National Park Service
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Natural Resource Stewardship and Science

Invasive Exotic Plant Monitoring in Capitol Reef National Park

2016 Field Season

Natural Resource Report NPS/NCPN/NRR—2017/1509



ON THE COVER

Tamarisk (*Tamarix* spp.)/Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

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Executive Summary

Invasive exotic plant (IEP) species are a significant threat to natural ecosystem integrity and biodiversity, and controlling IEPs 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. In conjunction with park staff, the NCPN created a target list of priority IEPs for early detection at Capitol Reef National Park. During surveys conducted on June 14–18, 2016, NCPN staff detected 638 patches of seven priority IEP species along 60.7 kilometers on the Highway 24 (531 patches) and Pleasant Creek (107 patches) monitoring routes, and three IEP species in transects. The species detected most frequently was tamarisk (*Tamarix* spp., 369 patches), followed by Russian olive (*Elaeagnus angustifolia*, 82 patches), quackgrass (*Elymus repens*, 54 patches), field bindweed (*Convolvulus arvensis*, 17 patches), asparagus (*Asparagus officinalis*, 5 patches), burdock (*Arctium minus*, 2 patches), and tree-of-heaven (*Ailanthus altissima*, 2 patches). Jointed goatgrass (*Aegilops cylindrica*, not a priority species), burdock, and quackgrass were all recorded for the first time along the Highway 24 route, while asparagus was recorded for the first time along Pleasant Creek. This was the first record of jointed goatgrass in the park. Two small infestations of tree-of-heaven were present after being absent along Highway 24 in 2013. IEPs were found on 56% and 20% of transects along the Highway 24 and Pleasant Creek routes, respectively. Cheatgrass (*Bromus tectorum*, only recorded in transects) had the highest percent cover of all species, at 2.77 and 1.70 percent cover at Highway 24 and Pleasant Creek. There was also high cover for tamarisk (1.37%) and Russian thistle (1.24%) at Highway 24. The recently completed (2016) monitoring rotation found large increases in tamarisk and Russian olive along these two routes compared to the earlier time periods of 2003–2005, 2009–2012, and 2013–2015. More Russian-olive patches were recorded along these routes in 2016 than in any other sample period. There was also a larger overall number of patches and a larger percentage of large patches, indicating that existing infestations are expanding and growing. The NCPN will skip monitoring in 2017 before returning in 2018 to complete the Cathedral Valley, Scenic Drive, and Oak Creek routes. Those routes will complete the third monitoring rotation.

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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 (Loope 1992). 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 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 escapees, livestock grazing and trailing, and seeds transported on apparel 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, and
2. To determine status and trends of selected invasive plant populations of management significance.

This report summarizes the 2016 field season along the Highway 24 and Pleasant Creek monitoring routes at Capitol Reef National Park (NP). This work begins the third rotation of NCPN IEP monitoring at the park.

2 Methods

We followed the invasive exotic plant monitoring protocol developed by the NCPN (Perkins et al. 2016). The protocol emphasizes the 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 will capture the greatest amount of information (i.e., benefit) with the least amount of time and effort (i.e., cost).

2.1 Developing a park target invasive exotic plant list

Prior to beginning monitoring in 2016, NCPN and Capitol Reef NP staff reviewed the park's list of high-priority target IEPs (Table 2-1), initially created in 2009. The original list was developed by reviewing past park literature and state and county weed lists, and consulting with park staff and county weed managers. Our high-priority target IEP list includes existing IEPs and potential IEPs of high management concern.

Because these methods are designed to be rapid, field crews are trained to develop a focused search image on the target plants, instead of looking for every possible invasive plant species. The likelihood of eradicating these target species, or containing them within a park, is generally high.

The list of priority species is reviewed before each field season, with a few minor changes from year to year. In addition to the priority species, cheatgrass (*Bromus tectorum*), Russian thistle (*Salsola* sp.), and crested wheatgrass (*Agropyron cristatum*) were all searched for consistently in transects but not mapped along monitoring routes. In 2016, African mustard (*Malcolmia africana*) was added to the priority list. It had previously been on the list in 2012–2013 before being removed at the park's request.

2.2 Monitoring routes

2.2.1 Minimum detection target size

The minimum detection target size (MDTS) represents the patch size that is large enough to be detected 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 that any missed patches smaller than the MDTS could still feasibly be eradicated if not found until the next scheduled monitoring visit. We established an MDTS of 40 m^2 (~20 × 20 ft) for all IEPs. Use of the MDTS was necessary because field technicians are not expected to find every single plant of every targeted IEP species during

Table 2-1. Priority invasive plant list, Capitol Reef NP, 2009–2016.

Scientific name	Common name
Ailanthus altissima	tree-of-heaven
Arctium minus	burdock
Asparagus officinalis	asparagus
Cardaria draba	hoary cress
Carduus acanthoides[1]	plumeless thistle
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[2]	common houndstongue
Elaeagnus angustifolia	Russian olive
Elymus repens	quackgrass
Euphorbia esula	leafy spurge
Hyoscyamus niger[2]	black henbane
Isatis tinctoria	Dyer's woad
Lythrum salicaria	purple loosestrife
Malcolmia africana[3]	African mustard
Marrubium vulgare	horehound
Medicago sativa[4]	alfalfa
Onopordum acanthium	Scotch thistle
Tamarix spp.	tamarisk
Ulmus pumila	Siberian elm
Verbascum thapsus	woolly mullein

[1]2009–2011 only; [2]Added in 2012; [3]2012–2013, 2016 only; [4]2009–2010 only

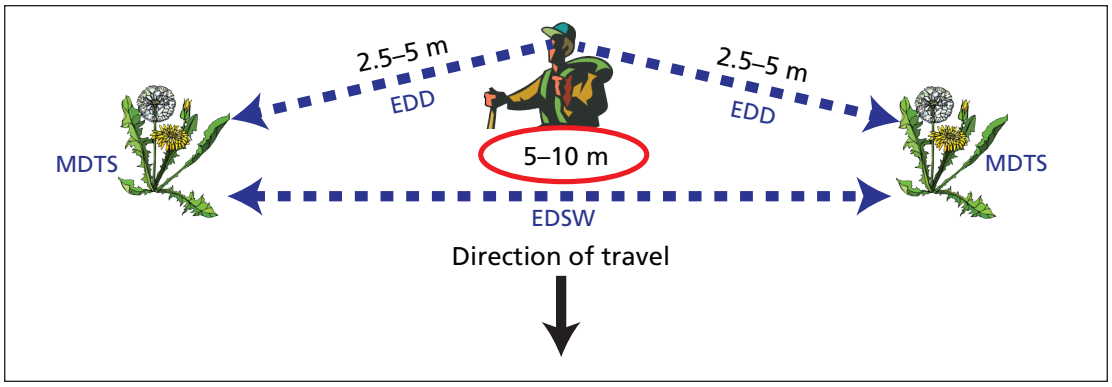


Figure 2-1. The maximum Effective Detection Distance (EDD) at Capitol Reef National Park was 2.5–5 meters, making the Effective Detection Swath Width (EDSW) 5–10 meters.

route surveys. Searching for single mature plants of some species, such as Russian olive (*Elaeagnus angustifolia*) and tamarisk (*Tamarix* spp.), 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.

2.2.2 Effective detection distance

The effective detection distance (EDD) is the maximum distance from which a searcher could consistently detect (i.e., see and recognize) the MDTS of the least-visible targeted species with at least 90% detection efficiency (Figure 2-1). Using fake plants of a targeted size, crew members are trained by walking away and determining the maximum distance from which they can 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 Capitol Reef NP in 2016 was 2.5–5 meters.

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 IEPs for one EDD on either side of his/her search route. The EDSW was 5–10 meters at Capitol Reef NP 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 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 Between feature position

Between feature positions allow electronic tracking of a user's route. A GPS unit is set to automatically generate these positions at a distance equal to the EDSW. Each time a surveyor walks the equivalent of one EDSW, the GPS unit creates a point.

2.2.6 Data collection methods

We have established a four-year rotation of monitoring routes at Capitol Reef NP that covers Highway 24, the Pleasant Creek cattle trail, Oak Creek cattle trail, Scenic Drive, and Cathedral Valley Road monitoring routes (Figure 2-2, Table 2-2). In 2016, the network visited the Highway24 and Pleasant Creek monitoring routes for the third time. NCPN

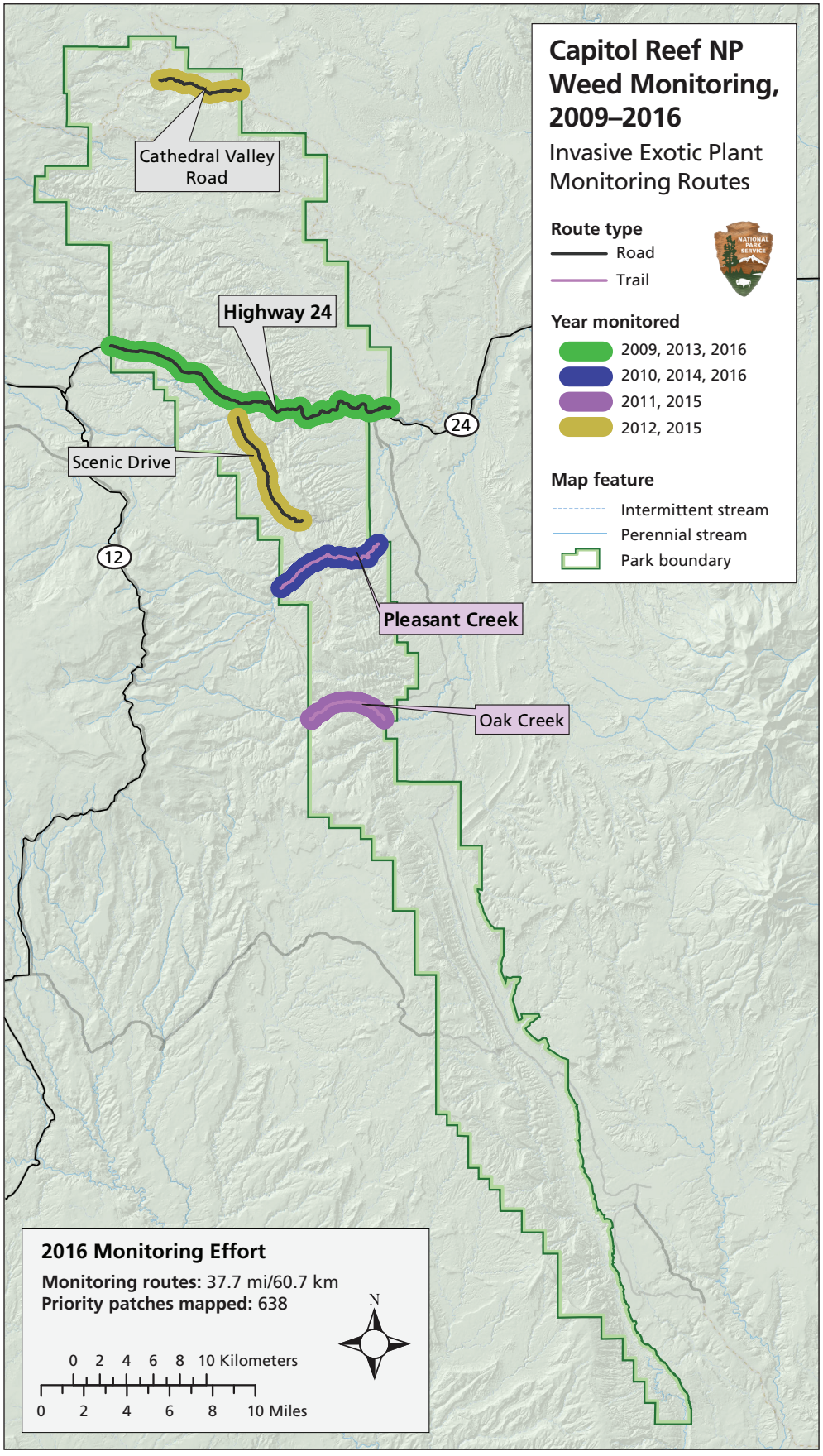


Figure 2-2. Overview of invasive exotic plant monitoring routes and extra areas surveyed at Capitol Reef National Park, 2009–2016.

Table 2-2. Planned monitoring revisit design for invasive exotic plant monitoring at Capitol Reef National Park.

Year	Monitoring routes
2009	Highway 24
2010	Pleasant Creek
2011	Oak Creek
2012	Cathedral Valley Road/Scenic Drive
2013	Highway 24
2014	Pleasant Creek
2015	Oak Creek/Cathedral Valley Road
2016	Highway 24/Pleasant Creek
2017	Rest
2018	Oak Creek
2019	Cathedral Valley Road/Scenic Drive

is currently ahead of schedule for the four-year rotation and will not visit Capitol Reef NP in 2017.

Along Highway 24, Cathedral Valley Road, and Scenic Drive, the observer walks out on one side of the road and walks back on the other. For all other routes, the observer walks down the center of the trail/route. 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 10 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 global positioning system (GPS) units with at least five-meter accuracy.

Only IEPs that were designated as priority were consistently recorded on monitoring routes. Survey crew members were given the latitude to record additional IEP species if they were noteworthy. When a priority IEP was discovered, we recorded the following information: (1) monitoring route, (2) sequential number of the invasion per monitoring route, (3) patch size class (see below), (4) whether the plant was pulled by the observer, and (5) canopy cover class (see below). If several IEPs 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. 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 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), the growth stage of exotic trees (e.g., sapling, pole, mature), evidence of prior treatment, and evidence of disturbances (e.g., recent fire, flood, small-mammal disturbance).

2.3 Monitoring transects

2.3.1 Quadrat establishment

We established one transect with three vegetation quadrats every 500 meters along monitoring routes (see Figures 2-3, 2-4, 2-5, and 2-6, starting on page 8). 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 being walked and on alternating sides for riparian areas, small roads, or trails. A 1-m^2 sampling frame, used to sample vegetation cover and soil surface features, was placed 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.

2.3.2 Data collection methods

In the monitoring quadrats, all IEP species known to the observer were recorded. At minimum, this included all priority species, as well as cheatgrass, crested wheatgrass, and Russian thistle. 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, 20, 30, 40, 50, 60, 70, 80, 90, or 100%. 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 kilometer for monitoring routes. Percent cover estimates were generated from the monitoring quadrat data. We calculated the mean and standard error of percent cover by species for monitoring quadrats. Due to differences in observers' knowledge, only priority species should be used when comparing results from year to year.

