Capitol Reef National Park



2005 Invasive Non-Native Plant Inventory

Northern Colorado Plateau Inventory and Monitoring Network

Addendum Report

December 2005

Prepared by

Steven Dewey and Kimberly Andersen

Utah State University

Cover photo:

Tamarix ramosissima seedling in a rock crevice in Deep Creek. Photo by R. Richards.

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Steven A. Dewey and Kimberly A. Andersen
Utah State University

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ADDENDUM REPORT

Inventory of Invasive Non-native Plants
Conducted During 2005 in Portions of Capitol Reef National Park,
Northern Colorado Plateau Network of the National Park Service.

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INTRODUCTION

Utah State University conducted an invasive plant inventory project during 2003 and 2004 for twelve Parks and Monuments associated with the National Park Service, Northern Colorado Plateau Network, including Capitol Reef National Park (CARE). Funding became available to continue the work on a limited basis during the 2005 field season. This report documents the results of the 2005 invasive non-native plant inventory at Capitol Reef National Park. The document serves as an addendum to the Final Report for the Capitol Reef National Park 2003-2005 Invasive Non-native Plant Inventory (Dewey and Andersen 2005). Methods are documented fully in the original report and only summarized in the current report.

OBJECTIVES

The primary objective of this project was to document distribution and abundance of targeted invasive non-native plant species across the range of habitats and areas of management concern at Capitol Reef National Park. It was anticipated that information from this inventory will be useful in the Park's ongoing efforts to improve strategic planning and to increase the effectiveness and efficiency of field operations associated with invasive plant management.

METHODS

SELECTION OF TARGET SPECIES AND INVENTORY AREAS

Five members of the Utah State University weed mapping crew participated in an inventory of targeted invasive plants in portions of Capitol Reef National Park in May and August of 2005. Crew qualifications are documented in Appendix A. All field and office methods used in 2005 were identical to those described in the 2003-2004 Final Report. The same seventeen species were identified as high-priority targets in the CARE inventory (Table 1), and searched for systematically by all inventory crew members. Any other non-native species recognized as relatively new to CARE and potentially invasive on wildlands in the West were documented if found. Forty-seven species were listed in the GPS data dictionary, representing all species targeted for inventory by the 12 Parks included in this project, plus additional species of regional or national concern.

Areas inventoried in 2005 were selected in consultation with Dave Worthington, CARE Biologist, and Tom Clark, CARE Chief of Resources. The areas included were those most likely to have invasive plant habitat, with priority given to areas of present or anticipated Park development and high visitor use and were designated a management priority. Areas of likely weed seed introduction as well as sites identified as significant known or potential weed seed sources or "vector areas" were also given priority during the selection process.

As in 2003 and 2004, the focus of this inventory project was NPS lands. However, in some cases a limited number of additional lands immediately adjacent to the CARE border were inventoried. Non-NPS lands inventoried included portions of Paradise Flat, Deep Creek, and Grand Wash. The access road between the town of Torrey and Tubb Flats was also inventoried as a matter of convenience and efficiency, as crew members had to travel that route in order to access Park lands.

Table 1. List of invasive plant species targeted in Capitol Reef National Park in the 2005 Non-native Plant Inventory.

Invasive species	Common Name
Ailanthus altissima	Tree-of-Heaven
Arctium minus	Burdock
Asparagus sp.	Wild Asparagus
Carduus nutans	Musk thistle
Centaurea diffusa	Diffuse knapweed
Centaurea maculosa	Spotted knapweed
Centaurea repens	Russian knapweed
Centaurea squarrosa	Squarrose knapweed
Cirsium arvense	Canada thistle
Cirsium vulgare	Bull thistle
Convolvulus arvensis	Field bindweed
Elaeagnus angustifolia	Russian olive
Euphorbia esula	Leafy spurge
Halogeton glomeratus	Halogeton
Marrubium vulgare	Horehound
Onopordum acanthium	Scotch thistle
Tamarix ramosissima	Saltcedar

DATA CATEGORIES

The data categories included in this inventory were discussed and agreed upon by NCPN and USU project leaders prior to initiation of the 2003-2004 project. A complete description of the data categories and value options appears in Table 2. Data collection categories and definitions comply with the minimum mapping data standards established by North American Weed Management Association (NAWMA 2003) and include most of the core elements contained in the NPS Intermountain Region Weed Mapping Guidelines (Benjamin 2001, USDI-NPS 1995).

Data elements were collected by one of several methods: automatically recorded or manually entered into GPS units in the field (GPS-entered); transcribed from field notes; obtained from previously existing GIS data sets during post-processing (GIS-derived), or added manually in the office during post-processing (office). GIS-entered data included the location and size of each infestation, percent canopy cover, phenology of the weedy species, woody growth stage (if a woody species), presence of site disturbance, hydrology, dominant native species present, date, time, and any additional pertinent notes about the site. Data entered in the office during post-processing included ecological status, Park code, record numbers, detection confidence for inventory area polygons, scientific name, ITIS code, lifeform of species, county, state, and country. Additional data elements (e.g. datum, UTM zone, source of data) that pertain to the spatial data set as a whole are provided as metadata files (e.g., datum, UTM zone).

Table 2. Data fields used in 2005 Inventory of Invasive Non-Native Plants in Capitol Reef National Park.

Data Field	Description	Options / Values	Priority	Entry
Species Name	Latin name of species	Pick-list to be provided by Park staff	Required	GPS
Species Code	IT IS		Required	Office
Additional Names	Common name of the species			Office
Date	Date species observed		Required	GPS
Observer	Name of person observing population	First initial of person's last name used in data file name	Required	GPS
Location ID	Unique identifier for species population ("Record #")		Required	GPS
Park Code	Four-letter abbreviation of Park	CARE	Required	Office
Country	Name of country (e.g. USA)		Required	Office
State	Two-letter state abbreviation		Required	Office
County	County name		Required	Office
UTMN	UTM northing coordinate for population		Required	GPS
UTME	UTM easting coordinate for population		Required	GPS
Elevation	Elevation in meters (and feet)	Meters (or feet)	Required	GPS
Size of Infested Area	Size of population (if a point feature). Based on average diameter of weed infestation.	- 1 to few plants - 0.1 acre - 0.25 acre - 1 acre - 2.5 acres - 5 acres	Required only for points.	GPS
Gross Area		Gross estimate of land area occupied by a weed species	Required in specific situations.	GPS
Cover of infested area	Estimated percent of area infested with weed	trace (<1%) low (1 to 5%) moderate (6 to 25%) high (26 to 50%) majority (51-100%)	Required.	GPS
Distribution	Characterization of density	To be determined by PI		GPS
Phenology	Life stage of majority of population. Use most progressive life stage if population appears evenly split.	- vegetative - bud - flower - immature fruit - mature fruit - seed dispersing - dormant	Required	GPS

Table 2 continued.

Data Field	Description	Options / Values	Priority	Entry
Woody Growth	Predominant growth stage of species. Use for woody weed species only (elm, tamarisk, Russian olive, etc.) If stages are mixed, use most advanced stage. (valuable for planning control efforts)	- seedling - sapling - mature - old-growth	Optional	GPS
Lifeform	Lifeform of species.	-tree -shrub -graminoid -forb	Required	office
Ecological Status	Qualitative description of the level of infestation that identifies ability of site to recover to natural state once the weeds have been removed.	1. No weeds -The management emphasis is preventing weed encroachment. 2. New and/or small infestations - These infestations have good potential for eradication because they are small and there is a good understory of desirable plants. 3. Large scale infestation with 30% or greater understory of residual grasses and good potential productivity – Management of these sites in a way that selects for the recovery of the residual native grasses and shrubs has good potential for control but not eradication of the weeds. May be more that one noxious weed species, but the underlying biologic integrity of the unit is good. 4. Large-scale infestations with few or no (less than 30% cover) desirable grasses in the understory. Infestation often dense and/or multiple weed species. Control will require intense treatment and probably revegetation. Control may be possible but not eradication. In some areas, the infestation may have changed the character of the land so much that attempts for rehabilitation are cost prohibitive.	Required	Field and Office
Dominant Species	Species Latin name for dominant species at site (up to four species can be recorded)	Two to three dominant species need to be provided at each point (list of dominant species provided by Park). If single or few plants, use dominant species in 1/10 acre area.	Required	GPS
Buffer	Buffer needed to encompass population if GPS'ed as a line or polygon feature	Enter number in feet	Required for lines, optional for polygons	GPS

Table 2 continued.

Data Field	Description	Options / Values	Priority	Entry
Hydrology	General hydrologic setting of site. If further specificity is needed in Park, add items as subcategories to existing terms (e.g., wetland - seep).	- upland (above and away from floodplains) - riparian (along rivers or stream channels) - perennial: stream flows continuously in time. - intermittent: stream flows only at certain times of the year (typically on seasonal basis) when it receives water from springs or from melting snow. - ephemeral: stream flows only in direct response to precipitation. Ephemeral streams generally lack obligate riparian vegetation. - wetland (saturated soil for majority of growing season) - playa lakebed (poorly drained depressions)	Required	GPS
Disturbance	Evaluate disturbance at population site	1 - no disturbance apparent 2 - light to moderate disturbance 3 - site heavily disturbed	Required	GPS
Notes	Additional comments	Can include compass bearing for photos, description of non-weed features, etc.	Optional	GPS and field notes
Area ID	Unique identifier for inventory area		Required	GPS
Disturbance Comments	Comments on type and extent of disturbance noted in inventory area. If area is undisturbed, note as such.	-Agriculture/Livestock Grazing -Construction/Development -Fire -Fire Suppression -Flooding -Wind -Geothermal -Animal Disturbance (e.g. gopher mound, buffalo wallow -Irrigation/Ditches -Mining and Quarries -Oil and Gas Exploration/Production -Habitat Improvement Project -Recreation/Visitor Use -Right-of-Way -Construction/Maintenance -Utility -Construction/Maintenance -Trail/Outfitter/ORV use	Required	Field notes

FIELD PROCEDURES

The 2005 invasive non-native plant inventory in Capitol Reef National Park was conducted by a five-person USU crew in May and August of 2005 (Table 3). Areas inventoried by the USU crew included portions of Deep Creek, Paradise Flats, Paradise Draw, Middle Desert, Cathedral Valley, Capitol Wash, Grand Wash, Fremont River, Highway 24, Caineville Wash Road, and Hartnet Draw Road. For purposes of planning and data analysis the inventoried lands were divided into twelve areas. The order in which areas were inventoried was determined by the crew leader and potential invasive habitat was considered prior to each day's travel route.

Field searches were conducted at as fine of a scale as required to be confident that 90 to 100 percent of all invasive plant infestations 0.01 acre or larger within each inventory area were detected. Search swath widths were adjusted as needed based on variations in terrain, walking speed, associated vegetation, and target species. Areas such as Cathedral Valley and Paradise Flat were open and visibility was generally good, allowing relatively broad EDSW's (typically 50 to 100 yards). In areas such as slot canyons, or stream corridors in which vegetation cover was heavy, EDSW's were usually narrower, sometimes less than 25 yards. This procedure was used in the upper half of Deep Creek as well as the portions of Capitol Wash and Grand Wash inventoried in 2005. Whenever inventorying areas wider than a single swath width, multiple parallel passes of a lone crew member (or multiple crew members walking parallel transects or contours) were searched as contiguous or slightly overlapping strips to avoid coverage gaps. Daily inventory routes of each crew member were recorded and mapped using the BFP tracking function of the GeoExplorer GPS units. BFP tracking distance settings were adjusted as needed to correspond closely to the EDSW distance for each area.

Each inventoried area within Capitol Reef National Park was assigned a detection confidence value based on the crews' estimated ability to see infestations of 0.01 acre in size of the least visible target species, taking into account terrain, vegetation cover, and the size and growth stage of the targeted plant species. Detection confidence was broken into three categories: Low (1 to 50 %), Medium (51 to 89 %), and High (90 to 100%).

The locations of all target species were documented by the USU crew using handheld Trimble GeoExplorer 3, Trimble XM, or Trimble XT global positioning system (GPS) units with 2- to 5-meter accuracy. Crews also recorded the location and documented the identity of any other non-target species they encountered if that species has a known history of invasiveness in other regions in the West. Field locations were recorded by GPS as UTM coordinates, and were later differentially corrected in the production of final digital products.

At the end of each day, field crews marked and dated all inventoried areas on USGS 7.5' topographic maps to assist in determining project progress and thoroughness of coverage. Data were downloaded from GPS units onto a laptop computer each day using Pathfinder Office GIS software. Edits (such as eliminating any duplicate features) were made to the data, and any additional information (such as infestations drawn by hand on field maps or other data not recorded with a GPS unit) were added at this time. The data was then processed and managed following the protocols described in the original report (Dewey and Andersen 2005).

GENERAL PHOTOGRAPHS

Representative photos are included in this report showing some of the species and habitats inventoried, as well as a sampling of photographs of field crews doing inventory work. Photographs were taken of each new weed species found in the Park. Close-up photographs were intended to serve as a type of voucher specimen for weed species encountered, and landscape photos of weeds are expected to assist in relocating small isolated infestations for future control. Photographs were taken with 35-mm slide film and later digitized. Pertinent photographs are included with this report (see Appendix B). Digital copies of all photographs were submitted to NCPN as part of the final deliverables.

Table 3: Invasive plant inventory areas, inventory dates, crew members, and acres inventoried in 2005 in Capitol Reef National Park.

Area Number	Area Description	Dates Inventoried	Crew Members *	Acres Inventoried **	Corresponding Inset Map Names and Letter Codes***
35	Middle Desert, Cathedral Valley	May 19 – 20, 2005, August 25, 2005	SD, KA, RR, KB, HH	2179.8	A – Cathedral Valley B – Pierce Draw
36	Capitol Wash	May 18, 2005, May 21, 2005	RR, KB	348.4	Q – Capitol Wash
37	Grand Wash – Section 1	May 18, 2005	RR, KB	159.4	P – Grand Wash
38	Grand Wash – Section 2	May 18, 2005	HH	54.8	P – Grand Wash
39	Fremont River – East section	May 17, 2005	RR, HH, KB	212.9	O – Deep Creek
40	Highway 24	May 23, 2005	RR, KB	354.2	K – Twin Rocks L – Chimney Rock M – Fruita N – Hickman Natural Bridge
41	Deep Creek, Paradise Draw, Paradise Flat – Section 1	August 24, 2005	KA, RR	613.8	G – Deep Creek Spring H – Paradise Flats
42	Paradise Flat – Section 2, road	August 24, 2005	SD, KA, RR	754.5	G – Deep Creek Spring H – Paradise Flats
43	Caineville Wash Road – Section 1	May 20, 2005	RR, HH, KB	183.8	B – Pierce Draw C – Middle Desert Wash
44	Hartnet Draw Road – Section 1	May 19, 2005	RR, HH, KB	850.7	A – Cathedral Valley B – Pierce Draw C – Middle Desert Wash D – Ackland Spring E – Hartnet Draw
45	Hartnet Draw Road – Section 2	May 19, 2005	RR, HH, KB	31.6	F – The Hartnet
46	Caineville Wash Road – Section 2	May 20, 2005	RR, HH, KB	14.6	E – Hartnet Draw
	TOTAL			5758.5	

* Crew abbreviations: SD = Steve Dewey, KA = Kim Andersen, RR = Ruth Richards, HH = Hilary Hudson, KB = Kelsey Benson.

** Year 2005 = 5758.5 acres. An average of 171.4 acres inventoried per person per 10-hr day.

*** Indicates the key to mapped areas presented later in Figure 2.

RESULTS and DISCUSSION

Field crews inventoried 5,758.5 acres in Capitol Reef National Park during May and August of 2005 (Table 3), an amount representing approximately 2.4 percent of the entire 241,904 -acre Park. An average of 171.4 acres was inventoried per person per 10-hr day during the season.

Figure 1 shows the twelve inventory areas used in planning and field operations in 2005. The identification number, drainage description, and acreage of each inventory area are listed in the legend. Each inventory area is also color-coded for ease in identification. Figure 2 serves as an orientation map for the smaller 1:24,000 scale weed-distribution "inset" maps found in Appendices C and D. Inset maps are distinguished by letters A – Q plus the name of a distinct geographic feature found within its boundaries. The corresponding inventory area numbers from Figure 1 are included in the legend in parentheses behind each inset map name. Seventeen inset maps are required to cover all 12 of the inventory areas, and large inventory areas may span over several inset maps. For example, different sections of Highway 24 (Inventory Area 40) appear on Twin Rocks, Chimney Rock, Fruita, and Hickman Natural Bridge (Insets K, L, M, N).

Invasive plants infested a total of 27.762 acres (Table 4), an amount equal to 0.48 percent of the land inventoried. Of the 17 targeted species, only *Ailanthus altissima, Centaurea repens, Convolvulus arvensis, Elaeagnus angustifolia, Halogeton glomeratus,* and *Tamarix ramosissima* were found in those portions of the Park inventoried in 2005. No infestations of *Arctium minus, Asparagus* sp., *Carduus nutans, Centaurea diffusa, Centaurea maculosa, Centaurea squarrosa, Cirsium arvense, Cirsium vulgare, Euphorbia esula, Marrubium vulgare,* or *Onopordum acanthium* were discovered. Non-target species mapped were *Salsola kali, Sisymbrium altissimum, Tragopogon dubius, Ulmus pumila*, and *Verbascum thapsus*.

The most abundant target species found in the Park in 2005 was *Tamarix ramosissima.* This species, which was especially common along much of the eastern portion of the Fremont River and the western portion of Capitol Wash, comprised more than 63 percent of the total infested acreage inventoried. *Halogeton glomeratus* made up 31.2 percent of the infested acres. The remaining infestations (5.7 % of the total infested acreage) were comprised of the other four targeted species and the two additional non-native species that were mapped.

Deciding which non-target weeds to map was left to the discretion of individual crew members, based on their assessment of the potential threat and relative abundance of each species. Species such as *Bromus tectorum, Bromus inermis, Lactuca serriola, Erodium cicutarium, Sonchus oleraceus, Melilotus officinalis, Dactylis glomeratus,* and *Chenopodium album* were present in most areas but were ignored due to their previously recognized abundance in the Park. Species such as *Salsola kali* and *Tragopogon dubius* were mapped by some but not all crew members; and those who chose to map them often did so only in locations of unusually low abundance. As a result, the acreage values and corresponding distribution maps for these non-target species should be considered less than complete inventories.

Appendix C contains maps showing the overall distribution and relative abundance of all mapped weeds (no species distinction) within the boundaries of inventoried areas. Appendix D

Table 4: Acres infested by invasive plant species within inventoried areas of Capitol Reef National Park and adjacent lands in 2005.

Species	Acres (Inside Park)	Acres (Outside Park)	Total Acres Infested
Ailanthus altissima	0.414	---	0.414
Centaurea repens	0.010	---	0.010
Convolvulus arvensis	0.427	0.010	0.437
Elaeagnus angustifolia	0.108	---	0.108
Halogeton glomeratus	7.020	1.631	8.651
Salsola kali	0.615	---	0.615
Tamarix ramosissima	17.450	0.050	17.500
Tragopogon dubius	0.027	---	0.027
Totals	**26.071**	**1.691**	**27.762**

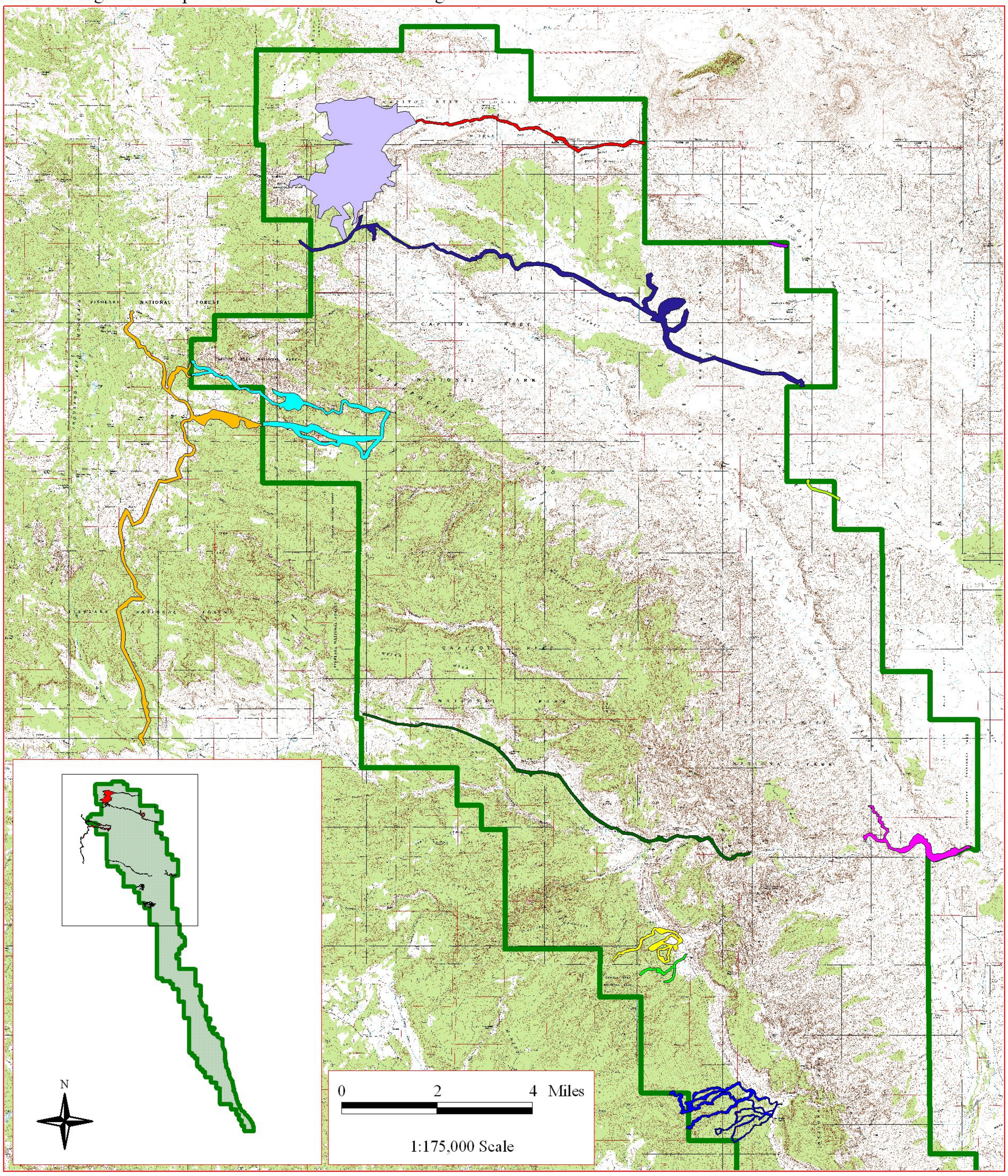
contains maps of individual species occurrences and weed-free areas within all inventoried portions of Capitol Reef National Park. Following is a summary of the weed situation in individual drainages and other inventory units within Capitol Reef National Park.

