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Natural Resource Stewardship and Science

Invasive Exotic Plant Monitoring in Capitol Reef National Park

2020 and 2021 Field Seasons

Natural Resource Report NPS/NCPN/NRR—2022/2435



ON THE COVER

Monitoring invasive exotic plants along Pleasant Creek, Capitol Reef National Park. NPS/Amy Washuta.

Invasive Exotic Plant Monitoring in Capitol Reef National Park

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Natural Resource Report NPS/NCPN/NRR—2022/2435

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Executive Summary

Invasive exotic plant (IEP) species are a significant threat to natural ecosystem integrity and biodiversity. Controlling them is a high priority for the National Park Service. The Northern Colorado Plateau Network (NCPN) selected the early detection of IEPs as one of 11 monitoring protocols to be implemented as part of its long-term monitoring program. From June 5 to July 29, 2020, and May 30 to June 2, 2021, network staff conducted surveys for priority IEP species along the Oak Creek, Pleasant Creek, and State Route 24 monitoring routes at Capitol Reef National Park. We detected 834 patches of 11 priority IEP species along 67.9 kilometers (42.2 miles) of three monitoring routes. There were more patches of tamarisk along State Route 24, and a higher percentage of large patches, than in previous years. This indicates that previously identified IEP patches have expanded and grown. Field bindweed (*Convolvulus arvensis*) and Russian olive (*Elaeagnus angustifolia*) along State Route 24 have both increased in prevalence since monitoring began. Tamarisk (*Tamarix* sp.) was the most prevalent priority IEP species on all three routes. On Oak and Pleasant creeks, there were fewer than three patches of all other IEPs. On State Route 24, there were 30 or more patches of Russian olive, quackgrass (*Elymus repens*), field bindweed, and blue mustard (*Chorispora tenella*). IEP priority species were found on 71%, 47%, and 62% of transects along Oak Creek, Pleasant Creek, and State Route 24, respectively. Yellow sweet-clover (*Melilotus officinalis*) was the most frequently observed IEP on Oak Creek and Pleasant Creek. Percent cover was highest for yellow sweet-clover, Russian thistle (*Salsola* sp.), and tamarisk on Oak Creek, Pleasant Creek, and State Route 24, respectively. The NCPN plans to return to Capitol Reef in 2023 to continue the fourth rotation of invasive plant monitoring.

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1 Introduction

Invasive exotic plant (IEP) 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) park managers identified 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 priority IEPs along key invasive pathways. Priority IEPs are a subset of species that are either present and potentially controllable at a park or have not been detected at a park but could soon become present due to their existence in surrounding areas. Park and network staff re-evaluate the list of these species before each monitoring season.

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

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. Instead, we select monitoring routes 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. At Capitol Reef National Park (NP), it takes 3–5 years to complete a full rotation of the standard monitoring routes, depending on staff and funding.

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 2020 and 2021 field seasons along the Oak Creek, Pleasant Creek, and State Route 24 monitoring routes at Capitol Reef NP. This completes the third rotation and starts the fourth rotation of monitoring routes at Capitol Reef.

2 Methods

We followed the invasive exotic plant monitoring protocol developed by the NCPN (Perkins et al. 2016), adapted from Andersen and Dewey (2007). The protocol emphasizes the quick collection of IEP location and abundance data in order to maximize the amount of area searched, thus increasing the chances of finding a higher percentage of both new and established invasions. By focusing on roads, trails, and waterways, which are major vectors for invasive plants, we capture the greatest amount of information (i.e., benefit) with the least amount of time and effort (i.e., cost).

2.1 Developing a park target invasive exotic plant list

Prior to beginning monitoring in 2020 and 2021, NCPN and Capitol Reef NP staff reviewed the park's list of priority IEPs (Table 2-1). The list was developed by reviewing past park literature and state and county weed lists, and consulting with park staff and county weed managers. It includes existing IEPs and potential IEPs of high management concern. In 2020, blue mustard (*Chorispora tenella*) was added to the target list, followed by tumble mustard (*Sisymbrium altissimum*) and puncture vine (*Tribulus terrestris*) in 2021. 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.

Because these methods are designed to be rapid, field crews are trained to develop a focused search image of 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.

Table 2-1. Priority invasive plant list, Capitol Reef NP, 2009–2021.

Scientific name	Common name
Aegilops cylindrica[1]	jointed goatgrass
Ailanthus altissima	tree-of-heaven
Arctium minus	burdock
Asparagus officinalis	asparagus
Cardaria sp.[1]	whitetop
Cardaria draba[2]	hoary cress
Carduus acanthoides[3]	plumeless thistle
Carduus nutans[1]	musk thistle
Centaurea diffusa	diffuse knapweed
Centaurea maculosa	spotted knapweed
Centaurea repens	Russian knapweed
Chorispora tenella[4]	blue mustard
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Convolvulus arvensis	field bindweed
Cynoglossum officinale[5]	common houndstongue
Elaeagnus angustifolia	Russian olive
Elymus repens	quackgrass
Euphorbia esula	leafy spurge
Hyoscyamus niger[5]	black henbane
Isatis tinctoria	dyer's woad
Lythrum salicaria	purple loosestrife
Malcolmia africana[6]	African mustard
Marrubium vulgare	horehound
Medicago sativa[7]	alfalfa
Onopordum acanthium	Scotch thistle
Rubia tinctoria[1]	madder
Sisymbrium altissimum[8]	tumble mustard
Tamarix sp.	tamarisk
Tribulus terrestris	puncture vine
Ulmus pumila	Siberian elm
Verbascum thapsus	woolly mullein

[1]Added in 2019; [2]2009–2016 only; [3]2009–2011 only; [4]Added in 2020; [5]Added in 2012; [6]2012–2013, 2016, 2019–2020; [7]2009–2010 only; [8]Added in 2021.

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 so 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 (0.01 acres or approximately 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 route surveys. Searching for single mature plants of some species, such as Russian olive (*Elaeagnus angustifolia*) and Siberian elm (*Ulmus pumila*), is possible due to their large size. Single plants of other species, such as madder (*Rubia tinctoria*), are very difficult to detect in most field conditions unless the observer is very close to the patch.

2.2.2 Effective detection distance

The effective detection distance (EDD) is the maximum distance from which a searcher 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 2020 and 2021 was 1.5–7.5 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 (see Figure 2-1). The effective detection swath width (EDSW) is equal to two times the EDD, because the surveyor can effectively detect IEPs for one EDD on either side of their search route. The EDSW for Capitol Reef NP in 2020 and 2021 was 3–15 meters.

2.2.4 Patch separation resolution

We define patch separation resolution 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 IEP-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 (global positioning system) 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

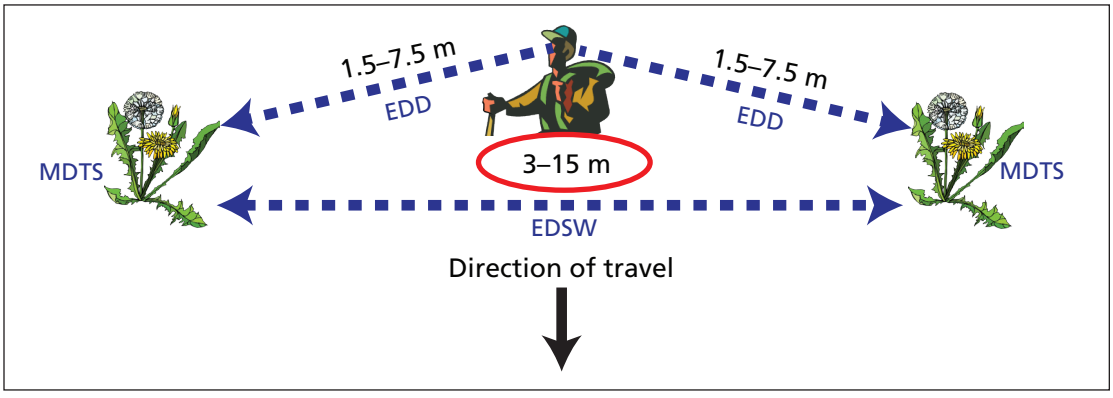


Figure 2-1. The maximum effective detection distance (EDD) at Capitol Reef National Park was 1.5–7.5 meters in 2020 and 2021, making the effective detection swath width (EDSW) 3–15 meters.

covers monitoring routes along State Route 24, the Pleasant Creek cattle trail, Oak Creek cattle trail, Scenic Drive, and Cathedral Valley Road (Table 2-2; Figure 2-2, page 7). In 2020, NCPN staff visited Oak Creek to complete the third rotation and started the fourth rotation with Pleasant Creek. In 2021, the fourth rotation was continued with State Route 24.

Along State Route 24, an observer walked out on one side of the route and walked back on the opposite side. For Oak and Pleasant creeks, the observer walked down the center of the trail/route. While walking, they searched for IEPs by visually scanning (side-to-side) all the land within the borders of the swath. If the terrain was uneven or steep, and the observer had to glance frequently at the ground to ensure safe foot placement, then they 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 GPS units with at least five-meter accuracy. Only priority species were consistently recorded on monitoring routes. Crew members were permitted to record additional species if they were noteworthy.

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

1. 1–3 plants (used for isolated single plants or very small patches (≤2 × 2 m),
2. 4 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).

Table 2-2. Number of rotations of invasive exotic plant monitoring routes at Capitol Reef NP, 2009–2022.

Year	State Route 24	Pleasant Creek	Oak Creek	Scenic Drive	Cathedral Valley Road
2009	1	–	–	–	–
2010	1	1	–	–	–
2011	–	–	1	–	–
2012	–	–	–	1	1
2013	2	–	–	–	–
2014	–	2	–	–	–
2015	–	–	2	2	2
2016	3	3	–	–	–
2017	–	–	–	–	–
2018	–	–	–	–	–
2019	–	–	–	3	3
2020	–	4	3	–	–
2021	4	–	–	–	–
2022	–	–	–	–	–

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, distance to road, wetland, stream), 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).

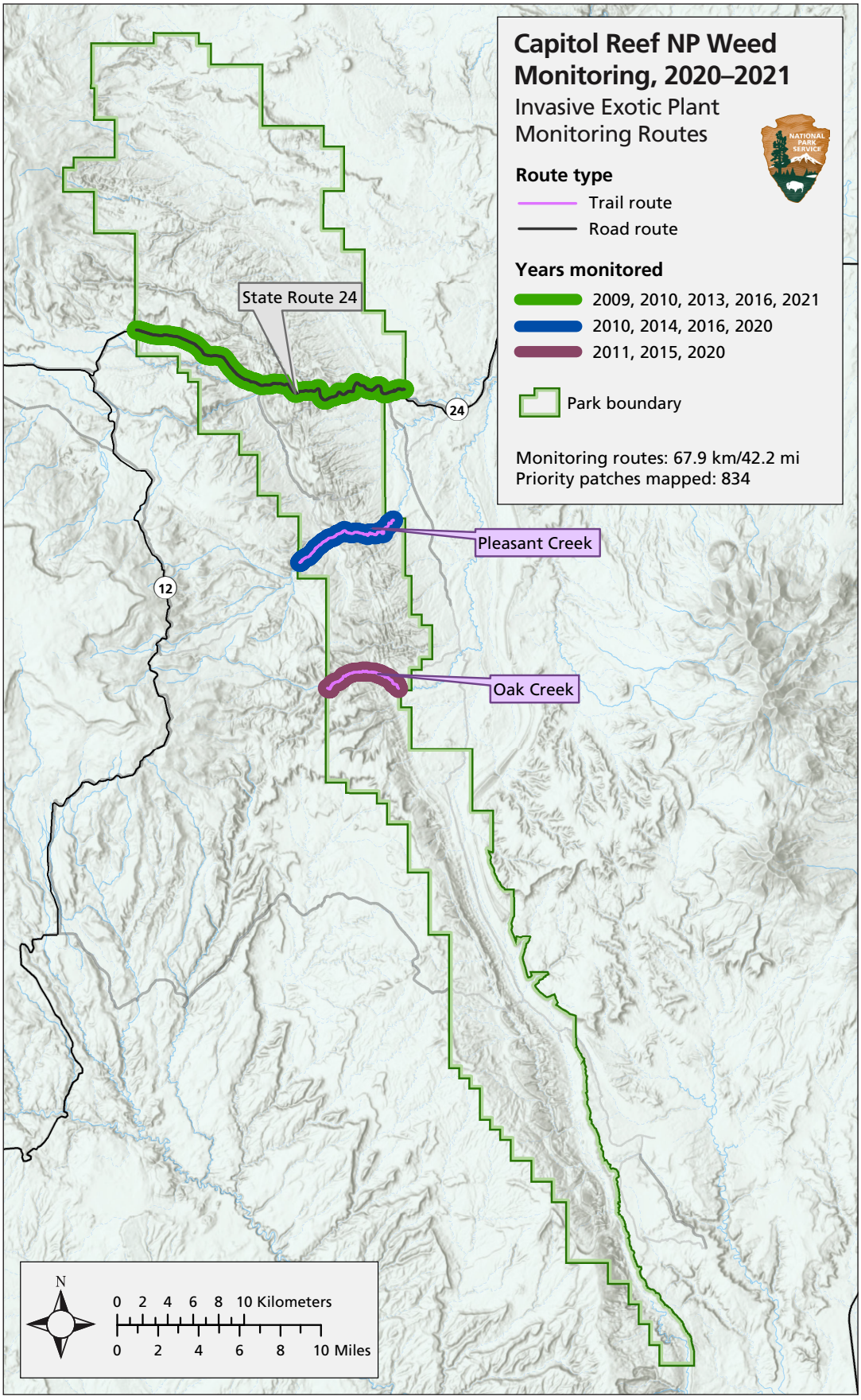


Figure 2-2. Invasive plant monitoring routes monitored in Capitol Reef National Park during the 2020–2021 field seasons.

2.3 Monitoring transects

2.3.1 Transect and quadrat establishment

We established transects with three vegetation quadrats every 500 meters along monitoring routes (Figures 2-3, 2-4, 2-5, and 2-6). Quadrats were centered at 0.5, 5, and 10 meters away from the edge of the road on the same side as the route being walked. 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

All priority IEP species observed on monitoring routes were also recorded in the monitoring quadrats, along with 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 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.

