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Natural Resource Stewardship and Science

Invasive Exotic Plant Monitoring at Fossil Butte National Monument

2016 Field Season

Natural Resource Report NPS/NCPN/NRR—2017/1555



ON THE COVER

Flixweed (*Descurainia sophia*). Photo by Mary Ellen (Mel) Harte, Bugwood.org.

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Contents

Figures v
Tables vii
Executive Summary ix
Acknowledgements xi

1 Introduction 1

2 Methods 3
2.1 Developing a park target invasive exotic plant list 3
2.2 Monitoring routes 3
2.3 Monitoring transects 5
2.4 Analyses 6

3 Results 7
3.1 Monitoring routes 7
3.2 Monitoring transects 7
3.3 Priority patches over time 8

4 Discussion 23
4.1 Control efforts by park staff, 2015–2016 23
4.2 Possibilities for management control 23
4.3 Future monitoring efforts 24

Literature Cited 25

Appendices 27
Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016 27
Appendix B. Exotic Plant Transect Data, Fossil Butte National Monument, 2016 52

Figures

Figure 2-1. The maximum Effective Detection Distance (EDD) at Fossil Butte National Monument ranged from 4 to 10 meters in 2016, making the Effective Detection Swath Width (EDSW) 8–20 meters. 4

Figure 3-1. Invasive plant monitoring routes, Fossil Butte National Monument, June 30–July 4, 2016. 17

Figure 3-2. Invasive plant monitoring routes and invasive patches detected along monitoring routes, in the northern section of Fossil Butte National Monument, June 30–July 4, 2016. 18

Figure 3-3. Invasive plant monitoring routes and invasive patches detected along monitoring routes, in the central section of Fossil Butte National Monument, June 30–July 4, 2016. 19

Figure 3-4. Invasive plant monitoring routes and invasive patches detected along monitoring routes, in the southern section of Fossil Butte National Monument, June 30–July 4, 2016. 20

Figure 3-5. Invasive plant monitoring transects, Fossil Butte National Monument, June 30–July 4, 2016. 21

Figure 3-6. Invasive plant patches per kilometer by area of priority invasive species that were consistently recorded on monitoring routes in all years at Fossil Butte National Monument, 2008–2016 22

Figure 3-7. Invasive plant patches per kilometer of the highest-density priority invasive species that were consistently recorded on monitoring routes in most years at Fossil Butte National Monument, 2008–2016. 22

Tables

Table 2-1. Priority invasive plant list, Fossil Butte National Monument, 2008–2016. 3

Table 3-1. Invasive exotic plants detected at Fossil Butte National Monument, June 30–July 4, 2016. 7

Table 3-2. Number of priority IEP patches per route, and number per kilometer by route type, Fossil Butte National Monument, June 30–July 4, 2016. 9

Table 3-3. Number of patches by species and patch size class detected along monitoring routes, Fossil Butte National Monument, June 30–July 4, 2016. 10

Table 3-4. Species observed and patch size detected along the Main Park Road, Fossil Butte National Monument, 2008–2016. 11

Table 3-5. Total number of patches (number per km) detected on the southern and northern drainages and roads other than Main Park Road, Fossil Butte National Monument, 2008–2016. 13

Table 3-6. Total number of infestations (number per km) detected along trails and parkwide at Fossil Butte National Monument, 2008–2016. 15

Table 4-1. Species and total number of individuals pulled in 2016 at Fossil Butte National Monument. 23

Executive Summary

Invasive exotic plant (IEP) species are one of the biggest threats to natural ecosystem integrity and biodiversity, and controlling them is a high priority for the National Park Service. The Northern Colorado Plateau Network (NCPN) selected the early detection of IEPs as one of 11 monitoring protocols to be implemented as part of its long-term monitoring program. This report represents work completed during the 2016 field season at Fossil Butte National Monument (NM). From June 30 to July 4, 2016, twelve priority IEP species in 809 patches were detected on monitoring routes that covered all major roads, trails, and riparian areas at Fossil Butte NM. The highest densities of plant patches were recorded in the drainages; specifically, East Red Hill (22.3/km), Fossil Butte East Drainage (19.2/km), North Dam Fork of Chicken Creek (17.2/km), Chicken Creek (15.0/km), and West Fork of Chicken Creek (13.9/km). The Main Park Road had the highest density (12.3/km) of patches of any road or trail. Cheatgrass (*Bromus tectorum*), flixweed (*Descurainia sophia*), and creeping foxtail (*Alopecurus arundinaceus*) were by far the most widespread species. Data from 2016 were compared to previous surveys done in 2008–2009, 2010, 2012, and 2014. Generally, invasive plants increased from 2014 to 2016, with very few areas or species that declined. Notably, patch density increased along trails, northern drainages, and the Main Park Road, driven primarily by increase in creeping foxtail and quackgrass (*Elymus repens*). Cheatgrass also had large increases along trails, roads other than the Main Park Road, southern drainages, and the Main Park Road. We found invasive plants on two formerly weedless routes (Fossil Butte Northwest and Wasatch Saddle drainages). The number of weedless areas has declined since monitoring began in 2008. The network will return to Fossil Butte NM for a sixth round of monitoring in 2018.

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1 Introduction

Invasive exotic species fragment native ecosystems, displace native plants and animals, and alter ecosystem function. Invasive species are second only to habitat loss as threats to global biodiversity (Scott and Wilcove 1998) and represent one of the most serious threats to natural ecosystem integrity (NRC 2002). Biological invasions are occurring at accelerated rates in nearly every major ecosystem (Mooney and Hobbs 2000). Exotic plants negatively affect park resources and visitor enjoyment by altering landscapes and fire regimes, reducing native plant communities and animal habitat, and increasing trail maintenance needs. Recognizing these challenges, Northern Colorado Plateau Network (NCPN) parks identified invasive exotic plants (IEPs) as a high-priority vital sign for long-term monitoring (O'Dell et al. 2005).

IEPs are a subset of exotic plants "whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13112). With the aim of facilitating strategic control approaches, this monitoring program detects early invasions, identifies existing invasions, and, to the extent possible, tracks changes in the abundance and distribution of target IEPs in parks along key invasive pathways.

Invasive exotic plants can spread into national parks via a number of different pathway types. Predictable IEP pathways include roads, trails, and riparian corridors. Long-distance dispersal through cargo containers and air freight are examples of sudden pathways. Anthropogenic pathways include horticultural escapes and seeds transported on shoes and in restoration seed mixes. For the National Park Service (NPS), the consequences of these plant invasions present a significant challenge to the agency's ability to maintain natural resources "unimpaired for the enjoyment of future generations."

Because regular, comprehensive monitoring of the distribution and abundance of all exotic plant species within NCPN units is beyond the fiscal capabilities of the network and parks, the NCPN is focusing on the most likely areas where a broad range of invasive exotic plants may occur: riparian corridors, roads, trails, areas of high visitor impact (e.g., campgrounds), and park boundaries. This approach is cost-effective for finding many new invasions in areas where they are most likely to occur, but it may miss exotic plants dispersed to the interior areas of large parks by wind and/or animals.

Specific objectives of NCPN invasive exotic plant monitoring are:

1. To detect incipient populations and new introductions of invasive plant species before they become established in areas of management significance and invasion pathways.
2. To determine status and trends of selected invasive plant populations of management significance.

This report summarizes the 2016 field season and fifth complete monitoring rotation at Fossil Butte National Monument (NM).

2 Methods

We followed the invasive plant monitoring protocol developed by the NCPN (Perkins et al. 2016). The protocol emphasizes quick collection of IEP location and abundance data in order to maximize the amount of area searched, thus increasing our chances of finding a higher percentage of both new invasions and established IEPs. By focusing on roads, trails, and waterways, which are major vectors for invasive plants, we capture the greatest amount of information (i.e., benefit) with the least amount of time and effort (i.e., cost).

After park and NCPN staff reviewed the list of target invasive plants, we established a series of co-located monitoring routes and quadrats along all roads, major drainages, and trails in the park. The quadrats, which are sampled in a quantitative manner, are used to make inference to the percent cover of IEPs located along the park's invasive pathways (i.e., the monitoring routes) and allow us to estimate trends in IEP percent cover over time. The monitoring routes, which are not quantitatively sampled, are used to increase the spatial coverage of mapping performed, with the goal of maximizing our opportunities for detecting IEPs in the park.

All roads, trails, and riparian areas were surveyed previously with monitoring routes and quadrats in 2008–2009, 2010, 2012, and 2014 (Perkins 2010, 2011, 2013, 2015). During the first rotation, the park was monitored over two years.

2.1 Developing a park target invasive exotic plant list

The original list of target IEPs was developed by reviewing past park literature and state and county weed lists, and consulting with park staff and county weed managers. Our priority IEP list includes existing IEPs and potential IEPs of high management concern. Because these methods were designed to be rapid, field crews were trained to develop a focused search image on the target plants, instead of looking for every possible invasive plant species. Eradicating these target species, or containing them within a park, is possible.

The list of priority species is reviewed before each field season. Prior to beginning monitoring in 2016, NCPN and park staff reviewed the list of high-priority target IEPs (Table 2-1) that was initially developed in 2008 and then reviewed in 2010, 2012, and 2014. In 2016, we added Japanese brome (*Bromus japonicus*) to the priority list. Cheatgrass (*Bromus tectorum*) was mapped throughout the park in 2012 with relatively few patches, so it was added to the priority list in 2014.

2.2 Monitoring routes

2.2.1 Minimum detection target size

The minimum detection target size (MDTS) represents the patch size that was large

Table 2-1. Priority invasive plant list, Fossil Butte National Monument, 2008–2016.

Scientific name	Common name
Alopecurus arundinaceus[1]	creeping foxtail
Arctium minus	burdock
Bassia scoparia	summer cypress
Bromus japonicus[2]	Japanese brome
Bromus tectorum[3]	cheatgrass
Cardaria sp.	whitetop
Carduus nutans	musk thistle
Centaurea diffusa	diffuse knapweed
Centaurea maculosa	spotted knapweed
Centaurea repens	Russian knapweed
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Convolvulus arvensis	field bindweed
Cynoglossum officinale	common houndstongue
Descurainia sophia[4]	flixweed
Elymus repens	quackgrass
Hyoscyamus niger	black henbane
Isatis tinctoria	Dyer's woad
Lepidium latifolium	perennial pepperweed
Linaria dalmatica	Dalmatian toadflax
Melilotus officinalis	yellow sweetclover
Sonchus arvensis	perennial sowthistle
Tamarix sp.	tamarisk
Verbascum thapsus	woolly mullein

[1]Added to priority list in 2010; [2]Added to priority list in 2016, referred to in Perkins (2015) as Japanese chess; [3]Added to priority list in 2014; [4]Added to priority list in 2012

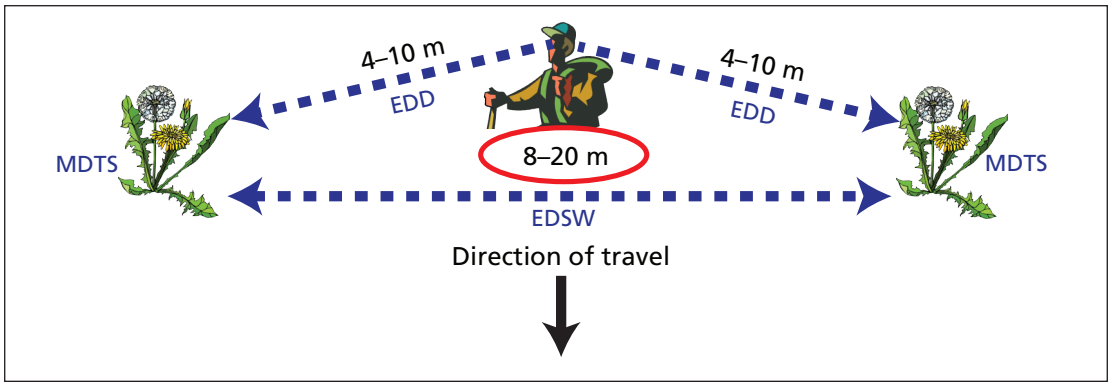


Figure 2-1. The maximum Effective Detection Distance (EDD) at Fossil Butte National Monument ranged from 4 to 10 meters in 2016, making the Effective Detection Swath Width (EDSW) 8–20 meters.

enough to detect with a high level of confidence (typically at least 90% of the total number of patches of that size and larger in the monitoring area) under actual field conditions, but small enough so that any missed patches smaller than the MDTS could still feasibly be eradicated if not found until the next scheduled monitoring visit. The NCPN has established an MDTS of 40 m^2 (0.01 acres, or approximately 20 × 20 ft) for all IEPs. Use of the MDTS is necessary because field technicians are not expected to find every single plant of every targeted weed species during route surveys. Although searching for single mature plants of some species, such as Russian olive (*Elaeagnus angustifolia*) and tamarisk (*Tamarix ramosissima*), is possible due to their large size, single plants of other species, such as field bindweed (*Convolvulus arvensis*), are nearly impossible to detect in most field conditions unless the observer is very close to the patch.

2.2.2 Effective detection distance

The effective detection distance (EDD) is the maximum distance from which a searcher can consistently detect (i.e., see and recognize) the MDTS of the least-visible targeted species with at least 90% detection efficiency (Figure 2-1). Crew members are trained by using fake plants of a targeted size and walking away and determining the maximum distance from which they could consistently see and recognize the patch with complete confidence. The size of the EDD is then estimated in the field by crew members. The distance is measured either by pacing or using a laser rangefinder. The EDD for Fossil Butte NM was between 4 and 10 meters in 2016, depending on surrounding vegetation.

2.2.3 Effective detection swath width

Effective detection swath width (EDSW) is defined as the maximum width of a linear search swath (band transect) in which a walking observer is confident of visually detecting 90% of all target species of the MDTS (Figure 2-1). The effective detection swath width (EDSW) is equal to two times the EDD, because the surveyor is able to effectively detect weeds for one EDD on either side of the search route. The EDSW ranged from 8 to 20 meters at Fossil Butte NM in 2016.

2.2.4 Patch separation resolution

We define patch separation resolution (PSR) as the minimum distance between plants that must be considered members of separate infestations, or patches. Individuals or clusters of a target species separated by the PSR distance or more are recorded as separate patches. We consider plants separated by less than the PSR to be a single patch. The PSR is set at 50 meters, based on the assumption that most plants or groups of plants separated by less than 50 meters are typically considered to be one patch during planning and implementation of weed-control operations. If a patch is continuous for more than 50 meters, then cover estimates are made every 50 meters to aid in developing an effective management strategy for the entire patch.

2.2.5 Data collection methods

For the Main Park Road, we walked one EDD out from one side of the road and then

returned to the starting point by walking back one EDD from the road on the other side. For secondary roads, single-track trails, and drainages, we walked the center of the trail or drainage in only one direction (Figure 2-2). While walking, we searched for IEPs by visually scanning (side-to-side) all of the land within the borders of the swath. However, if the terrain was uneven or steep, and the observer had to glance frequently at the ground to ensure safe foot placement, then searchers stopped approximately every 8–20 meters (the length of one EDSW) and visually scanned the area in all directions. As monitoring routes were traversed, locations of all target species were documented using GPS units with at least five-meter accuracy. Only species designated as priority were consistently recorded during monitoring routes.