Middle Desert, Cathedral Valley (Area Number 35, Inset Maps A, B)
Cathedral Valley and portions of the Middle Desert were inventoried by a crew of 3 in May and August of 2005. The valley is very open and relatively flat. Vegetation consists of a mixture of sagebrush, saltbrush, several native forbs, and little scattered juniper. The crew inventoried the large fields around Cathedral Mountain as well as around the Morrell Cabin and Lone Pine Spring. The crew primarily concentrated on riparian zones in the Middle Desert area, but inventoried as many open areas as possible. Two target species, *Tamarix ramosissima* and *Halogeton glomeratus*, were found in the inventory unit. *Tamarix ramosissima* was found primarily in Middle Desert Wash, although it was found lightly scattered in other minor washes throughout the valley. The heaviest infestations were found near the Morrell Cabin. Infestations of *T. ramosissima* ranged in size from 0.001 to 0.25 acres, and trees ranged from seedling to mature growth stages. *Halogeton glomeratus* was also found lightly scattered in the drier regions of the valley, and infestations ranged in size from 0.001 to 0.5 acres.

Although not a target species, *Salsola kali* was also found lightly scattered north of Cathedral Mountain and Needle Mountain. Infestations of this species were also small, often consisting of less than five plants per patch. Interestingly, most patches were found growing underneath juniper trees. It is likely that other areas contain *Salsola kali,* but it was not mapped by all crew members. Other species seen but not mapped include *Bromus tectorum, Chenopodium spp.*, and *Melilotus officinalis.*

The inventoried area in Middle Desert was extremely open and visibility was generally very good. The crew was confident in its ability to find at least 90 percent of all 0.01-acre or larger patches of the targeted species. Few disturbances were noted by the crew aside from flooding events along the washes, and the road. The crew did note the presence of recent tracts from dirt

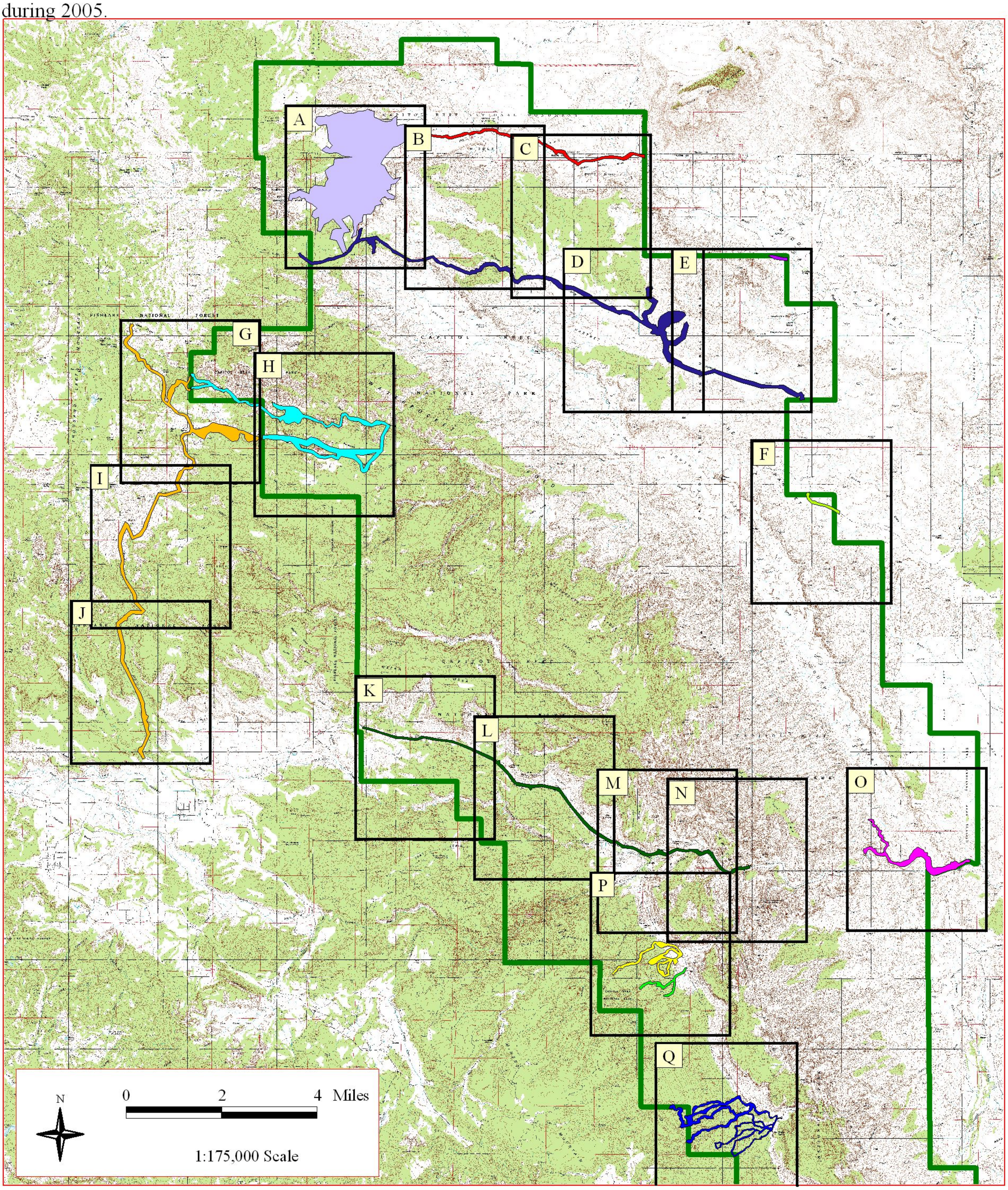
Figure 1. Identification number and acreage of individual areas inventoried for non-native invasive plant species in the northern region of Capitol Reef National Park during 2005.



- Area 35 - Middle Desert, Cathedral Valley (2179.8 acres)
- Area 36 - Capitol Wash (348.4 acres)
- Area 37 - Grand Wash, Section 1 (159.4 acres)
- Area 38 - Grand Wash - Section 2 (54.8 acres)
- Area 39 - Fremont River, East section (212.9 acres)
- Area 40 - Highway 24 (354.2 acres)
- Area 41 - Deep Creek, Paradise Draw, Paradise Flat - Section 1 (613.8 acres)
- Area 42 - Paradise Flat - Section 2, Road (754.5 acres)
- Area 43 - Caineville Wash Road - Section 1 (183.8 acres)
- Area 44 - Caineville Wash Road - Section 2 (850.7 acres)
- Area 45 - Harnet Draw Road - Section 1 (31.6 acres)
- Area 46 - Hartnet Draw Road - Section 2 (14.6 acres)
- Park boundary

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Figure 2. Insets indicating the location, letter code, and name of the twenty-one 1:24,000 scale maps used in Appendix tables to show weed distribution within individual inventoried areas in the northern region of Capitol Reef National Park during 2005.



Inset A - Cathedral Valley (Areas 35, 44)
Inset B - Pierce Draw (Areas 35, 43, 44)
Inset C - Middle Desert Wash (Areas 43, 44)
Inset D - Ackland Spring (Area 44)
Inset E - Hartnet Draw (Areas 44, 46)
Inset F - The Hartnet (Area 45)
Inset G - Deep Creek Spring (Areas 41, 42)
Inset H - Paradise Flats (Areas 41, 42)
Inset I - Sand Flat (Area 42)
Inset J - Holt Draw (Area 42)
Inset K - Twin Rocks (Area 40)
Inset L - Chimney Rock (Area 40)
Inset M - Fruita (Area 40)
Inset N - Hickman Natural Bridge (Area 40)
Inset O - Deep Creek (Area 39)
Inset P - Grand Wash (Areas 37, 38)
Inset Q - Capitol Wash (Area 36)
Park boundary

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bikes in several off-road areas south of Cathedral Mountain. The overall area was assigned an ecological status level three.

Capitol Wash (Area Number 36; Inset Map Q)
Portions of Capitol Wash were previously inventoried in 2003. The remaining sections of Capitol Wash from the western Park boundary to Eph Hanks Tower were inventoried in 2005. The crew searched several of the small side drainages that feed into the main portion of Capitol Wash below Eph Hanks Tower. *Tamarix ramosissima* was the only targeted species found in this inventory unit. Although several branches were searched, *Tamarix* appeared to occur only in the main branch marked as Capitol Wash on the 7.5-minute topographic map. Patches were typically 0.01-acre in size and consisted of mature trees.

No other targeted species were found, nor were any other non-target species noted. The crew did note the presence of water in many of the side drainages inventoried. No disturbances aside from natural flood events were noted. The drainages were narrow and the crew was confident that it was able to see at least 90 percent or greater of all 0.01-acre infestations of the targeted species. The inventory unit was assigned an overall ecological status level three, although this applies primarily to the main Capitol Wash. Several of the additional drainages included in this inventoried unit did not contain any of the targeted species and could be assigned a level one or two.

Grand Wash, Sections 1 and 2 (Area Numbers 37, 38; Inset Map P)
Several tributaries of Grand Wash were inventoried in May of 2005 by the USU crew. The crew searched several of the larger branches of Grand Wash starting from the South Draw road and working west. *Tamarix ramosissima* was the only targeted species found during the inventory. Most infestations were small in patch size and tree size. Patches were between 0.001 and 0.1 acres and consisted of primarily saplings. Infestations were also found more consistently near the road. The crew also noted the presence of *Bromus tectorum* although it was not mapped.

The crew noted the presence of water in several of the drainages, due to recent rains. No other disturbances were visible at the time of the inventory. The drainages inventoried were narrow and visibility was very good. The crew was confident in its ability to see at least 90 percent or greater of all 0.01-acre or larger infestations of the targeted species. The two sections of Grand Wash were each assigned an ecological status level two.

Deep Creek, Paradise Draw, Paradise Flat – Section 1 (Area Number 41; Inset Maps G, H)
The upper half of Deep Creek and portions of Paradise Draw and Paradise Flat were included in this inventory unit. The USU crew inventoried this portion of Capitol Reef National Park on August 24, 2005. The inventory of Deep Creek began at the western Park boundary and continued downstream approximately three miles, before crew climbed out and came back up along Paradise Flat and in Paradise Draw. A single seedling of *Tamarix ramosissima* was found in the head of Deep Creek, growing out of a boulder. It was pulled upon its discovery. No other targeted species were found along the inventoried stretch of Deep Creek, nor were any targeted species noted in the portions of Paradise Draw and Paradise Flats inventoried. The crew did note the presence of *Chenopodium album* and *Bromus tectorum* along Paradise Flat. These infestations were found primarily concentrated under juniper.

Visibility was very good in Deep Creek, as the area searched was very narrow at times and generally open. Vegetation along Deep Creek consisted of juniper, Douglas fir and aspen in places, singleleaf ash, and rabbitbrush. Visibility was generally good along Paradise Flat as this was open and vegetation consisted primarily of scattered juniper, native grasses, and cacti. Paradise Draw was also open, although the banks contained heavier stands of vegetation including cottonwood, willow, juniper, squawbush, and singleleaf ash. The crew was confident in its ability to see at least 90 percent of all 0.01-acre patches of the targeted species in all three areas included in this unit. No obvious disturbances were noted aside from natural flood events. Deep Creek Spring was flowing at the time of the inventory and this seems a likely place for future weed infestations to appear. The area was assigned an ecological status level one.

Paradise Flat – Section 2, Road (Area Number 42; Inset Maps G, H)

The access to Deep Creek and Paradise Flat and portions of Paradise Flat outside the Park boundary were included in this inventory as they were access points for areas within the Park boundary. Roads were inventoried from an ATV and Paradise Flat was inventoried on foot. The portion of road included in this unit extends from Tubb Flats to the Torrey Canal northwest of the town of Torrey. Only two small patches of *Halogeton glomeratus* were noted along the road shoulders. No other targeted species were discovered in this unit. Non-target species seen but not mapped include *Bromus tectorum*, *Melilotus officinalis*, and *Chenopodium album*.

The crew was confident in its ability to see at least 90 percent of all 0.01-acre infestations of the targeted species. Disturbances include vehicle and foot traffic along the road as well as grazing in the areas near Torrey. The area was assigned an ecological status level two.

Fremont River – East Section (Area Number 39; Inset Map O)

A section of the Fremont River between the waterfall and the eastern Park boundary was included in this inventory unit. *Tamarix ramosissima* and *Elaeagnus angustifolia* is found commonly throughout this stretch of the Fremont River. It was not included in the 2005 report because it was inventoried in 2004 and those findings are reported in the 2003-2004 Final Report (Reference). However, *Tamarix ramosissima* was found in a side canyon west of the Deep Creek confluence, and those numbers are included in this report. Over five acres of *Tamarix ramosissima* were found clustered in this drainage, consisting primarily of mature trees.

Halogeton glomeratus was also found, scattered along Highway 24 within a mile of the eastern Park boundary. A single patch of sapling *Ailanthus altissima* was found several hundred yards downstream of the waterfall. A single 0.01-acre patch of *Convolvulus arvensis* was also found approximately a half mile from the turn-off to the Notom Road. Although not a targeted species, two small patches of *Tragopogon dubius* were also found along the Fremont River in this unit. Species seen but not mapped include *Bromus tectorum, Melilotus officinalis, Chenopodium album, Salsola kali,* and *Lactuca serriola.*

Visibility along the river varied with the density of vegetation. Cottonwoods, willows, and *Tamarix ramosissima* were very heavy in some sections and the crew was not always able to penetrate the trees. However, the crew was still confident in finding at least 90 percent of all 0.01-acre infestations of the targeted species. Disturbance from recent flooding events was

evident along stretches of the Fremont River. The unit was assigned an ecological status level four based on the 2004 and 2005 findings.

Highway 24 (Area Number 40; Inset Maps K, L, M, N)
Highway 24 was inventoried in 2004 but was reinventoried in 2005 at the request of the Park. The crew walked both road shoulders in May of 2005. *Halogeton glomeratus* was the most common target species found along the road. It was found most frequently along a mile stretch at the western Park boundary. It was also found frequently between Chimney Rock and the Castle. *Convolvulus arvensis* was also found consistently along the road shoulder, primarily between Chimney Rock and Fruita. Also discovered along the drainages near the road shoulder include *Tamarix ramosissima, Elaeagnus angustifolia,* and *Ailanthus altissima*. Infestations of these three species were largely found near the Fruita historic district. An infestation of *Centaurea repens* near Chimney Rock was revisited in 2005. Its location was discovered in 2004, but the crew returned to the area to search for new or additional infestations in 2005. No new infestations were found.

Although not a target species, the crew also mapped occurrences of *Tragopogon dubius* along Highway 24. Infestations were lightly scattered and often consisted of single plants or small groups of plants. Additional species seen but not mapped include *Bromus tectorum, Melilotus officinalis, Lactuca serriola, Erodium cicutarium,* and *Salsola kali.*

Visibility was generally good along the road shoulder and the crew was confident of seeing at least 90 percent of all 0.01-acre or larger infestations of all targeted species in this area. Search coverage was intensified to compensate for areas of limited visibility near the Fremont River. Disturbance factors include grading of road shoulders, vehicle and foot traffic, and other human activities in visitor-usage areas. Highway 24 was given an ecological status level three.

Caineville Wash Road, Sections 1 and 2 (Area Numbers 43, 46; Inset Maps B, C, E)
Portions of the Caineville Wash Road inside the Park boundary were inventoried from the cab of a truck in May of 2005. The crew used a 200-foot buffer from the edge of the road as their search area for this inventory unit. *Tamarix ramosissima* and *Halogeton glomeratus* were found along the road shoulder in scattered locations along the road. *Tamarix ramosissima* was confined to the washes that parallel the road including Middle Desert Wash. *Halogeton glomeratus* was found in the drier sites and directly on the road. Although not mapped, the crew also noted the presence of *Bromus tectorum* and *Salsola kali*. These species were present in patches but not widespread in distribution. *Melilotus officinalis* was also present and fairly consistently found in the main washes near the road.

Visibility along the road shoulder was generally very good and the crew drove slow enough to ensure that 90 percent of all 0.01-acre or larger infestations of the targeted species could be seen and mapped. Disturbances include vehicle traffic along the road and flash flood events in many of the washes. Area 43 was assigned an ecological status level two and Area 46 was assigned an ecological status level one.

Harnet Draw Road, Sections 1 and 2 (Area Numbers 44, 45; Inset Maps A, B, C, D, E, F)
The Hartnet Draw Road was inventoried from the cab of a truck by the crew in May of 2005. Ackland Spring was also included in this inventory unit. *Tamarix ramosissima* was found in several of the washes that crossed or paralleled the road. However, the heaviest infestations were found near Ackland Spring. Infestations ranged in size from 0.001 to 0.5 acres and consisted of primarily sapling and mature trees. Most trees were also budding at the time of the inventory. The crew also recorded four infestations of *Halogeton glomeratus* found in a small section of the road. Although not mapped, *Melilotus officinalis* was found frequently along several of the washes near the Hartnet Road. *Salsola kali* and *Bromus tectorum* were also discovered widely scattered along the road shoulder during the inventory but were also not mapped at this time.

Visibility was very good and areas along the road shoulder were generally open. The crew was confident it found at least 90 percent of the 0.01-acre patches of the targeted species. Disturbances noted include vehicle traffic and flooding events in the numerous washes. An ecological status level three was assigned to Area 44 and a level one was assigned to Area 45.

CONCLUSIONS / RECOMMENDATIONS

The primary objective of this project was to document the distribution and relative abundance of targeted non-native invasive plant species across the range of habitats and areas of management concern within Capitol Reef National Park. As with the information contained in the 2003-2004 report, it is anticipated that this 2005 inventory will be useful in the Park's ongoing efforts to improve strategic planning and to increase the efficiency and effectiveness of all field operations associated with invasive plant management.

During 2005 the USU crew noted that Capitol Reef National Park continues to implement weed control strategies and practices. Evidence of *Tamarix ramosissima* control work was seen in several locations. The only known *Centaurea repens* infestation in the Park had also been treated prior to its reinventory in 2005. It was also evident that several sites containing *Ailanthus altissima* along Highway 24 had recently been controlled.

USU continues to urge the Park to develop a comprehensive written management plan for invasive plant species in CARE, and to review and improve it on a regular basis. Regularly scheduled weed inventories of all managed lands should be a part of the plan. Permanent monitoring sites should be established to evaluate the impact and spread of weeds, and to evaluate the effectiveness of its weed management approaches. Capitol Reef National Park is encouraged to become an active member of a local Cooperative Weed Management Area.

All NCPN Parks that were inventoried in 2003, 2004, and 2005 are in the enviable situation of still having the majority of their lands free of targeted invasive weeds. In Capitol Reef National Park 99.5 percent of the inventoried acres in 2005 were free of all targeted species. Furthermore, 94.4 percent of the inventoried acres in the three years combined (2003-2005) were free of all targeted species. And, because areas selected for this inventory were generally considered the sites most likely to be infested, it can be assumed that those CARE lands not inventoried have an

even higher proportion of weed-free acres. Furthermore, 100 percent of all inventoried lands in 2005 were completely free of at least 27 species of great concern to the region (Appendix E).

ACKNOWLEDGEMENTS:

We express appreciation to Angie Evenden and Margaret Beer at the Northern Colorado Plateau Network in Moab, UT, for their vision and efforts in continuing this inventory project. Thanks to Angie for her reviews of our data and reports, and to Aneth Wight for her invaluable technical assistance in GIS matters. We are grateful to Tom Clark and Dave Worthington for their help in logistical planning and coordination. Above all, we thank the dedicated USU crew members who frequently encountered potentially dangerous situations and considerable physical hardship in the intense summer heat and rugged backcountry of southern Utah to collect this information.

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[NAWMA] North America Weed Management Association. 2003. North American Invasive Plant Mapping Standards. (Web page: http://www.nawma.org).

[USDI-NPS] United States Department of Interior, National Park Service. 1995. Natural resource inventory and monitoring guidelines. NPS-75.

Appendix Tables and Figures

Appendix A. Crew Qualifications and Project Quality Assurance for 2005 Invasive Non-native Plant Inventory in Capitol Reef National Park.

The Utah State University wildland weed mapping team has considerable experience conducting the type of survey required in this NPS project. Previous weed surveys conducted by USU include:

1997	Mt. Naomi Wilderness Area, Cache County, UT
1998	Wellsville Mountains Wilderness Area, Cache and Box Elder Counties, UT
1999	Franklin Basin Recreation Area, USFS Logan Ranger District, Cache County UT
2000	Rich County Public Lands (BLM, USFS), UT
2001	Hardware Ranch WMA, UDWR, Cache County, UT
2001	Bud Phelps WMA, UDWR, Cache County, UT
2002	Hawkins Fire, USFS, Bannock County, ID
2002	Canyon Fire, USFS, Franklin County, ID
2002	Cherry Creek Fire, USFS, Bannock County, ID
2002	West Fork Fire, BLM, Bannock County, ID
2002	Dinosaur National Monument, Green River District, UT

Kim Andersen (crew leader) has considerable experience working on the USU crew in past years. Kim has a Bachelor of Science degree in Fisheries and Wildlife from the College of Natural Resources and is currently working towards a Master's Degree in Weed Science. Kim began work on the USU crew in 1999, and has been crew leader since 2000. Ruth Richards has a Bachelor of Science degree in Crop Science and is currently working towards a Master's Degree in Weed Science. She has worked on the crew in 2003 and 2004. Hillary Hudson has a Bachelor's degree and has worked on an Exotic Plant Management Team in California from 2003 to 2004. She worked on the crew in 2004. She has also worked as a National Park ranger in the Maze District of Canyonlands National Park. Kelsey Benson is currently working towards a Bachelor's degree in Plant Science at Utah State University. She has experience with GPS weed mapping for a county weed program in Idaho.

All USU weed survey crew members were required to pass a written exam in weed identification and mapping skills before being hired. Each also had passed an upper-division university course in weed identification, biology, and management, and/or has extensive practical experience in wildland plant identification. Once hired, USU and NPS crew members also attended a 3-week classroom and outdoor training course in late April and early May in wildland weed mapping techniques taught by Dr. Dewey at Logan and Zion National Park during 2003. A similar training course was offered to the USU crew in 2004 and 2005. Crew members were provided with weed identification field guide book, taxonomic keys, and pressed reference specimens of all targeted weeds. During the course of the summers USU crew members were quizzed periodically with fresh plant specimens provided by the crew leader and/or Dr. Dewey. Dr. Dewey also spent several days in the parks working with individual crew members under field conditions. To further authenticate findings, Dr. Dewey and/or the crew leader re-visited

representative areas in each park that had been previously mapped by the USU crew, using the most recent crew-generated weed infestation maps to compare them against their own field observations.

Appendix B. Project Photographs of Weed Species Detected, Inventoried Landscapes, and Crew Working in Capitol Reef National Park During the 2005 Invasive Non-native Plant Inventory.

