INVENTORY AND MONITORING OF SENSITIVE SPECIES IN THE NORTH FORK OF THE POWDER RIVER WILDERNESS STUDY AREA, WYOMING

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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 North Fork of the Powder River WSA (hereafter North Fork WSA) is a 10,089 acre area established in 1992 (https://www.blm.gov/node/9974/) at the southern end of the Big Horn Mountains. The North Fork of the Powder River and Pass Creek flow through deep, scenic canyons and the uplands support forests and meadows. Many animals are common in the WSA including elk (*Cervus elaphus*), black bear (*Ursus americanus*), eagles and hawks. The WSA has exceptional opportunities for solitude and primitive unconfined recreation; however, lack of public access restricts recreational use of this WSA. Little is known about 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://www.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 North Fork WSA is one of those information gaps.

Purpose and Objectives

The purpose of this project was to fill information gaps for Sensitive species suspected to occur in the North Fork WSA and assist the BLM Buffalo Field Office in designing and establishing a monitoring framework for key resources in the WSA. 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 North Fork 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 streams in the North Fork WSA.
4) Inventory pollinators across different habitats within the North Fork WSA.
5) Provide the Buffalo Field Office and the Wyoming State Office of the BLM with a list of Sensitive species occurring in the North Fork WSA, which can be used to support informed management decisions.

6) Use results to update species range maps and species distribution models in Wyoming.

North Fork of the Powder River Wilderness Study Area

The North Fork WSA encompasses 4,083 ha (10,089 acres) at the south end of the Big Horn Mountains in Johnson County, north-central Wyoming (Figure 1). It straddles the North Fork of the Powder River and is located about 27.9 km (17.3 mi) northwest of Kaycee. The WSA ranges in elevation from approximately 1,768-2,466 m (5,800-8,192 ft). Public access is limited and permission to access the WSA was coordinated by WYNDD with landowners, entering via the Mayoworth and the Slip Roads to reach eastern and western boundaries from which entry was on foot.

The North Fork of the Powder River flows from the northwest to the southeast through the middle of the WSA, and the land slopes from west to east with fundamentally different conditions on east and west sides. In describing the WSA and its biological resources, we refer to east and west sides as implicitly relating to these two segments of the WSA that are separated by the river.

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.

Field surveys were conducted by 4-5 WYNDD and 0-3 BLM personnel during two trips to the WSA in the summer of 2015. We targeted birds, plants, amphibians, pollinators, riparian areas and aquatic invertebrates from 15-19 June. We targeted bats, reptiles, pollinators, plants and raptor nests from 20-24 July. The east side of the WSA (east side of the North Fork of the Powder River) is separated from the west side by a canyon. We accessed both sides of the canyon during both visits.

Methods

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 began 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 North Fork 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[1] were suspended over water between aluminum poles in single-high arrangements to catch bats while feeding or drinking. Mist nets were 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 40ºF 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. 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+[2] full-spectrum recording equipment. Units were programed 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[3] ultrasonic microphone was attached to a 3m cable and placed between 1m and 2m above the ground. All calls were analyzed

[1] Avinet bat-specific mist nets, 38mm mesh, black polyester, Dryden, NY, www.Avinet.com
[2] Song Meter SM2Bat+ ultrasonic monitoring unit, Concord, MA, www.wildlifeacoustics.com
[3] SMX-US ultrasonic microphone, Concord, MA, www.wildlifeacoustics.com

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.

Other mammals

In addition to bats, we searched for evidence of other mammals in the North Fork WSA. Animal scat and tracks were identified to species, when possible. In order to document medium and large carnivores and other secretive species, we placed two digital infrared trail cameras[4] 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 North Fork 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.

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. 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.

Aquatic invertebrates

We collected aquatic invertebrates from the North Fork of the Powder River, Pass Creek and other habitats we encountered (e.g, rock pools) in the WSA. We collected aquatic invertebrates using a Surber sampler (243 µm mesh; Figure 2b). 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 assigned a tolerance value (Barbour et al. 1999). We measured dissolved oxygen, temperature, specific conductivity, pH, and oxidation-reduction potential using a Professional Plus made by Yellow Springs Instruments (Figure 2c). The sensors were calibrated before departing from the vehicles, but dissolved oxygen was calibrated on-site immediately before collecting measurements. We measured stream width, depth, and mean particle size of the substrate (n = 20; gravelometer).

[4] RECONYX PC800 HyperFire Professional Semi-Covert, Holmen, WI, http://www.reconyx.com

Pollinators

We collected insects using vane traps, bee cups and visual encounter surveys to estimate the abundance and diversity of pollinators in the North Fork WSA (Figure 2a). We placed vane traps and bee cups in different habitats for 24-48 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. Other pollinating insects encountered during our excursions were captured with nets (Figure 2d). 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).

Terrestrial snails and other invertebrates

We encountered excellent habitat for terrestrial snails on the western side of North Fork WSA. We collected snails by hand searching for individuals. Snails were drowned in water for ~24 hours before being preserved in ethanol to aid identification. Snails were identified under a dissecting microscope and using available keys (Burch and Pearce 1990). Other invertebrates were collected when they were encountered and preserved in ethanol.

Plants

Vascular flora

We searched the database at WYNDD for plant records within and near the study area prior to our visits to the WSA. The WYNDD database included records for plants with agency status (e.g., BLM sensitive plant species; USDI BLM 2010) and others that are rare in Wyoming (plant species of concern; SOC; Heidel 2012). Only one plant record was previously known from the WSA from WYNDD records. In 1992, William's waferparsnip (*Cymopterus williamsii*) was surveyed at the extreme edge of the WSA (south side of Packsaddle Canyon; Fertig 1992). Records of three SOC plants were within 20 km of the WSA (Howard's forget-me-not, *Eritrichium howardii*; coiled-beak lousewort, *Pedicularis contorta* var. *ctenophore;* woolly twinpod, *Physaria lanata*). Additionally, we searched the Rocky Mountain Herbarium (RM) on-line database (2015) and we found that the only collection record was a voucher of the same 1992 *Cymopterus williamsii* survey. We prepared a vascular plant checklist of the Big Horn Mountains generated using the on-line RM specimen database to include mountains and foothills for reference (RM on-line database 2013). We added wetland species documented from a prior study in the Big Horn Mountains (Heidel 2011a). The checklist was carried into the field for direct cross-reference when collecting species.

During fieldwork, all plant SOC were sought by taking routes using aerial photographs to target the range of habitats in any given locale to traverse prevailing environmental conditions and to traverse major gradients of elevation, topographic position, aspect and vegetation cover. Outcrop and wooded habitats were the emphasis in the June surveys, while grassland and canyon bottom habitats were the emphasis in the July surveys. Habitats spanning the range of successional to climax habitat conditions were also sought. The rest of species observed were compared with those on the Big Horn Mountains checklist and with the state flora (Dorn 2001) to determine whether or not the species was already known from the Big Horn Mountains and from Johnson County. Specimens were collected and

photographs were taken for documentation, to record target species, distribution extensions, typical species and other distinctive parts of the flora, as well as any that couldn't be readily identified in the field using Dorn (2001). GPS points were recorded at collection sites. The two sides of the North Fork of the Powder River differed fundamentally in habitat conditions, so GPS data and field notes were cross-referenced to distinguish between species' distributions on the east versus west sides. Voucher specimens were deposited at the Rocky Mountain Herbarium, where data have been entered for specimen database queries and they have been scanned and posted on-line. Rare plant survey forms were completed, voucher specimens collected, photographs taken of the species and their habitats, and GPS points projected to map population boundaries.

Vegetation

The framework for vegetation characterization in the Big Horn Mountains comes from work in the Bighorn National Forest (Despain 1973). Standard vegetation description forms from WYNDD were completed in six vegetation stands during July fieldwork, and field notes were compiled from both June and July fieldwork to characterize patterns of plant composition and distribution in the WSA according to the U.S. National Vegetation Classification system (http://usnvc.org/explore-classification/).

Limber pine surveys

Limber pine (*Pinus flexilis*) was also addressed because it is designated as a BLM Sensitive species, and the Forest Vegation Inventory Systems (Version 2) form was used to assess Limber pine stands in the field.

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 for each major drainage in the North Fork WSA after discussing each statement with the group of observers.

Results

Geology

The Big Horn Mountains were uplifted during the Laramide orogeny that began about 70 million years ago (Despain 1973, Lageson and Spearing 1988). The Precambrian core of the Big Horn Mountains is flanked by thrust blocks to the east and west of the Mountains, and these younger rocks are comprised of Paleozoic to early Mesozoic sedimentary formations. Outcrops of Precambrian bedrock extend as far south as The Horn immediately east of the WSA, with the sedimentary formations converging at the south end of the mountains. In the WSA, these formations include Madison Limestone (limestone and dolomite of Upper and Lower Mississippian), Tensleep and Amsden Formations (sandstone, shale and dolomite of mid- to lower Permian and upper to mid Pennsylvanian), and a limited area of the Chugwater and Goose Egg Formations (sandstone, siltstone, shale, dolomite and limestone in Upper Mississippian, mid to lower Permian and lower Triassic) in the southeastern corner of the WSA (Love and Christianson 1985).

Rivers and streams carved canyons in the sedimentary thrust blocks, and the WSA has a deep canyon on the North Fork of the Powder River and canyons on two of its tributaries, Pass Creek and Packsaddle Creek (Figure 3a, b). The North Fork of the Powder River runs the 10-mile length of the WSA, dividing it into east and west sides that have fundamentally different terrain. The east side has is

relatively low elevation with extensive grassland, and rolling or planar slopes. The west side is higher with forest cover predominant in the uplands in a relatively dissected terrain. Adding to the dramatic canyon topographic relief, the North Fork of the Powder River cuts through giant Madison Limestone escarpment blocks that have 1000 foot relief.

Soils

Soils of the North Fork WSA were generally mapped as rock outcrop by USDA Natural Resources Conservation Service (STATSGO). However, the WSA lies within that portion of Johnson County having more detailed soils mapping (Stephens 1975), and includes eight primary units (Table 1).

Vegetation characterization

The WSA contains many of the forested, shrub and grassland vegetation types of the Big Horn Mountains (Despain 1973). Generally, the east side of the WSA has a vegetation type typical of foothills and plains. The west side of the WSA, has a vegetation type more typical of the Rocky Mountains with montane elevation range (Figure 3c-f). We did not observe spruce-fir forests, lodgepole pine forests, or Utah juniper woodlands that have been noted in other places in the Big Horn Mountains.

Douglas fir forests and woodlands were the most extensive vegetation type in the WSA and were prevalent in upland vegetation west of the North Fork of the Powder River, especially on north-facing slopes. Woodland stands of Douglas fir with common juniper understory were on gentle uplands. Stands of Douglas fir with mixed age structure (sapling and pole size trees but little shrub understory) were generally on the leeward slopes and these stands occasionally had large Douglas fir and/or Ponderosa pine trees (greater than 30 in diameter at breast height; DBH) that rose above the canopy. Many of these large trees showed fire scars. We examined a forested slope of mixed Douglas fir and Limber pine that had burned about five years ago in a crown fire south of the Dry V.

A variety of upland vegetation types were observed at the North Fork WSA. Ponderosa pine woodland and parkland were localized in the uplands, and formed a pine parkland along the Dry V and a pine woodland on the east-facing limestone escarpment on the east side of the North Fork WSA. Limber pine woodlands were widespread on the west of the North Fork WSA, mainly at breaks in topography such as knolls and along rims. We conducted Limber pine health assessments and blister rust infection was widespread even though mortality levels were low currently. Idaho fescue grasslands were common on open ridgetops and at the heads of valleys on the west side of the WSA. Mountain big sagebrush steppe was localized in mesic heads of valleys west of the North Fork WSA and overlaped in composition with fescue grassland. The mountain big sagebrush steppe might reflect a climax condition in the absence of fire. Bluebunch wheatgrass grassland was mainly on south-facing outcrop slopes on ridges and in canyons on both sides of the North Fork WSA. Mixed grass prairie was prevalent east of the North Fork WSA across extensive colluvial deposits. Needlegrass with threadleaf sedge were dominant, and western wheatgrass was a major component in low areas. Golden pea was abundant over large areas of the WSA. Silver sage and fringed sage (a subshrub) were present at low numbers or only locally abundant. Mountain mahogany scrub formed extensive blocks and bands within canyons, on canyon rims, and on east-facing escarpment sloping into the canyon.

Different plants grew along the streams compared to the upland habitats. Cottonwood woodland formed small, isolated stands along the North Fork WSA floodplain. Willow thickets and Great Basin wild-rye terraces were prevalent along the floodplain of the North Fork WSA. Vast areas of uplands were cliffs, unvegetated outcrops or sparingly vegetated slopes. The stratigraphic complexity caused an array of barren slopes, deeply-incised canyons, and highly-meandering streams in the WSA. Perennial river and stream habitats were found along the North Fork of the Powder River and Pass Creek,

respectively. They were coldwater streams with gravel bottoms in canyon settings, and relatively low-gradient except for occasional waterfalls on tributary streams. The streams had little submerged aquatic vegetation and their emergent vegetation was limited to bank and backwater habitats.

Birds

We surveyed a total of 15 transects and conducted a total of 101 point counts (Figure 4). During point counts, we detected 990 individual birds representing 66 bird species (Table 3). The most frequently detected bird species was Ruby-crowned Kinglet (*Regulus calendula*) followed by Townsend's Solitaire (*Myadestes townsendi*). No bird species listed as Sensitive by Wyoming BLM were detected during point count surveys. Seven bird species listed as Species of Greatest Conservation Need (SGCN) by the WGFD were documented during point count surveys (Table 2). 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*), Cooper's Hawk (*Accipiter cooperii*), Golden Eagle (*Aquila chrysaetos*), Great-horned Owl (*Bubo virginianus*), and Northern Goshawk (*Accipiter gentilis*). We did not observe any raptor nests but did observe indirect evidence of breeding by three species. We we detected a Cooper's Hawk alarm call, observed a juvenile Golden Eagle in flight, and two fledgling Northern Goshawks.

Mammals

Bats

Acoustic recorders were deployed for a total of four nights at two sites (Figure 5). From these recordings, we identified seven bat species (Table 4). The most frequently detected species was the Little Brown Myotis (*Myotis lucifugus*) followed by Hoary Bat (*Lasiurus cinereus*). Only one bat species, Townsend's Big-eared Bat (*Corynorhinus townsendii*), was documented from acoustic recordings alone. Echolocation calls of Townsend's Big-eared Bat are generally considered diagnostic (Adams 2003).

We conducted a total of three mist-net surveys and captured 29 bats representing seven species (Figure 5). The most frequently captured bat was the Little Brown Myotis (Table 4). Overall, we observed a male sex bias, with 18 captures of male bats and 11 captures of female bats. We observed evidence of reproduction in three speices: Hoary Bat, Little Brown Myotis, and Silver-haired bat (Table 3). Specifically, we captured one female Hoary Bat that showed evidence of recent lactation, five female Silver-haired Bats that showed evidence of current lactation, and one juvenile Little Brown Myotis. Inspection of the wing and tail membranes of the captured bat did not reveal any signs of White-nose Syndrome (WNS).

We documented two bat species listed as Senstive by Wyoming BLM: Long-eared Myotis (*Myotis evotis*) and Townsend's Big-eared Bat. We document five bat species considered SGCN by WGFD (Table 4).

Other Mammals

In addition to bats, we documented several other mammal species (Table 5) using remote camera (Figure 6) and incidental observations. Elk (*Cervus canadensis*) were the most common species recorded by remote cameras (Figure 7c). Mountain lion (*Puma concolor*; Figure 7a), black bear (*Ursus americanus*; Figure 7b) mule deer (*Odocoileus hemionus*; Figure 7d), and yellow-bellied marmot (*Marmota flaviventris*) were also documented using remote cameras. Documentation of secretive species like mountain lion demonstrate the utility of remote cameras in generating complete speices lists. We visually documented a number of mammalian species including least chipmunk (*Tamias*

minimus), bushy-tailed woodrat (*Neotoma cinerea*), Wyoming ground squirrel (*Urocitellus elegans*), coyote (*Canis latrans*), and pronghorn (*Antilocapra americana*) in the WSA. Sign of North American porcupine (*Erethizon dorsatum*), cottontail rabbits (*Sylvilagus* sp.), and bobcat (*Lynx rufus*) also were detected.

Reptiles and amphibians

We detected 4 species of reptiles (1 lizard, 3 snakes) in the North Fork WSA (Figure 8, 9, 10; Table 6). The Northern Sagebrush Lizard (*Sceloporus graciosus graciosus*) was the only lizard species detected in the WSA (Figure 11a). We incidentally encountered a Prairie Rattlesnakes (*Crotalus viridis*) along the North Fork of the Powder River (Figure 11b). We also detected Bullsnakes (*Pituophis catenifer sayi*; Figure 11c) and two Eastern Yellowbellied Racer (*Coluber constrictor flaviventris*) along ephemeral drainages.

Aquatic invertebrates

We collected at least 43 taxa of aquatic invertebrates at the North Fork WSA (Figures 12, 13). Ninety-seven percent of invertebrates in both streams were insects from 5 orders (true flies, mayflies, stoneflies, beetles and caddisflies; Table 7; Figure 14). We also collected crustaceans, mites and mollusks. In the North Fork of the Powder River, 63% of taxa were true flies, 14% were caddisflies and 14% were mayflies. Similarly, 73% of invertebrates in Pass Creek were true flies, 9% were caddisflies, 7% were beetles and 5% were mayflies. Most of the invertebrates that we collected had moderate to low tolerance values (<6). The presence of sensitive taxa in the streams indicated good ecosystem quality; however, their absence from streams indicates poor ecosystem quality. Taxa in the orders mayflies, caddisflies and stoneflies (EPT) are generally considered sensitive and the number of taxa collected from these insect orders are often used to assess the ecosystem quality of streams. We collected 21 genera of EPT in the North Fork of the Powder River and and 10 EPT genera in Pass Creek. Both of these values indicate that the streams had excellent ecosystem quality. Hilsenshoff's Biotic index calculates the average tolerance value of an invertebrate in each river on a scale of 0 (very sensitive to ecosystem quality) to 10 (very tolerant of ecosystem quality). Invertebrates in the North Fork of the Powder River had an average tolerance value of 5.02 and invertebrates in Pass Creek had an average tolerance value of 5.00 indicating good ecosystem quality (Hilsenhoff 1987). Basic water quality in both streams were within the range of other mountain streams in Wyoming (Table 8) and indicated ample oxygen for aquatic life. pH was basic which is common across Wyoming. Additionally, we collected the Ceratopogonidae, *Dasyhelea*, from a rock pool at the rim of the canyon in the Dry V area.

Pollinators

We collected 48 taxa of bees in pollinator traps at the North Fork WSA (Figures 15, 16a-d; Table 9). Sampling locations are in Appendix 2A. We collected 1.6 insects/hr in traps; however, we collected more insects in July (1.8 insects/hr) than June (1.4 insects/hr). We captured twice as many insects in vane traps (2.1 insects/hr) than bee cups (0.9 insects/hr). Most of the pollinators we collected were beetles (56%), but true flies (20%), bee (19%), true bugs (3%) and butterflies and moths (1%) also were present. Of the bees we collected, *Lasioglossum* (subgenus Dialictus; 17%) *Osmia* (12%), *Anthophora* (6%) and *Agapostemon texanus/angelicus* were the most abundant.

We collected 32 taxa of butterflies and moths in pollinator traps and visual encounter surveys (Table 10; Figure 16e-f). The brush-footed butterflies were the most abundant family, and the Common Ringlet (*Coenonympha tullia ochraeae*), the Small Wood-nymph (*Cercyonis oetus charon*), Common Alpine (*Erebia epipsodea epipsodea)*, Field Cresent (*Phyciodes pulchella*) and the Mormon Fritillary (*Speyeria mormonia*) were the most abundant species in the family. The Clouded Sulphur (*Colias*

philodice) was the most abundant Sulphur butterfly and the Melissa Blue was the most abundant Blue butterfly. Eight butterflies and moths had not previously been collected in the county.

Terrestrial snails and other invertebrates

We collected 12 taxa of land snails in a canyon on the west side of North Fork WSA and near the North Fork of the Powder River, including *Oreohelix subrudis* and *Discus* (Table 11; Figure 17). Conditions were ideal for land snails in areas that had plentiful overstore with cool, moist conditions. We also collected a pseudoscorpion, six types of beetles and fairy shrimp (Table 11; Figure 17).

Plants

Vascular flora

A total of 277 vascular plants are now known from the WSA, of which 83 (~30%) have voucher specimens (Table 12). The WSA flora includes 251 native species and 16 non-native species (9.4 %). They represent 58 families, and about 26% of the Johnson County flora (of the ~1508 taxa reported for the county in Dorn 2001). About 25 of the WSA species were not previously known in the Johnson County flora. Some of the species are only on the east side of the study area and they are more typical of the Great Plains and foothills floras. Some of the species are only on the west side and they are more typical of the Rocky Mountain flora. The species in canyons and dry forests were on both sides of the river. This documentation of the flora represent preliminary numbers from a study that had dual objectives (survey of individual rare species and documentation of the flora as a whole).

Rare plants

Five plant SOC were documented, and they have contrasting distributions and habitat requirements in the North Fork WSA (Table 13). Only the William's waferparsnip (*Cymopterus williamsii*) is a BLM Sensitive species but three others are Wyoming species of concern and one is a Wyoming species of potential concern, i.e., species that are state or regional endemics and, though appearing to be secure at present, could become vulnerable under large-scale changes (Heidel 2012). *Cymopterus williamsii* and three others of the five rare plant species targets, hairy tranquil goldenweed (*Pyrrocoma clementis* var. *villosa*), Hapeman's sullivantia (*Sullivantia hapemannii*) and woolly Twinpod (*Physaria lanata*), have their global center of distribution restricted to or concentrated in the Big Horn Mountains. The fifth species, Howard's forget-me-not (*Eritrichium howardii*), is a regional endemic species of Montana and Wyoming, and the southern Big Horn Mountains represent the southern and eastern limits of its global distribution. The five species are also calciphiles, i.e., concentrated on calcium carbonate-rich substrates if not restricted to them.

Sullivantia hapemannii, is associated with limestone substrates, but it is in the canyon bottoms of the WSA along perennial rivers and streams including the North Fork of Powder River and Pass Creek (Figures 18, 19, 20). There, it occurs on boulders and rock outcrops above the scour-line, in cool, sheltered valleybottom settings that are in shade for at least part of the day. The North Fork population of *Sullivantia hapemanii* represents the southernmost extent of the species in the Big Horn Mountains. This species may be a relict of cooler, wetter climate conditions (Heidel 2004).

Pyrrocoma clementis var. *villosa* is concentrated in fescue grasslands (both valley and upland; Figures 18, 21, 22). The two taxa overlap or adjoin one another in Limber pine woodland and some outcrops adjoining fescue grassland. The North Fork population of *Pyrrocoma clementis* var.

villosa represents the first time it has been collected in the BLM Buffalo Field Office. More detailed information about its status is presented in Heidel (2011b) and with updates pending after 2017 fieldwork in the Bighorn National Forest.