When a priority IEP was discovered, we recorded the following information: (1) the monitoring route, (2) the sequential number of the invasion per monitoring route, (3) patch size class (see below), (4) whether the plant was pulled, and (5) canopy cover class (see below). If several species were present with similar distributions at a single point, then we recorded a point for each individual species and assigned it its own sequential identification number. Invasions more than 50 meters (55 yards) apart were considered separate patches and recorded with a separate point.

Patch size class was estimated as follows:

1. 1–a few plants (used for isolated single plants or very small patches (≤2 × 2 m),
2. few plants–40 m^2 (48 yd^2),
3. 40–400 m^2 (48–478 yd^2),
4. 400–1,000 m^2 (0.1–0.25 acre), and
5. 1,000–2,000 m^2 (0.25–0.5 acre).

We recorded canopy cover class by estimating the amount, or "percentage," of ground covered by the vertical projection of plant matter in the infestation patch as visualized from a bird's-eye view of the vegetation (Elzinga et al. 1998). This estimate included both the living and dead standing material of the vegetation of a single plant species. Canopy cover of a patch was recorded using the following classes:

1. Trace (<1%)
2. Low (1–5%)
3. Moderate (6–25%)
4. High (26–50%)
5. Majority (51–100%)

We recorded the following ancillary information with every patch: descriptive notes (e.g., hillside, distance to road, wetland, stream), the growth stage of exotic trees (i.e., sapling, pole, mature), evidence of prior treatment, and evidence of disturbances (e.g., recent fire, flood, small mammal disturbance).

2.3 Monitoring transects

We established transects with three vegetation quadrats every 500 meters along monitoring routes. If no IEPs were detected for four consecutive transects (12 quadrats), then transects were established every 1,000 meters. If invasive plants were found in categories greater than 1 for canopy cover class or patch size class, then we went back to establishing transects every 500 meters.

2.3.1 Quadrat establishment

From 2010 to 2016, we centered vegetation quadrats at 0.5, 5, and 10 meters away from the edge of a road on the same side as the route that was being walked and on alternating sides for riparian areas, small roads, or trails. We placed a 1-m^2 sampling frame to sample vegetation cover and soil-surface features on the right side of the transect line as the technician walked the monitoring route. In some cases, we leveled the sampling frame by propping up quadrat corners.

Quadrat-sampling methods differed slightly from 2008 to 2009–2012. In 2008, we used three 1-m^2 vegetation quadrats, placed in a circular macroplot (Perkins and Weissinger 2009). In 2009, quadrats were placed at 3, 8, and 13 meters away from the monitoring route. In 2008, all invasive species detected were recorded in monitoring quadrats. From 2009 to 2016, only priority species and cheatgrass were recorded in quadrats.

2.3.2 *Data collection methods*

In the monitoring quadrats, we recorded all

priority IEP species and cheatgrass observed. For each quadrat, we recorded percent cover of each IEP using the following classes: <1, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11–25, or >50%. We also recorded percent cover, to the nearest 10%, of dominant soil surface features (i.e., dead wood, dung, fungus, lichen, litter/duff, live root/bole, mineral soil/sediment, moss, biological soil crust, road, rock, standing water/ flooded, stream, or trash/junk).

2.4 Analyses

We calculated the mean number of patches per 100 meters for monitoring routes. Percent cover estimates for monitoring routes or groups of monitoring routes were generated from the monitoring transect data. We calculated the mean and standard error of percent cover by species for monitoring quadrats. For classes representing a range of percent cover values (11–25, 26–50, and 51–100), midpoints were used (18, 38, and 76%) when calculating the mean and standard error. Due to differences in observers' knowledge, only priority species should be used when comparing results from year to year.

3 Results

3.1 Monitoring routes

We covered 66.6 kilometers (41.4 mi) along 27 monitoring routes in 2016 (Figure 3-1). We recorded a total of 12 priority species in 809 patches in 2016 (Tables 3-1, 3-2, 3-3, Figures 3-1, 3-2, 3-3, 3-4, Appendix A; figures begin on page 17). An additional 10 patches were recorded by observers as they walked between monitoring routes. Of the 809 priority patches, 336 (41%) were larger than 40 m^2 (Table 3-3).

The highest densities of plant patches were recorded in the drainages; specifically, East Red Hill (22.3/km), Fossil Butte East Drainage (19.2/km), North Dam Fork of Chicken Creek (17.2/km), Chicken Creek (15.0/km), and West Fork of Chicken Creek (13.9/km). The Main Park Road had the highest density (12.3/km) of patches of any road or trail. Roads other than the Main Park Road generally had lower patch densities (1.8/km). The density of patches at the Historic Quarry Trail increased from 1.7/km in 2014 to 9.0/km in 2016. East Red Hill and Fossil Butte East Drainage also increased from 15.0/km and 12.2/km in 2014 to 22.3/km and 19.2/km in 2016, respectively. The West Fork of Chicken Creek has increased from 0.0/km in 2012 to 7.0/km in 2014 to 13.9/km in 2016. Conversely, the density of patches at South Millet Canyon dropped from 22.0/km in 2014 to 13.4/km in 2016.

Cheatgrass, flixweed (*Descurainia sophia*), and creeping foxtail (*Alopecurus arundinaceus*) were by far the most widespread species, representing 64% of all priority patches detected (Table 3-3). The next-most widespread was Japanese brome (*Bromus japonicus*), with 91 patches. Only priority species should be examined when comparing years and areas, as these were the only species recorded consistently by all observers in years that they were on the priority list.

3.2 Monitoring transects

A total of 122 transects were sampled in 2016 (Figure 3-5, Appendix B;). Only priority species and cheatgrass have been reliably recorded in all years. In 2016, six priority species and one additional, non-priority invasive species were detected in transects (Table 3-1). Quackgrass, yellow sweetclover (*Melilotus officinalis*), and bulbous bluegrass (*Poa bulbosa*) each occurred in one transect each along the Main Park Road, East Red Hill Drainage, and Bullpen Two Track routes, respectively. Flixweed occurred in two transects along the Historic Quarry Trail and one transect along the Main Park Road.

Table 3-1. Invasive exotic plants detected at Fossil Butte National Monument, June 30–July 4, 2016.

Scientific name	Common name	Method detected		Park priority?
		Route	Transect	
Alopecurus arundinaceus	creeping foxtail	X	X	Yes
Bromus japonicus	Japanese brome*	X	X	Yes
Bromus tectorum	cheatgrass	X	X	Yes
Cardaria sp.	whitetop	X		Yes
Carduus nutans	musk thistle	X		Yes
Centaurea maculosa	spotted knapweed	X		Yes
Cirsium arvense	Canada thistle	X		Yes
Convolvulus arvensis	field bindweed	X		Yes
Descurainia sophia	flixweed	X	X	Yes
Elymus repens	quackgrass	X	X	Yes
Hyoscyamus niger	black henbane	X		Yes
Melilotus officinalis	yellow sweetclover	X	X	Yes
Poa bulbosa	bulbous bluegrass		X	No

Total percent cover for any of the above species per monitoring route was less than 1.6%. Creeping foxtail occurred in five transects along Chicken Creek, with a percent cover of 1.4% (1.2 SE). It also occurred in two transects along the North Dam Fork of Chicken Creek and one transect along the West Fork of Chicken Creek. Japanese brome occurred in three transects on the Main Park Road, and one each along the Chicken Creek Nature Trail, Chicken Creek, and East Red Hill Drainage. Cheatgrass was the most widespread in transects and occurred in one transect along the Chicken Creek Nature Trail, Matate Drainage, and Smallpox Creek, two transects on the Historic Quarry Trail, and 22 transects along the Main Park Road, with a mean percent cover of 0.2% (0.1 SE) on the Main Park Road. Estimated percent covers of cheatgrass along the Main Park Road in 2009, 2010, 2012, and 2014 were 0.4% (0.3 SE), 0.4% (0.2 SE), 0.1% (0.1 SE), and 0.9% (0.5 SE), respectively.

3.3 Priority patches over time

In 2016, the number of priority IEP patches consistently recorded across the sampling periods increased from 2014. For this section, we combined routes into four areas:

- Northern drainages: Murder Hill, South Murder Hill, Millet Canyon, South Millet Canyon, and Moose Bones Canyon
- Southern drainages: Smallpox, Matate, West Red Hill, East Red Hill, Fossil Butte East, Fossil Butte NW, Fossil Butte Middle, Wasatch Saddle, Sage Grouse Lek, NE Fork of Chicken Creek, East Fork of Chicken Creek, West Fork of Chicken Creek, North Dam Fork of Chicken Creek, and Chicken Creek
- Roads: Eagle Nest Point, Rubey Point, Bullpen Two Track, and Cundick Ridge
- Trails: Chicken Creek and Historic Quarry Trails.

When examined by area, patch density increased along trails, northern drainages, and the Main Park Road in 2016 (Tables 3-4, 3-5, 3-6, Figure 3-6). These changes were driven by large increases in patch densities of creeping foxtail and quackgrass.

Creeping foxtail saw large increases along the Main Park Road and southern drainages from 2014 to 2016. Cheatgrass increased along trails, the Main Park Road, roads other than the Main Park Road, and southern drainages. Flixweed decreased along the Main Park Road and southern drainages (Tables 3-4, 3-5, 3-6, Figure 3-7). Other species with notable increases from 2014 to 2016 included Canada thistle (*Cirsium arvense*), quackgrass, and black henbane (*Hyoscyamus niger*) along the Main Park Road. Musk thistle (*Carduus nutans*) had notable decreases in northern and southern drainages.

We found invasive plants in two formerly weedless routes (Fossil Butte Northwest Drainage and Wasatch Saddle Drainage). The Northeast Fork of Chicken Creek was the only route where no priority invasive plants were detected, although there were three infestations detected there in 2014. As recently as 2012, Perkins (2013) noted, "No priority IEPs were detected on the Bullpen Two Track, Cundick Ridge Road, Eagle Nest Point Road, East Fork of Chicken Creek, East Red Hill Drainage, Historic Quarry Trail, Fossil Butte Middle Drainage, Fossil Butte NW Drainage, Fossil Butte South Drainage, Northeast Fork of Chicken Creek, Ruby [*sic*] Point Road, Wasatch Saddle Drainage, West Fork of Chicken Creek, or West Red Hill Drainage. A large area along the eastern tributaries of Chicken Creek in the southern portion of the park, as well as the roads other than the Main Park Road, appear to be mostly free of priority species."

Table 3-2. Number of priority IEP patches per route, and number per kilometer by route type, Fossil Butte National Monument, June 30–July 4, 2016.

Route	Route type	Length (m)	ha	Total patches	Patches/km
Chicken Creek	Riparian	7,200	4.3	108	15.0
East Fork Chicken Creek	Riparian	3,619	2.5	11	3.0
East Red Hill Drainage	Riparian	653	0.4	15	22.3
Fossil Butte East Drainage	Riparian	1,514	1.2	29	19.2
Fossil B. Middle Drainage	Riparian	1,018	0.8	5	4.9
Fossil Butte NW Drainage	Riparian	838	0.7	2	2.4
Fossil Butte S. Drainage	Riparian	1,167	0.7	2	1.7
Matate Drainage	Riparian	1,000	0.6	2	2.0
Millet Canyon	Riparian	1,090	0.4	12	11.0
Moose Bones Canyon	Riparian	1,248	0.8	12	9.6
Murder Hill Drainage	Riparian	967	0.4	2	2.1
NE Fork Chicken Creek	Riparian	841	0.5	0	0.0
N. Dam Fork Chicken Cr.	Riparian	2,037	1.6	35	17.2
Sage Grouse Lek Drainage	Riparian	1,192	1.0	4	3.4
Smallpox Creek	Riparian	1,957	1.6	29	9.3
South Millet Canyon	Riparian	822	0.3	11	13.4
S. Murder Hill Drainage	Riparian	717	0.3	4	5.6
Wasatch Saddle Drainage	Riparian	727	0.4	1	1.4
West Fork Chicken Creek	Riparian	722	0.6	10	13.9
West Red Hill Drainage	Riparian	700	0.4	2	2.9
All Riparian		*30,029*	*19.5*	*296*	*9.9*
Bullpen Two Track	Road	832	0.7	4	6.0
Cundick Ridge Road	Road	1,981	2.0	2	3.0
Eagle Nest Point Road	Road	1,134	0.9	1	1.8
Main Park Road	Road	23,548	12.1	446	12.3
Rubey Point Road	Road	2,740	2.2	5	1.1
Roads Other Than Main Park Road		*6,687*	*5.8*	*12*	*1.8*
Chicken Creek Nature Trail	Trail	2,391	1.4	20	8.4
Historic Quarry Trail	Trail	3,903	2.3	35	9.0
All Trails		*6,294*	*3.7*	*55*	*8.7*
Total		**66,558**	**41.0**	***809**	**12.2**

*An additional 10 infestations were noted as observers walked between monitoring routes (see Appendix B).

Table 3-3. Number of patches by species and patch size class detected along monitoring routes, Fossil Butte National Monument, June 30–July 4, 2016.

Scientific name	Common name	Total patches	Patch size class				
			1	2	3	4	5
Alopecurus arundinaceus	creeping foxtail	188	16	80	64	11	17
Bromus japonicus	Japanese brome*	91	3	62	24	2	0
Bromus tectorum	cheatgrass	337	6	127	139	49	16
Cardaria sp.	whitetop	7	2	4	1	0	0
Carduus nutans	musk thistle	17	9	6	1	1	0
Centaurea maculosa	spotted knapweed	1	1	0	0	0	0
Cirsium arvense	Canada thistle	27	5	20	1	1	0
Cirsium vulgare	bull thistle	4	2	2	0	0	0
Convolvulus arvense	field bindweed	2	0	2	0	0	0
Descurainia sophia	flixweed	81	19	57	5	0	0
Elymus repens	quackgrass	31	2	25	4	0	0
Hyoscyamus niger	black henbane	10	4	6	0	0	0
Melilotus officinalis	yellow sweetclover	23	12	11	0	0	0
All priority species		**819**	**81**	**402**	**239**	**64**	**33**

[1]Patch size classes: 1=1–a few plants (≤2 × 2 m), 2=few plants–40 m^2 (48 yd^2), 3=40–400 m^2 (48–478 yd^2), 4=400–1,000 m^2 (0.1–0.25 acre), 5=1,000–2,000 m^2 (0.25–0.5 acre)

Table 3-4. Species observed and patch size detected along the Main Park Road, Fossil Butte National Monument, 2008–2016.