Weeds Detected



Figure 1. *Tamarix ramosissima* seedling growing in a wash in Cathedral Valley. (CARE PR-71)



Figure 2. *Tamarix ramosissima* sapling growing underneath a juniper in Cathedral Valley. (CARE PR-72)



Figure 3. *Tamarix ramosissima* saplings growing in a wash in Cathedral Valley. (CARE PR-73)

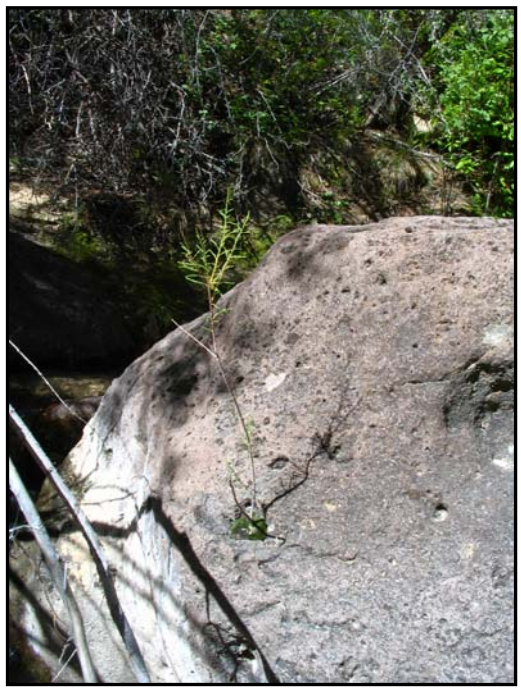


Figure 4. *Tamarix ramosissima* seedling growing in a boulder in Deep Creek. (CARE PR-74)

Capitol Reef National Park Landscapes



Figure 5. Head of Deep Creek as seen from Mud Spring. (CARE PR-62)



Figure 6. Looking into the head of Deep Creek.



Figure 7. View looking east into Deep Creek from its head. (CARE PR-67)

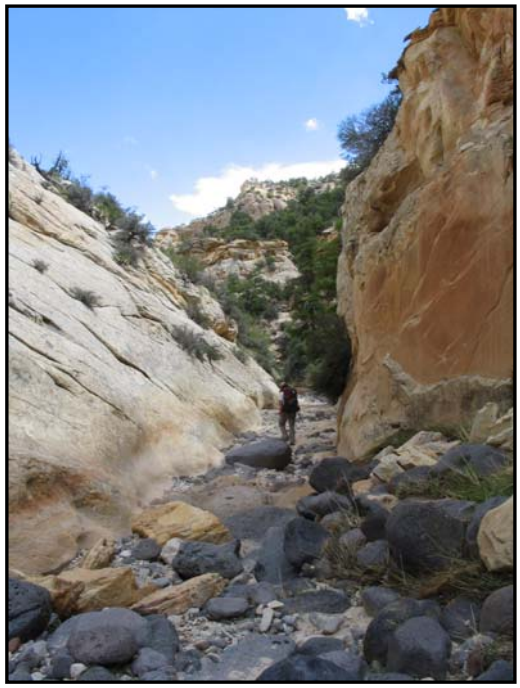


Figure 8. A section of narrows in Deep Creek.

Capitol Reef National Park Landscapes



Figure 9. Portion of an inventoried area in Deep Creek.



Figure 10. Deep Creek and Paradise Flats. (CARE PR-66)



Figure 11. Portion of an inventoried area on Paradise Flats.



Figure 12. View of Cathedral Valley from Tubb Flats. (CARE PR-65)

Capitol Reef National Park Landscapes



Figure 13. Looking north at the inventoried areas in Cathedral Valley and Middle Desert Wash.



Figure 14. Inventoried area at the southern edge of Cathedral Valley.



Figure 15. Inventoried areas around Cathedral Mountain and Needle Mountain. (CARE PR-69)



Figure 16. Inventoried portion at the southern edge of Cathedral Valley. (CARE PR-68)

Capitol Reef National Park Landscapes



Figure 17. Looking east across Cathedral Valley. (CARE PR-70)



Figure 18. Looking southwest along the Caineville Road towards Cathedral Mountain in Cathedral Valley.

Crew



Figure 19. Steve Dewey inventorying Cathedral Valley.



Figure 20. Kim Andersen preparing for the day at the Mud Spring campsite above Paradise Flats.



Figure 21. Kim Andersen and Ruth Richards inventorying an area above Deep Creek.



Figure 22. Ruth Richards inventorying the road shoulder in Cathedral Valley.

Crew



Figure 23. Steve Dewey driving to Mud Spring to inventory Deep Creek.



Figure 24. Steve Dewey and Kim Andersen preparing to drive to Mud Spring to inventory Deep Creek.

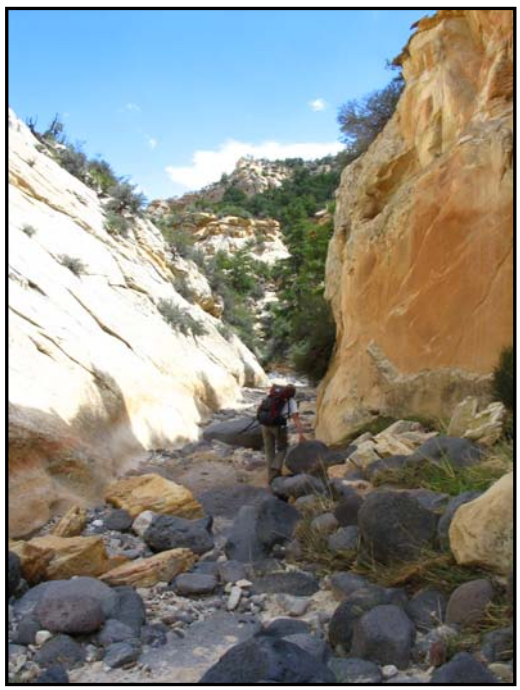


Figure 25. Kim Andersen inventorying an area a narrow section of Deep Creek.



Figure 26. Kim Andersen checking coordinates on the topographic map in Deep Creek.

Crew



Figure 27. Ruth Richards and Kim Andersen inventorying a section of Deep Creek.

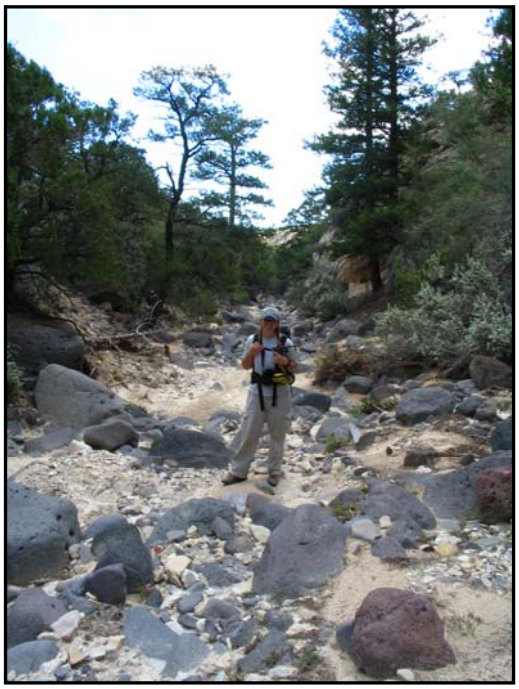


Figure 28. Ruth Richards in Deep Creek.

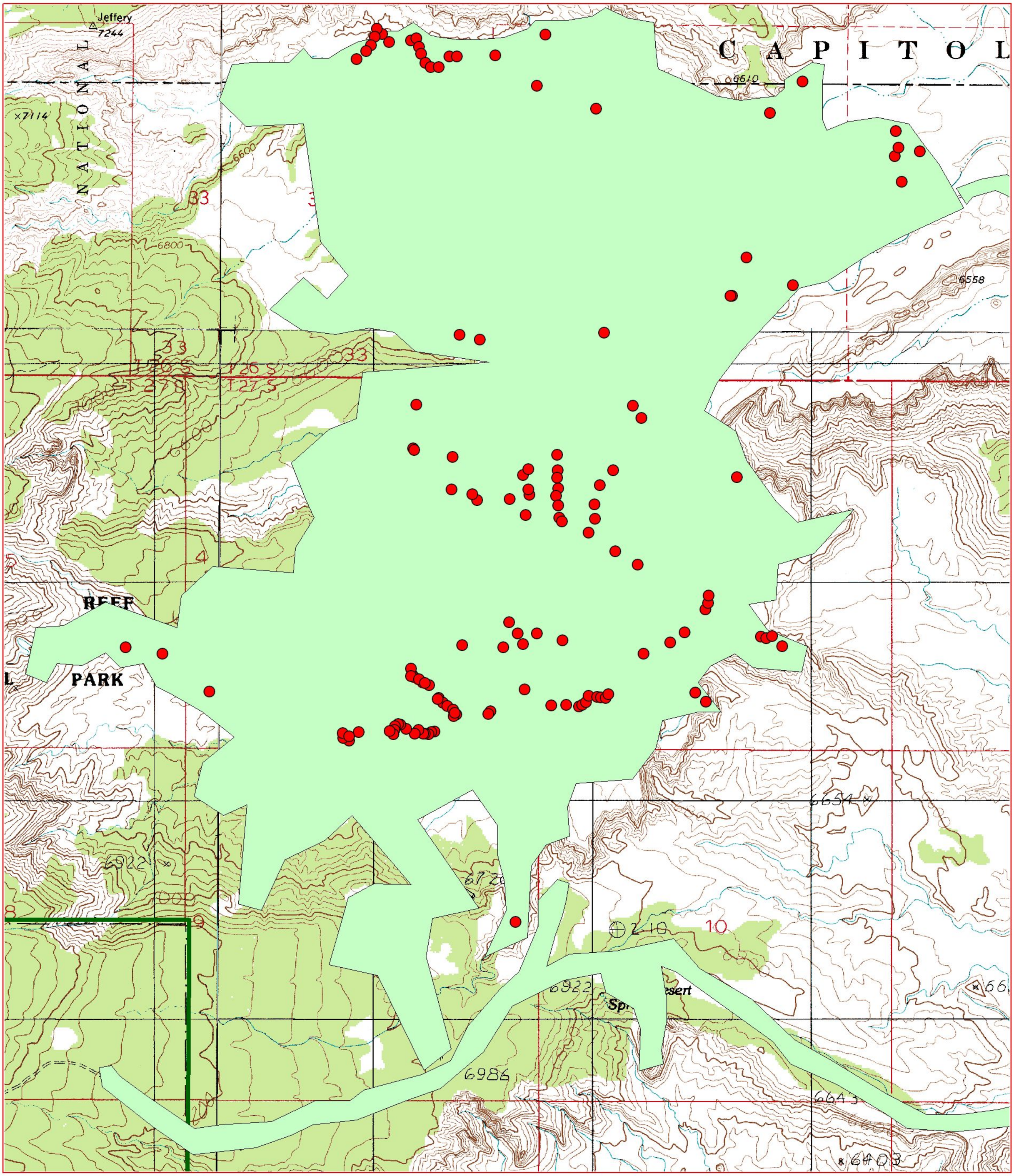


Figure 29. Steve Dewey and Kim Andersen packing equipment at the Mud Spring campsite above Paradise Flats.



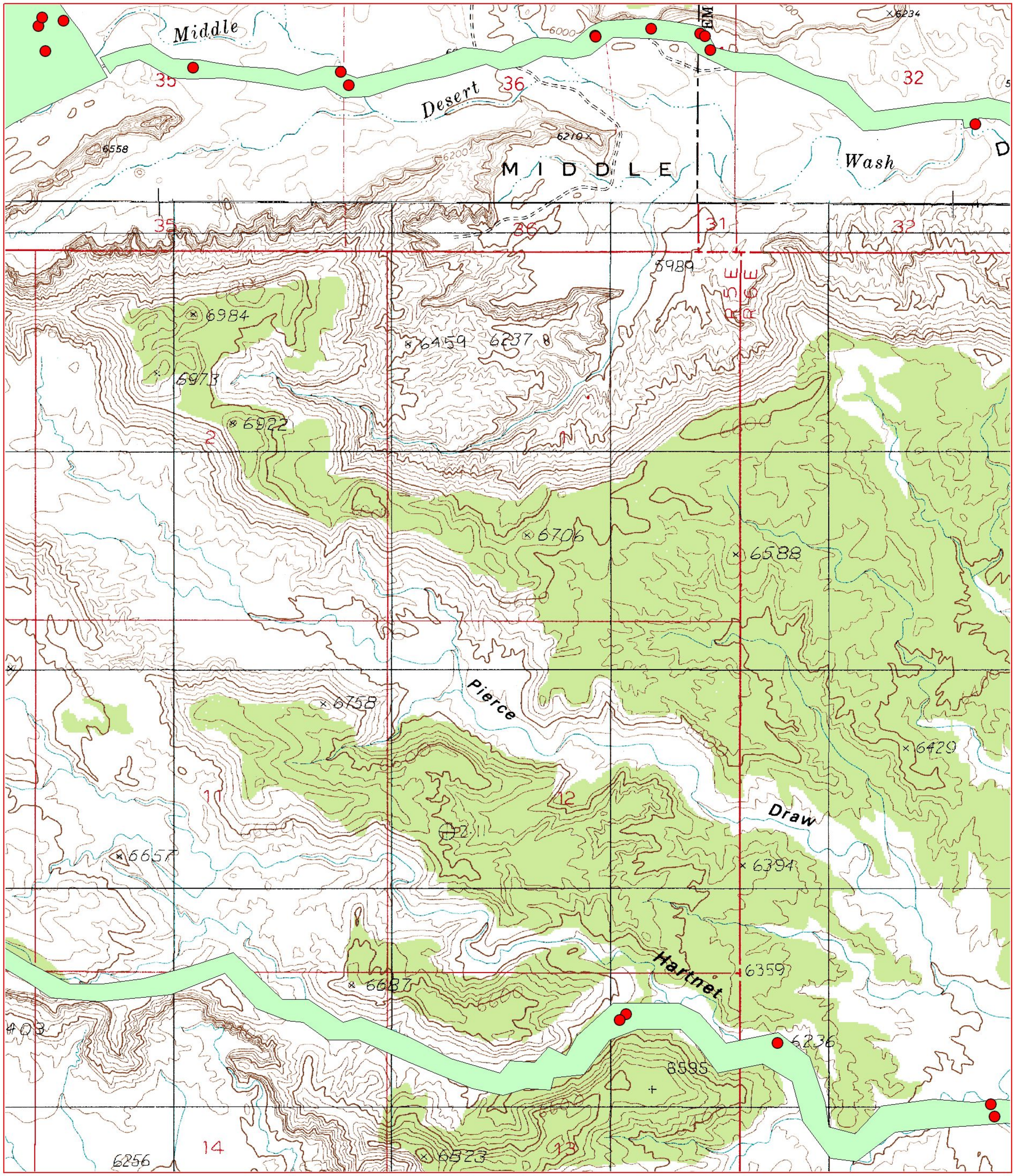
Figure 30. Steve Dewey and Ruth Richards preparing to inventory Cathedral Valley.

Appendix C. Overall Weed Distribution in Inventoried Areas - Cathedral Valley (Inset A)



Inset A
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Pierce Draw (Inset B)



Weed Points

Areas Inventoried

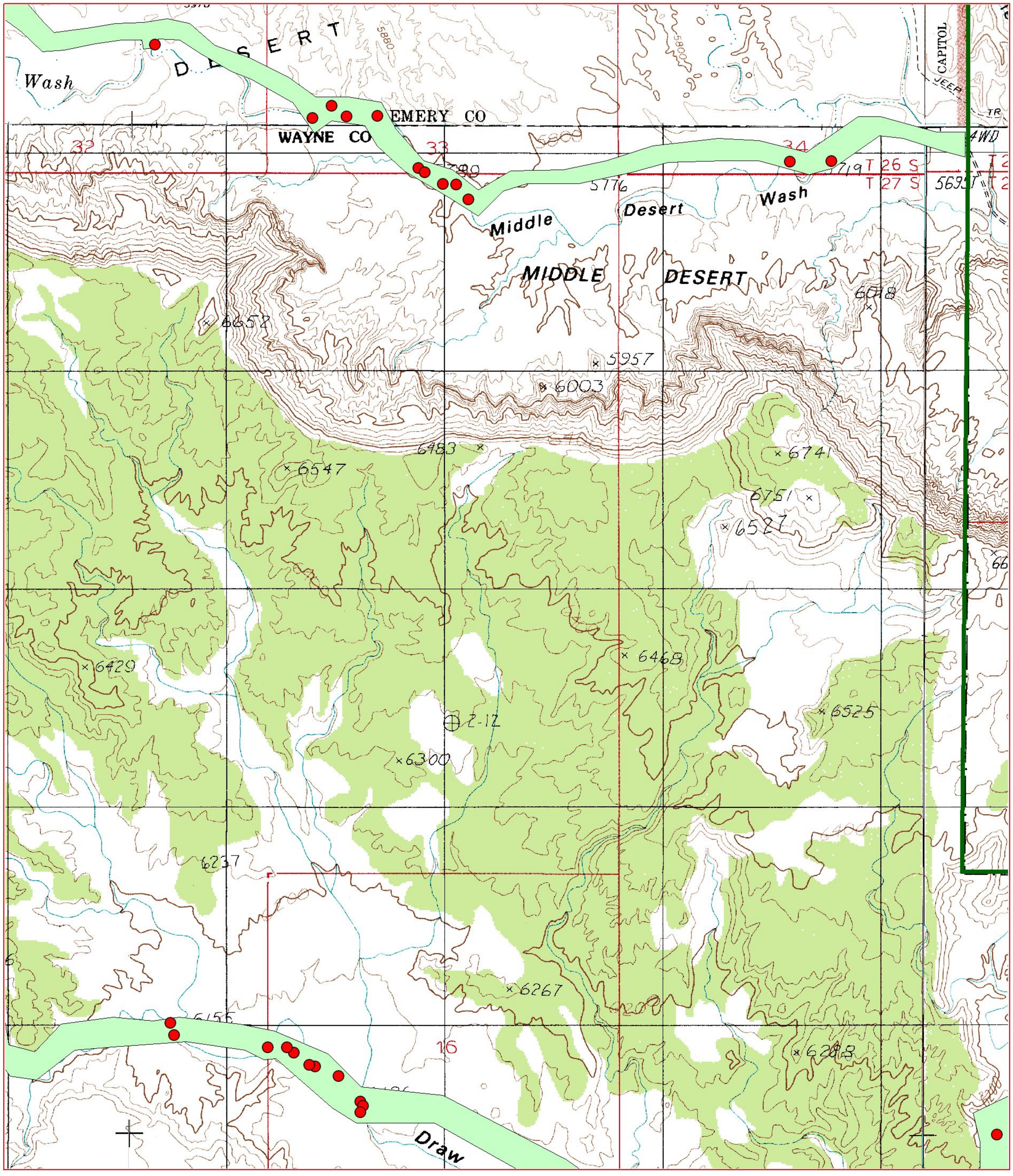
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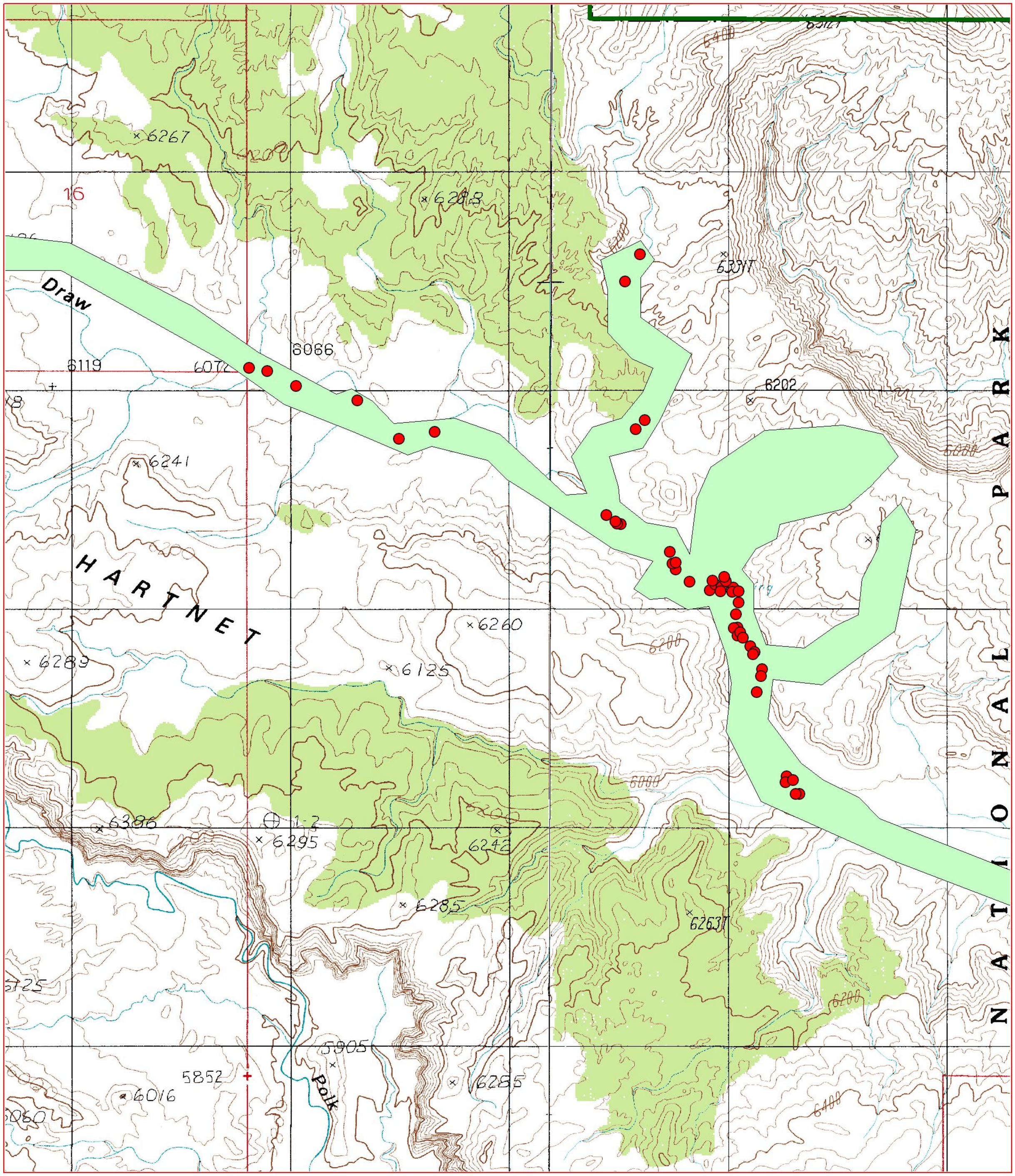
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Inset B
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

