Dinosaur National Monument



2005 Invasive Non-Native Plant Inventory

Northern Colorado Plateau Inventory and Monitoring Network

Addendum Report

January 2006

Prepared by

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Utah State University

Cover photo:

A *Tamarix ramosissima* removal project near the Rainbow Park boat ramp. Photo by S. A. Dewey.

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ADDENDUM REPORT

Inventory of Invasive Non-native Plants
Conducted During 2005 in portions of Dinosaur National Monument,
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 in portions of twelve Parks and Monuments associated with the National Park Service, Northern Colorado Plateau Network, including Dinosaur National Monument (DINO). Additional 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 in portions of Dinosaur National Monument. The document serves as an addendum to work conducted in Dinosaur National Monument in 2002, 2003, and 2004 (Dewey et al. 2003, 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 Dinosaur National Monument. It is 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

Six members of the Utah State University weed mapping crew participated in an inventory of targeted invasive plants in portions of Dinosaur National Monument in June, August, and September of 2005**.** Crew qualifications are documented in Appendix A. All field and office methods used in 2005 were identical to those described in the 2004 Addendum Report**.** The same twenty-five species were identified as high-priority targets in the DINO inventory (Table 1), and searched for systematically by all inventory crew members. Any other non-native species recognized as relatively new to DINO 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 some additional species of regional or national concern.

Areas inventoried in 2005 were selected in consultation with Tamara Naumann, Botanist at Dinosaur National Monument. The areas included lands considered most likely to have invasive plant habitat, with priority given to areas of present or anticipated Monument development and/or high visitor uses. Areas of likely weed seed introductions as well as sites identified as known or potential weed seed sources or "vector areas" were also given priority during the selection process.

As in 2004, the primary focus of this inventory project was NPS lands. However, in some cases a limited number of additional lands immediately adjacent to the DINO border were inventoried in 2005. Non-NPS lands inventoried included portions of drainages above Harland Cabin. This additional area was inventoried as a matter of convenience and efficiency, as crew members were already inventorying portions of the Monument's boundary.

Table 1. List of invasive plant species targeted in Dinosaur National Monument in the 2005 Non-native Plant Inventory.

Invasive species	Common Name
Arctium minus	Burdock
Cardaria draba	Hoary cress
Carduus nutans	Musk thistle
Centaurea diffusa	Diffuse knapweed
Centaurea maculosa	Spotted knapweed
Centaurea repens	Russian knapweed
Cirsium arvense	Canada thistle
Cirsium vulgare	Bull thistle
Conium maculatum	Poison hemlock
Cynoglossum officinale	Houndstongue
Elaeagnus angustifolia	Russian olive
Euphorbia esula	Leafy spurge
Halogeton glomeratus	Halogeton
Hyoscyamus niger	Black henbane
Isatis tinctoria	Dyer's woad
Lepidium latifolium	Perennial pepperweed
Linaria dalmatica	Dalmatian toadflax
Lythrum salicaria	Purple loosestrife
Melilotus officinalis	Sweetclover
Onopordum acanthium	Scotch thistle
Sonchus arvensis	Perennial sowthistle
Taeniatherum caput-medusae	Medusahead
Tamarix ramosissima	Saltcedar
Tribulus terrestris	Puncturevine
Ulmus pumila	Siberian elm

Monument Botanist and the NCPN Vegetation Ecologist worked closely with the USU crew to provide information about weed control efforts currently underway, and the best access routes to targeted areas. All of this information was used in planning the 2005 field inventory, and in gathering and analyzing data. NCPN and DINO staff also helped to ensure that data were assembled and provided to the network in a useable format

DATA CATEGORIES

The data categories included in this inventory were discussed at length and agreed upon by NCPN and USU project leaders prior to initiation of the project. A complete description of the data categories and value options appear in Table 2. Data collection categories and definitions comply with the minimum mapping data standards established in North America 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

Table 2. Data fields used in 2005 Inventory of Invasive Non-Native Plants in Dinosaur National Monument.

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	DINO	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

post-processing (office). GPS-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.

FIELD PROCEDURES

The 2005 invasive non-native plants inventory in Dinosaur National Monument was conducted between June 28 and September 18 (Table 3). Areas inventoried by the USU crew included portions of the Green River between the Gates of Lodore to Echo Park, Douglas Mountain, Zenobia Basin, Green River Slope, Limestone Spring, Iron Mine Draw, Iron Mine Ridge, burned areas east of the Gates of Lodore, Thanksgiving Gorge, Trail Draw, Pool Creek, Snow Ranch, and the drainages above Harland Cabin. For purposes of planning and data analysis the inventoried lands were divided into 10 areas (Table 3). Area numbering in 2005 began at 79 to avoid any confusion with the 78 inventoried areas in earlier reports. The order in which areas were inventoried in 2005 was determined by the USU crew leader Potential invasive plant habitat was considered prior to planning 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 (EDSW's) were adjusted as needed based on variations in terrain, walking speed, associated vegetation, and target species. Areas such as Zenobia Basin, Green River Slope, and the burns east of the Gates of Lodore 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. Examples include Iron Mine Draw, Limestone Draw, Trail Draw, and Pool Creek. 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 between-feature position (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 Dinosaur National Monument 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 were then processed and managed following the protocols described in the 2004 addendum report (Dewey and Andersen 2005).

Table 3: Invasive plant inventory areas, inventory dates, crew members, and acres inventoried in 2005 in Dinosaur National Monument.