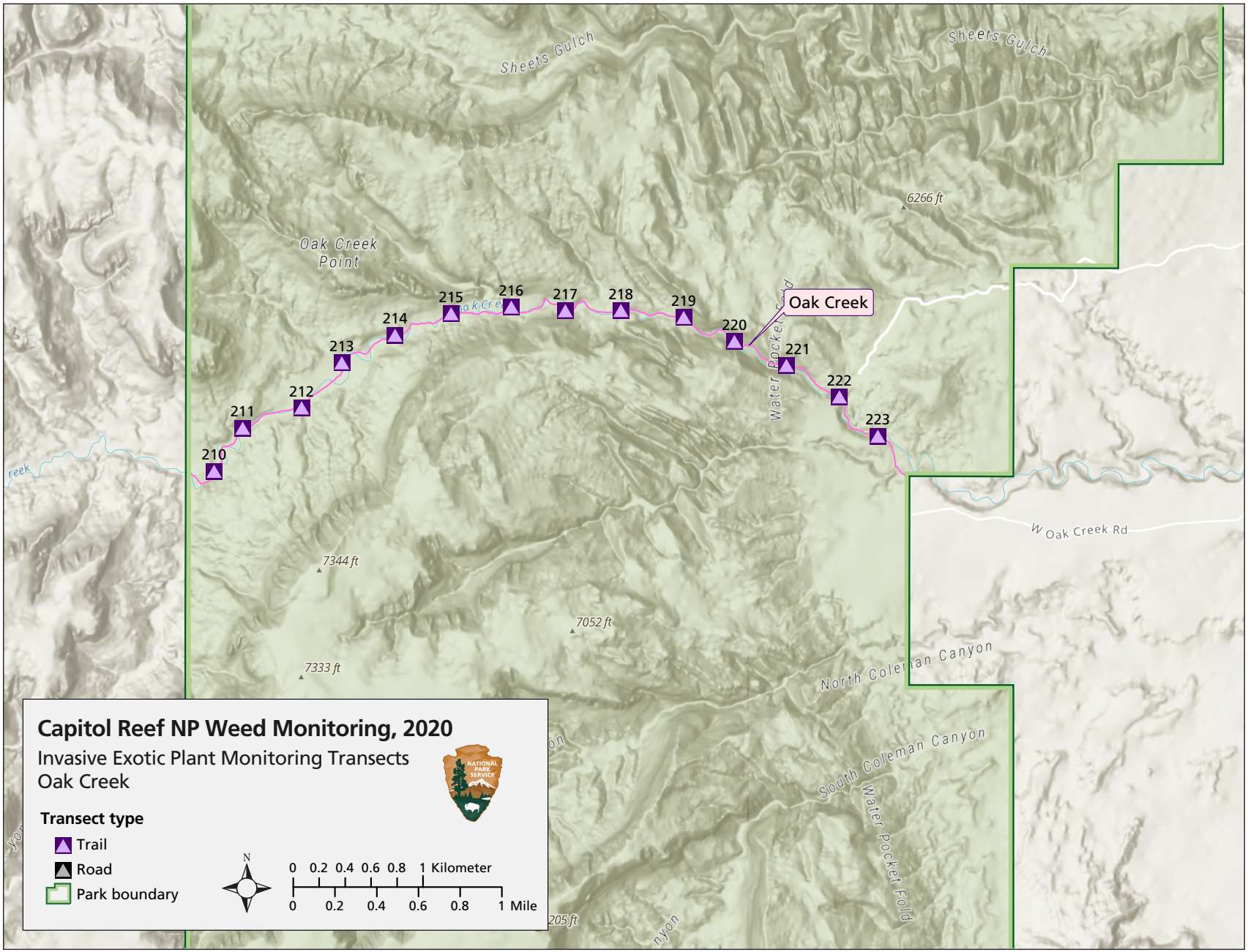


Figure 2-3. Transect locations along Oak Creek, Capitol Reef National Park, June 29–July 29, 2020.

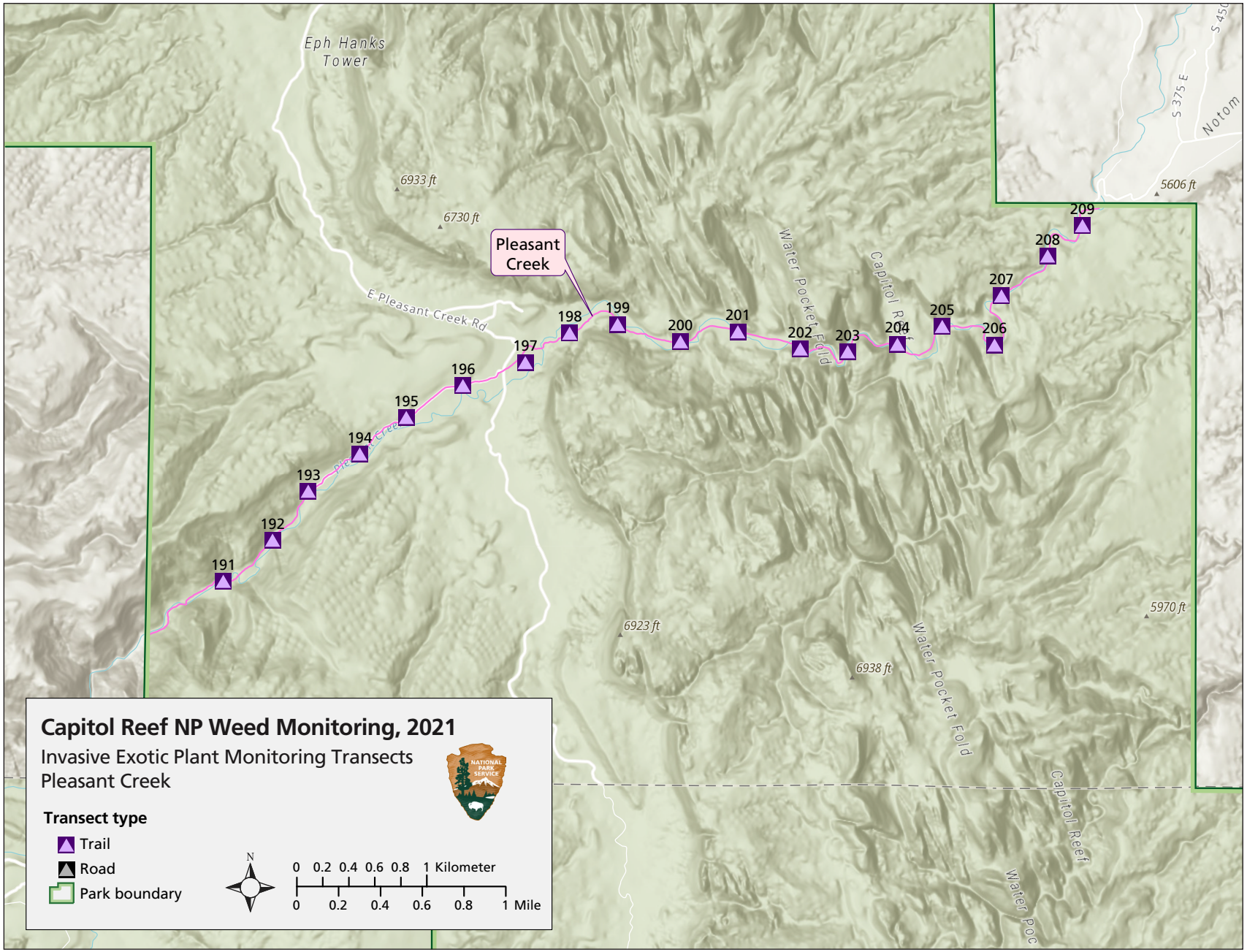


Figure 2-4. Transect locations along Pleasant Creek, Capitol Reef National Park, June 5–24, 2021.

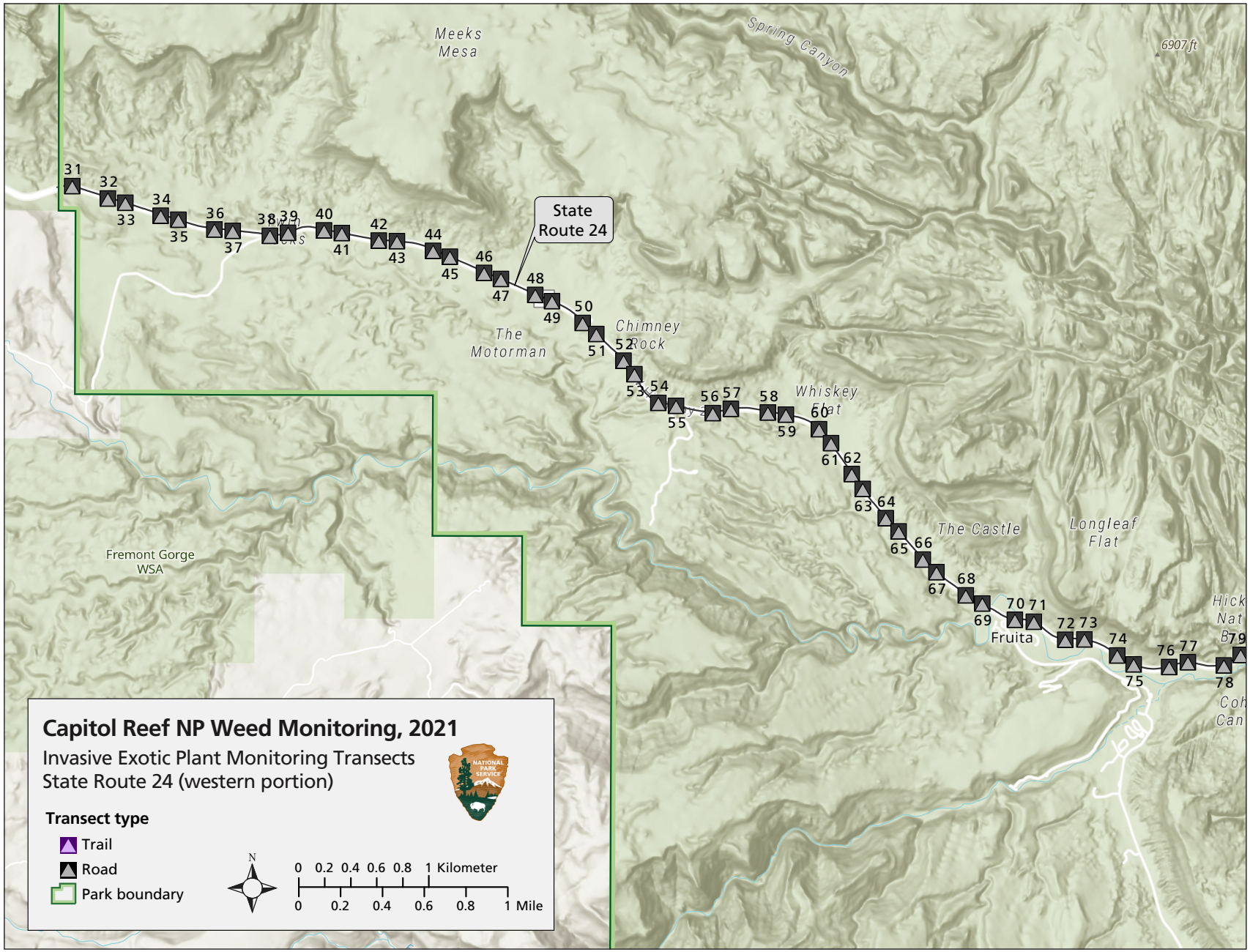


Figure 2-5. Transect locations along western portion of State Route 24, Capitol Reef National Park, May 30–June 2, 2021. Transects are placed on both sides of the road.

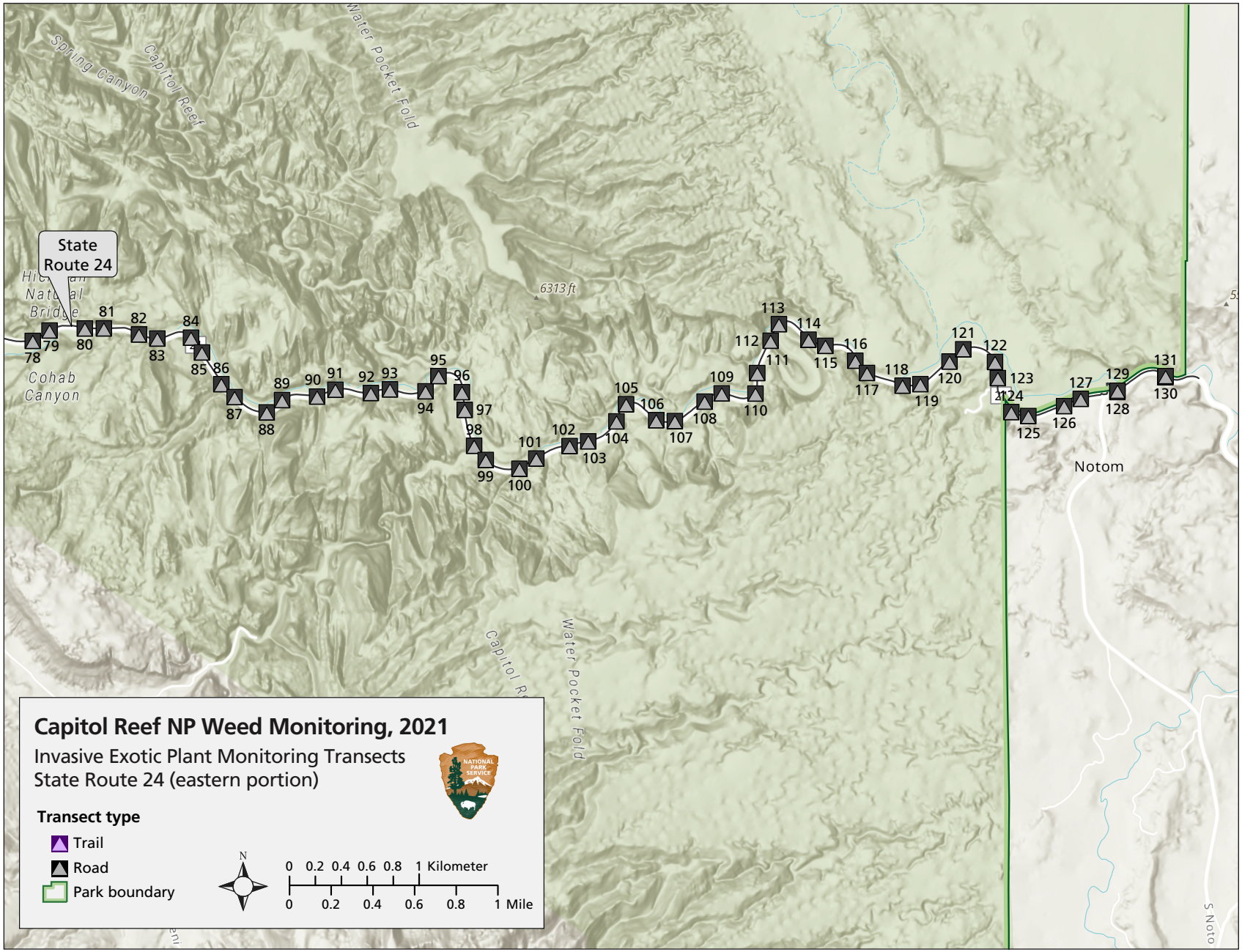


Figure 2-6. Transect locations along eastern portion of State Route 24, Capitol Reef National Park, May 30–June 2, 2021. Transects are placed on both sides of the road.

3 Results

3.1 Target invasive exotic plant list

There were 29 IEP species on the priority list for Capitol Reef NP in 2020 and 2021 (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 non-priority species are suspect.

We recorded a total of 11 priority IEP species on monitoring routes and five in transects in 2020 and 2021, respectively (Table 3-1). All three species recorded only in transects (cheatgrass, crested wheatgrass, and Russian thistle) were also detected. Three additional, non-priority exotic species were recorded in five patches on monitoring routes. Two additional non-priority exotic species were recorded in 14 transects. We covered 67.9 kilometers (42.2 miles) of monitoring routes.

3.2 Monitoring routes

We surveyed the Oak Creek monitoring route in 2020 as part of the third monitoring rotation. Pleasant Creek and Oak Creek were surveyed in 2021 as part of the fourth rotation. A total of 834 patches of 11 priority species were detected (Table 3-2; Figures 3-1 to 3-13, starting on page 16; Appendix A).

Tamarisk (*Tamarix* sp.) was the most prevalent priority species on monitoring routes in 2020 and 2021. With a total of 589 patches recorded, tamarisk represented 71% of all priority patches (Tables 3-3, 3-4, and 3-5, starting on page 29). The next-most common priority species were Russian olive, quackgrass (*Elymus repens*), field bindweed (*Convolvulus arvensis*), and blue mustard. Together, these five species represented 98% of all patches recorded in 2020 and

Table 3-1. Invasive exotic plants detected at Capitol Reef NP, June 5–August 28, 2020, and May 30–June 2, 2021.

Scientific name	Common name	Method detected[1]		Priority?
		Routes	Transects[2]	
Aegilops cylindrica	jointed goatgrass	X	–	Yes
Ailanthus altissima	tree-of-heaven	X	–	Yes
Arctium minus	burdock	X	–	Yes
Asparagus officinalis	asparagus	X	X	Yes
Chorispora tenella	blue mustard	X	X	Yes
Convolvulus arvensis	field bindweed	X	X	Yes
Elaeagnus angustifolia	Russian olive	X	–	Yes
Elymus repens	quackgrass	X	X	Yes
Rubia tinctoria	madder	X	–	Yes
Tamarix sp.	tamarisk	X	X	Yes
Tribulus terrestris	puncture vine	X	–	Yes
Agropyron cristatum	crested wheatgrass	–	X	Transect only
Bromus tectorum	cheatgrass	–	X	Transect only
Salsola spp.	Russian thistle	–	X	Transect only
Bromus japonicus	Japanese chess	X	–	No
Erodium cicutarium	stork's bill	X	–	No
Melilotus alba	white sweet-clover	–	X	No
Melilotus officinalis	yellow sweet-clover	–	X	No
Tragopogon dubius	yellow salsify	X	–	No

[1] "X" = Yes; "–" = No.
[2] Transect species are recorded only in transects and are not recorded along monitoring routes.