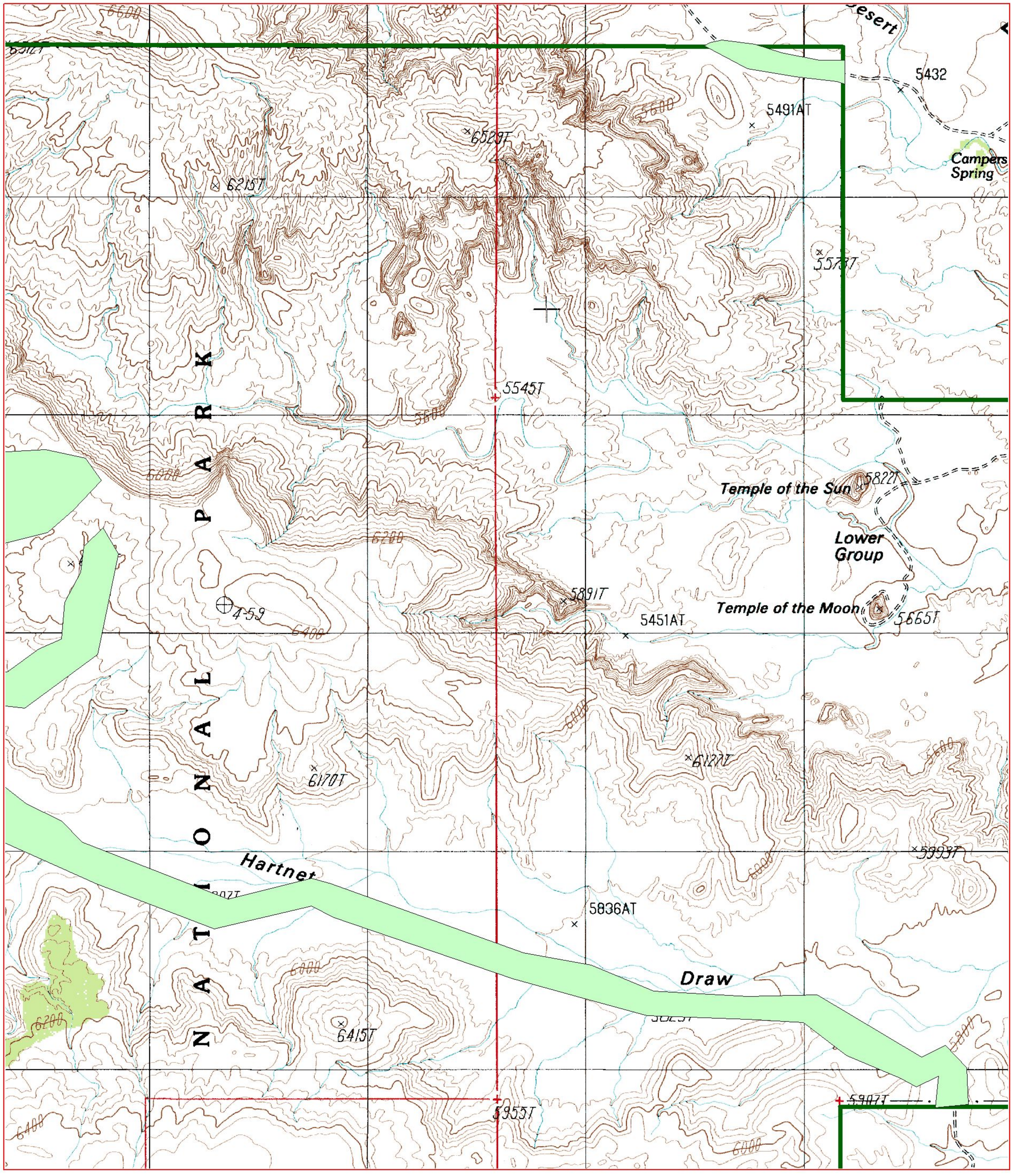
Appendix C. Overall Weed Distribution in Inventoried Areas - Middle Desert Wash (Inset C)



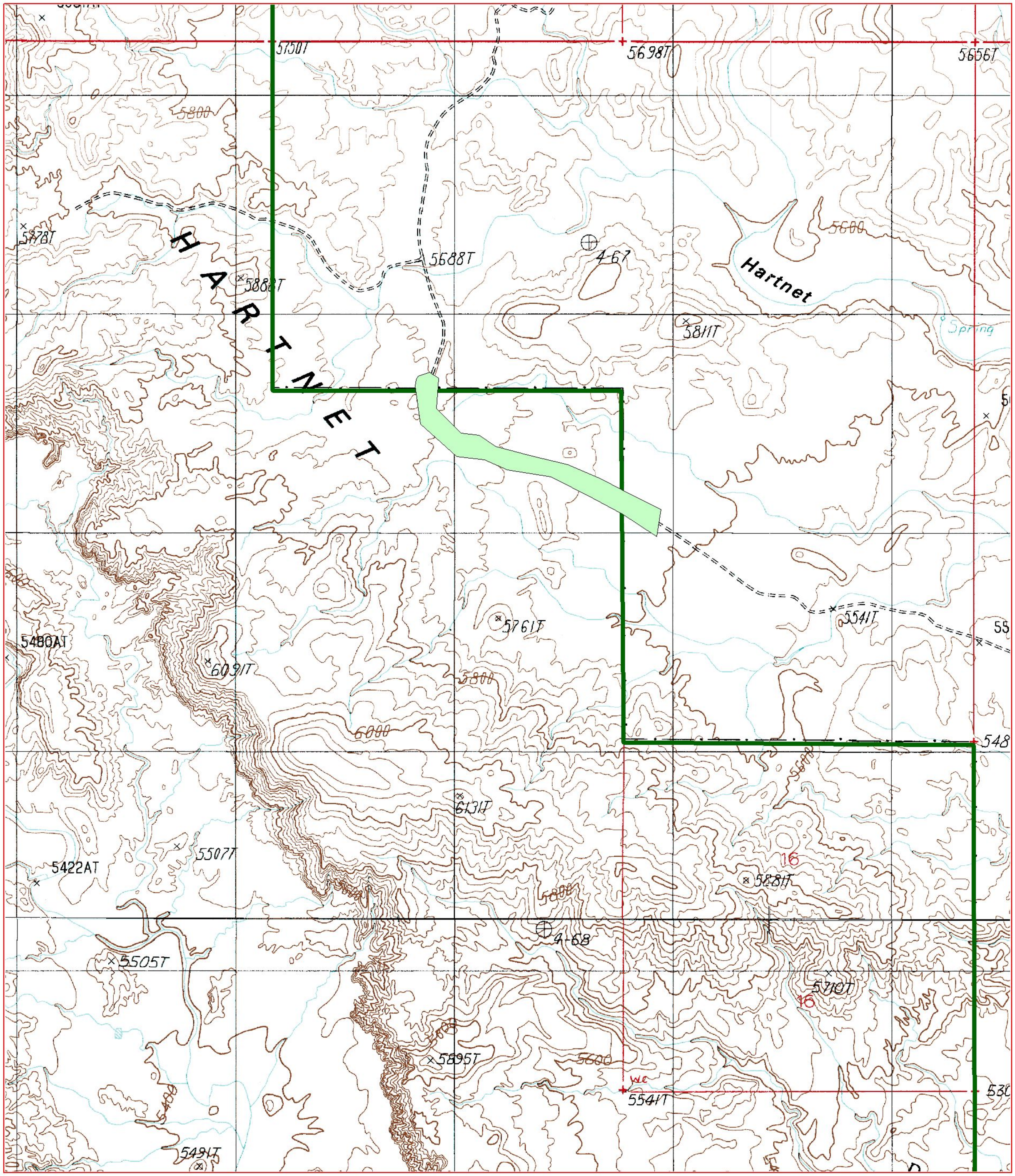
Appendix C. Overall Weed Distribution in Inventoried Areas - Ackland Spring (Inset D)



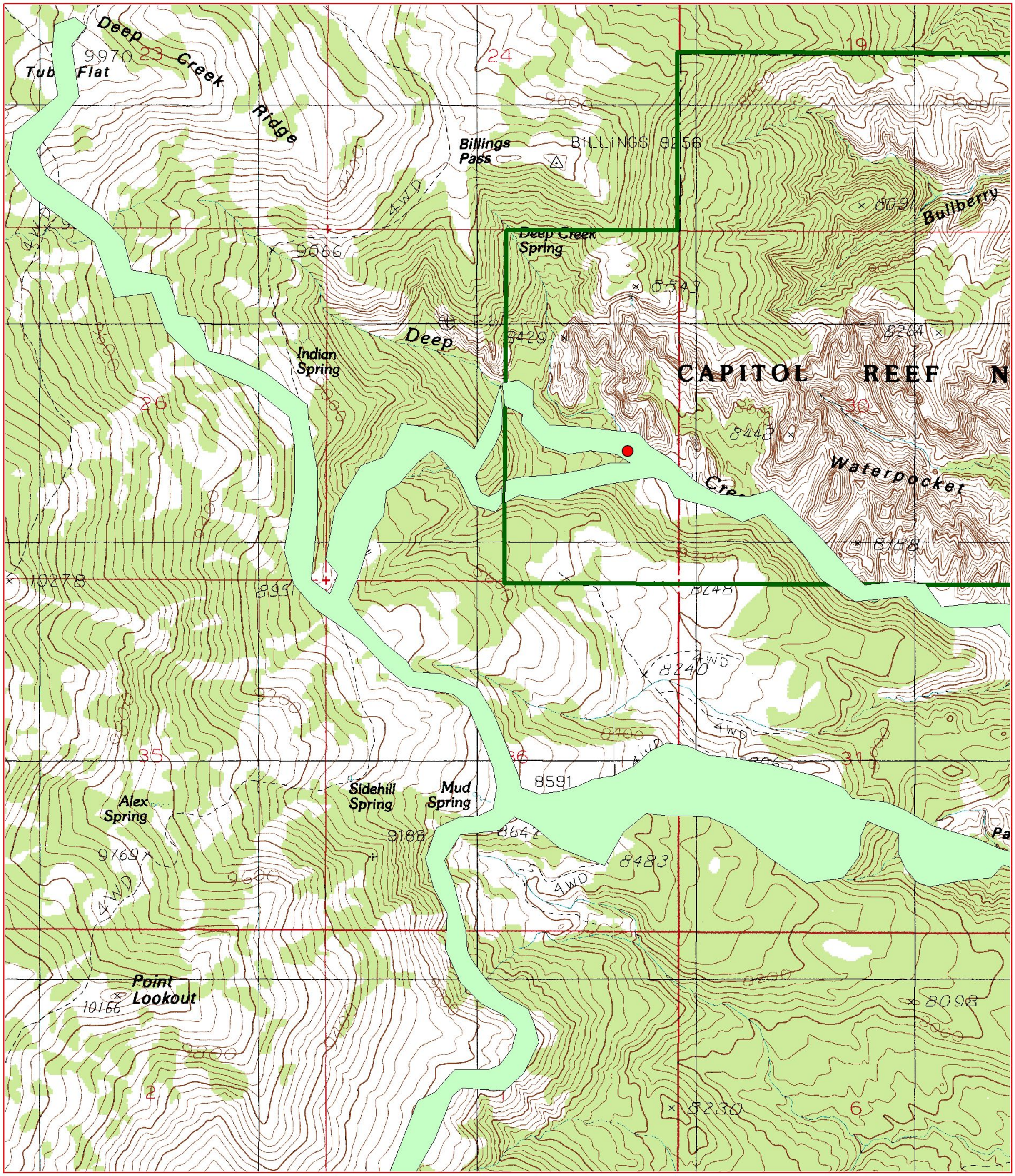
Appendix C. Overall Weed Distribution in Inventoried Areas - Hartnet Draw (Inset E)



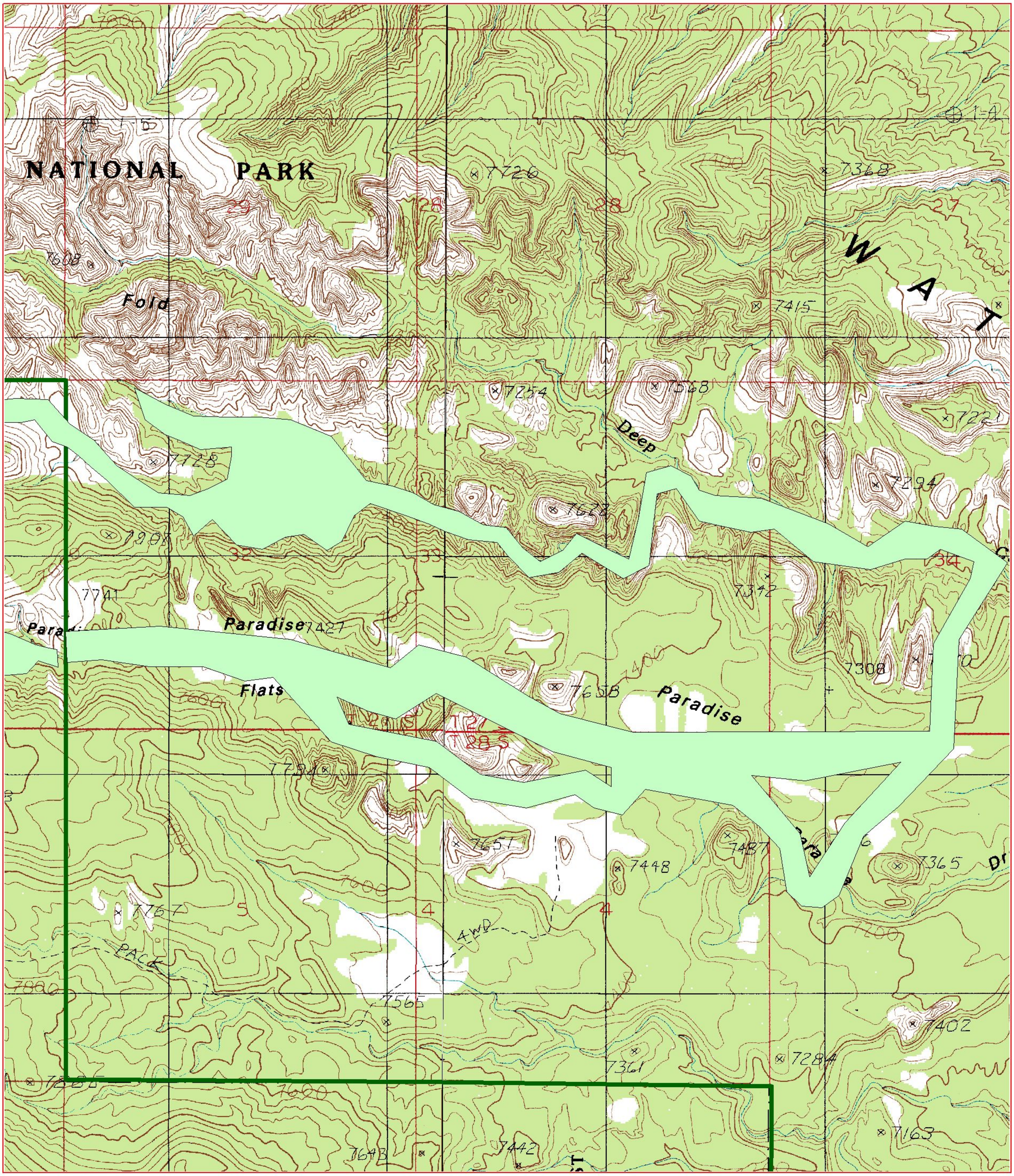
Appendix C. Overall Weed Distribution in Inventoried Areas - The Hartnet (Inset F)



Appendix C. Overall Weed Distribution in Inventoried Areas - Deep Creek Spring (Inset G)



Appendix C. Overall Weed Distribution in Inventoried Areas - Paradise Flats (Inset H)



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1:24,00 Scale

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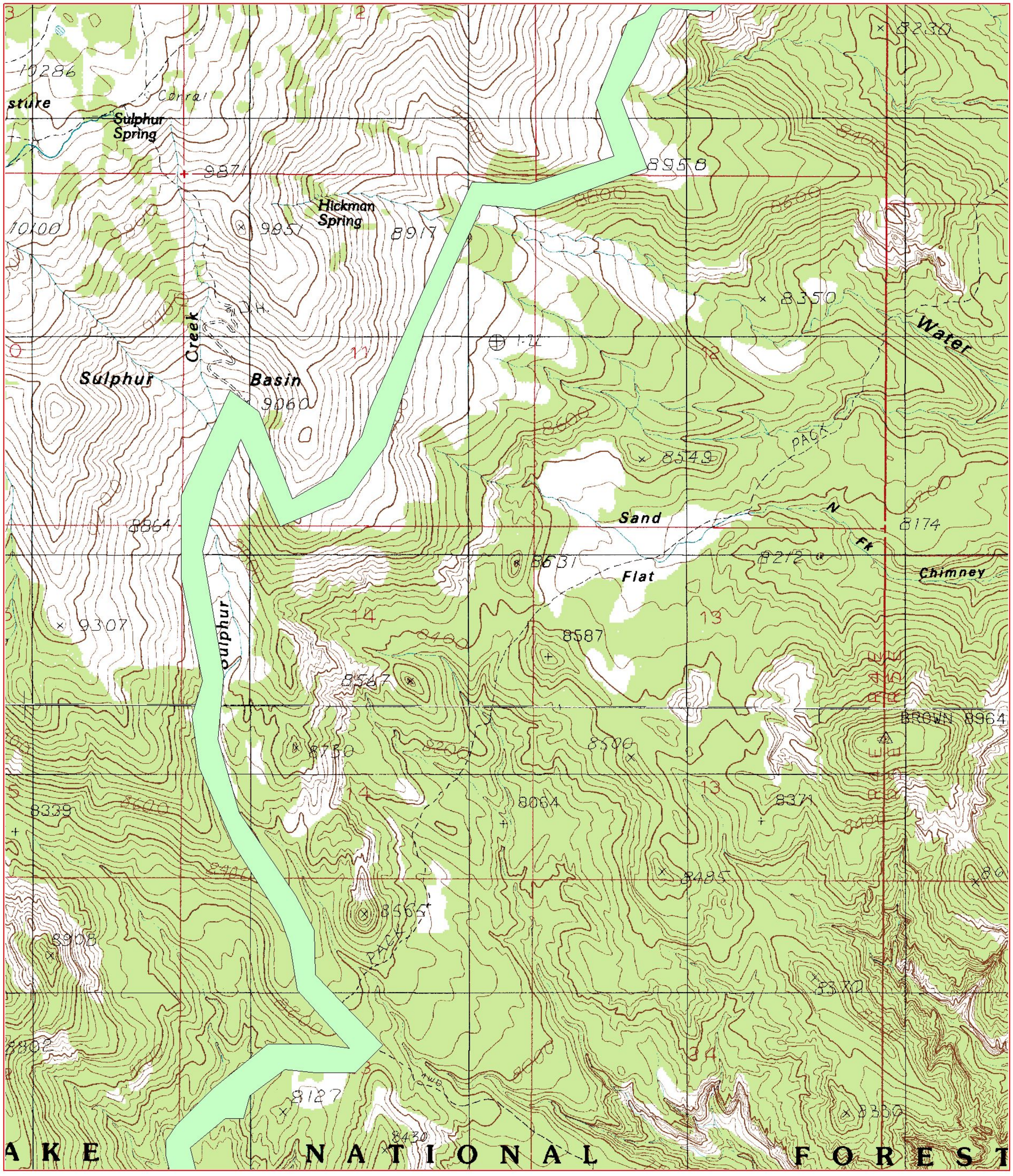
✱ No target species found

Areas Inventoried

Park boundary

Inset H
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Sand Flat (Inset I)



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1:24,00 Scale

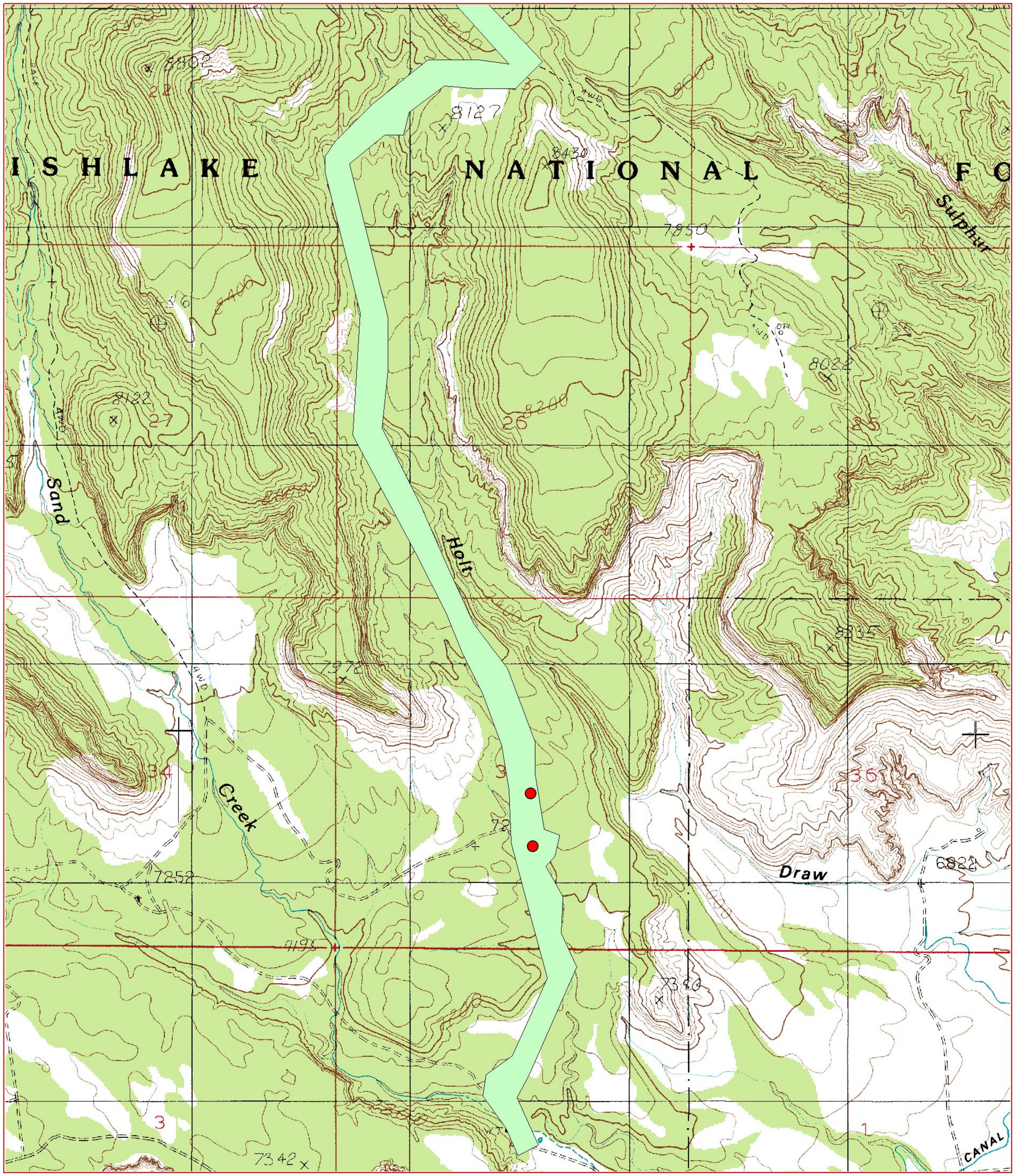
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* No target species found