Area Number	Area Description	Dates Inventoried	Crew Members *	Acres Inventoried **	Corresponding Inset Map Names and Letter Codes***
79	Green River – Gates of Lodore to Echo Park	July 1-4, 2005	SD, KA	846.2	A – Gates of Lodore B – Lower Disaster Falls C – Green River Slope D – Hell's Half Mile E – Steamboat Rock
80	Iron Mine Draw, Iron Mine Ridge	August 7, 2005	RR, KB	627.7	F – Iron Mine Ridge G – Iron Mine Draw
81	Douglas Mountain, Zenobia Basin	August 6, 2005	RR, KB	2067.4	B - Lower Disaster Falls C – Green River Slope F – Steamboat Rock G – Zenobia Peak
82	Burn east of Zenobia Basin	August 5, 2005	RR, KB	554.1	G- Zenobia Peak
83	Burn east of Gates of Lodore	August 2, 2005	RR, KB	1113.9	A – Gates of Lodore
84	Thanksgiving Gorge	June 29, 2005	RR, HH	991	N – Bear Draw O – West Cactus Flat
85	Drainages above Harland Cabin	June 30, 2005	RR, HH	141.3	M – Harland Cabin
86	Trail Draw, Pool Creek	June 30, 2005	RR, HH	244.4	J – Vivas Cake Hill K – Harper's Corner L – Pool Creek
87	Snow Ranch area	June 28, 2005	RR, HH	1336.1	J – Vivas Cake Hill K – Harper's Corner
88	Green River Slope, Zenobia Basin, Limestone Spring	September 16 – 18, 2005	RR, BA	1884.9	C – Green River Slope D- Hell's Half Mile F – Zenobia Basin G – Zenobia Peak H – Iron Mine Ridge
	TOTAL			9807	

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

** Year 2005 = 9,807 acres. An average of 262.2 acres inventoried per person per 10-hr day.

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

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 Monument. 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 a 35-mm digital camera, or 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.

RESULTS and DISCUSSION

Field crews inventoried 9,807 acres in Dinosaur National Monument during the summer of 2005 (Table 3), an amount representing approximately 4.7 percent of the entire 210,278-acre Monument. An average of 262.2 acres was inventoried per person per 10-hr day during the season.

The location and size of the areas inventoried in 2002, 2003, 2004, and 2005 are represented in Figure 1. Lands inventoried in 2002 are shown in green, lands inventoried in 2003 are shown in yellow, lands inventoried in 2004 are shown in orange, and those inventoried in 2005 are shown in red. Figure 2 shows the ten 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 3 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 – O 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. Fifteen inset maps are required to cover all 12 of the inventory areas, and large inventory areas may span over several inset maps. For example, the Green River (Inventory Area 79) appears on Gates of Lodore, Lower Disaster Falls, Green River Slope, Hell's Half Mile, and Steamboat Rock (Insets A, B, C, D, and E).

Invasive plants infested a total of 153.919 acres (Table 4), an amount equal to 1.6 percent of the land inventoried. Of the 25 targeted species, only *Carduus nutans, Centaurea repens, Cirsium arvense, Cirsium vulgare, Lepidium latifolium, Melilotus officinalis, Sonchus arvensis,* and *Tamarix ramosissima* were found in those portions of the Monument inventoried in 2005. No infestations of *Arctium minus, Cardaria draba, Centaurea diffusa, Centaurea maculosa, Conium maculatum, Cynoglossum officinale, Elaeagnus angustifolia, Euphorbia esula, Halogeton glomeratus, Hyoscyamus niger, Isatis tinctoria, Linaria dalmatica, Lythrum salicaria, Onopordum acanthium, Taeniatherum caput-medusae, Tribulus terrestris* or *Ulmus pumila* were discovered. The non-target species mapped were *Convolvulus arvensis, Verbascum thapsus,* and *Dipsacus fullonum.*

The most abundant target species found in the Park in 2005 was *Tamarix ramosissima.* This species, which was especially common along much of the Green River, comprised more than 69.9 percent of the

Figure 1. Total area inventoried for non-native invasive plant species in Dinosaur National Monument in 2002, 2003, 2004, and 2005.

