae	Western groundsel	Perennial Forb	N	
<b><i>Silene</i> spp.</b>	Caryophyllaceae		Perennial Forb	N	
<b><i>Sisymbrium loeselii</i> L.</b>	Brassicaceae	False London rocket	Annual Forb	I	
<b><i>Solanum triflorum</i> Nutt.</b>	Solanaceae	Cut-leaf nightshade	Annual Forb	N	
<b><i>Solidago missouriensis</i> Nutt. var. <i>missouriensis</i></b>	Asteraceae	Missouri goldenrod	Perennial Forb	N	
<b><i>Sonchus arvensis</i> L.</b>	Asteraceae	Field sow- thistle	Perennial Forb	I	
<b><i>Spartina pectinata</i> Link</b>	Poaceae	Prairie cordgrass	Perennial Graminoid	N	

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<b><i>Sphaeralcea coccinea</i> (Nutt.) Rydb.</b>	Malvaceae	Scarlet globe-mallow	Perennial Forb	N	
<b><i>Sporobolus cryptandrus</i> (Torrey) Gray</b>	Poaceae	Sand dropseed	Perennial Graminoid	N	
<b><i>Stephanomeria runcinata</i> Nutt.</b>	Asteraceae	Desert wirelettuce	Perennial Forb	N	
<b><i>Symphoricarpos occidentalis</i> Hook.</b>	Caprifoliaceae	Western snowberry	Shrub	N	
<b><i>Symphoricarpos oreophilus</i> Gray var. <i>utahensis</i> (Rydb.) A. Nels.</b>	Caprifoliaceae	Mountain snowberry	Shrub	N	Collected
<b><i>Symphotrichum falcatum</i> (Lindl.) Nesom var. <i>commutatum</i> (T. &amp; G.) Nesom</b>	Asteraceae	Rough white prairie american-aster	Perennial Forb	N	
<b><i>Tamarix chinensis</i> Loureiro</b>	Tamaricaceae	Five-stamen Tamarisk	Shrub	I	Collected
<b><i>Taraxacum officinale</i> Weber</b>	Asteraceae	Common dandelion	Perennial Forb	I	
<b><i>Tetradymia canescens</i> DC.</b>	Asteraceae	Spineless horsebrush	Shrub	N	Collected
<b><i>Thermopsis rhombifolia</i> (Nutt. ex Pursh) Nutt. ex Richardson var. <i>rhombifolia</i></b>	Fabaceae	Prairie golden-banner	Perennial Forb	N	
<b><i>Thlaspi arvense</i> L.</b>	Brassicaceae	Field pennycress	Annual Forb	I	
<b><i>Toxicodendron rydbergii</i> (Small ex Rydb.) Greene</b>	Anacardiaceae	Western poison ivy	Shrub	N	
<b><i>Tradescantia occidentalis</i> (Britt.) Smyth</b>	Commelinaceae	Prairie spiderwort	Perennial Forb	N	
<b><i>Tragopogon dubius</i> Scop.</b>	Asteraceae	Yellow salsify	Perennial Forb	I	
<b><i>Vicia americana</i> Muhl. ex Willd. var. <i>americana</i></b>	Fabaceae	American purple vetch	Perennial Forb	N	Collected
<b><i>Viola nuttallii</i> Pursh</b>	Violaceae	Yellow prairie violet	Perennial Forb	N	

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<b><i>Viola vallicola</i> A. Nels.</b>	Violaceae	Valley violet	Perennial Forb	N	
<b><i>Vulpia octoflora</i> (Walt.) Rydb.</b>	Poaceae	Eight-flower six-weeks fescue	Annual Graminoid	N	
<b><i>Xanthium strumarium</i> L. var. <i>canadense</i> (Miller) T. &amp; G.</b>	Asteraceae	Rough cocklebur	Annual Forb	N	
<b><i>Yucca glauca</i> Nutt.</b>	Agavaceae	Soapweed yucca	Shrub	N	
<b><i>Zannichellia palustris</i> L.</b>	Zannichelliaceae	Horned pondweed	Perennial Forb	N	Collected
<b><i>Zigadenus venenosus</i> Wats. var. <i>gramineus</i> (Rydb.) Walsh ex Peck</b>	Melanthiaceae	Meadow deathcamas	Perennial Forb	N	

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