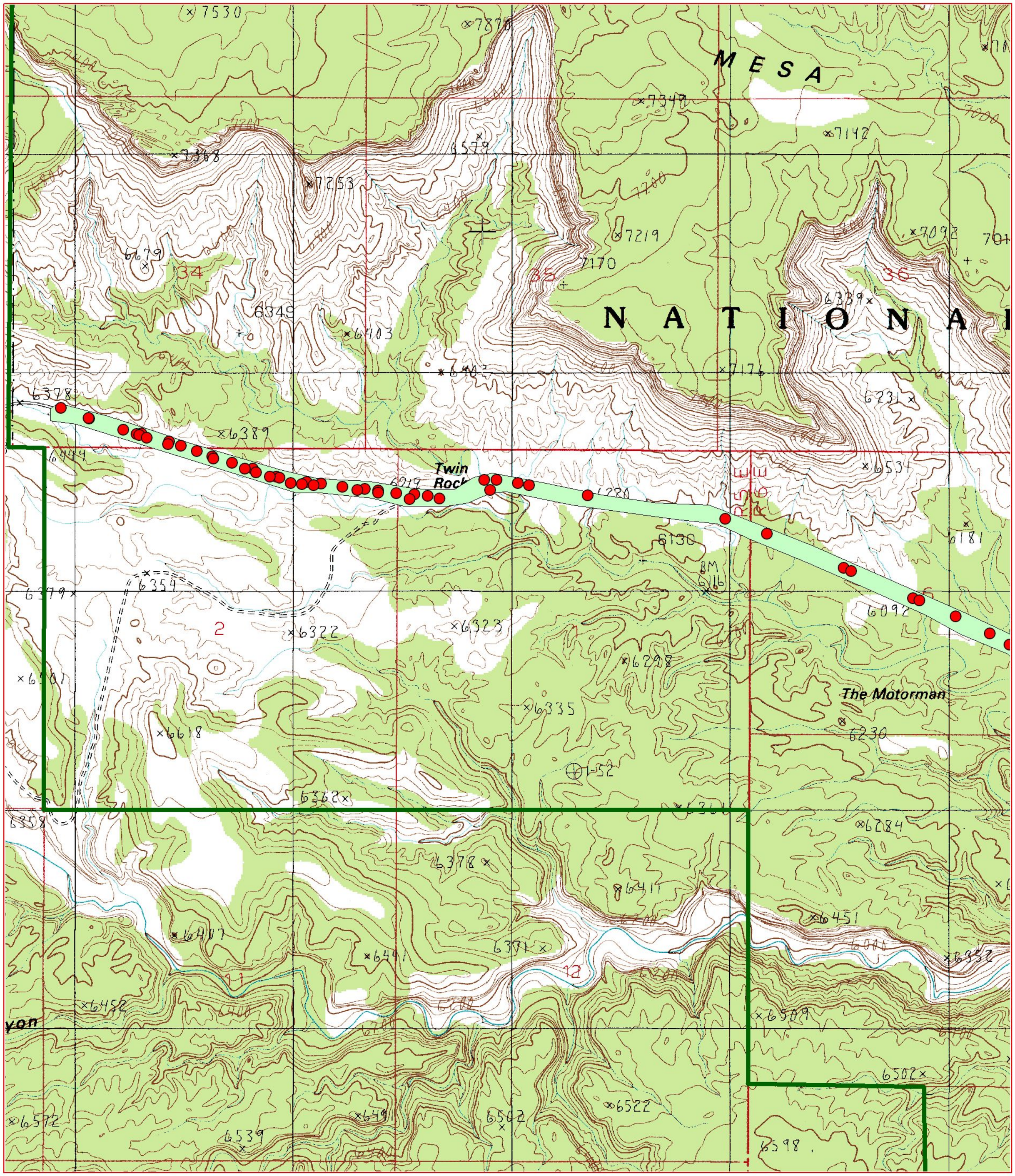
Areas Inventoried

Inset I
Capitol Reef National Park
Utah State University
2005- Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

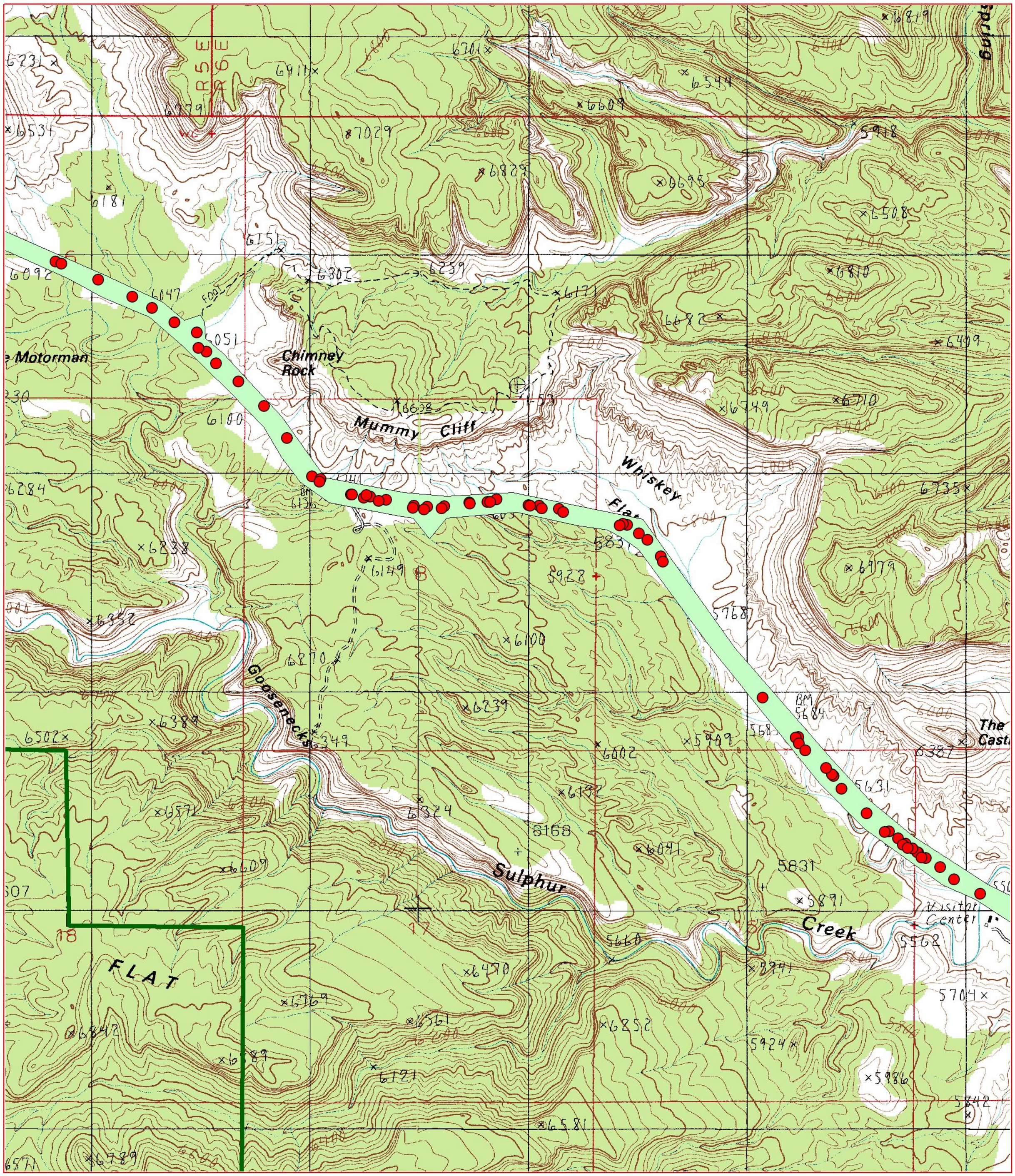
Appendix C. Overall Weed Distribution in Inventoried Areas - Holt Draw (Inset J)



Appendix C. Overall Weed Distribution in Inventoried Areas - Twin Rocks (Inset K)



Appendix C. Overall Weed Distribution in Inventoried Areas - Chimney Rock (Inset L)



Appendix C. Overall Weed Distribution in Inventoried Areas - Fruita (Inset M)



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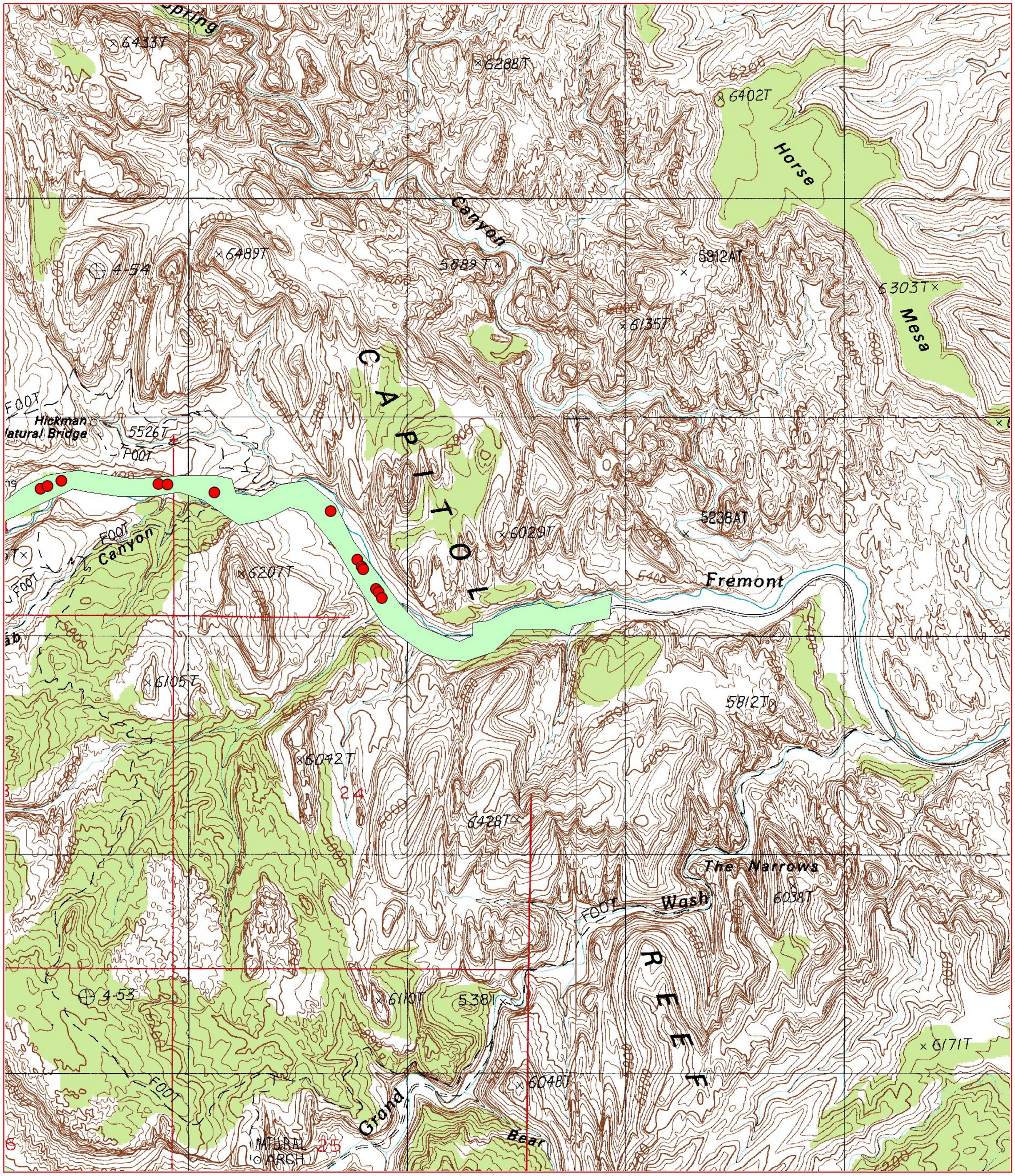
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● Weed Points

▭ Areas Inventoried

Inset M
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

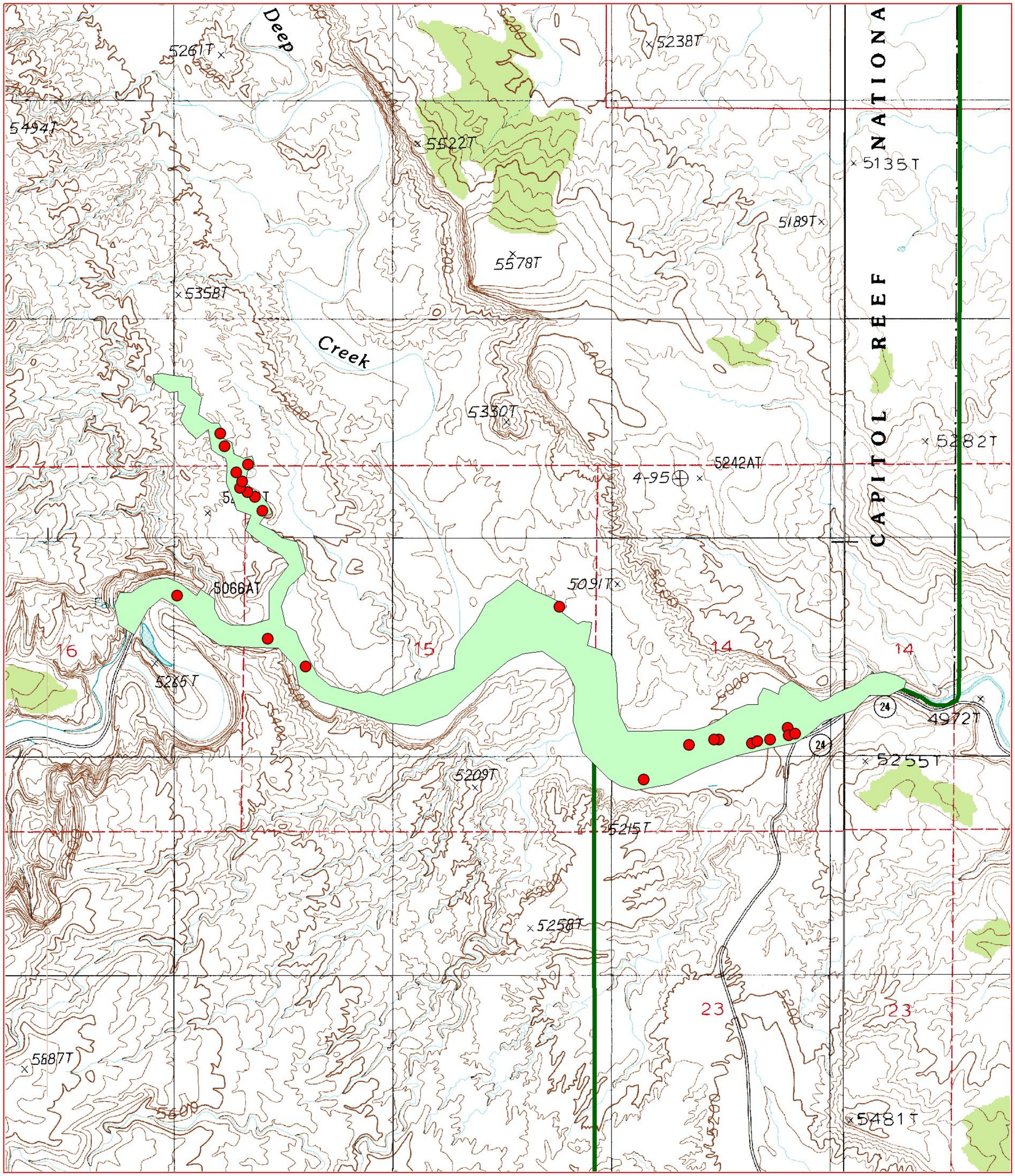
Appendix C. Overall Weed Distribution in Inventoried Areas - Hickman Natural Bridge (Inset N)



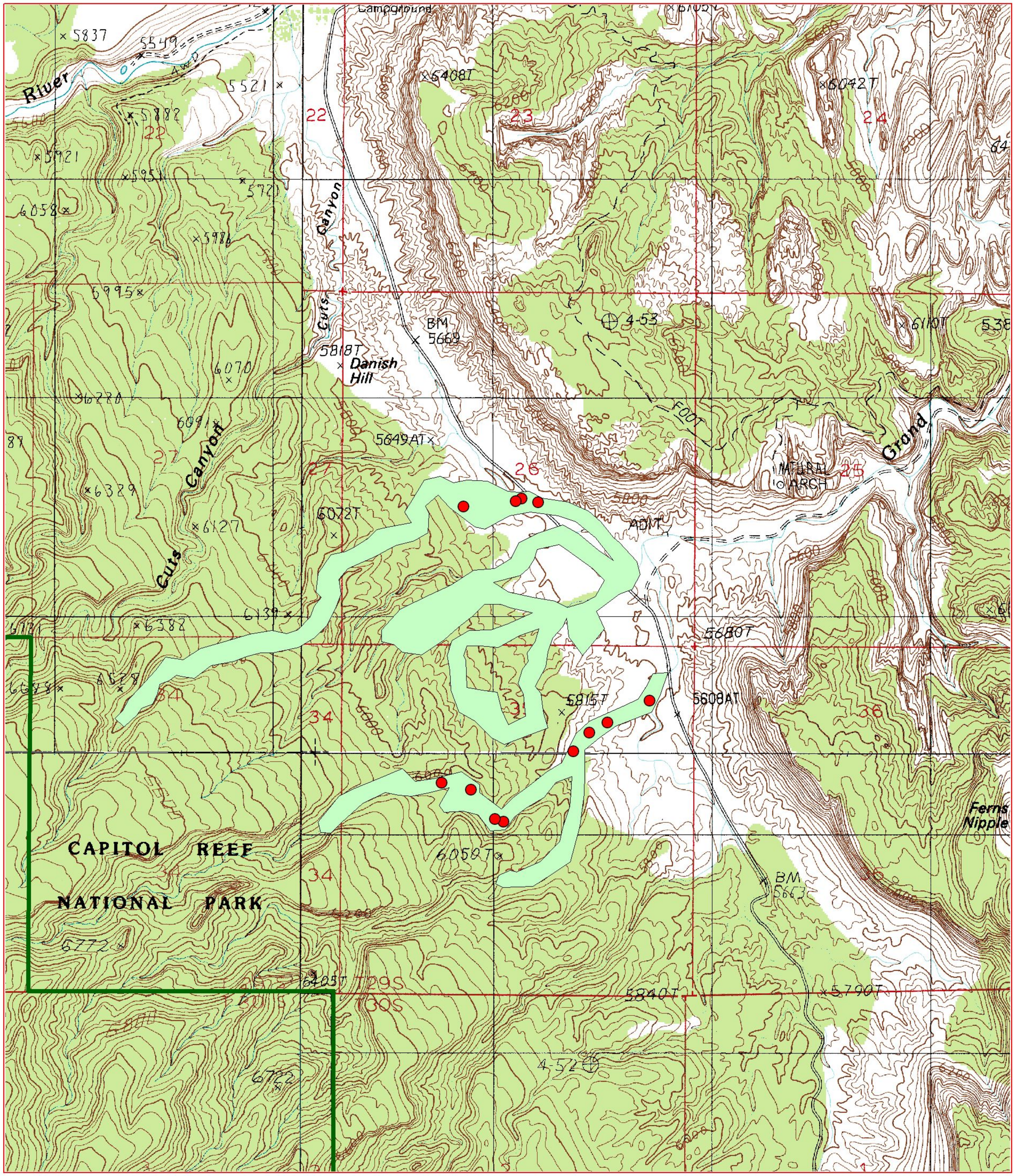
- Weed Points
- Areas Inventoried
- Park boundary

Inset N
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

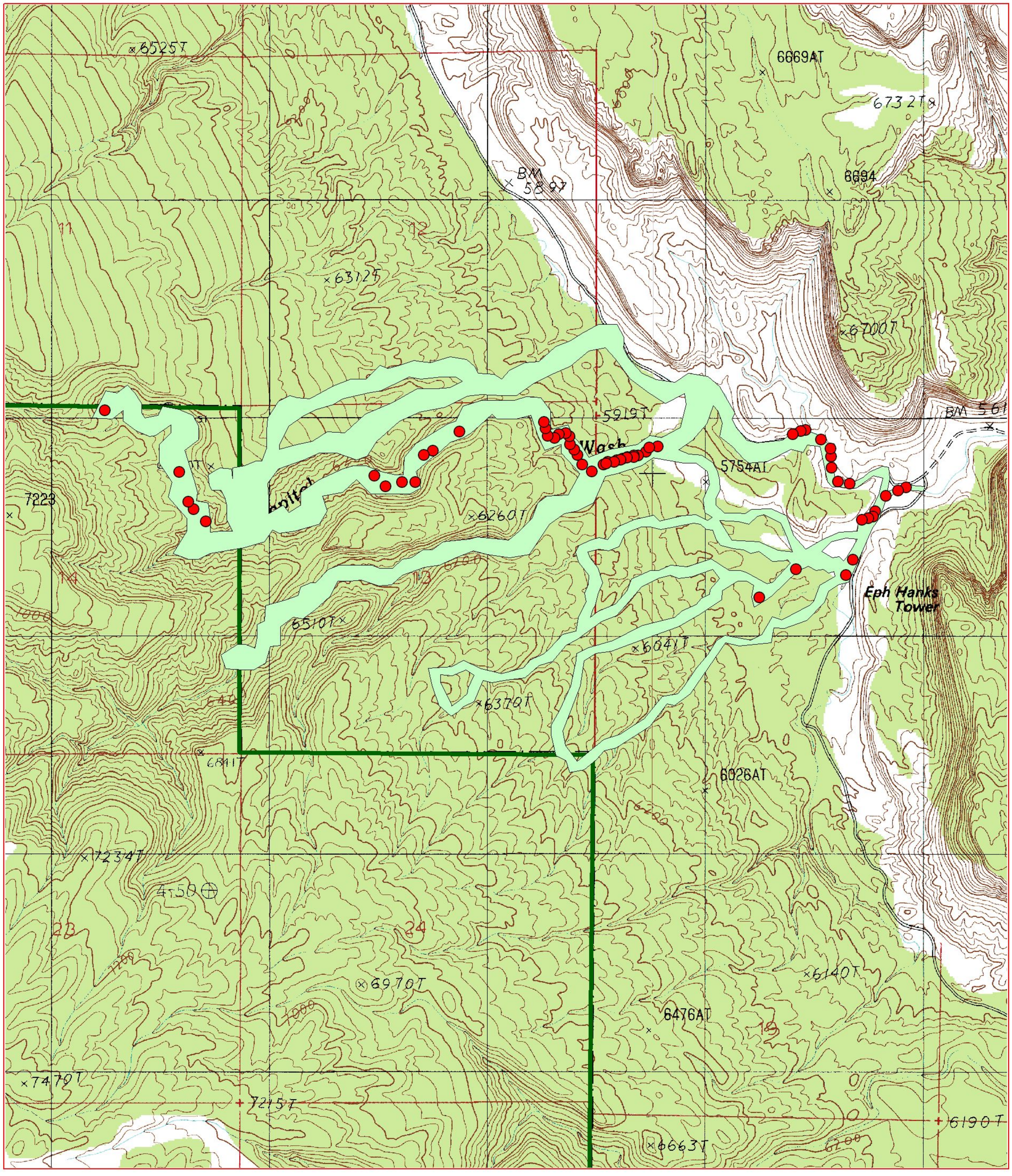
Appendix C. Weed Species Detected in Inventoried Areas - Deep Creek (Inset O)



Appendix C. Overall Weed Distribution in Inventoried Areas - Grand Wash (Inset P)