Scientific name	Common name	Year[1]	Total patches (per km)	Patch size class				
				1	2	3	4	5
Alopecurus arundinaceus[2]	creeping foxtail	2008	-	-	-	-	-	-
		2010	6 (0.26)	3	3	0	0	0
		2012	2 (0.08)	0	2	0	0	0
		2014	9 (0.38)	5	4	0	0	0
		2016	16 (0.68)	5	11	0	0	0
Bromus tectorum[3]	cheatgrass	2008	37 (1.97)	15	12	9	1	0
		2010	95 (4.10)	2	35	44	13	1
		2012	15 (0.64)	13 pulled and no size class recorded				
		2014	139 (5.91)	3	58	49	18	11
		2016	234 (9.94)	1	77	111	33	12
Cardaria sp.	whitetop	2008	2 (0.11)	1	1	0	0	0
		2010	0 (0.00)	0	0	0	0	0
		2012	0 (0.00)	0	0	0	0	0
		2014	1 (0.04)	0	1	0	0	0
		2016	4 (0.17)	1	2	1	0	0
Carduus nutans	musk thistle	2008	6 (0.32)	4	2	0	0	0
		2010	13 (0.56)	11	1	1	0	0
		2012	2 (0.08)	1	1	0	0	0
		2014	9 (0.38)	8	1	0	0	0
		2016	6 (0.25)	3	2	0	1	0
Centaurea maculosa	spotted knapweed	2008	0 (0.00)	0	0	0	0	0
		2010	0 (0.00)	0	0	0	0	0
		2012	4 (0.17)	2	2	0	0	0
		2014	6 (0.26)	1	4	1	0	0
		2016	1 (0.04)	1	0	0	0	0
Cirsium arvense	Canada thistle	2008	29 (1.54)	12	16	1	0	0
		2010	12 (0.52)	7	5	0	0	0
		2012	2 (0.08)	1	1	0	0	0
		2014	2 (0.09)	0	1	1	0	0
		2016	13 (0.55)	4	9	0	0	0
Cirsium vulgare	bull thistle	2008	1 (0.05)	0	1	0	0	0
		2010	1 (0.04)	1	0	0	0	0
		2012	3 (0.13)	1	2	0	0	0
		2014	0 (0.00)	0	0	0	0	0
		2016	1 (0.04)	1	0	0	0	0
Convolvulus arvensis	field bindweed	2008	4 (0.21)	0	4	0	0	0
		2010	1 (0.04)	0	1	0	0	0
		2012	0 (0.00)	0	0	0	0	0
		2014	2 (0.09)	0	2	0	0	0
		2016	2 (0.08)	0	2	0	0	0

Table 3-4. Species observed and patch size detected along the Main Park Road, Fossil Butte National Monument, 2008–2016, cont.

Scientific name	Common name	Year[1]	Total patches (per km)	Patch size class				
				1	2	3	4	5
Descurainia sophia[4]	flixweed	2008	-	-	-	-	-	-
		2010	-	-	-	-	-	-
		2012	2 (0.08)	2	0	0	0	0
		2014	75 (3.19)	6	51	10	5	3
		2016	43 (1.82)	9	29	5	0	0
Elymus repens	quackgrass	2008	49 (2.61)	19	16	12	2	0
		2010	69 (2.98)	5	23	19	15	7
		2012	21 (0.89)	0	17	3	1	0
		2014	4 (0.17)	1	3	0	0	0
		2016	25 (1.06)	2	21	2	0	0
Hyoscyamus niger	black henbane	2008	16 (0.85)	15	0	1	0	0
		2010	2 (0.09)	2	0	0	0	0
		2012	4 (0.17)	0	4	0	0	0
		2014	4 (0.17)	1	3	0	0	0
		2016	10 (0.42)	4	6	0	0	0
Melilotus officinalis	yellow sweetclover	2008	48 (2.55)	38	7	3	0	0
		2010	35 (1.51)	18	14	3	0	0
		2012	6 (0.25)	2	4	0	0	0
		2014	15 (0.64)	9	5	1	0	0
		2016	14 (0.59)	7	7	0	0	0
Total priority species recorded in all years[5]		**2008**	**155 (8.25)**	**89**	**47**	**17**	**2**	**0**
		2010	**133 (5.73)**	**44**	**44**	**23**	**15**	**7**
		2012	**42 (1.78)**	**7**	**31**	**3**	**1**	**0**
		2014	**43 (1.83)**	**20**	**20**	**3**	**0**	**0**
		2016	**76 (3.23)**	**23**	**49**	**3**	**1**	**0**

[1]Dates and distances surveyed: July 14–15, 2008 (18,793 m), July 24–28, 2010 (23,192 m), August 2–5, 2012 (23,531 m), July 19–22, 2014 (23,490 m), and June 30–July 4, 2016 (23,548 m)

[2]Species not searched for in 2008–2009

[3]Species not searched for in 2008–2012

[4]Species not searched for in 2008–2010

[5]Does not include *Alopecurus arundinaceus, Bromus tectorum, Descurainia sophia*

Table 3-5. Total number of patches (number per km) detected on the southern and northern drainages and roads other than Main Park Road, Fossil Butte National Monument, 2008–2016.

Scientific name	Common name	Year[1]	Southern drainages[2]	Northern drainages[3]	Roads[4]
Alopecurus arundinaceus[5]	creeping foxtail	2008–2009	NA	NA	0 (0.00)
		2010	43 (1.64)	8 (1.75)	2 (0.30)
		2012	55 (1.97)	1 (0.23)	0 (0.00)
		2014	95 (3.64)	15 (3.07)	2 (0.30)
		2016	149 (5.92)	14 (2.89)	5 (0.75)
Bromus tectorum[6]	cheatgrass	2008–2009	NA	NA	NA
		2010	NA	NA	NA
		2012	NA	NA	NA
		2014	31 (1.19)	13 (2.66)	1 (0.15)
		2016	53 (2.10)	11 (2.27)	7 (1.05)
Cardaria chalepensis	orbicular whitetop	2008–2009	0 (0.00)	0 (0.00)	0 (0.00)
		2010	1 (0.04)	0 (0.00)	0 (0.00)
		2012	0 (0.00)	0 (0.00)	0 (0.00)
		2014	0 (0.00)	0 (0.00)	0 (0.00)
		2016	3 (0.12)	0 (0.00)	0 (0.00)
Carduus nutans	musk thistle	2008–2009	13 (0.50)	7 (1.45)	1 (0.15)
		2010	16 (0.61)	7 (1.53)	1 (0.15)
		2012	11 (0.39)	5 (1.15)	0 (0.00)
		2014	11 (0.42)	9 (1.84)	1 (0.15)
		2016	5 (0.20)	4 (0.83)	0 (0.00)
Centaurea maculosa	spotted knapweed	2008–2009	0 (0.00)	0 (0.00)	0 (0.00)
		2010	1 (0.04)	0 (0.00)	0 (0.00)
		2012	0 (0.00)	0 (0.00)	0 (0.00)
		2014	0 (0.00)	0 (0.00)	0 (0.00)
		2016	0 (0.00)	0 (0.00)	0 (0.00)
Cirsium arvense	Canada thistle	2008–2009	26 (1.00)	10 (2.06)	0 (0.00)
		2010	22 (0.84)	13 (2.84)	3 (0.44)
		2012	1 (0.04)	5 (1.15)	0 (0.00)
		2014	11 (0.42)	6 (1.23)	0 (0.00)
		2016	5 (0.20)	9 (1.86)	0 (0.00)
Cirsium vulgare	bull thistle	2008–2009	4 (0.15)	1 (<.21)	0 (0.00)
		2010	3 (0.11)	4 (0.87)	0 (0.00)
		2012	2 (0.07)	1 (0.23)	0 (0.00)
		2014	0 (0.00)	0 (0.00)	0 (0.00)
		2016	3 (0.12)	0 (0.00)	0 (0.00)
Descurainia sophia[7]	flixweed	2008–2009	NA	NA	NA
		2010	NA	NA	NA
		2012	1 (0.04)	0 (0.00)	0 (0.00)
		2014	65 (2.49)	6 (1.23)	1 (0.15)
		2016	23 (0.91)	3 (0.62)	0 (0.00)

Table 3-5. Total number of patches (number per km) detected on the southern and northern drainages and roads other than Main Park Road, Fossil Butte National Monument, 2008–2016, cont.

Scientific name	Common name	Year[1]	Southern drainages[2]	Northern drainages[3]	Roads[4]
Elymus repens	quackgrass	2008–2009	3 (0.12)	0 (0.00)	1 (0.15)
		2010	0 (0.00)	13 (2.84)	8 (1.18)
		2012	2 (0.07)	0 (0.00)	0 (0.00)
		2014	0 (0.00)	1 (0.20)	0 (0.00)
		2016	2 (0.08)	0 (0.00)	0 (0.00)
Hyoscyamus niger	black henbane	2008–2009	2 (0.08)	1 (0.21)	0 (0.00)
		2010	2 (0.08)	1 (0.21)	0 (0.00)
		2012	0 (0.00)	0 (0.00)	0 (0.00)
		2014	0 (0.00)	0 (0.00)	0 (0.00)
		2016	0 (0.00)	0 (0.00)	0 (0.00)
Isatis tinctoria	Dyer's woad	2008–2009	2 (0.08)	0 (0.00)	0 (0.00)
		2010	0 (0.00)	0 (0.00)	0 (0.00)
		2012	0 (0.00)	0 (0.00)	0 (0.00)
		2014	0 (0.00)	0 (0.00)	0 (0.00)
		2016	0 (0.00)	0 (0.00)	0 (0.00)
Melilotus officinalis	yellow sweetclover	2008–2009	6 (0.23)	0 (0.00)	0 (0.00)
		2010	18 (0.69)	0 (0.00)	0 (0.00)
		2012	3 (0.11)	0 (0.00)	0 (0.00)
		2014	5 (0.19)	0 (0.00)	0 (0.00)
		2016	8 (0.32)	0 (0.00)	0 (0.00)
Total priority species		**2008–2009**	**78 (3.00)**	**21 (4.34)**	**2 (0.30)**
		2010	**106 (4.05)**	**46 (10.04)**	**14 (2.07)**
		2012	**75 (2.68)**	**12 (2.77)**	**0 (0.00)**
		2014	**218 (8.35)**	**50 (10.23)**	**5 (0.75)**
		2016	**251 (9.97)**	**41 (8.46)**	**12 (1.79)**
Total priority species recorded in all years[8]		**2008–2009**	**56 (2.16)**	**19 (3.92)**	**2 (0.30)**
		2010	**62 (2.37)**	**38 (8.29)**	**14 (2.07)**
		2012	**19 (0.68)**	**11 (2.54)**	**0 (0.00)**
		2014	**27 (1.03)**	**16 (3.27)**	**4 (0.60)**
		2016	**26 (1.03)**	**13 (5.86)**	**0 (0.00)**
Meters monitored		2008–2009	25,983	4,844	6,638
		2010	26,173	4,580	6,774
		2012	27,942	4,335	6,745
		2014	26,108	4,884	6,660
		2016	25,185	4,844	6,688

[1]Sampling dates: July 14–15, 2008; August 6–8, 2009; July 24–28, 2010; August 2–5, 2012; July 19–22, 2014; June 30–July 4, 2016
[2]Southern drainages: all Chicken Creek tributaries, Small Pox Creek, Matate, Sage Grouse Lek, Wasatch Saddle, Red Hill, and Fossil Butte drainages
[3]Northern drainages: Millet Canyon, Murder Hill, South Millet Canyon, South Murder Hill and Moose Bones
[4]Roads: Rubey Point, Bullpen 2-Track, Eagle Nest, and Cundick Ridge
[5]Species not searched for in 2008–2009
[6]Species not searched for in 2008–2012
[7]Species not searched for in 2008–2010
[8]Does not include *Alopecurus arundinaceus, Bromus tectorum, Descurainia sophia*

Table 3-6. Total number of infestations (number per km) detected along trails and parkwide at Fossil Butte National Monument, 2008–2016.

Scientific name	Common name	Year[1]	Trails[2]	Parkwide
Alopecurus arundinaceus[3]	creeping foxtail	2008–2009	NA	NA
		2010	4 (0.66)	63 (0.94)
		2012	0 (0.00)	58 (0.87)
		2014	1 (0.18)	123 (1.85)
		2016	2 (0.32)	188 (2.82)
Bromus tectorum[4]	cheatgrass	2008–2009	NA	NA
		2010	NA	NA
		2012	NA	NA
		2014	13 (2.38)	199 (2.99)
		2016	30 (4.77)	337 (5.06)
Cardaria chalepensis	whitetop	2008–2009	0 (0.00)	2 (0.03)
		2010	0 (0.00)	1 (0.01)
		2012	0 (0.00)	0 (0.00)
		2014	0 (0.00)	1 (0.02)
		2016	0 (0.00)	7 (0.11)
Carduus nutans	musk thistle	2008–2009	0 (0.00)	27 (0.44)
		2010	0 (0.00)	37 (0.55)
		2012	1 (0.17)	19 (0.24)
		2014	0 (0.00)	30 (0.45)
		2016	1 (0.16)	17 (0.26)
Centaurea maculosa	spotted knapweed	2008–2009	0 (0.00)	0 (0.00)
		2010	0 (0.00)	1 (0.01)
		2012	0 (0.00)	4 (0.06)
		2014	0 (0.00)	6 (0.09)
		2016	0 (0.00)	1 (0.02)
Cirsium arvense	Canada thistle	2008–2009	1 (0.18)	66 (1.07)
		2010	4 (0.66)	54 (0.81)
		2012	1 (0.17)	9 (0.14)
		2014	0 (0.00)	19 (0.29)
		2016	0 (0.00)	27 (0.41)
Cirsium vulgare	bull thistle	2008–2009	1 (0.18)	7 (0.11)
		2010	1 (0.17)	9 (0.13)
		2012	0 (0.00)	6 (0.09)
		2014	0 (0.00)	0 (0.00)
		2016	0 (0.00)	4 (0.06)
Convolvulus arvensis	field bindweed	2008–2009	0 (0.00)	4 (0.06)
		2010	0 (0.00)	1 (0.01)
		2012	0 (0.00)	0 (0.00)
		2014	0 (0.00)	2 (0.03)
		2016	0 (0.00)	2 (0.03)
Descurainia sophia[5]	flixweed	2008–2009	NA	NA
		2010	NA	NA
		2012	0 (0.00)	3 (0.05)
		2014	10 (1.83)	165 (2.48)
		2016	11 (1.75)	81 (1.22)

Table 3-6. Total number of infestations (number per km) detected on trails and parkwide, Fossil Butte National Monument, 2009–2016, cont.