Eritrichium howardii was found in one cushion plant rim setting, but appears to be mainly in the contiguous mountain mahogany shrubland on the escarpment (Figures 18, 23, 24). It is a regional endemic of southwestern Montana and northern Wyoming at its southern and eastern limits aspresent in the North Fork WSA. It has the most incomplete of surveys among all five species, so interpretations are preliminary. In June surveys, it was first spotted in vegetative condition as a tiny, spheroid, hairy rosette and later in flower. It cannot be identified with certainty in vegetative condition and is readily overlooked as such. It is possible that the timing of June survey work was relatively late for this species and that the population is much more extensive than documented to date.

Cymopterus williamsii only occurs in the southern Big Horn Mountains and nowhere else (Figures 18, 25, 26). However, in the study area, it is widespread and was found in cushion plant communities and barren outcrops along well-developed limestone canyon rims both east and west of the North Fork of Powder River, as well as in open Douglas fir stands on gentle upland slopes, open Limber pine stands, mountain mahogany stands, rocky portions of fescue grassland, and small outcrops in otherwise contrasting vegetation of the west side. The place where it was originally surveyed in 1992, on limestone knolls and breaks near the canyon rim on the south side of Packsaddle Canyon, supported the species in high densities, but it is far more extensive on the landscape, in far more habitats, and with additional high-density population segments than previously known. The North Fork population of *C. williamsii* is now one of two largest and most extensive populations known to date. Furthermore, the North Fork population might be treated as part of an even larger population complex, i.e., a metapopulation connecting with Gardner Mountain. This area of the Big Horn Mountains and south of Middle Fork, farther south, are the highest known concentrations of this state endemic species globally. Results from North Fork surveys of *C. williamsii* were incorporated in a related project to survey and monitor this species and update its status report (Handley in progress).

Physaria lanata just barely enters the WSA on Chugwater sandstone outcrop in the southeastern corner (Figures 27, 28). While this formation is exposed in a number of places in the southeastern corner, the particular locale where the species was found is relatively unvegetated compared to the rest, with scattered pine and plants that grow on barrens. Only two individual plants were found, so there is very low viability if the population does not extend into surrounding lands (not surveyed). However, this species is present on calcium carbonate-rich substrates that span a wide range of elevation elsewhere in the Big Horn Mountains (Handley and Heidel 2011).

Noxious weeds

Noxious weeds are restricted to the canyon bottoms, including Canada thistle (*Cirsium arvense*), hound's-tongue (*Cynoglossum officinale*) and musk thistle (*Carduus nutans*). Cheatgrass (*Bromus tectorum*) is nearly absent from uplands at present, but is present in canyons and common on south-facing canyon slopes above Pass Creek where bluebunch wheatgrass is dominant. Wild licorice (*Glycyrrhiza lepidota*) is present in canyon bottoms and valley heads, but even though it is native, it is on

the noxious weed list of Johnson County. Weed-spraying is conducted by spot treatments in canyon bottoms. One instance was noted of a native stickseed (American stickseed; *Hackelia deflexa* var. *americana*) having been sprayed and killed by herbicide, possibly confused with flatspine stickseed (*Lappula redowski*) or maybe even with hound's-tongue, all of which are in the same family.

Limber pine surveys

We surveyed four limberpine stands and assessed the level of blister rust (Appendix A). Younger trees (<10 m height) had little blister rust infections (0-20%); however 50-100% of older, taller trees (>20 m height) were infected with blisterrust.

Riparian assessments

We assessed the riparian habitat of North Fork of the Powder River and Pass Creek. Both rivers are naturally confined in caynons. The hydrology, erosion and deposition was as expected for confined streams with cobble bottom. The riparian vegetation was diverse, dense and consisted of multiple age classes. However, noxious weeds were present in the riparian area. Overall, the streams are in good conditions as was also suggested by the aquatic invertebrate assemblage.

Acknowledgements

We sincerely thank the NLCS Research Support Program for funding this project. Dennis Saville, 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 Gordon family and Neil Delapp for allowing us access through their land to the WSA. Chris Sheets, Wyatt Wittkop, and Charlotte Darling (BLM) were invaluable help in the field. WYNDD information systems and services coordinator Mark Andersen also provided invaluable help in the field. WYNDD ecologist George Jones classified the vegetation types that occur in the North Fork of the Powder River WSA. We are also grateful to Bryan Tronstad, Oliver Wilmot and Katrina Cook of WYNDD for help processing and identifying invertebrates, and Cliff Ferris for checking butterfly identification. The resources of the Rocky Mountain Herbarium, including both on-line resources and herbarium resources, are acknowledged with gratitude.

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Figures

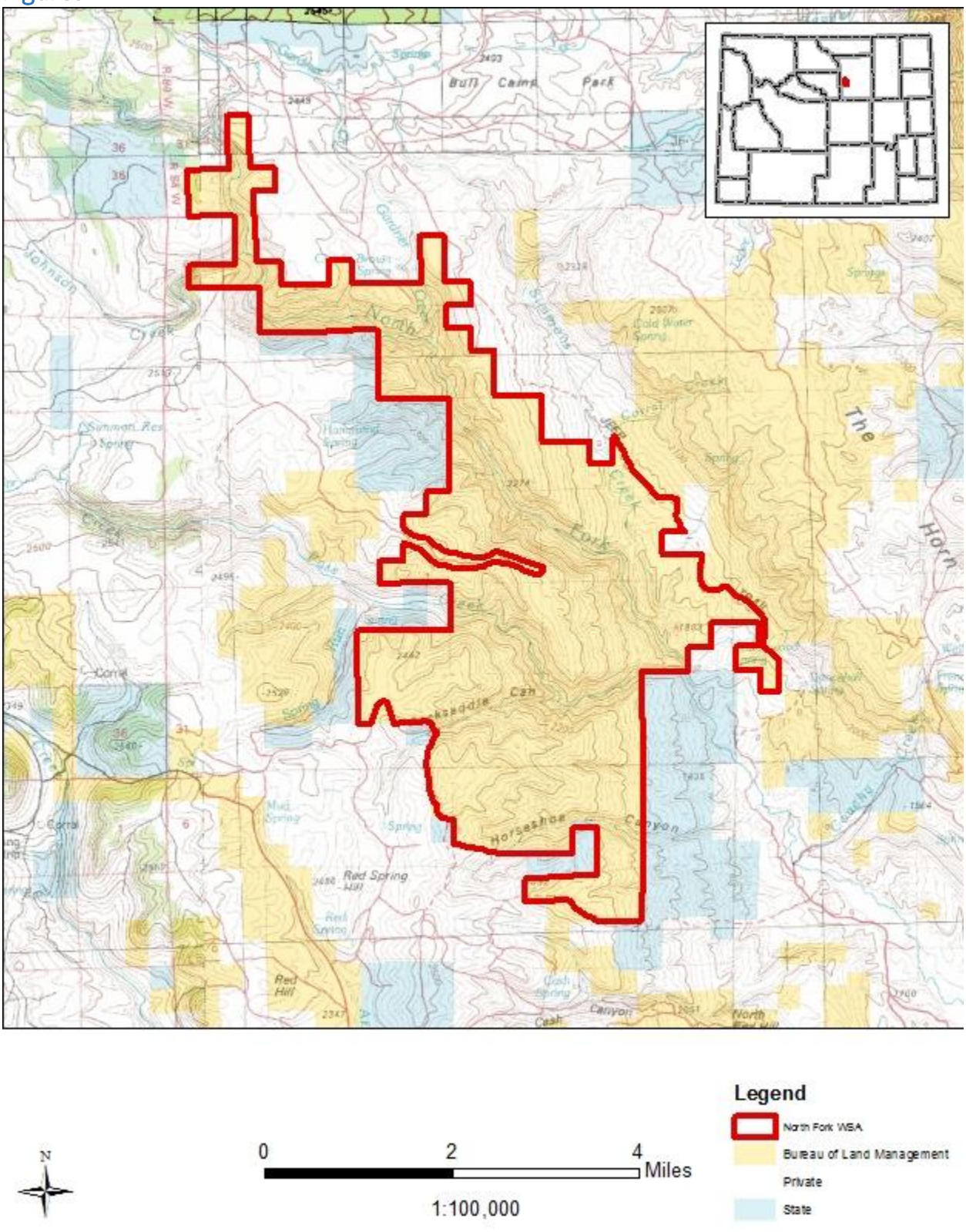

Figure 1. Map of the North Fork Wildness WSA in Wyoming.

Figure 2. Photo of a vane trap (top portion) and bee cups (bottom portion) used to collect pollinators (a). We collected aquatic invertebrates using a Surber sampler (b) and basic water quality with sonde (c). We collected butterflies and bees that we encountered with an aerial net (d).

Figure 3. Photographs of prominent study area features. Canyon topography dissects NF WSA terrain (a). Exposed rim and cliffs on North Fork of the Powder River (b). Pass Creek has a deeply-incised side canyon at its mouth on North Fork of the Powder River (c). North Fork of the Powder River is a cold river with bankside seeps and coldwater tributaries (d). Fire is a recurring natural disturbance in the NF WSA, recent and historic (e and f). Grassland and forest habitats are well-developed on both sides of the North Fork, but those on the west are typical of Rocky Mountains at higher elevation compared with those on the east side which are typical of Great Plains.

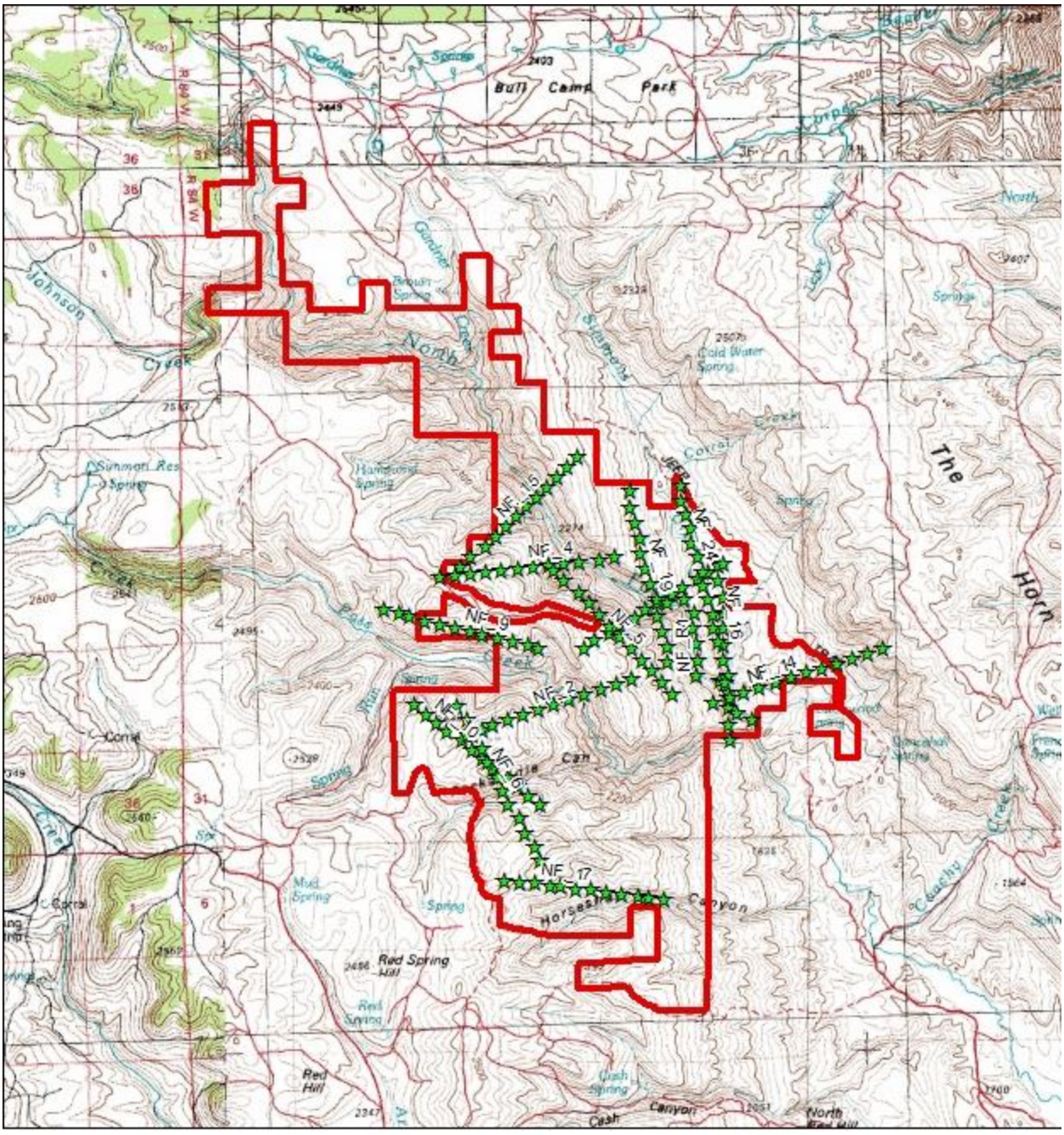

Figure 4. Locations of songbird point count transects surveyed in 2015 in the North Fork WSA.

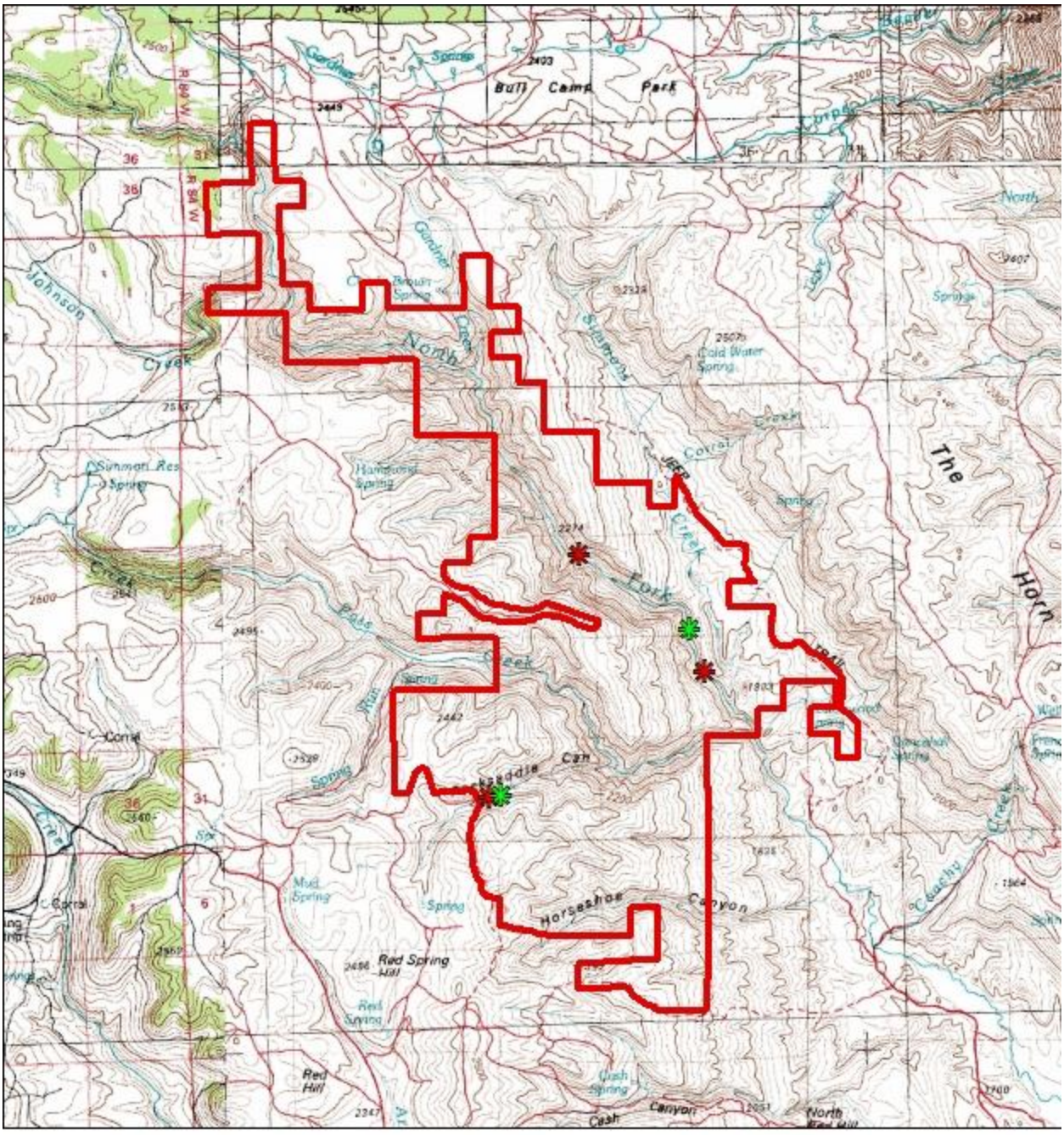

Figure 5. Locations of acoustic and mist net surveys for bats in the North Fork WSA in 2015.

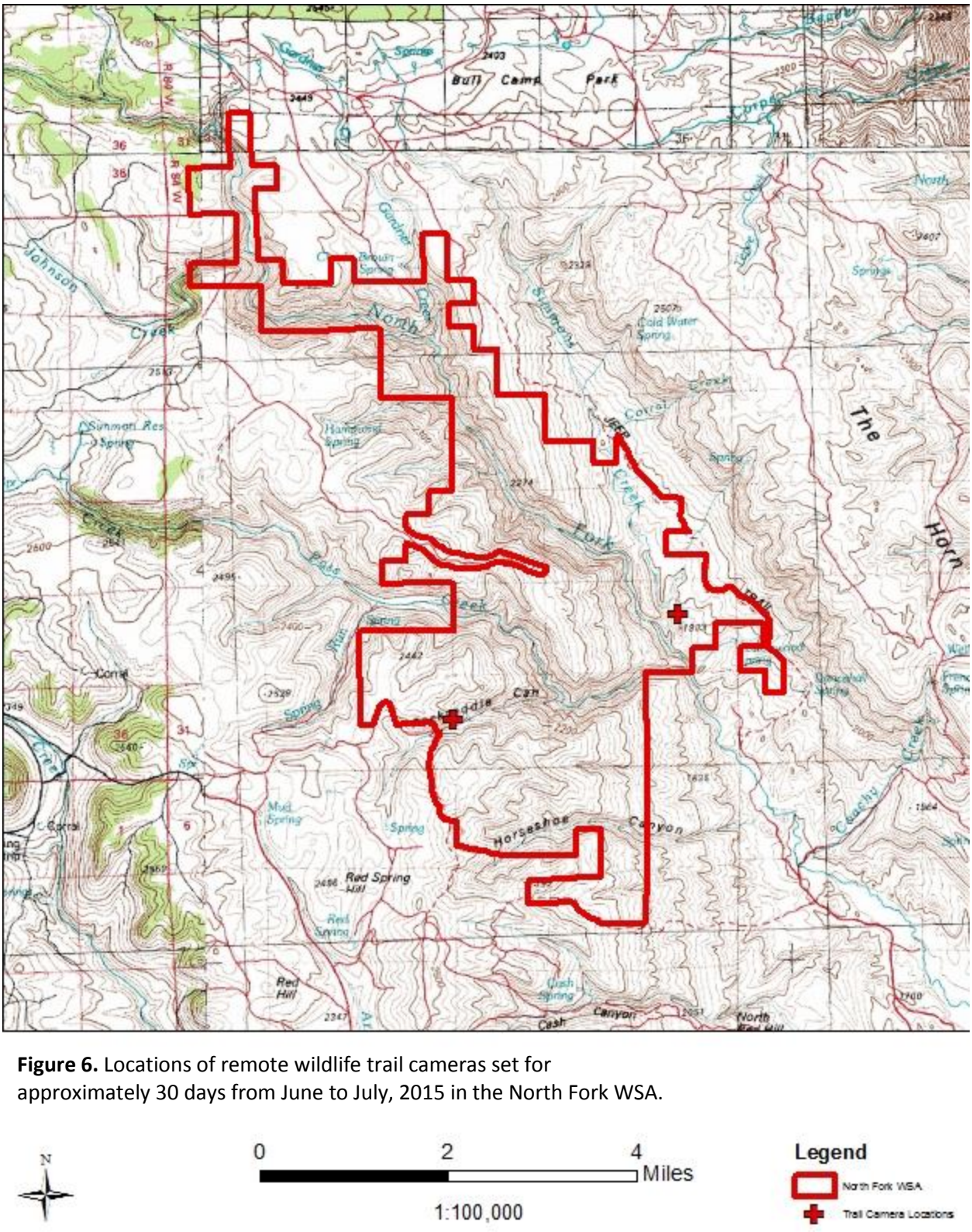

Figure 6. Locations of remote wildlife trail cameras set for approximately 30 days from June to July, 2015 in the North Fork WSA.

Figure 7. Trail camera photos documenting from top left to bottom right: mountain lion (*Puma concolor*), black bear (*Ursus americanus*), elk (*Cervus canadensis*), and mule deer (*Odocoileus hemionus*) in the North Fork WSA in 2015.