Table 3-2. Number of priority and total IEP patches by route and route type, Capitol Reef NP, June 5–August 28, 2020, and May 30–June 2, 2021.

Route	Route type	Length (km)	Priority/Total patches	IEP priority patches/km
State Route 24	Road/Riparian	50.513	717/721	14.2
Oak Creek	Riparian	7.267	57/57	7.8
Pleasant Creek	Riparian	10.158	60/61	5.9

2021. State Route 24 had higher IEP priority patches per kilometer (14.2) than Oak (7.8) or Pleasant (5.9) creeks.

Three tree species were found along the monitoring routes: tamarisk, Russian olive, and tree-of-heaven (*Ailanthus altissima*). Of the 589 tamarisk patches recorded, 161 (27%) were seedlings, 269 (46%) were saplings, 153 (26%) were mature trees, and 5 (1%) were old growth. Growth stage was not recorded for one location. Of the 141 Russian olive patches recorded, 15 (11%) were seedlings, 110 (78%) were saplings, and 16 (11%) were mature trees. Two patches of tree-of-heaven saplings were found (see Appendix A).

3.3 Monitoring transects

A total of 134 transects were sampled along monitoring routes in 2020 and 2021 (Table 3-6; Appendix B). IEP priority species were found on 71%, 47%, and 62% of transects along Oak Creek, Pleasant Creek, and State Route 24, respectively. Yellow sweet-clover (*Melilotus officinalis*) was the most frequently observed IEP on Oak Creek and Pleasant Creek. Cheatgrass was most prevalent on State Route 24 (see Table 3-6; see page 31). Percent cover was highest for yellow sweet-clover, Russian thistle (*Salsola* sp.), and tamarisk on Oak Creek, Pleasant Creek, and State Route 24, respectively.

3.4 Results comparison: 2009–2021

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 2021. 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 resolution 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 sample periods.

3.4.1 Oak Creek

The frequency of patches of comparable IEP species along Oak Creek has stayed relatively stable during NCPN monitoring, ranging from 6.5 to 9.5 patches/kilometer in three visits from 2011 to 2020 (Perkins and Lenhart 2012; Perkins 2016) (see Table 3-3). Tamarisk patches have declined, however, from 89 found by Dewey and Anderson (2005 a, b) in 2003–2005 to 68, 45, and 54 in 2011, 2015, and 2020, respectively.

Percent cover of invasives was low for all species in transects. However, total percent cover of all species was highest in 2020, at 1.51±0.81—up from 0.10±0.05 and 0.14±0.07 in 2015 and 2011, respectively. Similarly, IEP frequency was higher (71.4%) in 2020 than 2015 (26.7%) and 2011 (26.7%). No new priority species were detected in 2020.

3.4.2 Pleasant Creek

The frequency of patches of comparable IEP species along Pleasant Creek stayed relatively stable from 2009 to 2020, ranging from 6.1 to 8.9 patches per kilometer, with 5.9 patches found in 2020 (see Table 3-4).

Tamarisk is the primary species found there, representing 98.8% of IEP patches found on routes. Yellow salsify (*Tragopogon dubius*) was found for the first time on this route in 2020, and could be considered for addition to the priority list in future years.

One notable change is that we believe that many of the previous patches of Russian olive found along Pleasant Creek were actually the native silverleaf buffaloberry (*Shepherdia argentea*). Detections from previous years have been removed from IEP totals, as Russian olive was not found this year and no control efforts have taken place.

Total percent cover of IEPs dropped to their lowest recorded rate in 2020: 0.48%±0.20, with previous values ranging from 3.49 to 5.80%. However, frequency remained similar: IEPs were found in 49% of transects in 2020, compared to 26–60% in previous years. This was largely driven by a drop to 0% cover for cheatgrass. No new priority species were detected in 2020.

3.4.3 State Route 24

Patch frequency of comparable IEP species along State Route 24 increased for Russian olive and tamarisk from 2016 to 2021, and generally increased from results in 2009–2010 (see Table 3-5). Russian olive has become more prevalent below the abandoned oxbow (see Figure 3-12). Tamarisk patches increased from 6.74 patches/kilometer in 2009–2010 to 9.45 in 2021. Russian olive has similarly increased, from 0.67 patches/kilometer in 2009–2010 to 2.73 in 2021. Field bindweed has followed a similar pattern but at lower densities. These three species have had a general trend of moving to larger size classes over the monitoring history (see Table 3-5).

Cheatgrass frequency has generally increased since monitoring began in 2009–2010, but stayed relatively stable in 2021 when compared to 2016. Yellow sweetclover was not found in transects in 2021, but was found in 19% of transects in 2013. The frequency of Russian thistle has stayed relatively constant during the monitoring history, ranging from 22% to 54%. Overall, invasives were found in 62% of transects in 2021, compared to 56% in 2016, down from a high of 72% in 2009–2010.

After being added to the priority list in 2020, madder (3 patches) and blue mustard (20 patches) were detected for the first time along State Route 24 in 2021. One patch of burdock (*Actium minus*), a priority species, was also detected for the first time along State Route 24 in 2021.

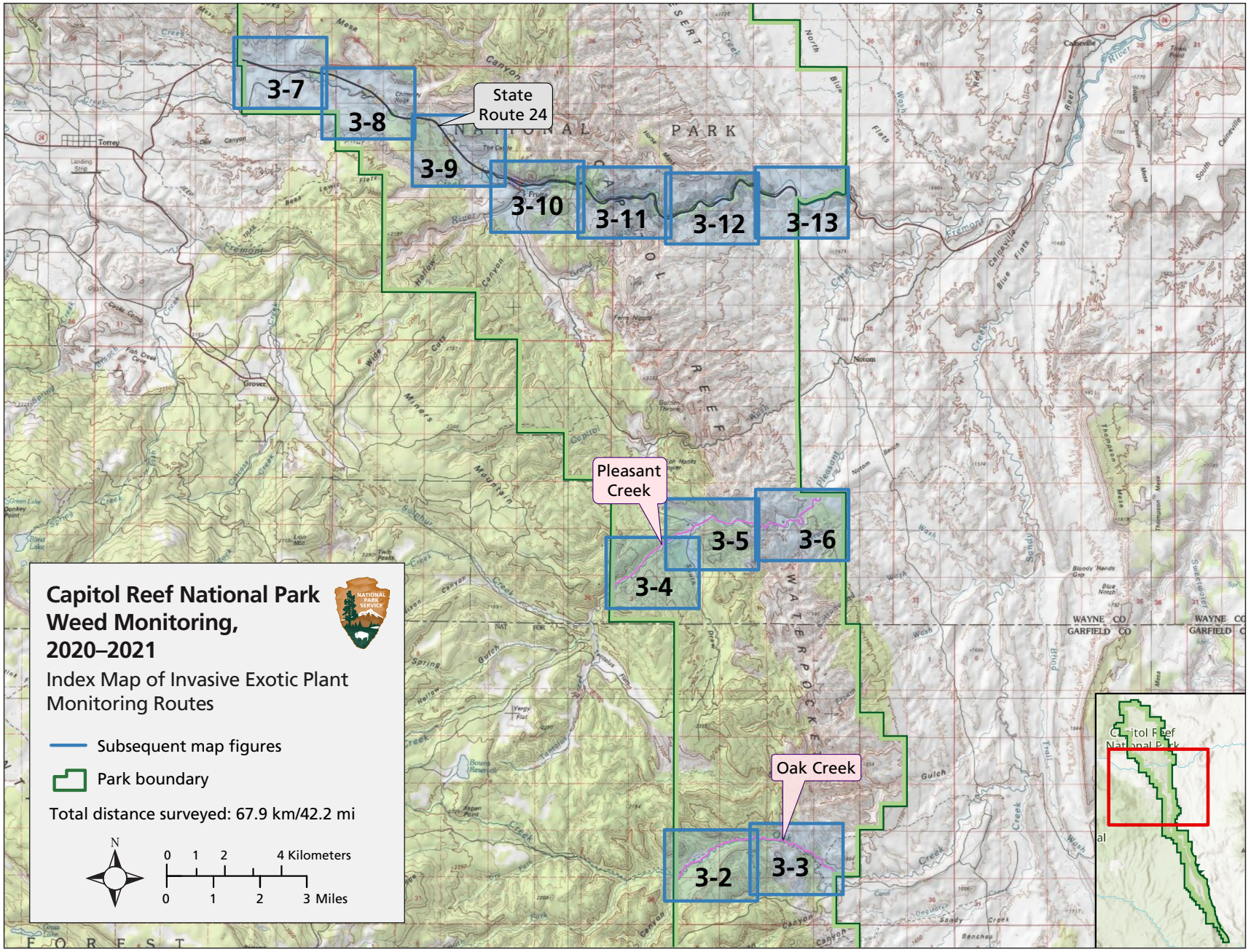


Figure 3-1. Index map of monitoring routes, Capitol Reef National Park, 2020–2021.

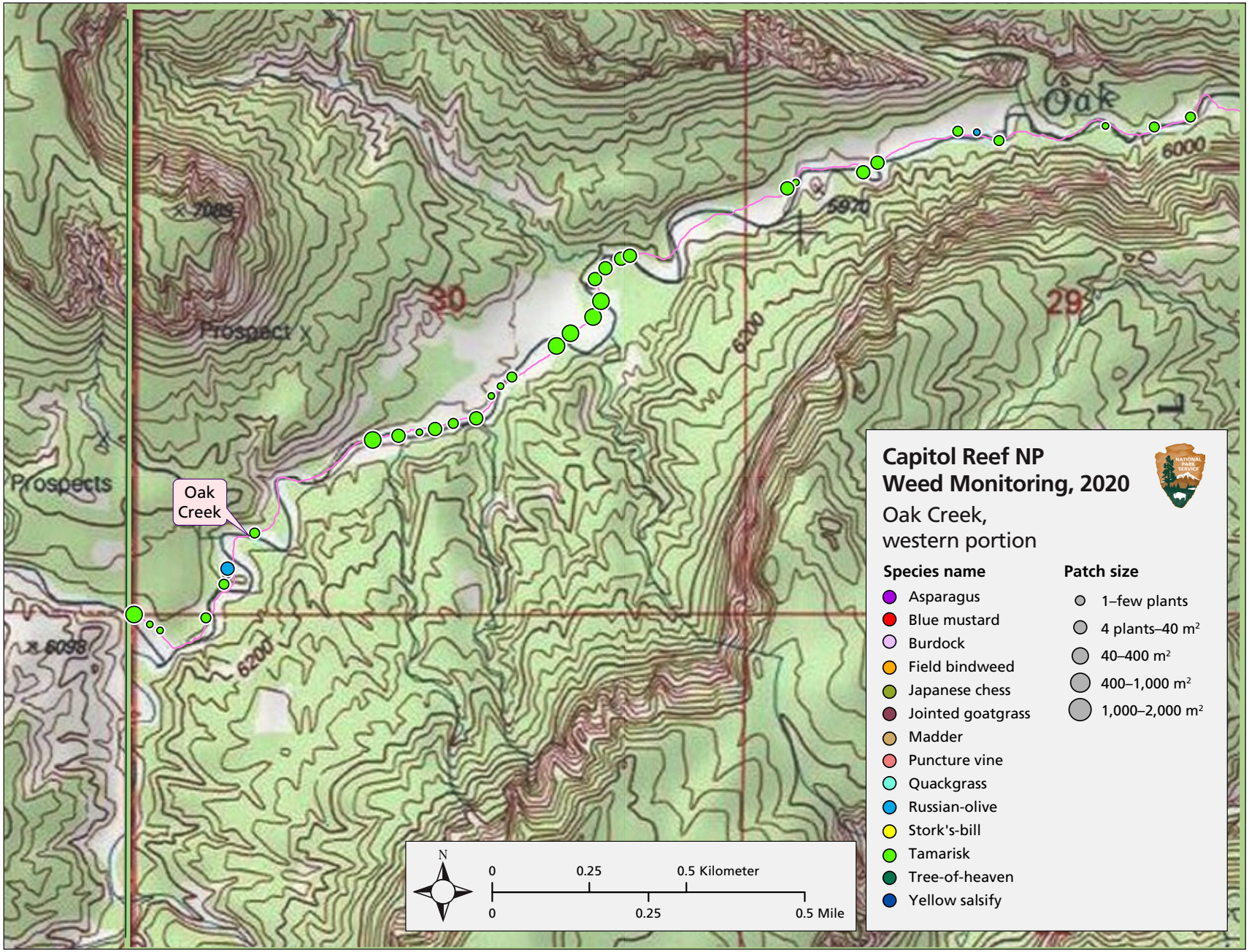


Figure 3-2. Invasive plants detected along the western portion of Oak Creek, Capitol Reef National Park, June 29 and July 29, 2020.

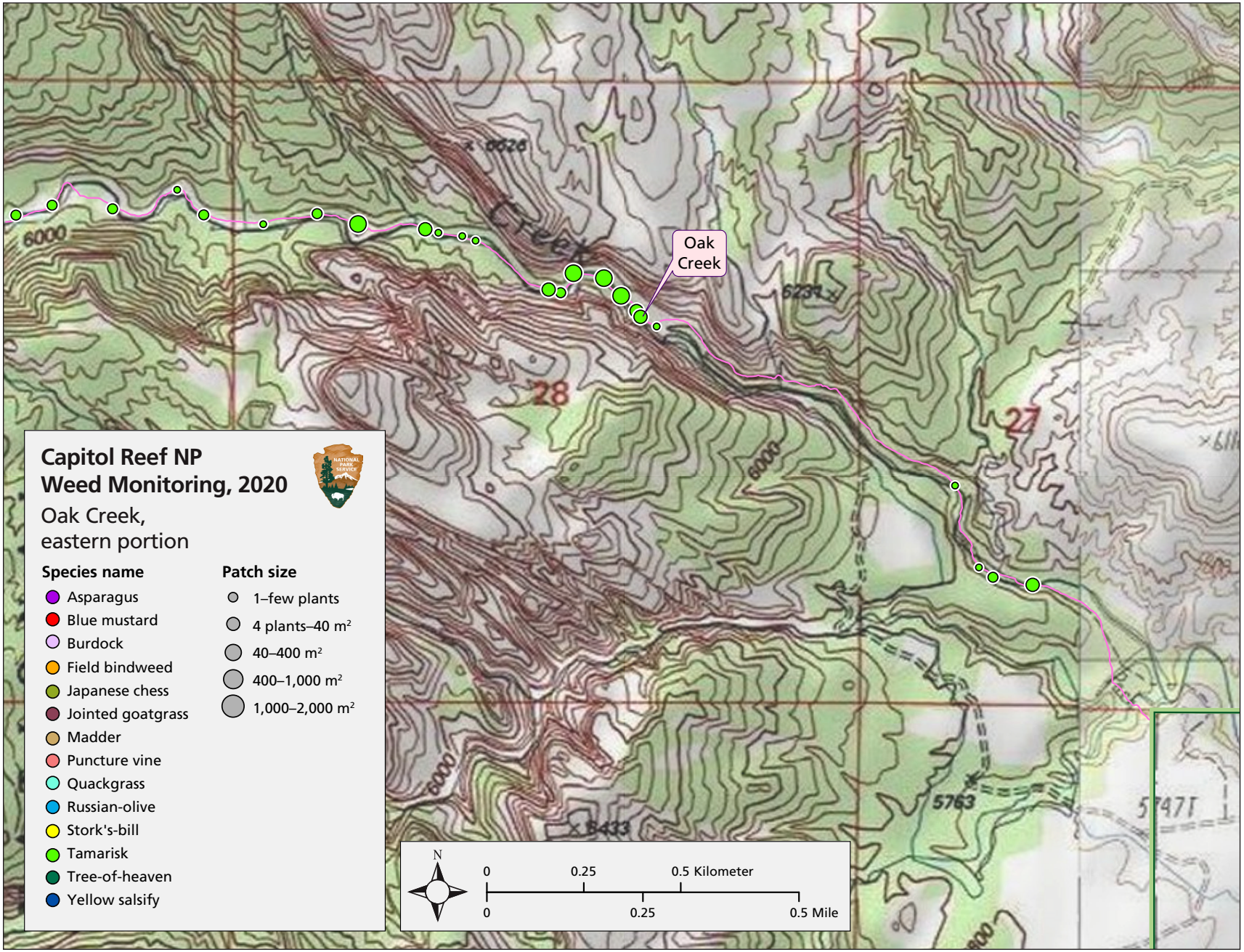


Figure 3-3. Invasive plants detected along the eastern portion of Oak Creek, Capitol Reef National Park, June 29 and July 29, 2020.