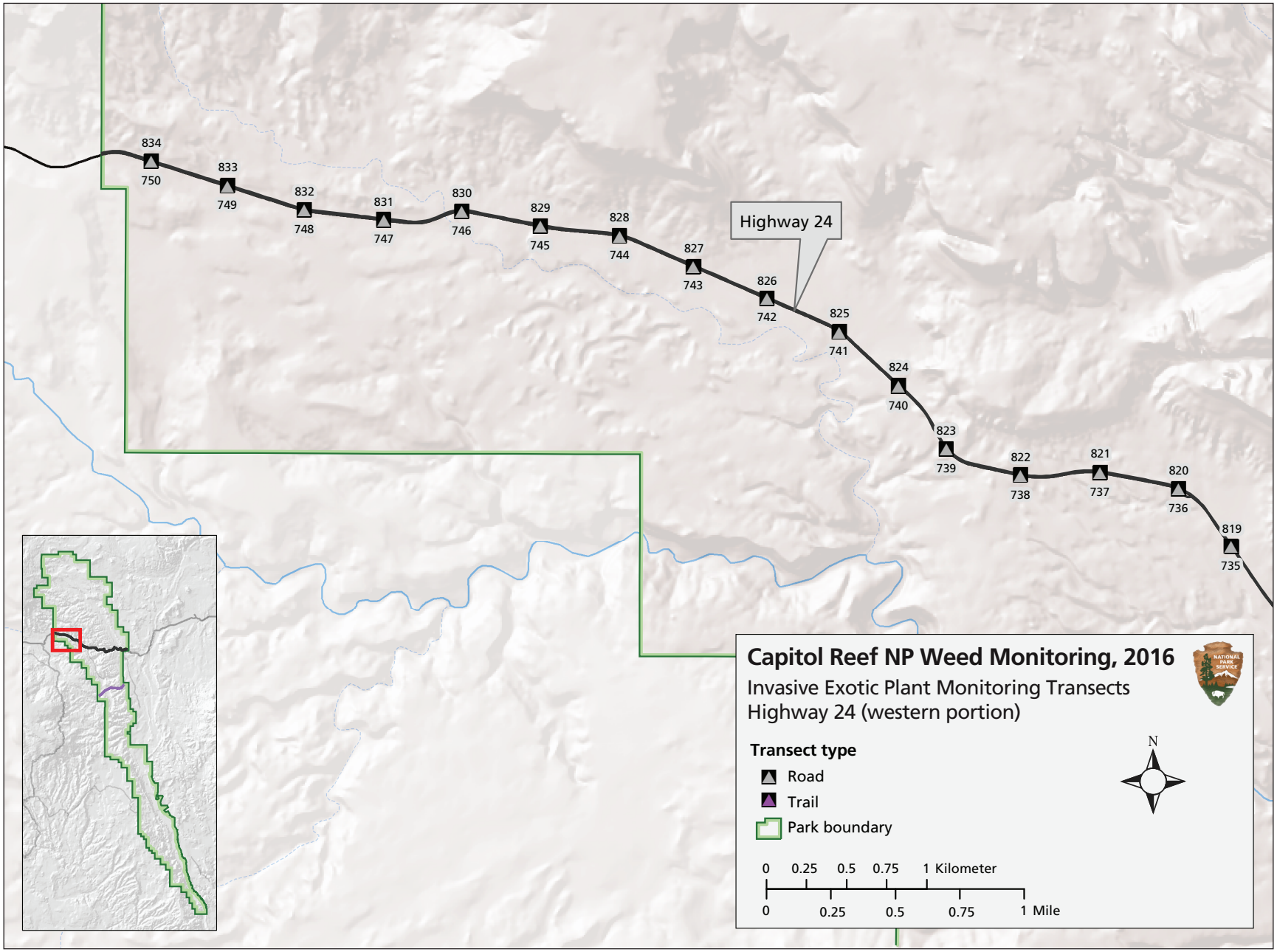


Figure 2-3. Transects completed at Capitol Reef NP, western portion of Highway 24, June 14–18, 2016.

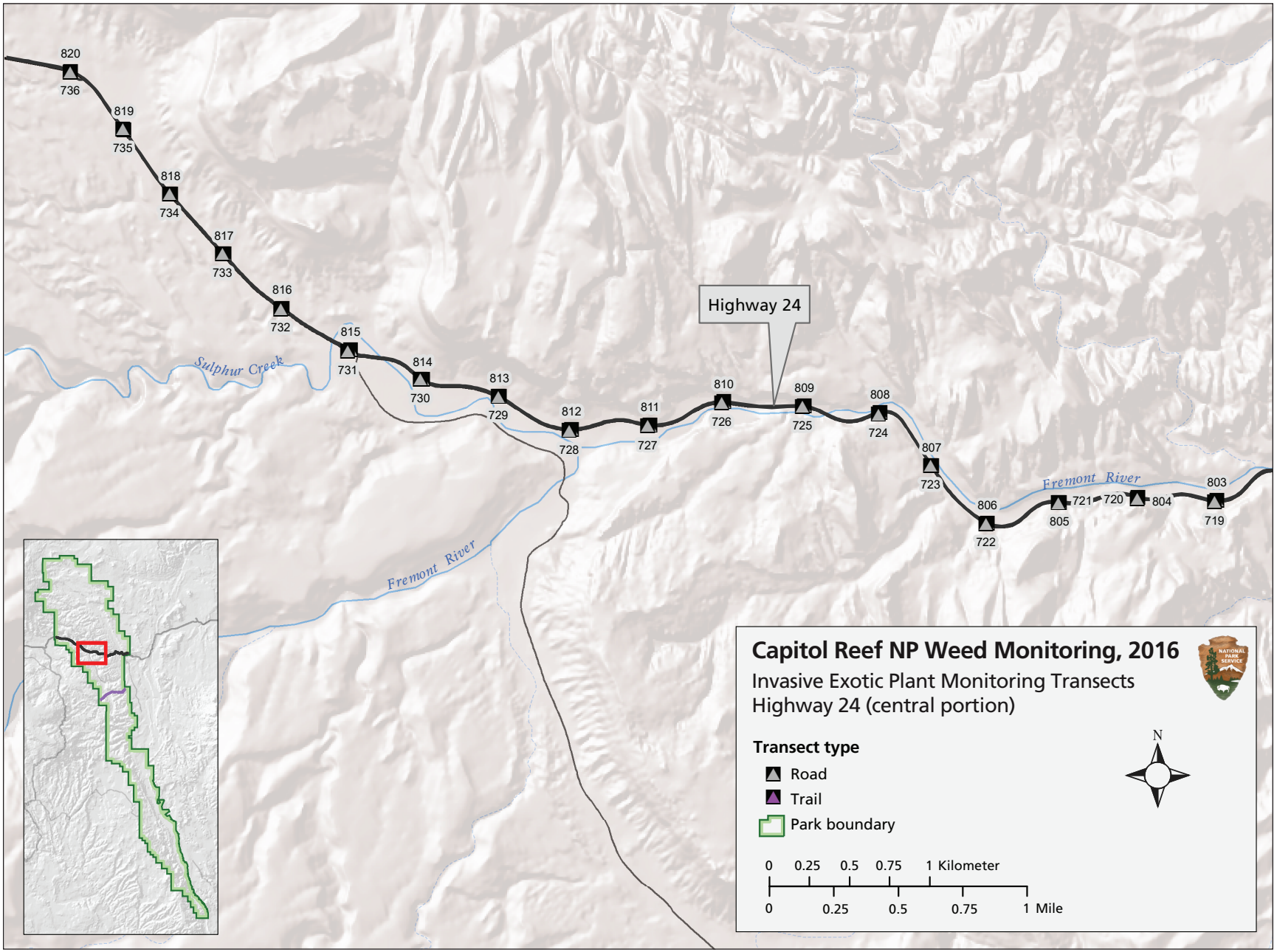


Figure 2-4. Transects completed at Capitol Reef NP, central portion of Highway 24, June 14–18, 2016.

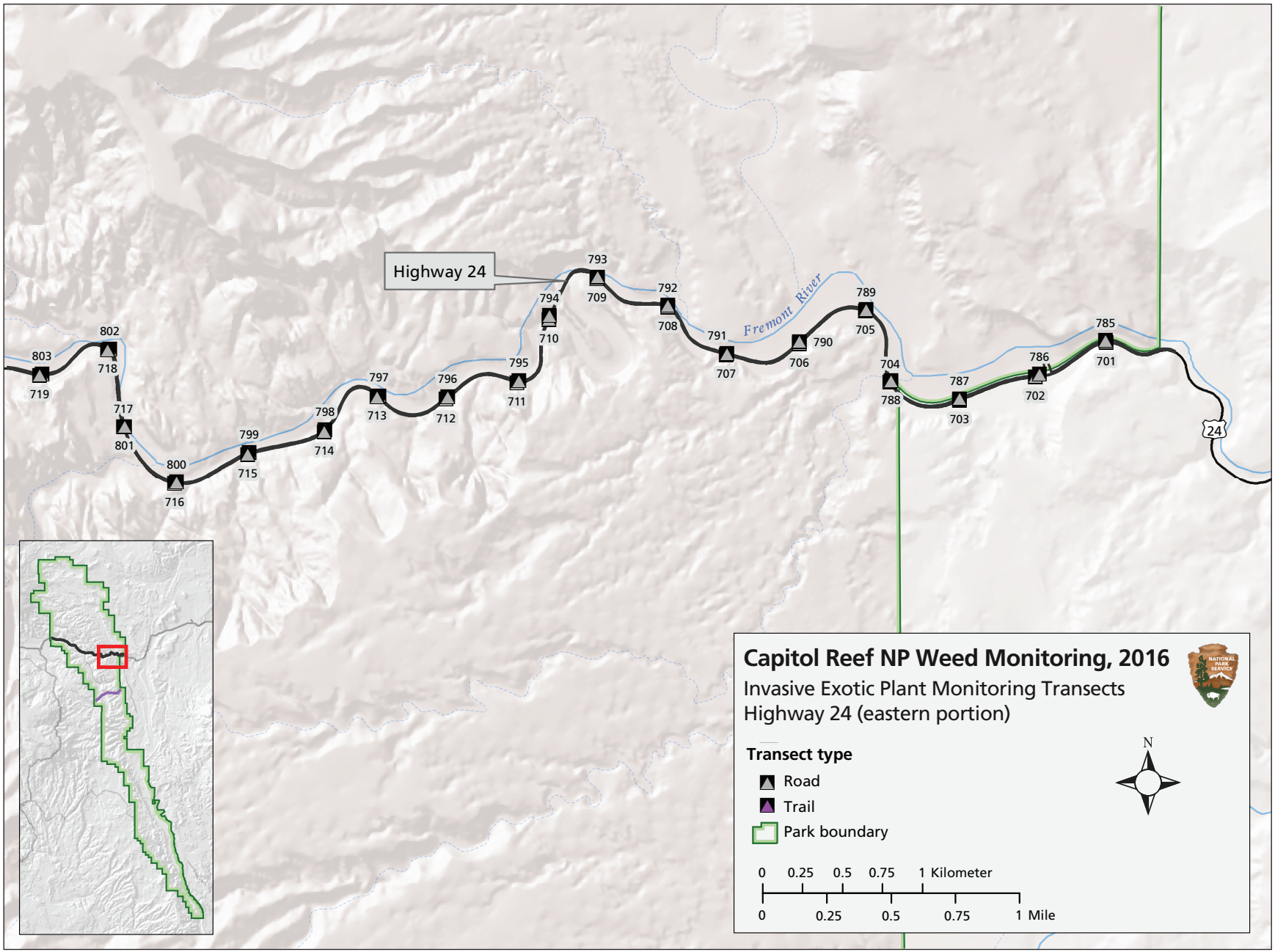


Figure 2-5. Transects completed at Capitol Reef NP, eastern portion of Highway 24, June 14–18, 2016.

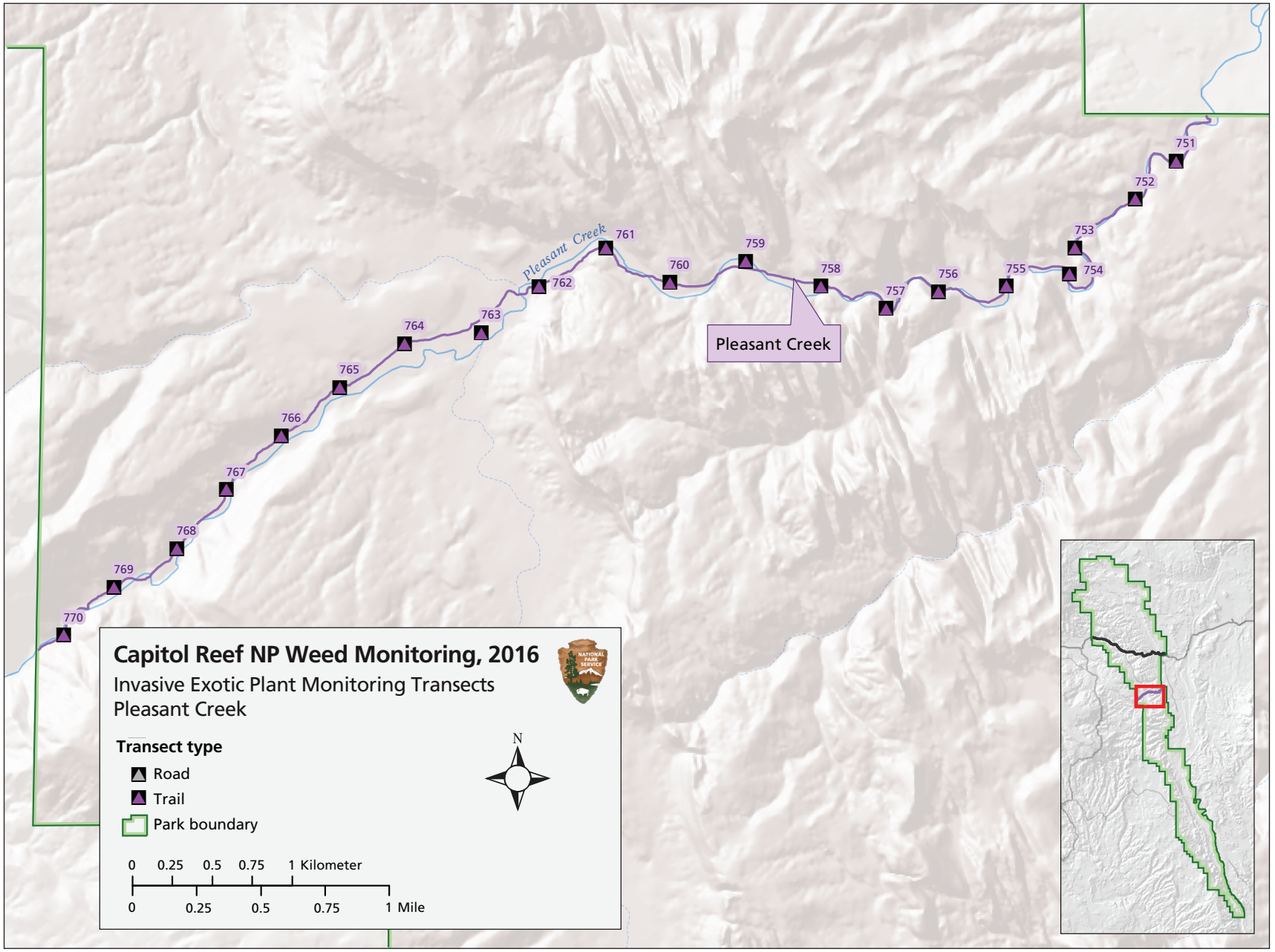


Figure 2-6. Transects completed at Capitol Reef NP, Pleasant Creek, June 14–18, 2016.

3 Results

3.1 Target invasive exotic plant list

In 2016, field crews searched on monitoring routes for 24 species identified as high-priority at Capitol Reef NP (see Table 2-1). Observers were trained to recognize priority species but given the freedom to map additional species. Therefore, presence and absence data for priority species are reliable for the areas searched, but absence data for other species are suspect. We recorded a total of seven priority, three transect species, and three non-priority IEP species on monitoring routes and transects in 2016 (Table 3-1). We covered 60.7 kilometers (37.7 miles) of monitoring routes in 2016.