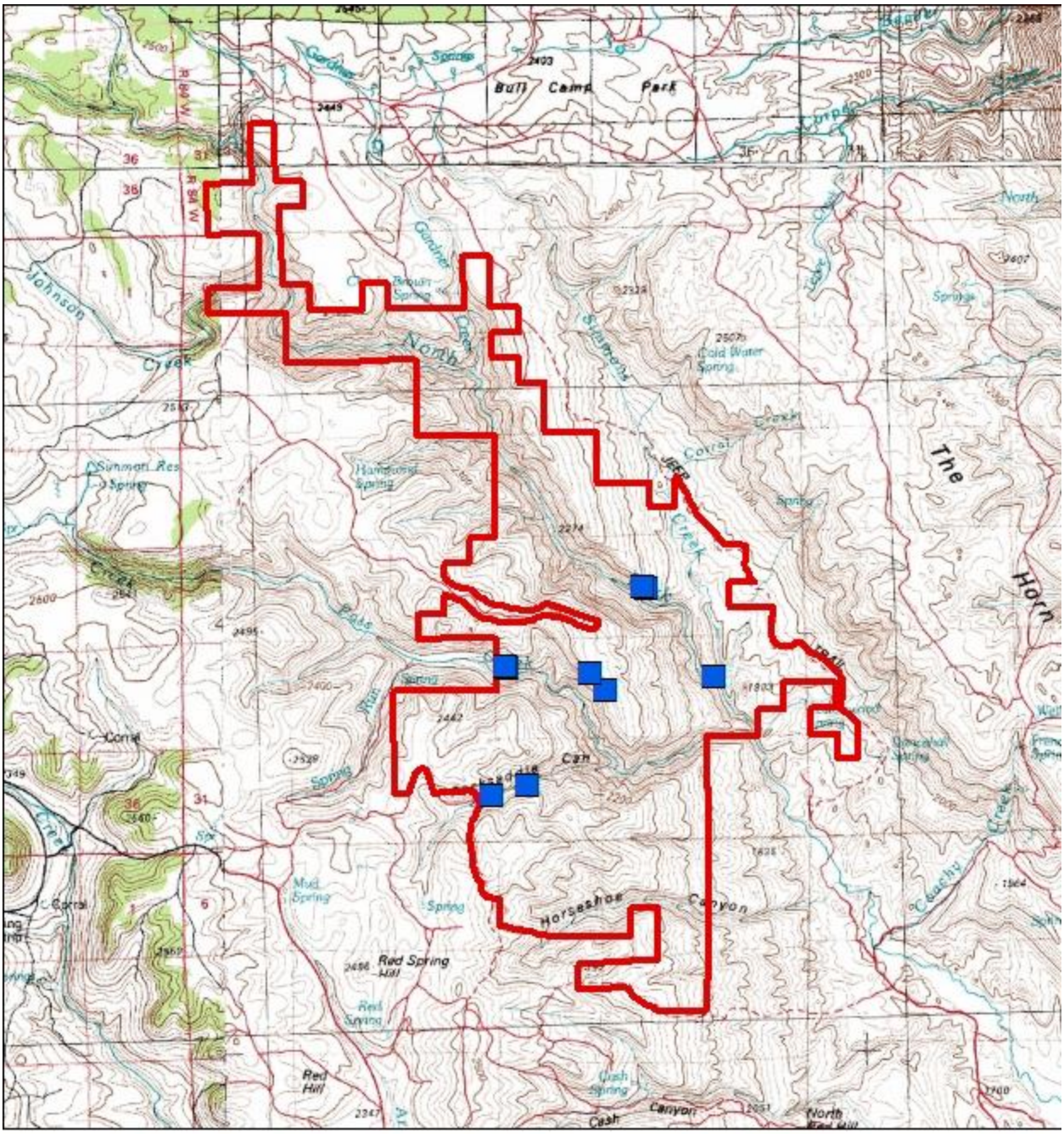

Figure 8. Locations of rock outcrop surveys conducted in June and July, 2015, in the North Fork WSA.

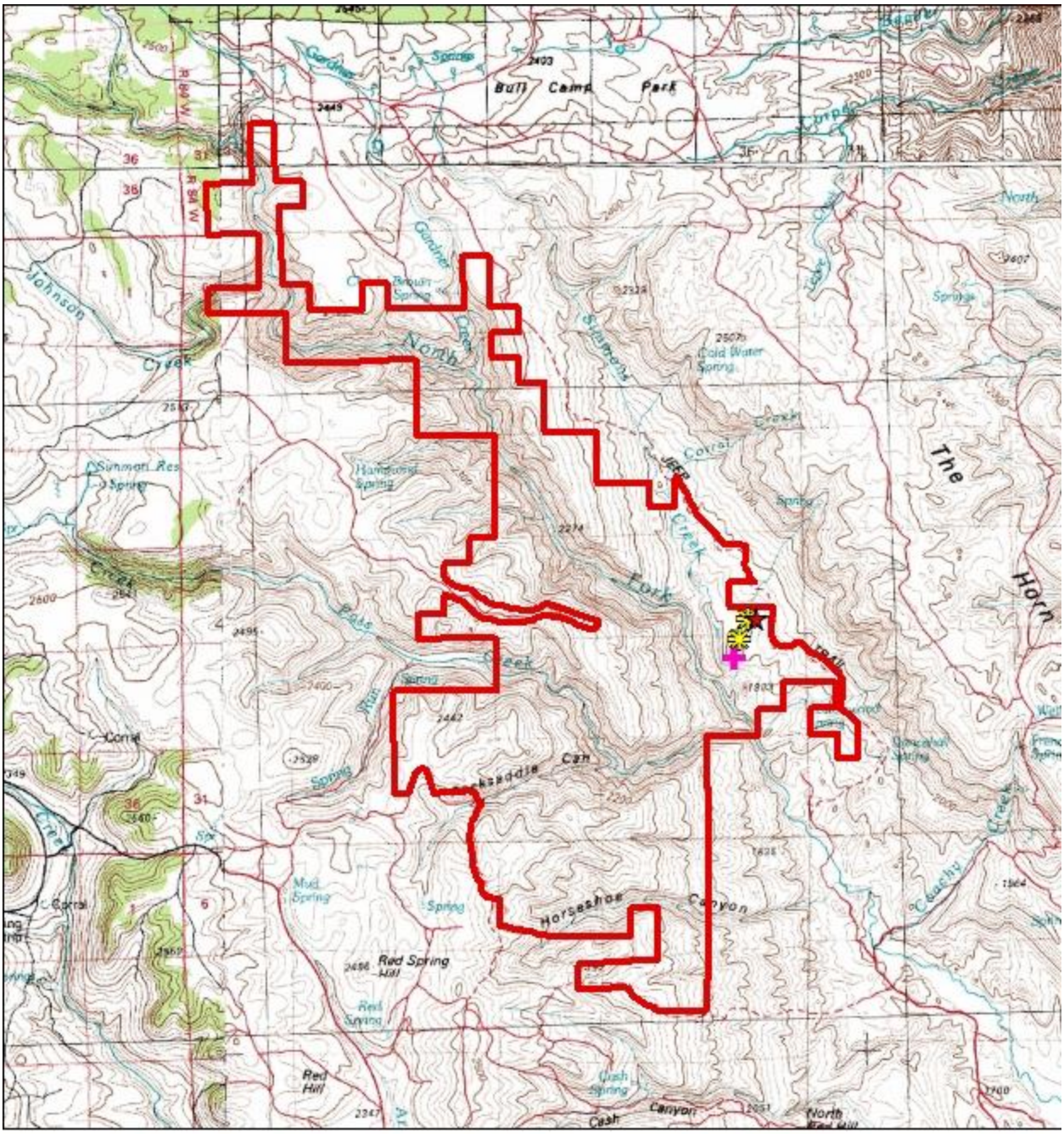

Figure 9. Locations of all reptiles detected in June and July, 2015 in the North Fork WSA.

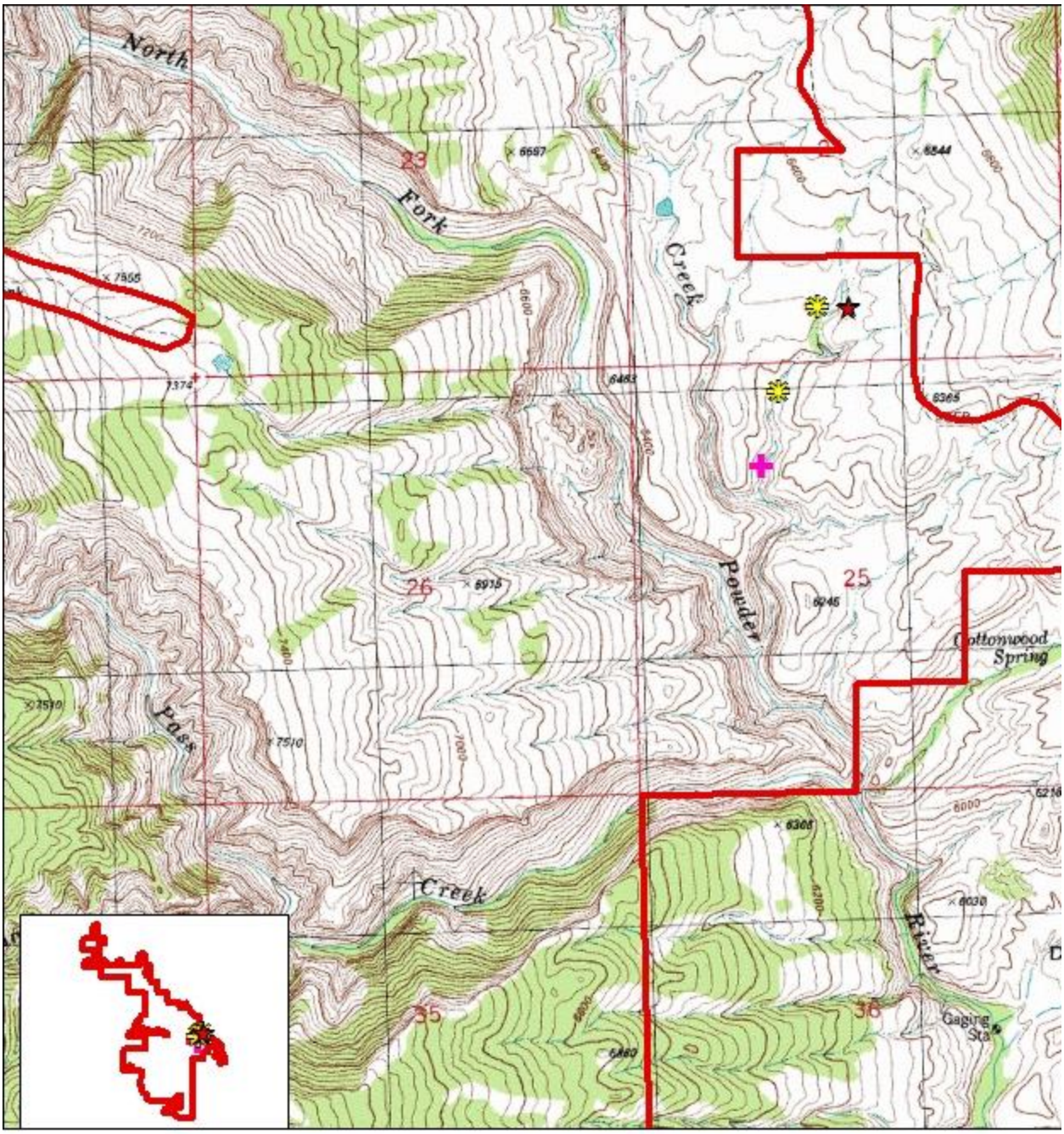

Figure 10. Locations of all reptile detected in June and July, 2015, in the North Fork WSA.

Figure 11. Example of reptile species in the North Fork WSA. Northern Sagebrush Lizard (a) a rattle snake that apparently drowned in the river (b) and a bull snake (c).

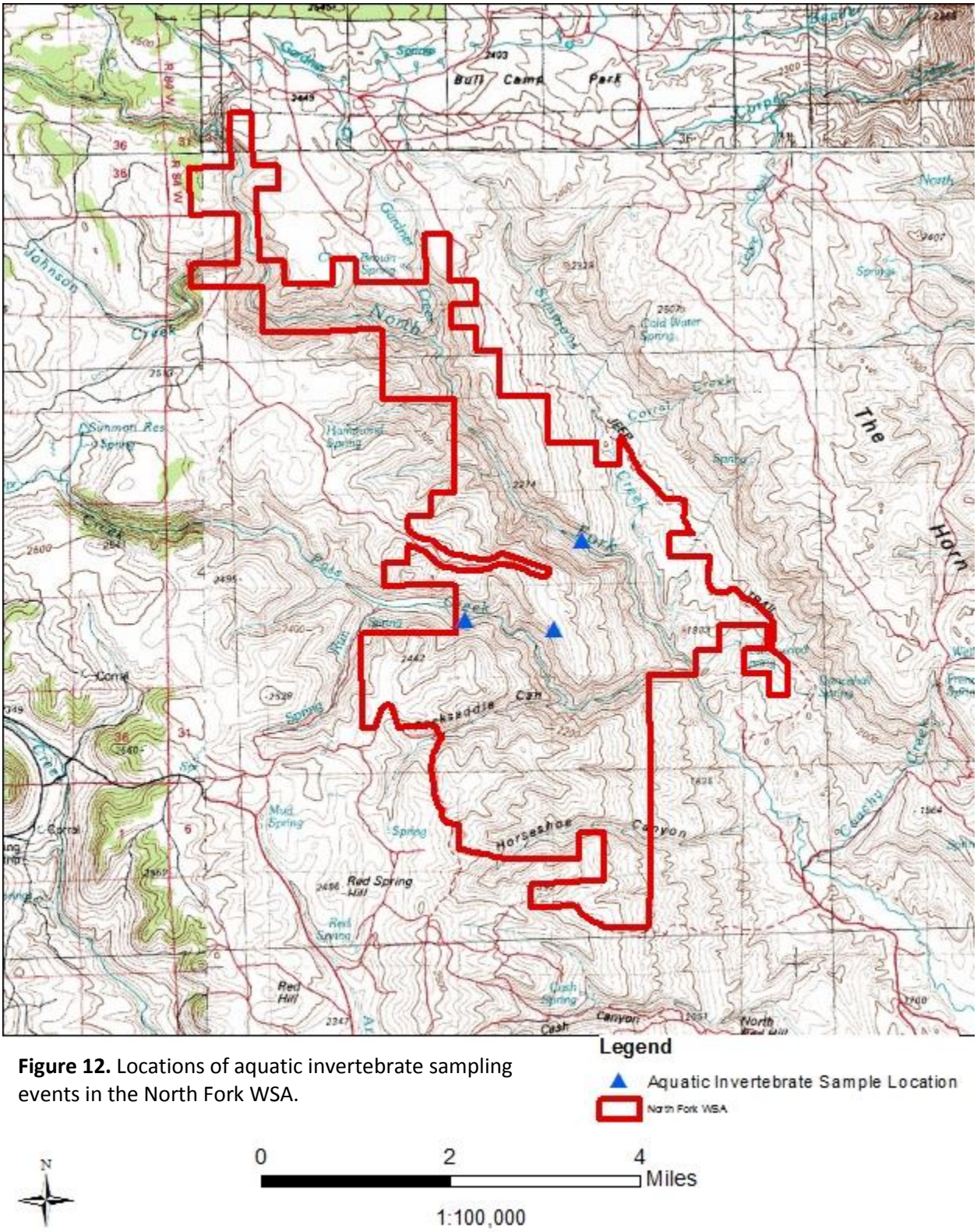

Figure 12. Locations of aquatic invertebrate sampling events in the North Fork WSA.

Figure 13. Pass Creek (a), North Fork of the Powder River (b) and a temporary rock pool (c) where we sampled aquatic invertebrates in the North Fork WSA.

Figure 14. Photos of some of the aquatic invertebrates we collected at North Fork WSA. *Neothremma* (caddisfly; a), *Drunella coloradensis* (mayfly; b), *Heterocloeon* (mayfly; c), *Rhyacophila brunnea* (caddisfly; d), *Antocha* (true fly; e), Elmidae larvae (beetle; f) and several insects captured during sampling (g).

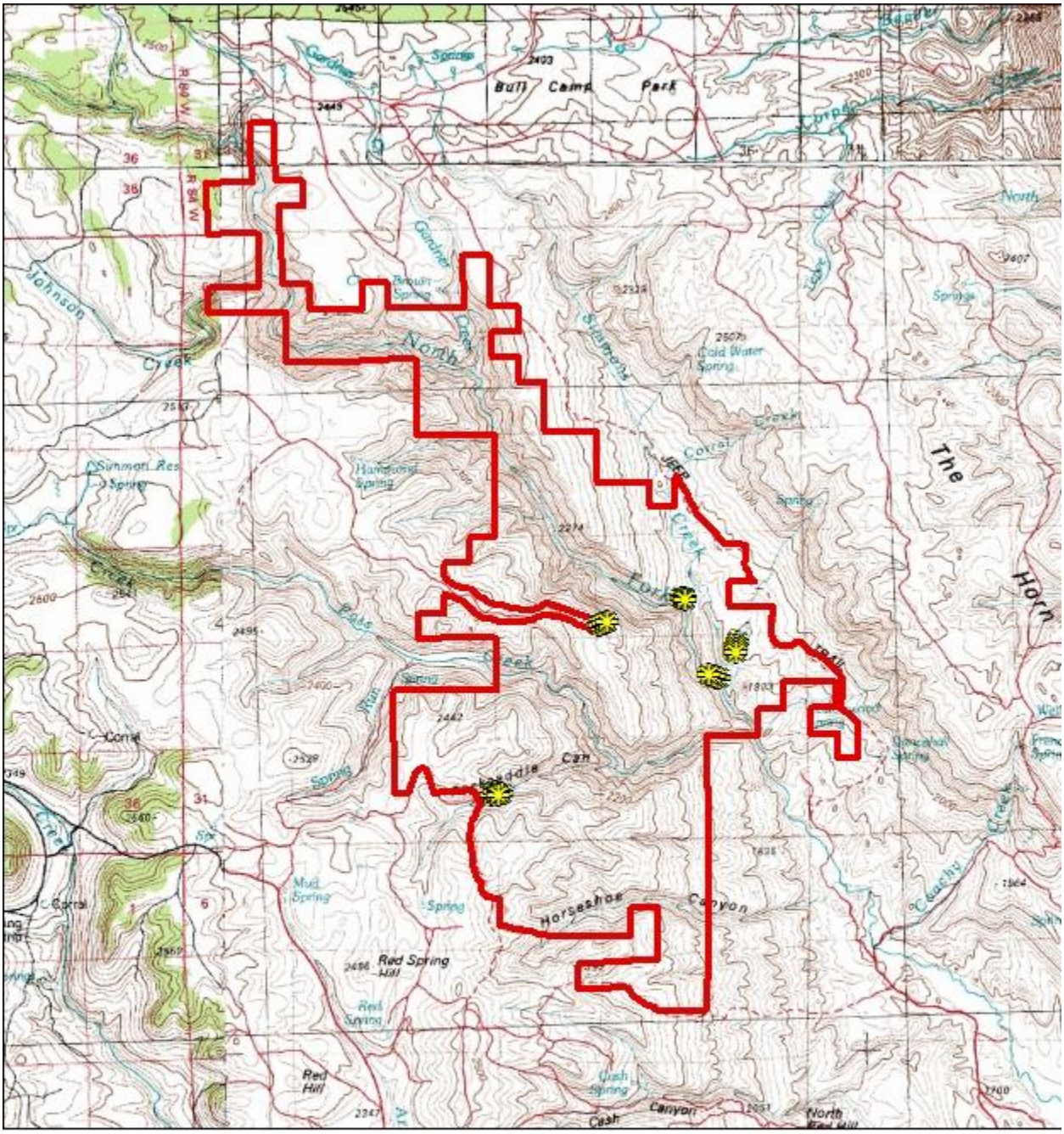

Figure 15. Locations of pollinator sampling events conducted on the North Fork WSA in 2015.

Figure 16. Some of the most abundant pollinators observed at North Fork WSA were Osmia (a), *Lasioglossum* (b), Anthophora (c,d), *Agapostemon*, *Plebejus icarioides* (e) and *Euphudryas editha* (f).

Figure 17. We collected *Oreohelix subrudis*, *Euconullus fulvus*, *Prophysaon*, *Nesovitrea*, Vitrina (terrestrial snails), *Dasyhelea* (no-see-um in a rool pool) and *Americhernes* (pseudoscorpion) at North Fork WSA.

Figure 18. All five rare plant species of North Fork WSA are calciphiles, in a range of settings. Hapeman's sullivantia is in seeps and mossy river spray zones (a), Hairy tranquil goldenweed is in montane grassland (b), Howard forget-me-not is in canyon breaks (c) and Williams' cymopterus is in rocky woodland (d).

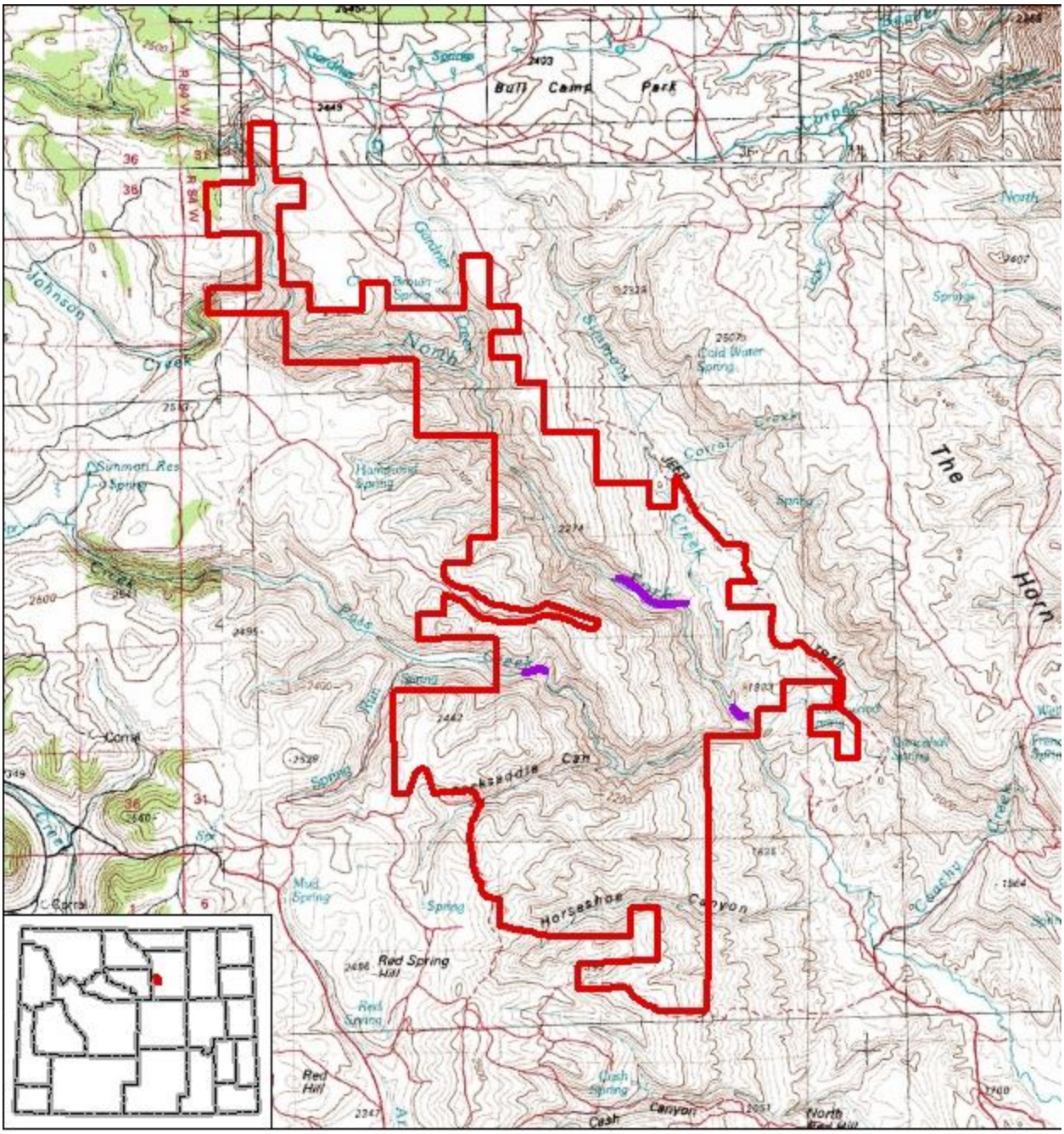

Figure 19. Distribution of *Sullivantia hapemannii* – Hapeman's sullivantia, on the North Fork WSA in 2015.