Scientific name	Common name	Year[1]	Trails[2]	Parkwide
Elymus repens	quackgrass	2008–2009	0 (0.00)	53 (0.86)
		2010	5 (0.83)	95 (1.42)
		2012	0 (0.00)	23 (0.35)
		2014	0 (0.00)	5 (0.08)
		2016	4 (0.64)	31 (0.47)
Hyoscyamus niger	black henbane	2008–2009	2 (0.36)	21 (0.34)
		2010	0 (0.00)	5 (0.07)
		2012	0 (0.00)	4 (0.06)
		2014	0 (0.00)	4 (0.06)
		2016	0 (0.00)	10 (0.15)
Isatis tinctoria	Dyer's woad	2008–2009	0 (0.00)	2 (0.03)
		2010	0 (0.00)	0 (0.00)
		2012	0 (0.00)	0 (0.00)
		2014	0 (0.00)	0 (0.00)
		2016	0 (0.00)	0 (0.00)
Melilotus officinalis	yellow sweetclover	2008–2009	0 (0.00)	54 (0.87)
		2010	1 (0.17)	54 (0.81)
		2012	1 (0.17)	10 (0.15)
		2014	0 (0.00)	20 (0.30)
		2016	1 (0.16)	23 (0.35)
Total priority species		2008–2009	4 (1.07)	260 (4.20)
		2010	15 (2.49)	320 (4.79)
		2012	3 (0.50)	133 (2.00)
		2014	24 (4.39)	574 (8.62)
		2016	49 (7.79)	728 (10.94)
Total priority species recorded in all years[6]		**2008–2009**	**4 (1.07)**	**236 (3.82)**
		2010	**11 (1.83)**	**257 (3.85)**
		2012	**3 (0.50)**	**75 (1.13)**
		2014	**0 (0.00)**	**87 (1.31)**
		2016	**6 (0.95)**	**122 (1.83)**
Meters monitored		**2008–2009**	5,597	61,855
		2010	6,021	66,739
		2012	6,021	66,456
		2014	5,473	66,616
		2016	6,294	66,558

[1]Sampling dates: July 14–15, 2008; August 6–8, 2009; July 24–28, 2010; August 2–5, 2012; July 19–22, 2014; June 30–July 4, 2016

[2]Trails sampled: Historic Quarry and Chicken Creek Nature Trails

[3]Species not searched for in 2008–2009

[4]Species not searched for in 2008–2012

[5]Species not searched for in 2008–2010

[6]Does not include *Alopecurus arundinaceus, Bromus tectorum, Descurainia sophia*

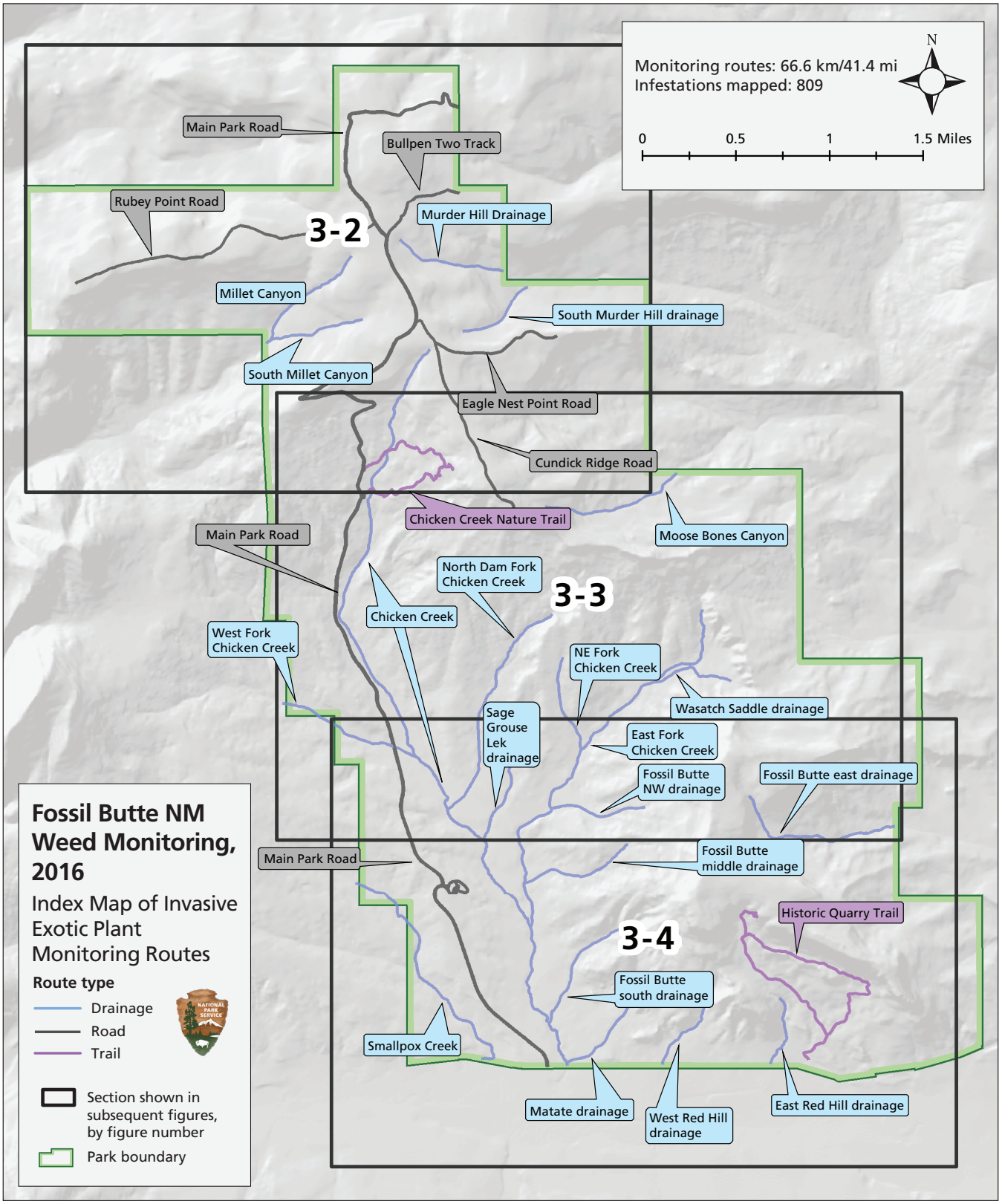


Figure 3-1. Invasive plant monitoring routes, Fossil Butte National Monument, June 30–July 4, 2016.

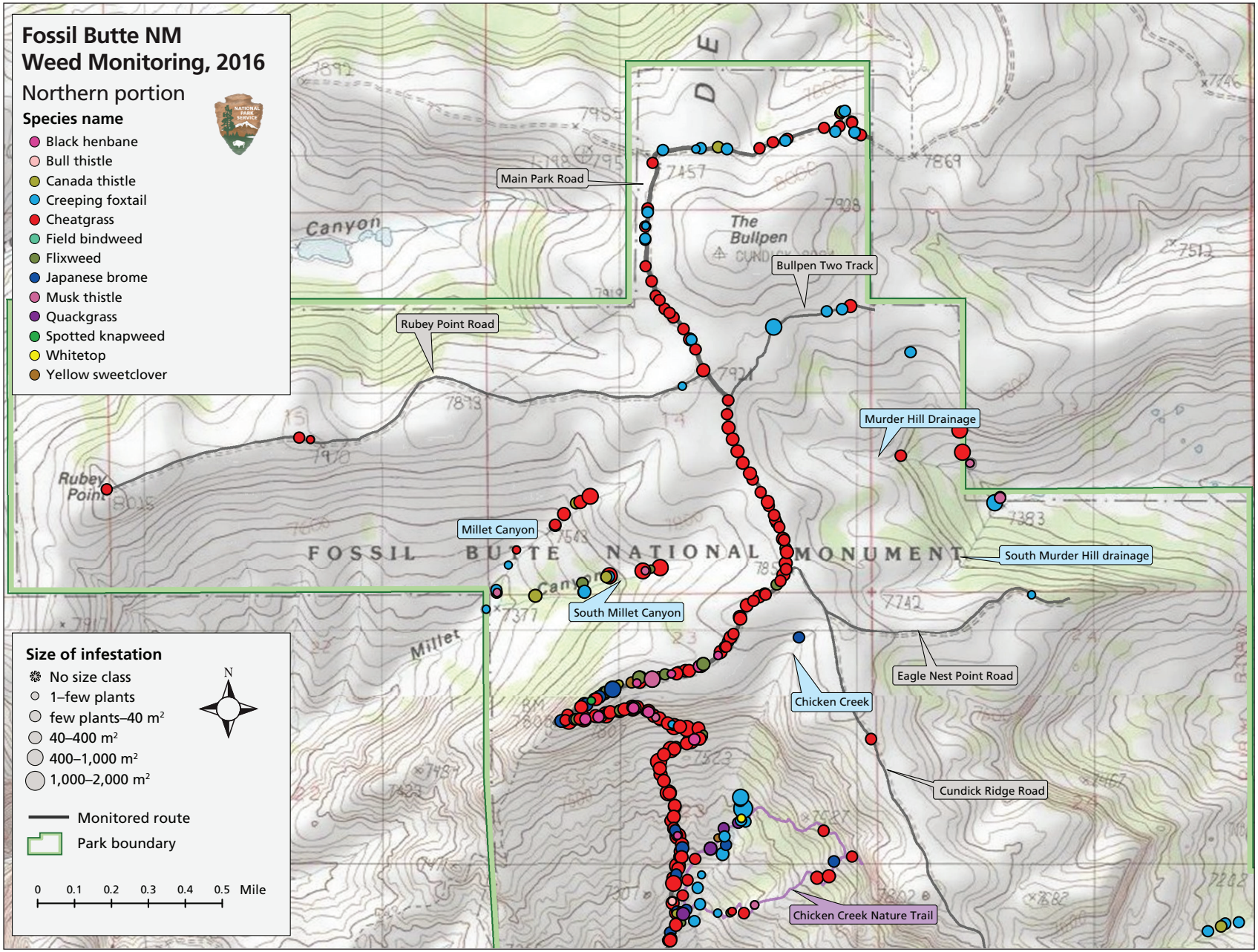


Figure 3-2. Invasive plant monitoring routes and invasive patches detected along monitoring routes, in the northern section of Fossil Butte National Monument, June 30–July 4, 2016.

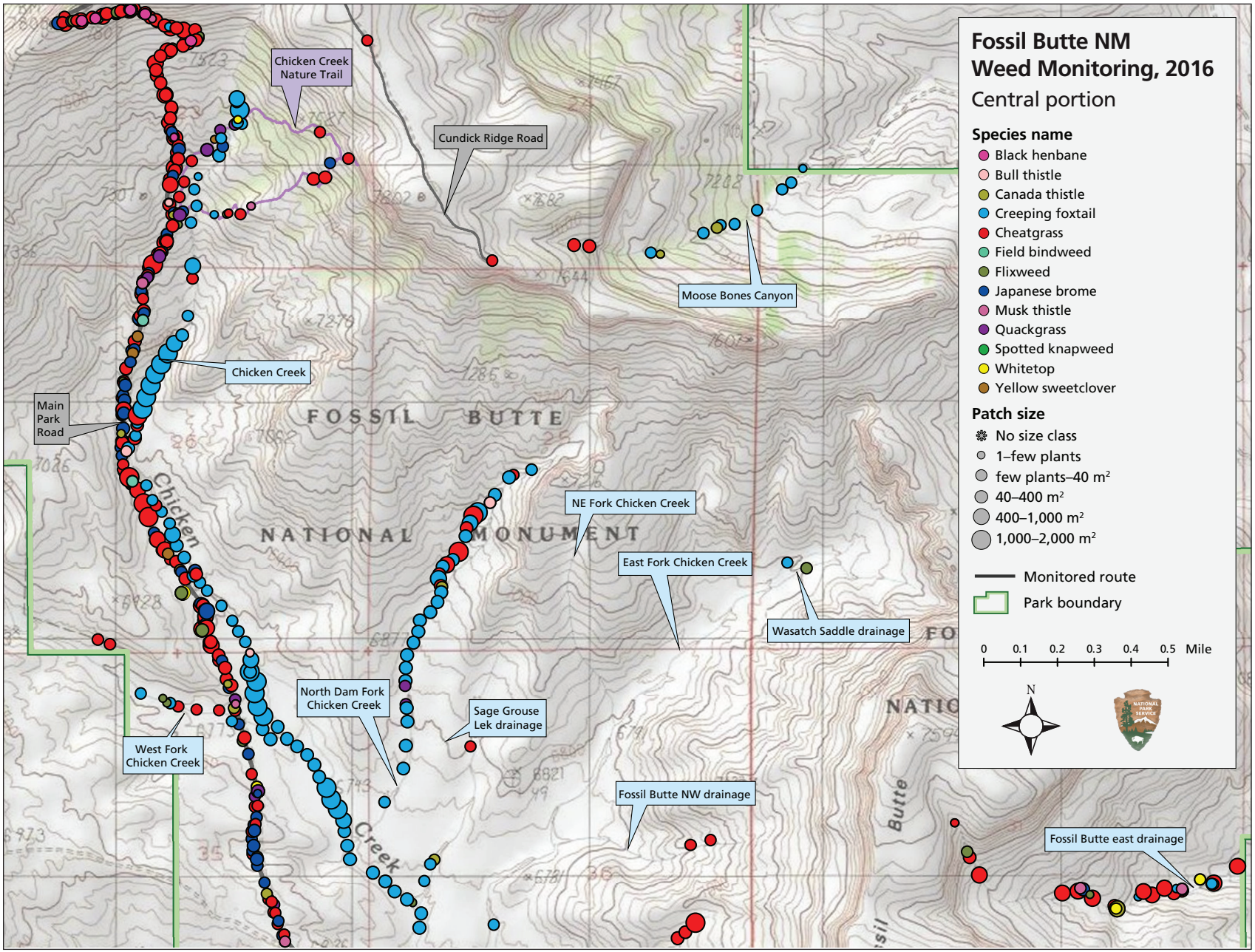


Figure 3-3. Invasive plant monitoring routes and invasive patches detected along monitoring routes, in the central section of Fossil Butte National Monument, June 30–July 4, 2016.

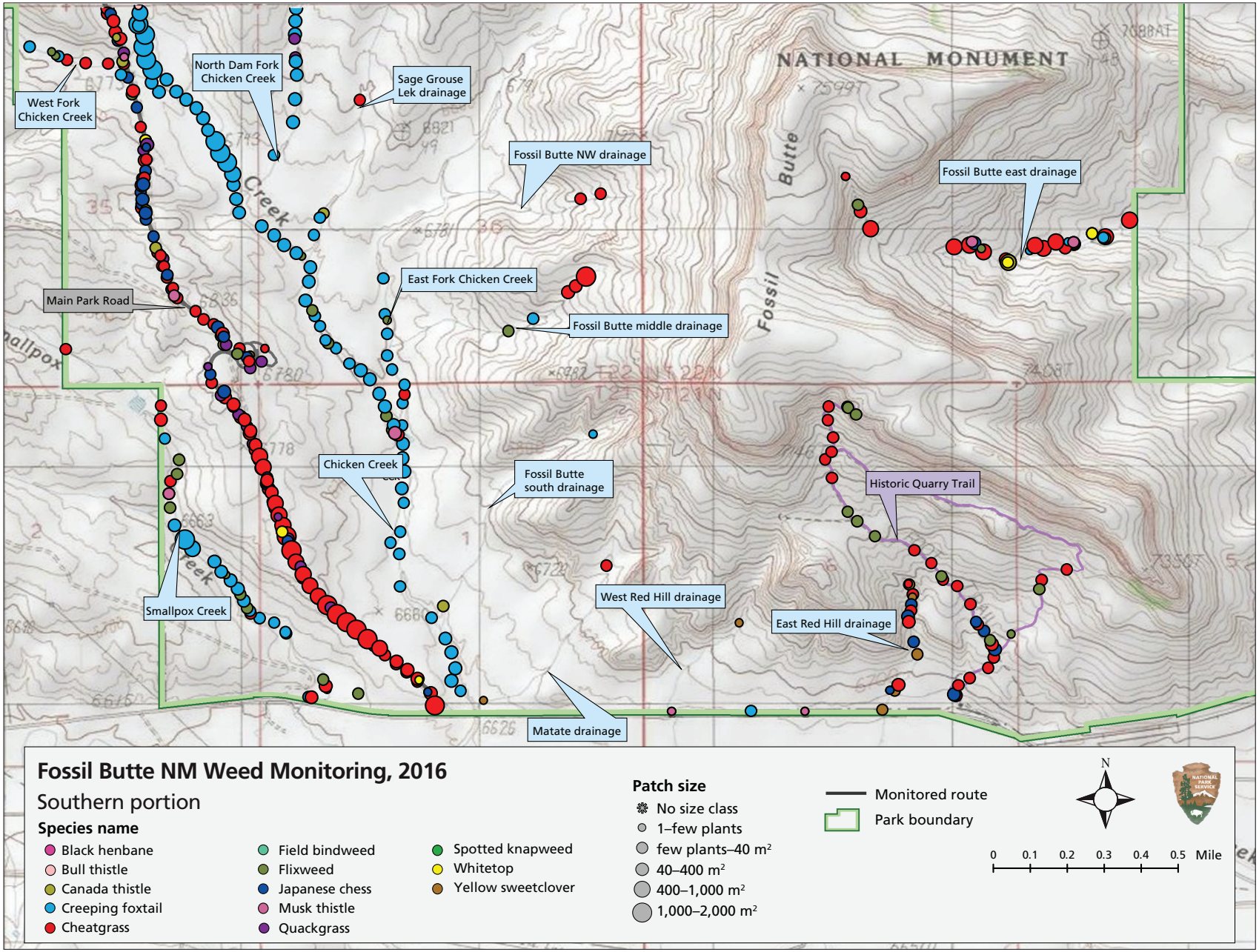


Figure 3-4. Invasive plant monitoring routes and invasive patches detected along monitoring routes, in the southern section of Fossil Butte National Monument, June 30–July 4, 2016.