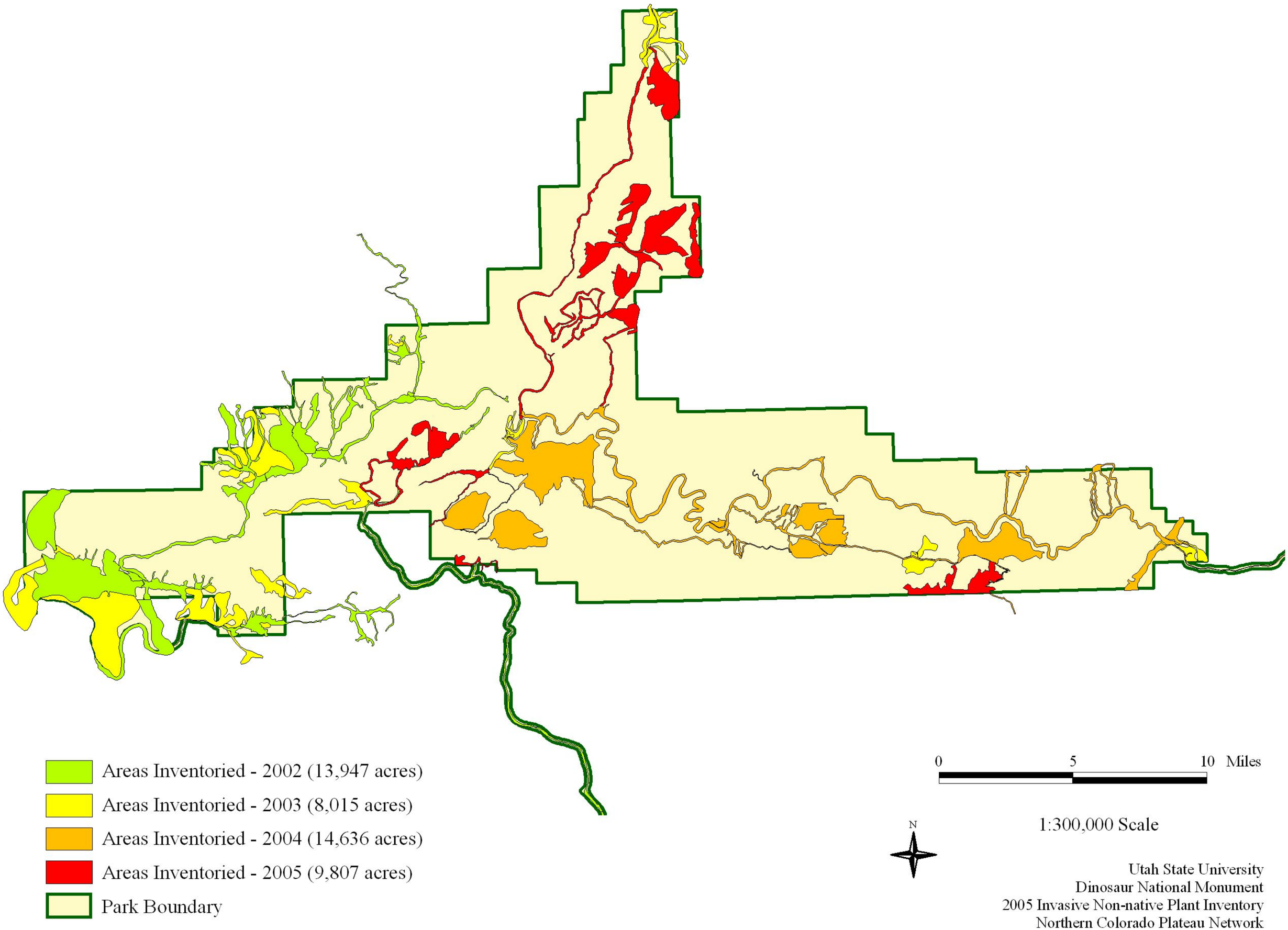


Figure 2. Identification number and acreage of individual areas inventoried for non-native invasive plant species in Dinosaur National Monument during 2005.