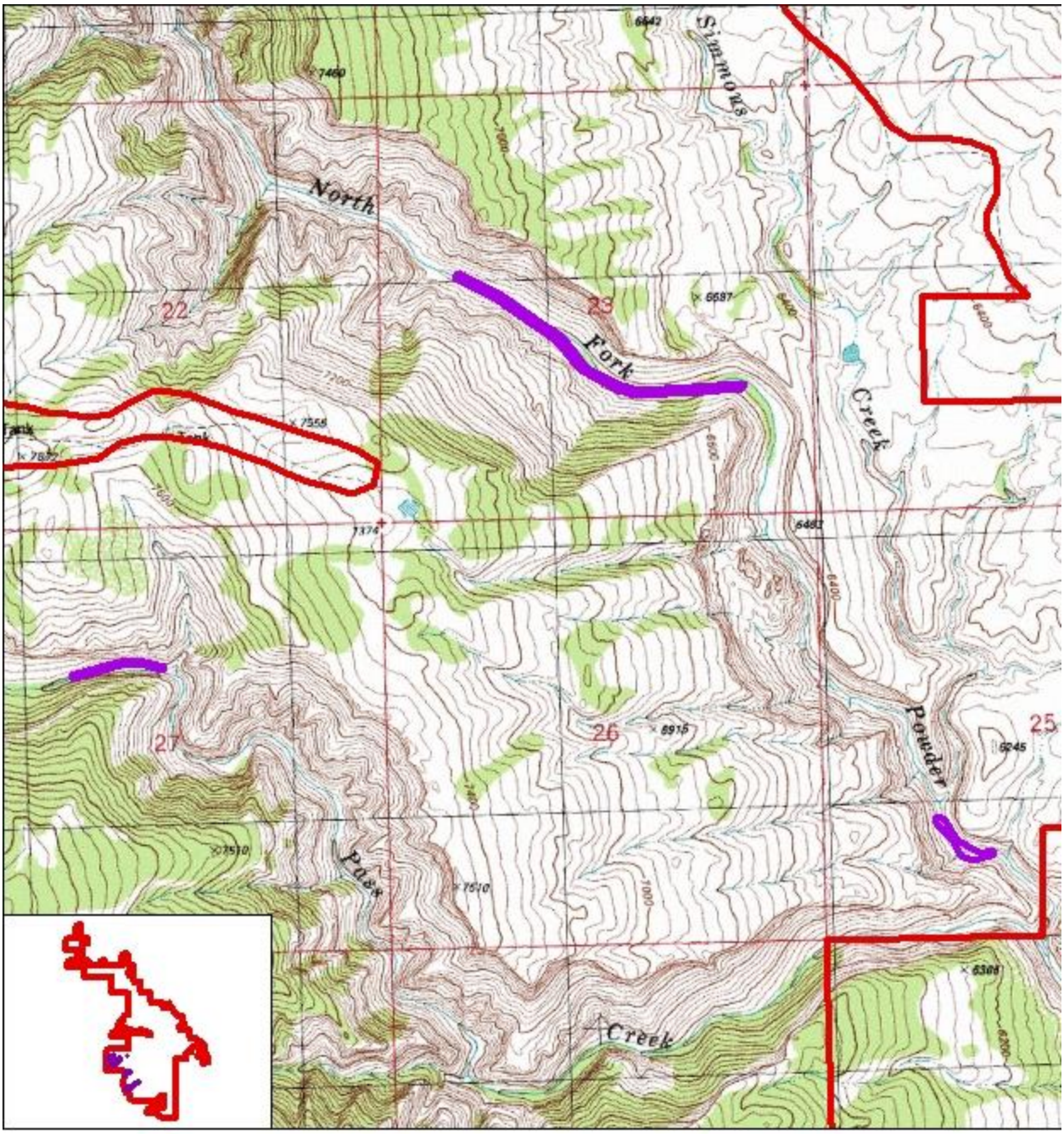

Figure 20. Distribution of *Sullivantia hapemannii* – Hapeman's sullivantia, on the North Fork WSA in 2015 (enlargement).

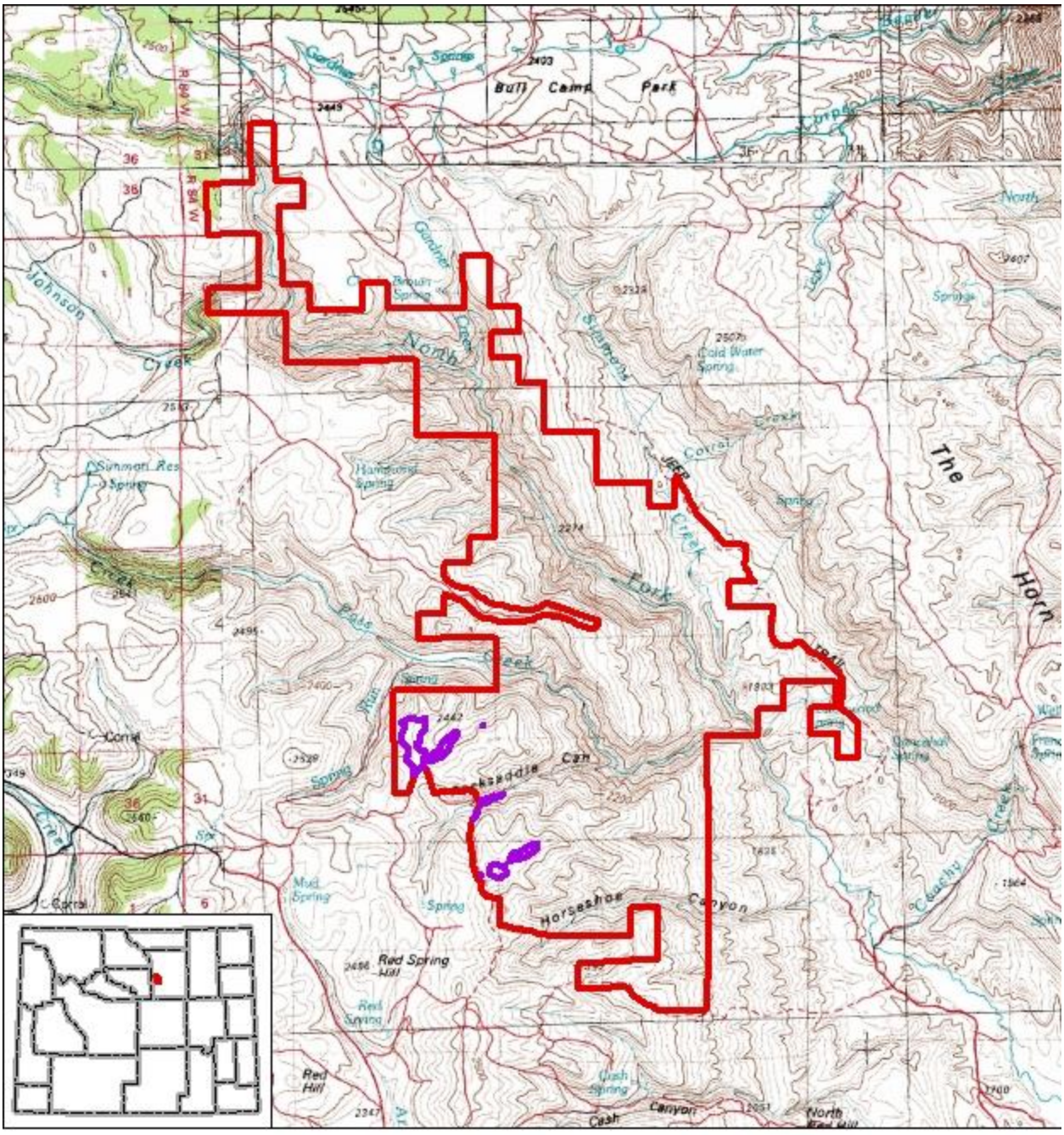

Figure 21. Distribution of *Pyrrocoma clementis var.* villosa; Hairy tranquil goldenweed on the North Fork WSA in 2015.

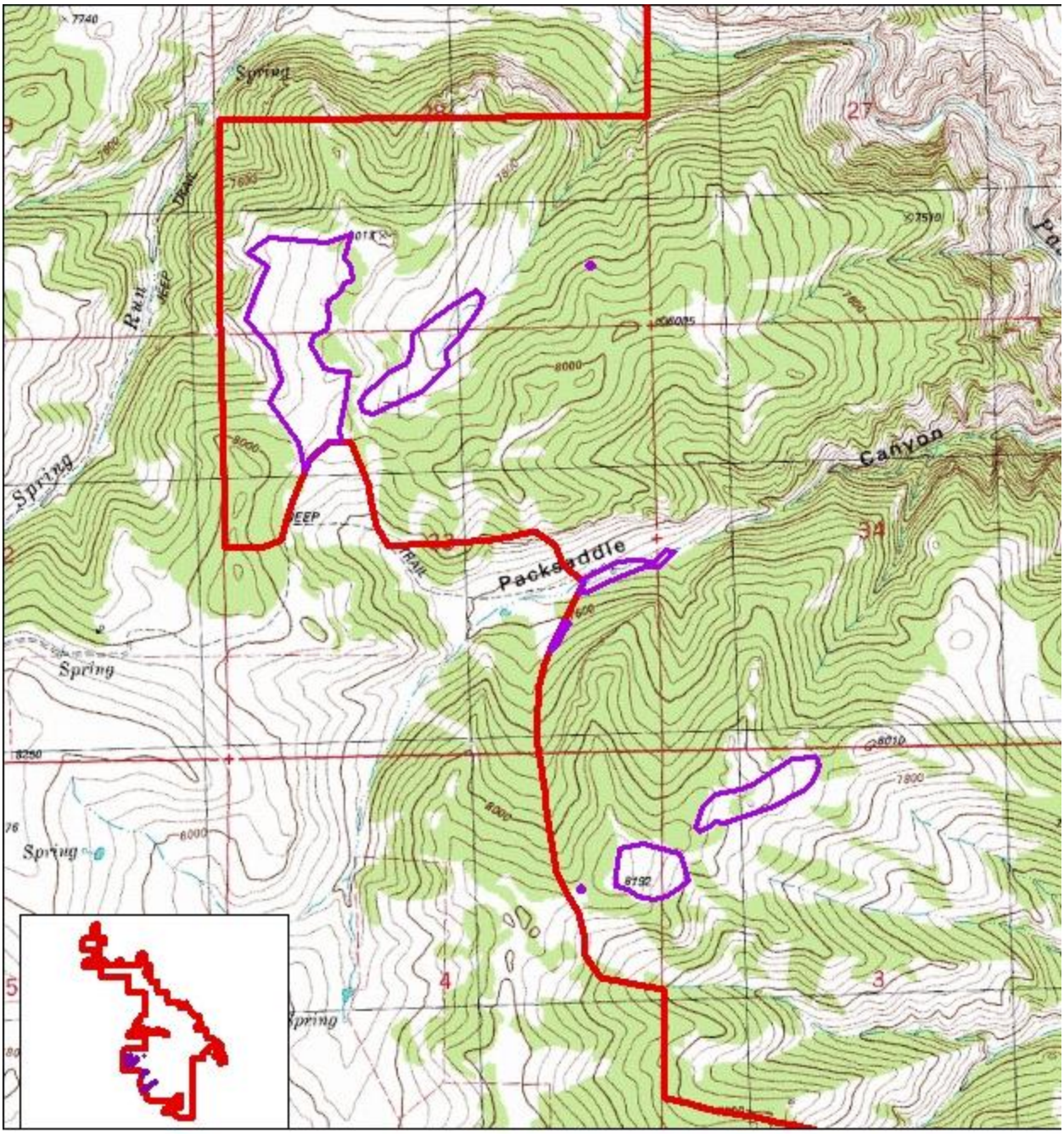

Figure 22. Distribution of *Pyrrocoma clementis var.* villosa; Hairy tranquil goldenweed on the North Fork WSA in 2015 (enlargement).

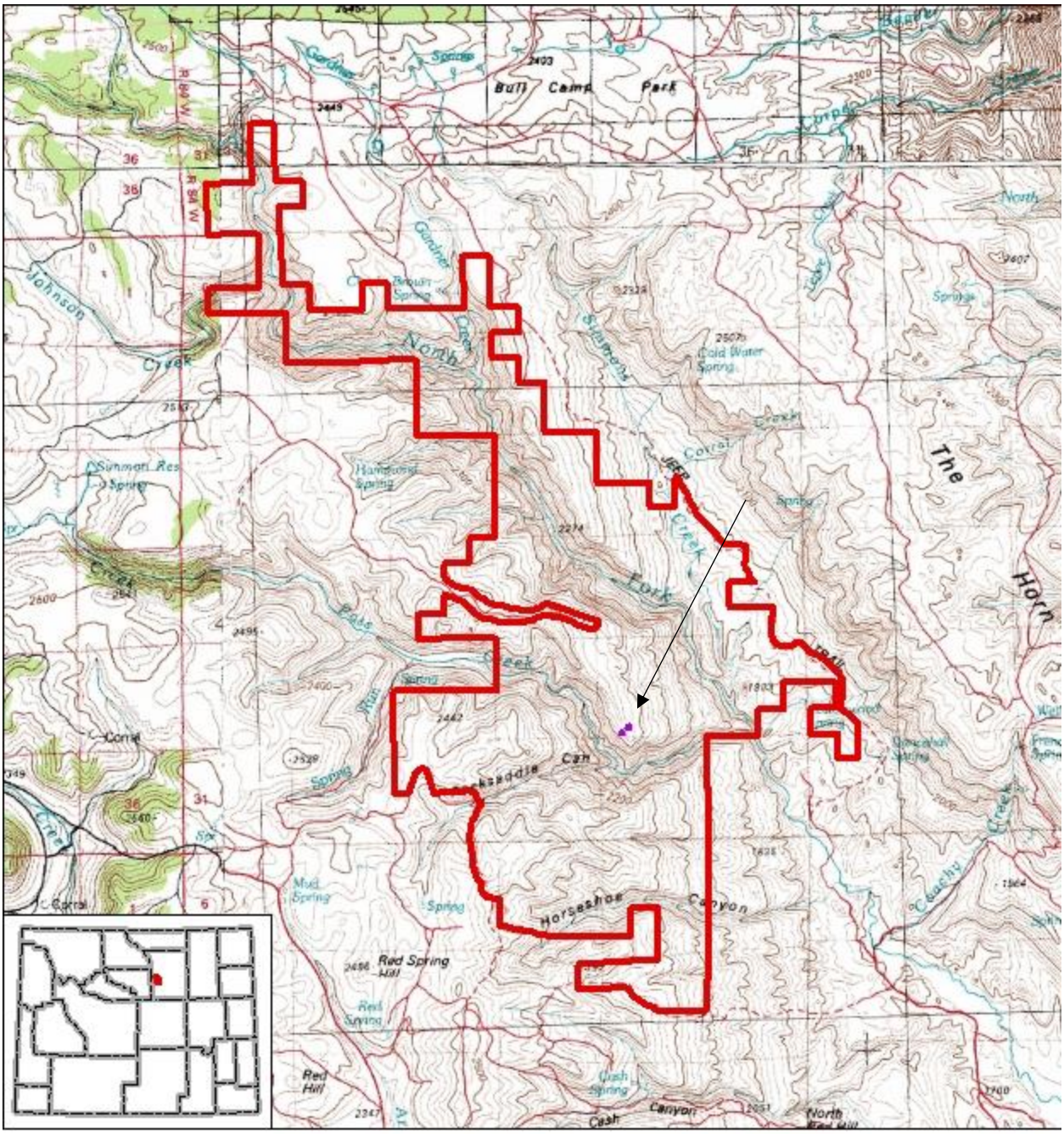

Figure 23. Distribution of *Eritrichium howardii* ; Howard's forget-me-not made on the North Fork WSA in 2015.

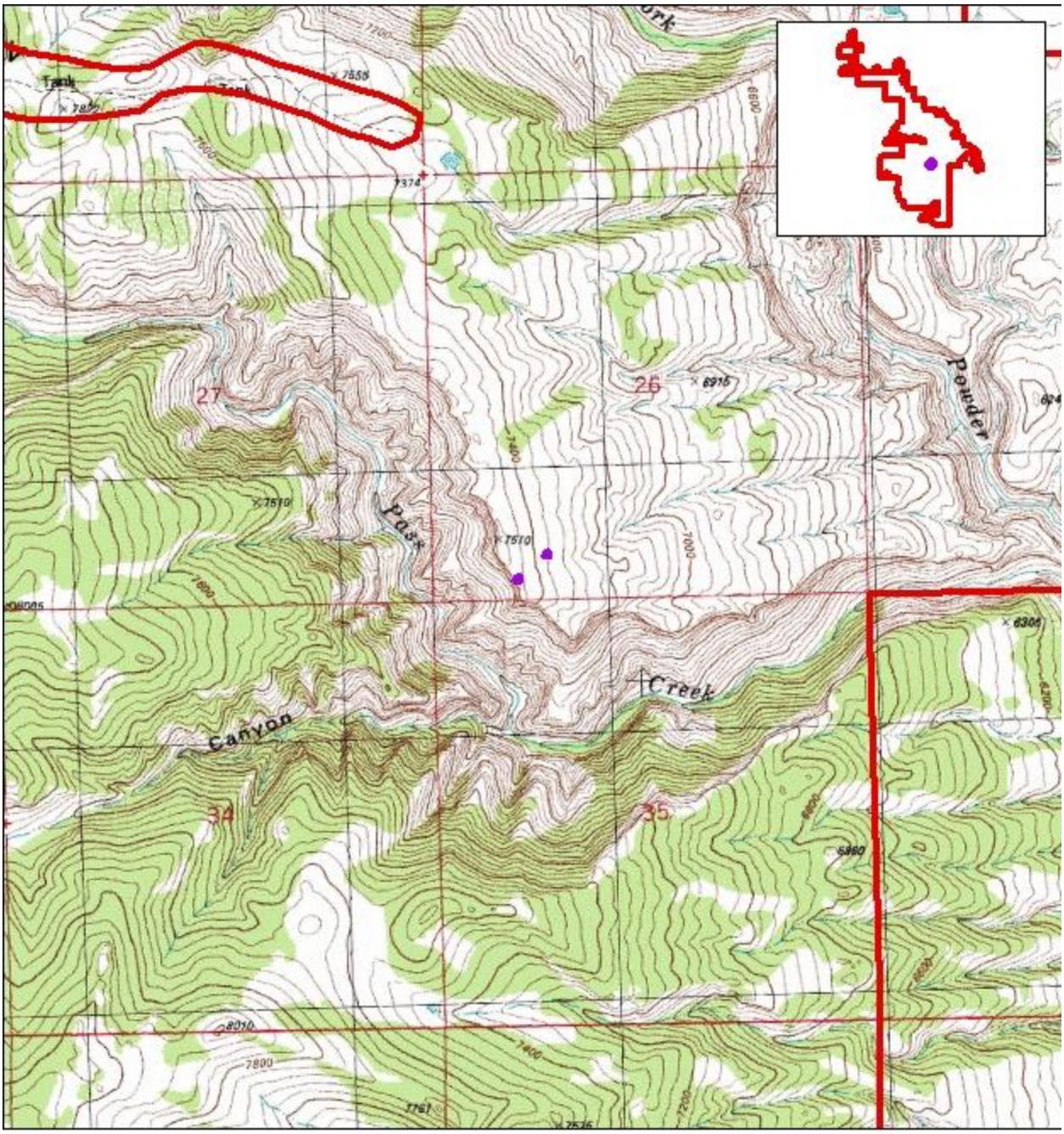

Figure 24. Distribution of *Eritrichum howardii* ; Howard's forget-me-not made on the North Fork WSA in 2015 (enlargement).

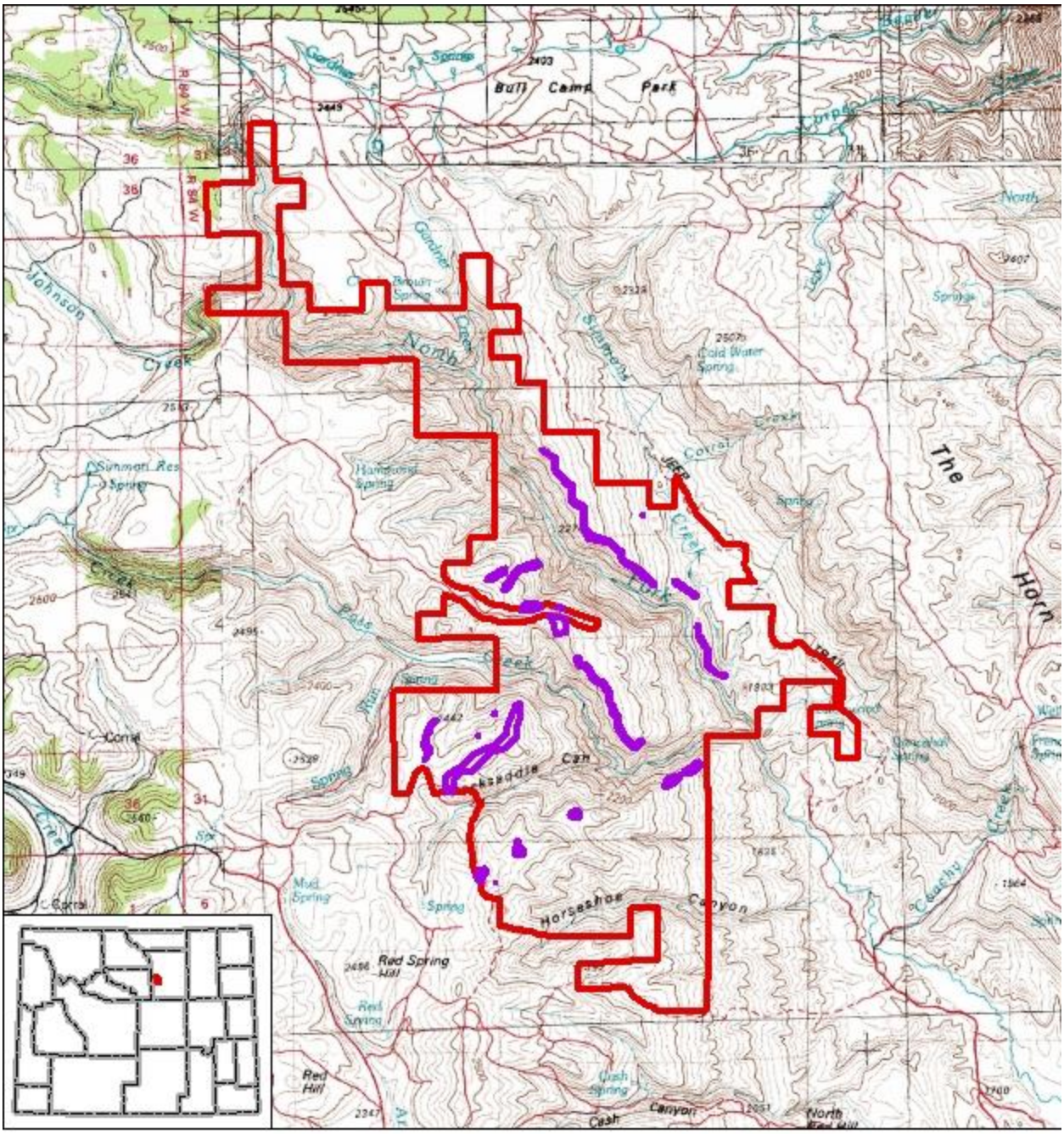

Figure 25. Distribution of *Cymopterus williamsii*; Williams' cymopterus on the North Fork WSA in 2015.