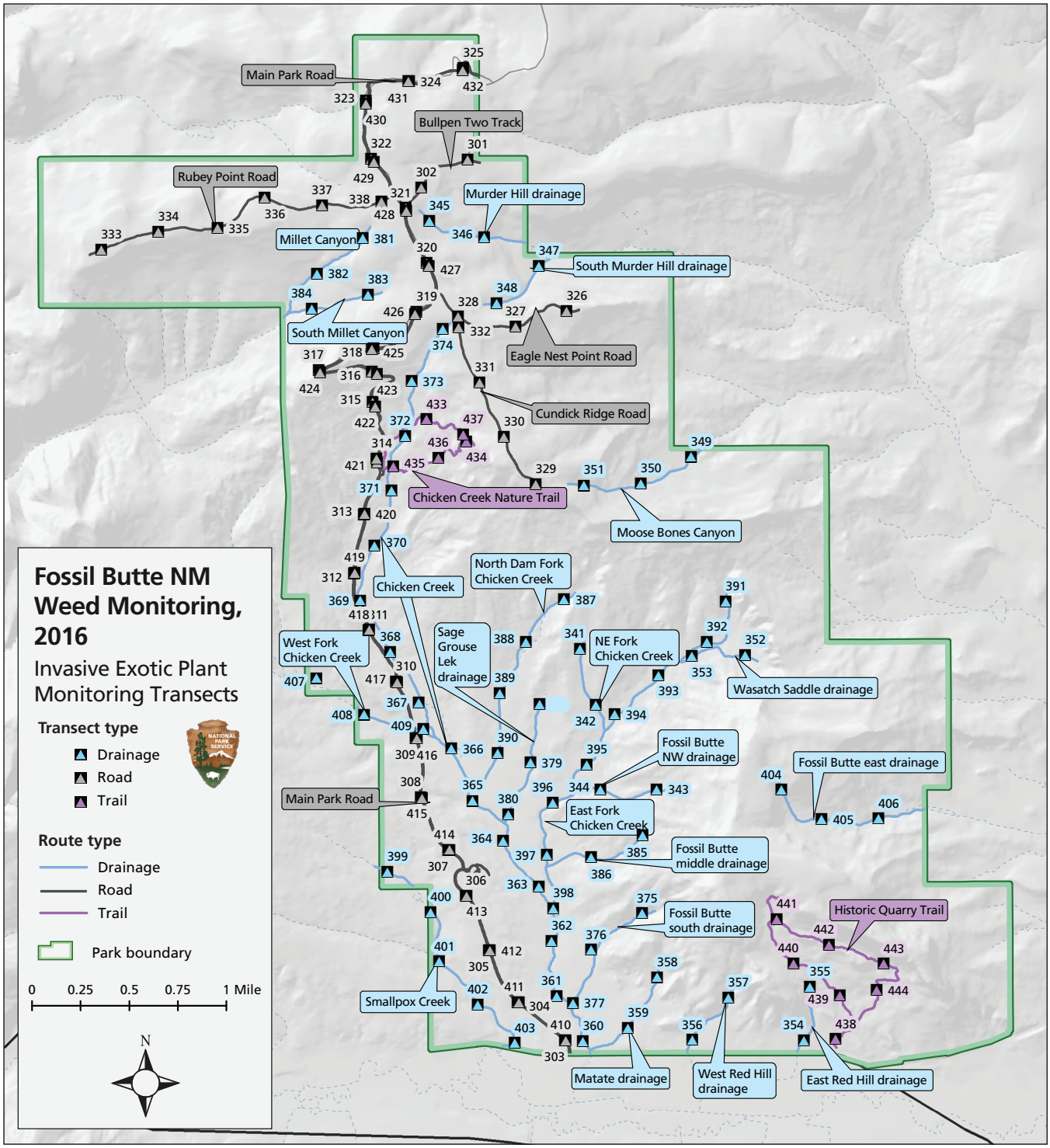


Figure 3-5. Invasive plant monitoring transects, Fossil Butte National Monument, June 30–July 4, 2016.

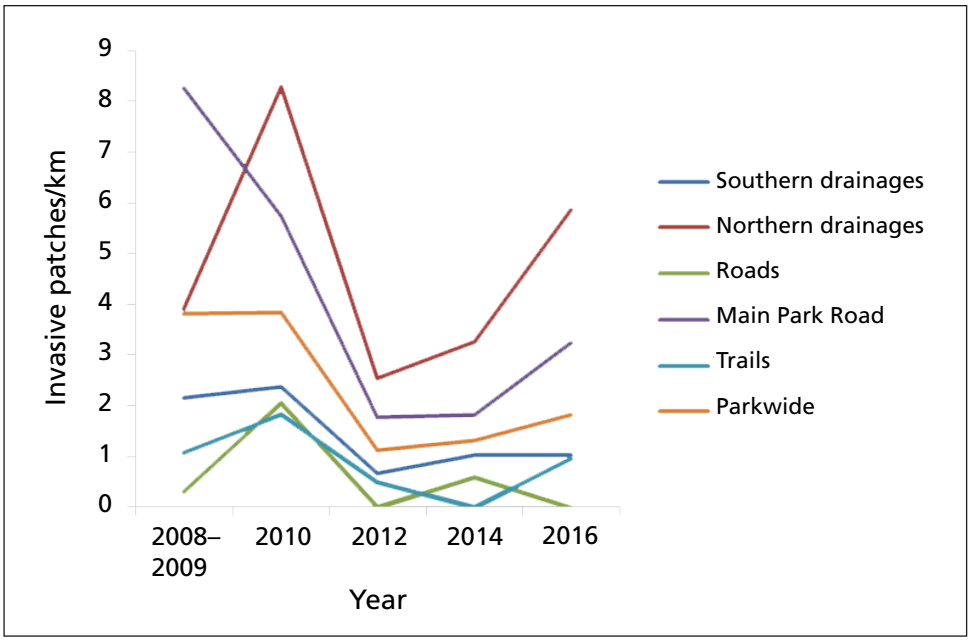


Figure 3-6. Invasive plant patches per kilometer by area of priority invasive species that were consistently recorded on monitoring routes in all years at Fossil Butte National Monument, 2008–2016. See Section 3.3 for list of routes in each category.

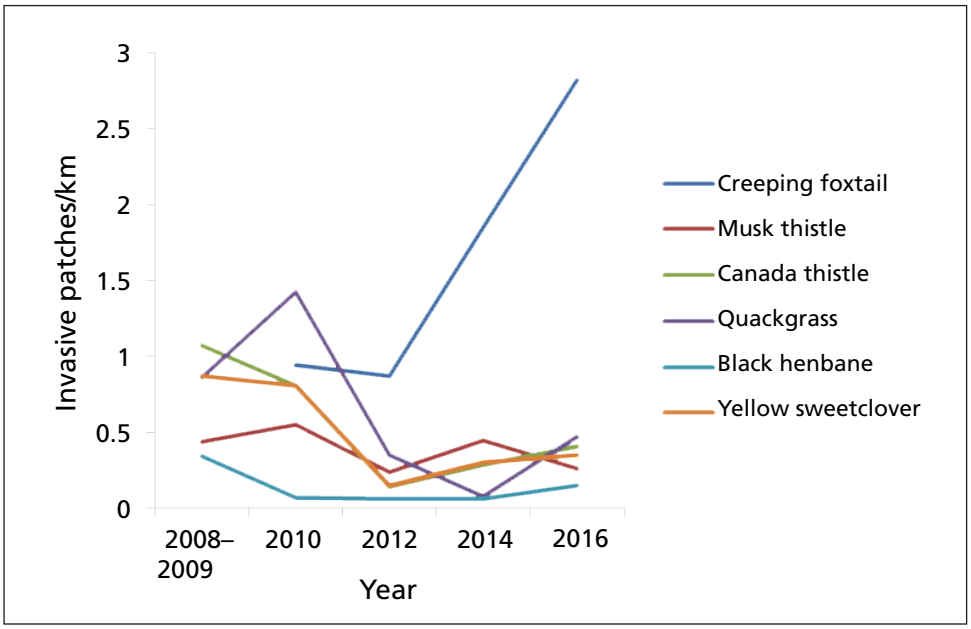


Figure 3-7. Invasive plant patches per kilometer of the highest-density priority invasive species that were consistently recorded on monitoring routes in most years at Fossil Butte National Monument, 2008–2016.

4 Discussion

4.1 Control efforts by park staff, 2015–2016

Staff treated 16 different IEP species in 2015–2016, 10 of which were priority species. In 2015, work focused on the roadsides, Cundick Ridge, Historic Quarry area, the county road, visitor center, Chicken Creek Nature Trail, Millet Canyon, North Canyon, Moose Bones Canyon, and Cundick Ridge Canyon. Control crews did not specify locations for 2016.

In 2015, staff treated 24.5 acres of invasive plants by mowing, pulling, and spraying, using Milestone, Telar, glyphosate, and 2,4 D. In 2016, park staff treated 6.9 acres with herbicide, using Milestone, Escort, Salvo, and Alligare. Staff also pulled 14 different invasive species, 9 of which were priority species.

In 2015–2016, control efforts were focused on flixweed, yellow sweetclover, smooth brome, musk thistle, and Canada thistle (Table 4-1).* Park staff also mowed areas of cheatgrass and filled 202 thirty-three-gallon bags with that weed in 2015 and 2016.

Table 4-1. Species in estimated order of volume removed in control efforts at Fossil Butte National Monument in 2015 and 2016.

Scientific name	Common name
Descurainia sophia	flixweed
Melilotus officinalis	yellow sweetclover
Bromus inermis	smooth brome
Carduus nutans	musk thistle
Cirsium arvense	Canada thistle
Tragopogon dubius	yellow salsify
Centaurea maculosa	spotted knapweed
Salsola tragus	Russian thistle
Halogeton glomeratus	halogeton
Hyoscyamus niger	black henbane
Cirsium vulgare	bull thistle
Medicago lapulina	black medick
Cynoglossum officinale	houndstongue
Rumex crispus	curly dock
Chenopodium album	lambs quarters
Verbascum thapsus	common mullein

4.2 Possibilities for management control

The NCPN will continue to work with Fossil Butte NM staff and area weed experts to review and update the list of priority species each year. Presence and absence data for most priority species should be reliable for the areas searched. However, absence data for other species are suspect, as they are not consistently recorded from year to year. NCPN does not have any suggestions to the priority list.

There were more increases than decreases for priority IEP species in areas that have been consistently surveyed from 2008 to 2016. Park staff believe the efforts of a seasonal biotechnician may have contributed to the decreases seen in many species from 2010 to 2012 (A. Aase, pers. comm.). However, newer species to the priority list, such as cheatgrass and creeping foxtail, all had large increases from 2014 to 2016, despite being the focus of control efforts. Control efforts for Canada thistle, musk thistle, and yellow sweetclover appear to be keeping the populations at levels similar to those of previous years. If current control efforts were ceased, it is likely that these species will increase. Flixweed, another species targeted for control, was one of the few species that decreased from 2014 to 2016.

Cheatgrass, which can be very hard to control, continued to increase along southern drainages, trails, and roads other than the Main Park Road from 2014 to 2016. However, park managers should be congratulated for even being able to consider controlling cheatgrass, as its levels at many parks are too high for control efforts to be effective.

*Table 4-1 provides a general idea of where efforts were focused, based on estimates of weeds removed. Control efforts in 2015 and 2016 were not directly comparable and a change in the way the park recorded effort in these years further complicates comparison. However, even a rough estimate of control efforts helps provide some useful context for understanding the park's situation relative to invasive exotic plants.

Areas away from riparian areas and the Main Park Road continued to have fewer IEPs. The area around the Fossil Butte geologic feature was largely free of priority IEPs in 2012, but between 2014 and 2016, invasive plant patches were found on all routes that had previously been weed-free since monitoring began. Efforts should be made to eliminate these patches and return this area to a weed-free state. This area had no priority infestations in 2009, and two each in 2010 and 2012, but had 27 and 26 (plus an explosion of creeping foxtail, which was not monitored in all years) in 2014 and 2016, respectively (see Figure 3-7). Efforts should be made to control these patches, particularly those at the upper ends of drainages, before they become widespread.

It should be noted that estimates of percent cover in this report (see Section 3.3) are limited to the routes surveyed. Actual percent cover of IEPs across the entire park cannot be inferred with these methods. Because we have chosen to monitor along areas most likely to be invaded by a broad suite of IEPs, it is plausible that the percent cover for most IEP species is lower in the interior of the park than along the monitoring routes. Data from monitoring routes are meant to provide information for control efforts. Unlike the monitoring transects and associated quadrats, the routes are not designed to make statistical comparisons between years and areas. However, large changes in patches are likely to represent biological realities.

4.3 Future monitoring efforts

IEPs at Fossil Butte NM will generally be monitored at the same time of year, every other year. Consistency in timing of monitoring should ensure consistency in detection probabilities and cover estimates of most species. For many species, sampling at any time from June to August is not expected to drastically alter the chances of detecting invasive species larger than the minimum detection target size. A complete sixth rotation of monitoring routes will be completed in 2018. Long-term trend reporting will focus on trends in species distributions and percent cover of individual species, and changes in IEP percent cover of priority species by monitoring route. Extra-area surveys will also be considered for inventories at the park's request.