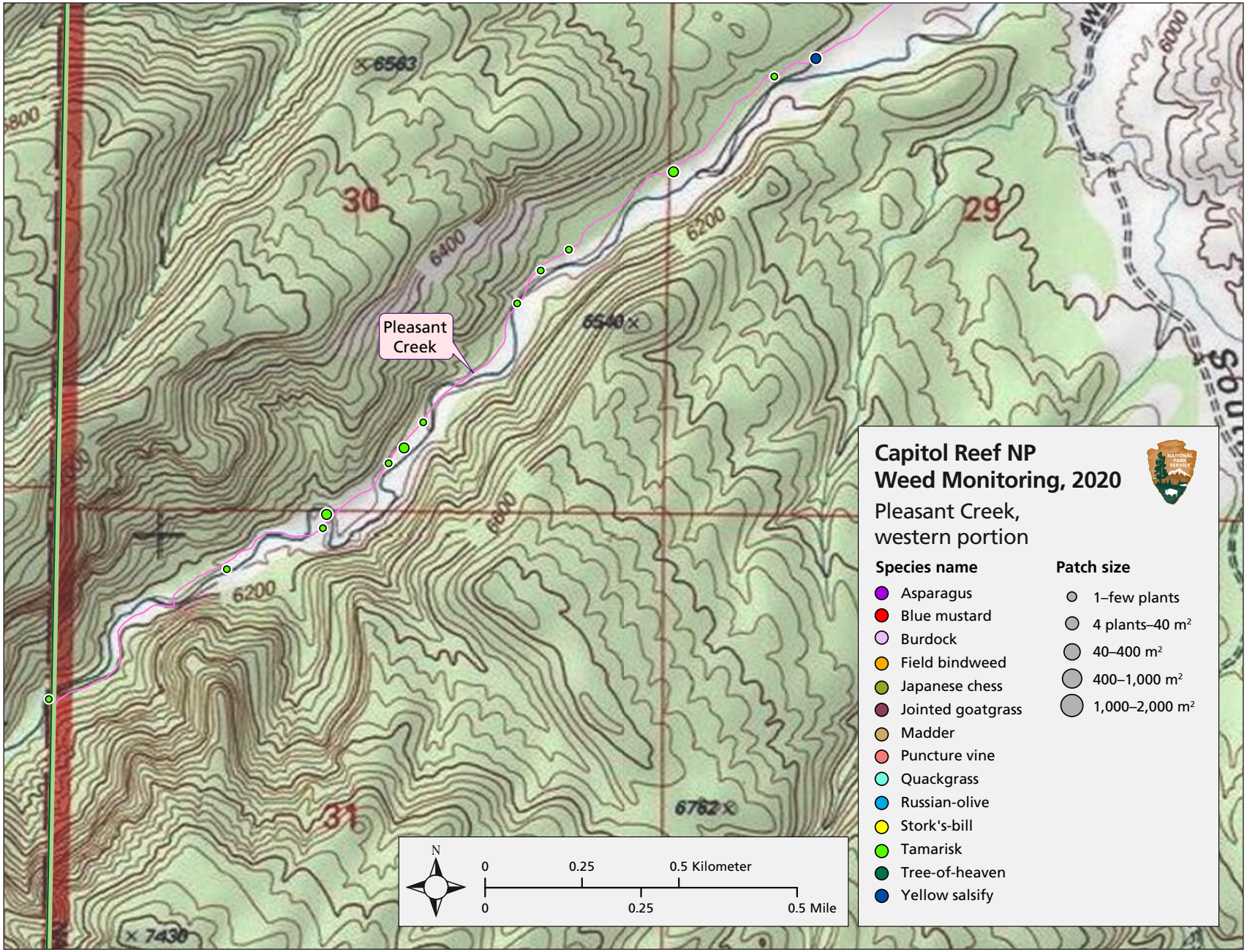


Figure 3-4. Invasive plants detected along the western portion of Pleasant Creek, Capitol Reef National Park, June 5–24, 2020.

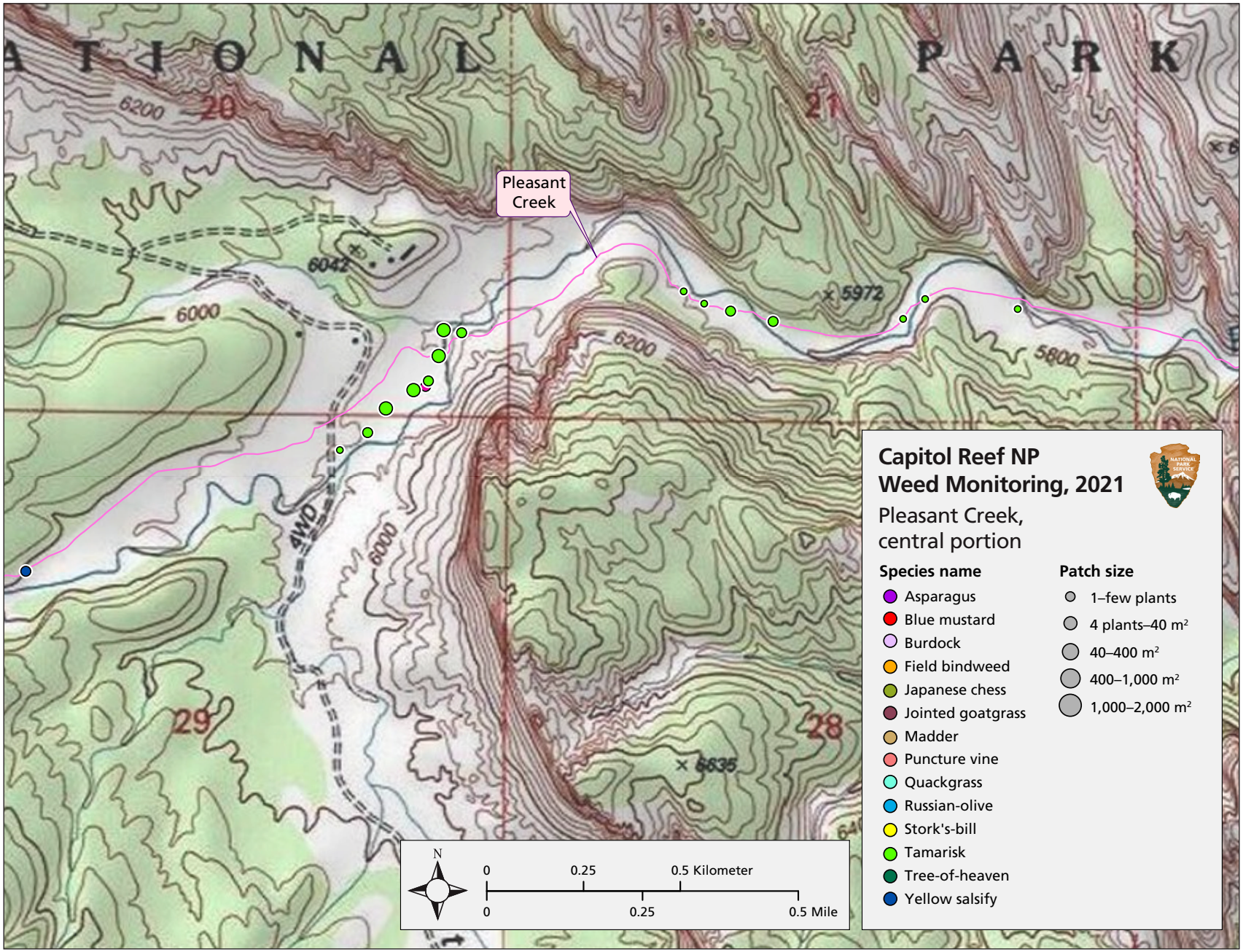


Figure 3-5. Invasive plants detected along the central portion of Pleasant Creek, Capitol Reef National Park, June 5–24, 2020.

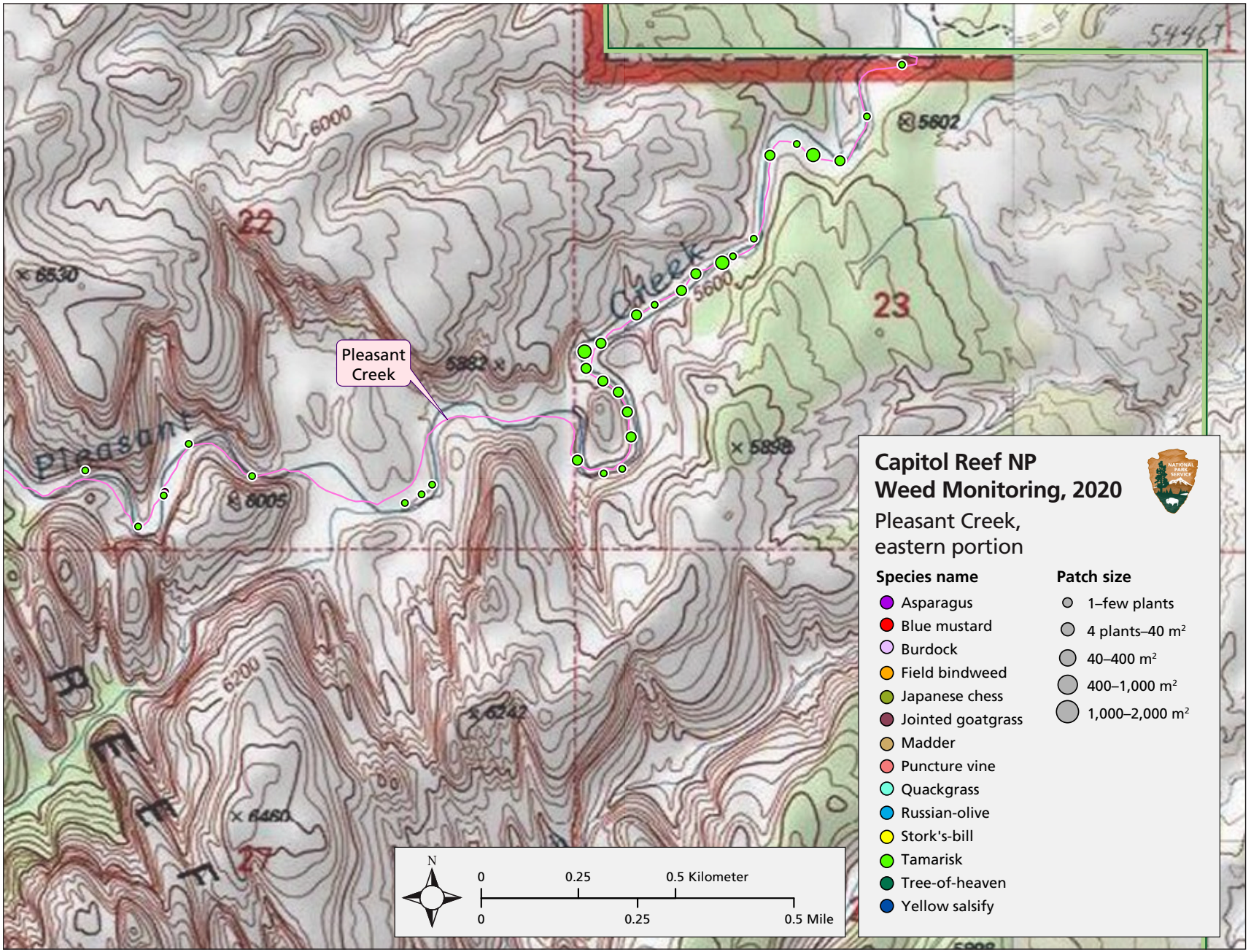


Figure 3-6. Invasive plants detected along the eastern portion of Pleasant Creek, Capitol Reef National Park, June 5–24, 2020.

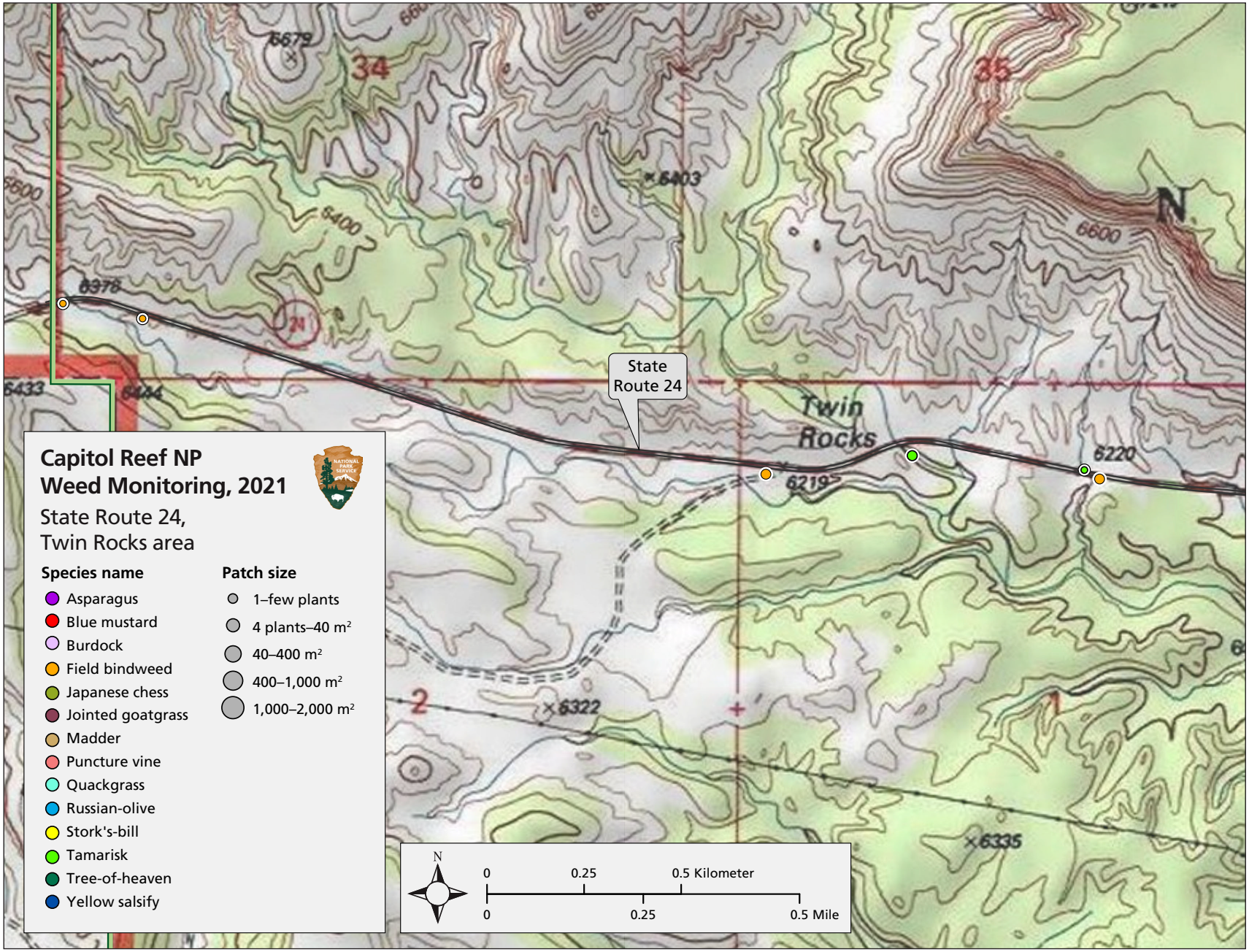


Figure 3-7. Invasive plants detected near Twin Rocks along the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.