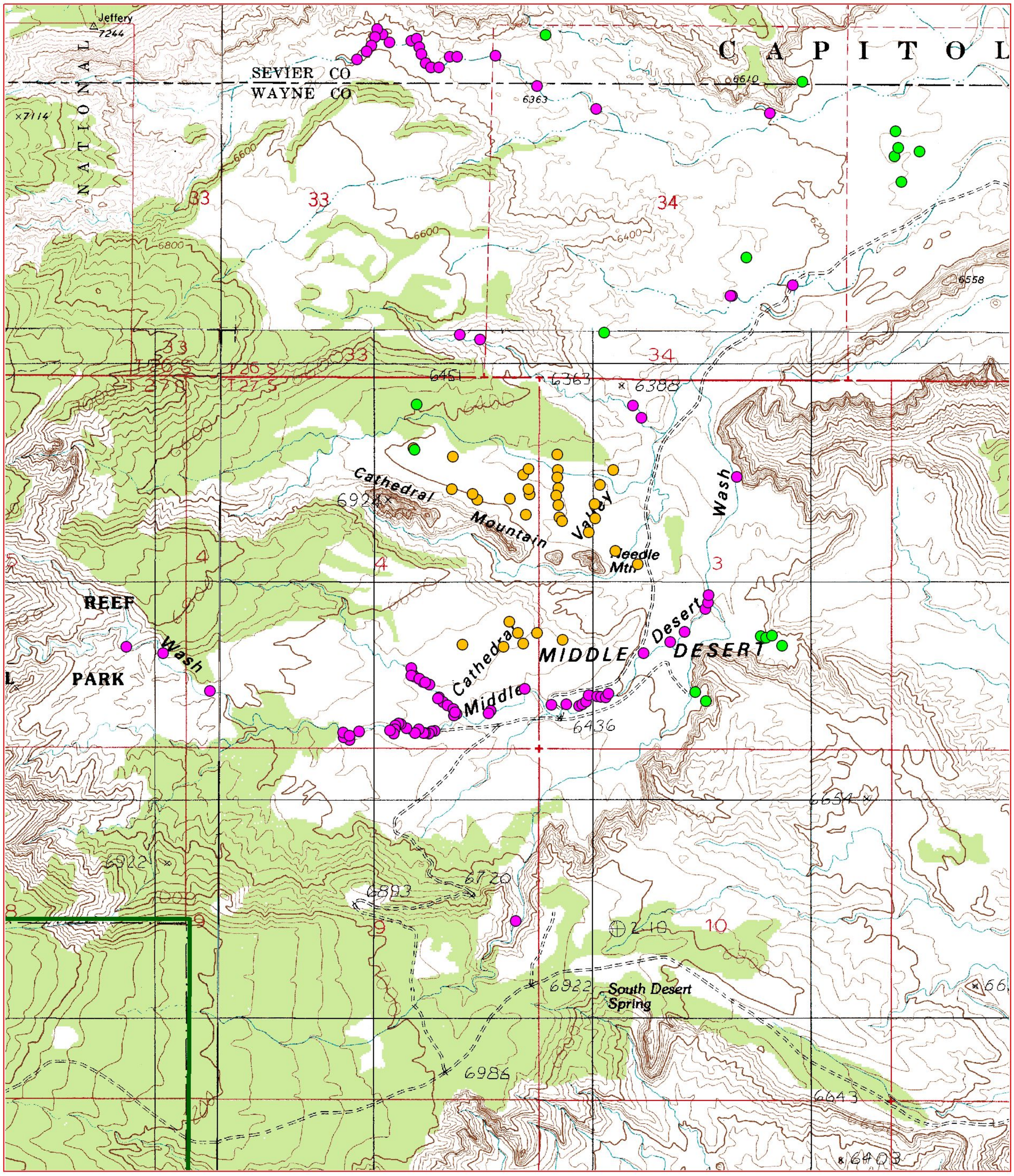
Appendix C. Overall Weed Distribution in Inventoried Areas - Capitol Wash (Inset Q)



- Weed Points
- Areas Inventoried
- Park boundary

Inset Q
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Cathedral Valley (Inset A)



Halogeton glomeratus

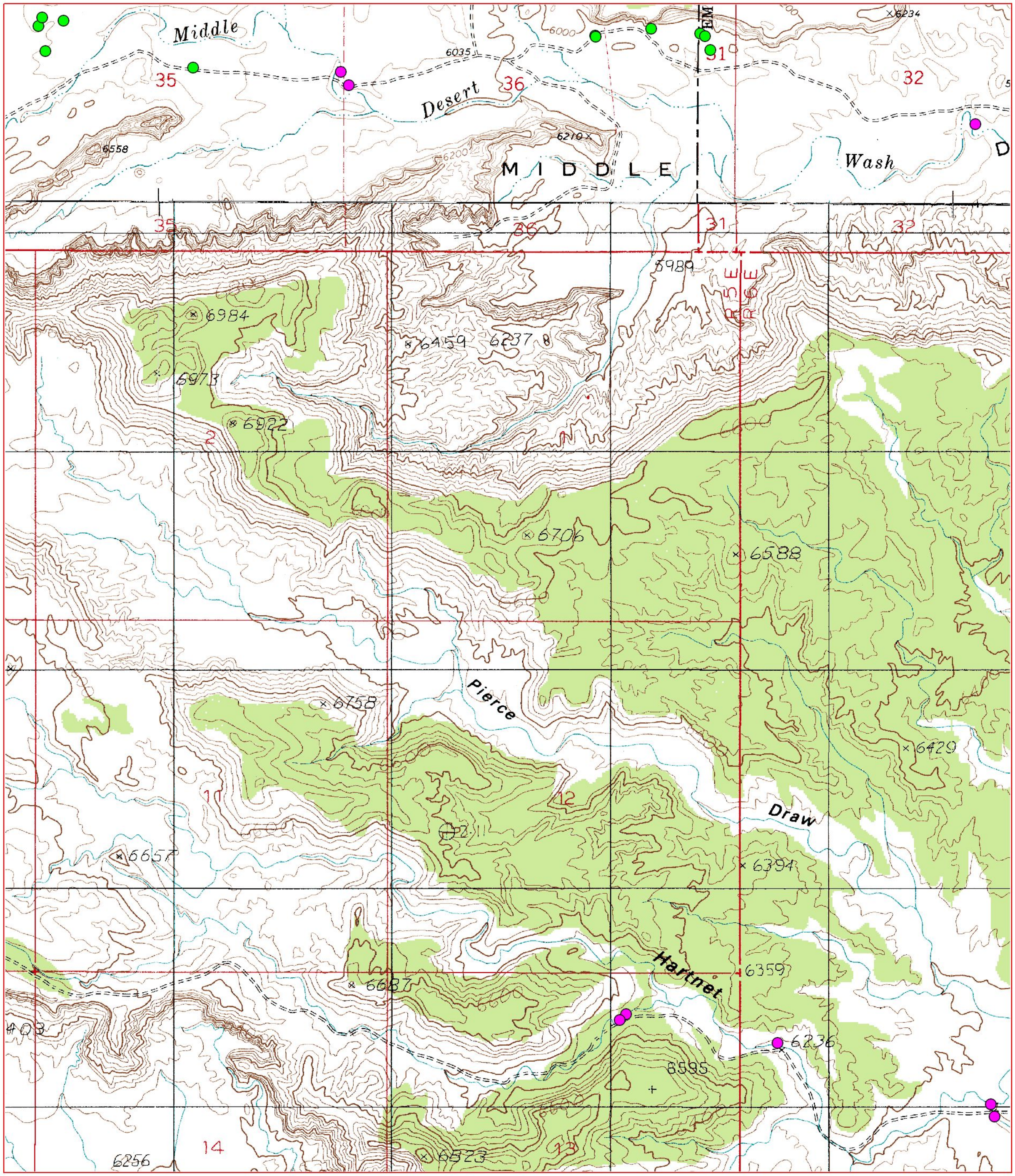
Salsola kali

Tamarix ramosissima

Park boundary

Inset A
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Pierce Draw (Inset B)



0 2000 4000 Feet

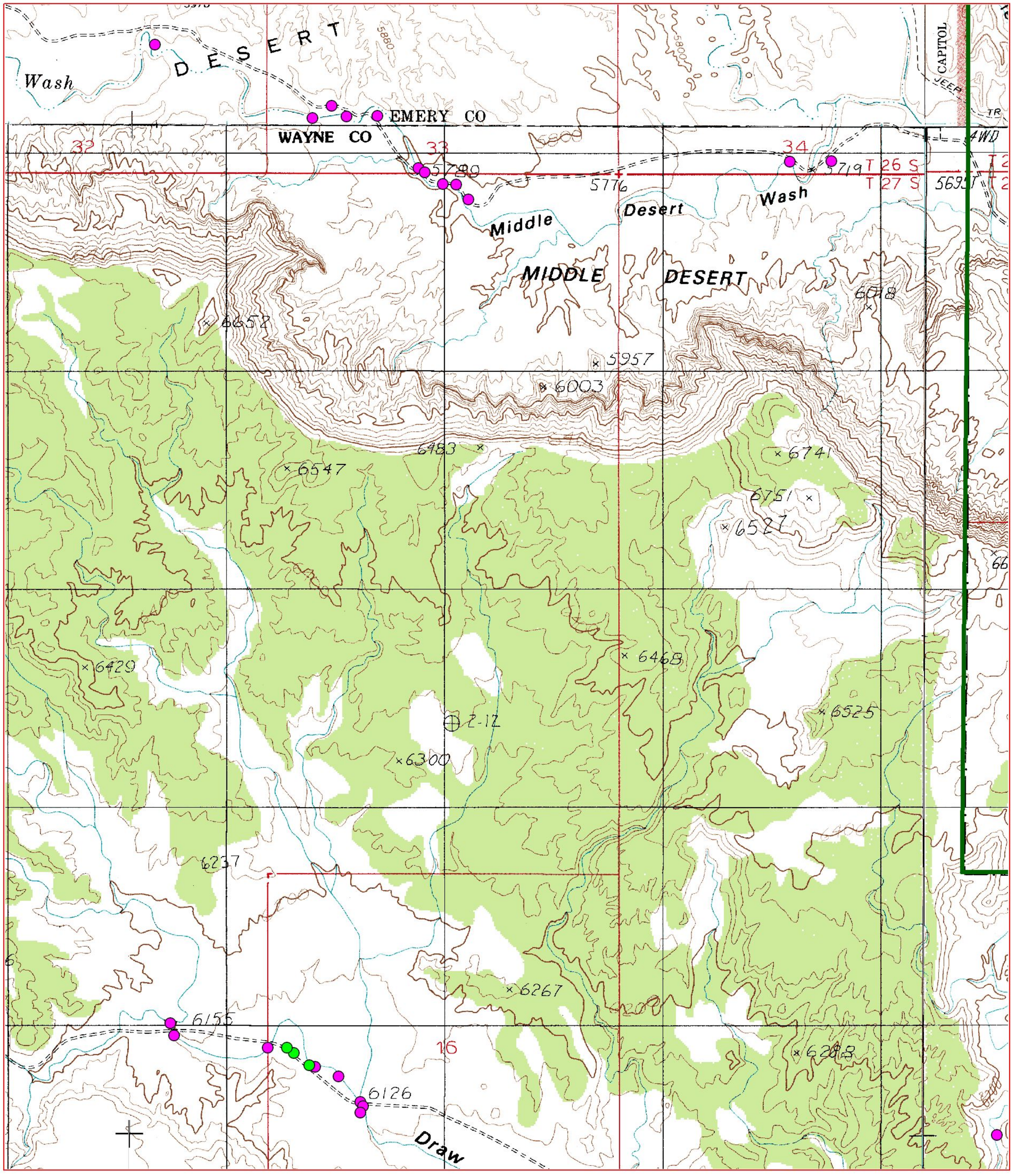
1:24,00 Scale

N

- *Halogeton glomeratus*
- *Tamarix ramosissima*

Inset B
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Middle Desert Wash (Inset C)



- *Halogeton glomeratus*
- *Tamarix ramosissima*
- Park boundary

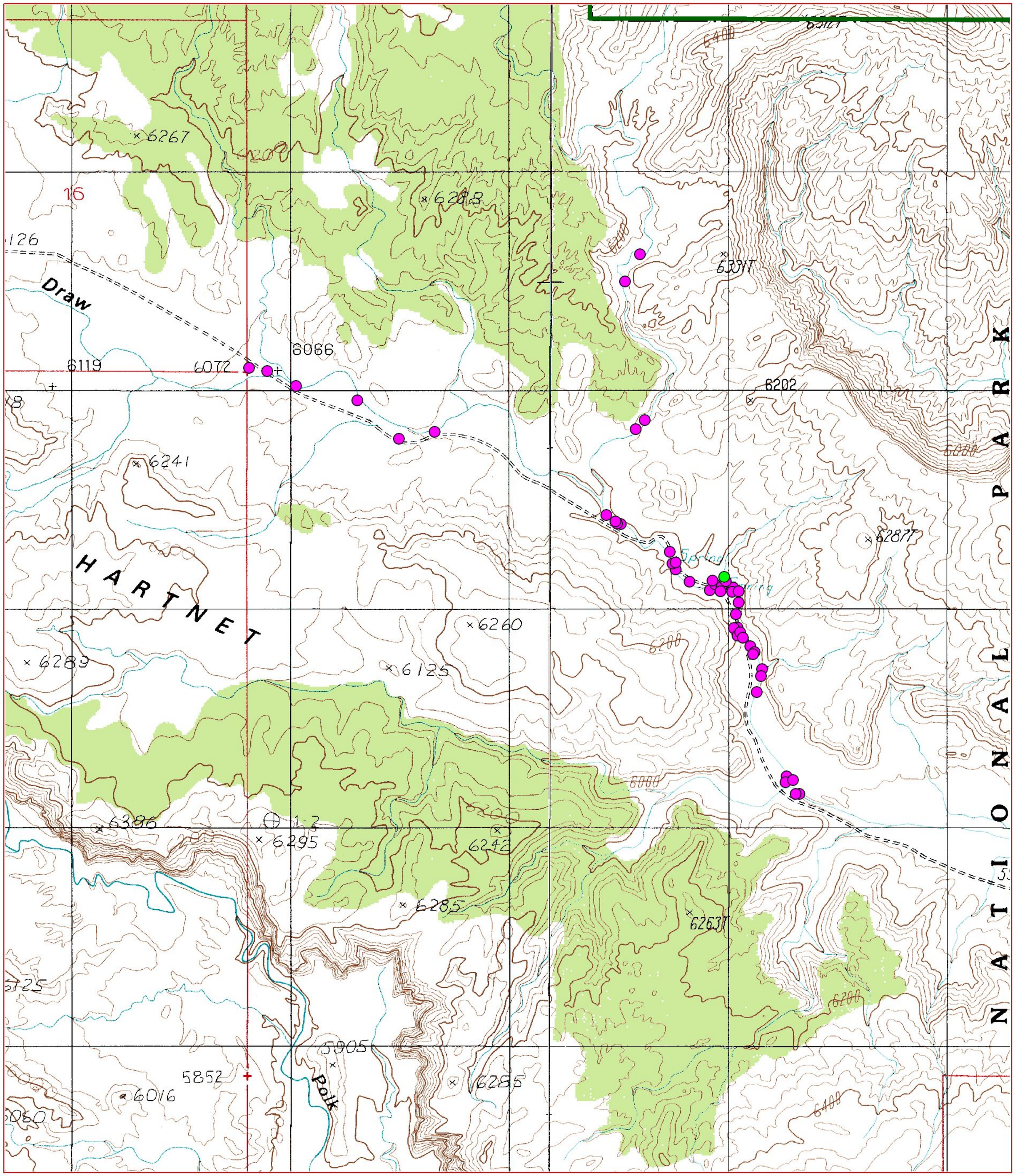
0 2000 4000 Feet

1:24,00 Scale

N

Inset C
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Ackland Spring (Inset D)



Halogeton glomeratus

Tamarix ramosissima

Park boundary

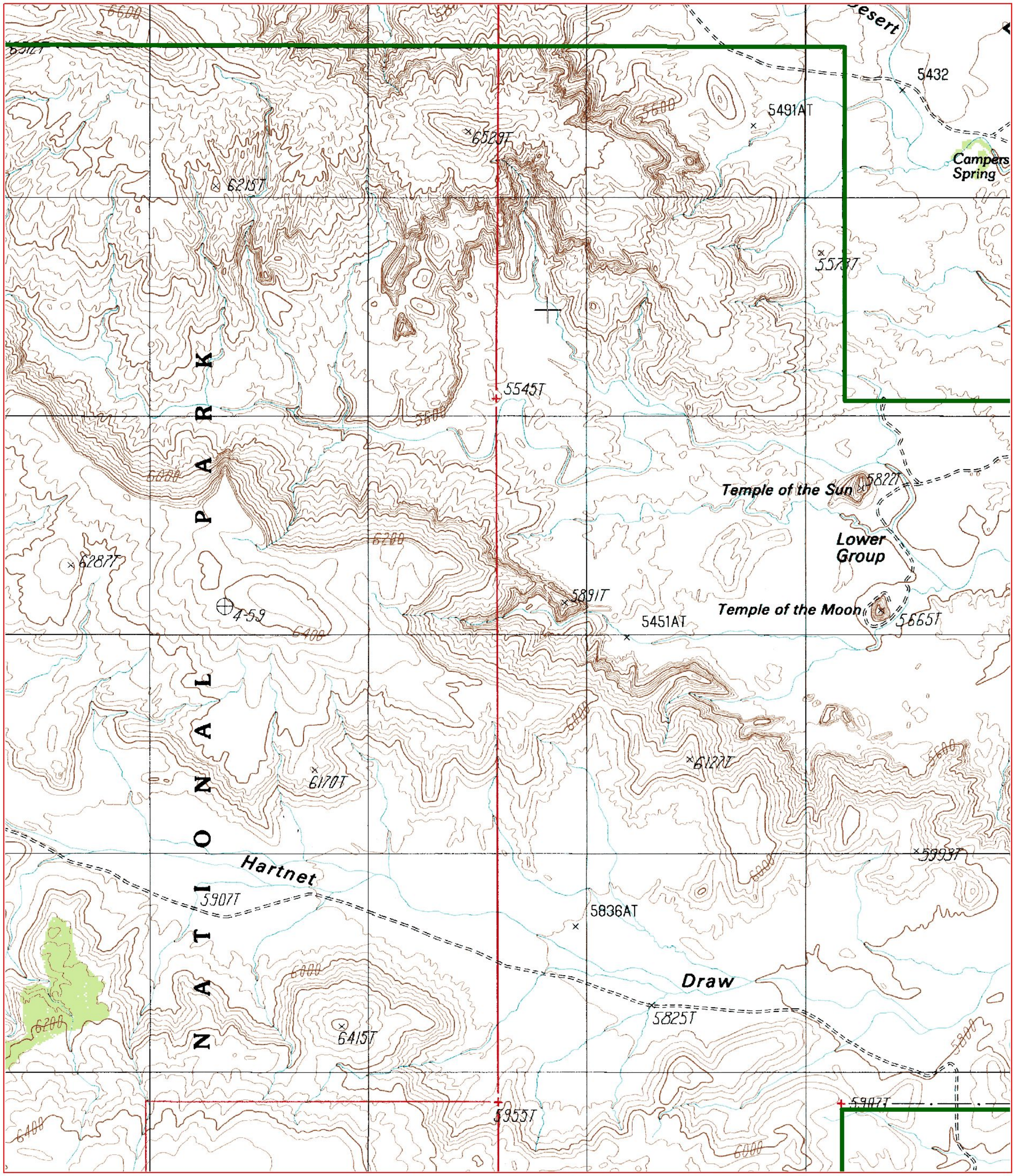
0 2000 4000 Feet

1:24,00 Scale

N

Inset D
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Hartnet Draw (Inset E)