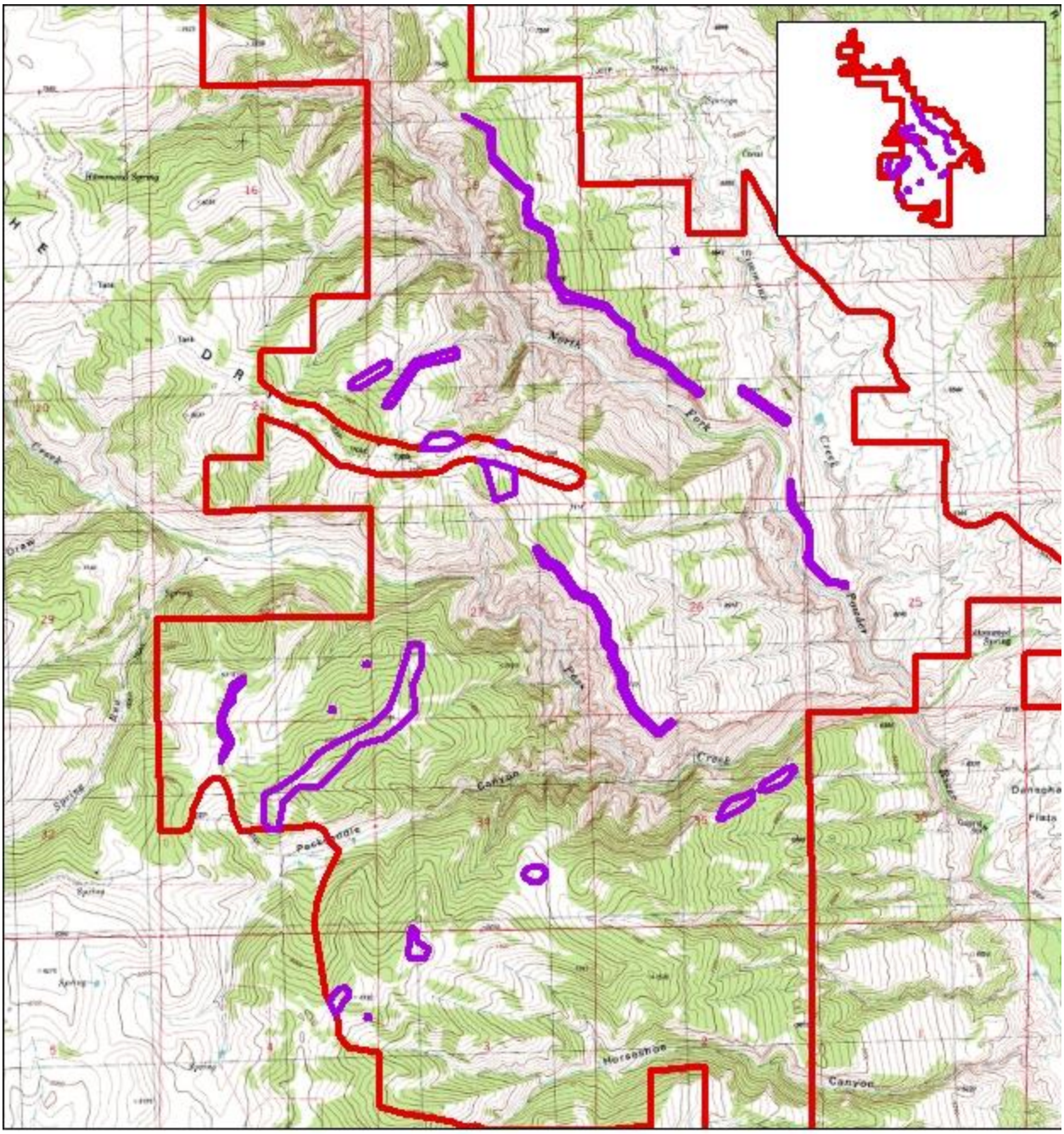

Figure 26. Distribution of *Cymopterus williamsii*; Williams' cymopterus on the North Fork WSA in 2015 (enlargement).

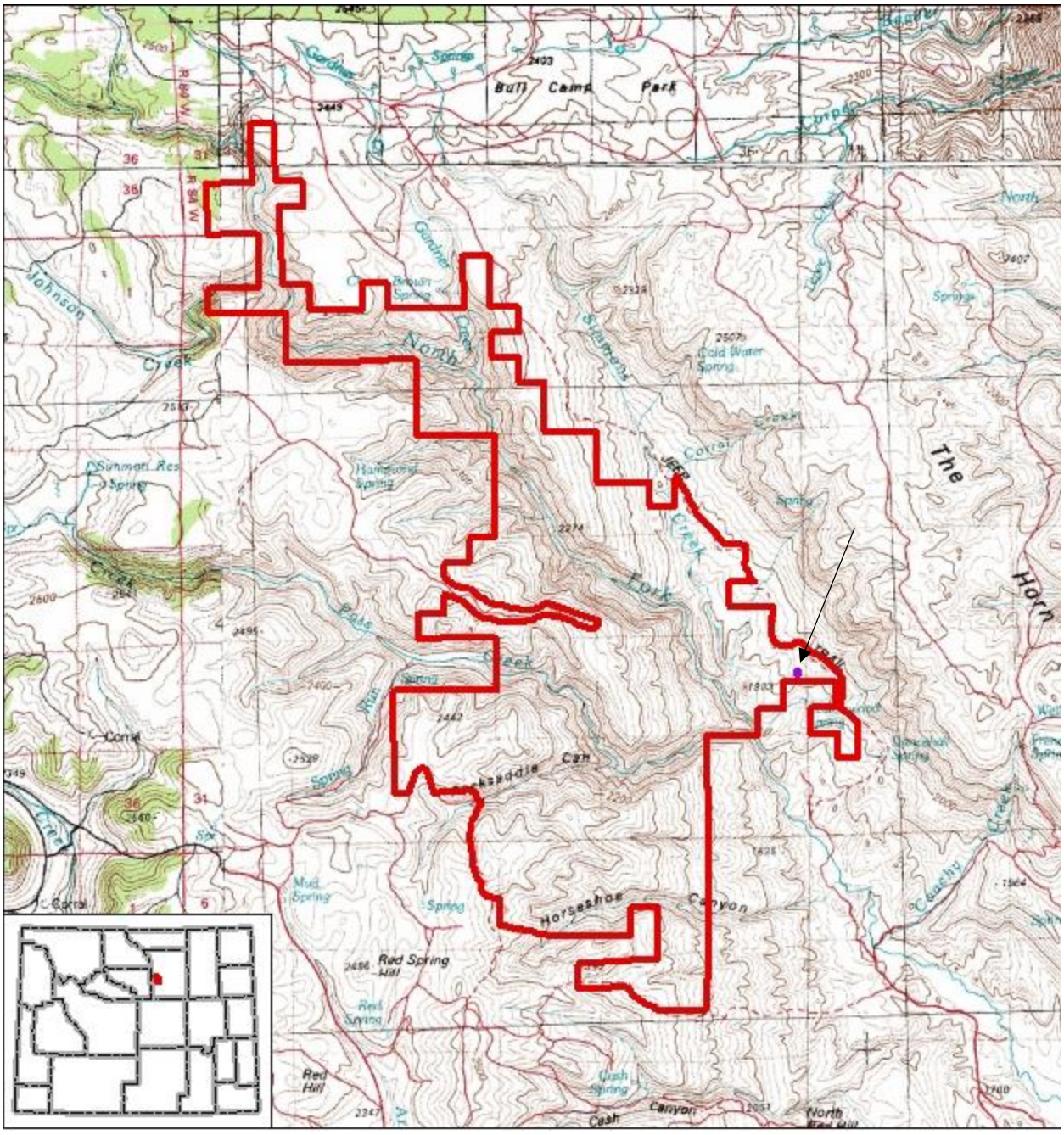

Figure 27. Distribution of *Physaria lanata*; Wooly Twinpod on North Fork WSA in 2015.

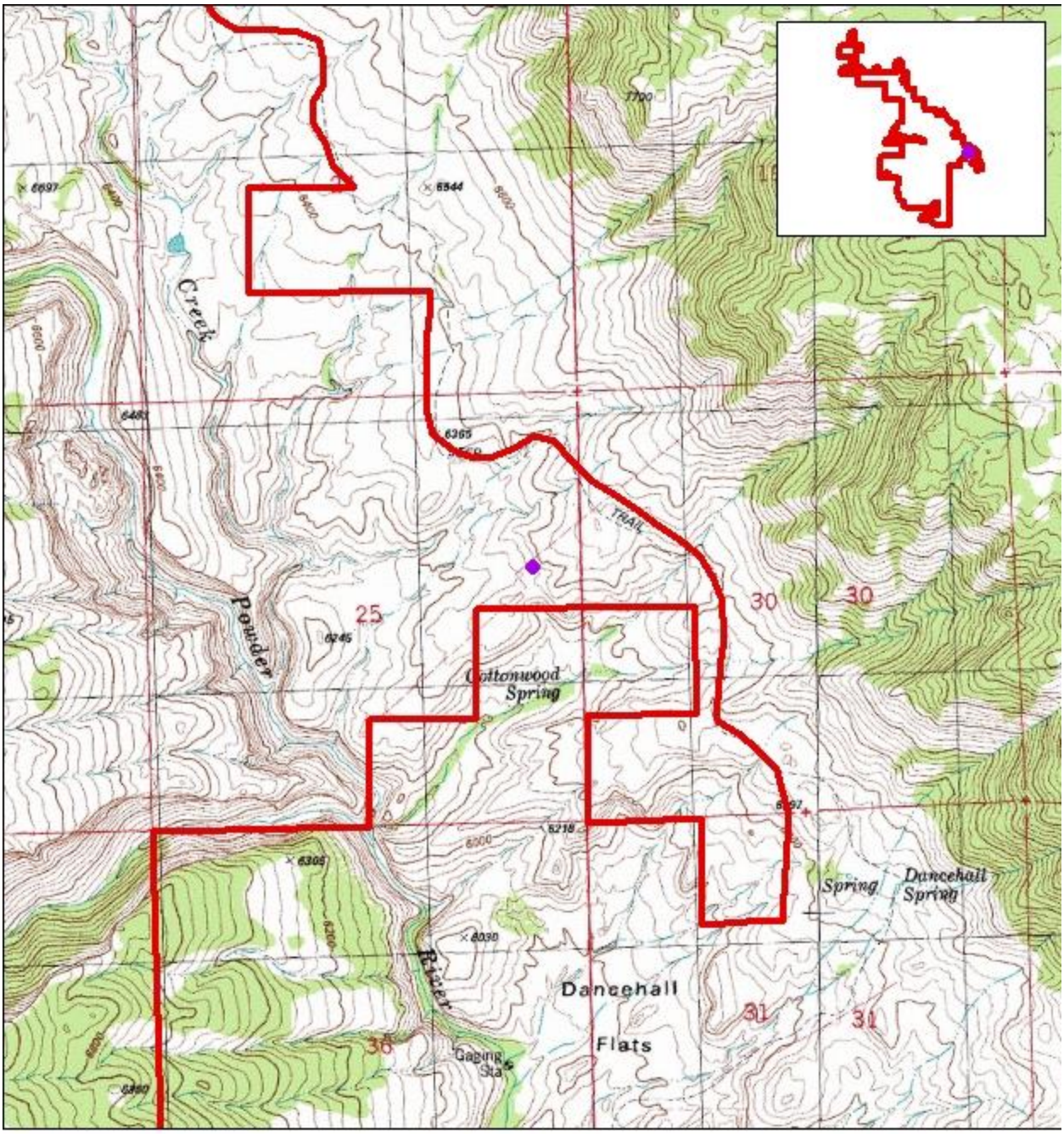

Figure 28. Distribution of *Physaria lanata*; Wooly Twinpod on North Fork WSA in 2015 (enlargement).

Tables

Table 1. Soils units of the North Fork WSA listed from most to least extensive (from Stephens 1975).

Soils unit	Soil textural class	Soil description setting	WSA setting
CloudPeak-Dell Association	Silt loam residuum derived from limestone	North-facing hillsides in the mountains with Douglas fir and others	West side timbered uplands
Hazelton-Burgess Association	Sandy to gravelly loam residuum derived from granite	Upland hillsides and ridges in the mountains	East side grassland colluvial slopes
Leavitt-Passcreek Association	Loam residuum weathered from limestone and sandstone	Sloping to moderately steep hillsides in mountains with Idaho fescue and sometimes Ponderosa pine	Steep south-facing canyon walls with bluebunch wheatgrass
Nathrop-Passcreek Association	Stony loam residuum weathered from limestone	Hillsides in the mountains	Grassy uplands and valley heads
Nathrop-Woolsley Association	Stony loam to loam residuum weathered from limestone	Hillsides in the mountains	Grassy uplands and valley heads
Rock land	70-90% barren rock	Shallow to very shallow, steep to very steep slopes	Canyon walls and timbered north-facing slopes
Starley-Rock outcrop complex, steep	Gravelly loam residuum derived from limestone	Hillsides in the mountains	Canyon walls, slopes and ledges
Sunup-Rock outcrop complex, steep	Clay loam derived from sandstone and shale on hillsides and ridges	Foothills slopes with bluebunch wheatgrass	South-facing Douglas fir woodlands and east-facing pine escarpment

Table 2. Placement of the vegetation of the North Fork of the Powder River WSA into units from the National Vegetation Classification (USNVC 2016). Information about the vegetation-types in the WSA is somewhat cursory and their placement into the national classification is tentative.

I. UPLAND VEGETATION

A. Forest and Woodland Vegetation

1. Douglas-fir forests and woodlands

- *CLASS:* 1 - Mesomorphic Tree Vegetation Class
  - *SUBCLASS:* 1.B - Temperate & Boreal Forest & Woodland Subclass
    - *FORMATION:* 1.B.2 - Cool Temperate Forest & Woodland Formation
      - *DIVISION:* 1.B.2.Nb - *Pseudotsuga menziesii - Tsuga heterophylla - Abies lasiocarpa* Forest & Woodland Division
        - *MACROGROUP*: 1.B.2.Nb.2 - *Pinus ponderosa var. ponderosa - Pseudotsuga menziesii - Pinus flexilis* Central Rocky Mountain Dry Forest Macrogroup
          - *GROUP:* 1.B.2.Nb.2.c - *Pseudotsuga menziesii* Middle Rocky Mountain Montane Forest & Woodland Group
            - *ALLIANCE: Pseudotsuga menziesii* Middle Rocky Mountain Dry-Mesic Forest & Woodland Alliance

Most of the Douglas-fir dominated woodland (observation NFk-Heidel-2015-02) may be placed into the *Pseudotsuga menziesii / Juniperus scopulorum* Woodland Association (CEGL000903). The vegetation on mesic sites (observations NFk-EZ-2015-01, likely MDA01-2015 as well) may represent the *Pseudotsuga menziesii / Acer glabrum* Forest Association (CEGL000418).

2. Ponderosa pine woodland and parkland

Based on the information in observation NFk-Heidel-2015-06, this vegetation can with some confidence be named as:

- *CLASS:* 1 - Mesomorphic Tree Vegetation Class
  - *SUBCLASS:* 1.B - Temperate & Boreal Forest & Woodland Subclass
    - *FORMATION:* 1.B.2 - Cool Temperate Forest & Woodland Formation
      - *DIVISION:* 1.B.2.Nb - *Pseudotsuga menziesii - Tsuga heterophylla - Abies lasiocarpa* Forest & Woodland Division
        - *MACROGROUP*: 1.B.2.Nb.2 - *Pinus ponderosa var. ponderosa - Pseudotsuga menziesii - Pinus flexilis* Central Rocky Mountain Dry Forest Macrogroup
          - *GROUP:* 1.B.2.Nb.2.a. - *Pinus ponderosa* var. *ponderosa* Central Rocky Mountain Open Woodland Group

Information is insufficient to determine whether the vegetation belongs to the *Pinus ponderosa* / Herbaceous Understory Central Rocky Mountain Open Woodland Alliance or to the *Pinus ponderosa* / Shrub Understory Central Rocky Mountain Woodland Alliance.

3. Limber pine woodlands

These woodlands can be placed into:

- *CLASS:* 1 - Mesomorphic Tree Vegetation Class
  - *SUBCLASS:* 1.B - Temperate & Boreal Forest & Woodland Subclass
    - *FORMATION:* 1.B.2 - Cool Temperate Forest & Woodland Formation
      - *DIVISION:* 1.B.2.Nb - *Pseudotsuga menziesii - Tsuga heterophylla - Abies lasiocarpa* Forest & Woodland Division
        - *MACROGROUP*: 1.B.2.Nb.2 - *Pinus ponderosa var. ponderosa - Pseudotsuga menziesii - Pinus flexilis* Central Rocky Mountain Dry Forest Macrogroup
          - *GROUP:* 1.B.2.Nb.2.d - *Pinus flexilis - Juniperus scopulorum* Rocky Mountain Foothill Woodland Group

B. SHRUB VEGETATION

1. Mountain big sagebrush steppe

This vegetation may best considered an expression of *Festuca idahoensis* grassland (see below). It may also qualify as:

- *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 - *Artemisia tridentata - Atriplex confertifolia / Hesperostipa comata* Cool Semi-Desert Scrub & Grassland Division
        - *MACROGROUP*: 3.B.1.Ne.3 - *Artemisia tridentata - Artemisia tripartita ssp. tripartita - Purshia tridentata* Steppe & Shrubland Macrogroup
          - *GROUP:* 3.B.1.Ne.3.c - *Artemisia tridentata ssp. spiciformis - Artemisia tridentata ssp. vaseyana - Artemisia cana ssp. viscidula* Steppe & Shrubland Group
            - *ALLIANCE: Artemisia tridentata ssp. vaseyana* - Mixed Steppe & Shrubland Alliance

2. Mountain mahogany scrub

Information from observation NFk-Heidel-2015-04 suggests that this shrub-dominated vegetation likely is in:

- *CLASS:* 1 - Mesomorphic Tree Vegetation Class
  - *SUBCLASS:* 1.B - Temperate & Boreal Forest & Woodland Subclass
    - *FORMATION:* 1.B.2 - Cool Temperate Forest & Woodland Formation
      - *DIVISION:* 1.B.2.Nb - *Pseudotsuga menziesii - Tsuga heterophylla - Abies lasiocarpa* Forest & Woodland Division
        - *MACROGROUP*: 1.B.2.Nb.2 - *Pinus ponderosa var. ponderosa - Pseudotsuga menziesii - Pinus flexilis* Central Rocky Mountain Dry Forest Macrogroup
          - *GROUP:* 1.B.2.Nb.2.d - *Pinus flexilis - Juniperus scopulorum* Rocky Mountain Foothill Woodland Group

It may represent the *Juniperus osteosperma - Juniperus scopulorum* / Shrub Understory Central Rocky Mountain Woodland Alliance, *Juniperus scopulorum - Cercocarpus ledifolius* Woodland Association (CEGL000744).

B. GRASSLANDS

1. Idaho fescue grasslands

Based on information from observation NFk-Heidel-2015-01, this vegetation very likely can be classified to the association level:

- *CLASS:* 2 - Mesomorphic Shrub & Herb Vegetation Class
  - *SUBCLASS:* 2.B - Temperate & Boreal Grassland & Shrubland Subclass
    - *FORMATION:* 2.B.2 - Temperate Grassland & Shrubland Formation
      - *DIVISION:* 2.B.2.Na - *Acer glabrum / Danthonia intermedia - Thalictrum occidentale* Western North American Grassland & Shrubland Division
        - *MACROGROUP*: 2.B.2.Na.2 - *Amelanchier alnifolia / Festuca idahoensis - Pseudoroegneria spicata* Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup
          - *GROUP:* 2.B.2.Na.2.a - *Leymus innovatus - Festuca idahoensis - Leucopoa kingii* Grassland Group
            - *ALLIANCE: Festuca idahoensis - Carex scirpoidea - Danthonia intermedia* Central Rocky Mountain Subalpine Dry Grassland Alliance
              - *ASSOCIATION: Festuca idahoensis - Leucopoa kingii* Grassland (CEGL001901)

2. Bluebunch wheatgrass grassland

Information from observation NFk-Heidel-2015-03 suggests that this vegetation can be placed into:

- *CLASS:* 2 - Mesomorphic Shrub & Herb Vegetation Class
  - *SUBCLASS:* 2.B - Temperate & Boreal Grassland & Shrubland Subclass
    - *FORMATION:* 2.B.2 - Temperate Grassland & Shrubland Formation
      - *DIVISION:* 2.B.2.Na - *Acer glabrum / Danthonia intermedia - Thalictrum occidentale* Western North American Grassland & Shrubland Division
        - *MACROGROUP*: 2.B.2.Na.2 - *Amelanchier alnifolia / Festuca idahoensis - Pseudoroegneria spicata* Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup
          - *GROUP:* 2.B.2.Na.2.c - *Festuca campestris - Festuca idahoensis - Pseudoroegneria spicata* Central Rocky Mountain Foothill Grassland Group
            - *ALLIANCE: Festuca idahoensis - Pseudoroegneria spicata - Poa secunda* Dry Grassland Alliance

3. Mixed grass prairie

This vegetation also can be placed at the alliance level:

- *CLASS:* 2 - Mesomorphic Shrub & Herb Vegetation Class
  - *SUBCLASS:* 2.B - Temperate & Boreal Grassland & Shrubland Subclass
    - *FORMATION:* 2.B.2 - Temperate Grassland & Shrubland Formation
      - *DIVISION:* 2.B.2.Nb - *Andropogon gerardii - Pascopyrum smithii - Bouteloua gracilis* Grassland & Shrubland Division
        - *MACROGROUP*: 2.B.2.Nb.2 - *Hesperostipa comata - Pascopyrum smithii - Festuca hallii* Grassland Macrogroup
          - *GROUP:* 2.B.2.Nb.2.b - *Hesperostipa comata - Bouteloua gracilis* Dry Mixedgrass Prairie Group
            - *ALLIANCE: Hesperostipa comata* Northwestern Great Plains Grassland Alliance

II. RIPARIAN VEGETATION

A. Forest and Woodland

Information from observation NFk-Heidel-2015-05 indicates that the cottonwood woodlands can be placed into:

- *CLASS:* 1 - Mesomorphic Tree Vegetation Class
  - *SUBCLASS:* 1.B - Temperate & Boreal Forest & Woodland Subclass
    - *FORMATION:* 1.B.2 - Cool Temperate Forest & Woodland Formation
      - *DIVISION:* 1.B.2.Nc - *Populus angustifolia - Populus balsamifera - Picea engelmannii* Rocky Mountain-Great Basin Montane Flooded & Swamp Forest Division
        - *MACROGROUP*: 1.B.2.Nc.1 - *Picea engelmannii - Populus angustifolia / Cornus sericea* Riparian & Swamp Forest Macrogroup
          - *GROUP:* 1.B.2.Nc.1.a - *Picea engelmannii - Picea pungens - Populus angustifolia* Riparian & Swamp Forest Group
            - *ALLIANCE: Populus angustifolia* Riparian Forest Alliance

They may represent either of two very similar associations: *Populus angustifolia / Betula occidentalis* Riparian Woodland Association (CEGL000648) or *Populus angustifolia / Cornus sericea* Riparian Woodland Association (CEGL002664)

B. Willow thickets and Great Basin wild-rye terraces

Riparian vegetation often constitutes a mosaic of woodland, shrubland, and grassland patches, and these two types of stands may best be considered part of a mosaic of the *Populus angustifolia* Riparian Forest Alliance.