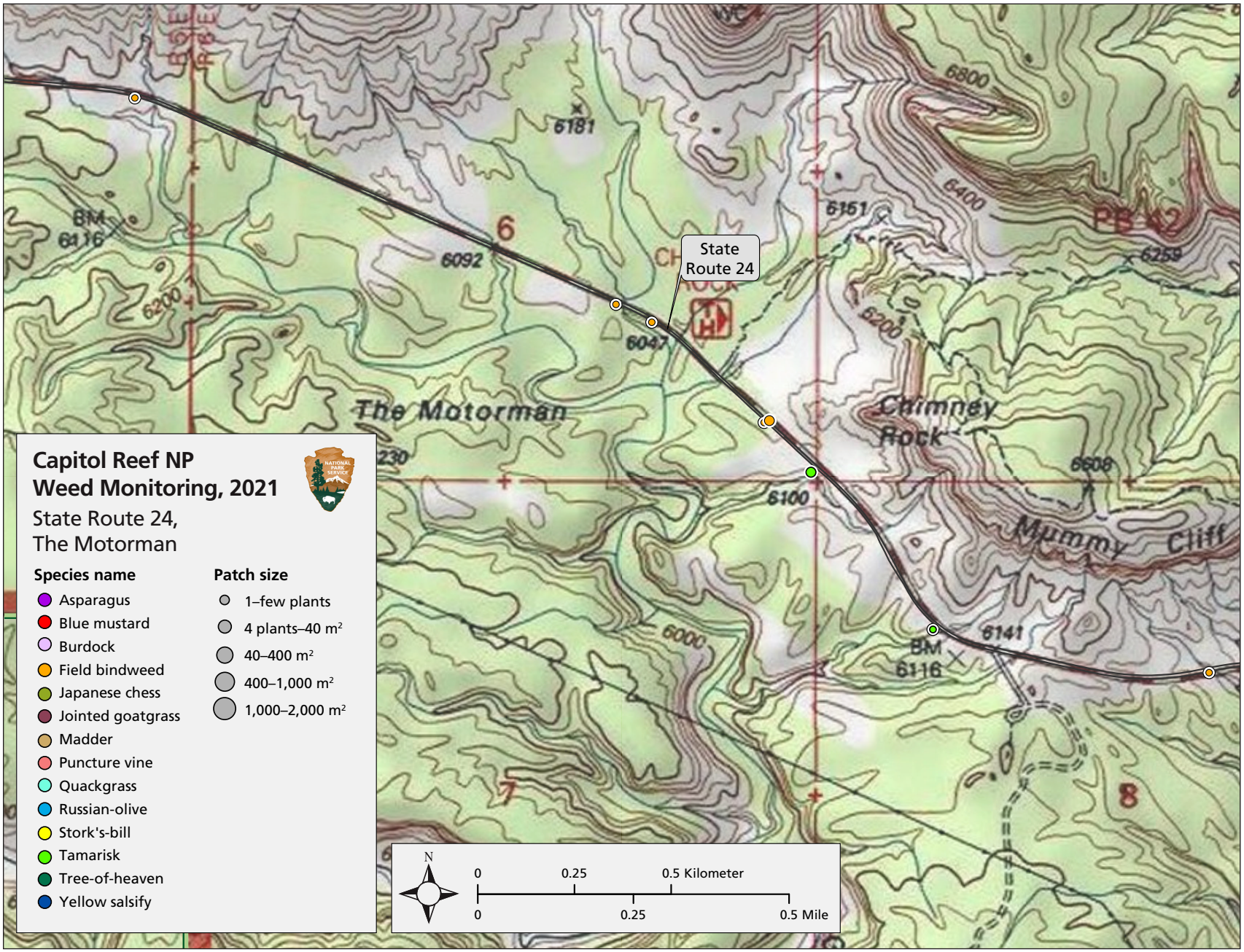


Figure 3-8. Invasive plants detected near The Motorman along the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.



Figure 3-9. Invasive plants detected near the Visitor Center along the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.

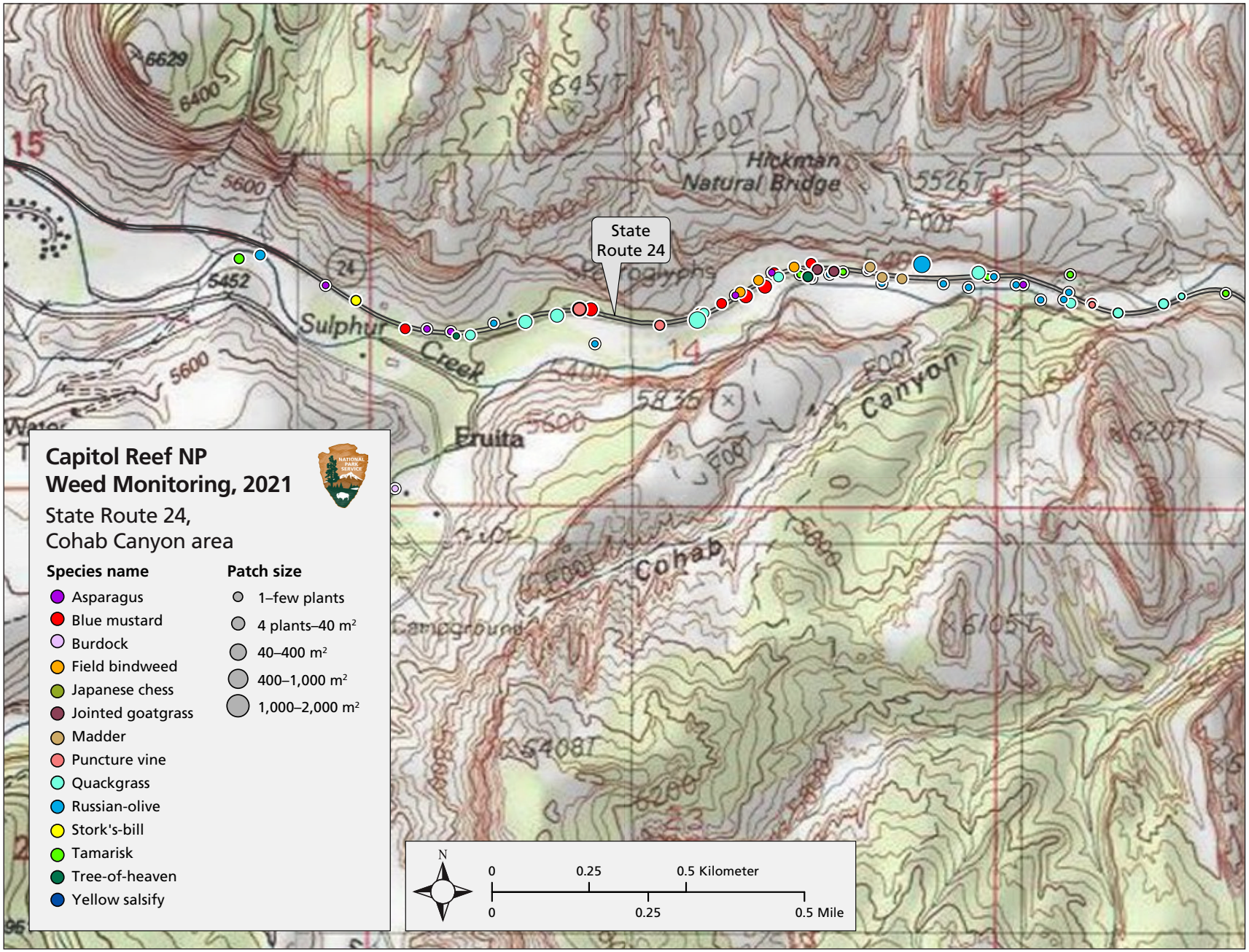


Figure 3-10. Invasive plants detected near Cohab Canyon along the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.

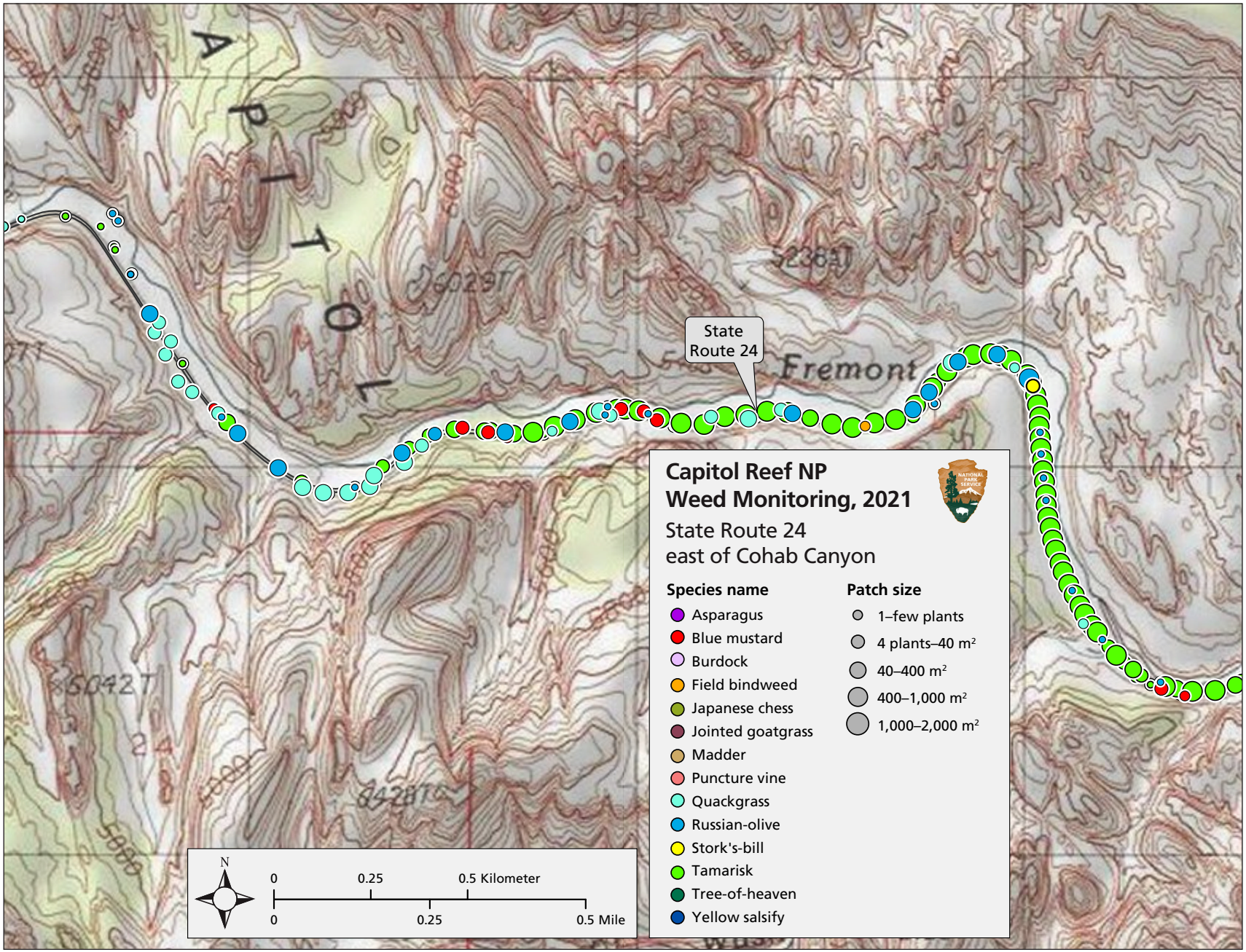


Figure 3-11. Invasive plants detected east of Cohab Canyon along the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.

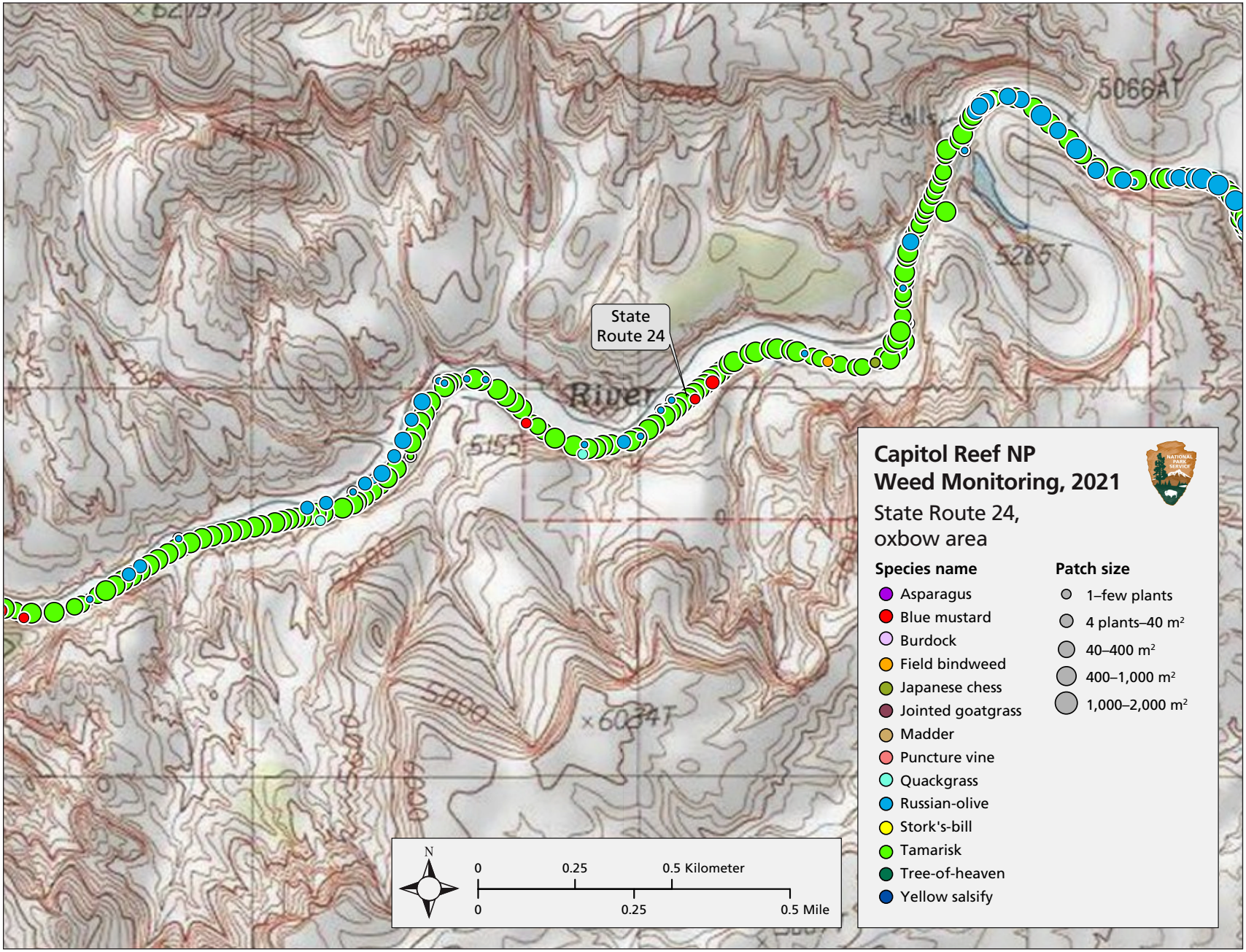


Figure 3-12. Invasive plants detected in the oxbow area along the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.