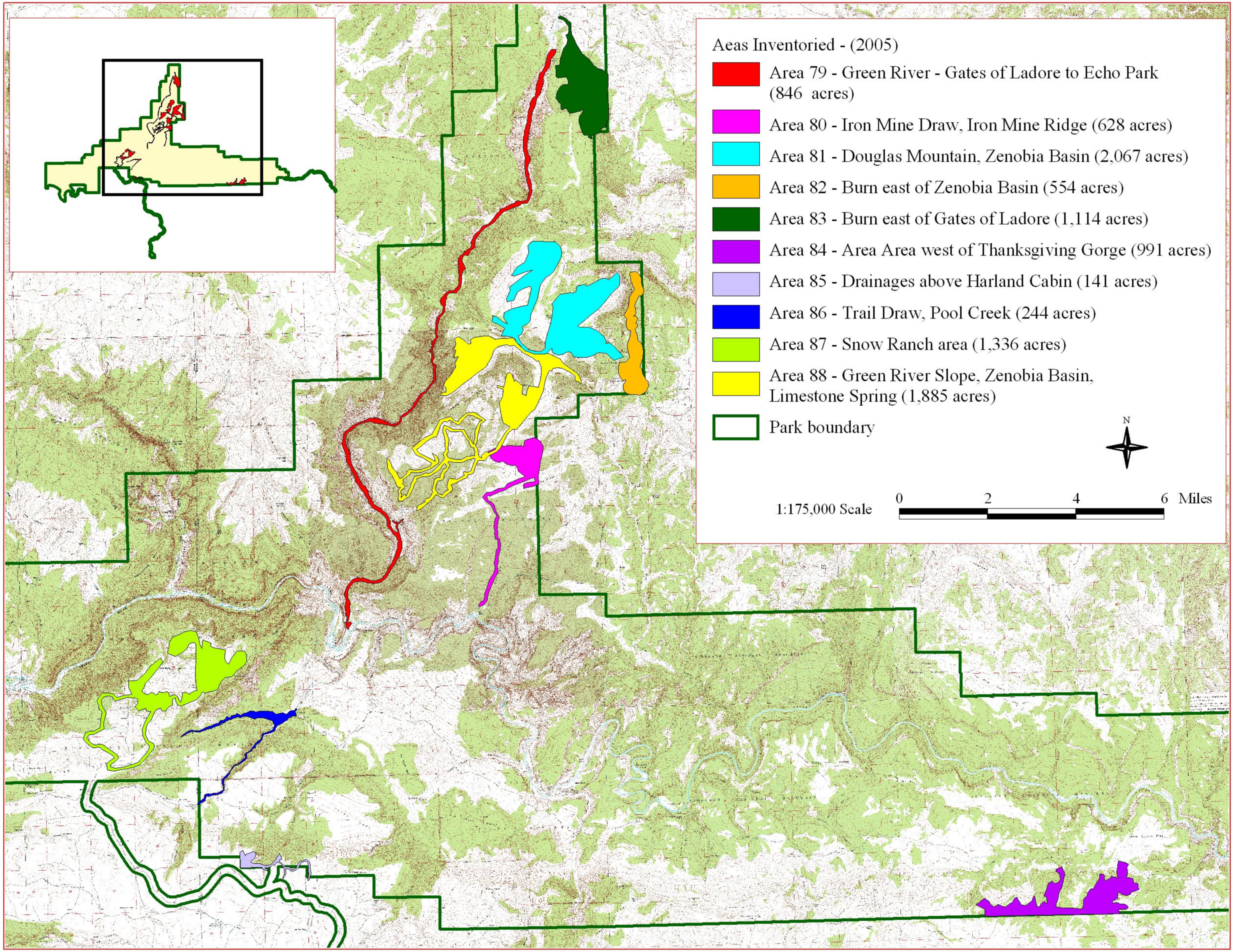
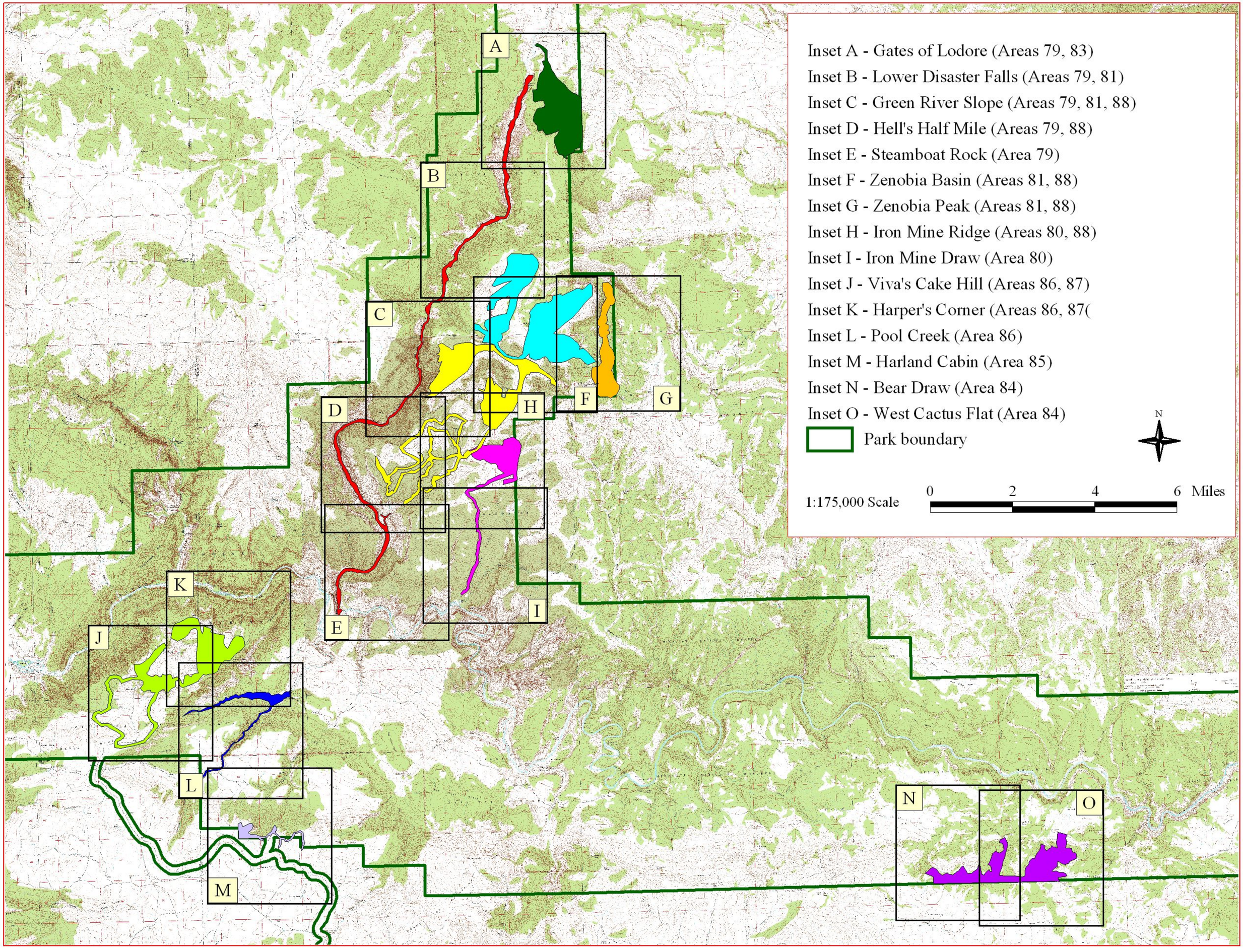


Figure 3. Insets indicating the location, letter code, and name of hte fifteen 1:24,000 scale maps used in Appendix tables to show weed distribution within individual inventoried areas in Dinosaur National Monument.



total infested acreage inventoried. *Lepidium latifolium* was also common along the Green River and made up 14 percent of the infested acres. *Cirsium arvense* comprised approximately 9.6 percent of the total infestations. The remaining infestations (6.5 % of the total infested acreage) were comprised of the remaining five target species and three non-target species.

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, Descurainia sophia, Kochia scoparia, Lactuca serriola, Polygonum aviculare, Sisymbrium altissimum, Sonchus oleraceus, Tragopogon dubius,* and *Chenopodium album* were present in several areas but were ignored due to their previously recognized abundance in the Monument. Species such as *Melilotus officinalis* 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 *Melilotus officinalis* should not be considered a complete inventory.

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

Table 4: Acres infested by invasive plant species within inventoried areas of Dinosaur National Monument in 2005.

Species	Total Acres Infested
Carduus nutans	5.837
Centaurea repens	1.117
Cirsium arvense	14.708
Cirsium vulgare	3.461
Convolvulus arvensis	0.100
Dipsacus fullonum	0.001
Lepidium latifolium	21.474
Melilotus officinalis	0.443
Sonchus arvensis	0.001
Tamarix ramosissima	106.096
Verbascum thapsus	0.681
Totals	**153.919**

Green River – Gates of Lodore to Echo Park (Area 79; Insets A, B, C, D, and E)