Table 3. All birds detected in 2015 during formal point count surveys as well as opportunistic sightings in the North Fork WSA, Wyoming.

Common Name	Scientific Name	Count
American Crow	*Corvus brachyrhynchos*	3
American Dipper	*Cinclus mexicanus*	3
American Goldfinch	*Spinus tristis*	2
American Robin	*Turdus migratorius*	52
Black-billed Magpie	*Pica hudsonia*	13
Belted Kingfisher	*Megaceryle alcyon*	1
Brown-headed Cowbird	*Molothrus ater*	4
Black-headed Grosbeak	*Pheucticus melanocephalus*	5
Brown Creeper	*Certhia americana*	6
Broad-tailed Hummingbird	*Selasphorus platycercus*	5
Cassin's Finch	*Haemorhous cassinii*	2
Chipping Sparrow	*Spizella passerina*	24
Chukar	*Alectoris chukar*	1
Clark's Nutcracker*	*Nucifraga columbiana*	23
Cliff Swallow	*Petrochelidon pyrrhonota*	2
Cordilleran Flycatcher	*Empidonax occidentalis*	5
Cooper's Hawk	*Accipiter cooperii*	1
Common Merganser	*Mergus merganser*	3
Common Nighthawk*	*Chordeiles minor*	3
Common Poorwill	*Phalaenoptilus nuttallii*	1
Common Raven	*Corvus corax*	6
Dark-eyed Junco	*Junco hyemalis*	54
Downy Woodpecker	*Picoides pubescens*	2
Dusky Flycatcher	*Empidonax oberholseri*	17
Dusky Grouse	*Dendragapus obscurus*	8
Gray Catbird	*Dumetella carolinensis*	1
Great Horned Owl	*Bubo virginianus*	
Green-tailed Towhee	*Pipilo chlorurus*	40
Hammond's Flycatcher	*Empidonax hammondii*	18
Hermit Thrush	*Catharus guttatus*	37
House Wren	*Troglodytes aedon*	42
Lark Bunting	*Calamospiza melanocorys*	1
Lazuli Bunting	*Passerina amoena*	15
Least Flycatcher	*Empidonax minimus*	3
American Kestrel*	*Falco sparverius*	2
Mallard	*Anas platyrhynchos*	1
MacGillivray's Warbler*	*Geothlypis tolmiei*	5
Mountain Bluebird	*Sialia currucoides*	22
Mountain Chickadee	*Poecile gambeli*	36
Mourning Dove	*Zenaida macroura*	5

Common Name	Scientific Name	Count
No Bird Detected	*No Bird Detected*	188
Northern Flicker	*Colaptes auratus*	16
Northern Goshhawk*	*Accipiter gentilis*	2
Orange-crowned Warbler	*Oreothlypis celata*	1
Ovenbird	*Seiurus aurocapilla*	4
Pine Siskin	*Spinus pinus*	1
Plumbeous Vireo	*Vireo plumbeus*	2
Pygmy Nuthatch*	*Sitta pygmaea*	5
Red-breasted Nuthatch	*Sitta canadensis*	35
Ruby-crowned Kinglet	*Regulus calendula*	77
Red Crossbill*	*Loxia curvirostra*	6
Red Squirrel	*Tamiasciurus hudsonicus*	54
Rock Wren	*Salpinctes obsoletus*	50
Song Sparrow	*Melospiza melodia*	12
Spotted Towhee	*Pipilo maculatus*	13
Townsend's Solitaire	*Myadestes townsendi*	74
Tree Swallow	*Tachycineta bicolor*	2
Turkey Vulture	*Cathartes aura*	4
Unknown Bird	-	27
UnknownEmpid	-	3
Unknown Flycatcher	-	3
Unknown Jay	-	1
Unknown Woodpecker	-	2
Vesper Sparrow	*Pooecetes gramineus*	5
Violet-green Swallow	*Tachycineta thalassina*	34
Warbling Vireo	*Vireo gilvus*	20
White-breasted Nuthatch	*Sitta carolinensis*	6
White-crowned Sparrow	*Zonotrichia leucophrys*	1
Western Meadowlark	*Sturnella neglecta*	6
Western Tanager	*Piranga ludoviciana*	18
Western Wood-Pewee	*Contopus sordidulus*	7
Williamson's Sapsucker*	*Sphyrapicus thyroideus*	1
White-throated Swift	*Aeronautes saxatalis*	40
Yellow Warbler	*Setophaga petechia*	10
Yellow-rumped Warbler	*Setophaga coronata*	66

* Species of Greatest Conservation Need

Table 4. Number of mist-net captures and acoustic recordings for bat species in the North Fork WSA in 2015.

Common Name	Scientific Name	Mist-net Captures	Acoustic Recordings
Townsend's Big-eared Bat*	*Corynorhinus townsendii*	0	1
Big Brown Bat	*Eptesicus fuscus*	2	16
Hoary Bat	*Lasiurus cinereus*	5	34
Silver-haired Bat	*Lasionycteris noctivagans*	5	18
Western Small-footed Myotis*	*Myotis ciliolabrum*	1	26
Long-eared Myotis*	*Myotis evotis*	4	7
Little Brown Myotis*	*Myotis lucifugus*	7	43
Long-legged Myotis*	*Myotis volans*	5	0
Total	**-**	**29**	**145**

* Species of Greatest Conservation Need

Table 5. All mammal species detected in the North Fork WSA in June and July 2015. Detections included visual detections as well as species-specific sign (e.g., scat, nests, etc.).

Common Name	Scientific Name	How detected
Townsend's Big-eared Bat*	*Corynorhinus townsendii*	Acoustic
Big Brown Bat	*Eptesicus fuscus*	Capture, Acoustic
Hoary Bat	*Lasiurus cinereus*	Capture, Acoustic
Silver-haired Bat	*Lasionycteris noctivagans*	Capture, Acoustic
Western Small-footed Myotis*	*Myotis ciliolabrum*	Capture, Acoustic
Long-eared Myotis*	*Myotis evotis*	Capture, Acoustic
Little Brown Myotis*	*Myotis lucifugus*	Capture, Acoustic
Long-legged Myotis*	*Myotis volans*	Capture
North American Porcupine	*Erethizon dorsatum*	Sign (feeding scars)
Yellow-bellied Marmot	*Marmota flaviventris*	Visual, Remote Camera
Least Chipmunk	*Tamias minimus*	Visual
Red Squirrel	*Tamiasciurus hudsonicus*	Visual, Sign (middens)
Bushy-tailed Woodrat	*Neotoma cinerea*	Visual, Sign (nests)
Wyoming Ground Squirrel	*Urocitellus elegans*	Visual, Sign (burrows)
Cottontail	*Sylvilagus sp.*	Scat
Coyote	*Canis latrans*	Visual
Bobcat	*Lynx rufus*	Skull
Mountain Lion	*Puma concolor*	Remote Camera
American Black Bear	*Ursus americanus*	Visual, Remote Camera
Elk	*Cervus canadensis*	Visual, Remote Camera
Mule Deer	*Odocoileus hemionus*	Visual, Remote Camera
Pronghorn	*Antilocapra americana*	Visual

* Species of Greatest Conservation Need

Table 6. Reptiles detected in the North Fork WSA in June and July 2015.

Common Name	Scientific Name	Lifestage
Northern Sagebrush Lizard	*Sceloporus graciosus graciosus*	Adult
Bullsnake	*Pituophis catenifer sayi*	Adult
Eastern Yellow-bellied racer	*Coluber constrictor flaviventris*	Adult
Prairie Rattlesnake*	*Crotalus viridis*	Adult

* Species of Greatest Conservation Need

Table 7. Aquatic invertebrates collected from two streams in the North Fork Wilderness Study Area. Invertebrate tolerance values to ecosystem quality range from 0 (intolerant) to 10 (tolerant).

Scientific Name	North Fork of the Powder River	Pass Creek	Tolerance
Coleoptera	122	649	
Dytiscidae		172	
Agabus		172	6.5
Elmidae	145	888	
Cleptelmis addenda	135	859	4
Narpus	11		4
Optioservus	289	917	3.7
Gyrinidae	54		
Crustacea		86	
Copepoda		86	
Harpacticoid		86	8
Diptera	1817	2851	
Ceratopogonidae	11		
Chironomidae	4678	9685	
Non-Tanypodinae	8930	18926	6
Empididae	114	86	
Neoplasta	114	86	5.9
Simulidae	1326	243	
Simulium	1326	243	5.3
Stratiomyidae		11	
Caloparyphus		11	7
Tipulidae	95	124	
Antocha	95	205	3.2
Dicranota		43	2
Ephemeroptera	269	218	
Baetidae	534	315	
Baetis	734		4.7
Fallceon	16	108	4.7
Heterocloeon	850	522	3.6
Ephemerelidae	72	153	
Drunella coloradensis	75	230	0
Drunella doddsi	65		0
Serratella	138	75	1.5
Heptageniidae	265	186	
Cinygmula	192	88	4
Epeorus	338	284	0.4
Molluska		132	
Sphaeriidae		132	
Plecoptera	40	208	

Chloroperlidae	29	121	
Bisancora		129	1
Suwallia	11		0.5
Sweltsa	47	113	0.5
Nemouridae	92	383	
Zapada	172	383	2
Perlidae	23		
Calineuria	11		3
Claassenia	18		3
Doroneuria	11		1
Perlesta	54		3.2
Perlodidae	22		
Kogotus	22		2
Trichoptera	188	406	
Hydropsychidae	261		
Hydroptilidae	140		
Hydroptila	269		5.5
Ochrotrichia	11		5.6
Limnephilidae	83		
Psychoglypha	83		1
Rhyacophilidae	81	100	
Rhyacophila brunnea	18	235	0
Rhyacophila hyalinata	59	57	0
Rhyacophila nevadensis	86		1
Rhyacophila pellisa/valuma	22	86	0.5
Rhyacophila rotunda	54		0
Rhyacophila vagrita	102	35	0
Uenoidae	48	1940	
Neothremma	48	1940	0
Grand Total	405	981	

Table 8. Basic water quality at North Fork of the Powder River (NF River) and Pass Creek at North Fork WSA.

Parameter	Unit	NF River	Pass Creek
Water temperature	℃	13.4	10.2
Dissolved oxygen	% saturation	116	111
Dissolved oxygen	mg/L	11.6	11.7
Specific conductivity	µS/cm	207.4	323.8
pH		8.95	8.71
Oxidation-reduction potential	mV	5.9	71.7
Stream width	m	5.2	1.5
Stream depth	cm	37	69
Mean particle size	mm	132	91

Table 9. We identified 48 taxa of bees and at North Fork WSA.

Family	Scientific Name	Number
Adrenidae	Andrena	1
Andrenidae	Andrena	8
Apidae	Anthophora	17
Apidae	Anthophora bomboides	6
Apidae	Anthrophora	2
Apidae	Bombus appositus	4
Apidae	Bombus bifarius	3
Apidae	Bombus californicus	1
Apidae	Bombus centralis	3
Apidae	Bombus centrals	1
Apidae	Bombus fervidus	1
Apidae	Bombus flavifrons	3
Apidae	Bombus huntii	2
Apidae	Bombus insularis	1
Apidae	Bombus nevadensis	1
Apidae	Bombus rufocinctus	4
Apidae	Bombus sylvicola	1
Apidae	Ceratina	3
Apidae	Diadasia	2
Apidae	Eucera	7
Apidae	Eucera fulvitarsis	1
Apidae	Habropoda	4
Apidae	Melecta	2
Apidae	Melissodes	2
Colletidae	Colletes	1
Colletidae	Hylaeus	1
Halicitidae	Agapostemon femoratus	3
Halicitidae	Agapostemon texanus/angelicus	12
Halicitidae	Agapostemon virescens	8
Halicitidae	Duforea	1
Halicitidae	Duforea maura	1
Halicitidae	Halictus confusus	1
Halicitidae	Halictus ligatus	2
Halicitidae	Halictus rubicundus	1
Halicitidae	Halictus tripartitus	6
Halicitidae	Lasioglossum	20
Halicitidae	Lasioglossum dialictus	34
Halicitidae	Lasioglossum evylaeus	3
Halicitidae	Sphecodes	1

Family	Scientific Name	Number
Megachilidae	Anthidium	2
Megachilidae	Hoplitis	9
Megachilidae	Hoplitis fulgida	3
Megachilidae	Lithurgopsis apicalis	6
Megachilidae	Megachile	4
Megachilidae	Osmia	36
Vespidae	Eumeninae	2
Vespidae	Pseudomasaris vespoides	9
Vespidae	Vespula atropilosa	1

Table 10. We collected 32 taxa of butterflies and moths of the North Fork WSA

Family	Genus	Common Name	Number
Crambidae	*Crambus whitmerellus**	Whitmer's Grass-veneer Moth	1
Erebidae	*Caenurgina erechtea**	Common Grass Moth	2
Geometridae	*Enypia griseata**	Mountain Girdle Moth	1
Geometridae	*Scopula luteolata**	A geometrid moth	6
Geometridae	*Xanthotype urticarial**	False Crocus Geometer	1
Lycaenidae	*Glaucopsyche lygdamus oro*	Silvery Blue	3
Lycaenidae	*Plebejus icarioides iycea*	Boisduval's Blue	2
Lycaenidae	*Plebejus m. melissa*	Melissa Blue	5
Noctuidae	*Anagrapha falcifera*	Celery Looper Moth	1
Noctuidae	*Apamea scoparia**	Faint-spotted Quaker Moth	1
Noctuidae	*Euxoa auxiliaris**	Army Cutworm Moth	1
Nymphalidae	*Cereyonis oetus charon*	Small Wood-nymph	6
Nymphalidae	*Chlosyne acastus*	Sagebrush Checkerspot	1
Nymphalidae	*Chlosyne palla ssp.*	Northern Checkerspot	2
Nymphalidae	*Coenonympha tullia ochraeae*	Common Ringlet	7
Nymphalidae	*Erebia e. epipsodea*	Common Alpine	4
Nymphalidae	*Euphydryas editha ssp.*	Edith's Checkerspot	2
Nymphalidae	*Oeneis c. chryxus*	Chryxus Artic	2
Nymphalidae	*Oeneis jutta reducta**	Artic	1
Nymphalidae	*Phyciodes pallida barnesi*	Pale Crescent	1
Nymphalidae	*Phyciodes pulchella*	Field Crescent	4
Nymphalidae	*Phyciodes tharos*	Pearl Crescent	3
Nymphalidae	*Speyeria callippe gallatini*	Callippe Fritillary	2
Nymphalidae	*Speyeria eglies*	Great Basin Fritillary	1
Nymphalidae	*Speyeria mormonia eurynome*	Mormon Fritillary	4
Nymphalidae	*Speyeria zerene*	Zerene Fritillary	3
Nymphalidae	*Vanessa atalanta*	Red Admiral	2
Papilionidae	*Parnassius smintheus sayii*	Rocky Mountain Parnassian	1
Papilionidae	*Papilio* sp.	Swallowtail	1
Pieridae	*Colias a. alexandra*	Queen Alexandra's Sulphur	1
Pieridae	*Colias philodice eriphyle*	Clouded Sulphur	5
Pieridae	*Pontia occidentalis*	Western White	4

Table 11. Other invertebrates observed at North Fork WSA.

	Scientific name	Common Name
Molluska	Land snails	
Gastropoda	*Discus*	Discus snails
Gastropoda	*Euconulus fulvus*	Brown hive
Gastropoda	*Hawaiia minuscula*	Minute gem
Gastropoda	*Nesovitrea*	Glass snail
Gastropoda	*Oreohelix subrudis*	Subalpine mountain snail
Gastropoda	*Prophysaon*	Taildropper slug
Gastropoda	*Punctum*	Spot snail
Gastropoda	*Pupilla*	Column snail
Gastropoda	*Vallonia*	Vallonia snail
Gastropoda	*Vertigo*	Vertigo snail
Gastropoda	*Vitrina pellucida*	Western glass-snail
Gastropoda	*Zonitoides*	Gloss snail
Arthropoda	Pseudoscorpion	
Arachnida	*Americhernes*	Pseudoscorpion
Arthropoda	Insects	
Diptera	*Dasyhelea*	No-see-um
Coleoptera	*Rhantus*	Predaceous diving beetle
Coleoptera	*Coptotomus*	Predaceous diving beetle
Coleoptera	*Hydrobius*	Water scavenger beetle
Coleoptera	*Cicindela terricola terricola*	Variable tiger beetle
Coleoptera	Buprestidae	Jewel beetle
Coleoptera	Scarabaeidae	Scarab beetle
Orthoptera	Acrididae	Grasshopper
Athropoda	Crustacea	
Anostraca	*Branchinecta contricta*	Fairy shrimp

Table 12. Plant species documented by collections or otherwise observed within boundary of North Fork WSA, Wyoming in 2015.