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Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
btn Bullpen Two Track & Murder Hill Drainage	Alopecurus arundinaceus	Creeping foxtail	0		4637368.396	519175.27	3	2
btn Bullpen Two Track & Murder Hill Drainage	Bromus tectorum	Cheatgrass	0		4637039.552	519383.557	1	4
btn Bullpen Two Track & Murder Hill Drainage	Bromus tectorum	Cheatgrass	0		4636946.823	519395.812	1	4
btn E. & W. Red Hill drainages	Carduus nutans	Musk thistle	0		4630172.197	521321.58	5	1
btn E. & W. Red Hill drainages	Alopecurus arundinaceus	Creeping foxtail	0		4630174.2	521093.636	3	2
btn Smallpox Ck & Main Park Road	Descurainia sophia	Flixweed	0		4630247.445	519439.055	1	2
Bullpen Two Track	Alopecurus arundinaceus	Creeping foxtail	0		4637540.785	518823.624	3	2
Bullpen Two Track	Alopecurus arundinaceus	Creeping foxtail	0		4637549.367	518887.947	3	2
Bullpen Two Track	Bromus tectorum	Cheatgrass	0		4637563.633	518922.934	3	3
Bullpen Two Track	Alopecurus arundinaceus	Creeping foxtail	0		4637474.247	518597.597	4	4
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635160.909	518295.614	5	1
Chicken Creek	Cardaria sp.	whitetop	0		4635400.725	518462.919	2	1
Chicken Creek	Cirsium vulgare	Bull thistle	0		4633147.186	518512.783	5	1
Chicken Creek	Descurainia sophia	Flixweed	0		4632091.822	519201.812	5	1
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633743.32	518140.943	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633238.191	518464.655	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633345.71	518393.839	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635106.712	518278.361	3	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635037.657	518288.438	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634570.913	518250.805	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633694.564	518174.19	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634118.188	518038.109	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634064.058	518029.942	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635390.13	518460.572	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633282.256	518439.073	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630836.148	519610.592	3	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633855.175	518074.853	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633193.258	518493.458	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631795.857	519279.02	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633792.759	518101.691	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630884.029	519575.452	1	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633409.874	518333.35	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631050.507	519630.233	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630567.959	519747.669	3	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631703.471	519345.346	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630930.213	519616.288	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631837.831	519255.997	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631639.161	519401.865	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633444.826	518301.9	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635323.018	518392.024	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630258.985	519870.323	2	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630699.374	519614.306	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634966.624	518263.396	1	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631737.55	519301.865	2	2
Chicken Creek	Bromus japonicus	Japanese chess	0		4635287.645	518397.75	3	2
Chicken Creek	Bromus japonicus	Japanese chess	0		4636164.288	518704.231	2	2
Chicken Creek	Bromus tectorum	Cheatgrass	0		4633771.453	518116.549	3	2
Chicken Creek	Bromus tectorum	Cheatgrass	0		4634729.395	518270.491	4	2
Chicken Creek	Cirsium arvense	Canada thistle	0		4635474.351	518457.677	3	2
Chicken Creek	Cirsium vulgare	Bull thistle	0		4633998.92	517991.947	3	2
Chicken Creek	Descurainia sophia	Flixweed	0		4631359.874	519582.331	2	2
Chicken Creek	Descurainia sophia	Flixweed	0		4631863.378	519244.946	2	2
Chicken Creek	Descurainia sophia	Flixweed	0		4631416.665	519557.246	2	2
Chicken Creek	Descurainia sophia	Flixweed	0		4631725.091	519311.645	3	2
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632274.05	518936.589	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631904.729	519215.907	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631572.718	519488.603	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631458.168	519551.08	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632104.588	519177.489	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633550.359	518236.489	4	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631611.341	519449.427	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632715.504	518756.347	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631378.704	519588.442	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633066.01	518514.303	1	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633601.058	518202.362	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632217.502	519032.439	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634490.178	518227.793	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632623.011	518806.728	3	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632835.04	518630.445	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635249.738	518382.829	3	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632751.468	518713.969	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630302.344	519831.143	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631984.246	519230.277	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631183.916	519633.676	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631112.166	519622.295	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632138.083	519125.145	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631300.935	519627.64	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632784.394	518671.382	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630354.544	519847.419	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632044.896	519237.747	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633474.506	518275.257	3	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634011.297	517999.594	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632392.329	518912.851	3	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630479.59	519806.436	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632331.485	518923.987	2	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631511.764	519527.554	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631240.656	519626.3	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630421.267	519830.634	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632180.327	519084.928	1	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632673.73	518784.882	2	3
Chicken Creek	Bromus japonicus	Japanese chess	0		4633493.568	518282.565	2	3
Chicken Creek	Bromus tectorum	Cheatgrass	0		4633479.3	518287.156	2	3
Chicken Creek	Bromus tectorum	Cheatgrass	0		4631338.935	519605.3	3	3
Chicken Creek	Bromus tectorum	Cheatgrass	0		4634108.923	518037.913	2	3
Chicken Creek	Bromus tectorum	Cheatgrass	0		4634053.674	518026.734	2	3
Chicken Creek	Carduus nutans	Musk thistle	0		4631347.2	519593.043	3	3
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634455.384	518193.965	3	4

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633116.17	518518.538	2	4
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632437.887	518909.748	3	4
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635490.087	518458.556	4	4
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633647.014	518187.385	3	4
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634782.174	518271.301	4	4
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634227.402	518075.709	2	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633024.74	518540.876	1	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634177.101	518058.455	4	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632975.697	518533.503	2	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634324.94	518113.354	1	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632918.978	518545.352	1	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632527.3	518857.389	4	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634278.602	518093.1	1	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633067.871	518512.336	1	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632577.392	518837.213	4	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4635441.992	518470.505	3	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632486.885	518885.652	4	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634367.804	518137.062	3	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632878.737	518570.762	1	5
Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4634414.242	518166.618	3	5
Chicken Creek	Bromus tectorum	Cheatgrass	0		4634151.753	518038.64	1	5
Chicken Creek Nature Trail	Alopecurus arundinaceus	Creeping foxtail	0		4635000.164	518362.724	3	1
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635006.474	518422.382	1	1
Chicken Creek Nature Trail	Carduus nutans	Musk thistle	0		4635035.369	518517.862	5	1
Chicken Creek Nature Trail	Descurainia sophia	Flixweed	0		4635001.793	518415.325	2	1
Chicken Creek Nature Trail	Melilotus officinalis	Yellow sweet-clover	0		4635317.328	518364.468	4	1
Chicken Creek Nature Trail	Alopecurus arundinaceus	Creeping foxtail	0		4635385.695	518480.507	3	2
Chicken Creek Nature Trail	Bromus japonicus	Japanese chess	0		4635218.361	518852.53	2	2
Chicken Creek Nature Trail	Bromus japonicus	Japanese chess	0		4635013.191	518230.543	2	2
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635139.147	518235.928	2	2
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635074.568	518215.063	2	2
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635000.494	518473.711	3	2
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635237.968	518929.159	1	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635348.803	518809.61	2	2
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635228.054	518267.146	2	2
Chicken Creek Nature Trail	Elymus repens	Quackgrass	0		4635357.704	518388.964	3	2
Chicken Creek Nature Trail	Elymus repens	Quackgrass	0		4635380.94	518448.555	3	2
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635150.56	518782.103	2	3
Chicken Creek Nature Trail	Bromus tectorum	Cheatgrass	0		4635156.392	518831.193	2	3
Chicken Creek Nature Trail	Elymus repens	Quackgrass	0		4634997.323	518216.634	3	3
Chicken Creek Nature Trail	Elymus repens	Quackgrass	0		4635273.099	518332.394	2	3
Cundick Ridge Road	Bromus tectorum	Cheatgrass	0		4635735.568	519009.448	3	2
Cundick Ridge Road	Bromus tectorum	Cheatgrass	0		4634806.355	519538.68	3	2
Eagle Nest Point Road	Alopecurus arundinaceus	Creeping foxtail	0		4636343.885	519688.372	5	1
East Fork Chicken Creek	Descurainia sophia	Flixweed	0		4631822.473	519560.769	5	1
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631471.48	519625.766	2	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631997.227	519544.272	3	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633527.755	520787.129	2	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631673.511	519560.684	1	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631846.484	519550.86	3	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631613.445	519582.467	1	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631377.405	519625.154	3	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631764.598	519560.241	1	2
East Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631549.626	519633.425	2	2
East Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4631509.435	519634.253	2	2
East Red Hill drainage	Bromus japonicus	Japanese chess	0		4630261.34	521680.036	3	1
East Red Hill drainage	Bromus tectorum	Cheatgrass	0		4630710.609	521758.932	5	1
East Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630581.302	521760.38	5	1
East Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630655.101	521775.012	5	1
East Red Hill drainage	Bromus japonicus	Japanese chess	0		4630623.961	521769.114	3	2
East Red Hill drainage	Bromus japonicus	Japanese chess	0		4630465.525	521778.963	3	2
East Red Hill drainage	Bromus tectorum	Cheatgrass	0		4630665.168	521776.374	2	2
East Red Hill drainage	Bromus tectorum	Cheatgrass	0		4630596.302	521768.904	3	2
East Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630412.818	521796.044	2	2
East Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630706.646	521761.948	2	2
East Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630179.084	521647.719	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
East Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630260.347	521700.172	2	2
East Red Hill drainage	Bromus japonicus	Japanese chess	0		4630572.943	521756.207	3	3
East Red Hill drainage	Bromus tectorum	Cheatgrass	0		4630284.377	521715.47	3	3
East Red Hill drainage	Bromus tectorum	Cheatgrass	0		4630548.758	521759.264	3	3
fenceline near Smallpox Creek	Bromus tectorum	Cheatgrass	0		4631460.574	518608.265	3	2
fenceline near Smallpox Creek	Bromus tectorum	Cheatgrass	0		4631401.793	518607.969	3	3
Fossil Butte east drainage	Alopecurus arundinaceus	Creeping foxtail	0		4632151.176	522430.098	2	1
Fossil Butte east drainage	Alopecurus arundinaceus	Creeping foxtail	0		4632114.298	522268.7	5	1
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632427.867	521493.219	3	1
Fossil Butte east drainage	Descurainia sophia	Flixweed	0		4632123.942	522065.108	2	1
Fossil Butte east drainage	Alopecurus arundinaceus	Creeping foxtail	0		4632169.902	522580.729	4	2
Fossil Butte east drainage	Alopecurus arundinaceus	Creeping foxtail	0		4632065.941	522168.861	2	2
Fossil Butte east drainage	Cardaria sp.	whitetop	0		4632188.435	522531.605	3	2
Fossil Butte east drainage	Cardaria sp.	whitetop	0		4632065.183	522176.385	2	2
Fossil Butte east drainage	Carduus nutans	Musk thistle	0		4632149.446	522454.413	2	2
Fossil Butte east drainage	Carduus nutans	Musk thistle	0		4632151.631	522025.116	1	2
Fossil Butte east drainage	Descurainia sophia	Flixweed	0		4632307.029	521545.301	1	2
Fossil Butte east drainage	Descurainia sophia	Flixweed	0		4632069.287	522176.627	2	2
Fossil Butte east drainage	Descurainia sophia	Flixweed	0		4632146.003	522455.101	2	2
Fossil Butte east drainage	Descurainia sophia	Flixweed	0		4632168.565	522587.973	2	2
Fossil Butte east drainage	Bromus japonicus	Japanese chess	0		4632147.622	522036.822	2	3
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632142.971	522454.633	2	3
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632281.031	521556.889	2	3
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632129.601	522419.462	1	3
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632077.424	522168.695	2	3
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632139.513	522015.548	2	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632109.696	522075.314	3	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632243.934	522689.486	3	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632173.14	522588.777	3	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632130.942	521949.473	3	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632151.485	522379.897	3	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632208.327	521598.355	3	4
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632137.762	522291.478	3	4