3.2 Monitoring routes

We surveyed all of the Highway 24 and Pleasant Creek monitoring routes in 2016. A total of 638 patches of seven different priority species were detected along the monitoring routes (Tables 3-2 and 3-3; Figures 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7; Appendix A).* Tamarisk had the highest infestation rates by far, with 8.82 patches per kilometer along Pleasant Creek and 7.37/km along the Highway 24 corridor. Tamarisk represented 72% of all patches. Russian olive was also widespread on both routes and quackgrass (*Elymus repens*) was widespread along Highway 24. Of the 368 tamarisk patches where growth stage was noted along Highway 24, 2 were in the seedling stage, 181 were in the sapling stage, and 185 were mature trees (see Appendix A). Of the 82 Russian olive patches where growth stage was noted along Highway 24, 4 were in the seedling stage, 62 were in the sapling stage, and 16 were mature trees (see Appendix A). Along Pleasant Creek, there were 14 sapling and 2 mature-tree patches of Russian olive and 12 seedlings, 47 saplings, and 31 mature-tree patches of tamarisk. Patches along both routes were higher on the eastern portion of the route than the western portion (Figures 3-2, 3-3, 3-4, 3-5, 3-6, 3-7).

Jointed goatgrass (*Aegilops cylindrica*), burdock (*Arctium minus*), and quackgrass were all recorded for the first time along the Highway 24 route, while asparagus (*Asparagus officinalis*) was recorded for the first time along Pleasant Creek. This was the first record of jointed goatgrass in the park. Two small patches of tree-of-heaven (*Ailanthus altissima*) also were present after being ab-

* Tables begin on page 16, figures on page 20.

Table 3-1. Invasive exotic plants detected along Highway 24 and Pleasant Creek at Capitol Reef National Park, June 14–18, 2016.

Scientific name	Common name	Method detected		Priority?
		Route	Transect	
Ailanthus altissima	tree-of-heaven	X	-	Yes
Arctium minus	burdock	X	-	Yes
Asparagus officinalis	asparagus	X	-	Yes
Convolvulus arvensis	field bindweed	X	-	Yes
Elaeagnus angustifolia	Russian olive	X	-	Yes
Elymus repens	quackgrass	X	X	Yes
Tamarix spp.	tamarisk	X	X	Yes
Aegilops cylindrica	jointed goatgrass	X	-	No
Dactylis glomerata	orchard grass	X	-	No
Rubia tinctoria	madder	X	-	No
Agropyron cristatum	crested wheatgrass	-	X	Transect*
Bromus tectorum	cheatgrass	-	X	Transect*
Salsola sp.	Russian thistle	-	X	Transect*

*Transect species are recorded only in transects. They are not recorded along monitoring routes.

sent along Highway 24 in 2013. These tree-of-heaven patches have been treated by the park. Two additional non-priority species were noted along Highway 24: madder (*Rubia tinctoria*) and orchard grass (*Dactylis glomerata*). Crews discovered a small, dense patch of madder along Highway 24. This plant is exotic and established in southern Utah. It was not previously listed for Capitol Reef NP on NPSpecies. Park staff was notified of this patch after crews returned from the field. The patch was subsequently pulled and treated with an herbicide to ensure it was eradicated. As of publication of this report, the madder has not reappeared at this location.

3.3 Monitoring transects

A total of 120 transects were sampled in 2016 (Tables 3-4, 3-5; Appendix B). Russian thistle, crested wheatgrass, quackgrass, cheatgrass, and tamarisk were detected. IEPs were found on 56% and 20% of transects along Highway 24 and Pleasant Creek, respectively. Percent cover was highest for cheatgrass, at 2.77 percent cover (Highway 24) and 1.70 percent cover (Pleasant Creek). There was also high cover for tamarisk (1.37%) and Russian thistle (1.24%) at Highway 24. All other percent covers were <0.5% (Tables 3-4, 3-5). Cheatgrass was the most widespread IEP species, present on 52% and 50% of transects along Highway 24 and Pleasant Creek, respectively.

3.4 Results comparison: 2003–2005, 2009–2012, and 2013–2015

From 2003 to 2005, Dewey and Anderson (2005a, b) surveyed the same general sections of Capitol Reef NP that the NCPN monitored from 2009 to 2012 and 2013–2015 (Perkins 2010, 2015, 2016, Perkins and Lenhart, 2011, 2012, 2013). NCPN monitoring methods were based on the methods used by Dewey and Anderson (2005), but it should be noted that mapping is subjective. For example, one observer may call two small patches, separated by 45 meters (the patch separation rule is 50 m, but exact measurements are not made in the field), as two patches, while another observer may call them one large patch. Therefore, although general comparisons and major differences noted between the two survey periods are useful (if somewhat problematic) and likely represent biological differences, smaller changes may not reflect actual conditions. Eight different priority species were detected in at least one of the three sample periods.

3.4.1 Highway 24

From 2003 to 2005, Dewey and Anderson (2005a, b) surveyed the same sections of Highway 24 that the NCPN surveyed in 2009–2010, 2013, and 2016. However, in the 2003–2005 surveys, crews mapped patches of tamarisk and Russian olive with a combination of points, lines, and polygons. From 2009 to 2016, the crew used points exclusively. Due to these differences in mapping methods, the number of patches of tamarisk and Russian olive cannot be compared to the earliest time period.

There were 71 tree-of-heaven patches in 2003–2005 (Dewey and Anderson 2005 a, b). These declined to just two in 2009 and none in 2013. However, two small patches returned along the Highway 24 route in 2016. When comparing 2009–2010 to 2013 (when the methods were the same), Russian olive and tamarisk both had fewer patches along this route in 2013 than in 2009–2010. However, tamarisk has returned to the number of patches present in 2009–2010, and Russian olive patches were the highest amount ever in 2016 (Figure 3-8).

Total patches declined from 7.62 patches per kilometer in 2009–2010 (Perkins and Lenhart 2011) to 5.54 per kilometer in 2013 (Perkins and Lenhart 2014), but then increased to 10.62/kilometer in 2016. Perkins (2014) reported that percent cover also declined, from 8.42% in 2009–2010 to 5.66% in 2013. However, the cover in 2016 (5.08%) was similar to that in 2013 (Figure 3-9). Percent cover and species mapped on monitoring routes are not the same, so trends between the two methods are not necessarily the same.

Cheatgrass cover along Highway 24 increased from 0.21% in 2009–2010 to 0.61% in 2013 to 1.70% in 2016. This species can vary considerably with precipitation. Of the 532 patches of cheatgrass, 69% were larger than 40 m^2, compared to 49% and 50% in 2013 and 2009–2010, respectively. The num-

ber of patches larger than 400 m^2 increased from 21 (5% of patches) in 2009–2010 to 78 in 2013 (28% of patches) to 284 (53% of patches) in 2016.

3.4.2 Pleasant Creek

In 2003, Dewey and Anderson (2005) surveyed the same sections of Pleasant Creek that the NCPN surveyed in 2010, 2014, and 2016. Although the area covered along Pleasant Creek in 2003–2005 was significantly larger than the area covered from 2010 to 2016, and survey methods differed in some respects, general comparisons between the two survey periods are useful (if somewhat problematic). However, since NCPN began monitoring in 2009, the methods and routes have been comparable.

Tamarisk, Russian olive, asparagus, and tree-of-heaven were all detected in at least one of the four time periods. One tree-of-heaven patch was detected in 2003, but this species was not detected in 2010, 2014, or 2016. Russian olive has increased over the four sample periods: four in 2003, three in 2010, eight in 2014, and 16 in 2016. The number of tamarisk patches declined from 100 patches detected in 2003, to 60 in 2010, and 49 in 2014, but then increased to 90 patches in 2016 (Figure 3-10).

Monitoring methods were the same between 2010 and 2016, so these numbers are directly comparable (Table 3-2). The number of tamarisk patches larger than 40 m^2 increased from 5 to 24 to 36 in 2010, 2014, and 2016. For the first time, there were also 15 tamarisk patches over 400 m^2 in size in 2016. There were minimal changes in percent cover of the three species detected and in total cover of invasive species from 2010 to 2016 (Figure 3-11).

Table 3-2. Total patches observed, number of patches/kilometer, and size of patches detected, Highway 24 monitoring routes, Capitol Reef NP, 2009–2016.

Scientific name	Common name	Year(s)	Total patches	Km	Patches/ km	Patch size class[1]				
						1	2	3	4	5
Aegilops cylindrica[2]	jointed goatgrass	2016	1	50.1	0.02	1	0	0	0	0
Ailanthus altissima	tree-of-heaven	2009–2010	2	50.6	0.04	2	0	0	0	0
		2013	0	50.5	0.00	0	0	0	0	0
		2016	2	50.1	0.04	2	0	0	0	0
Arctium minus	burdock	2016	2	50.1	0.04	2	0	0	0	0
Asparagus officinalis	asparagus	2009–2010	5	50.6	0.10	4	1	0	0	0
		2013	0	50.5	0.00	0	0	0	0	0
		2016	5	50.1	0.10	4	1	0	0	0
Cirsium vulgare	bull thistle	2013	1	50.5	0.02	0	0	1	0	0
		2016	0	50.1	0.00	0	0	0	0	0
Convolulus arvensis	field bindweed	2009–2010	2	50.6	0.04	2	0	0	0	0
		2013	8	50.5	0.16	3	5	0	0	0
		2016	17	50.1	0.34	10	4	3	0	0
Elaeagnus angustifolia	Russian olive	2009–2010	34	50.6	0.67	23	11	0	0	0
		2013	24	50.5	0.48	14	7	3	0	0
		2016	82	50.1	1.64	45	16	13	7	1
Elymus repens	quackgrass	2016	54	50.1	1.08	2	23	22	7	0
Tamarix spp.	tamarisk	2009–2010	341	50.6	6.74	60	87	173	21	0
		2013	245	50.5	4.89	48	65	54	78	0
		2016	369	50.1	7.37	31	24	45	73	196
Verbascum thapsus	woolly mullein	2009–2010	1	50.6	0.02	1	0	0	0	0
		2013	0	50.5	0.00	0	0	0	0	0
		2016	0	50.1	0.00	0	0	0	0	0
Total		**2009–2010**	**385**	**50.6**	**7.62**	**92**	**99**	**173**	**21**	**0**
		2013	**278**	**50.5**	**5.54**	**65**	**77**	**58**	**78**	**0**
		2016	**532**	**50.1**	**10.62**	**97**	**68**	**83**	**87**	**197**

[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).

[2]Not a priority species.

Table 3-3. Total patches observed, number of patches/kilometer, and size of patches detected, Pleasant Creek monitoring route, Capitol Reef NP, 2010–2016.

Scientific name	Common name	Year	Total patches	Km	Patches/ km	Patch size class				
						1	2	3	4	5
Asparagus officinalis	asparagus	2016	1	10.2	0.10	1	0	0	0	0
Elaeagnus angustifolia	Russian olive	2010	3	9.9	0.30	2	1	0	0	0
		2014	8	10.2	0.78	6	2	0	0	0
		2016	16	10.2	1.57	7	6	3	0	0
Tamarix spp.	tamarisk	2010	60	9.9	6.07	41	14	5	0	0
		2014	49	10.2	4.82	11	13	24	1	0
		2016	90	10.2	8.82	29	25	21	11	4
Total		**2010**	**63**	**9.9**	**6.37**	**43**	**15**	**5**	**0**	**0**
		2014	**57**	**10.2**	**5.61**	**17**	**15**	**24**	**1**	**0**
		2016	**107**	**10.2**	**10.49**	**37**	**31**	**24**	**11**	**4**

*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. Number of monitoring transects where exotic plant species were detected/total number of transects monitored, mean percent cover, and standard error by sampling area, Highway 24 monitoring route, Capitol Reef NP in 2009–2010, 2013, and 2016.

Scientific name	Common name	Year(s)	Detected/Total	Percent cover (SE)
Agropyron cristatum[1]	crested wheatgrass	2009–2010	2/50	0.09 (0.07)
		2013	2/102	<0.01 (<0.01)
		2016	4/100	0.30 (0.17)
Bromus tectorum[2]	cheatgrass	2009–2010	8/50	0.21 (0.14)
		2013	24/102	0.61 (0.22)
		2016	52/100	1.70 (0.49)
Elaeagnus angustifolia	Russian olive	2009–2010	0/50	0.00 (0.00)
		2013	1/102	0.33 (0.33)
		2016	0/100	0.00 (0.00)
Elymus repens	quackgrass	2009–2010	0/50	0.00 (0.00)
		2013	0/102	0.00 (0.00)
		2016	6/100	0.27 (0.23)
Halogeton glomeratus[1]	halogeton	2009–2010	5/50	0.14 (0.08)
		2013	6/102	0.03 (0.01)
		2016	0/100	0.00 (0.00)
Medicago sativa[1]	alfalfa	2009–2010	2/50	0.01 (0.01)
		2013	13/102	0.08 (0.03)
		2016	0/100	0.00 (0.00)
Melilotus officinalis[1]	yellow sweetclover	2009–2010	5/50	0.70 (0.56)
		2013	19/102	0.13 (0.03)
		2016	0/100	0.00 (0.00)
Portulaca oleracea[1]	common purslane	2009–2010	1/50	0.02 (0.02)
		2013	0/102	0.00 (0.00)
		2016	0/100	0.00 (0.00)
Salsola sp.[2]	Russian thistle	2009–2010	27/50	4.72 (1.42)
		2013	36/102	2.12 (0.63)
		2016	22/100	1.24 (0.36)
Tamarix spp.	tamarisk	2009–2010	3/50	2.27 (1.49)
		2013	10/102	2.37 (0.92)
		2016	9/100	1.37 (0.56)
Tribulus terrestris[1]	puncturevine	2009–2010	2/50	0.26 (0.25)
		2013	0/102	0.00 (0.00)
		2016	0/100	0.00 (0.00)
All invasive species		**2009–2010**	**36/50**	**8.42 (2.04)**
		2013	**73/102**	**5.66 (1.66)**
		2016	**56/100**	**5.08 (0.77)**

[1]These species were consistently mapped in transects from 2011 to 2016, but not in earlier years.

[2]Not on priority list, but species that is consistently recorded in all transects.

Table 3-5. Number of monitoring transects where exotic plant species were detected/total number of transects monitored, mean percent cover, and standard error by sampling area along Pleasant Creek, Capitol Reef NP in 2010, 2014, and 2016.

Scientific name	Common name	Year	Detected/Total	Percent cover (SE)
Agropyron cristatum[1]	crested wheatgrass	2010	0/20	0.00 (0.00)
		2014	0/19	0.00 (0.00)
		2016	1/20	0.42 (0.42)
Bromus tectorum[2]	cheatgrass	2010	0/20	0.00 (0.00)
		2014	2/19	1.23 (0.85)
		2016	10/20	2.77 (2.49)
Salsola sp.[2]	Russian thistle	2010	6/20	5.13 (3.00)
		2014	4/19	1.95 (1.75)
		2016	3/20	0.27 (0.18)
Tamarix spp.	tamarisk	2010	1/20	0.67 (0.67)
		2014	1/19	1.40 (1.40)
		2016	2/20	0.03 (0.02)
All invasive species		**2010**	**7/20**	**5.80 (3.02)**
		2014	**5/19**	**4.58 (2.24)**
		2016	**12/20**	**3.49 (2.55)**

[1]These species were consistently mapped in transects from 2011 to 2016, but not in earlier years.

[2]Not on priority list, but species that is consistently recorded in all transects.