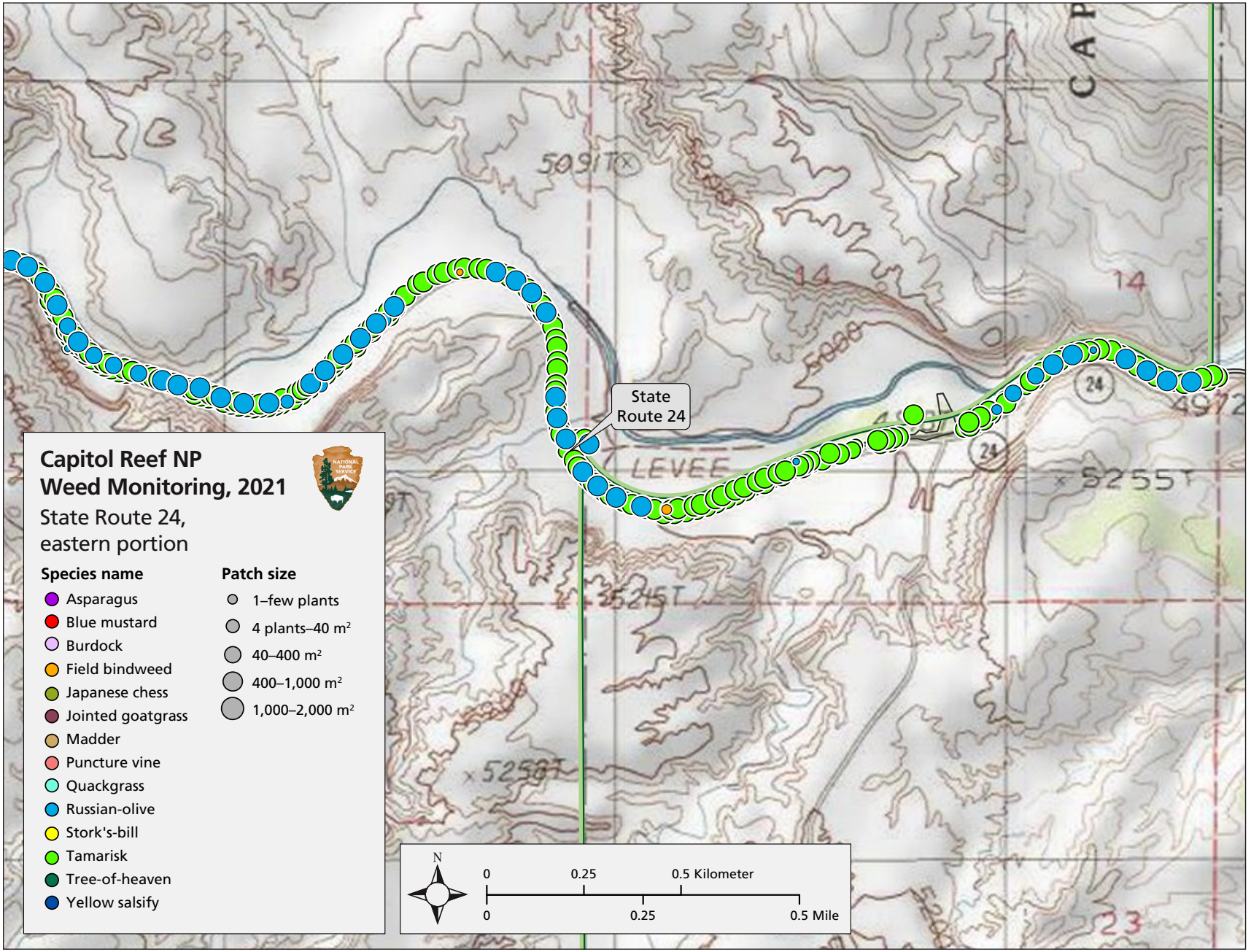


Figure 3-13. Invasive plants detected at the eastern end of the State Route 24 monitoring route, Capitol Reef National Park, May 30–June 2, 2021.

Table 3-3. Number of priority and total IEP patches by species and patch size class detected along Oak Creek in 2011, 2015, and 2020, Capitol Reef NP.

Scientific name	Common name	Year(s)	Priority/ Total patches	Patches/ km	Patch size class[1]				
					1	2	3	4	5
Elaeagnus angustifolia	Russian olive	2011	1/1	0.13	1	0	0	0	0
		2015	3/3	0.41	1	1	0	1	0
		2020	3/3	0.41	1	1	1	0	0
Tamarix sp.	tamarisk	2011	68/68	9.32	24	16	12	9	7
		2015	45/45	6.16	5	8	10	7	15
		2020	54/54	7.40	15	14	15	10	0
Total IEP priority species		2011	69/69	9.45	25	16	12	9	7
		2015	48/48	6.57	6	9	10	8	15
		2020	57/57	7.81	16	15	16	10	0

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

Table 3-4. Number of priority and total IEP patches by species and patch size class detected along Pleasant Creek in 2010, 2014, 2016, and 2020, Capitol Reef NP.

Scientific name	Common name	Year(s)	Priority/ Total patches	Kilometers measured	Patches/ km	Patch size class[1]				
						1	2	3	4	5
Asparagus officinalis	asparagus	2016	1/1	10.2	0.10	1	0	0	0	0
		2020	2/2	10.2	0.19	1	1	0	0	0
Tamarix sp.	tamarisk	2010	60/60	9.9	6.1	41	14	5	0	0
		2014	49/49	10.2	4.8	11	13	24	1	0
		2016	90/90	10.2	8.8	29	25	21	11	4
		2020	58/58	10.2	5.7	31	20	7	0	0
Tragopogon dubius	yellow salsify	2020	0/1	10.2	0.10	0	0	1	0	0
Total IEP priority species		2010	60/60	9.9	6.1	41	14	5	0	0
		2014	49/49	10.2	4.8	11	13	24	1	0
		2016	91/91	10.2	8.9	30	25	21	11	4
		2020	61/60	10.2	5.9	32	21	7	0	0

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

Table 3-5. Number of priority and total IEP patches by species and patch size class detected along State Route 24 in 2009–2010, 2013, 2016, and 2021, Capitol Reef NP.

Scientific name	Common name	Year(s)	Priority/ Total patches	Kilometers measured	Priority patches/km	Patch size class[1]				
						1	2	3	4	5
Aegilops cylindrica[2]	jointed goatgrass	2016	0/1	50.1	0.00	1	0	0	0	0
		2021	2/2	50.5	0.04	0	2	0	0	0
Ailanthus altissima	tree-of-heaven	2009–2010	2/2	50.6	0.04	2	0	0	0	0
		2013	0/0	50.5	0.00	0	0	0	0	0
		2016	2/2	50.1	0.04	2	0	0	0	0
		2021	2/2	50.5	0.04	1	1	0	0	0
Arctium minus	burdock	2021	1/1	50.5	0.02	1	0	0	0	0
Asparagus officinalis	asparagus	2009–2010	5/5	50.6	0.10	4	1	0	0	0
		2013	0/0	50.5	0.00	0	0	0	0	0
		2016	5/5	50.1	0.10	4	1	0	0	0
		2021	7/7	50.5	0.14	7	0	0	0	0
Bromus japonicus	Japanese brome	2021	0/1	50.5	0.00	0	1	0	0	0
Chorispora tenella[3]	blue mustard	2021	20/20	50.5	0.40	10	10	0	0	0
Cirsium vulgare	bull thistle	2013	1/1	50.5	0.02	0	0	1	0	0
		2016	0/0	50.1	0.00	0	0	0	0	0
		2021	0/0	50.5	0.00	0	0	0	0	0
Convolvulus arvensis	field bindweed	2009–2010	2/2	50.6	0.04	2	0	0	0	0
		2013	8/8	50.5	0.16	3	5	0	0	0
		2016	17/17	50.1	0.34	10	4	3	0	0
		2021	30/30	50.5	0.59	13	12	4	1	0
Elaegnus angustifolia	Russian olive	2009–2010	34/34	50.6	0.67	23	11	0	0	0
		2013	24/24	50.5	0.47	14	7	3	0	0
		2016	82/82	50.1	1.64	45	16	13	7	1
		2021	138/138	50.5	2.73	52	3	12	32	39
Elymus repens	quackgrass	2016	54/54	50.1	1.08	2	23	22	7	0
		2021	35/35	50.5	0.69	0	9	16	10	0
Erodium cicutarium[4]	stork's bill	2021	0/0	50.5	0.00	0	2	1	0	0
Rubia tinctoria[2]	madder	2021	3/3	50.5	0.06	0	3	0	0	0
Tamarix sp.	tamarisk	2009–2010	341/341	50.6	6.74	60	87	173	21	0
		2013	245/245	50.5	4.85	48	65	54	78	0
		2016	369/369	50.1	7.37	31	24	45	79	196

Table 3-5, cont. Number of priority and total IEP patches by species and patch size class detected along State Route 24 in 2009–2010, 2013, 2016, and 2021, Capitol Reef NP.

Scientific name	Common name	Year(s)	Priority/ Total patches	Kilometers measured	Priority patches/km	Patch size class[1]				
						1	2	3	4	5
Tamarix sp.	tamarisk	2021	477/477	50.5	9.45	36	8	27	63	343
Tribulus terrestris[4]	puncture vine	2021	2/2	50.5	0.04	0	1	1	0	0
Verbascum thapsus	woolly mullein	2009–2010	1/1	50.6	0.02	1	0	0	0	0
		2013	0/0	50.5	0.00	0	0	0	0	0
		2016	0/0	50.1	0.00	0	0	0	0	0
		2021	0/0	50.5	0.00	0	0	0	0	0
Total IEP priority species[5]		2009–2010	385/385	50.6	7.61	92	99	173	21	0
		2013	278/278	50.5	5.50	65	77	58	78	0
		2016	532/532	50.1	10.62	97	68	83	87	197
		2021	691/691	50.5	13.68	110	34	59	106	382

[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 until 2019.
[3]Not a priority species until 2020.
[4]Not a priority species.
[5]Includes only IEPs listed as priority species in all years (2009–2010, 2013, 2016, and 2021).

Table 3-6. Number of transects in which the five most common IEP species were detected/total transects monitored, mean percent cover, and standard error along the Oak Creek, Pleasant Creek, and State Route 24 monitoring routes, Capitol Reef NP, 2009–2021.

Scientific name	Common name	Rotation	Oak Creek[1]		Pleasant Creek[2]		State Route 24[3]	
			Detected/ Total	Percent cover (SE)	Detected/ Total	Percent cover (SE)	Detected/ Total	Percent cover (SE)
Agropyron cristatum	crested wheatgrass	1	–	–	–	–	–	–
		2	3/15	0.00	0/19	0.00	2/102	<0.01 (<0.01)
		3	0/14	0.00	1/20	0.42 (0.42)	4/100	0.30 (0.17)
		4	NA	NA	1/19	0.04 (0.04)	0/101	0.00
Bromus tectorum	cheatgrass	1	0/15	0.00	0/20	0.00	8/50	0.21 (0.14)
		2	3/15	0.08 (0.04)	2/19	1.23 (0.85)	24/102	0.61 (0.22)
		3	5/14	0.24 (0.12)	10/20	2.77 (2.49)	52/100	1.70 (0.49)
		4	NA	NA	0/19	0.00	48/101	0.24 (0.07)
Tamarix sp.	tamarisk	1	1/15	0.02 (0.02)	1/20	0.67 (0.67)	3/50	2.27 (1.49)
		2	1/15	0.01 (0.01)	1/19	1.40 (1.40)	10/102	2.37 (0.92)
		3	2/14	0.03 (0.02)	2/20	0.03 (0.02)	9/100	1.37 (0.56)
		4	NA	NA	0/19	0.00	10/101	0.78 (0.34)
Salsola sp.	Russian thistle	1	3/15	0.06 (0.03)	6/20	5.13 (3.00)	27/50	4.72 (1.42)
		2	1/15	0.01 (0.01)	4/19	1.95 (1.75)	36/102	2.12 (0.63)
		3	3/14	0.35 (0.31)	3/20	0.27 (0.18)	22/100	1.24 (0.36)
		4	NA	NA	3/19	0.16 (0.12)	25/101	0.09 (0.02)
All species		1	4/15	0.14 (0.07)	7/20	5.80 (3.02)	36/50	8.42 (2.04)
		2	4/15	0.10 (0.05)	5/19	4.58 (2.24)	73/102	5.66 (1.66)
		3	10/14	1.51 (0.81)	12/20	3.49 (2.55)	56/100	5.08 (0.77)
		4	NA	NA	9/19	0.48 (0.20)	63/101	1.18 (0.34)

[1] Monitored 2011, 2015, 2020. A dash denotes the species was not on the priority or transect list that year. NA indicates the rotation has not yet taken place.
[2] Monitored 2010/2014/2016/2020. A dash denotes the species was not on the priority or transect list that year.
[3] Monitored 2009–2010/2013/2016/2021. A dash denotes the species was not on the priority or transect list that year.

4 Discussion

4.1 Priority IEP 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 should be reliable for the area surveyed. However, data for non-priority species should not be assumed to be complete, as these species were not reliably mapped across observers, routes, or years.

During 2020 and 2021, one non-priority exotic species, stork's bill (*Erodium cicutarium*), was observed along the State Route 24 monitoring route. This species could be considered for inclusion on the IEP priority list for the next monitoring rotation. It is important to bear in mind the overall length of the IEP priority list, as well as potential for control, when adding species. Species may also be considered for monitoring in transects only.

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 2016, when tree-of-heaven was found. This year we detected two tree-of-heaven patches along State Route 24. These should be targeted for control. Russian knapweed was not detected in 2020 or 2021.

Oak Creek and Pleasant Creek have remained relatively stable over time. However, now that we have cleared up the identification issue between Russian olive and silverleaf buffaloberry, there are only three patches of Russian olive in Oak Creek. Given this low number of patches, Russian olive could be controlled.

Along State Route 24, field bindweed continues to increase (30 patches) and could be targeted for control. Madder has been aggressively and successfully treated by park staff in the past. Despite this, three patches were documented in 2021. Russian olive continues to increase in both patch numbers and size class; the number of large patches has increased. The number of Russian olive patches has notably increased downstream from the oxbow. The two puncture vine patches along Pleasant Creek could be a target for control while they are still limited in extent.

Tamarisk remains the most prolific IEP along all three monitoring routes. It has remained relatively stable along Oak and Pleasant creeks, but numbers of both total patches and large patches have increased along State Route 24. This indicates that previously identified patches have expanded and grown. Along State Route 24 and Oak Creek, tamarisk distribution looks similar to during the last monitoring visit in 2016. Patch numbers have stayed constant at Pleasant Creek, but they are more concentrated in the central portion of the route.

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 (State Route 24 monitoring route) in 2010 (G. Lenhart, pers. comm.). However, viable communities of tamarisk beetle appear patchy at the park, and activity may even have decreased in 2022 (J. Roche, M. Wehtje, pers comm). While the increase in tamarisk patches along State Route 24 is discouraging, continued monitoring will show the effects of both future control efforts and the tamarisk beetle as a biological control agent. Beetle-related tamarisk mortality has required several years of defoliation at Dinosaur National Monument. However, stem mortality can allow native species to colonize and compete with tamarisk stands (Williams 2013). Stem mortality at Dinosaur increased substantially in 2013, seven years after the first releases of tamarisk beetle.

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 for 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 return to Capitol Reef NP in 2023. Because any previous IEP detections may be eradicated by park staff between monitoring visits, the locations of monitoring quadrats are re-generated prior to each survey. Long-term trend reporting will focus on trends in species distribution, percent cover of individual species, and changes in IEP percent cover of priority species by monitoring route. The park is investigating larger control options for African mustard in the Upper South Desert and cheatgrass in the southern portion of the park. Because the former is in and around the Sandy 3 allotment, where NCPN conducts upland monitoring, information for that area may already be available. In consultation with the park, NCPN may devote some time to extra-area surveys at these locations on the next visit. State Route 24 is scheduled to be widened in 2022. Due to construction-related disturbance, it may be wise to monitor this route again in 2023 or 2024, ahead of its normal spot in the rotation.