0 2000 4000 Feet

1:24,00 Scale

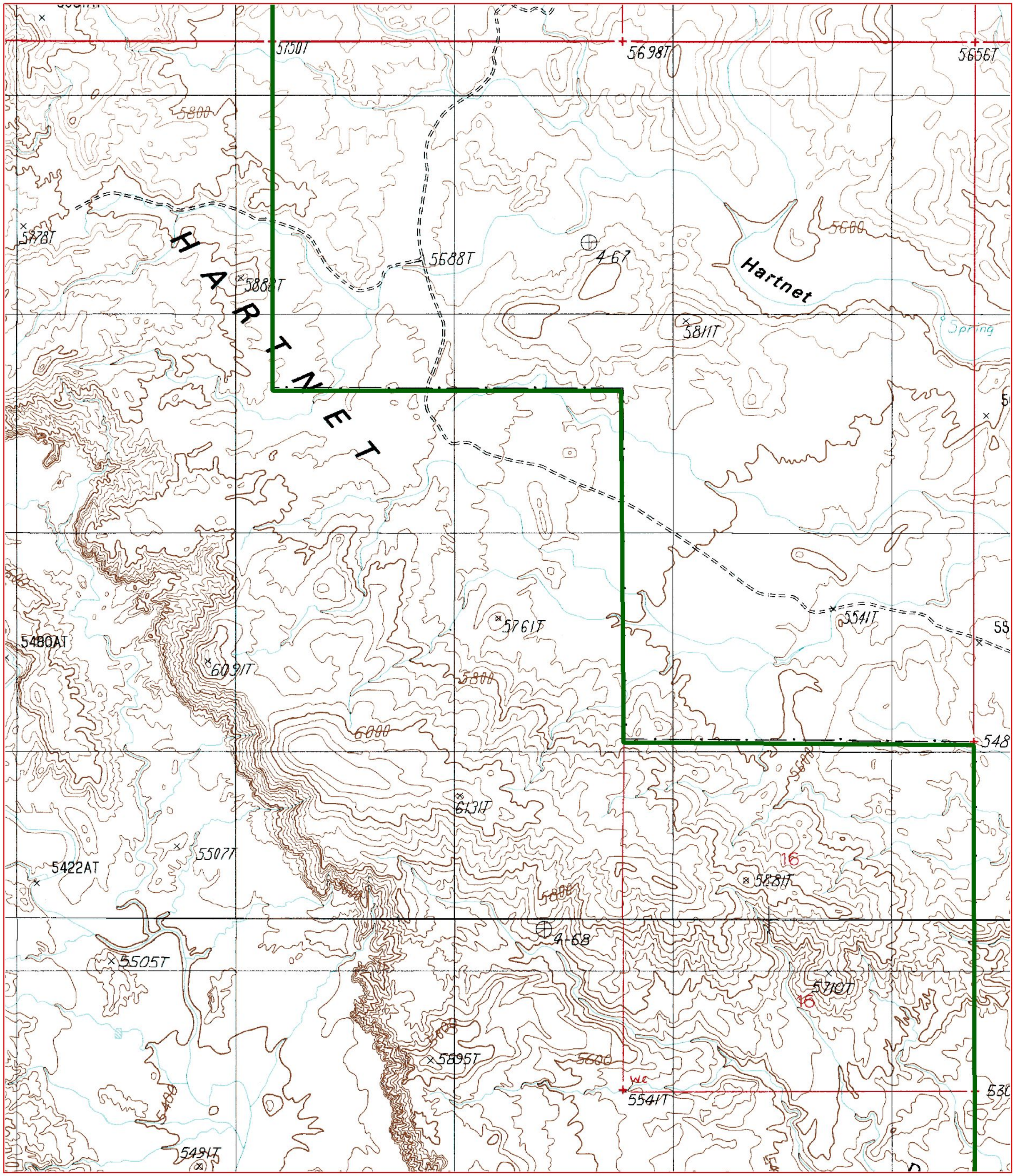
N

✱ No target species found

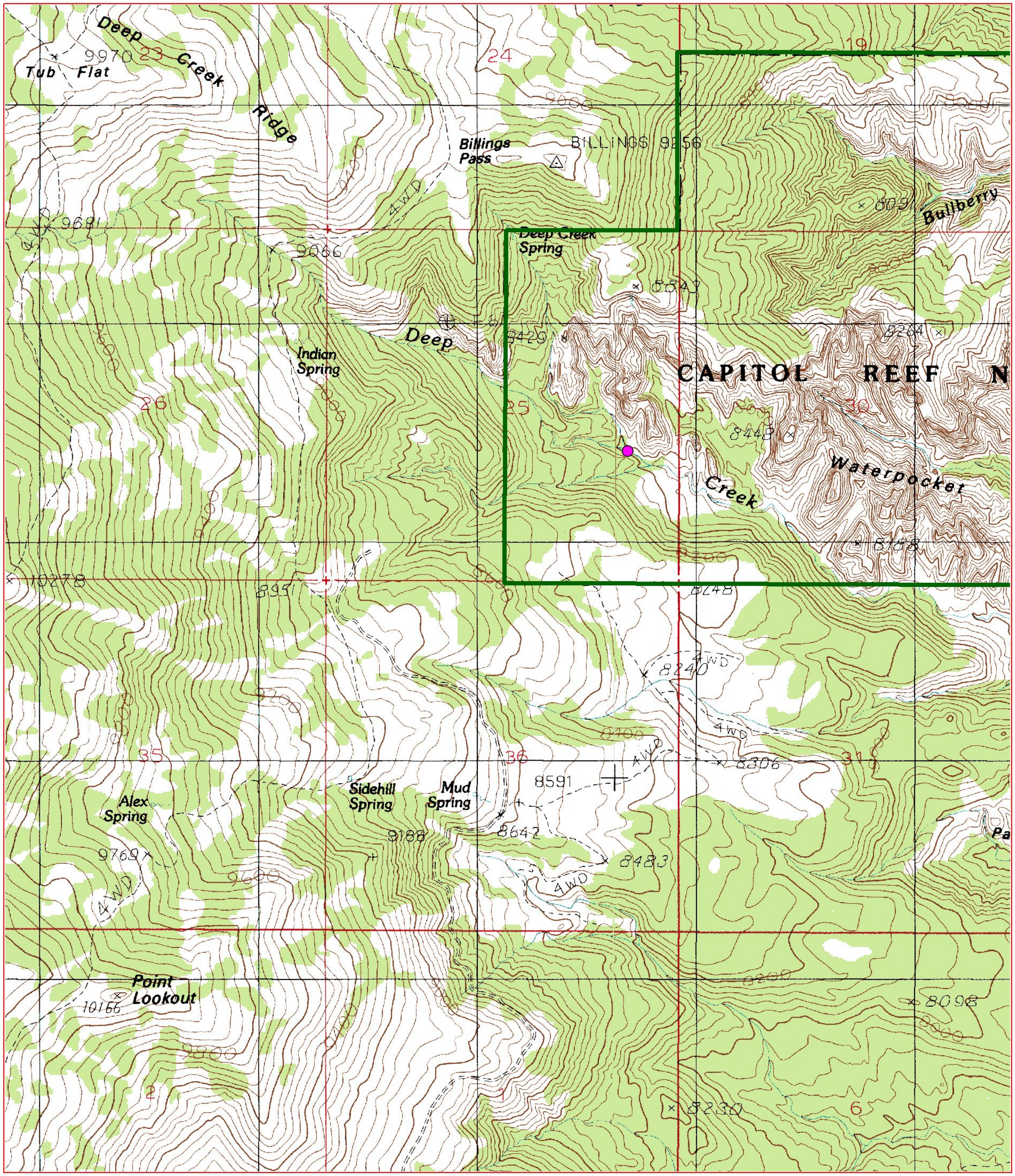
Park boundary

Inset E
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

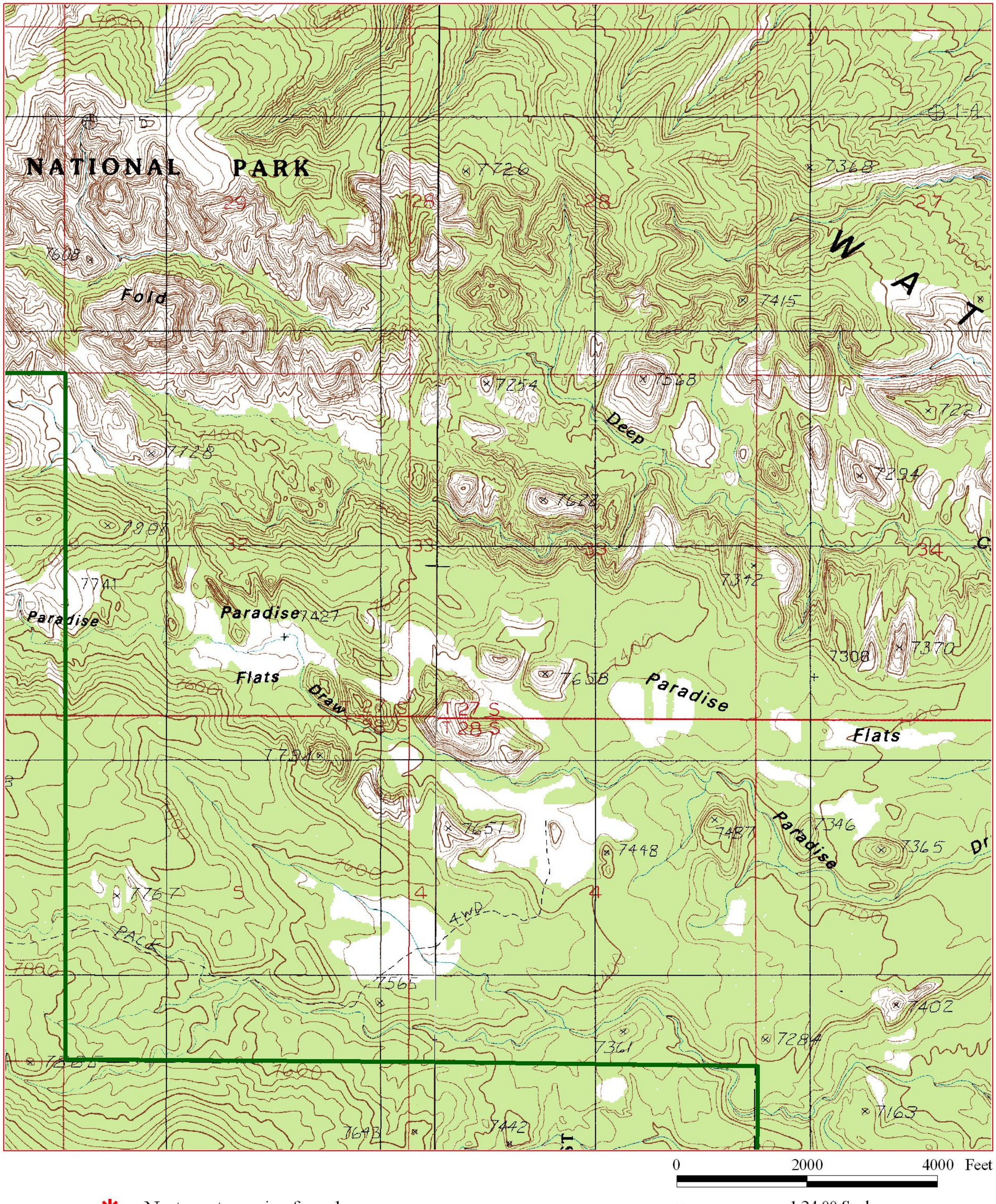
Appendix D. Weed Species Detected in Inventoried Areas - The Hartnet (Inset F)



Appendix D. Weed Species Detected in Inventoried Areas - Deep Creek Spring (Inset G)



Appendix D. Weed Species Detected in Inventoried Areas - Paradise Flats (Inset H)

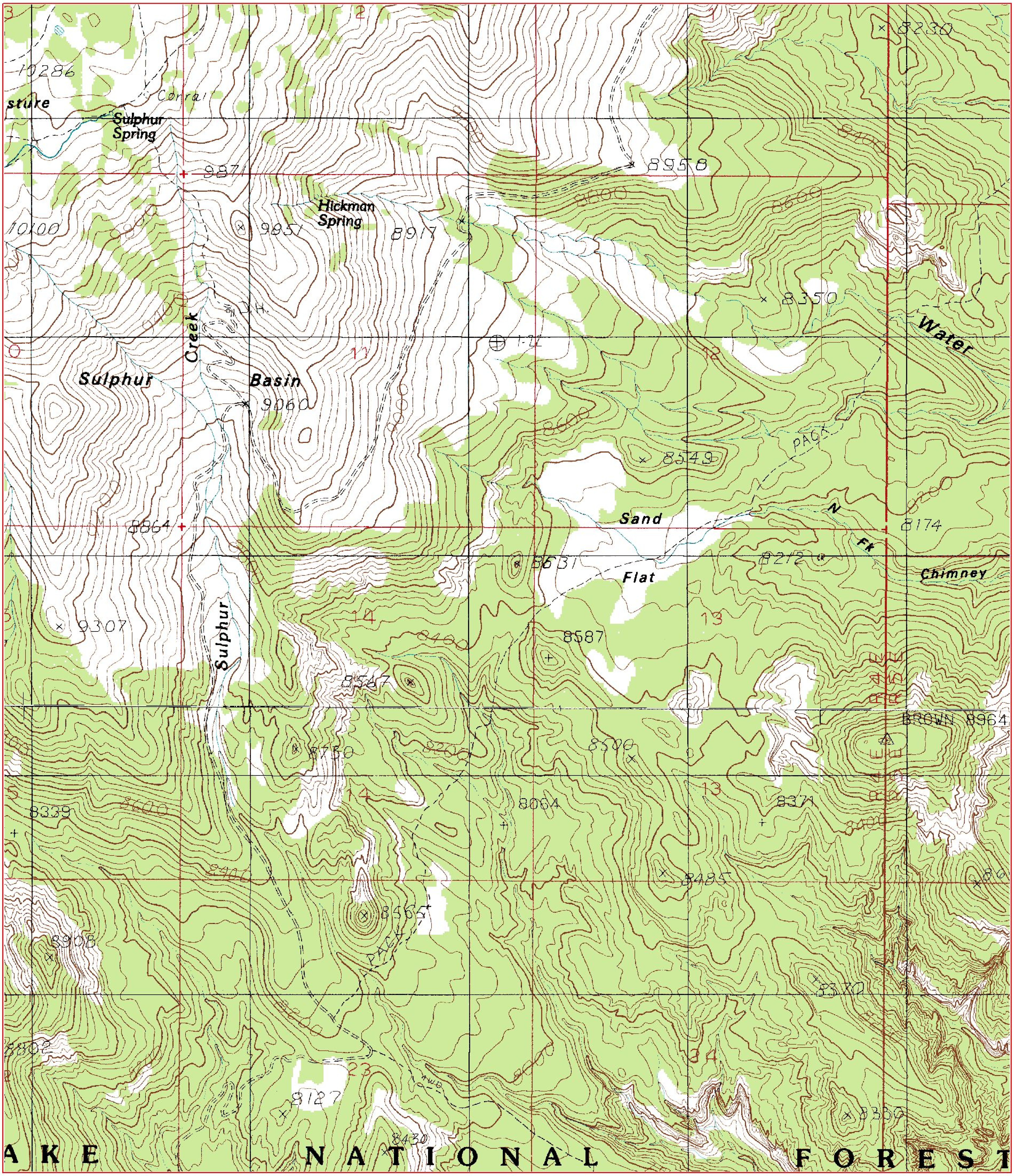


* No target species found

Park boundary

Inset H
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Sand Flat (Inset I)



0 2000 4000 Feet

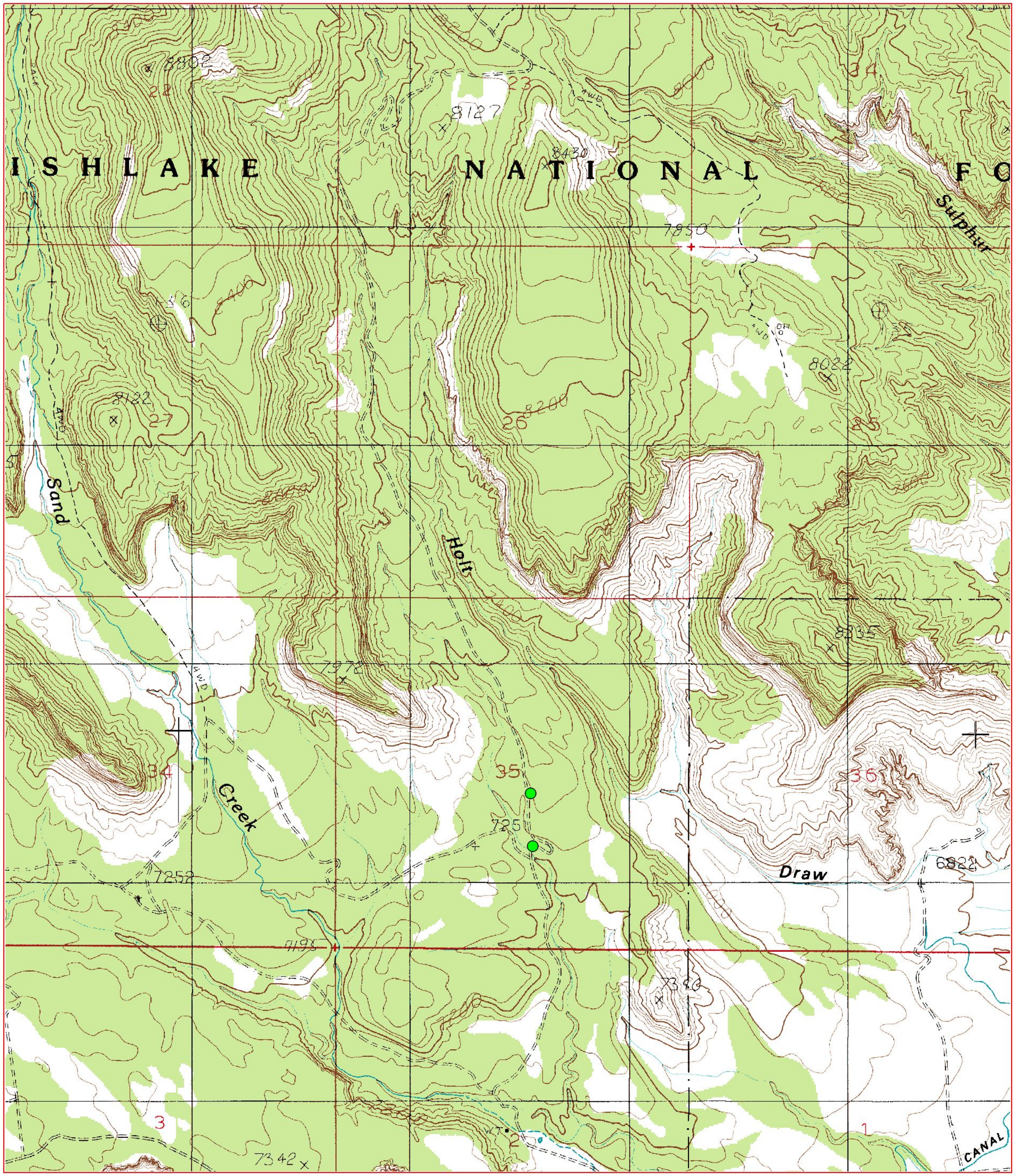
1:24,00 Scale

N

* No target species found

Inset I
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Weed Species Detected in Inventoried Areas - Holt Draw (Inset J)

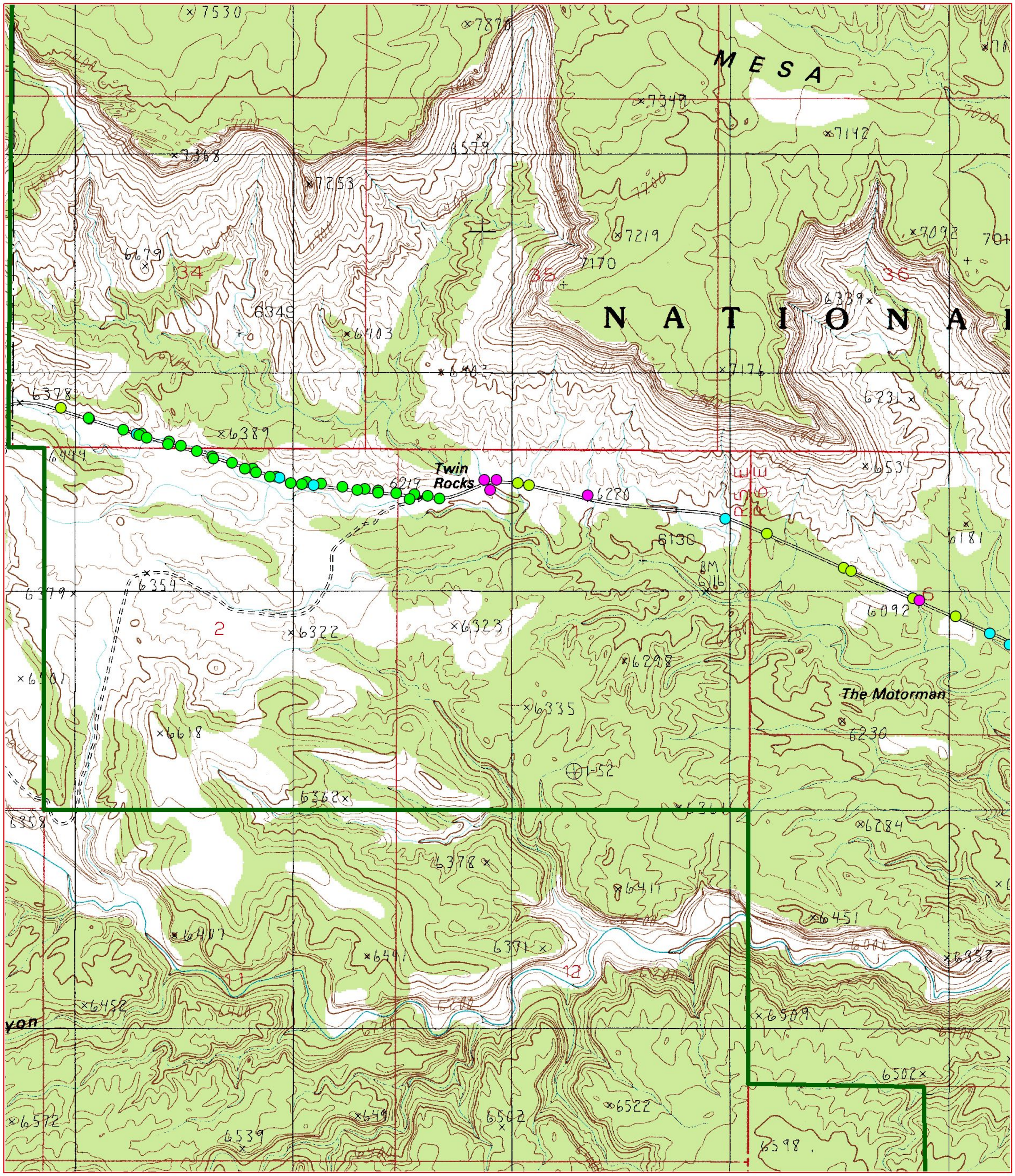


● *Halogeton glomeratus*

Park boundary

Inset J
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Twin Rocks (Inset K)



- *Convolvulus arvensis*
- *Halogeton glomeratus*
- *Tamarix ramosissima*
- *Tragopogon dubius*
- Park boundary

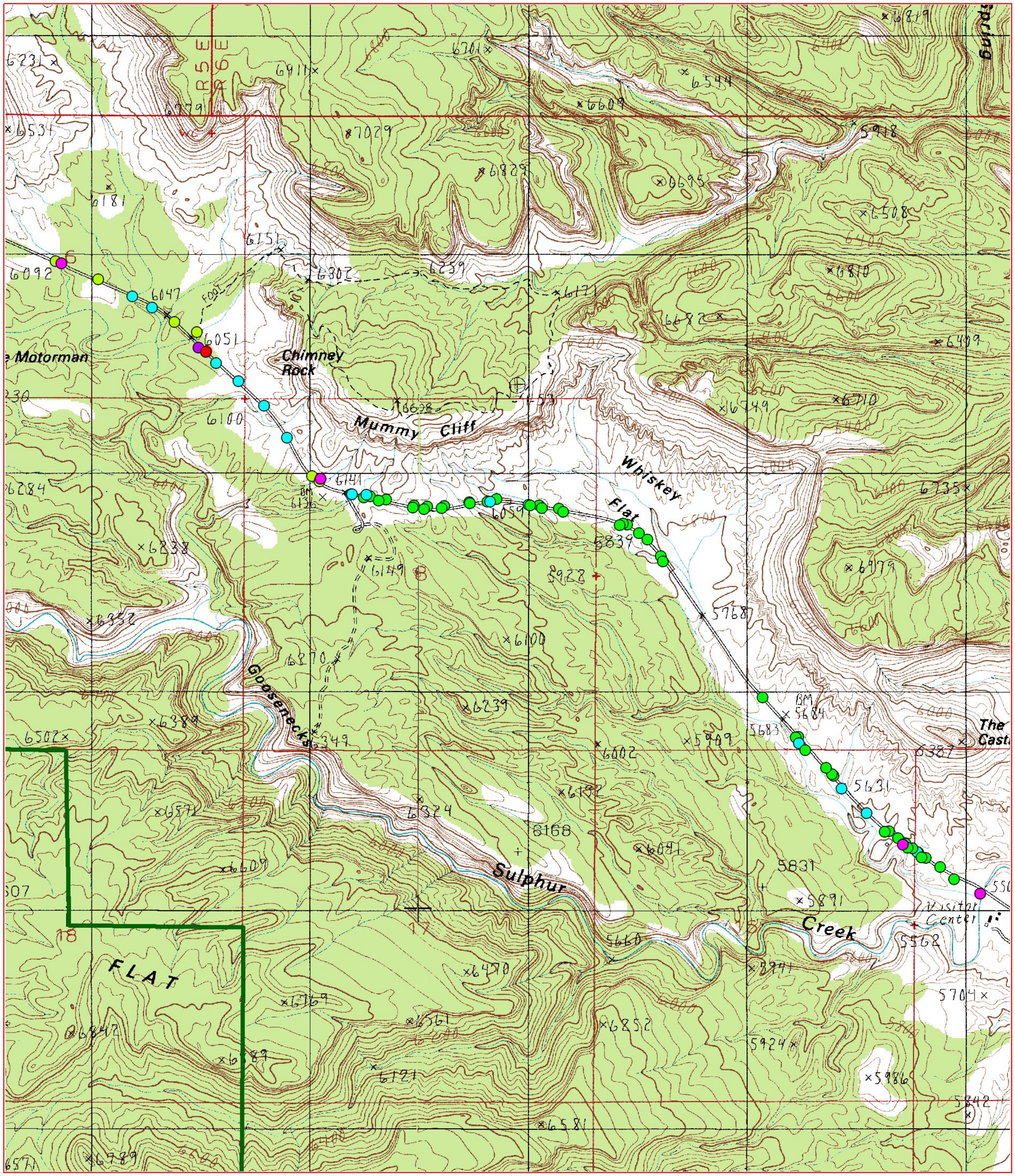
0 2000 4000 Feet

1:24,00 Scale

N

Inset K
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Chimney Rock (Inset L)