The Green River corridor between the Gates of Lodore and Echo Park (approximately 19 miles of river) was inventoried by two USU crew members during the first week of July. Whenever possible the inventory was conducted by crew members walking along the banks between the water's edge and the

canyon walls. Where bank access was impractical crew members searched for weeds by inspecting the banks visually from the rafts. *Tamarix ramosissima* was the most common species inventoried among the several target species located along this section of the Green River. Infestations ranged from 0.001 to 1 acre in size and were comprised of mainly mature trees and saplings. Mature trees were often found further from the water's edge, while seedlings and saplings were at the water's edge or on shallow cobble bars. The density of infestations also varied along the riverbanks. Point features were used to map most infestations, however linear features were used to inventory continuous sections of *Tamarix* infestations near Pot Creek, Hell's Half Mile, and Upper Disaster Falls. *Lepidium latifolium* was also found widely scattered throughout the inventory area. Infestations ranged in size from 0.001 to 2.5 acres and were often discovered growing directly on the river's edge mixed with *Tamarix*. Infestations of both *Lepidium latifolium* and *Tamarix ramosissima* appeared to be more numerous near the Gates of Lodore and Echo Park, and less abundant along Hell's Half Mile. However this observation should be tempered by the fact that the crew was unable to conduct on-the-ground searches in much of this more rugged central portion of the river course due to the many rapids and limited bank inaccessibility.

Small infestations of *Cirsium arvense* and *Carduus nutans* were found scattered intermittently along the Green River. Infestations of *Cirsium arvense* were most frequent and generally most dense between the Gates of Lodore and Jack Springs Draw, although it was found along the entire length of the river. *Carduus nutans* was found primarily between the Gates of Lodore and Jack Springs Draw. Additional infestations of *Carduus nutans* were found below Rippling Brook and above Echo Park

Centaurea repens, *Cirsium vulgare*, and *Melilotus officinalis* were also found along the Green River. Infestations of *Centaurea repens* were largely between Gates of Lodore and Jack Springs Draw, and above Echo Park. Patches of *Cirsium vulgare* and *Melilotus officinalis* were intermittently scattered along the riverbanks. Small patches of *Verbascum thapsus* were recorded on a sand bar at the confluence of the Yampa River and Green River in Echo Park.

Infestations of *Dipsacus follonum* and *Sonchus arvensis* were found and mapped, although not targeted species for this inventory. A few dead stalks of *Dipsacus follonum* were found in the Kolb river campsite below Pot Creek. A 0.001-acre patch of *Sonchus arvensis* was found approximately a mile upstream from Echo Park. Although not mapped, large amounts of *Bromus tectorum* were found along the riverbanks, particularly between the Gates of Lodore and Jack Springs Draw. Other species seen but not mapped include *Descurainia sophia*, *Sisymbrium altissimum*, *Bromus inermis*, and *Lactuca serriola*.

The majority of the riverbanks were inventoried on foot, and with the exception of some small sections of thick brush, visibility and detection confidence were generally good. When bank access was impractical and mapping had to take place from the rafts, visibility was more restricted and it is likely that crew members missed some infestations of the smaller species. However, visibility was generally good along the river corridor overall, and the crew was confident it found at least 90 percent of all 0.01-acre and larger infestations of the targeted species. The river corridor still contained healthy vegetation and stands of cottonwoods, willows, box elders. rabbitbrush, singleleaf ash, sagebrush, and native forbs were present in many areas. No obvious disturbances aside from the effects of erosion were seen along the river corridor. However, due to the relatively high incidence of non-native species, the inventory unit was assigned an ecological status level three.

Iron Mine Draw, Iron Mine Ridge (Area 80; Insets H, I)

Two crew members inventoried Iron Mine Draw and the fields near Iron Mine Ridge near the Walker Ranch. *Tamarix ramosissima* was the only targeted species found within this inventory unit, occurring in the lower half of Iron Mine Draw near the Yampa River. The infestations were fairly consistent in this portion of the Draw, with most of them being 0.001-acre in size. No other targeted species were encountered in this inventory unit.

No obvious disturbances were noted, and the crew felt confident it found at least 90 percent of all 0.01-acre and larger infestations of the targeted species in the unit. The area was assigned an ecological status level two.

Douglas Mountain, Zenobia Basin (Area 81; Insets B, C, F, G)

The northern portion of Zenobia Basin and Douglas Mountain were included in this inventory unit. Contiguous transects were walked across the open meadows, and crew members paid particular attention to any shallow drainages and springs within the meadows. The crew discovered infestations of *Carduus nutans, Cirsium vulgare,* and *Cirsium arvense* within this unit. Two 0.25-acre patches of *Carduus nutans* were found in the northern tip of the unit, within the boundaries of a recent burn. Two 0.01 and two 0.1-acre patches of *Cirsium arvense* were found in the southern tip of the inventory unit within a drainage north of Zenobia Peak and the Lookout Tower. Infestations of *Cirsium vulgare* were also found in this drainage. Several small patches of *Cirsium vulgare* were also found at the spring at the Old Bassett Camp and along Zenobia Creek. Although several patches were found along the bank of Zenobia Creek itself, the majority were close to an associated spring site.

Although not mapped, the crew observed the presence of *Bromus tectorum* throughout Zenobia Basin. However, the crew also noted several native grass and forb species present as well. The disturbance from fire was evident in the northern section of the basin and it appeared there were recent signs of livestock as well. The crew noted that visibility was generally good, and was confident they found at least 90 percent of all 0.01-acre and larger patches of the targeted species within the area. The inventory unit was assigned an ecological status level two.

Green River Slope; Zenobia Basin, Limestone Spring (Area 88; Insets C, D, F, G, and H)

Two crew members inventoried this portion of Zenobia Basin between September 16 and September 17 in 2005. Included in this area are the Green River Slope, Zenobia Basin, Limestone Draw, Limestone Spring, and Alcove Brook. Crew members found *Carduus nutans, Cirsium vulgare, Carduus nutans,* and *Lepidium latifolium* within the inventory unit. A 0.01-acre patch of *Lepidium latifolium* was found along the northwestern border along the cliff edge of Green River Slope. A single 0.001-acre infestation of *Carduus nutans* was found in this same location and the plants were pulled upon their discovery.