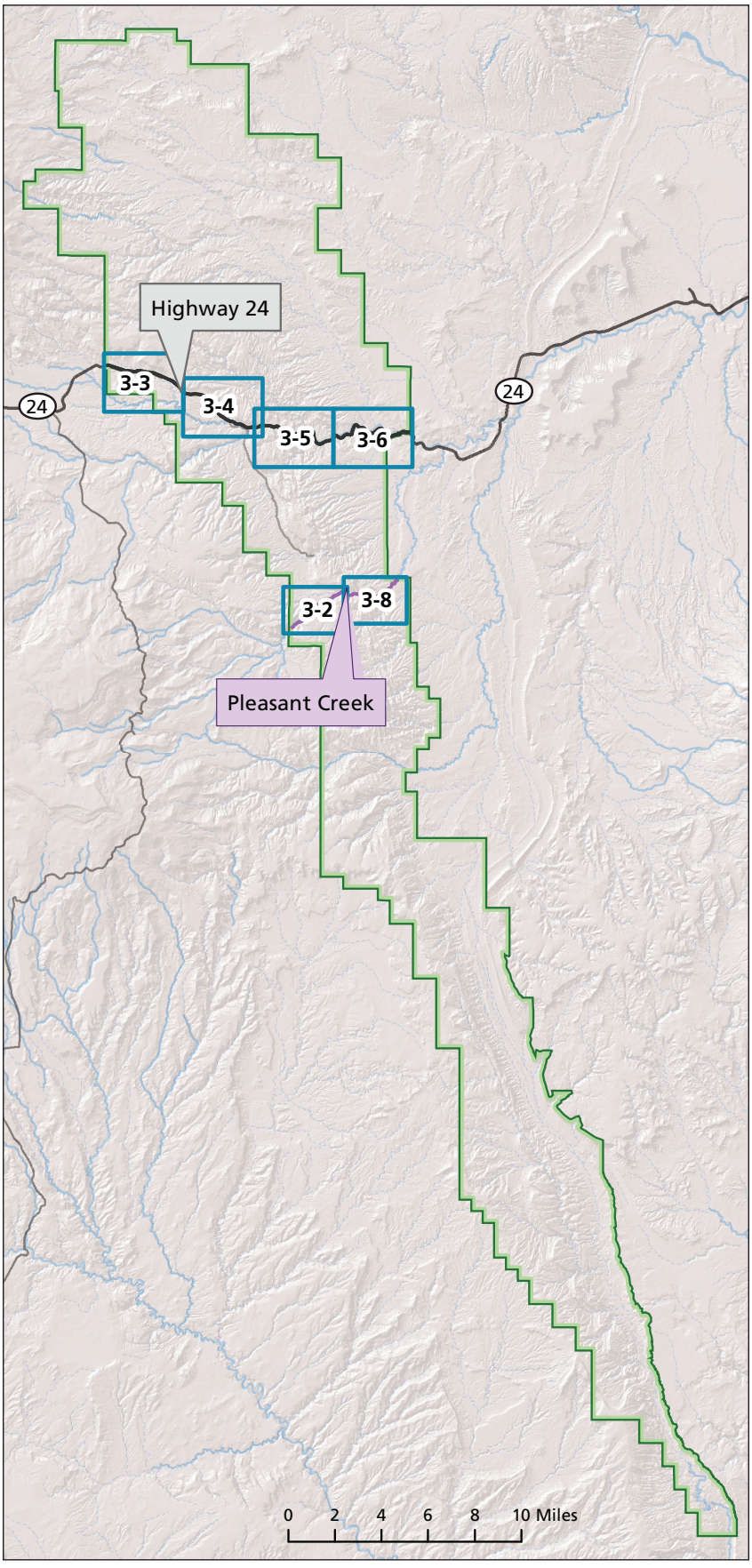


Figure 3-1. Monitoring routes completed at Capitol Reef NP, June 14–18, 2016.

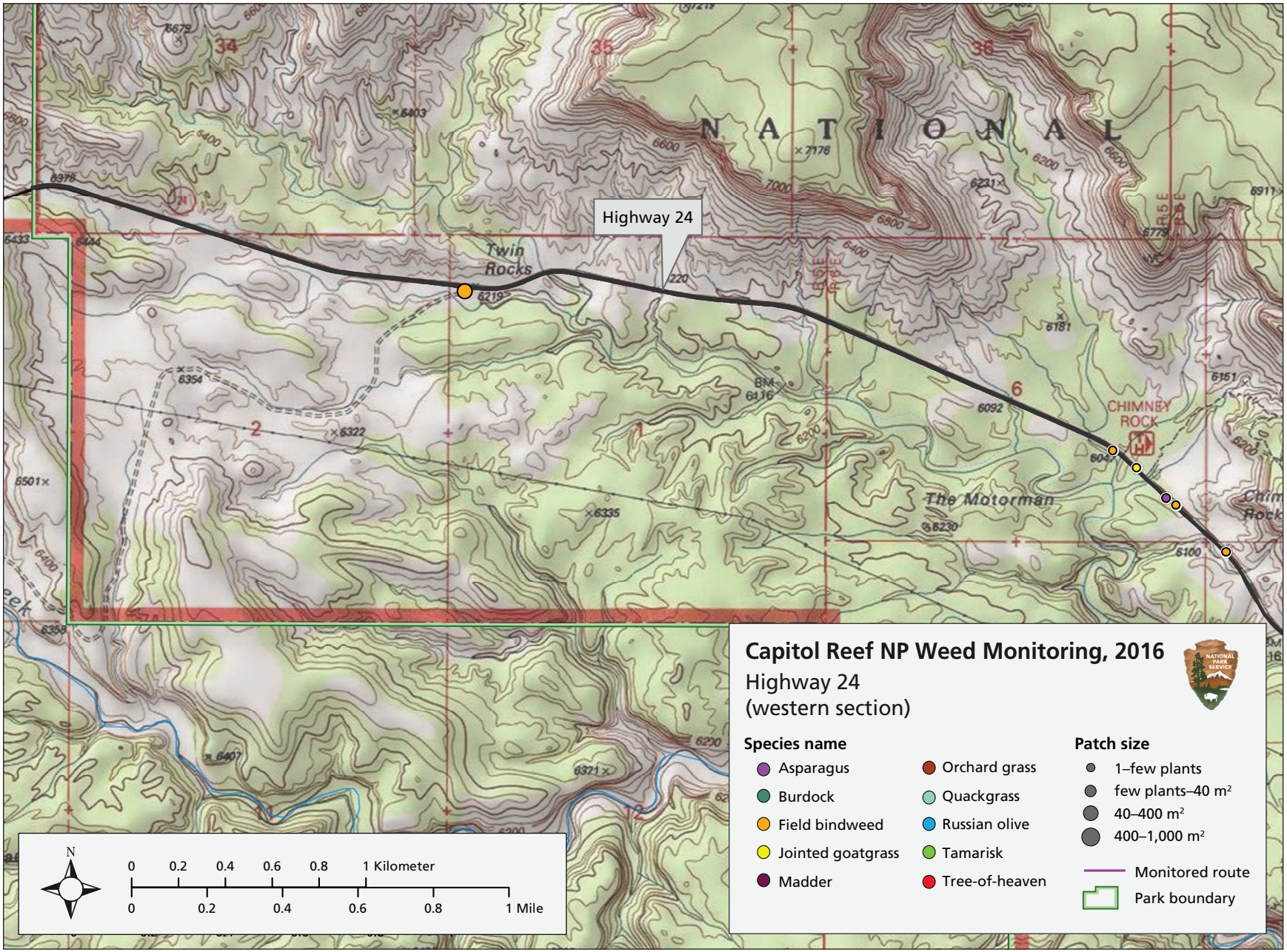


Figure 3-2. Priority invasive exotic plants detected on the western section of the Highway 24 monitoring route in Capitol Reef National Park, June 14–18, 2016.

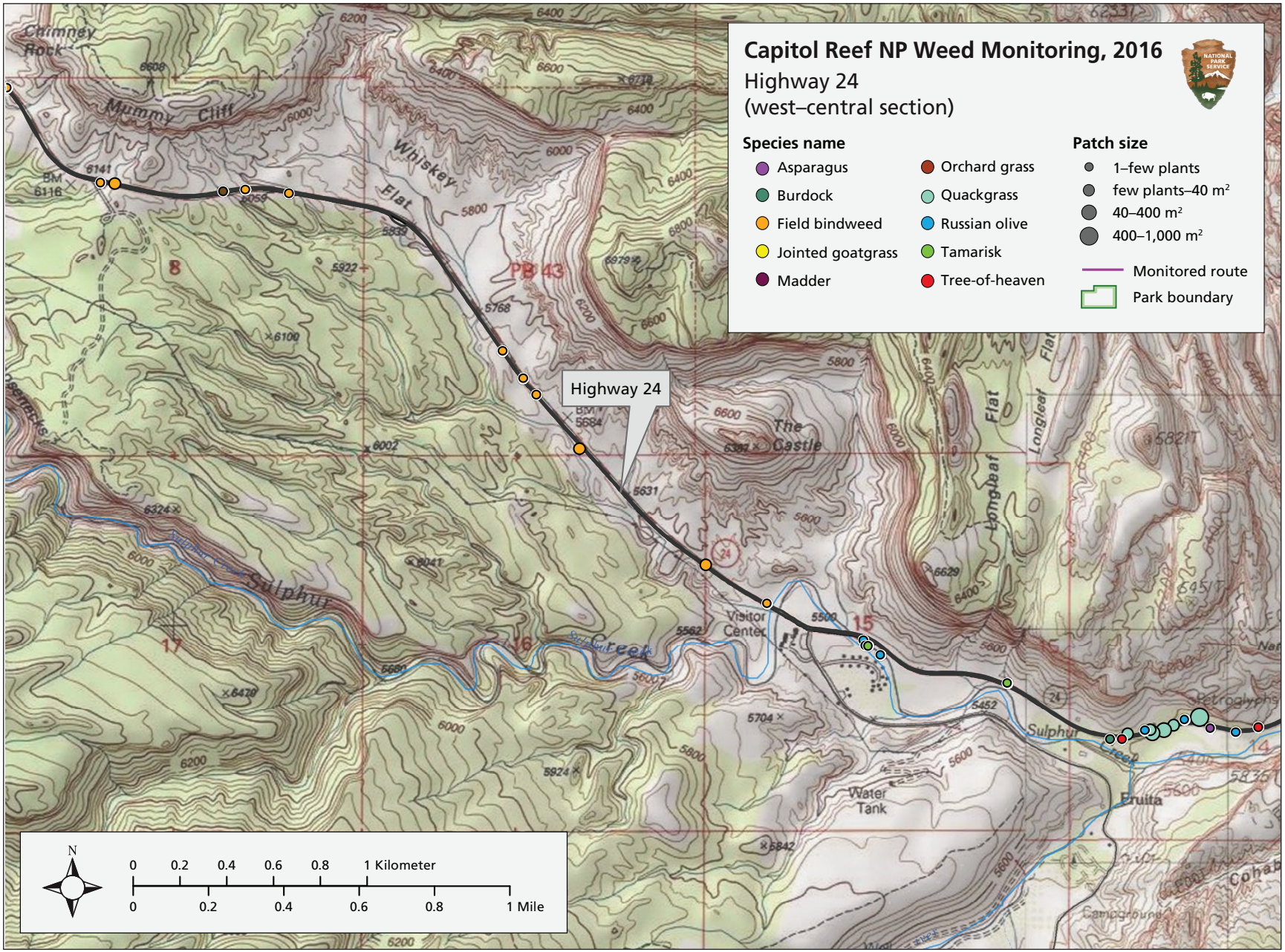


Figure 3-3. Priority invasive exotic plants detected on the west-central section of the Highway 24 monitoring route in Capitol Reef National Park, June 14–18, 2016.

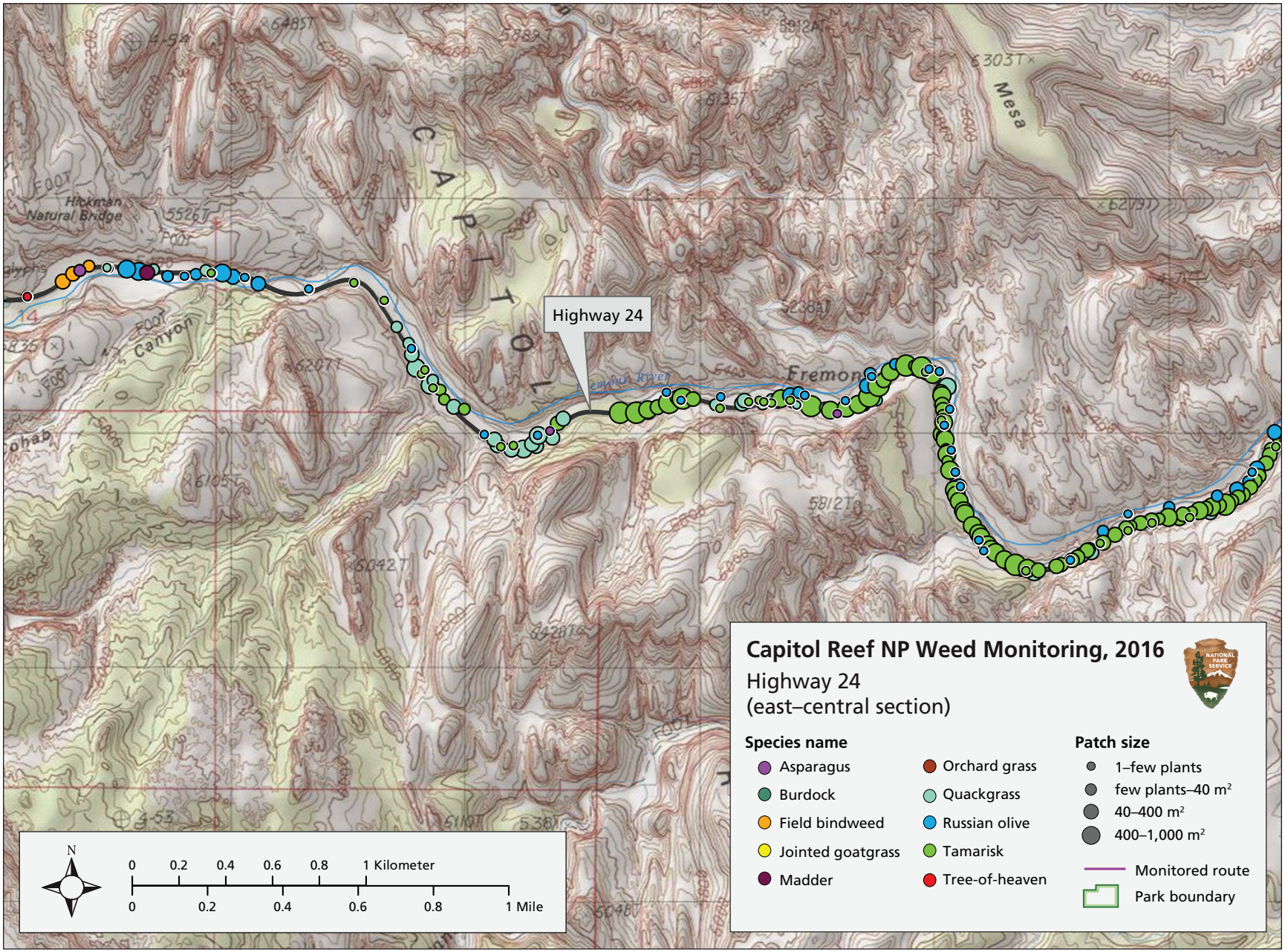


Figure 3-4. Priority invasive exotic plants detected on the east-central section of the Highway 24 monitoring route in Capitol Reef National Park, June 14–18, 2016.