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Fossil Butte east drainage	Bromus tectorum	Cheatgrass	0		4632123.142	522327.869	2	4
Fossil Butte east drainage	Cirsium arvense	Canada thistle	0		4632064.526	522180.043	3	4
Fossil Butte middle drainage	Alopecurus arundinaceus	Creeping foxtail	0		4631828.486	520176.053	3	2
Fossil Butte middle drainage	Descurainia sophia	Flixweed	0		4631776.817	520071.818	3	2
Fossil Butte middle drainage	Bromus tectorum	Cheatgrass	0		4631940.242	520322.773	3	3
Fossil Butte middle drainage	Bromus tectorum	Cheatgrass	0		4631964.668	520355.567	2	3
Fossil Butte middle drainage	Bromus tectorum	Cheatgrass	0		4632005.981	520397.976	2	5
Fossil Butte NW drainage	Bromus tectorum	Cheatgrass	0		4632355.741	520461.025	4	2
Fossil Butte NW drainage	Bromus tectorum	Cheatgrass	0		4632333.774	520376.279	3	2
Fossil Butte south drainage	Alopecurus arundinaceus	Creeping foxtail	0		4631341.2	520428.061	3	1
Fossil Butte south drainage	Cirsium arvense	Canada thistle	0		4630616.756	519796.74	2	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630498.479	522191.441	5	1
Historic Quarry Trail	Bromus japonicus	Japanese chess	0		4630511.057	522076.714	3	2
Historic Quarry Trail	Bromus japonicus	Japanese chess	0		4630548.641	522044.138	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630726.896	522318.545	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630399.783	522117.451	1	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630728.72	521903.863	3	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630282.322	521968.99	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630538.083	522051.896	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630313.886	522015.206	1	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630356.631	522093.93	1	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630699.608	521963.332	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630625.44	522019.645	3	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631265.414	521432.999	4	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631401.21	521418.612	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631457.49	521421.909	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631156.344	521435.116	1	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630770.456	522425.96	3	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631327.433	521439.946	1	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630796.241	521854.886	3	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630851.928	521783.339	2	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631234.947	521406.605	1	2
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4631456.046	521500.475	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630909.731	521616.667	2	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630472.171	522103.427	4	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630686.614	522308.886	2	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630740.813	521897.298	2	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4631423.731	521537.279	2	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630241.508	521953.469	1	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4631013.401	521502.48	1	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4630973.64	521541.989	2	2
Historic Quarry Trail	Descurainia sophia	Flixweed	0		4631453.538	521504.28	3	2
Historic Quarry Trail	Bromus japonicus	Japanese chess	0		4630432.639	522122.208	3	3
Historic Quarry Trail	Bromus japonicus	Japanese chess	0		4630243.811	521949.482	3	3
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630239.228	521956.234	3	3
Historic Quarry Trail	Bromus tectorum	Cheatgrass	0		4630456.723	522109.055	3	3
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4636029.288	518243.121	5	1
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638226.634	518270.781	2	1
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4635795.647	518170.123	1	1
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4637901.034	518058.399	3	1
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4630625.675	519283.265	5	1
Main Park Road	Bromus japonicus	Japanese chess	0		4632552.547	518545.276	2	1
Main Park Road	Bromus japonicus	Japanese chess	0		4630253.389	519733.438	5	1
Main Park Road	Bromus tectorum	Cheatgrass	0		4631703.217	519044.924	1	1
Main Park Road	Cardaria sp.	whitetop	0		4630304.316	519694.383	2	1
Main Park Road	Carduus nutans	Musk thistle	0		4633331.075	518313.693	5	1
Main Park Road	Carduus nutans	Musk thistle	0		4632931.609	518451.602	2	1
Main Park Road	Carduus nutans	Musk thistle	0		4635827.24	518101.549	5	1
Main Park Road	Centaurea maculosa	Spotted knapweed	1		4635897.084	517829.67	5	1
Main Park Road	Cirsium arvense	Canada thistle	0		4634073.852	517968.44	5	1
Main Park Road	Cirsium arvense	Canada thistle	0		4634997.992	518186.421	5	1
Main Park Road	Cirsium arvense	Canada thistle	0		4635966.467	517945.184	5	1
Main Park Road	Cirsium arvense	Canada thistle	0		4633014.981	518420.174	5	1
Main Park Road	Cirsium vulgare	Bull thistle	0		4635050.637	518170.076	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4635285.484	518210.47	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4635193.627	518191.568	5	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Descurainia sophia	Flixweed	0		4635755.328	518303.319	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4634958.696	518210.447	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4634764.463	518082.694	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4634295.786	517977.251	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4635562.852	518127.953	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4635788.15	518175.504	5	1
Main Park Road	Descurainia sophia	Flixweed	0		4633859.362	518015.879	5	1
Main Park Road	Elymus repens	Quackgrass	0		4631624.713	518806.557	5	1
Main Park Road	Elymus repens	Quackgrass	0		4630992.59	519101.115	3	1
Main Park Road	Hyoscyamus niger	Black henbane	0		4635972.239	518021.615	2	1
Main Park Road	Hyoscyamus niger	Black henbane	0		4635326.825	518193.37	5	1
Main Park Road	Hyoscyamus niger	Black henbane	0		4636088.198	518363.273	5	1
Main Park Road	Hyoscyamus niger	Black henbane	0		4636009.116	518167.455	2	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4635384.44	518166.172	5	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4634294.916	517980.141	5	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4635809.862	518129.612	5	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4631675.344	518982.736	5	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4635791.384	518165.067	5	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4635778.056	518273.329	5	1
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4636002.151	518113.965	5	1
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638260.7	518647.264	1	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638387.29	518898.773	4	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638297.547	518940.38	4	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4637420.198	518251.633	3	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4635862.096	518000.644	4	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638220.944	518130.345	2	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638229.055	518291.865	3	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638300.509	518859.401	2	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4637847.263	518057.598	1	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4637959.122	518067.551	1	2
Main Park Road	Alopecurus arundinaceus	Creeping foxtail	0		4638225.721	518400.818	3	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631665.106	518970.723	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633904.84	517995.326	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus japonicus	Japanese chess	0		4634583.475	518065.564	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4630890.937	519142.882	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631158.535	519055.936	2	2
Main Park Road	Bromus japonicus	Japanese chess	1		4635933.407	517890.21	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632360.714	518522.026	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632175.179	518575.781	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632452.64	518541.529	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631751.787	518871.195	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634842.502	518144.455	3	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633848.608	518031.52	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635163.173	518187.941	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634376.37	518007.994	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633112.622	518394.544	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634151.901	517972.148	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635775.56	518278.17	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633488.424	518222.768	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633286.427	518317.757	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635828.628	517855.51	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631593.099	518815.73	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632718.987	518506.462	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634752.974	518086.503	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634894.202	518164.543	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634015.975	517966.401	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632311.542	518525.252	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635349.446	518183.316	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633655.276	518107.277	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632012.828	518633.946	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634430.995	518023.844	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635007.046	518190.951	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632844.276	518467.383	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633355.675	518303.704	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633912.095	517980.209	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631754.836	518860.474	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus japonicus	Japanese chess	0		4634808.21	518106.856	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633981.05	517971.456	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634798.751	518110.525	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634425.973	518012.719	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635356.373	518175.812	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632418.706	518529.442	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634999.637	518186.072	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635852.241	517943.028	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633787.351	518061.249	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631233.317	519019.425	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634676.64	518054.334	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4636147.232	518407.186	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4635817.964	517757.912	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634917.661	518162.512	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632999.616	518425.14	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4631951.511	518651.418	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4633867.432	518010.123	1	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634237.326	517976.803	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4632247.13	518543.965	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630336.507	519642.89	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632105.841	518592.492	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631955.96	518658.345	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630486.556	519455.729	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630557.585	519366.455	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632047.708	518621.327	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638321.285	518877.599	3	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631825.476	518786.152	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630735.32	519203.91	3	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631915.445	518674.23	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630448.173	519504.595	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632500.287	518545.597	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632094.448	518605.115	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630802.862	519167.237	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4631804.241	518828.38	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630692.942	519230.71	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631649.073	518977.642	3	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631702.581	518938.412	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630298.41	519688.384	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4634643.904	518060.335	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632000.925	518631.859	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4633942.836	517976.308	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631557.966	518820.208	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4634155.845	517972.564	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4634571.9	518047.169	3	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4631860.513	518753.579	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632422.071	518537.389	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4633540.848	518177.296	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636628.957	518622.361	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637533.92	518159.091	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636681.007	518600.426	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630409.822	519551.295	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637380.115	518269.045	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637164.28	518406.886	3	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636719.888	518577.892	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636178.258	518428.703	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4635813.738	517721.36	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638337.113	518929.748	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636452.244	518650.61	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637104.81	518402.102	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636575.583	518643.326	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4635836.619	517728.721	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636346.075	518564.347	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636402.712	518628.244	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636318.718	518513.811	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4635994.46	518093.089	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4635821.325	517779.295	1	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4638375.901	518879.904	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637606.341	518100.563	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637975.609	518066.514	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4635359.304	518177.444	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632050.264	518612.901	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4633921.258	517977.44	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632634.99	518521.98	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630370.726	519598.876	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636660.187	518605.494	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638253.879	518595.189	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636124.96	518397.954	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637552.393	518138.273	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4632902.203	518450.647	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637842.356	518056.728	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630645.693	519269.194	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638229.346	518539.415	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638284.496	518967.423	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636776.873	518544.348	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4630598.136	519317.467	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637730.681	518057.863	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637587.803	518116.409	1	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4635940.449	517911.45	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637466.963	518217.015	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637515.198	518174.752	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4636831.986	518510.237	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638315.317	518810.949	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637668.908	518083.725	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4637897.864	518056.707	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638268.073	518655.897	2	2
Main Park Road	Bromus tectorum	Cheatgrass	0		4638167.905	518088.432	2	2
Main Park Road	Cardaria sp.	whitetop	0		4632579.793	518542.377	2	2
Main Park Road	Cardaria sp.	whitetop	0		4630929.95	519117.076	2	2
Main Park Road	Carduus nutans	Musk thistle	0		4634711.094	518059.435	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Carduus nutans	Musk thistle	0		4631925.198	518662.587	2	2
Main Park Road	Cirsium arvense	Canada thistle	0		4634679.41	518054.282	2	2
Main Park Road	Cirsium arvense	Canada thistle	0		4633835.674	518031.228	3	2
Main Park Road	Cirsium arvense	Canada thistle	0		4632127.781	518585.325	3	2
Main Park Road	Cirsium arvense	Canada thistle	0		4632284.026	518544.023	1	2
Main Park Road	Cirsium arvense	Canada thistle	0		4631718.834	518871.364	3	2
Main Park Road	Cirsium arvense	Canada thistle	0		4638234.094	518362.945	3	2
Main Park Road	Cirsium arvense	Canada thistle	0		4636539.117	518648.843	2	2
Main Park Road	Cirsium arvense	Canada thistle	0		4632913.494	518445.621	2	2
Main Park Road	Cirsium arvense	Canada thistle	0		4633780.331	518054.866	3	2
Main Park Road	Convolvulus arvensis	Field bindweed	0		4634553.924	518060.691	2	2
Main Park Road	Convolvulus arvensis	Field bindweed	0		4633872.148	518016.527	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635852.863	518060.673	3	2
Main Park Road	Descurainia sophia	Flixweed	0		4636008.071	518140.898	3	2
Main Park Road	Descurainia sophia	Flixweed	0		4635773.357	518282.83	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4633191.775	518338.487	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635636.685	518112.38	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635700.942	518186.123	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4635831.299	517870.028	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4636018.13	518198.371	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635818.413	517793.001	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4633284.064	518315.824	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4638292.933	518948.502	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635851.133	517942.086	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635903.781	517841.697	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4635806.915	517711.359	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4636386.381	518611.173	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4636349.112	518561.262	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4636124.351	518393.462	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4638383.723	518885.001	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4638341.108	518930.629	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635328.374	518190.868	4	2
Main Park Road	Descurainia sophia	Flixweed	0		4635935.378	517892.435	1	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Descurainia sophia	Flixweed	0		4635855.388	517950.516	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4635846.143	517899.833	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4632775.756	518484.239	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4635868.112	518003.283	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4635814.074	518121.09	2	2
Main Park Road	Descurainia sophia	Flixweed	0		4635819.424	517767.337	1	2
Main Park Road	Descurainia sophia	Flixweed	0		4631678.851	518929.761	3	2
Main Park Road	Descurainia sophia	Flixweed	0		4634885.972	518153.803	2	2
Main Park Road	Elymus repens	Quackgrass	0		4630855.676	519141.541	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631505.747	518860.482	2	2
Main Park Road	Elymus repens	Quackgrass	0		4631620.379	518983.222	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631689.237	518937.299	4	2
Main Park Road	Elymus repens	Quackgrass	0		4630782.569	519196.582	3	2
Main Park Road	Elymus repens	Quackgrass	0		4630901.154	519146.266	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631646.31	519030.154	2	2
Main Park Road	Elymus repens	Quackgrass	0		4634733.309	518081.686	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631423.874	518934.546	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631138.253	519051.657	4	2
Main Park Road	Elymus repens	Quackgrass	0		4631056.645	519078.982	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631372.673	518969.214	3	2
Main Park Road	Elymus repens	Quackgrass	0		4632949.278	518450.299	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631457.713	518912.405	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631719.153	518881.72	4	2
Main Park Road	Elymus repens	Quackgrass	0		4632538.54	518533.678	4	2
Main Park Road	Elymus repens	Quackgrass	0		4630587.19	519330.729	4	2
Main Park Road	Elymus repens	Quackgrass	0		4631194.22	519032.67	3	2
Main Park Road	Elymus repens	Quackgrass	0		4630609.99	519323.122	3	2
Main Park Road	Elymus repens	Quackgrass	0		4632081.139	518616.99	3	2
Main Park Road	Elymus repens	Quackgrass	0		4631300.484	518994.039	2	2
Main Park Road	Hyoscyamus niger	Black henbane	0		4635829.513	517860.46	2	2
Main Park Road	Hyoscyamus niger	Black henbane	0		4635819.84	517803.468	2	2
Main Park Road	Hyoscyamus niger	Black henbane	0		4635733.639	518263.843	2	2
Main Park Road	Hyoscyamus niger	Black henbane	0		4635864.724	518007.614	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Hyoscyamus niger	Black henbane	0		4636041.539	518283.88	2	2
Main Park Road	Hyoscyamus niger	Black henbane	0		4635847.912	518069.668	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4634484.467	518039.89	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4636645.514	518611.901	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4635973.988	517999.573	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4633565.902	518166.72	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4634553.677	518046.891	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4634413.795	518017.383	2	2
Main Park Road	Melilotus officinalis	Yellow sweet-clover	0		4633497.094	518218.312	2	2
Main Park Road	Bromus japonicus	Japanese chess	0		4634277.891	517987.39	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4633267.165	518327.888	1	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635810.165	517703.163	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635881.31	517808.804	1	3
Main Park Road	Bromus japonicus	Japanese chess	0		4632273.118	518541.939	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635883.223	517799.7	1	3
Main Park Road	Bromus japonicus	Japanese chess	0		4632395.05	518532.806	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4632330.286	518529.488	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4634095.172	517976.675	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4634160.26	517980.845	1	3
Main Park Road	Bromus japonicus	Japanese chess	0		4634043.432	517973.987	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635913.265	517862.558	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4634213.825	517984.012	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4631790.714	518846.685	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4631133.397	519052.978	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635274.887	518213.415	1	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635238.508	518204.178	2	3
Main Park Road	Bromus japonicus	Japanese chess	0		4631520.22	518872.394	1	3
Main Park Road	Bromus japonicus	Japanese chess	0		4634561.195	518044.363	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4632391.283	518524.7	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634291.856	517980.865	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634465.41	518025.484	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634951.406	518187.365	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631108.271	519061.287	2	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4634776.051	518087.416	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633625.405	518115.913	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631094.97	519073.626	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633861.948	518013.067	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631345.606	518980.972	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631467.024	518913.123	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634837.496	518134.102	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634718.615	518063.329	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633114.939	518383.454	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631029.147	519089.421	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631198.086	519030.418	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635833.465	518092.484	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634740.089	518081.535	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636856.678	518497.68	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4630855.893	519144.785	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633348.409	518315.384	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631764.903	518866.949	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4630310.043	519688.56	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633036.383	518415.201	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631354.261	518984.78	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635000.377	518209.899	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634225.735	517975.543	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631295.017	519006.153	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633397.147	518229.067	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631146.949	519056.079	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631496.711	518876.797	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634034.384	517973.983	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4630347.683	519644.95	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633580.92	518144.393	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631402.286	518959.99	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633193.501	518347.462	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633007.673	518435.789	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633460.399	518240.366	1	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4634664.063	518053.225	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633136.995	518381.787	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4632787.927	518489.828	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633531.626	518201.593	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4633083.161	518407.928	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635042.856	518171.358	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631274.94	519006.008	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4630248.926	519744.754	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634885.727	518162.152	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4631414.099	518943.874	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4630381.285	519600.586	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635870.5	517785.409	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636523.935	518654.527	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635408.094	518177.518	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635869.774	518022.242	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636735.963	518573.487	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635611.426	518116.986	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635235.995	518210.042	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635779.724	518282.041	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635669.983	518135.71	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635290.481	518211.762	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635505.88	518157.982	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4637050.458	518407.994	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636999.87	518425.498	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636900.954	518468.699	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635447.897	518181.072	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636244.326	518457.913	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635902.64	517850.538	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636011.285	518189.456	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635586.287	518120.17	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635822.434	518116.609	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636950.436	518445.88	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635848.303	517908.45	1	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4636251.252	518455.861	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636476.924	518650.065	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636048.785	518296.79	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635880.441	517796.938	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635788.728	518203.647	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635453.969	518181.681	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635832.313	517846.758	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635852.839	518069.793	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635928.514	517885.45	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635692.471	518180.3	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635994.304	518037.943	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636335.245	518536.916	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635715.395	518231.814	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635800.63	518152.357	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635860.207	517967.841	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635557.607	518135.764	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635737.53	518286.309	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634350.213	517990.7	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4632295.754	518527.907	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636427.646	518639.759	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4632496.782	518538.364	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634832.066	518123.7	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4634592.583	518063.788	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636021.962	518242.265	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4637422.958	518245.97	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635852.691	517950.743	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636022.906	518226.483	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636102.557	518374.788	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635001.918	518185.838	3	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635389.568	518166.692	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635187.059	518197.058	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4630938.645	519119.121	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635148.9	518174.436	2	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4636163.338	518416.556	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635261.501	518205.464	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635974.245	518031.985	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636043.26	518293.616	1	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4635746.86	518293.943	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636299.714	518485.644	2	3
Main Park Road	Bromus tectorum	Cheatgrass	0		4636579.726	518637.85	1	3
Main Park Road	Cardaria sp.	whitetop	0		4633399.68	518232.162	4	3
Main Park Road	Descurainia sophia	Flixweed	0		4633242.465	518310.993	2	3
Main Park Road	Descurainia sophia	Flixweed	0		4635995.411	518030.708	2	3
Main Park Road	Descurainia sophia	Flixweed	0		4636052.839	518301.859	2	3
Main Park Road	Descurainia sophia	Flixweed	0		4633400.776	518224.782	2	3
Main Park Road	Descurainia sophia	Flixweed	0		4635866.114	518010.75	2	3
Main Park Road	Elymus repens	Quackgrass	0		4634823.739	518130.941	3	3
Main Park Road	Elymus repens	Quackgrass	0		4632562.103	518548.005	3	3
Main Park Road	Bromus japonicus	Japanese chess	0		4635946.321	517918.409	2	4
Main Park Road	Bromus japonicus	Japanese chess	0		4633323.741	518331.418	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633246.972	518309.656	4	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4630801.19	519177.062	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633301.607	518325.98	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4634881.621	518153.174	3	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633581.92	518154.022	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633835.561	518039.503	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4631048.992	519090.476	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633253.288	518330.364	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633626.947	518122.675	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4630955.558	519120.944	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4631248.716	519021.865	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4630749.817	519206.897	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4630658.141	519270.055	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4631202.807	519038.077	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4631000.861	519104.828	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4630701.493	519235.006	2	4