Cirsium arvense and *Cirsium vulgare* were found scattered near the head of Limestone Draw. Additional infestations of *Cirsium vulgare* were observed at Limestone Springs. *Cirsium vulgare* was also found in Zenobia Creek. Other species seen but not mapped include *Bromus tectorum, Tragopogon dubius, Polygonum aviculare,* and *Kochia scoparia*. These additional species were lightly scattered throughout the inventory unit.

The area had burned in the past five to ten years and disturbances could be linked to this and to disturbances from livestock on the private inholdings included in this unit. Visibility was generally good and the crew was confident that it found at least 90 percent of all 0.01-acre and larger patches of the targeted species likely to be in the area. The area was assigned an ecological status level two.

Burn east of Zenobia Basin (Area 82; Inset G)

A large burned area east of Zenobia Basin was inventoried by two crew members on August 5, 2005. The crew found infestations of *Cirsium arvense, Cirsium vulgare,* and *Carduus nutans* in this inventory unit. Two small patches of *Carduus nutans* were found at the northern tip of the unit and one infestation was found east of Zenobia Peak. Small scattered patches of *Cirsium vulgare* occurred in a drainage running along the western boundary of the unit. *Cirsium arvense* was found at the southern end of the inventory unit, just to the north of Zenobia Peak. No other targeted species were found in this unit during the inventory.

The area was very steep and rocky and the crew had difficulty reaching all areas within this inventory unit. The vegetation was also thick in some sections of the unit, thus hindering the crew's ability to see the landscape completely at times. The crew was confident in its ability to see approximately 80 percent of all 0.01-acre infestations of the targeted species due to the difficulties in terrain and vegetation present. Areas containing weedy species exhibited signs of high disturbance from fires. No other disturbances were noted at the time of the inventory. The area was assigned an ecological status level three.

Burn east of the Gates of Lodore (Area 83; Inset A)

A large burned slope east of the Gates of Lodore was inventoried on August 2, 2005 by two crew members. The majority of targeted weed species found within the burn was *Carduus nutans. Carduus nutans* could be found throughout the southern half of the inventory unit. Although the majority of patches mapped were 0.01-acre in size, the sizes ranged from 0.01 to 1 acre. All patches recorded were found in the seed-dispersing stage of growth. Other species found include *Verbascum thapsus, Tamarix ramosissima, Lepidium latifolium, Cirsium vulgare,* and *Cirsium arvense.* These species were also found lightly scattered through the southern edge of the burn within the inventory unit.

Although not mapped, *Bromus tectorum* was found widely throughout the burn. However, native grasses such as needle-and-thread grass and Indian ricegrass were still present in much of the area. Visibility was very good throughout the inventory area and the crew was confident in its ability to find at least 90 percent of all 0.01-acre and larger patches of the targeted species. Fire was the only disturbance noted by the crew and the area was assigned an ecological status level three.

Area west of Thanksgiving Gorge (Area 84; Insets N, O)

An area west of Thanksgiving Gorge and along the eastern Park boundary was inventoried on June 29, 2005 by two crew members. This area had been burned five years prior to the inventory. A single *Carduus nutans* was found in the eastern portion of the unit and was pulled after its location was marked. No other targeted species were detected during the inventory of this area. However, several non-targeted weedy species were present. These included *Bromus tectorum* which was found scattered throughout the

burned section of the unit. *Descurainia sophia* also was found throughout the burn site. Other species seen within the unit but not mapped include *Sisymbrium altissimum, Tragopogon dubius, Lactuca serriola, Sonchus oleraceus,* and *Chenopodium album.*

Visibility was generally very good as most of the woody vegetation had been burned off by the fire. The crew felt it found at least 90 percent or more of all 0.01-acre and larger patches of the targeted species searched for within the unit. The area was very rocky and contained little native vegetation aside from occasional pinyon pine or juniper. The fire was the only obvious disturbance noted by the crew. The area was assigned an ecological status level three due to the abundance of non-native plant species.

Drainages above Harland Cabin (Area 85; Inset M)

The drainages above Harland Cabin at a canyon overlook were inventoried on June 30, 2005 by two crew members. No targeted weed species were found in this area. However, *Bromus tectorum* was found in minute amounts. Low-growing sagebrush made up the majority of the native vegetation, making visibility very good. The crew felt very confident in its ability to see at least 90 percent of all 0.01-acre and larger patches of the targeted species. No obvious disturbances were noted in the area. The area did contain a visitor-use parking lot, so the potential for new introductions of invasive plant species is high. The area was assigned an ecological status level two due to the low occurrence of *Bromus tectorum* and the lack of targeted species.

Trail Draw, Pool Creek (Area 86; Insets J, K)

The areas of Trail Draw and Pool Creek were inventoried on June 30, 2005 by two crew members. Trail Draw was very dry and rocky and contained no targeted species. Pool Creek was inventoried from the Park boundary to the Chew Ranch and contained several targeted species. The targeted species were likely abundant due to the favorable habitat created by a large spring found in Pool Creek. The majority of weedy plants found were near this spring. The crew found *Tamarix ramosissima*, *Cirsium vulgare*, and *Cirsium arvense* in Pool Creek. A handful of small patches of sapling *Tamarix ramosissima* were found at the Park boundary. The remaining *Tamarix ramosissima* infestations were found between the spring in Pool Creek and the Chew Ranch. These infestations ranged from 0.001 to 0.25 acres in size and were mainly mature trees.