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Acer glabrum Torrey	Rocky Mountain maple	Aceraceae	Shrub	obs	N
Achillea millefolium L. var. lanulosa (Nutt.) Piper	Common yarrow	Asteraceae	Perennial Forb	obs	N
Achnatherum hymenoides (R. & S.) Barkw.	Indian ricegrass	Poaceae	Perennial Graminoid	obs	N
Achnatherum nelsonii (Scribn.) Barkw. var. dorei (Barkw. & Maze) Dorn	Nelson's needlegrass	Poaceae	Perennial Graminoid	4174b	N
Actaea rubra (Aiton) Willd.	Western red baneberry	Ranunculaceae	Perennial Forb	obs	N
Agoseris glauca (Pursh) Raf. var. laciniata (Eaton) Smiley	Pale goat-chicory	Asteraceae	Perennial Forb	obs	N
Agrostis exarata Trin.	Spiked bent	Poaceae	Perennial Graminoid	4185	N
Allium geyeri Wats. var. tenerum Jones	Geyer's onion	Alliaceae	Perennial Forb	4115	N
Alyssum desertorum Stapf	Desert madwort	Brassicaceae	Annual Forb	obs	I
Amelanchier alnifolia (Nutt.) Nutt. ex Roem. var. alnifolia	Saskatoon serviceberry	Rosaceae	Shrub	obs	N
Anaphalis margaritacea (L.) Benth. & Hook.	Pearly-everlasting	Asteraceae	Perennial Forb	4184	N
Androsace septentrionalis L. var. subulifera Gray	Pygmy-flower rock-jasmine	Primulaceae	Annual Forb	obs	N
Anemone multifida Poiret	Red windflower	Ranunculaceae	Perennial Forb	4119	N
Anemone patens L. var. multifida Pritzel	American pasqueflower	Ranunculaceae	Perennial Forb	obs	N
Angelica roseana Henderson	Rock angelica	Apiaceae	Perennial Forb	obs	N
Antennaria anaphaloides Rydb.	Tall pussytoes	Asteraceae	Perennial Forb	4102b	N
Antennaria microphylla Rydb.	Small-leaf pussyoes	Asteraceae	Perennial Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Antennaria rosea Greene	Rosy pussytoes	Asteraceae	Perennial Forb	obs	N
Antennaria umbrinella Rydb.	Brown-bract pussytoes	Asteraceae	Perennial Forb	obs	N
Apocynum androsaemifolium L.	Spreading dogbane	Apocynaceae	Perennial Forb	obs	N
Arabis glabra (L.) Bernh.	Tower-mustard	Brassicaceae	Perennial Forb	4160	N
Arabis hirsuta (L.) Scop. var. glabrata T. & G.	Hairy rockcress	Brassicaceae	Perennial Forb	4111	N
Arnica fulgens Pursh	Shining leopardbane	Asteraceae	Perennial Forb	obs	N
Artemisia campestris L. var. scouleriana (Bess.) Cronq.	Pacific wormwood	Asteraceae	Perennial Forb	obs	N
Artemisia cana Pursh var. cana	Silver sagebrush	Asteraceae	Shrub	obs	N
Artemisia dracunculus L.	Tarragon	Asteraceae	Perennial Forb	obs	N
Artemisia frigida Willd.	Fringed sagebrush	Asteraceae	Shrub	obs	N
Artemisia ludoviciana Nutt. var. ludoviciana	White sagebrush	Asteraceae	Perennial Forb	obs	N
Artemisia tridentata Nutt. var. vaseyana (Rydb.) Boivin	Mountain big sagebrush	Asteraceae	Shrub	obs	N
Astragalus miser Dougl. var. decumbens (Nutt. ex T. & G.) Cronq.	Timber milkvetch	Fabaceae	Perennial Forb	4104	N
Astragalus missouriensis Nutt.	Missouri milkvetch	Fabaceae	Perennial Forb	4156	N
Balsamorhiza sagittata (Pursh) Nutt.	Arrow-leaf balsamroot	Asteraceae	Perennial Forb	obs	N
Besseya wyomingensis (A. Nels.) Rydb.	Wyoming kittentails	Scrophulariaceae	Perennial Forb	obs	N
Betula occidentalis Hook.	Water birch	Betulaceae	Tree	obs	N
Boechera collinsii (B. holboellii (Hornem.) Love & Love var. collinsii (Fern.) Dorn	Holboell's rockcress	Brassicaceae	Perennial Forb	4111a	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Boechera pauciflora (B. holboellii (Hornem.) Love & Love var. pinetorum (Tidestr.) Dorn	Holboell's rockcress	Brassicaceae	Perennial Forb	4111b	N
Boechera nuttallii (Robins.) Dorn	Nuttall's rockcress	Brassicaceae	Perennial Forb	4122	N
Bromus commutatus Schrad.	Meadow brome	Poaceae	Annual Graminoid	obs	I
Bromus tectorum L.	Cheatgrass	Poaceae	Annual Graminoid	obs	I
Bupleurum americanum Coult. & Rose	American thorow-wax	Apiaceae	Perennial Forb	obs	N
Calamagrostis canadensis (Michx.) Beauv.	Bluejoint reedgrass	Poaceae	Perennial Graminoid	obs	N
Calamagrostis inexpansa Gray	Slim-stem reedgrass	Poaceae	Perennial Graminoid	obs	N
Calamovilfa longifolia (Hook.) Scribn.	Prairie sandreed	Poaceae	Perennial Graminoid	obs	N
Calochortus gunnisonii Wats.	Gunnison's mariposa-lily	Calochortaceae	Perennial Forb	obs	N
Calochortus nuttallii T. & G.	Sego-lily	Calochortaceae	Perennial Forb	obs	N
Camelina microcarpa Anrdz. ex DC.	Little-pod false flax	Brassicaceae	Annual Forb	obs	I
Campanula rotundifolia L.	Harebell	Campanulaceae	Perennial Forb	obs	N
Carex filifolia Nutt.	Thread-leaf sedge	Cyperaceae	Perennial Graminoid	obs	N
Carex geyeri Boott	Elk sedge	Cyperaceae	Perennial Graminoid	obs	N
Carex microptera Mack. var. limnophila (Hermann) Dorn	Pond sedge	Cyperaceae	Perennial Graminoid	4177b	N
Carex pachystachya Cham. ex Stedel	Thick-headed sedge	Cyperaceae	Perennial Graminoid	4173	N
Carex pellita Muhl. ex Willd.	Woolly sedge	Cyperaceae	Perennial Graminoid	obs	N
Carex pensylvanica Lam. var. digyna Boeckl.	Pennsylvania sedge	Cyperaceae	Perennial Graminoid	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Carex rossii Boott	Ross' sedge	Cyperaceae	Perennial Graminoid	4132	N
Carex sprengelii Dewey ex Spreng.	Long-beak sedge	Cyperaceae	Perennial Graminoid	obs	N
Carex utriculata Boott	Beaked sedge	Cyperaceae	Perennial Graminoid	obs	N
Carex xerantica Bailey	Lake Tahoe sedge	Cyperaceae	Perennial Graminoid	4141	N
Castilleja cusickii Greenm.	Cusick's Indian-paintbrush	Scrophulariaceae	Perennial Forb	4103	N
Castilleja flava Wats.	Yellow paintbrush	Scrophulariaceae	Perennial Forb	obs	N
Cerastium arvense L.	Field mouse-ear chickweed	Caryophyllaceae	Perennial Forb	obs	I
Cercocarpus ledifolius Nutt. var. ledifolius	Curl-leaf mountain mahogany	Rosaceae	Shrub	obs	N
Chaenactis douglasii (Hook.) H. & A. var. montana Jones	Hoary dusty-maiden	Asteraceae	Perennial Forb	obs	N
Chamerion angustifolium (L.) Holub var. angustifolium	Narrow-leaf fireweed	Onagraceae	Perennial Forb	obs	N
Cheilanthes feei Moore	Slender lipfern	Adiantaceae	Ferns/Fern Allies	obs	N
Chenopodium fremontii Wats.	Fremont's goosefoot	Chenopodiaceae	Annual Forb	obs	N
Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	Perennial Forb	obs	I
Cirsium hookerianum Nutt.	White thistle	Asteraceae	Perennial Forb	4157	N
Clematis columbiana (Nutt.) T. & G. var. tenuiloba (Gray) Pringle	Columbian virgin's-bower	Ranunculaceae	Perennial Forb	4139	N
Clematis hirsutissima Pursh	Sugar-bowls	Ranunculaceae	Perennial Forb	obs	N
Clematis ligusticifolia Nutt.	Western virgin's-bower	Ranunculaceae	Perennial Forb	obs	N
Collinsia parviflora Lindl.	Small-flower blue-eyed Mary	Scrophulariaceae	Annual Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Comandra umbellata (L.) Nutt. var. pallida (A. DC.) Jones	Bastard toadflax	Santalaceae	Perennial Forb	obs	N
Cornus sericea L.	Red-osier dogwood	Cornaceae	Shrub	obs	N
Corydalis aurea Willd. var. aurea	Golden smoke	Fumariaceae	Perennial Forb	4133	N
Coryphantha vivipara (Nutt.) Britt. & Rose	Pincushion cactus	Cactaceae	Perennial Forb	obs	N
Crepis modocensis Greene	Siskiyou hawk's-beard	Asteraceae	Perennial Forb	obs	N
Cryptantha celosioides (Eastw.) Payson	Cockscomb cryptantha	Boraginaceae	Perennial Forb	4138. 4149	N
Cryptogramma acrostichoides R. Br.	American rockbrake	Adiantaceae	Ferns/Fern Allies	obs	N
Cymopterus longipes Wats.	Long-stalk spring-parsley	Apiaceae	Perennial Forb	4124	N
Cymopterus williamsii Hartm. & Const.	Williams' spring-parsley	Apiaceae	Perennial Forb	4099, 4135, 4146	N
Cynoglossum officinale L.	Common hound's-tongue	Boraginaceae	Perennial Forb	obs	I
Cystopteris fragilis (L.) Bernh.	Brittle bladder-fern	Aspleniaceae	Ferns/Fern Allies	obs	N
Dactylis glomerata L.	Orchard grass	Poaceae	Perennial Graminoid	obs	I
Dalea spp.	prairie clover	Fabaceae		obs	N
Danthonia unispicata (Thurb.) Munro ex Macoun	Few-flower wild oatgrass	Poaceae	Perennial Graminoid	4144	N
Delphinium bicolor Nutt.	Flat-head larkspur	Ranunculaceae	Perennial Forb	obs	N
Descurainia incana (Bernh. ex Fisch. & Meyer) Dorn var. incana	Mountain tansy-mustard	Brassicaceae	Annual Forb	obs	N
Dodecatheon conjugens Greene	Bonneville shooting-star	Primulaceae	Perennial Forb	obs	N
Douglasia montana Gray	Rocky Mountain dwarf-primrose	Primulaceae	Perennial Forb	obs	N
Draba nemorosa L.	Woodland whitlow-grass	Brassicaceae	Annual Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Draba oligosperma Hook.	Few-seed whitlow-grass	Brassicaceae	Perennial Forb	4117, 4121	N
Eleocharis acicularis (L.) R. & S.	Needle spike-rush	Cyperaceae	Perennial Graminoid	obs	N
Elymus cinereus Scribn. & Merr.	Great Basin wildrye	Poaceae	Perennial Graminoid	obs	N
Elymus glaucus Buckl.	Blue wildrye	Poaceae	Perennial Graminoid	4176	N
Elymus smithii (Rydb.) Gould	Western wheatgrass	Poaceae	Perennial Graminoid	obs	N
Elymus spicatus (Pursh) Gould	Bluebunch wheatgrass	Poaceae	Perennial Graminoid	obs	N
Elymus trachycaulus (Link) Gould ex Shinners var. andinus (Scribn. & Sm.) Dorn	Slender wheatgrass	Poaceae	Perennial Graminoid	obs	N
Epilobium ciliatum Raf. var. glandulosum (Lehm.) Dorn	Fringed willowherb	Onagraceae	Perennial Forb	obs	N
Epilobium halleanum Hausskn.	Glandular willowherb	Onagraceae	Perennial Forb	obs	N
Equisetum arvense L.	Field horsetail	Equisetaceae	Ferns/Fern Allies	obs	N
Equisetum laevigatum A. Br.	Smooth scouring-rush	Equisetaceae	Ferns/Fern Allies	obs	N
Eremogone congesta (Nutt.) Ikonnikov var. congesta	Ball-head sandwort	Caryophyllaceae	Perennial Forb	obs	N
Eremogone hookeri (Nutt.) Weber var. hookeri	Hooker's sandwort	Caryophyllaceae	Perennial Forb	obs	N
Ericameria nauseosa (Pallas ex Pursh) Nesom & Baird var. nauseosa	Rubber-rabbitbrush	Asteraceae	Shrub	obs	N
Erigeron caespitosus Nutt.	Tufted fleabane	Asteraceae	Perennial Forb	obs	N
Erigeron compositus Pursh var. discoideus Gray	Cut-leaved fleabane	Asteraceae	Perennial Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Erigeron ochroleucus Nutt. var. ochroleucus	Buff fleabane	Asteraceae	Perennial Forb	obs	N
Erigeron ochroleucus Nutt. var. scribneri (Canby ex Rydb.) Cronq.	Buff fleabane	Asteraceae	Perennial Forb	4107	N
Eriogonum brevicaule Nutt. var. brevicaule	Shortstem wild buckwheat	Polygonaceae	Perennial Forb	obs	N
Eriogonum flavum Nutt. var. flavum	Yellow buckwheat	Polygonaceae	Perennial Forb	obs	N
Eriogonum pauciflorum Pursh var. pauciflorum	Few-flower wild buckwheat	Polygonaceae	Perennial Forb	obs	N
Eriogonum umbellatum Torrey var. dichrocephalum Gand.	Sulphur-flower wild buckwheat	Polygonaceae	Perennial Forb	4179	N
Eritrichium howardii (Gray) Rydb.	Howard's alpine forget-me-not	Boraginaceae	Perennial Forb	4137	N
Erysimum asperum (Nutt.) DC. var. arkansanum (Nutt.) Gray	Sand dune wallflower	Brassicaceae	Perennial Forb	obs	N
Erysimum inconspicuum (Wats.) MacM.	Shy wallflower	Brassicaceae	Perennial Forb	obs	N
Eucephalus glaucus Nutt.	Blueleaf aster	Asteraceae	Perennial Forb	obs	N
Festuca idahoensis Elmer	Idaho fescue	Poaceae	Perennial Graminoid	obs	N
Fragaria virginiana Miller	Virginia strawberry	Rosaceae	Perennial Forb	obs	N
Gaillardia aristata Pursh	Great blanketflower	Asteraceae	Perennial Forb	obs	N
Galium boreale L.	Northern bedstraw	Rubiaceae	Perennial Forb	obs	N
Galium triflorum Michx.	Fragrant bedstraw	Rubiaceae	Perennial Forb	obs	N
Gaura coccinea Nutt. ex Pursh	Scarlet beeblossom	Onagraceae	Perennial Forb	obs	N
Gentianella amarella (L.) Boerner var. amarella	Autumn dwarf-gentian	Gentianaceae	Perennial Forb	obs	N
Geranium richardsonii Fisch. & Trautv.	White crane's-bill	Geraniaceae	Perennial Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Geranium viscosissimum Fisch. & Meyer ex Meyer var. viscosissimum	Sticky purple crane's-bill	Geraniaceae	Perennial Forb	obs	N
Geum macrophyllum Willd. var. perincisum (Rydb.) Raup	Large-leaf avens	Rosaceae	Perennial Forb	obs	N
Glyceria striata (Lam.) Hitchc.	Fowl mannagrass	Poaceae	Perennial Graminoid	obs	N
Grindelia squarrosa (Pursh) Dunal var. squarrosa	Curly-cup gumweed	Asteraceae	Perennial Forb	obs	N
Gutierrezia sarothrae (Pursh) Britt. & Rusby	Broom snakeweed	Asteraceae	Shrub	obs	N
Hackelia deflexa (Wahl.) Opiz var. americana (Gray) Fern. & Johnst. ex Fern.	Nodding stickseed	Boraginaceae	Perennial Forb	4158	N
Hedeoma drummondii Benth.	Drummond's false pennyroyal	Lamiaceae	Perennial Forb	4182	N
Heracleum sphondylium L. var. lanatum (Michx.) Dorn	American cow parsnip	Apiaceae	Perennial Forb	obs	N
Hesperostipa comata (Trin. & Rupr.) var. comata	Needle-and-thread	Poaceae	Perennial Graminoid	obs	N
Heterotheca villosa (Pursh) Shinners var. villosa	Hairy false golden-aster	Asteraceae	Perennial Forb	obs	N
Heuchera parvifolia Nutt. ex T. & G.	Little-leaf alumroot	Saxifragaceae	Perennial Forb	obs	N
Holodiscus dumosus (Nutt. ex Hook.) Heller	Glandular oceanspray	Rosaceae	Shrub	4191	N
Humulus lupulus L. var. neomexicanus Nels. & Cock.	Common hop	Cannabaceae	Perennial Forb	4190	N
Hymenopappus polycephalus Osterh.	Fine-leaf woollywhite	Asteraceae	Perennial Forb	4159	N
Ipomopsis spicata (Nutt.) Grant var. spicata	Spiked skyrocket	Polemoniaceae	Perennial Forb	obs	N
Ivesia gordonii (Hook.) T. & G.	Gordon's ivesia	Rosaceae	Perennial Forb	obs	N
Juncus balticus Willd. var. montanus Engelm.	Baltic rush	Juncaceae	Perennial Graminoid	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Juniperus communis L. var. depressa Pursh	Common juniper	Cupressaceae	Shrub	obs	N
Juniperus horizontalis Moench	Creeping juniper	Cupressaceae	Shrub	obs	N
Juniperus scopulorum Sarg.	Rocky Mountain juniper	Cupressaceae	Tree	obs	N
Koeleria macrantha (Ledeb.) Schultes	Prairie junegrass	Poaceae	Perennial Graminoid	obs	N
Krascheninnikovia lanata (Pursh) Meeuse & Smit	Winterfat	Chenopodiacea e	Shrub	obs	N
Mulgedium pulchellum (Lactuca oblongifolia Nutt.)	Russian blue lettuce	Asteraceae	Perennial Forb	4183	N
Lesquerella alpina (Nutt.) Wats.	Alpine bladderpod	Brassicaceae	Perennial Forb	4100	N
Leucopoa kingii (Wats.) Weber	Spikefescue	Poaceae	Perennial Graminoid	obs	N
Lewisia rediviva Pursh	Oregon bitter-root	Portulacaceae	Perennial Forb	obs	N
Liatris punctata Hook.	Dotted gayfeather	Asteraceae	Perennial Forb	obs	N
Linanthus pungens (Torrey) Porter & Johnson	Granite prickly-phlox	Polemoniaceae	Shrub	obs	N
Linum lewisii Pursh	Blue flax	Linaceae	Perennial Forb	obs	N
Lithospermum ruderale Dougl. ex Lehm.	Western gromwell	Boraginaceae	Perennial Forb	obs	N
Lomatium cous (Wats.) Coult. & Rose	Cous-root desert-parsley	Apiaceae	Perennial Forb	obs	N
Lomatium orientale Coult. & Rose	Oriental desert-parsley	Apiaceae	Perennial Forb	4127	N
Lomatium triternatum (Pursh) Coult. & Rose var. anomalum (Jones ex Coult. & Rose) Math.	Nine-leaf desert-parsley	Apiaceae	Perennial Forb	obs	N
Lupinus argenteus Pursh var. argenteus	Silver-stem lupine	Fabaceae	Perennial Forb	obs	N
Dieteria canescens var. canescens (Machaeranthera	Hoary tansy-aster	Asteraceae	Perennial Forb	4195	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
canescens (Pursh) Gray var. canescens)+C181					
Mahonia repens (Lindl.) G. Don	Creeping Oregon-grape	Berberidaceae	Shrub	4118	N
Maianthemum stellatum (L.) Link	Starry false Solomon's-seal	Convallariaceae	Perennial Forb	obs	N
Mentha arvensis L. var. canadensis (L.) Kuntze	American wild mint	Lamiaceae	Perennial Forb	obs	N
Mertensia oblongifolia (Nutt.) G. Don	Leafy bluebells	Boraginaceae	Perennial Forb	obs	N
Microseris nutans (Hook.) Schultz-Bip.	Nodding microseris	Asteraceae	Perennial Forb	obs	N
Mimulus guttatus DC.	Seep monkeyflower	Scrophulariaceae	Perennial Forb	obs	N
Minuartia nuttallii (Pax) Briq.	Brittle stitchwort	Caryophyllaceae	Perennial Forb	4106	N
Mirabilis linearis (Pursh) Heimerl	Narrow-leaf four-o'clock	Nyctaginaceae	Perennial Forb	obs	N
Monarda fistulosa L. var. menthifolia (Grah.) Fern.	Oswego-tea	Lamiaceae	Perennial Forb	obs	N
Nassella viridula (Trin.) Barkw.	Green needlegrass	Poaceae	Perennial Graminoid	4131	N
Nasturtium officinale R. Br.	Watercress	Brassicaceae	Perennial Forb	obs	I
Oenothera albicaulis Pursh	White-stem evening-primrose	Onagraceae	Annual Forb	obs	N
Oenothera cespitosa Nutt. var. cespitosa	Tufted evening-primrose	Onagraceae	Perennial Forb	obs	N
Oenothera nuttallii Sweet	Nuttall's evening-primrose	Onagraceae	Perennial Forb	obs	N
Onosmodium molle Michx. var. occidentale (Mack.) Johnston	Soft-hair marbleseed	Boraginaceae	Perennial Forb	obs	N
Opuntia polyacantha Haw. var. polyacantha	Plains prickly-pear	Cactaceae	Perennial Forb	obs	N
Orobanche fasciculata Nutt.	Clustered broomrape	Orobanchaceae	Perennial Forb	4152	N
Orthilia secunda (L.) House	Sidebells pyrola	Ericaceae	Perennial Forb	4171	N
Orthocarpus luteus Nutt.	Yellow owl-clover	Scrophulariaceae	Annual Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Oxytropis besseyi (Rydb.) Blank. var. besseyi	Bessey's locoweed	Fabaceae	Perennial Forb	4154b	N
Oxytropis campestris (L.) DC. var. spicata Hook.	Northern yellow locoweed	Fabaceae	Perennial Forb	4113, 4154a	N
Oxytropis sericea Nutt. var. sericea	White locoweed	Fabaceae	Perennial Forb	4128	N
Packera cana (Hook.) Weber & Love	Silver-woolly groundsel	Asteraceae	Perennial Forb	obs	N
Packera paupercula (Michx.) Love & Love	Balsam goundsel	Asteraceae	Perennial Forb	4134, 4172	N
Packera streptanthifolia (Greene) Weber & A. Love	Rocky Mountain groundsel		Perennial Forb		N
Parietaria pensylvanica Muhl. ex Willd.	Pennsylvania pellitory	Urticaceae	Annual Forb	obs	N
Paronychia sessiliflora Nutt.	Low nailwort	Caryophyllaceae	Perennial Forb	4112	N
Pedicularis spp.	lousewort	Scrophulariaceae		obs	N
Pediomelum argophyllum (Pursh) Grimes	Silver-leaf Indian-breadroot	Fabaceae	Perennial Forb	obs	N
Pellaea breweri Eaton	Brewer's cliffbrake	Adiantaceae	Ferns/Fern Allies	4153	N
Penstemon aridus Rydb.	Stiff-leaf beardtongue	Scrophulariaceae	Perennial Forb	4114, 4126	N
Penstemon attenuatus Dougl. ex Lindl. var. pseudoprocerus (Rydb.) Cronq.	Sulphur beardtongue	Scrophulariaceae	Perennial Forb	4145	N
Penstemon eriantherus Pursh var. eriantherus	Fuzzy-tongue beardtongue	Scrophulariaceae	Perennial Forb	4148	N
Penstemon glaber Pursh var. glaber	Western smooth beardtongue	Scrophulariaceae	Perennial Forb	obs	N
Penstemon laricifolius H. & A. var. laricifolius	Larch-leaf beardtongue	Scrophulariaceae	Perennial Forb	4155	N
Penstemon nitidus Dougl. ex Benth.	Waxy-leaf beardtongue	Scrophulariaceae	Perennial Forb	4129	N
Penstemon procerus Dougl. ex Grah.	Small-flower beardtongue	Scrophulariaceae	Perennial Forb	obs	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Perideridia montana (Blank.) Dorn	Common yampah	Apiaceae	Perennial Forb	obs	N
Petrophyton caespitosum (Nutt.) Rydb.	Rocky Mountain rockmat	Rosaceae	Perennial Forb	obs	N
Phacelia hastata Dougl. ex Lehm.	Silver-leaf scorpion-weed	Hydrophyllaceae	Perennial Forb	4125	N
Phalaris arundinacea L.	Reed canarygrass	Poaceae	Perennial Graminoid	obs	N
Phleum pratense L.	Common timothy	Poaceae	Perennial Graminoid	obs	I
Phlox hoodii Richardson	Hood's phlox	Polemoniaceae	Perennial Forb	obs	N
Phlox multiflora A. Nels.	Rocky Mountain phlox	Polemoniaceae	Perennial Forb	4101	N
Phlox muscoides Nutt.	Moss phlox	Polemoniaceae	Perennial Forb	obs	N
Physaria lanata (A. Nels.) Rydb.	Woolly twinpod	Brassicaceae	Perennial Forb	obs	N
Picea engelmannii Parry ex Engelm.	Engelmann spruce	Pinaceae	Tree	obs	N
Pinus flexilis James	Limber pine	Pinaceae	Tree	obs	N
Pinus ponderosa Laws. & Laws.	Ponderosa pine	Pinaceae	Tree	obs	N
Platanthera aquilonis Sheviak	Eagle green bog-orchid	Orchidaceae	Perennial Forb	4194	N
Poa interior Rydb.	Interior bluegrass	Poaceae	Perennial Graminoid	4174	N
Poa palustris L.	Fowl bluegrass	Poaceae	Perennial Graminoid	4192	N
Poa pratensis L.	Kentucky bluegrass	Poaceae	Perennial Graminoid	4192	I
Poa secunda Presl var. secunda	Sandberg bluegrass	Poaceae	Perennial Graminoid	obs	N
Polygonum bistortoides Pursh	American bistort	Polygonaceae	Perennial Forb	obs	N
Populus angustifolia James	Narrow-leaf cottonwood	Salicaceae	Tree	4150	N
Populus tremuloides Michx.	Quaking aspen	Salicaceae	Tree	obs	N
Potentilla concinna Richardson var.	Red cinquefoil	Rosaceae	Perennial Forb	4110a	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
bicrenata (Rydb.) Welsh & Johnston					
Potentilla concinna Richardson var. concinna	Red cinquefoil	Rosaceae	Perennial Forb	4110	N
Drymocallis fissa (Potentilla fissa Nutt.)	Big-flower cinquefoil	Rosaceae	Perennial Forb	4116	N
Potentilla hippiana Lehm. var. effusa (Dougl. ex Lehm.) Dorn	Branched cinquefoil	Rosaceae	Perennial Forb	4108	N
Potentilla ovina J.M. Macon var. decurrens (Wats.) Welsh & Johnston	Sheep cinquefoil	Rosaceae	Perennial Forb	4105	N
Prosartes trachycarpa Wats.	Rough-fruit fairy-bells	Calochortaceae	Perennial Forb	obs	N
Prunus virginiana L. var. melanocarpa (A. Nels.) Sarg.	Choke cherry	Rosaceae	Shrub	obs	N
Pseudognaphalium stramineum (H.B.K.) Anderb.	Cotton batting-plant	Asteraceae	Annual Forb	4102a	N
Pseudotsuga menziesii (Mirb.) Franco var. glauca (Beissn.) Franco	Douglas-fir	Pinaceae	Tree	obs	N
Psoralidium lanceolatum (Pursh) Rydb.	Lemon scurf-pea	Fabaceae	Perennial Forb	obs	N
Pyrrocoma clementis Rydb. var. villosa (Rydb.) Mayes ex Brown & Keil	Tranquil goldenweed	Asteraceae	Perennial Forb	4170	N
Ranunculus aquatilis L. var. diffusus With.	Long-beak water-crowfoot	Ranunculaceae	Perennial Forb	4181	N
Ranunculus flammula L. var. reptans (L.) Meyer	Greater creeping buttercup	Ranunculaceae	Perennial Forb	obs	N
Ranunculus ranunculinus (Nutt.) Rydb.	Tadpole buttercup	Ranunculaceae	Perennial Forb	4143	N
Rhus aromatica Aiton var. trilobata (Nutt.) Gray	Ill-scented sumac	Anacardiaceae	Shrub	obs	N
Ribes aureum Pursh var. aureum	Golden currant	Grossulariaceae	Shrub		N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Ribes cereum Dougl. var. pedicellare Brewer & Wats.	Wax currant	Grossulariaceae	Shrub	4109	N
Ribes lacustre (Pers.) Poiret	Bristly black gooseberry	Grossulariaceae	Shrub	obs	N
Rosa arkansana Porter	Prairie rose	Rosaceae	Shrub	obs	N
Rosa sayi Schwein.	Prickly rose	Rosaceae	Shrub	obs	N
Rubus idaeus L. var. strigosus (Michx.) Maxim.	Common red raspberry	Rosaceae	Perennial Forb	obs	N
Rudbeckia laciniata L. var. ampla (A. Nels.) Cronq.	Green-head coneflower	Asteraceae	Perennial Forb	obs	N
Rumex aquaticus L. var. fenestratus (Greene) Dorn	Western dock	Polygonaceae	Perennial Forb	4177b	N
Salix amygdaloides Anderss.	Peach-leaf willow	Salicaceae	Tree	4186	N
Salix bebbiana Sarg.	Bebb willow	Salicaceae	Shrub	obs	N
Salix exigua Nutt. var. exigua	Coyote willow	Salicaceae	Shrub	4189	N
Salix fragilis L.	Crack willow	Salicaceae	Tree	4187	N
Sambucus cerulea Raf.	Blue elder	Adoxaceae	Shrub	4120	N
Saxifraga odontoloma Piper	Brook saxifrage	Saxifragaceae	Perennial Forb	obs	N
Saxifraga rhomboidea Greene	Diamond-leaf saxifrage	Saxifragaceae	Perennial Forb	obs	N
Sedum lanceolatum Torrey	Lance-leaf stonecrop	Crassulaceae	Perennial Forb	obs	N
Selaginella densa Rydb.	Dense spike-moss	Selaginellaceae	Ferns/Fern Allies	obs	N
Senecio eremophilus Richardson	Desert ragwort	Asteraceae	Perennial Forb	4196	N
Shepherdia canadensis (L.) Nutt.	Canada buffaloberry	Elaeagnaceae	Shrub	obs	N
Silene drummondii Hook.	Drummond's catchfly	Caryophyllaceae	Perennial Forb	obs	N
Sisymbrium altissimum L.	Tumblemustard	Brassicaceae	Annual Forb	obs	I