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Main Park Road	Bromus tectorum	Cheatgrass	0		4633345.471	518308.196	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4630437.335	519528.922	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4634174.435	517980.273	1	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635125.841	518177.472	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635837.989	517891.46	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635198.521	518193.318	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635864.855	518002.385	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633176.971	518348.273	3	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635788.153	518178.383	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635729.057	518249.075	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635808.906	517733.046	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635691.142	518165.814	3	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635506.97	518153.481	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635641.092	518113.349	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635819.527	517798.159	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635779.454	518232.398	2	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4635324.893	518194.461	2	4
Main Park Road	Carduus nutans	Musk thistle	0		4635987.598	518086.236	3	4
Main Park Road	Bromus tectorum	Cheatgrass	0		4633779.781	518063.312	1	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630582.833	519349.025	2	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630851.037	519157.015	2	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630909.441	519136.518	2	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630196.313	519761.979	1	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4634789.307	518103.662	1	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4633888.629	518003.83	1	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630515.992	519430.417	1	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630477.689	519478.924	1	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630620.087	519307.777	2	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4630547.967	519389.365	2	5
Main Park Road	Bromus tectorum	Cheatgrass	0		4633722.001	518085.123	1	5
Matate drainage	Melilotus officinalis	Yellow sweet-clover	0		4630217.745	519966.688	5	1
Matate drainage	Bromus tectorum	Cheatgrass	0		4630786.814	520485.32	1	2
Millet Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4636468.544	517479.827	5	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Millet Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4636283.065	517386.21	4	1
Millet Canyon	Bromus tectorum	Cheatgrass	0		4636532.642	517513.886	3	1
Millet Canyon	Carduus nutans	Musk thistle	0		4636353.989	517431.478	5	1
Millet Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4636363.949	517428.022	2	2
Millet Canyon	Bromus tectorum	Cheatgrass	0		4636639.18	517676.895	3	2
Millet Canyon	Cirsium arvense	Canada thistle	0		4636354.529	517430.185	3	2
Millet Canyon	Cirsium arvense	Canada thistle	0		4636731.775	517764.466	2	2
Millet Canyon	Cirsium arvense	Canada thistle	0		4636634.689	517675.543	2	2
Millet Canyon	Bromus tectorum	Cheatgrass	0		4636736.34	517782.597	2	3
Millet Canyon	Bromus tectorum	Cheatgrass	0		4636685.432	517713.649	2	3
Millet Canyon	Bromus tectorum	Cheatgrass	0		4636759.228	517824.216	2	4
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4635193.848	520851.615	5	1
Moose Bones Canyon	Cirsium arvense	Canada thistle	0		4634832.722	520248.142	5	1
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4635019.585	520658.333	2	2
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4634838.451	520208.98	3	2
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4634922.729	520430.976	2	2
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4635105.61	520764.087	2	2
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4635135.601	520802.434	2	2
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4634960.885	520562.568	2	2
Moose Bones Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4634955.993	520504.862	2	2
Moose Bones Canyon	Cirsium arvense	Canada thistle	0		4634944.506	520487.242	2	2
Moose Bones Canyon	Bromus tectorum	Cheatgrass	0		4634866.128	519948.731	2	3
Moose Bones Canyon	Bromus tectorum	Cheatgrass	0		4634871.699	519884.775	3	3
Murder Hill drainage	Carduus nutans	Musk thistle	0		4636899.613	519426.336	5	1
Murder Hill drainage	Bromus tectorum	Cheatgrass	0		4636930.992	519134.268	3	2
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632516.876	519082.425	2	2
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633922.215	519704.41	2	2
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633899.108	519628.312	4	2
North Dam Fork Chicken Creek	Cirsium arvense	Canada thistle	0		4633424.099	519324.57	3	2
North Dam Fork Chicken Creek	Cirsium vulgare	Bull thistle	0		4633783.055	519528.949	2	2
North Dam Fork Chicken Creek	Elymus repens	Quackgrass	0		4632929.325	519173.025	5	2
North Dam Fork Chicken Creek	Elymus repens	Quackgrass	0		4633007.205	519169.375	5	2
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633640.553	519424.364	2	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633318.614	519275.667	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633888.677	519609.172	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633511.688	519328.856	3	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632754.097	519172.025	1	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633138.16	519176.922	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632855.526	519179.512	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633362.701	519307.215	3	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633540.14	519370.764	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632912.633	519175.392	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633284.205	519231.279	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633028.472	519171.109	1	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633816.08	519550.215	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633190.736	519205.442	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633235.505	519224.986	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633083.517	519173.061	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633581.517	519402.613	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633403.284	519321.77	3	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632657.711	519163.428	1	3
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633674.78	519430.652	2	3
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633478.687	519314.233	2	3
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633429.767	519319.267	2	3
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633694.737	519444.821	4	4
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633461.59	519309.831	5	4
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633520.605	519345.72	2	4
North Dam Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4633741.535	519477.01	5	5
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633573.584	519395.528	1	5
North Dam Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4633727.001	519457.612	2	5
Ruby Point Road	Alopecurus arundinaceus	Creeping foxtail	0		4637225.695	518212.812	5	1
Ruby Point Road	Bromus tectorum	Cheatgrass	0		4636998.437	516643.715	5	1
Ruby Point Road	Bromus tectorum	Cheatgrass	0		4636789.336	515784.723	4	2
Ruby Point Road	Bromus tectorum	Cheatgrass	0		4637007.782	516597.267	5	2
Ruby Point Road	Bromus tectorum	Cheatgrass	0		4637293.234	518301.807	2	3
Sage Grouse Lek drainage	Alopecurus arundinaceus	Creeping foxtail	0		4632181.053	519251.977	1	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Sage Grouse Lek drainage	Alopecurus arundinaceus	Creeping foxtail	0		4632253.354	519276.088	1	2
Sage Grouse Lek drainage	Bromus tectorum	Cheatgrass	0		4632750.308	519445.66	2	2
Sage Grouse Lek drainage	Cirsium arvense	Canada thistle	0		4632271.519	519293.561	3	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630263.437	519307.943	2	1
Smallpox Creek	Descurainia sophia	Flixweed	0		4630747.637	518879.89	1	1
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4631322.177	518624.148	2	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630596.043	518980.7	1	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630506.245	519131.67	2	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630545.396	519084.807	2	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630566.605	519022.799	2	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630232.239	519229.508	1	2
Smallpox Creek	Bromus tectorum	Cheatgrass	0		4631142.43	518647.109	3	2
Smallpox Creek	Bromus tectorum	Cheatgrass	0		4631699.426	518205.89	3	2
Smallpox Creek	Bromus tectorum	Cheatgrass	0		4630583.164	518985.437	3	2
Smallpox Creek	Carduus nutans	Musk thistle	0		4631090.24	518640.187	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4631172.722	518674.36	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4630666.234	518942.1	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4630306.498	519291.521	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4630608.094	518970.429	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4631032.169	518644.733	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4630500.672	519134.862	2	2
Smallpox Creek	Descurainia sophia	Flixweed	0		4631233.265	518683.152	3	2
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630761.409	518862.209	1	3
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630725.675	518901.425	1	3
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630804.356	518832.095	2	3
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630637.962	518957.464	2	3
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630956.07	518665.029	1	3
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630689.109	518931.106	2	3
Smallpox Creek	Bromus tectorum	Cheatgrass	0		4630278.155	519301.012	3	3
Smallpox Creek	Bromus tectorum	Cheatgrass	0		4630231.059	519241.847	2	3
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630857.729	518739.675	1	4
Smallpox Creek	Alopecurus arundinaceus	Creeping foxtail	0		4630896.32	518706.819	1	5
South Millet Canyon	Carduus nutans	Musk thistle	0		4636446.457	518056.68	5	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Fossil Butte National Monument, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
South Millet Canyon	Descurainia sophia	Flixweed	0		4636453.124	518079.909	5	1
South Millet Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4636421.904	517903.886	3	2
South Millet Canyon	Cirsium arvense	Canada thistle	0		4636420.468	517892.308	3	2
South Millet Canyon	Cirsium arvense	Canada thistle	0		4636355.082	517795.401	2	2
South Millet Canyon	Descurainia sophia	Flixweed	0		4636392.698	517791.087	2	2
South Millet Canyon	Alopecurus arundinaceus	Creeping foxtail	0		4636357.124	517800.246	3	3
South Millet Canyon	Cirsium arvense	Canada thistle	0		4636338.801	517592.509	3	3
South Millet Canyon	Bromus tectorum	Cheatgrass	0		4636424.012	517906.727	2	4
South Millet Canyon	Bromus tectorum	Cheatgrass	0		4636458.877	518119.691	2	4
South Millet Canyon	Bromus tectorum	Cheatgrass	0		4636443.828	518047.039	2	4
South Murder Hill drainage	Descurainia sophia	Flixweed	0		4636751.954	519553.56	5	1
South Murder Hill drainage	Carduus nutans	Musk thistle	0		4636752.584	519555.43	2	2
South Murder Hill drainage	Cirsium arvense	Canada thistle	0		4636755.915	519555.506	2	2
South Murder Hill drainage	Alopecurus arundinaceus	Creeping foxtail	0		4636733.881	519531.178	3	4
Wasatch Saddle drainage	Descurainia sophia	Flixweed	0		4633505.083	520866.733	2	2
West Fork Chicken Creek	Descurainia sophia	Flixweed	0		4632954.08	518146.03	2	1
West Fork Chicken Creek	Descurainia sophia	Flixweed	0		4632935.976	518162.847	5	1
West Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632975.91	518053.037	2	2
West Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632856.845	518438.205	2	2
West Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632934.074	518176.58	2	2
West Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4632906.47	518288.538	2	2
West Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4632919.08	518209.969	2	2
West Fork Chicken Creek	Bromus tectorum	Cheatgrass	0		4632903.645	518384.233	2	2
West Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632782.731	518600.1	1	3
West Fork Chicken Creek	Alopecurus arundinaceus	Creeping foxtail	0		4632824.92	518567.482	2	3
West Fork Chicken Creek along fenceline	Bromus tectorum	Cheatgrass	0		4633203.963	517869.49	2	2
West Fork Chicken Creek along fenceline	Bromus tectorum	Cheatgrass	0		4633184.041	517921.252	2	2
West Red Hill drainage	Carduus nutans	Musk thistle	0		4630172.282	520759.595	5	1
West Red Hill drainage	Melilotus officinalis	Yellow sweet-clover	0		4630546.083	521043.97	5	1

Appendix B. Exotic Plant Transect Data, Fossil Butte National Monument, 2016

Route	Transect	E_Coord	N_Coord	Species	Master_Common_Name	Alive?	AverageCover
Chicken Creek	360	519873.342	4630264.502	Alopecurus arundinaceus	Creeping foxtail	Y	0.167
Chicken Creek	363	519507.167	4631544.827	Alopecurus arundinaceus	Creeping foxtail	Y	2.333
Chicken Creek	364	519211.499	4631922.206	Alopecurus arundinaceus	Creeping foxtail	Y	0.667
Chicken Creek	368	518274.638	4633489.886	Alopecurus arundinaceus	Creeping foxtail	Y	0.333
Chicken Creek	370	518144.359	4634374.614	Alopecurus arundinaceus	Creeping foxtail	Y	17.833
North Dam Fork Chicken Creek	388	519398.434	4633578.477	Alopecurus arundinaceus	Creeping foxtail	Y	0.167
North Dam Fork Chicken Creek	389	519181.573	4633149.701	Alopecurus arundinaceus	Creeping foxtail	Y	0.167
West Fork Chicken Creek	408	518057.242	4632970.681	Alopecurus arundinaceus	Creeping foxtail	Y	0.667
Chicken Creek	374	518708.409	4636168.095	Bromus japonicus	Japanese chess	Y	0.167
Chicken Creek Nature Trail	435	518299.613	4635032.503	Bromus japonicus	Japanese chess	Y	0.167
East Red Hill drainage	354	521705.151	4630269.642	Bromus japonicus	Japanese chess	Y	1.333
Main Park Road	308	518529.022	4632287.088	Bromus japonicus	Japanese chess	Y	0.167
Main Park Road	415	518539.462	4632282.112	Bromus japonicus	Japanese chess	Y	0.167
Main Park Road	417	518332.02	4633240.704	Bromus japonicus	Japanese chess	Y	0.167
Chicken Creek Nature Trail	434	518903.792	4635238.535	Bromus tectorum	Cheatgrass	Y	0.167
Historic Quarry Trail	439	522000.702	4630643.075	Bromus tectorum	Cheatgrass	Y	2.167
Historic Quarry Trail	444	522308.106	4630687.413	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	304	519331.562	4630586.605	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	305	519093.376	4631015.945	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	310	518320.121	4633244.919	Bromus tectorum	Cheatgrass	Y	0.5
Main Park Road	313	518053.651	4634632.067	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	315	518128.821	4635559.922	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	316	518122.466	4635814.171	Bromus tectorum	Cheatgrass	Y	0.833
Main Park Road	319	518493.31	4636309.247	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	320	518578.177	4636717.539	Bromus tectorum	Cheatgrass	Y	1
Main Park Road	322	518116.04	4637581.814	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	325	518878.545	4638333.729	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	412	519101.129	4631015.379	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	413	518906.68	4631472.204	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	416	518494.355	4632772.38	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	418	518099.848	4633675.965	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	420	518061.47	4634635.24	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	422	518150.387	4635525.413	Bromus tectorum	Cheatgrass	Y	0.167

Appendix B. Exotic Plant Transect Data, Fossil Butte National Monument, 2016, cont.

Route	Transect	E_Coord	N_Coord	Species	Master_Common_Name	Alive?	AverageCover
Main Park Road	423	518162.946	4635797.234	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	424	517691.596	4635811.232	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	426	518481.982	4636288.85	Bromus tectorum	Cheatgrass	Y	0.167
Main Park Road	427	518595.674	4636693.756	Bromus tectorum	Cheatgrass	Y	0.333
Main Park Road	428	518406.248	4637147.121	Bromus tectorum	Cheatgrass	Y	1.667
Main Park Road	429	518140.961	4637553.86	Bromus tectorum	Cheatgrass	Y	0.167
Matate drainage	358	520485.986	4630794.103	Bromus tectorum	Cheatgrass	Y	0.167
Smallpox Creek	403	519307.688	4630249.99	Bromus tectorum	Cheatgrass	Y	0.167
Historic Quarry Trail	440	521619.054	4630908.91	Descurainia sophia	Flixweed	Y	0.167
Historic Quarry Trail	444	522308.106	4630687.413	Descurainia sophia	Flixweed	Y	0.333
Main Park Road	310	518320.121	4633244.919	Descurainia sophia	Flixweed	Y	1.667
Main Park Road	304	519331.562	4630586.605	Elymus repens	Quackgrass	Y	0.167
East Red Hill drainage	354	521705.151	4630269.642	Melilotus officinalis	Yellow sweet-clover	Y	3.333
Bullpen Two Track	301	518915.146	4637575.333	Poa bulbosa	Bulbous bluegrass	Y	0.333

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U.S. Department of the Interior

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