Cirsium arvense was found consistently along Pool Creek between the spring and the Chew Ranch. The majority of infestations were 0.25-acre in size and moderately dense (6 to 25 %). Infestations of *Cirsium vulgare* also were found along this stretch of Pool Creek. Infestations of *Cirsium vulgare* were either 0.001 or 0.1-acres and moderately dense. A single 0.1-acre patch of *Convolvulus arvensis* was found near the junction of Pool Creek and Trail Draw. Other species seen but not inventoried include *Bromus tectorum, Sisymbrium altissimum, Tragopogon dubius, Melilotus officinalis,* and *Descurainia sophia*. *Bromus tectorum* was found scattered in both drainages. *Sisymbrium altissimum* and *Bromus tectorum* were particularly heavy in the mouth of Trail Draw. *Melilotus officinalis, Tragopogon dubius,* and *Descurainia sophia* were found in Pool Creek.

Visibility was generally acceptable and the crew felt confident that it was able to find at least 90 percent of all 0.01-acre and larger infestations of the assigned targeted species. No obvious disturbances were

noted by the crew aside from flooding events. It should be noted that the targeted and inventoried weeds were only near spring sites in this inventory unit. The area was assigned an ecological status level three.

Snow Ranch Area (Area 87; Inset J, K)

The areas surrounding Snow Ranch were inventoried on June 28, 2005 by two USU members. Both NPS land and private inholdings were included in this unit. Springs and stock ponds were also searched in this unit. No targeted species were found in this unit during the inventory. Although not mapped, *Bromus tectorum* was found in scattered patches throughout the area. Patches were relatively infrequent, but dense when present. The heaviest *Bromus tectorum* occurrence was found in the northern region of the unit, within an area that had recently burned. Other species seen but not inventoried include *Tragopogon dubius, Chenopodium album, Polygonum aviculare,* and *Descurainia sophia.*

Visibility was generally very good. The sagebrush was very tall in some portions, somewhat limiting visibility. However, the crew felt confident in its ability to find at least 90 percent of all 0.01-acre and larger infestations of the assigned targeted species overall. The native plant community appeared to be in good condition. The crew noted the presence of sagebrush, needle-and-thread grass, Indian ricegrass, arrowleaf balsamroot, lupines, wild onions, and sego lilies. A burned area and stock ponds showed evidence of recent disturbances. The area was assigned an ecological status level two due to the presence of *Bromus tectorum* and other weedy species.

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 Dinosaur National Monument. As with the information contained in the 2004 Addendum report, it is anticipated that this 2005 inventory will be useful in the Monument'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 Dinosaur National Monument continues to implement weed control strategies and practices. Evidence of *Tamarix ramosissima* control work was seen in several locations along the Green River. The USU crew also participated in a *Tamarix* removal project in conjunction with the Weed Warrior Program. The USU crew and the Monument's Weed Warrior leader met with a NOLS group and spent several hours removing *Tamarix* from a river campsite.

USU commends the Monument for its efforts to develop a comprehensive written management plan for invasive plant species in DINO, and encourages the Monument 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 specific weed management efforts. Dinosaur National Monument is also praised for its continued participation in a local Cooperative Weed Management Area and is encouraged to maintain that relationship. As stated in the previous reports, weed management goals can be achieved

more effectively when managed in cooperation with partner organizations also trying to achieve the same goals.

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 Dinosaur National Monument 98.4 percent of the inventoried acres in 2005 were free of all targeted species. Furthermore, 96.6 percent of the 46,405 acres inventoried acres in the four years combined (2002-2005) 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 DINO 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 23 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 Tamara Naumann for her help in logistical planning and coordination as well as for her continued enthusiasm for this project. 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 the Monument 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 Dinosaur National Monument.

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 Dinosaur National Monument During the 2005 Invasive Non-native Plant Inventory.

Weeds Detected



Figure 1. *Cirsium vulgare* in a burn east of the Gates of Lodore. (DINO PR-42)



Figure 2. *Cirsium vulgare* found in Zenobia Basin. (DINO PR-45)



Figure 3. *Cirsium vulgare* amid *Bromus tectorum* along the banks of the Green River. (DINO PR-58)



Figure 4. A landscape view of *Cirsium vulgare* and *Bromus tectorum* on the banks of the Green River. (DINO PR-58)

Weeds Detected



Figure 5. *Cirsium arvense* found in Zenobia Basin. (DINO PR-46)



Figure 6. A landscape view of *Cirsium arvense* in Zenobia Basin. (DINO PR-46)

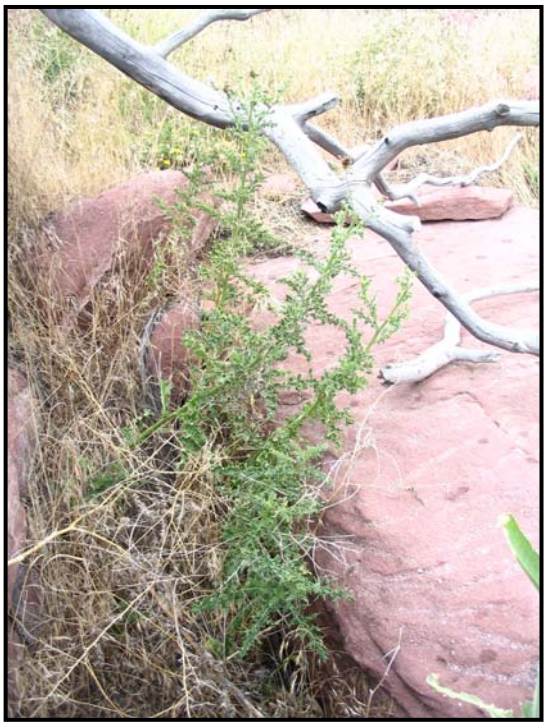


Figure 7. *Cirsium arvense* found in a burned hillside above the Gates of Lodore.