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Appendix A. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Aegilops cylindrica*	Jointed goatgrass	No	–	4237896	479460	2	2
2021	State Route 24	*Aegilops cylindrica*	Jointed goatgrass	No	–	4237901	479417.3	3	2
2021	State Route 24	*Ailanthus altissima*	Tree-of-heaven	No	Sapling(s)	4237730	478487.3	5	1
2021	State Route 24	*Ailanthus altissima*	Tree-of-heaven	No	Sapling(s)	4237882	479392.9	3	2
2021	State Route 24	*Arctium minus*	Burdock	No	–	4237337	478329.6	5	1
2020	Pleasant Creek	*Asparagus officinalis*	Asparagus	No	–	4226093	486812.3	2	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	No	–	4237835	479206.3	5	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	No	–	4237893	479299.8	5	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	No	–	4237862	479947.5	3	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	No	–	4237748	478411.8	5	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	No	–	4237741	478473.1	5	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	Yes	–	4237860	478150.8	5	1
2021	State Route 24	*Asparagus officinalis*	Asparagus	No	–	4237899	479547.1	5	1
2020	Pleasant Creek	*Asparagus officinalis*	Asparagus	No	–	4226034	484406.3	3	2
2021	State Route 24	*Bromus japonicus*	Japanese chess	No	–	4237259	485555.1	1	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237267	481609.7	3	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4236601	483358.8	3	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237343	480852.4	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237103	484654.7	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237814	479170.8	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237748	478355.7	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237165	485090.4	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237814	480124.5	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237893	479306.2	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237917	479401.2	2	2
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237857	479282.3	3	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237798	478833.9	2	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237313	481996.1	2	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237342	481903.7	2	3

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237336	481962.1	2	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237832	479233	3	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237293	481494.1	2	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237208	485135.5	2	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4236619	483298.3	3	3
2021	State Route 24	*Chorispora tenella*	Blue mustard	No	–	4237282	481560.4	2	3
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4240072	474751.8	5	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4240705	473501.5	2	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4239950	475385.4	1	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4239315	475894	5	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4241544	471874.9	5	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237703	487552.8	5	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4240056	474935.1	2	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4242024	468877.6	2	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4242063	468672.5	2	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4240058	474651.9	5	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4241010	473118.6	2	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4238365	476868.8	5	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4240964	473211.3	2	1
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237262	485432.8	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4240710	473515.2	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4238752	476373.1	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237297	482533.6	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237908	479357.5	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237873	479265.8	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237843	479218.7	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237788	479113.6	1	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4238471	476710.6	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4237092	488085.2	2	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4241623	470482.5	2	2

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4241611	471341.6	1	2
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4239383	475846.6	2	3
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4238954	476183	3	3
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4238648	476481.8	2	3
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4239268	475931.1	3	3
2021	State Route 24	*Convolvulus arvensis*	Field bindweed	No	–	4238182	477240.2	1	4
2020	Oak Creek	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4215334	485779.1	4	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237710	478844.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237502	489183.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237507	486543.8	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237827	480605.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237355	482712.5	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4236925	484208.1	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237806	485785.8	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237212	484429.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4236956	484262.2	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237136	485002	3	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237889	479448.8	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237823	479992.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237902	485970.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237882	479872	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237326	481862.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237282	485373	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237862	479929.2	2	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237878	479403.3	4	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237855	479806.7	3	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237866	479583.7	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237846	480590.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237864	479741.9	3	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237725	486221.7	5	1

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237206	484443.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237725	486334.3	2	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237162	485029.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236746	483145.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236873	483068.1	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237139	481216.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237329	481973.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236805	483758.1	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237281	482985.1	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237069	484949.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237451	485626.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237321	480872.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237215	484550.2	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236648	483528.8	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237217	484501.3	2	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237216	488418.5	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237047	484805.1	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237561	487338.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236636	483296	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237934	485923.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237824	480051.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237763	478583.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237163	482993.9	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237842	480065	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4238061	477193.3	3	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237691	480640.3	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237225	482987.7	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237106	483000.4	5	1
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237348	481869	5	1
2020	Oak Creek	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4214199	483847.7	3	2

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237349	488934.6	4	2
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237522	487297.5	3	2
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237938	477982.2	3	2
2020	Oak Creek	*Elaeagnus angustifolia*	Russian-olive	No	Mature Tree(s)	4214211	483849.7	1	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4236885	484089.8	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237580	487358.5	4	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237018	484314.2	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237277	481422.9	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237412	487194.7	3	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236897	484138.4	3	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237112	484358.9	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237370	487108.3	3	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236734	483658.8	3	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236947	484239	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237054	484906.8	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236713	483629.5	2	3
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237908	485813.8	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237158	484385.9	4	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237385	482698.5	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237755	486124.7	3	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237340	482657	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237483	482874.3	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237058	484336.6	3	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237282	481604.3	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237463	482773.2	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237914	479686.6	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237437	489034.9	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237391	488977.2	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237736	486339.3	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237443	486725.8	2	4

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237858	486026.4	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237489	486610.8	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237463	486661.6	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237571	485646.5	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237564	486543.3	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237938	485931.1	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237588	480686.9	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237190	481018.5	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237946	485897.1	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237330	482345.8	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237730	486194.1	3	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237279	480913.9	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237932	485840.9	3	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237309	481771.5	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4236973	484282.6	3	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237735	486326.4	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237920	485824.2	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237228	481337.8	2	4
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Mature tree(s)	4237490	489129.5	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237406	486883.8	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237717	486440.4	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237677	486484.2	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237618	486516.4	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237734	486398.3	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237810	486074.4	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237897	485982.8	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237465	489079.6	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237650	487737.9	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237571	487337.5	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237615	487383.9	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237100	488020.1	3	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237421	489435.7	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237479	489267	3	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237274	487825.8	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237450	489321.3	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237381	487799.2	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237328	487803.3	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237189	487869.2	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237261	487885.5	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237423	489373.2	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237123	487955	3	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237366	486996.5	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237425	486787.1	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237599	487774.7	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237524	486570.6	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237491	487251.9	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237681	487697.2	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237153	487907.6	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237450	487205.4	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237380	486937.6	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237366	487061.5	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237416	487168.6	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237533	487296.8	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237413	486827	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237703	487645.9	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Sapling(s)	4237420	482956.7	2	5
2021	State Route 24	*Elaeagnus angustifolia*	Russian-olive	No	Seedling(s)	4237734	486383.3	2	5
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237789	479125.1	2	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4236787	483096.8	3	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4236851	484123.8	3	2

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237732	478523.6	2	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237284	481725.4	3	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237448	482919.4	3	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237814	480070.3	3	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237023	484800.5	2	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237882	479317.4	2	2
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237322	482136	2	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237340	482316.4	2	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237247	481389.3	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237385	480796.5	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237331	480863.9	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237893	479832.3	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237325	481876.2	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4238164	477291.5	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237412	480760.3	2	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237539	480699.4	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237482	480727.2	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237516	480741.5	2	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4238183	477218.2	2	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237565	480710.8	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237782	478746.8	2	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237766	478665.4	3	3
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237317	482232.2	2	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237126	481198.5	3	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237204	481343.9	3	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237142	481254.9	3	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237139	481081.7	3	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237125	481134.9	3	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237170	481265.6	2	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237771	479108.4	3	4

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237462	482756.3	2	4
2021	State Route 24	*Elymus repens*	Quackgrass	No	–	4237336	481847.8	2	4
2021	State Route 24	*Erodium cicutarium*	Stork's-bill	No	–	4239924	475408.5	2	2
2021	State Route 24	*Erodium cicutarium*	Stork's-bill	No	–	4237821	478228.9	2	2
2021	State Route 24	*Erodium cicutarium*	Stork's-bill	No	–	4237401	482966.9	1	3
2021	State Route 24	*Rubia tinctoria*	Madder	No	–	4237907	479553.2	3	2
2021	State Route 24	*Rubia tinctoria*	Madder	No	–	4237877	479635.2	4	2
2021	State Route 24	*Rubia tinctoria*	Madder	No	–	4237881	479584.3	4	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Old Growth	4215205	485313.2	3	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4215324	486873.6	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214067	483649.5	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214051	483675.9	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214655	484528.9	1	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4215061	487887.9	3	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214680	484552.7	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4214650	488657.2	3	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4214562	484343.8	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215350	486110.3	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215282	487421	3	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215413	486651.8	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4214439	488718.7	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215294	487386.7	2	1
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215302	487325	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4223903	481395.1	4	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4224512	482271.5	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226259	485696.6	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226233	485935.8	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226574	488072.6	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226988	488438.4	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226247	485126	3	1

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

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2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4224238	481854.2	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4225063	482736.6	4	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226208	485639.8	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4225510	483266.4	4	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226064	487429.7	1	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4227192	488709.1	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226087	487472.7	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4227059	488618.9	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226083	486809	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4225869	484184.9	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226140	487941.5	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226152	487989.1	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226111	487499.8	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226004	486743.1	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4224617	482360.8	1	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4224924	482603.1	4	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226279	485073	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4225009	482663.9	4	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226148	486607	3	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226133	487036.4	1	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226744	488327.7	2	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4224344	482102.1	4	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226216	486873.3	1	1
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4226699	488274.1	2	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236788	483766.8	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236775	483770.9	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237729	486248.1	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237405	486818.5	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237141	487907.3	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237428	486739.5	5	1

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237746	486152.3	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237277	481703.7	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237888	480068.6	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237895	479483.6	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237888	479372.9	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237881	479856.2	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4240170	473938.1	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237036	484779.8	2	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236805	483870.2	3	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236937	483029.2	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237133	484409.3	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237320	482251.5	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237053	484929.6	2	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236605	483346.1	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236630	483270.4	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237297	482040	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236850	483065.8	2	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237446	489306.4	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237123	481148.4	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237151	481268.8	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4241634	471302.3	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237760	480594.5	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237459	480771.6	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237459	485638.1	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236913	484257.3	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237939	485906.1	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237017	484356.4	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237360	485641.5	2	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237442	482929.9	5	1
2021	State Route 24	*Tamarix* sp.	tamarisk	No	–	4237840	480469.3	5	1

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215364	486485.1	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214585	484431	3	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215313	485836	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214084	483794	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215351	487012.5	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Old Growth	4215148	487640.4	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4215348	486720.2	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4215337	485730	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214302	483919.6	1	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214170	483840.5	1	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214704	484581.9	3	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214414	488755	1	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215373	486329.2	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Seedling(s)	4215348	486235.9	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226378	487939.3	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226201	485304.1	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4225264	483006.4	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226654	488178.7	1	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226475	487934.4	1	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226299	488002.3	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226350	487979.1	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226959	488369.3	1	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4224551	482311.5	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226945	488549.6	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226411	487896.1	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226234	488012	1	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4224380	482111.6	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226611	488141.7	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Old Growth	4226548	488025.9	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4225914	484256.6	2	2

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226172	484499.5	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226228	485194.1	2	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226048	484413.7	1	2
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226174	487873.7	1	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237258	488615.7	2	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237307	482622.1	2	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4240576	473622.7	3	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236845	484039.8	2	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237929	477927.9	2	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4241671	470859.2	3	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236649	483231.9	3	2
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237473	482860.1	2	2
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215008	484863.1	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215231	485486.5	3	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214956	484795.9	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214598	484490.1	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215256	485523.3	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214394	488857.2	1	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214984	484822.9	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215311	487291.3	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215100	487836	3	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215085	487846.3	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Old Growth	4215156	487609.4	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4215190	485291	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214553	484289.9	1	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4214570	484384.1	1	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4215016	484885.6	2	3
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226179	484453	2	3
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226454	487892.2	2	3
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226960	488480.6	2	3

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4226683	488246.7	2	3
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4225977	484303.8	2	3
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226112	484440.2	1	3
2020	Pleasant Creek	*Tamarix* sp.	tamarisk	No	Sapling(s)	4226024	484375.1	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237945	485877.7	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237727	486190	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237650	486488.8	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237256	488571.9	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237190	488409.9	4	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236686	483202.1	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237927	485947.8	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236654	483246.7	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237496	487268.3	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237241	487823.4	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237574	487352.3	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237377	488972.7	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237415	489450.7	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237534	487310.6	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237229	488512.3	4	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237273	481407.5	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237405	489010.5	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237154	481078.8	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237241	481356.5	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237194	481288.3	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237458	482906.7	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237210	482979.4	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237409	489423.9	2	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237733	486171.1	3	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237106	484672.4	1	3
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236728	483162.1	2	3

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237324	482657.6	2	3
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214899	484811.2	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214542	484223.5	1	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215185	487751.8	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214817	484732.7	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214784	484696.8	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214858	484791	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4214092	483609	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215325	487118	1	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Mature Tree(s)	4215140	487796.2	2	4
2020	Oak Creek	*Tamarix* sp.	tamarisk	No	Old Growth	4215198	487673.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236843	483987.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236629	483489.6	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237472	489282.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237442	489333.4	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237376	488956.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236659	483549	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237665	485691.3	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237615	485669.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237082	484699.1	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236942	484280.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236876	484146.2	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237718	485716.5	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237278	481626.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236910	484238.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236889	484198.3	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237645	487732.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237775	486110.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237285	481566.3	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237412	482719.7	3	4

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237209	484468	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236619	483337.3	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237609	487390.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237300	488850.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237150	488311.2	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237210	488460.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237424	489036.1	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237418	489391.2	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237420	487187.7	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237373	486924.7	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237456	489065	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237245	488562.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237378	485626.1	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237701	485708.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236926	484260.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237095	484684.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237652	485685.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237940	485858.5	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237437	485627	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237278	481617.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237289	481473.3	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237285	481550.9	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237751	485730.7	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237603	485662.6	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237307	480886.6	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236669	483225.5	1	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237170	488360	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237270	485413.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237276	485573.8	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237248	485521.4	2	4