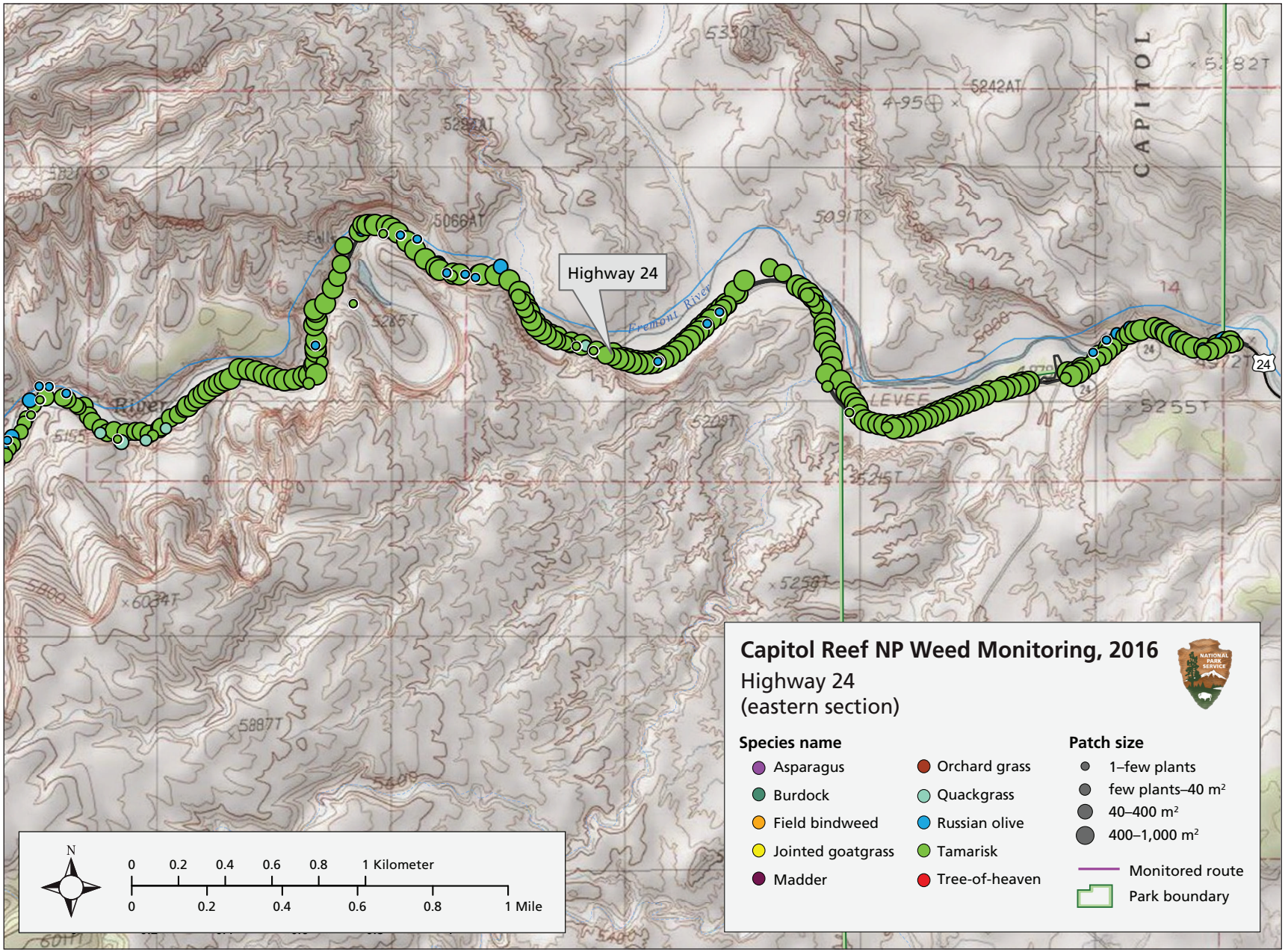


Figure 3-5. Priority invasive exotic plants detected on the eastern section of the Highway 24 monitoring route in Capitol Reef National Park, June 14–18, 2016.

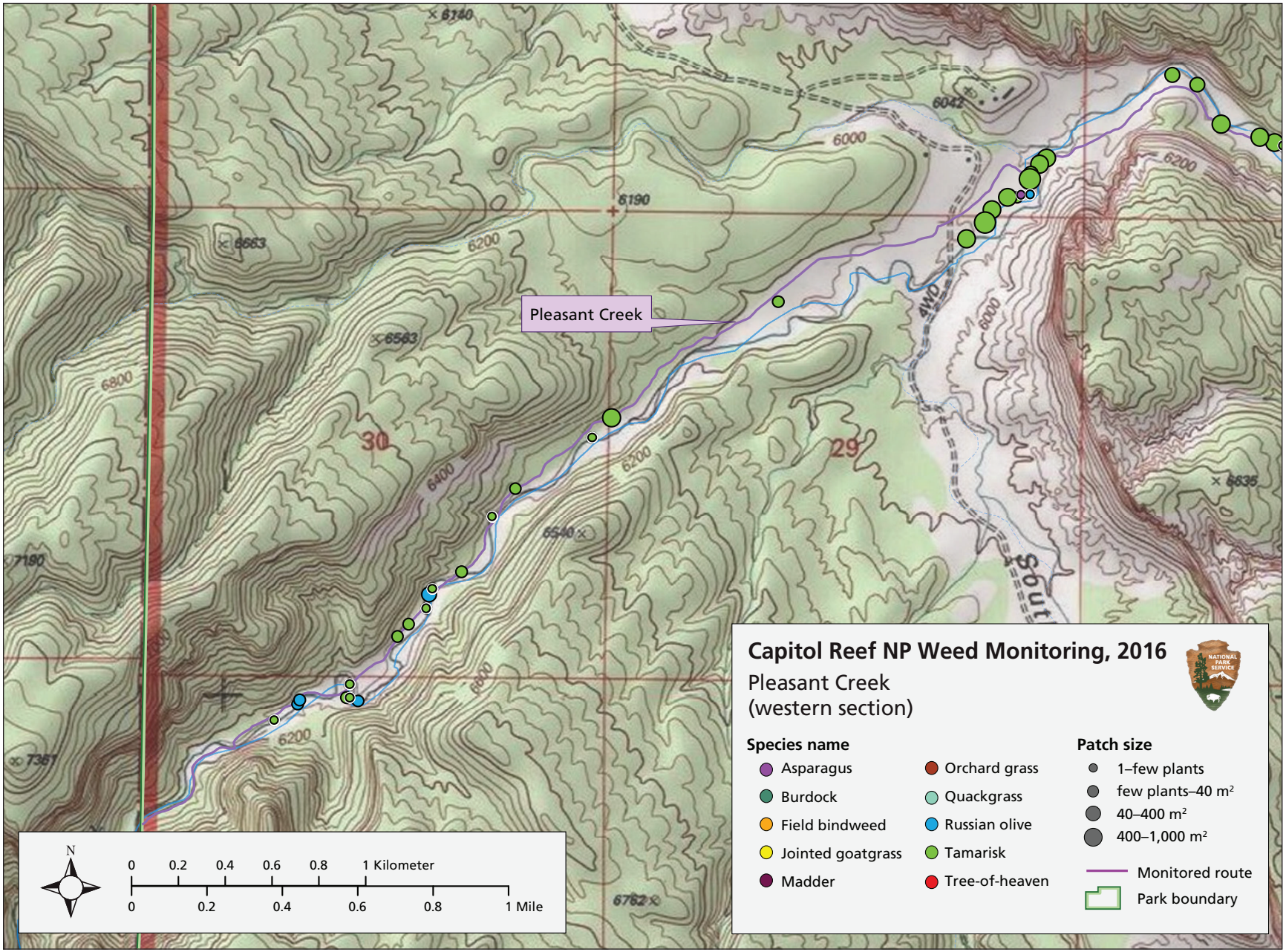


Figure 3-6. Priority invasive exotic plants detected on the western section of Pleasant Creek monitoring route in Capitol Reef National Park, June 14–18, 2016.

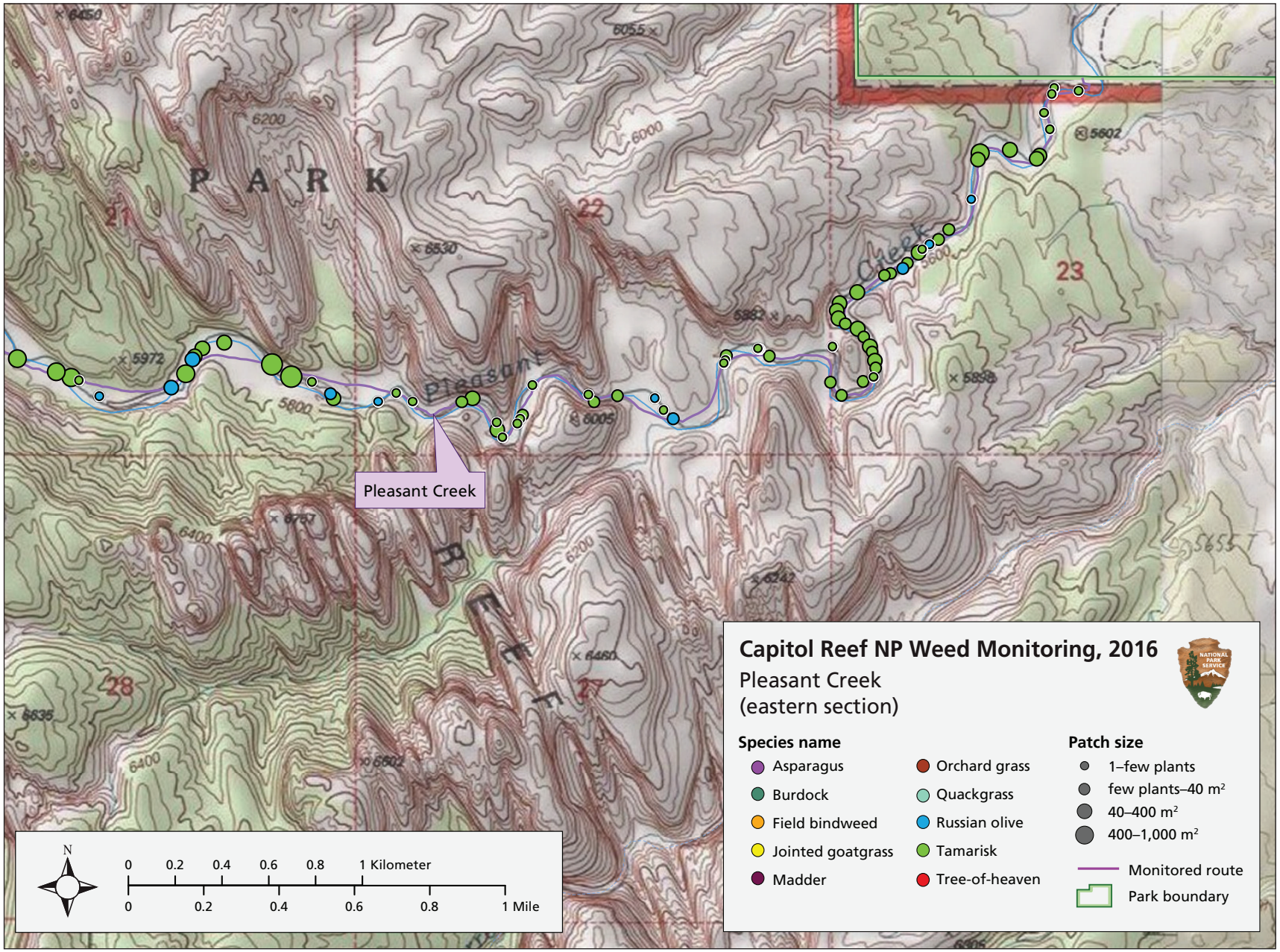


Figure 3-7. Priority invasive exotic plants detected on the eastern section of Pleasant Creek monitoring route in Capitol Reef National Park, June 14–18, 2016.

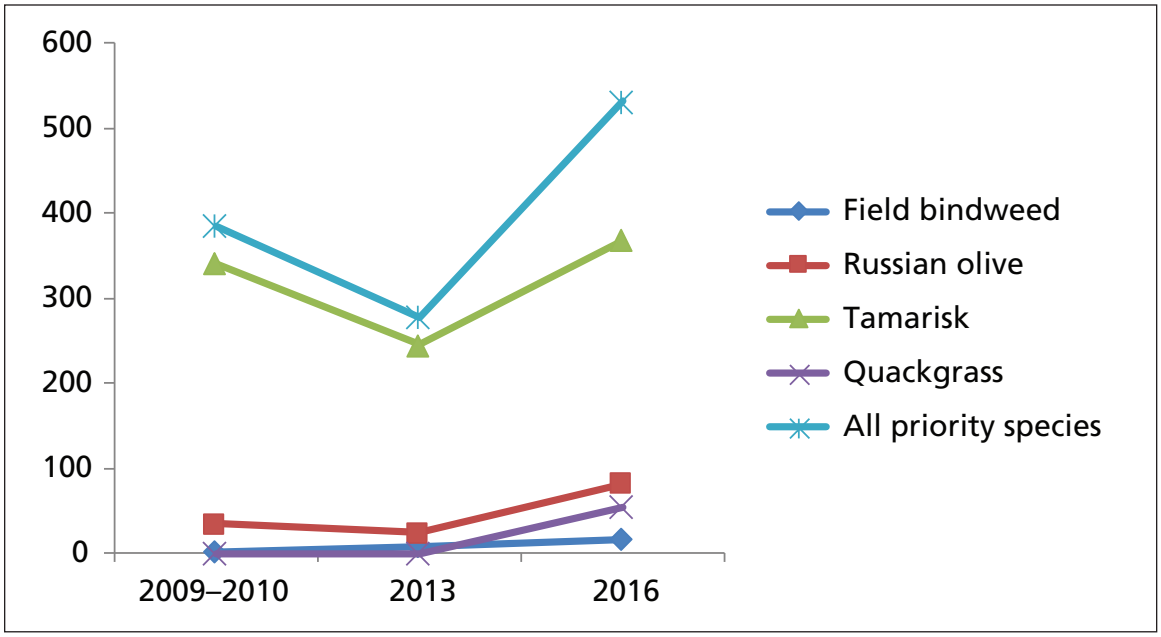


Figure 3-8. Patches per kilometer of the highest density priority invasive species that were consistently recorded on monitoring routes in all years and for all priority species found along the Highway 24 monitoring route at Capitol Reef NP, 2009–2016.