- *Centaurea repens*
- *Convolvulus arvensis*
- *Elaeagnus angustifolia*
- Halogeton glomeratus
- *Tamarix ramosissima*
- *Tragopogon dubius*
- Park boundary

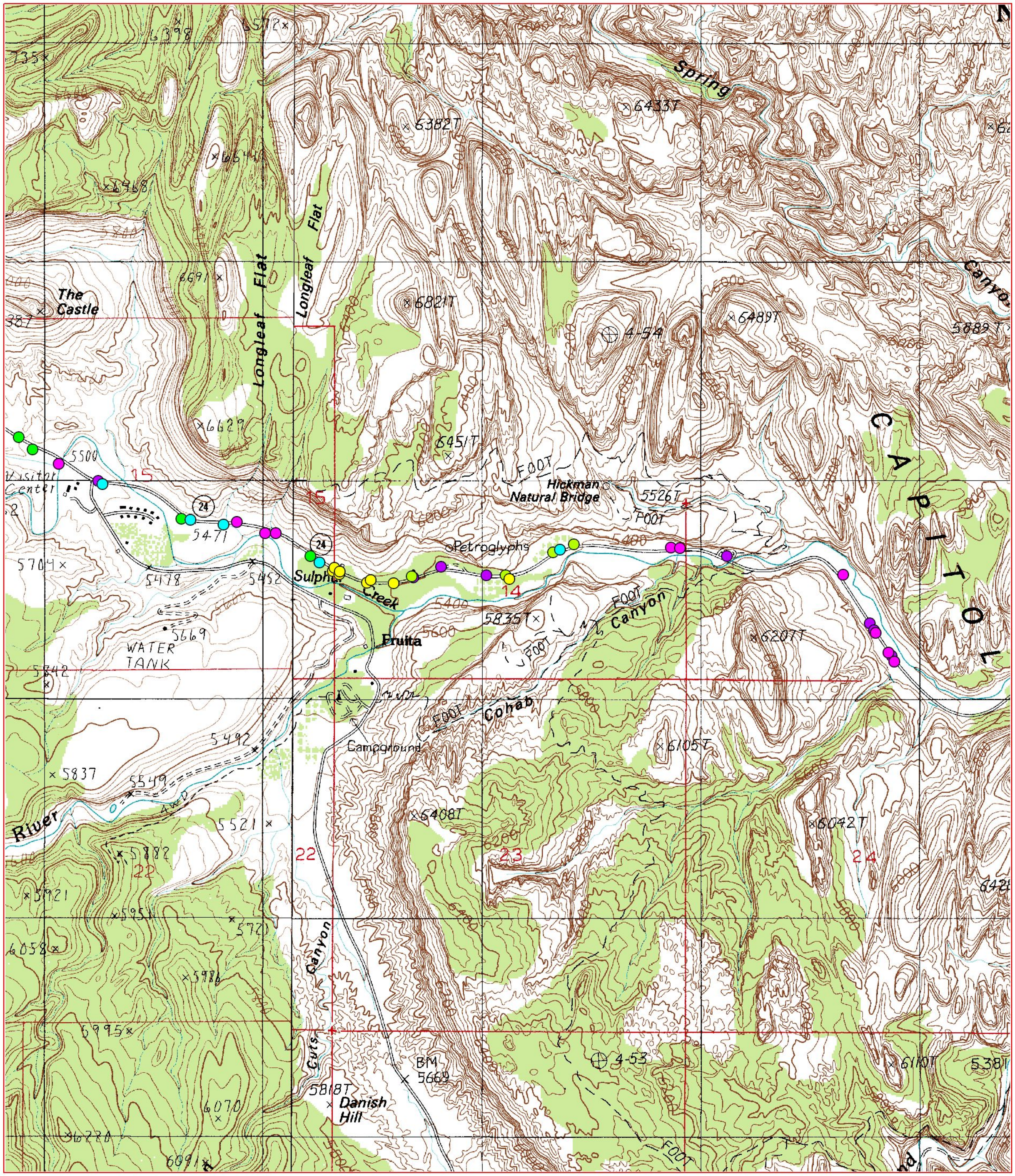
0 2000 4000 Feet

1:24,00 Scale

N

Inset L
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Fruita (Inset M)

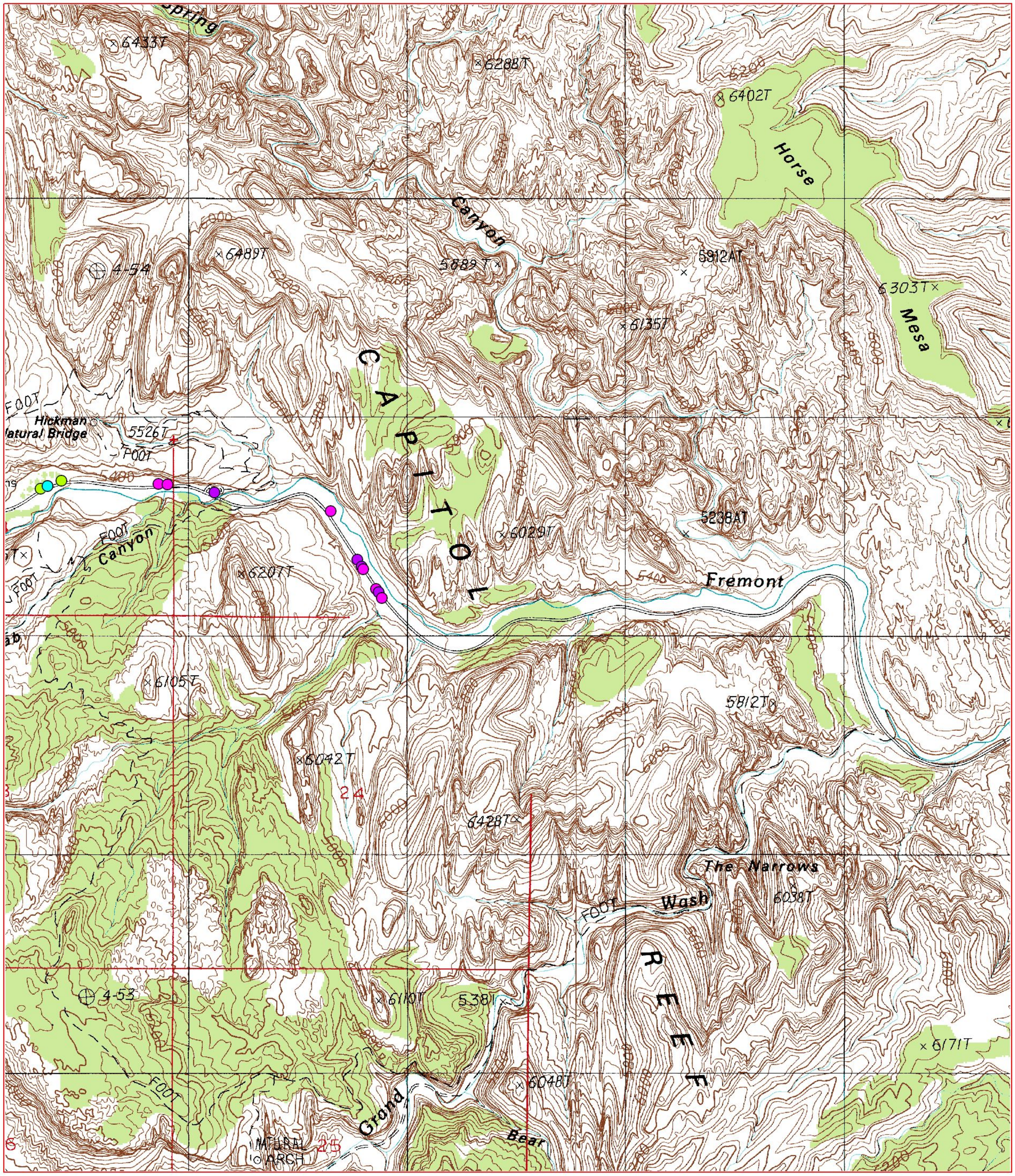


- *Ailanthus altissima*
- *Convolvulus arvensis*
- *Elaeagnus angustifolia*
- *Halogeton glomeratus*
- *Tamarix ramosissima*
- *Tragopogon dubius*
- Park boundary

D-13

Inset M
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Hickman Natural Bridge (Inset N)



- *Convolvulus arvensis*
- *Elaeagnus angustifolia*
- *Tamarix ramosissima*
- *Tragopogon dubius*
- Park boundary

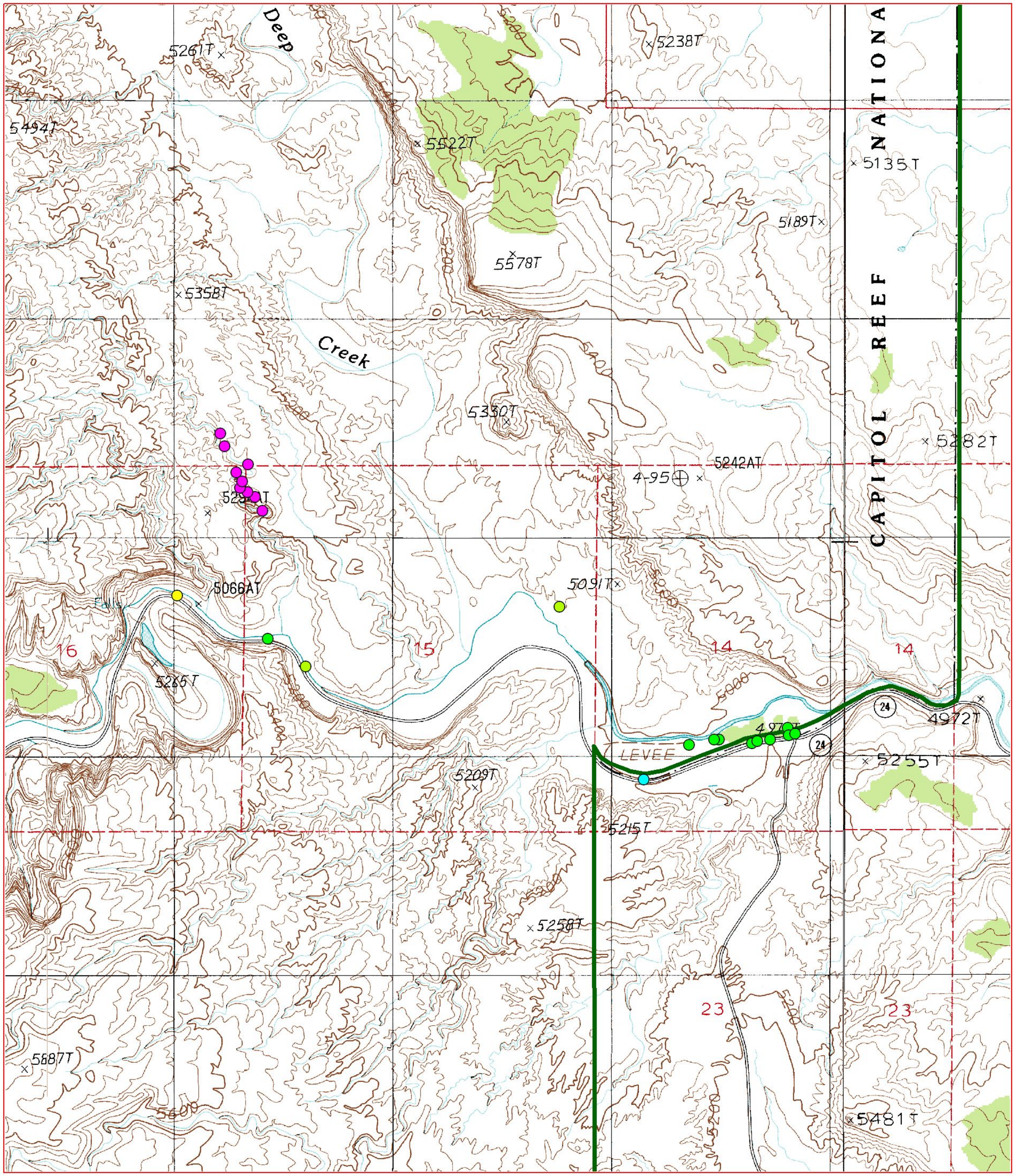
0 2000 4000 Feet

1:24,00 Scale

N

Inset N
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Deep Creek (Inset O)

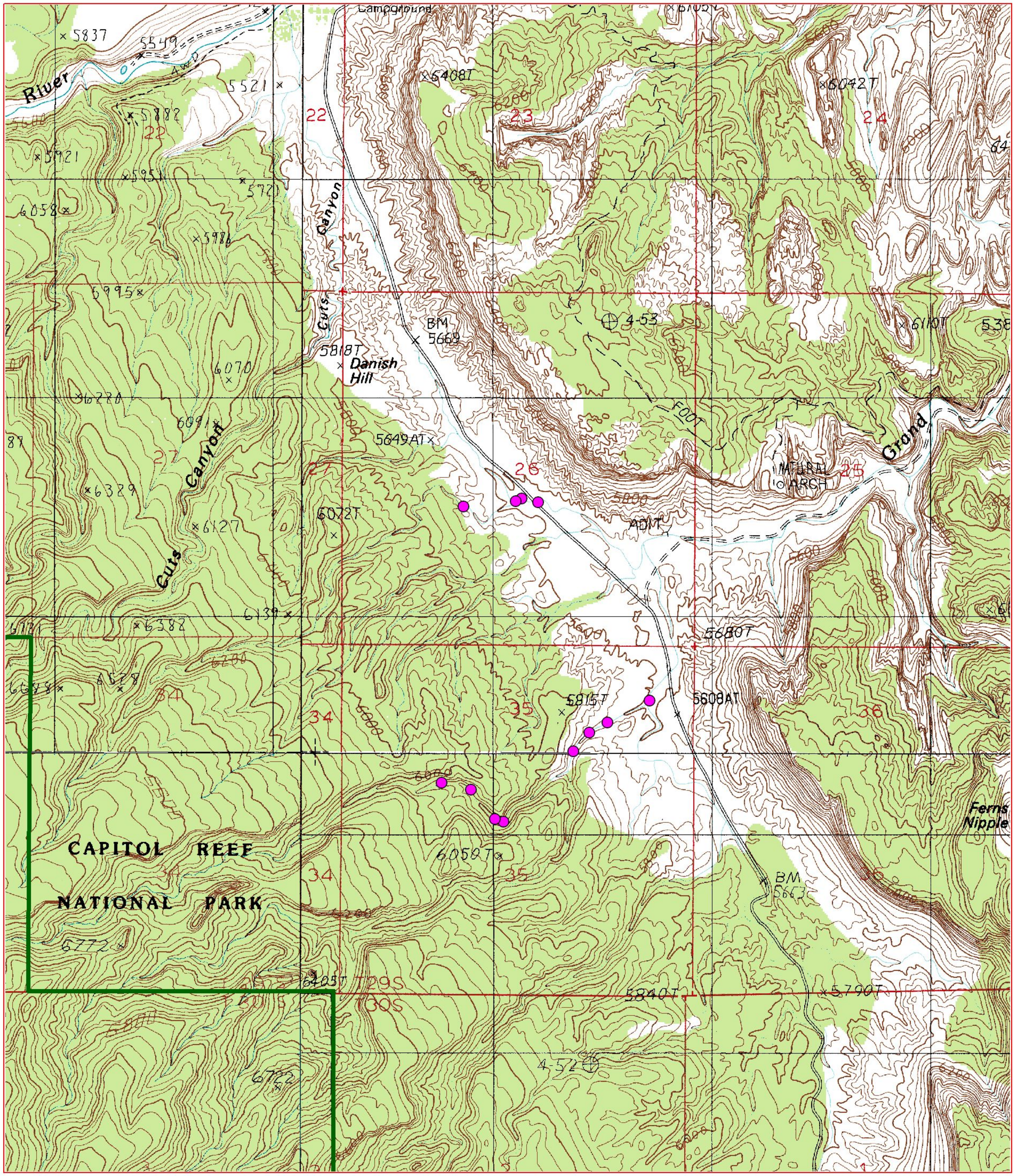


- *Ailanthus altissima*
- *Convolvulus arvensis*
- *Halogeton glomeratus*
- *Tamarix ramosissima*
- *Tragopogon dubius*
- Park boundary

D-15

Inset O
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Grand Wash (Inset P)



0 2000 4000 Feet

1:24,00 Scale

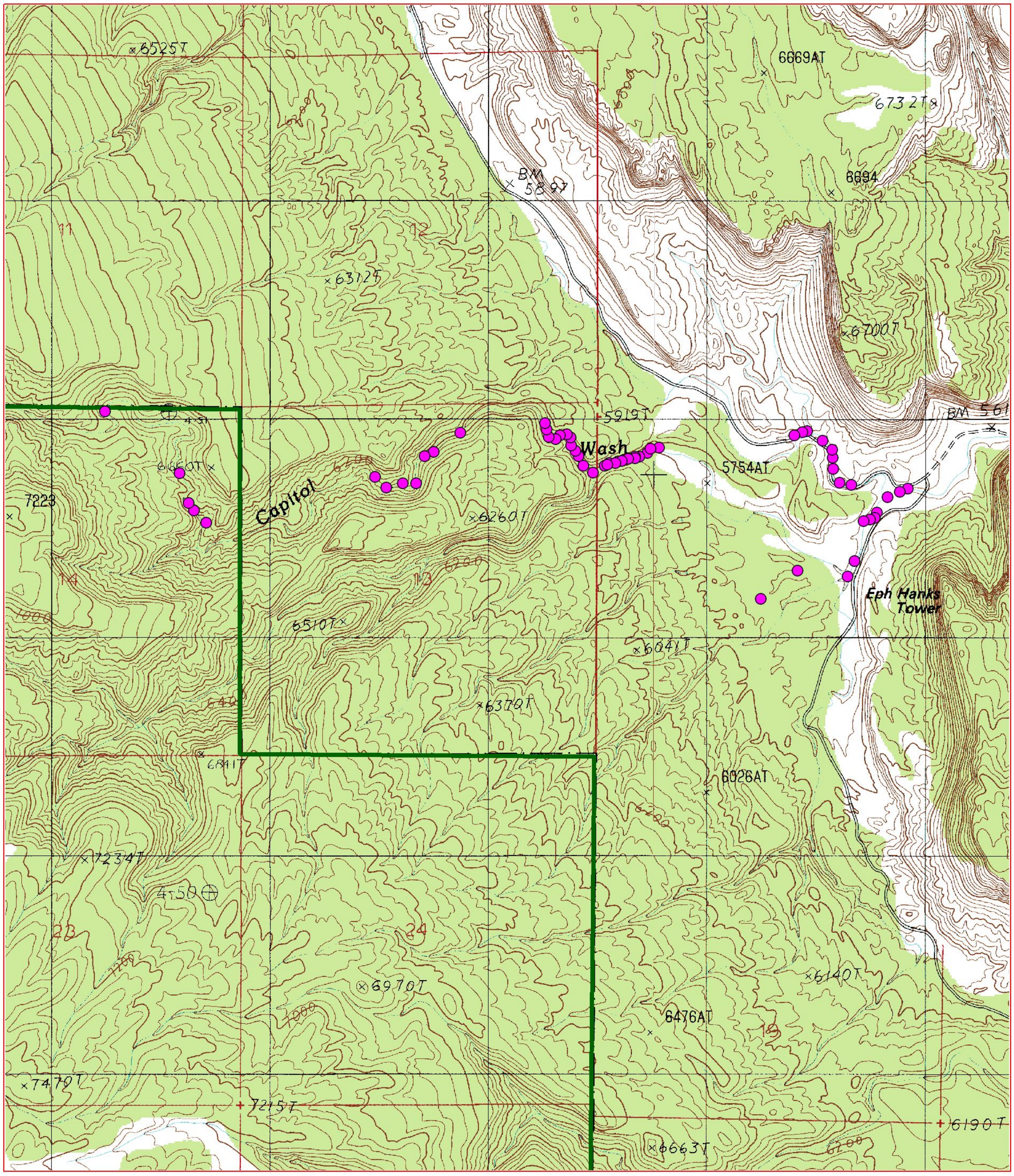
N

● *Tamarix ramosissima*

Park boundary

Inset P
Capitol Reef National Park
Utah State University
2005 Invasive Non-Native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Capitol Wash (Inset Q)



Appendix E. Summary of occurrence and inventory status of the 47 non-native species listed in the GPS data dictionary, plus any additional species noted in the 2005 inventory of invasive plants in Capitol Reef National Park.

GPS Species	A	B	C	D	E	GPS Species	A	B	C	D	E
Agropyron cristatum					X	*Lepidium latifolium*				X	
Ailanthus altissima	X					*Linaria dalmatica*				X	
Alhagi pseudalhagi				X		*Linaria vulgaris*				X	
Anthemis L.					X	*Lythrum salicaria*				X	
Arctium minus				X		*Marrubium vulgare*				X	
Arundo donax				X		*Moluccella laevis*					X
Asparagus sp.				X		*Onopordum acanthium*				X	
Brassica tournefortii					X	*Phleum pratense*					X
Bromus inermis			X			*Rubus discolor*				X	
Bromus tectorum			X			*Rumex crispus*					X
Cardaria draba				X		*Salsola kali*		X			
Carduus nutans				X		*Sorghum halepense*				X	
Centaurea diffusa				X		*Tamarix ramosissima*	X				
Centaurea maculosa				X		*Tragopogon dubius*		X			
Centaurea repens	X					*Tribulus terrestris*					X
Centaurea solstitialis				X		*Verbascum thapsus*				X	
Centaurea virgata				X		*Ulmus pumila*				X	
Chenopodium album			X								
Cirsium arvense				X		**Other:**					
Cirsium vulgare				X		*Erodium cicutarium*			X		
Conium maculatum				X		*Melilotus officinalis*			X		
Convolvulus arvensis	X										
Cynoglossum officinale				X							
Dactylis glomerata			X								
Elaeagnus angustifolia	X										
Euphorbia esula				X							
Halogeton glomeratus	X										
Hyoscyamus niger				X							
Isatis tinctoria				X							
Iva xanthifolia					X						

A = Present - Full inventory
B = Present – Partial inventory
C = Present – Not Mapped
D = Searched For - Absent
E = No Information