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Solidago altissima var. gilvocanescens (S. canadensis L. var. gilvocanescens Rydb.)	Canadian goldenrod	Asteraceae	Perennial Forb	4178a	N
Solidago gigantea Ait.	Late goldenrod	Asteraceae	Perennial Forb	obs	N
Solidago missouriensis Nutt. var. missouriensis	Missouri goldenrod	Asteraceae	Perennial Forb	4193	N
Solidago multiradiata Ait. var. scopulorum Gray	Rocky Mountain goldenrod	Asteraceae	Perennial Forb	4278a	N
Sphaeralcea coccinea (Nutt.) Rydb.	Scarlet globe-mallow	Malvaceae	Perennial Forb	obs	N
Spiraea betulifolia Pallas var. *lucida* (Dougl. ex Greene) Hitchc.	Shiny-leaf meadowsweet	Rosaceae	Shrub	obs	N
Stenotus acaulis (Nutt.) Nutt.	Stemless mock goldenweed	Asteraceae	Perennial Forb	obs	N
Stephanomeria runcinata Nutt.	Desert wirelettuce	Asteraceae	Perennial Forb	obs	N
Sullivantia hapemanii (Coult. & Fish.) Coult.	Hapeman's coolwort	Saxifragaceae	Perennial Forb	4175, 4180	N
Symphoricarpos occidentalis Hook.	Western snowberry	Caprifoliaceae	Shrub	obs	N
Symphoricarpos oreophilus Gray var. *utahensis* (Rydb.) A. Nels.	Mountain snowberry	Caprifoliaceae	Shrub	obs	N
Symphyotrichum ascendens (Lindl.) Nesom	Western american-aster	Asteraceae	Perennial Forb	obs	N
Symphyotrichum foliaceum (Lindl. ex DC.) Nesom var. *parryi* (Eaton) Nesom	Alpine leafy-head american-aster	Asteraceae	Perennial Forb	obs	N
Taraxacum officinale Weber	Common dandelion	Asteraceae	Perennial Forb	obs	I
Tetradymia canescens DC.	Spineless horsebrush	Asteraceae	Shrub	obs	N
Tetraneuris acaulis (Pursh) Greene var. *acaulis*	Stemless four-nerve-daisy	Asteraceae	Perennial Forb	4147	N

Species	Common Name	Family	Form	Obs. or Coll. no.	Native(N) Introduced (I)
Tetraneuris torreyana (Nutt.) Greene	Torrey's four-nerve-daisy	Asteraceae	Perennial Forb	obs	N
Thalictrum spp.	meadowrue	Ranunculaceae		obs	N
Thermopsis rhombifolia (Nutt. ex Pursh) Nutt. ex Richardson var. *rhombifolia*	Prairie golden-banner	Fabaceae	Perennial Forb	4151	N
Townsendia hookeri Beaman	Hooker's Townsend-daisy	Asteraceae	Perennial Forb	obs	N
Townsendia parryi Eaton	Parry's Townsend-daisy	Asteraceae	Perennial Forb	4130	N
Tragopogon dubius Scop.	Yellow salsify	Asteraceae	Perennial Forb	obs	I
Trifolium spp.	clover	Fabaceae		obs	I
Veronica biloba L.	Two-lobe speedwell	Scrophulariaceae	Annual Forb	obs	N
Woodsia scopulina Eaton	Rocky Mountain cliff fern	Aspleniaceae	Ferns/Fern Allies	obs	N
Yucca glauca Nutt.	Soapweed yucca	Agavaceae	Shrub	obs	N
Zigadenus elegans Pursh	Mountain deathcamas	Melanthiaceae	Perennial Forb	obs	N

Table 13. Wyoming plant species of concern in the North Fork WSA

Scientific and Common names	Agency status	WYNDD SOC	WSA locations	Significance of North Fork population	Most current report on Wyoming status
Cymopterus williamsii **; Williams cymopterus**	BLM Sensitive	Track	West side – common; East side only on escarpment	Among the most extensive and largest of populations ever documented. This species is endemic to the southern Big Horn Mtns. in Wyoming.	Handley In progress
Eritrichium howardii **; Howard's forget-me-not**		Track	West side; localized	Undetermined population size and extent at the southern and easternmost extent of distribution. Regional endemic in parts of n. WY and w. MT.	None. See state species accounts on WYNDD homepage.
Physaria lanata **; Woolly twinpod**	USFS R2 Sensitive	Track	East side; localized	Tiny population. Known from Mayoworth so the WSA might represent an upper elevation extension. This species is endemic to the Big Horn Mtns and vicinity; mainly WY but reaching southcentral MT.	Handley and Heidel 2011
Pyrrocoma clementis var. villosa**; Hairy tranquil goldenweed**		Track	West side; common	Large population and one of the few populations of this taxon that are on the east side of the Big Horn Mtns (most are on the west side). It is endemic to the Big Horn Mtns. (WY).	Heidel 2011b
Sullivantia hapemannii **; Hapeman's sullivantia**		Watch (i.e. potential concern)	West side canyons and main canyon dividing east-west sides	Large population and southernmost location in the Big Horn Mtns. This species is concentrated mainly in the Big Horn Mtns (WY) and Pryor Mtns (MT); with a few disjunct locations in ID and elsewhere in WY.	Heidel 2004

Appendix A. Limber pine assessment datasheets from the North Fork WSA.

Lat: 43.904208
Long: -106.940014

This table pages 4-5

FORVIS id	Date	Classifier	Data Source
	7/22/2015	Tom Abernethy / Mark Arsenault	W

TREE CANOPY DESCRIPTIONS pp 10-14

TREE CANOPY LAYER #					
Canopy Cover %	10		Canopy Height	15m	
Trees Per Acre	40		Birth Year		
User 3	50		User 4	75	
Species	LM				
% Comp.	60				
Crown Ratio	80				
Size Class	Reg				

TREE CANOPY LAYER #					
Canopy Cover %	5		Canopy Height	7m	
Trees Per Acre	100		Birth Year		
User 3	20		User 4	10	
Species	LM				
% Comp.	50				
Crown Ratio	90				
Size Class	Med				

TREE CANOPY LAYER #					
Canopy Cover %	5		Canopy Height	7m	
Trees Per Acre	160		Birth Year		
User 3	5		User 4	0	
Species	LM				
% Comp.	20				
Crown Ratio	80				
Size Class	Small				

POLYGON MISCELLANEOUS DATA pp 6-9

Slope 30	Aspect 35	Elev. 7933
Pot. Veg.	Structure	Ext. Veg.
Disturb. 1	Disturb. 2	Disturb. 3
Severity 1	Severity 2	Severity 3
Tot Canopy %	~~User 1~~	~~User 2~~

~~GARCIA TABLE (Dead trees/acre) pp 15-16~~

~~Dead tree position:~~		~~Standing(snag)~~		~~Down(log)~~	
~~Decay class~~		~~Hard~~	~~Soft~~	~~Hard~~	~~Soft~~
~~Height/ Length 1~~	~~Dia. 1~~	———	———	———	———
	~~Dia. 2~~	———	———	———	———
~~Height/ Length 2~~	~~Dia. 1~~	———	———	———	———
	~~Dia. 2~~	———	———	———	———
~~Height/ Length 3~~	~~Dia. 1~~	———	———	———	———
	~~Dia. 2~~	———	———	———	———

~~Number per Acre 0, 1=<1, 2=<2, 3=2+~~
~~Hard = Decay classes 1&2, Soft = Decay Classes 3-5~~

~~FUELS/RESIDUE DATA~~

~~Refer. page~~		~~Refer. page~~
~~Size class~~	~~Wt.(ton/ac)~~	
~~0-0.25"~~	———	~~Duff Depth~~
~~.26-1.0"~~	———	~~Litter Depth~~
~~1.0-3.0"~~	———	~~Ground Cover %~~
~~3.0+"~~	———	~~Crown Bk.~~
~~Total~~	———	~~Fuel Model~~
~~User 5~~	———	~~User 6~~

UNDERSTORY DESCRIPTION (Trees, Shrubs, Grasses, Forbs) pp 17-18

VEGEGTAION LAYER # 1 (0-2.0') Pg 15			VEGETATION LAYER # 2 (2.1-6.0')			VEGETATION LAYER # 3 (6.1+)		
Species	Cover	Status	Species	Cover	Status	Species	Cover	Status
Iorda			Bromus Sterilis			Limber pine		
Fescue			Poa Pratensis			Ponderosa		
Bluebunch			Limber pine			Doug Fir		
Owl Clover			Doug Fir					
Scilla Mysc			Common Juniper					
Flax			Nodding thistle					
Mariposa lily								
Yellow salsify								
Doug Fir								
Common Juniper								

Juniper

Waypt Limb survey 1

NAD83 Geo Lat 43.91751
Long -106.950059

This table pages 4-5

FORVIS id	Date	Classifier	Data Source
	7/22/15	Wendy Estes-Zumpf	W

TREE CANOPY DESCRIPTIONS pp 10-14

TREE CANOPY LAYER #	1 Limber				
Canopy Cover %	5		Canopy Height	15m	
Trees Per Acre	7	20 (140)	~~Birth Year~~		
User 3	0		User 4	0	
Species	LIM	DF	RP		
% Comp.	20	70	10		
~~Crown Ratio~~					
Size Class					

TREE CANOPY LAYER #					
Canopy Cover %			Canopy Height		
Trees Per Acre			~~Birth Year~~		
User 3			User 4		
Species					
% Comp.					
Crown Ratio					
Size Class					

TREE CANOPY LAYER #					
Canopy Cover %			Canopy Height		
Trees Per Acre			~~Birth Year~~		
User 3			User 4		
Species					
% Comp.					
Crown Ratio					
Size Class					

POLYGON MISCELLANEOUS DATA pp 6-9

Slope	5	Aspect	SW>NE	Elev.	8055
Pot. Veg.		Structure		Ext. Veg.	
Disturb. 1		Disturb. 2		Disturb. 3	
Severity 1		Severity 2		Severity 3	
Tot Canopy %		~~User 1~~		~~User 2~~	

~~GARCIA TABLE (Dead trees/acre) pp 15-16~~

~~Dead tree position:~~		~~Standing(snag)~~		~~Down(log)~~	
~~Decay class:~~		~~Hard~~	~~Soft~~	~~Hard~~	~~Soft~~
~~Height/ Length 1~~	~~Dia. 1~~				
	~~Dia. 2~~				
~~Height/ Length 2~~	~~Dia. 1~~				
	~~Dia. 2~~				
~~Height/ Length 3~~	~~Dia. 1~~				
	~~Dia. 2~~				

~~Number per Acre 0, 1=<1, 2=<2, 3=2+~~
~~Hard = Decay classes 1&2, Soft = Decay Classes 3-5~~

~~FUELS/RESIDUE DATA~~

~~Refer. page~~		~~Refer. page~~
~~Size class~~	~~Wt.(ton/ac)~~	
~~0-0.25"~~		~~Duff Depth~~
~~.25-1.0"~~		~~Litter Depth~~
~~1.0-3.0"~~		~~Ground Cover %~~
~~3.0+"~~		~~Crown Ht.~~
~~Total~~		~~Fuel Model~~
~~User 5~~		~~User 6~~

UNDERSTORY DESCRIPTION (Trees, Shrubs, Grasses, Forbs) pp 17-18

VEGEGTAION LAYER # 1 (0-2.0') Pg 15			VEGETATION LAYER # 2 (2.1-6.0')			VEGETATION LAYER # 3 (6.1+)		
Species	Cover	Status	Species	Cover	Status	Species	Cover	Status
CJ			DF					
			RJ					
YELLOW			LIMB					
BALSAMRT								
CURRANT								
SAGEBRU								
WILD ROSE								
MISC. FORBS								
LUPINE								

This table pages 4-5

FORVIS ID	Date	Classifier	Data Source
01	21 Jul 2015	B. Heidel	W

TREE CANOPY DESCRIPTIONS pp 10-14

TREE CANOPY LAYER #					
Canopy Cover %	20		Canopy Height	35	
Trees Per Acre	10 = 200		~~Birth Year~~		
User 3	90		User 4	50	
Species					
% Comp.	20				
~~Crown Ratio~~					
Size Class	20"				

TREE CANOPY LAYER #					
Canopy Cover %	10		Canopy Height	20	
Trees Per Acre			~~Birth Year~~		
User 3	100		User 4		
Species					
% Comp.	10				
Crown Ratio					
Size Class	8"				

TREE CANOPY LAYER #					
Canopy Cover %			Canopy Height		
Trees Per Acre			~~Birth Year~~		
User 3			User 4		
Species					
% Comp.					
Crown Ratio					
Size Class					

POLYGON MISCELLANEOUS DATA pp 6-9

Slope 0	Aspect 0	Elev. 7980
Pot. Veg.	Structure	Ext. Veg.
Disturb. 1	Disturb. 2	Disturb. 3
Severity 1	Severity 2	Severity 3
Tot Canopy %	~~User 1~~	~~User 2~~

~~GARCIA TABLE (Dead trees/acre)~~ pp 15-16

~~Dead tree position:~~		~~Standing (snag)~~		~~Down (log)~~	
~~Decay class:~~		~~Hard~~	~~Soft~~	~~Hard~~	~~Soft~~
~~Height/ Length 1~~	~~Dia. 1~~				
	~~Dia. 2~~				
~~Height/ Length 2~~	~~Dia. 1~~				
	~~Dia. 2~~				
~~Height/ Length 3~~	~~Dia. 1~~				
	~~Dia. 2~~				

~~Number per Acre 0, 1=<1, 2=<2, 3=2+~~
~~Hard = Decay classes 1&2, Soft = Decay Classes 3-5~~

~~FUELS/RESIDUE DATA~~

~~Refer. page~~		~~Refer. page~~
~~Size class~~	~~Wt (ton/ac)~~	
~~0-0.25"~~		~~Duff Depth~~
~~.25-1.0"~~		~~Litter Depth~~
~~1.0-3.0"~~		~~Ground Cover %~~
~~3.0+"~~		~~Crown Ht.~~
~~Total~~		~~Fuel Model~~
~~User 5~~		~~User 6~~

UNDERSTORY DESCRIPTION (Trees, Shrubs, Grasses, Forbs) pp 17-18

VEGEGTAION LAYER # 1 (0-2.0') Pg 15			VEGETATION LAYER # 2 (2.1-6.0')			VEGETATION LAYER # 3 (6.1+)		
Species	Cover	Status	Species	Cover	Status	Species	Cover	Status
PINCLE	30		0			0		
JUNCUS	20							
FESTUC	20							
PURPLE	T							

low bird berry

#157 43° 55, 192 106° 57, 708

This table pages 4-5

& B. Heidel

FORVIS id	Date	Classifier	Data Source
02	22 JUL 2015	Charlotte Darlina	W

TREE CANOPY DESCRIPTIONS pp 10-14

TREE CANOPY LAYER #	1				
Canopy Cover %	30		Canopy Height	30ft	
Trees Per Acre	24 x 20 = 480		~~Birth Year~~		
User 3	60		User 4	10	
Species	PIFL	BAME			
% Comp.	95	5			
Crown Ratio					
Size Class					

TREE CANOPY LAYER #	2				
Canopy Cover %	5		Canopy Height	20	
Trees Per Acre	8 x 20 = 160		~~Birth Year~~		
User 3	100		User 4	50	
Species	PIFL				
% Comp.	100				
Crown Ratio					
Size Class					

TREE CANOPY LAYER #	3				
Canopy Cover %	1		Canopy Height	10	
Trees Per Acre	4 x 20 = 60		~~Birth Year~~		
User 3	0		User 4	0	
Species	PSEM	TSCA	PIFL		
% Comp.	25	50	25		
Crown Ratio					
Size Class					

POLYGON MISCELLANEOUS DATA pp 6-9

Slope	0	Aspect	0	Elev.	8167
Pot. Veg.		Structure		Ext. Veg.	
Disturb. 1		Disturb. 2		Disturb. 3	
Severity 1		Severity 2		Severity 3	
Tot Canopy %		~~User 1~~		~~User 2~~	

~~GARCIA TABLE (Dead trees/acre)~~ pp 15-16

~~Dead tree position~~		~~Standing (snag)~~		~~Down (log)~~	
~~Decay class~~		~~Hard~~	~~Soft~~	~~Hard~~	~~Soft~~
~~Height/ Length 1~~	~~Dia. 1~~				
	~~Dia. 2~~				
~~Height/ Length 2~~	~~Dia. 1~~				
	~~Dia. 2~~				
~~Height/ Length 3~~	~~Dia. 1~~				
	~~Dia. 2~~				

~~Number per Acre 0, 1=<1, 2=<2, 3=2+~~
~~Hard = Decay classes 1&2, Soft = Decay Classes 3-5~~

~~FUELS/RESIDUE DATA~~

~~Refer. page~~		~~Refer. page~~
~~Size class~~	~~Wt.(ton/ac)~~	
~~0-0.25"~~		~~Duff Depth~~
~~.25-1.0"~~		~~Litter Depth~~
~~1.0-3.0"~~		~~Ground Cover %~~
~~3.0+"~~		~~Crown Ht.~~
~~Total~~		~~Fuel Model~~
~~User 5~~		~~User 6~~

UNDERSTORY DESCRIPTION (Trees, Shrubs, Grasses, Forbs) pp 17-18

VEGETAION LAYER # 1 (0-2.0') Pg 15			VEGETATION LAYER # 2 (2.1-6.0')			VEGETATION LAYER # 3 (6.1+)		
Species	Cover	Status	Species	Cover	Status	Species	Cover	Status
SYMORE	1							
JUNCOM	10							
CARSPP								
ERFCON	8							
ASTSPP	5							
CYMWIL								
BALSAG	1							
SERCAN								
BUPAMP								

veg. Above or Soil...

GALARI
PSEMON
CLETEN

#166 UTM 343463E 4862681N 13N

Unknown canker in canopy 3 — User 3 % w/ blister rust

many nests or middens — user 4 % dead

dead trees have been dead for a long time - prob. not blister rust

Appendix B. Proper Functioning Condition Datasheets for streams in the North Fork WSA.

Standard Checklist

Name of Riparian-Wetland Area: North Fork of Poudre River

Date: 23 July 2015 Segment/Reach ID: _____

Miles: 3 Acres: _____

ID Team Observers: LI, WEZ, IA, MA

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
	X		2) Where beaver dams are present they are active and stable
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
X			14) Point bars are revegetating with riparian-wetland vegetation
X			15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

63

Remarks

Cobble - bottom stream
Many dippers
Many large boulders in stream
Dense riparian vegetation
A lot of noxious weeds (Canada thistle, Cheatgrass)
Mayflies, stoneflies & midges are the dominant invertebrates in the stream. These insects indicate that the stream is in good health.

Summary Determination

Functional Rating:

Proper Functioning Condition	X
Functional—At Risk	
Nonfunctional	
Unknown	

Trend for Functional—At Risk:

Upward	
Downward	
Not Apparent	X

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes	X
No	

If yes, what are those factors?

___ Flow regulations ___ Mining activities ___ Upstream channel conditions
___ Channelization ___ Road encroachment ___ Oil field water discharge
___ Augmented flows ___ Other (specify)_____

64

Standard Checklist

Name of Riparian-Wetland Area: Pass Creek

Date: 21 July 2015 Segment/Reach ID: _____

Miles: Y4 - Y2 Acres: _____

ID Team Observers: KI, IA, MA, CD, BH

Yes	No	N/A	HYDROLOGY
	X		1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable only observed 1 abandon, old dam
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
X			15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

63

Remarks

Cobble bottom stream

Many Mayflies + caddisflies abundant (good water quality)

I don't observe much erosion, stream appears to be in excellent conditions.

No sign of flooding or going over the banks despite observing floods in other nearby streams + washes.

North facing slope forested
South facing slope open meadow

Summary Determination

Functional Rating:

Proper Functioning Condition	X
Functional—At Risk	
Nonfunctional	
Unknown	

Trend for Functional—At Risk:

Upward	
Downward	
Not Apparent	X

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes	
No	X

If yes, what are those factors?

___ Flow regulations ___ Mining activities ___ Upstream channel conditions
___ Channelization ___ Road encroachment ___ Oil field water discharge
___ Augmented flows ___ Other (specify)_____