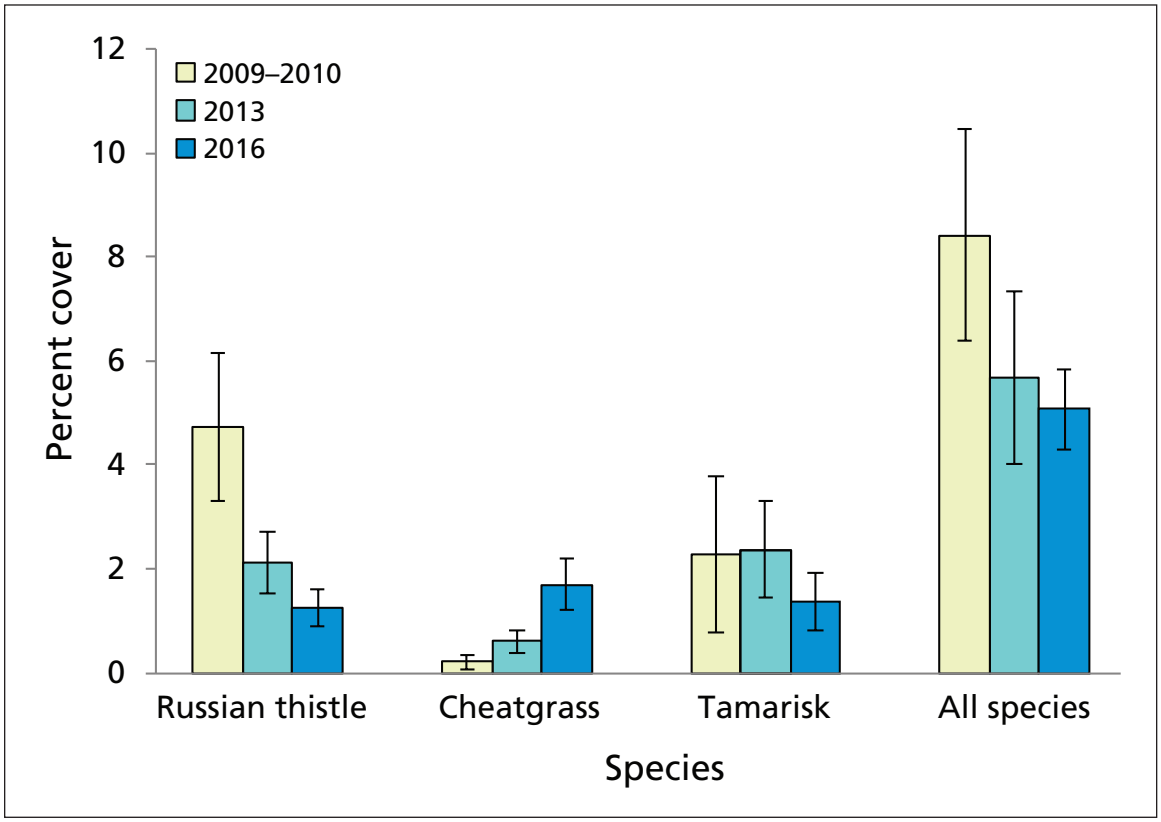


Figure 3-9. Percent cover and standard error of invasive species that were consistently recorded in transects in all years and percent cover of total invasive species found along the Highway 24 monitoring route at Capitol Reef NP, 2009–2016.

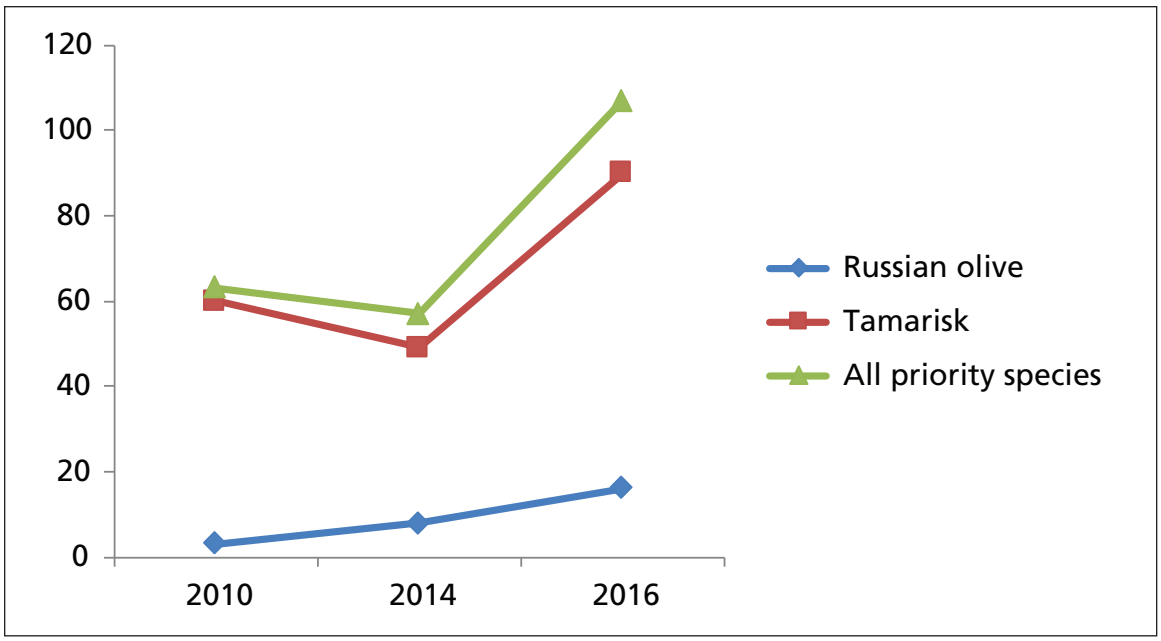


Figure 3-10. Patches per kilometer of the highest density priority invasive species that were consistently recorded on monitoring routes in all years and for all priority species found along the Pleasant Creek monitoring route at Capitol Reef NP, 2010–2016.

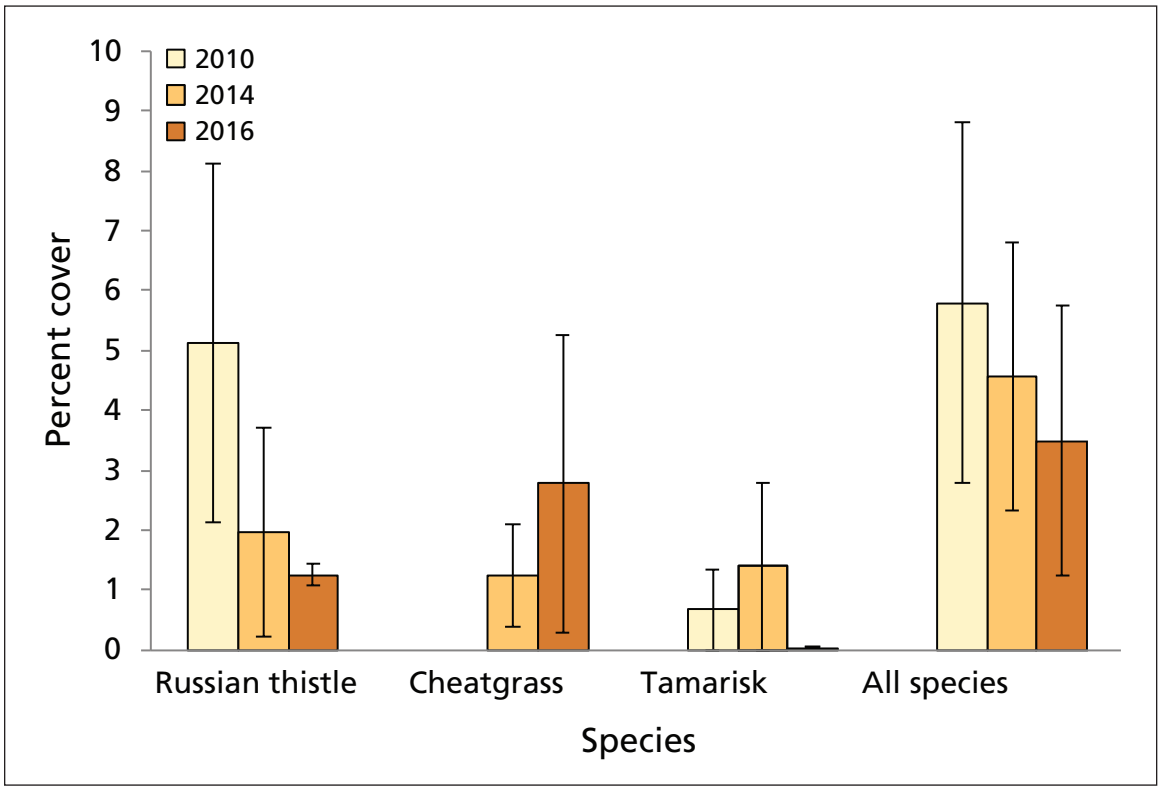


Figure 3-11. Percent cover and standard error of invasive species that were consistently recorded in transects in all years and percent cover of total invasive species found along the Pleasant Creek monitoring route at Capitol Reef NP, 2010–2016.

4 Discussion

4.1 Priority invasive exotic plant list

The NCPN will continue to work with park staff and area IEP experts to review and update the list of priority species each year. Presence and absence data for most priority species, and presence data for other species, should be reliable for the area surveyed. However, absence data for non-priority species are suspect, because not all observers recorded all of these species in all years. We suggest that madder and jointed goatgrass be added to the priority list.

4.2 Possibilities for management control

The park has targeted tree-of-heaven and Russian knapweed (*Centaurea repens*) for control efforts since the IEP inventories of 2003–2005. Both species had remained absent from all monitoring routes until two tree-of-heaven patches were detected along the Highway 24 route in 2016. Asparagus also went from five patches along this route in 2009–2010 to none in 2013 to five in 2016. Russian olive was recorded in the highest number of patches of the four sampling periods for both Highway 24 and Pleasant Creek. There was also a larger number of patches in the more than 40-m^2 size class in 2016 than in any other time period. These large increases may be due in part to loss of a key staff member who routinely patrolled those areas and brought volunteers in for control projects.

Tamarisk invasion along the two monitoring routes increased from the previous sampling period, as did the number of patches larger than 40 m^2. Park staff is hoping that defoliation by the tamarisk beetle (*Diorhabda carinulata*) will make future control efforts easier. The tamarisk beetle's presence was confirmed for the first time along the Fremont River (Highway 24 monitoring route) in 2010 (G. Lenhart, pers. comm.). However, the beetle had not been detected in Pleasant or Oak creeks, Scenic Drive, or Cathedral Valley Road as of the end of the 2016 field season (S. Borthwick, pers. comm.). Continued monitoring will show the effects of both future control efforts and the tamarisk beetle as a biological control agent. Mortality of tamarisk from the beetle has required several years of defoliation at Dinosaur National Monument (NM); however, stem mortality can allow native species to colonize and compete with tamarisk stands (Williams 2013). Stem mortality at Dinosaur NM increased substantially in 2013, seven years after the first releases of tamarisk beetle.

Jointed goatgrass, tree-of-heaven, burdock, and quackgrass were all noted for the first time or after being absent in the previous sample period along Highway 24. Asparagus was noted for the first time in Pleasant Creek and after being absent in the previous sample period along the Highway 24 route. These small patches should be controlled before they become too widespread. It is encouraging that data from these reports are quickly used by the park, as park staff have eradicated the madder and tree-of-heaven patches that were detected.

It should be noted that estimates of percent cover in this report (see Table 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.

4.3 Future monitoring efforts

IEPs at Capitol Reef NP will generally be monitored at the same time of year each time monitoring occurs. 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 May through September is not expected to drastically alter the chances of detecting invasive species at a level larger than the minimum detection target size. The NCPN will not visit Capitol Reef NP in 2017. We will return in 2018 to continue work on the third round of NCPN monitoring. We may also complete some extra-area surveys in locations yet to be determined. Because any previous detections could have been eradicated by park staff, the locations of monitoring quadrats are re-generated each year. Long-term trend reporting will fo-

cus on trends in species distributions, trends in percent cover of individual species, and changes in IEP percent cover of priority species by monitoring route.

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Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Aegilops cylindrica	Jointed goatgrass	0		4240868.411	473344.758	2	1
Highway 24	Ailanthus altissima	Tree-of-heaven	0	Sapling(s)	4237726.804	478488.863	2	1
Highway 24	Ailanthus altissima	Tree-of-heaven	0	Sapling(s)	4237776.296	479071.649	3	1
Highway 24	Arctium minus	Burdock	0		4237897.621	479421.278	2	1
Highway 24	Arctium minus	Burdock	0		4237726.72	478438.975	5	1
Highway 24	Asparagus officinalis	Asparagus	0		4237201.943	481304.634	2	1
Highway 24	Asparagus officinalis	Asparagus	0		4237275.917	482532.029	5	1
Highway 24	Asparagus officinalis	Asparagus	0		4237772.16	478866.134	2	1
Highway 24	Asparagus officinalis	Asparagus	0		4240740.173	473471.153	2	1
Highway 24	Asparagus officinalis	Asparagus	0		4237887.666	479295.801	2	2
Highway 24	Convolvulus arvensis	Field bindweed	0		4240509.467	473725.873	2	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4240104.859	474125.43	5	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4238304.82	476973.538	2	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4240057.83	474930.043	1	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4240709.388	473513	5	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4239197.229	475988.353	3	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4240943.338	473244.036	2	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4240073.735	474744.76	5	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4239266.91	475930.935	5	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4239383.996	475843.987	5	1
Highway 24	Convolvulus arvensis	Field bindweed	0		4238965.311	476171.312	1	2
Highway 24	Convolvulus arvensis	Field bindweed	0		4240098.763	474186.789	2	2
Highway 24	Convolvulus arvensis	Field bindweed	0		4238469.312	476711.755	2	2
Highway 24	Convolvulus arvensis	Field bindweed	0		4237906.956	479334.296	2	2
Highway 24	Convolvulus arvensis	Field bindweed	0		4237873.291	479267.07	2	3
Highway 24	Convolvulus arvensis	Field bindweed	0		4241623.451	470479.001	2	3
Highway 24	Convolvulus arvensis	Field bindweed	0		4237840.893	479223.119	2	3
Highway 24	Dactylis glomerata	Orchard grass	0		4240066.969	474649.556	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237735.598	486264.337	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4238126.494	477392.444	4	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237331.481	482568.271	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237366.571	487095.948	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237433.801	482679.787	3	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237025.718	484305.05	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237574.935	487351.657	4	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237258.202	484442.716	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4238084.69	477457.804	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237366.001	482366.868	2	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237483.16	489050.004	4	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237334.905	488917.522	4	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237510.972	489103.958	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237197.937	484401.453	3	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4236952.268	484240.733	3	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4237445.337	489511.053	3	5
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237887.001	486058.054	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237755.267	478975.174	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236649.884	483527.082	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237453.797	489005.41	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237332.887	481864.065	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237226.016	482989.758	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237026.079	483036.644	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237904.063	485988.387	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236734.662	483137.174	3	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237295.491	483013.274	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236846.013	483775.772	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237183.532	481250.777	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237187.525	481024.855	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237858.054	479999.198	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237763.578	478586.991	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237432.426	485623.864	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237525.078	487298.971	3	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237348.357	482033.905	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4238147.312	477384.723	2	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237466.703	482925.372	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237809.532	478756.98	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237554.702	480712.629	5	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236964.554	483059.428	2	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237402.256	488948.551	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237363.523	487087.928	4	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237119.941	483020.234	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237721.491	486307.507	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237256.257	484486.009	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237366.176	481802.536	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237456.287	482968.154	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237227.13	484558.804	3	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237808.043	480274.194	3	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237355.365	482393.176	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237923.545	485821.217	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236875.217	483951.929	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236773.685	483668.002	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236925.082	484155.63	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237871.569	479791.831	1	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237476.032	486637.236	2	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237426.922	489362.631	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236985.784	484290.256	2	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237486.407	482780.772	2	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237448.48	482672.224	2	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237419.538	489418.862	3	2
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237041.551	484325.68	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237673.845	486489.125	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4236965.619	483052.935	1	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237782.959	486149.103	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237958.522	485864.67	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237355.636	482329.564	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237830.918	480058.781	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237860.541	479949.981	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237768.93	486415.703	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237513.723	486584.19	2	3
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237393.336	482658.953	2	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237884.583	486008.812	1	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237876.934	479904.466	2	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237894.161	479496.852	2	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237883.517	479548.351	1	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237458.386	489310.579	2	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237492.63	489250.5	2	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4237737.656	486320.121	2	4
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Seedling(s)	4237741.886	486185.379	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Seedling(s)	4237862.676	479742.826	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Seedling(s)	4236688.765	483158.813	5	1
Highway 24	Elaeagnus angustifolia	Russian-olive	0	Seedling(s)	4237863.421	479671.287	1	2
Highway 24	Elymus repens	Quackgrass	0		4237312.329	482358.971	3	1
Highway 24	Elymus repens	Quackgrass	0		4237900.944	479412.169	2	1
Highway 24	Elymus repens	Quackgrass	0		4237179.888	482980.051	2	2
Highway 24	Elymus repens	Quackgrass	0		4236881.998	484209.932	3	2
Highway 24	Elymus repens	Quackgrass	0		4237333.085	482700.431	2	2
Highway 24	Elymus repens	Quackgrass	0		4237318.068	482213.841	3	2
Highway 24	Elymus repens	Quackgrass	0		4236606.936	483317.574	4	2
Highway 24	Elymus repens	Quackgrass	0		4237431.686	486779.552	1	2
Highway 24	Elymus repens	Quackgrass	0		4236628.864	483261.259	1	2
Highway 24	Elymus repens	Quackgrass	0		4236788.37	483099.651	3	2
Highway 24	Elymus repens	Quackgrass	0		4237026.15	484898.752	3	2
Highway 24	Elymus repens	Quackgrass	0		4237419.982	480803.595	3	2
Highway 24	Elymus repens	Quackgrass	0		4237748.095	478513.912	3	2
Highway 24	Elymus repens	Quackgrass	0		4237764.408	478610.497	3	2
Highway 24	Elymus repens	Quackgrass	0		4237887.554	479833.486	3	2
Highway 24	Elymus repens	Quackgrass	0		4237785.419	478710.327	2	2
Highway 24	Elymus repens	Quackgrass	0		4237645.382	480650.176	3	2
Highway 24	Elymus repens	Quackgrass	0		4237576.397	480701.535	4	2
Highway 24	Elymus repens	Quackgrass	0		4237892.132	479612.316	3	2
Highway 24	Elymus repens	Quackgrass	0		4237332.958	481872.329	4	2
Highway 24	Elymus repens	Quackgrass	0		4237335.608	482252.292	3	2
Highway 24	Elymus repens	Quackgrass	0		4237314.283	482012.791	2	2