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237318	482391.5	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237255	485464.5	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236636	483506.7	1	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237640	485679.7	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237740	485725.9	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237422	485626.6	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237364	485626.6	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237794	485736.3	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237689	485702.9	3	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237258	485449.6	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237264	485566.3	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237589	485654.6	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237247	485505.2	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237275	485393.4	2	4
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237339	485620	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237168	485073.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236865	484094.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237423	489021	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237446	486676	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237505	486577.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237426	486778	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237217	488453	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237131	485027.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237237	488504.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237270	488628.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237279	488681.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237198	488410.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237317	488863.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237485	489111.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237077	484369.2	1	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237341	481914.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237127	484391.7	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237099	484985.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236986	484319.6	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237065	484940.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237190	484580.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237203	485114.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237236	485157.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4236855	484042	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237092	488160.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237046	484852.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237213	484537.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237157	484623.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237600	487766.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237109	488211.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237130	488262.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237082	488104.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237355	487037.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237433	489502.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237501	489229.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237458	487227.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237499	489174.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237430	489462.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237598	486515.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237470	486622.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237345	488914.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237336	488720.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237387	487143.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237552	486539.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237364	487092.6	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237389	486869.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237358	486983.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237322	488900.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237410	487160.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Mature tree(s)	4237409	486839.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236709	483637.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237093	483001.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236861	484075	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236818	483868.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236805	483818.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236839	483970.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237035	483011.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237462	489296.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237590	487370.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237047	484873.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237496	489147.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237173	488337.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237150	488284.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237128	488227.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237086	484969.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237057	484924.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236900	484217.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237330	488892.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237490	489251.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237475	489095.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237318	482004.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237491	486591	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237809	485739.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237209	488437.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237282	481676.3	3	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237341	481893.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237849	485780.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237105	484381	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237197	484444.2	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237337	481949.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237157	484407.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237192	485101.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237064	484728.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237045	484777.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237314	481785.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237052	484357.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237156	485056.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237038	484834.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237139	484643	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237369	486981.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237225	485142.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236812	483100.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236871	484130.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237439	482744.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236977	483025.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236684	483594	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236766	483730.7	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236828	483920.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237544	485639.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237396	482707.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236884	484180.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236921	483044.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236766	483133	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237302	482117.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237327	482225.7	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237320	485613.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236850	484023.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236962	484296.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237493	485630.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236736	483682.2	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236862	483073.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237333	481839.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237897	485806.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237210	482991.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237333	482333.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237352	482663.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237297	481731.4	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237321	482984.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237322	482171.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237477	487249.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237092	488053	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237305	482058.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237336	482280.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237445	489050.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237505	489198.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237738	486177.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237378	482973.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237467	482910.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236615	483437	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237649	485737.4	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237267	482985.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237834	486054.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237798	486087.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237172	484602.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237931	485838.7	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237121	485013.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237306	482557.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237303	482448	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237295	485302.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237315	482612.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237475	482795.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237213	484538.2	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237203	484453.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237484	482857.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236625	483308.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237217	484520.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237760	486129.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237312	488877	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236613	483378.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237290	485611.9	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4236706	483182	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237916	485963.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237730	486229.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237120	488237.7	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237549	487324.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237443	486693.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237510	487285.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237520	487283	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237366	488958.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237338	488919.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237266	488659.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237942	485915.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237357	487003.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237100	488187.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237384	486886.7	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237086	488133.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237154	482996.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237081	488077.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237690	486474	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237613	486507.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237435	489344.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237385	486924.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237424	489477.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237417	489417.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237438	489490.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237560	487326.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237404	487165.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237130	487938.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237511	487802.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237601	487369.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237678	487458.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237095	488114.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237161	487896.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237482	487238.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237286	487812.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237535	486550.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237461	486639	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237375	487122.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237274	487874.4	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237455	487803.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237398	487799.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237344	487799.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237273	488648	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237624	487751.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237356	487057.8	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237368	486945.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237702	487512.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237714	487564.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237711	487621.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237192	488390.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237734	486307.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237432	486762.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237618	487763	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237563	487791.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237105	488174	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237439	487195.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237294	482500.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237876	486006.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237287	485353	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237262	485190.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237691	487680.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237430	482952.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237734	486368.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237286	485246.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237635	486509.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237202	487857.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237105	487995.8	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237401	487146.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237377	487096.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237417	486815.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237364	487039.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237448	486709.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237439	487207.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237474	486635	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237400	486870.3	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237496	486599.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237539	486559	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237588	486531.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237468	486648.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237643	487412	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237660	487726.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Sapling(s)	4237725	486426.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236778	483752.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236794	483788	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237003	483017.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236722	483658.8	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236894	484207.9	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236835	483952.9	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236870	484112.8	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236888	483059.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237164	488318.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237142	488262	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237219	487847.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237272	487856.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237185	488371.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237140	488287.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237037	484814	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237276	488666.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236671	483570.3	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236846	484006.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236751	483704.4	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237180	485087.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237215	485127.7	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236858	484058.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237311	485601.5	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236782	483120.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236943	483036.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236811	483844.4	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237062	483005	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237835	485774.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236823	483894.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237142	485042	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237477	485629.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236833	483088.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237533	485637.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237282	485231.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4236696	483613.7	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237240	482987.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237182	482992.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237352	482978.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237479	482884.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237262	488634.9	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237296	482982.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237923	485827.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237887	485798.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237120	483000.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237411	482962.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237291	485339.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237430	489355.9	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237295	485286.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237482	482812.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237256	485178.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237307	488865.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237268	485593	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237314	485630.3	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237379	486906.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237200	488434.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237360	487076.2	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237159	488336.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237179	488381.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237631	486498.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237697	487494.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237672	487444	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237551	487314.4	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237588	487355.7	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237372	486965.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237473	487804.3	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237454	486655.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237479	486606.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237173	487883.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237359	487800.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237120	488210.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237302	487809.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237510	487269.7	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237235	488529.5	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237219	488484.8	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237363	486963.9	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237354	487020.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237518	486563.1	1	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237204	488424.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237672	487713.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237404	486856.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237711	487546.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237712	487601.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237699	487660.8	2	5

Appendix A, cont. Exotic plant patches detected on monitoring routes at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_ Year	Plot_ID	Species	Common_Name	Pulled?	Growth_Stage	N_Coord	E_Coord	Cover_ Class	Size_Class
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237092	488097	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237632	487753.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237581	487784.2	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237421	486802.8	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237704	486460.6	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237735	486290.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237730	486410.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237737	486350.9	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237413	487801	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237429	487183.5	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237634	487398.7	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237101	488156.1	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237140	487923.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237363	487022	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237469	487227	4	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237095	488034.6	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237371	487082.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237393	487134	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237113	487975.9	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237509	486584.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237437	486747.5	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237454	486689.3	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237653	486498.1	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237530	487800.4	3	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237554	486548.4	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237606	486521.2	2	5
2021	State Route 24	*Tamarix* sp.	tamarisk	No	Seedling(s)	4237388	486910.2	2	5
2020	Pleasant Creek	*Tragopogon dubius*	Yellow salsify	Yes	–	4225556	483373.6	2	2
2021	State Route 24	*Tribulus terrestris*	Puncture vine	No	–	4237757	479011.3	2	2
2021	State Route 24	*Tribulus terrestris*	Puncture vine	No	–	4237799	478804.6	1	3

Appendix B. Exotic plant transect data detected at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Route	Transect	E_Coord	N_Coord	Species	Common_Name	Alive?	AverageCover	Priority
2020	Pleasant Creek	198	484669.5	4226232	*Agropyron cristatum*	crested wheatgrass	Y	0.666667	Transect
2021	State Route 24	74	478149.2	4237861	*Asparagus officinalis*	Asparagus	Y	0.166667	Yes
2020	State Route 24	83	480218.1	4237793	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2020	Oak Creek	210	483808.1	4214104	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2020	Oak Creek	214	485203.4	4215153	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2020	Oak Creek	215	485635.9	4215319	*Bromus tectorum*	Cheatgrass	Y	0.666667	Transect
2020	Oak Creek	220	487821.4	4215106	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2020	Oak Creek	223	488927.3	4214374	*Bromus tectorum*	Cheatgrass	Y	1.5	Transect
2021	State Route 24	59	475173.4	4240024	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	61	475578.8	4239768	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	66	476403.1	4238723	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	67	476525.6	4238609	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	69	476937.2	4238328	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	72	477682.4	4238002	*Bromus tectorum*	Cheatgrass	Y	0.833333	Transect
2021	State Route 24	73	477854.3	4238005	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	75	478296.6	4237781	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	76	478615.9	4237758	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	78	479106.7	4237772	*Bromus tectorum*	Cheatgrass	Y	0.833333	Transect
2021	State Route 24	80	479575.9	4237884	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	82	480063.7	4237830	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	83	480228.6	4237793	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	86	480805.6	4237382	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	87	480925	4237266	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	88	481214.5	4237128	*Bromus tectorum*	Cheatgrass	Y	0.25	Transect
2021	State Route 24	89	481353.3	4237239	*Bromus tectorum*	Cheatgrass	Y	0.25	Transect
2021	State Route 24	90	481668.5	4237270	*Bromus tectorum*	Cheatgrass	Y	1	Transect
2021	State Route 24	92	482153.1	4237302	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	94	482645	4237318	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	96	482973.2	4237310	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect

Appendix B, cont. Exotic plant transect data detected at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Route	Transect	E_Coord	N_Coord	Species	Common_Name	Alive?	AverageCover	Priority
2021	State Route 24	98	483082.9	4236827	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	100	483491.3	4236621	*Bromus tectorum*	Cheatgrass	Y	6.833333	Transect
2021	State Route 24	101	483643.1	4236712	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	102	483943.5	4236825	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	103	484111	4236867	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	104	484365.3	4237047	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	105	484452.2	4237202	*Bromus tectorum*	Cheatgrass	Y	0.833333	Transect
2021	State Route 24	106	484723	4237057	*Bromus tectorum*	Cheatgrass	Y	1.25	Transect
2021	State Route 24	107	484891.2	4237050	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	108	485159.2	4237225	*Bromus tectorum*	Cheatgrass	Y	1.166667	Transect
2021	State Route 24	109	485313.2	4237299	*Bromus tectorum*	Cheatgrass	Y	0.666667	Transect
2021	State Route 24	110	485617.5	4237298	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	111	485633.8	4237482	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	112	485754.2	4237773	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	113	485829	4237923	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	114	486095.6	4237783	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	116	486517.1	4237594	*Bromus tectorum*	Cheatgrass	Y	0.666667	Transect
2021	State Route 24	117	486621.8	4237483	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	118	486942.3	4237369	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	119	487103	4237382	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	121	487489	4237696	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	122	487775.2	4237582	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	123	487800.9	4237437	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	126	488397.6	4237184	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	127	488547.9	4237250	*Bromus tectorum*	Cheatgrass	Y	0.166667	Transect
2021	State Route 24	130	489310.5	4237445	*Bromus tectorum*	Cheatgrass	Y	0.333333	Transect
2021	State Route 24	131	489312	4237454	*Bromus tectorum*	Cheatgrass	Y	0.5	Transect
2021	State Route 24	83	480228.6	4237793	*Chorispora tenella*	Blue mustard	Y	0.166667	Yes
2021	State Route 24	70	477229.9	4238182	*Convolvulus arvensis*	Field bindweed	Y	0.333333	Yes
2021	State Route 24	79	479257.8	4237865	*Convolvulus arvensis*	Field bindweed	Y	0.5	Yes
2021	State Route 24	78	479106.7	4237772	*Elymus repens*	Quackgrass	Y	1.333333	Yes

Appendix B, cont. Exotic plant transect data detected at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Route	Transect	E_Coord	N_Coord	Species	Common_Name	Alive?	AverageCover	Priority
2021	State Route 24	86	480805.6	4237382	*Elymus repens*	Quackgrass	Y	0.166667	Yes
2021	State Route 24	88	481214.5	4237128	*Elymus repens*	Quackgrass	Y	1	Yes
2021	State Route 24	91	481833.1	4237332	*Elymus repens*	Quackgrass	Y	0.166667	Yes
2021	State Route 24	93	482324.7	4237335	*Elymus repens*	Quackgrass	Y	0.5	Yes
2021	State Route 24	95	482762.3	4237455	*Elymus repens*	Quackgrass	Y	0.333333	Yes
2021	State Route 24	99	483187.7	4236699	*Elymus repens*	Quackgrass	Y	0.166667	Yes
2020	Oak Creek	212	484483	4214593	*Melilotus alba*	White sweet-clover	Y	0.166667	No
2020	Pleasant Creek	195	483411.5	4225583	*Melilotus alba*	White sweet-clover	Y	3.5	No
2020	Oak Creek	210	483808.1	4214104	*Melilotus officinalis*	Yellow sweet-clover	Y	3.666667	No
2020	Oak Creek	212	484483	4214593	*Melilotus officinalis*	Yellow sweet-clover	Y	1	No
2020	Oak Creek	213	484793.1	4214940	*Melilotus officinalis*	Yellow sweet-clover	Y	4	No
2020	Oak Creek	216	486100.1	4215370	*Melilotus officinalis*	Yellow sweet-clover	Y	0.75	No
2020	Oak Creek	218	486945.5	4215344	*Melilotus officinalis*	Yellow sweet-clover	Y	0.166667	No
2020	Oak Creek	219	487430.3	4215290	*Melilotus officinalis*	Yellow sweet-clover	Y	2.666667	No
2020	Oak Creek	220	487821.4	4215106	*Melilotus officinalis*	Yellow sweet-clover	Y	0.666667	No
2020	Pleasant Creek	191	482002.3	4224321	*Melilotus officinalis*	Yellow sweet-clover	Y	0.166667	No
2020	Pleasant Creek	192	482381.8	4224638	*Melilotus officinalis*	Yellow sweet-clover	Y	0.333333	No
2020	Pleasant Creek	206	487941.4	4226140	*Melilotus officinalis*	Yellow sweet-clover	Y	0.333333	No
2020	Pleasant Creek	207	487994.7	4226519	*Melilotus officinalis*	Yellow sweet-clover	Y	0.333333	No
2020	Pleasant Creek	208	488349.8	4226826	*Melilotus officinalis*	Yellow sweet-clover	Y	1	No
2020	Pleasant Creek	209	488618.4	4227059	*Melilotus officinalis*	Yellow sweet-clover	Y	0.333333	No
2020	State Route 24	83	480218.1	4237793	*Salsola* sp.	Russian thistle	Y	0.833333	Transect
2020	Oak Creek	214	485203.4	4215153	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2020	Oak Creek	220	487821.4	4215106	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2020	Oak Creek	223	488927.3	4214374	*Salsola* sp.	Russian thistle	Y	4	Transect
2020	Pleasant Creek	195	483411.5	4225583	*Salsola* sp.	Russian thistle	Y	2.333333	Transect
2020	Pleasant Creek	198	484669.5	4226232	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2020	Pleasant Creek	204	487193.4	4226146	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	43	471680.2	4241582	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	45	472155.8	4241443	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	54	474027.7	4240130	*Salsola* sp.	Russian thistle	Y	0.166667	Transect

Appendix B, cont. Exotic plant transect data detected at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Route	Transect	E_Coord	N_Coord	Species	Common_Name	Alive?	AverageCover	Priority
2021	State Route 24	67	476525.6	4238609	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	68	476788.9	4238401	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	71	477400.1	4238164	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	74	478149.2	4237861	*Salsola* sp.	Russian thistle	Y	1.166667	Transect
2021	State Route 24	79	479257.8	4237865	*Salsola* sp.	Russian thistle	Y	1	Transect
2021	State Route 24	83	480228.6	4237793	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	87	480925	4237266	*Salsola* sp.	Russian thistle	Y	0.5	Transect
2021	State Route 24	90	481668.5	4237270	*Salsola* sp.	Russian thistle	Y	0.833333	Transect
2021	State Route 24	102	483943.5	4236825	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	105	484452.2	4237202	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	106	484723	4237057	*Salsola* sp.	Russian thistle	Y	0.25	Transect
2021	State Route 24	108	485159.2	4237225	*Salsola* sp.	Russian thistle	Y	0.5	Transect
2021	State Route 24	109	485313.2	4237299	*Salsola* sp.	Russian thistle	Y	0.5	Transect
2021	State Route 24	110	485617.5	4237298	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	111	485633.8	4237482	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	116	486517.1	4237594	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	119	487103	4237382	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	123	487800.9	4237437	*Salsola* sp.	Russian thistle	Y	0.5	Transect
2021	State Route 24	126	488397.6	4237184	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	127	488547.9	4237250	*Salsola* sp.	Russian thistle	Y	0.333333	Transect
2021	State Route 24	129	488878.7	4237323	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2021	State Route 24	130	489310.5	4237445	*Salsola* sp.	Russian thistle	Y	0.166667	Transect
2020	Oak Creek	213	484793.1	4214940	*Tamarix* sp.	tamarisk	Y	0.166667	Yes
2020	Oak Creek	220	487821.4	4215106	*Tamarix* sp.	tamarisk	Y	0.166667	Yes
2021	State Route 24	95	482762.3	4237455	*Tamarix* sp.	tamarisk	Y	17.66667	Yes
2021	State Route 24	103	484111	4236867	*Tamarix* sp.	tamarisk	Y	0.333333	Yes
2021	State Route 24	105	484452.2	4237202	*Tamarix* sp.	tamarisk	Y	10	Yes
2021	State Route 24	115	486247.7	4237727	*Tamarix* sp.	tamarisk	Y	0.166667	Yes
2021	State Route 24	117	486621.8	4237483	*Tamarix* sp.	tamarisk	Y	4.666667	Yes
2021	State Route 24	118	486942.3	4237369	*Tamarix* sp.	tamarisk	Y	3.333333	Yes
2021	State Route 24	120	487365.5	4237586	*Tamarix* sp.	tamarisk	Y	4.333333	Yes

Appendix B, cont. Exotic plant transect data detected at Capitol Reef National Park, June 5–August 28, 2020, and May 30–June 2, 2021.

Visit_Year	Route	Transect	E_Coord	N_Coord	Species	Common_Name	Alive?	AverageCover	Priority
2021	State Route 24	126	488397.6	4237184	*Tamarix* sp.	tamarisk	Y	24	Yes
2021	State Route 24	128	488877.4	4237312	*Tamarix* sp.	tamarisk	Y	1.333333	Yes
2021	State Route 24	131	489312	4237454	*Tamarix* sp.	tamarisk	Y	13.33333	Yes

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

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National Park Service
U.S. Department of the Interior

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