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Elymus repens	Quackgrass	0		4237077.122	484985.036	5	2
Highway 24	Elymus repens	Quackgrass	0		4237299.845	482480.697	3	2
Highway 24	Elymus repens	Quackgrass	0		4237058.571	484703.84	4	2
Highway 24	Elymus repens	Quackgrass	0		4236681.85	483617.162	2	3
Highway 24	Elymus repens	Quackgrass	0		4236854.34	484124.91	4	3
Highway 24	Elymus repens	Quackgrass	0		4237329.316	482278.056	2	3
Highway 24	Elymus repens	Quackgrass	0		4237145.879	481227.798	3	3
Highway 24	Elymus repens	Quackgrass	0		4237254.499	481362.396	4	3
Highway 24	Elymus repens	Quackgrass	0		4237165.642	481067.648	4	3
Highway 24	Elymus repens	Quackgrass	0		4237305.645	480894.122	3	3
Highway 24	Elymus repens	Quackgrass	0		4237751.41	478620.085	1	3
Highway 24	Elymus repens	Quackgrass	0		4237530.087	480714.588	2	3
Highway 24	Elymus repens	Quackgrass	0		4237318.594	482637.227	2	3
Highway 24	Elymus repens	Quackgrass	0		4237120.708	481139.455	2	3
Highway 24	Elymus repens	Quackgrass	0		4237141.608	481080.284	2	3
Highway 24	Elymus repens	Quackgrass	0		4237137.2	481246.025	3	3
Highway 24	Elymus repens	Quackgrass	0		4237171.65	481315.537	2	3
Highway 24	Elymus repens	Quackgrass	0		4237319.084	482125.374	3	3
Highway 24	Elymus repens	Quackgrass	0		4237281.632	481723.783	3	3
Highway 24	Elymus repens	Quackgrass	0		4237763.738	478669.059	2	3
Highway 24	Elymus repens	Quackgrass	0		4236671.789	483576.86	2	3
Highway 24	Elymus repens	Quackgrass	0		4237331.545	482135.963	3	3
Highway 24	Elymus repens	Quackgrass	0		4237345.272	481848.771	3	3
Highway 24	Elymus repens	Quackgrass	0		4237020.099	484793.429	4	3
Highway 24	Elymus repens	Quackgrass	0		4237450.372	482915.451	3	3
Highway 24	Elymus repens	Quackgrass	0		4236600.086	483373.818	2	4
Highway 24	Elymus repens	Quackgrass	0		4237819.908	478820.618	3	4
Highway 24	Elymus repens	Quackgrass	0		4237123.651	481191.816	2	4
Highway 24	Elymus repens	Quackgrass	0		4237181.739	481254.784	3	4
Highway 24	Elymus repens	Quackgrass	0		4237471.359	480731.912	3	4
Highway 24	Elymus repens	Quackgrass	0		4237397.637	480793.078	2	4
Highway 24	Elymus repens	Quackgrass	0		4237389.594	483002.158	3	4
Highway 24	Rubia tinctoria	Madder	0		4237877.96	479583.686	3	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0		4237248.302	482977.865	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237144.335	487905.785	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237332.957	482329.988	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237428.454	486739.33	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237332.888	482198.967	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237199.195	484446.435	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237611.103	485785.459	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236720.912	483656.284	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237409.135	486812.542	5	1
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237255.788	487813.936	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237081.392	488066.575	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237337.281	482273.497	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237291.193	488830.758	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236825.879	483908.048	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236795.359	483786.077	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237728.566	486205.562	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237176.084	482994.85	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237071.45	483004.18	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237268.292	482984.205	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237122.163	482998.422	2	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237480.169	482862.494	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237451.582	482932.347	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236698.726	483612.595	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236854.503	484047.503	3	2
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237646.376	487727.268	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237369.123	482976.061	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237641.561	486490.757	2	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237601.49	487765.159	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237443.281	486690.097	2	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237168.751	484611.352	2	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237337.869	481915.466	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237438.852	489560.912	2	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236988.984	484314.629	1	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236629.346	483489.404	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236900.964	484216.165	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236883.39	484162.309	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237099.365	484379.658	2	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237315.01	482979.918	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237419.267	482730.26	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236661.93	483560.689	2	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236869.666	484106.706	4	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236930.364	484264.606	3	3
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237460.55	486641.069	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237424.692	489033.499	4	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237588.536	486518.603	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237347.788	488937.581	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237078.817	484707.418	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237428.846	489502.494	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237386.993	488991.19	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237407.773	489448.412	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236763.126	483136.251	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237201.233	484563.425	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236859.838	483072.223	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236615.139	483345.003	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236682.066	483207.148	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237173.354	484634.615	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237392.353	486865.512	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237065.613	484854.54	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236927.226	483041.332	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237059.869	484814.62	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237137.268	485036.957	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237076.1	484958.333	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236797.254	483110.145	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236651.908	483247.001	1	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236714.243	483174.561	1	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237123.244	485004.174	3	4

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237069.226	484762.59	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237107.969	484669.965	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237053.081	484911.451	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237605.294	487382.746	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237412.871	486825.416	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237856.907	485746.037	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237723.615	485718.963	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237764.786	487566.484	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237610.857	487767.937	3	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237740.878	487621.581	2	4
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237384.719	487138.248	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237098.474	488187.264	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237141.231	488292.393	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237497.2	489152.759	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237082.032	488126.005	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237207.289	488460.565	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237267.082	488620.027	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237509.787	487283.257	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237539.654	486547.582	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237184.978	488403.471	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237361.485	486972.963	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237121.357	488240.507	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237495.02	486587.264	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237482.484	489106.362	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237237.728	488539.6	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237433.979	489479.098	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237422.012	489375.995	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237420.798	489016.091	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237447.518	489324.693	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237314.13	488884.562	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237317.696	488838.813	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237506.333	489211.321	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237336.632	488898.551	2	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237388.541	488972.625	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237277.387	488673.852	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237252.161	488596.481	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237163.44	488347.573	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237483.264	489263.773	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237449.982	489533.558	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237266.362	488658.261	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237383.604	487832.222	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237091.545	488056	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237429.432	487195.27	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237209.824	485123.581	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237434.18	486764.042	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237418.837	489423.678	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237354.064	487028.902	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237374.734	486919.745	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237445.101	486718.026	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4236629.394	483294.248	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237360.611	487077.786	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237471.044	487239.722	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237561.135	487339.371	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237357.086	485622.634	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237802.624	486091.928	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237943.616	485927.79	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237172.443	485078.717	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237305.682	485595.673	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237711.05	486453.839	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237617.539	486516.835	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237572.782	486538.114	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237739.31	486212.314	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237914.274	485975.185	1	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237841.687	486051.046	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237918.972	485812.311	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237329.657	485334.878	2	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237532.96	486563.902	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237661.114	486496.4	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237946.744	485879.015	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237501.2	486596.854	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237467.969	486658.695	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237876.57	486016.859	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237404.928	485625.871	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237736.314	486331.775	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237612.519	485665.683	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237290.09	485260.066	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237947.216	485844.753	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237289.302	485534.045	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237733.798	486393.525	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237215.403	488453.523	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237308.486	485402.427	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237241.254	485165.07	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237754.172	486155.345	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237440.357	487800.408	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237309.744	487808.813	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237107.145	488178.889	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237501.553	487802.283	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237449.046	489054.184	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237610.303	487380.267	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237656.151	487731.633	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237183.767	487930.479	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237193.973	488398.362	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237270.505	485211.294	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237454.21	485626.319	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237233.224	487894.691	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237150.62	488291.068	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237235.844	488505.697	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237126.693	488232.241	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237091.147	488117.82	3	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237664.547	487416.511	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237103.057	488000.323	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237134.667	487951.002	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237171.147	488342.203	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237365.861	486993.75	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237378.076	486941.321	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237376.992	487106.963	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237407.902	487157.443	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237399.554	486896.666	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237540.627	485628.134	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237291.116	485461.185	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237708.345	487458.31	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237585.347	485619.546	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237570.953	487336.345	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237678.344	485697.806	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237688.61	487682.958	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237482.781	487244.009	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237529.195	487291.339	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237445.155	487200.963	3	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237363.491	487052.203	2	5
Highway 24	Tamarix sp.	tamarisk	0	Mature Tree(s)	4237255.327	488567.338	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237326.69	482217.762	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237032.043	484777.833	2	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237299.19	482030.448	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237910.336	485912.683	4	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237320.571	482251.485	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236831.956	484038.34	2	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236604.89	483337.872	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236775.548	483775.325	3	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237463.558	480771.112	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237135.207	481093.798	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237876.529	479857.545	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237836.531	480467.188	5	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237445.149	480754.709	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237384.826	480804.795	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236809.286	483876.854	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237454.595	482908.948	3	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237758.934	480596.748	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4238123.712	477404.696	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237139.789	481147.721	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237964.97	477998.819	5	1
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237270.515	485593.858	1	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237361.991	485651.736	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237046.382	484928.426	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237312.303	482649.008	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236862.767	483059.033	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237376.958	480835.314	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237336.753	480853.937	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237462.953	482865.012	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237295.489	480937.475	2	2
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237562.023	486536.164	1	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237176.766	484600.293	3	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237329.078	482346.61	1	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237626.837	487748.126	1	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236622.962	483468.356	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237303.946	481763.996	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237372.95	488971.764	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237404.102	489421.614	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236819.631	483875.388	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236648.11	483534.707	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237435.855	486710.375	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236807.603	483827.339	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236758.252	483719.752	1	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236724.931	483667.65	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237064.226	484364.82	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237176.756	484420.542	1	3

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236961.045	484297.982	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236918.284	484246.294	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237121.152	484388.238	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237291.799	482983.857	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237010.01	484332.925	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236785.771	483767.015	1	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236691.209	483600.635	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236845.429	484010.639	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236830.603	483994.677	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237233.837	481337.556	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236606.12	483392.934	2	3
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237316.349	482621.803	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237589.662	487366.432	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237298.473	482570.706	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237339.524	482292.239	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237454.578	482758.901	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237406.995	489013.31	4	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237291.591	481722.376	3	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237438.194	489537.766	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236950.646	483032.925	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236748.599	483146.161	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236900.751	483052.99	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236832.943	483947.219	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237620.33	486505.55	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237210.345	484470.556	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236860.949	484080.464	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237453.176	486656.454	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236876.385	484132.111	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237161.397	485064.987	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237208.779	484545.299	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237034.749	483012.159	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237102.43	483001.35	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237165.553	482994.139	2	4

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237238.467	482987.885	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237291.309	482503.577	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237353.038	482979.372	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237443.056	482939.607	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237064.961	484877.411	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236696.4	483191.497	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236848.589	483078.068	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237383.348	486891.972	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237130.483	484652.265	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237948.464	485821.695	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237058.819	484734.934	3	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237083.321	484964.993	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237190.568	485101.19	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237187.822	482981.414	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237378.31	488960.561	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237469.839	489082.774	2	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237780.301	485734.248	1	4
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237129.318	488265.749	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237516.124	486564.578	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237173.008	488373.6	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237077.908	488095.708	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237196.841	488433.596	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237087.874	488156.615	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237492.147	487262.278	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237454.755	487221.494	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237435.301	489346.356	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237470.016	489286.12	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237491.77	489129.361	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237153.709	488326.066	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237499.348	489237.881	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237482.582	482826.811	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237141.109	488265.428	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237161.179	488316.669	2	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237272.694	488646.977	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237464.174	487222.323	3	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237474.015	482891.89	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237325.233	488901.189	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237348.022	482668.527	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237218.683	488487.109	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237244.429	488568.058	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237301.568	488857.749	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237110.851	488215.958	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237418.424	489474.739	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237323.452	481813.123	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237260.554	488629.233	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237309.662	485626.678	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237354.929	487001.174	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237280.769	481673.834	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237339.929	481872.075	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237406.418	487169.142	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237394.179	482708.19	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237367.572	486946.683	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237540.475	487314.232	3	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4236888.083	484190.639	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237356.325	487056.876	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237372.738	487111.921	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237280.97	481603.853	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237346.565	485617.737	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237422.139	485622.889	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237479.953	486609.854	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237932.603	485952.042	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237284.069	485492.147	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237477.982	486629.619	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237735.943	486240.483	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237586.454	486531.446	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237320.575	485368.55	3	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237764.775	486139.865	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237300.654	485573.237	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237300.25	485432.935	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237225.43	485145.991	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237508.143	487268.399	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237281.947	485235.336	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237258.962	485191.245	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237519.247	485618.474	3	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237331.624	485298.776	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237583.979	487783.76	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237372.681	486962.359	3	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237468.787	487802.442	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237164.514	487939.991	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237095.145	488029.577	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237407.632	487823.152	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237112.177	487972.858	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237674.617	487707.273	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237654.243	487427.035	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237635.277	487750.97	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237527.332	487799.646	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237319.496	488870.243	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237210.883	487912.524	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237204.519	488424.146	1	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237183.427	488373.008	3	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237090.647	488090.065	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237115.703	488205.21	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237576.42	485625.384	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237096.983	488148.315	3	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237390.27	487133.201	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237281.214	487868.357	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237362.687	487022.828	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237591.081	487358.811	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237337.32	487830.221	2	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237307.963	482419.369	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237368.696	487079.638	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237549.05	487312.758	2	5
Highway 24	Tamarix sp.	tamarisk	0	Sapling(s)	4237426.668	487178.819	2	5
Highway 24	Tamarix sp.	tamarisk	0	Seedling(s)	4237325.619	482154.64	5	1
Highway 24	Tamarix sp.	tamarisk	0	Seedling(s)	4237135.057	484407.294	5	1
Pleasant Creek	Asparagus officinalis	Asparagus	0		4226032.376	484403.842	3	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4226145.55	485366.697	5	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Mature Tree(s)	4224307.707	481940.6	3	2
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226665.263	488202.237	5	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226127.416	486318.428	4	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226818.352	488346.025	5	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226306.875	487622.581	2	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226033.408	484434.618	4	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226139.109	487264.682	5	1
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4224293.255	481933.721	3	2
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4224303.063	482140.441	3	2
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226582.398	488110.947	2	2
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226153.74	486156.114	4	2
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226068.532	487327.583	3	2
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226271.095	485684.409	4	3
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4226174.43	485613.472	4	3
Pleasant Creek	Elaeagnus angustifolia	Russian-olive	0	Sapling(s)	4224668.255	482381.906	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226647.607	488178.16	1	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4227198.843	488628.706	3	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4227058.057	488614.227	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226200.435	485297.851	3	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4224687.204	482393.506	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4224316.47	482111.641	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226269.035	487505.498	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226099.357	487294.064	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226052.777	486794.474	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4225202.959	482939.178	2	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226308.647	487616.789	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226005.832	486744.951	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4224361.935	482111.664	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226564.174	488069.26	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226600.682	488127.996	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226241.93	488020.091	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4224523.931	482275.341	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4224567.066	482312.904	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226347.956	487979.132	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226023.282	484390.355	3	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226296.607	488006.93	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226392.323	487914.661	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226967.768	488579.509	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226988.198	488477.047	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226953.228	488368.713	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226437.587	487886.416	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226281.701	485693.222	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226104.56	484437.36	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226442.364	484920.097	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4225270.536	483005.364	2	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Mature Tree(s)	4226254.12	485957.625	2	5
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4227189.949	488711.754	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4227113.124	488594.251	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4227178.572	488621.002	1	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226194.986	486092.44	2	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226127.347	486437.029	1	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4224620.194	482372.54	3	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4224239.049	481853.745	4	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226151.457	487036.923	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226156.884	486381.764	1	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226314.925	487871.738	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226211.313	488011.493	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4224934.01	482597.663	5	1

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226258.086	487500.126	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226715.357	488268.7	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226558.684	488049.026	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226196.129	487976.77	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226681.808	488234.05	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226193.346	487865.416	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226126.121	486604.518	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4224316.103	482100.841	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226148.931	487902.346	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4224745.754	482493.331	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4225029.206	482677.058	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4225667.16	483575.348	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226080.485	486814.235	2	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226635.995	488166.168	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226956.782	488568.877	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226309.429	485719.192	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226407.847	485005.659	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226138.702	486166.613	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226329.331	485793.874	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226315.833	487999.521	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226267.378	488016.474	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226376.388	487957.055	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226411.387	487891.675	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226463.704	487896.096	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226501.244	487955.324	2	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226222.709	485661.69	1	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226273.378	485087.396	1	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226229.027	485219.861	2	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226157.14	484491.054	1	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4225882.465	484217.96	2	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226977.238	488375.504	1	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226022.959	484358.11	2	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226212.266	486021.934	1	5

Appendix A. Exotic Plant Patches Detected on Monitoring Routes, Capitol Reef NP, 2016, cont.

Plot_ID	Species	Master_Common_Name	Pulled	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4226085.37	484433.664	2	5
Pleasant Creek	Tamarix sp.	tamarisk	0	Sapling(s)	4225937.565	484281.194	2	5
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226056.847	486724.264	1	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226183.481	486845.935	5	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226068.661	486803.687	1	1
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226147.717	487137.079	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226125.193	487057.052	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226283.853	487508.546	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226283.357	487655.837	1	2
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226030.771	486726.559	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226137.589	486641.904	1	3
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226209.51	485270.008	1	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4226137.262	484467.675	1	4
Pleasant Creek	Tamarix sp.	tamarisk	0	Seedling(s)	4225981.667	484305.182	1	4

Appendix B. Exotic Plant Transect Data, Capitol Reef NP, 2016

Route	Transect	E_Coord	N_Coord	Species	Master_Common_Name	Alive?	AverageCover
Highway 24	701	489176.063	4237491.852	Bromus tectorum	Cheatgrass	Y	1.167
Highway 24	702	488732.495	4237273.859	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	702	488732.495	4237273.859	Salsola sp.	Russian thistle	N	1.167
Highway 24	702	488732.495	4237273.859	Salsola sp.	Russian thistle	Y	10
Highway 24	703	488256.867	4237126.505	Bromus tectorum	Cheatgrass	Y	0.667
Highway 24	703	488256.867	4237126.505	Salsola sp.	Russian thistle	N	6.667
Highway 24	703	488256.867	4237126.505	Salsola sp.	Russian thistle	Y	1.667
Highway 24	703	488256.867	4237126.505	Tamarix sp.	tamarisk	Y	26.667
Highway 24	705	487667.644	4237687.874	Bromus tectorum	Cheatgrass	Y	0.833
Highway 24	705	487667.644	4237687.874	Salsola sp.	Russian thistle	N	8.333
Highway 24	705	487667.644	4237687.874	Salsola sp.	Russian thistle	Y	6.667
Highway 24	706	487253.196	4237482.882	Bromus tectorum	Cheatgrass	Y	4
Highway 24	706	487253.196	4237482.882	Tamarix sp.	tamarisk	N	2.333
Highway 24	706	487253.196	4237482.882	Tamarix sp.	tamarisk	Y	0.333
Highway 24	707	486797.048	4237412.885	Bromus tectorum	Cheatgrass	Y	2.667
Highway 24	707	486797.048	4237412.885	Salsola sp.	Russian thistle	Y	10
Highway 24	708	486430.812	4237710.688	Bromus tectorum	Cheatgrass	Y	4.667
Highway 24	710	485687.743	4237633.179	Bromus tectorum	Cheatgrass	Y	0.5
Highway 24	710	485687.743	4237633.179	Salsola sp.	Russian thistle	Y	6.667
Highway 24	711	485487.094	4237237.593	Bromus tectorum	Cheatgrass	Y	10.333
Highway 24	711	485487.094	4237237.593	Salsola sp.	Russian thistle	Y	20
Highway 24	712	485042.415	4237133.838	Bromus tectorum	Cheatgrass	Y	2.833
Highway 24	712	485042.415	4237133.838	Salsola sp.	Russian thistle	Y	1.667
Highway 24	713	484610.438	4237148.423	Bromus tectorum	Cheatgrass	Y	1.333
Highway 24	713	484610.438	4237148.423	Salsola sp.	Russian thistle	Y	0.667
Highway 24	714	484280.342	4236929.494	Bromus tectorum	Cheatgrass	Y	1.75
Highway 24	715	483798.989	4236786.858	Bromus tectorum	Cheatgrass	Y	15.333
Highway 24	715	483798.989	4236786.858	Salsola sp.	Russian thistle	Y	2.667
Highway 24	716	483341.15	4236606.762	Bromus tectorum	Cheatgrass	Y	36.667
Highway 24	716	483341.15	4236606.762	Elymus repens	Quackgrass	Y	23.333
Highway 24	717	483021.37	4236960.385	Bromus tectorum	Cheatgrass	Y	1.5
Highway 24	718	482923.801	4237443.553	Bromus tectorum	Cheatgrass	Y	0.5
Highway 24	719	482497.206	4237283.939	Bromus tectorum	Cheatgrass	Y	26.667

Appendix B. Exotic Plant Transect Data, Capitol Reef NP, 2016, cont.

Route	Transect	E_Coord	N_Coord	Species	Master_Common_Name	Alive?	AverageCover
Highway 24	720	482014.652	4237303.07	Agropyron cristatum	crested wheatgrass	Y	13.333
Highway 24	720	482014.652	4237303.07	Bromus tectorum	Cheatgrass	Y	4
Highway 24	721	481520.936	4237276.602	Bromus tectorum	Cheatgrass	Y	4.833
Highway 24	722	481069.327	4237147.92	Agropyron cristatum	crested wheatgrass	Y	3.667
Highway 24	722	481069.327	4237147.92	Bromus tectorum	Cheatgrass	Y	0.333
Highway 24	722	481069.327	4237147.92	Elymus repens	Quackgrass	Y	0.667
Highway 24	723	480723.51	4237509.897	Elymus repens	Quackgrass	Y	2.5
Highway 24	724	480398.457	4237831.057	Agropyron cristatum	crested wheatgrass	Y	10
Highway 24	724	480398.457	4237831.057	Bromus tectorum	Cheatgrass	Y	4.333
Highway 24	726	479419.187	4237900.659	Bromus tectorum	Cheatgrass	Y	1
Highway 24	727	478957.478	4237755.855	Bromus tectorum	Cheatgrass	Y	0.333
Highway 24	727	478957.478	4237755.855	Salsola sp.	Russian thistle	Y	0.167
Highway 24	729	478026.203	4237940.805	Bromus tectorum	Cheatgrass	Y	0.333
Highway 24	731	477086.09	4238225.128	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	785	489172.668	4237501.796	Bromus tectorum	Cheatgrass	Y	0.5
Highway 24	785	489172.668	4237501.796	Tamarix sp.	tamarisk	Y	16.667
Highway 24	786	488757.884	4237288.774	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	786	488757.884	4237288.774	Salsola sp.	Russian thistle	Y	1
Highway 24	787	488258.841	4237136.328	Bromus tectorum	Cheatgrass	Y	0.833
Highway 24	787	488258.841	4237136.328	Salsola sp.	Russian thistle	Y	1.667
Highway 24	788	487828.18	4237248.478	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	789	487673.014	4237694.924	Bromus tectorum	Cheatgrass	Y	3.833
Highway 24	789	487673.014	4237694.924	Salsola sp.	Russian thistle	Y	1
Highway 24	790	487254.754	4237494.615	Bromus tectorum	Cheatgrass	Y	4.167
Highway 24	790	487254.754	4237494.615	Salsola sp.	Russian thistle	Y	0.167
Highway 24	790	487254.754	4237494.615	Tamarix sp.	tamarisk	Y	3.333
Highway 24	791	486803.172	4237419.816	Bromus tectorum	Cheatgrass	Y	2.5
Highway 24	792	486432.097	4237720.572	Bromus tectorum	Cheatgrass	Y	1.667
Highway 24	792	486432.097	4237720.572	Salsola sp.	Russian thistle	Y	0.333
Highway 24	794	485689.861	4237657.139	Tamarix sp.	tamarisk	Y	23.333
Highway 24	795	485499.168	4237250.259	Bromus tectorum	Cheatgrass	Y	4
Highway 24	795	485499.168	4237250.259	Salsola sp.	Russian thistle	Y	14
Highway 24	796	485051.837	4237148.179	Bromus tectorum	Cheatgrass	Y	8.333

Appendix B. Exotic Plant Transect Data, Capitol Reef NP, 2016, cont.

Route	Transect	E_Coord	N_Coord	Species	Master_Common_Name	Alive?	AverageCover
Highway 24	796	485051.837	4237148.179	Salsola sp.	Russian thistle	Y	4.333
Highway 24	796	485051.837	4237148.179	Tamarix sp.	tamarisk	Y	30
Highway 24	797	484621.891	4237158.635	Bromus tectorum	Cheatgrass	Y	0.833
Highway 24	797	484621.891	4237158.635	Salsola sp.	Russian thistle	Y	16.667
Highway 24	798	484285.651	4236943.562	Bromus tectorum	Cheatgrass	Y	5.167
Highway 24	799	483810.349	4236801.878	Bromus tectorum	Cheatgrass	Y	0.667
Highway 24	799	483810.349	4236801.878	Tamarix sp.	tamarisk	Y	0.167
Highway 24	800	483354.11	4236615.097	Tamarix sp.	tamarisk	Y	26.667
Highway 24	801	483030.097	4236963.151	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	801	483030.097	4236963.151	Elymus repens	Quackgrass	Y	0.333
Highway 24	802	482934.602	4237447.097	Bromus tectorum	Cheatgrass	Y	0.667
Highway 24	802	482934.602	4237447.097	Tamarix sp.	tamarisk	N	1
Highway 24	802	482934.602	4237447.097	Tamarix sp.	tamarisk	Y	10
Highway 24	803	482512.349	4237293.546	Bromus tectorum	Cheatgrass	Y	5.167
Highway 24	804	482019.479	4237311.877	Agropyron cristatum	crested wheatgrass	Y	2.667
Highway 24	804	482019.479	4237311.877	Bromus tectorum	Cheatgrass	Y	1.333
Highway 24	804	482019.479	4237311.877	Elymus repens	Quackgrass	Y	0.333
Highway 24	805	481527.705	4237279.364	Bromus tectorum	Cheatgrass	Y	0.333
Highway 24	805	481527.705	4237279.364	Salsola sp.	Russian thistle	Y	1.667
Highway 24	806	481079.67	4237151.284	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	806	481079.67	4237151.284	Elymus repens	Quackgrass	Y	0.167
Highway 24	808	480409.312	4237844.403	Bromus tectorum	Cheatgrass	Y	0.333
Highway 24	808	480409.312	4237844.403	Salsola sp.	Russian thistle	Y	10
Highway 24	810	479432.37	4237908.268	Bromus tectorum	Cheatgrass	Y	0.833
Highway 24	810	479432.37	4237908.268	Salsola sp.	Russian thistle	Y	10
Highway 24	811	478972.029	4237763.108	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	813	478033.193	4237942.623	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	815	477103.136	4238234.232	Bromus tectorum	Cheatgrass	Y	0.333
Highway 24	825	473239.754	4240955.828	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	826	472787.41	4241159.456	Bromus tectorum	Cheatgrass	Y	0.167
Highway 24	828	471864.88	4241552.813	Salsola sp.	Russian thistle	Y	3.333
Highway 24	833	469421.578	4241866.563	Bromus tectorum	Cheatgrass	Y	0.167
Pleasant Creek	753	487899.098	4226403.457	Salsola sp.	Russian thistle	Y	0.333

Appendix B. Exotic Plant Transect Data, Capitol Reef NP, 2016, cont.

Route	Transect	E_Coord	N_Coord	Species	Master_Common_Name	Alive?	AverageCover
Pleasant Creek	754	487866.153	4226241.423	Bromus tectorum	Cheatgrass	N	0.167
Pleasant Creek	754	487866.153	4226241.423	Bromus tectorum	Cheatgrass	Y	0.333
Pleasant Creek	755	487469.299	4226164.577	Salsola sp.	Russian thistle	Y	3.333
Pleasant Creek	756	487046.988	4226129.883	Bromus tectorum	Cheatgrass	Y	0.167
Pleasant Creek	756	487046.988	4226129.883	Salsola sp.	Russian thistle	Y	1.667
Pleasant Creek	757	486716.443	4226023.315	Tamarix sp.	tamarisk	Y	0.333
Pleasant Creek	758	486308.171	4226162.467	Bromus tectorum	Cheatgrass	Y	1.333
Pleasant Creek	759	485837.353	4226320.617	Agropyron cristatum	crested wheatgrass	Y	8.333
Pleasant Creek	759	485837.353	4226320.617	Bromus tectorum	Cheatgrass	Y	0.167
Pleasant Creek	760	485360.826	4226186.783	Bromus tectorum	Cheatgrass	Y	1.833
Pleasant Creek	761	484961.477	4226403.643	Bromus tectorum	Cheatgrass	Y	0.167
Pleasant Creek	762	484540.478	4226160.038	Bromus tectorum	Cheatgrass	Y	50
Pleasant Creek	763	484180.702	4225870.464	Bromus tectorum	Cheatgrass	Y	0.5
Pleasant Creek	768	482273.051	4224518.505	Bromus tectorum	Cheatgrass	Y	0.667
Pleasant Creek	768	482273.051	4224518.505	Tamarix sp.	tamarisk	Y	0.333
Pleasant Creek	770	481564.188	4223977.352	Bromus tectorum	Cheatgrass	Y	0.167

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