Figure 8. *Lepidium latifolium* and *Bromus tectorum* in a recent burn above the Gates of Lodore. (DINO PR-43)

Weeds Detected



Figure 9. *Lepidium latifolium* along the banks of the Green River. (DINO PR-61))



Figure 10. *Lepidium latifolium*, *Carduus nutans*, *Tamarix ramosissima*, and *Centaurea repens* along the bank of the Green River. (DINO PR-53))



Figure 11. *Centaurea repens* amid the rushes on the banks of the Green River near Winnie's Rapids. (DINO PR-52)



Figure 12. *Carduus nutans* found beneath *Tamarix ramosissima* saplings along the Green River.

Weeds Detected



Figure 13. *Carduus nutans* amid *Bromus tectorum* hillside above the Green River.



Figure 14. *Carduus nutans* infesting a recent burn above the Gates of Lodore. (DINO PR-37)

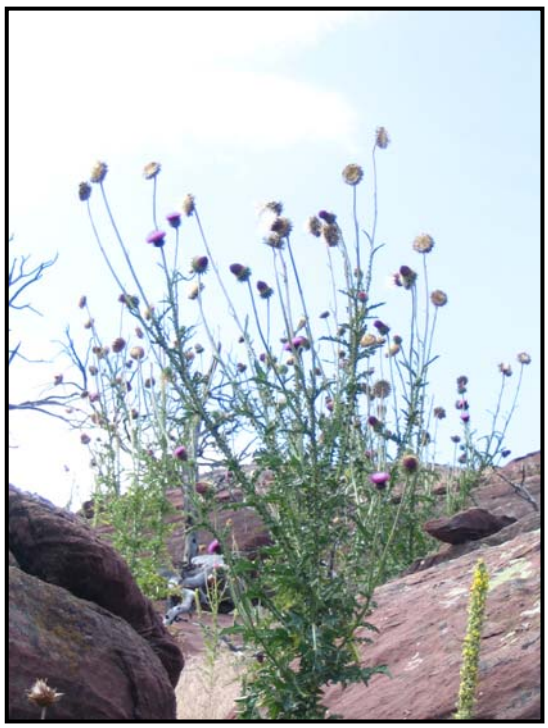


Figure 15. *Carduus nutans* infesting a recent burn above the Gates of Lodore.



Figure 16. *Verbascum thapsus* infesting a recent burn above the Gates of Lodore. (DINO PR-34)

Weeds Detected



Figure 17. Typical stand of *Tamarix ramosissima* along the Green River near Winnie's Rapids.



Figure 18. Typical stand of *Tamarix ramosissima* seedlings in a submerged gravel bar along the Green River. (DINO PR-59)



Figure 19. Typical stand of *Tamarix ramosissima*, with seedlings in the foreground and mature trees in the background, along the Green River.



Figure 20. Cut-stump treatment of *Tamarix ramosissima* at Echo Park.

Weeds Detected



Figure 21. Typical stand of *Tamarix ramosissima* along the Green River at Rainbow Park. A cut-stump herbicide treatment can be seen in the left portion of the photograph.



Figure 22. *Tamarix ramosissima* removal project along the Green River at Rainbow Park.



Figure 23. *Tamarix ramosissima* sapling found in a recent burn on an hillside above the Gates of Lodore.



Figure 24. *Tamarix ramosissima* resprouting in a burn above the Gates of Lodore. (DINO PR-38)

Dinosaur National Monument Landscapes



Figure 25. Looking down canyon from Winnie's Rapids along the Green River.



Figure 26. Looking up canyon along the Green River. *Tamarix ramosissima* and box elder line the banks. (DINO PR-57)



Figure 27. Mapping crew inventorying the banks of the Green River.



Figure 28. NOLS volunteer *Tamarix ramosissima* removal project at the Kolb campsite.

Dinosaur National Monument Landscapes



Figure 29. View downstream of the Green River near Limestone Creek.



Figure 30. Inventory area in a recent burn on a hillside above the Gates of Lodore. (DINO PR-40)



Figure 31. Burn site inventoried above the Gates of Lodore (DINO PR-30).



Figure 32. Inventoried meadows in Zenobia Basin. (DINO PR-48)

Dinosaur National Monument Landscapes



Figure 33. Inventoried area near Zenobia Peak. (DINO PR-44)



Figure 34. Inventory site in Zenobia Basin. (DINO PR-50)



Figure 35. Inventoried site in Zenobia Basin.



Figure 36. Bridget Atkin walking transects across Zenobia Basin inventory site.

Dinosaur National Monument Landscapes



Figure 37. Inventoried area near Zenobia Peak.



Figure 38. Inventory site in Zenobia Basin.



Figure 39. Inventoried site on the Green River Slope near Zenobia Basin.



Figure 40. Inventoried fields on the Green River Slope near Zenobia Basin.

Crew



Figure 41. Eric Lane, NPS Weed Warrior, and Kim Andersen during the Green River inventory.



Figure 42. Kim Andersen taking a weed point for *Centaurea repens* along the Green River.



Figure 43. Kim Andersen and NPS Weed Warrior standing at a *Tamarix ramosissima* treated site in Echo Park.



Figure 44. Steve Dewey at the edge of a dense *Tamarix ramosissima* stand in Echo Park.

Crew



Figure 45. Weed Mapping crew in Island Park.



Figure 46. Ruth Richards downloading data in Zenobia Basin.



Figure 47. Bridget Atkin packing her work equipment in Zenobia Basin.



Figure 48. Kelsey Benson and Ruth Richards inventorying in Zenobia Basin. (DINO PR-51)

Crew



Figure 49. Bridget Atkin marking a weed point in Zenobia Basin.



Figure 50. Weed warriors and NOLS group at the Kolb river campsite for a *Tamarix ramosissima* removal project.



Figure 51. NPS Botanist Tamara Naumann illustrating how much *Tamarix ramosissima* root needs to be removed.

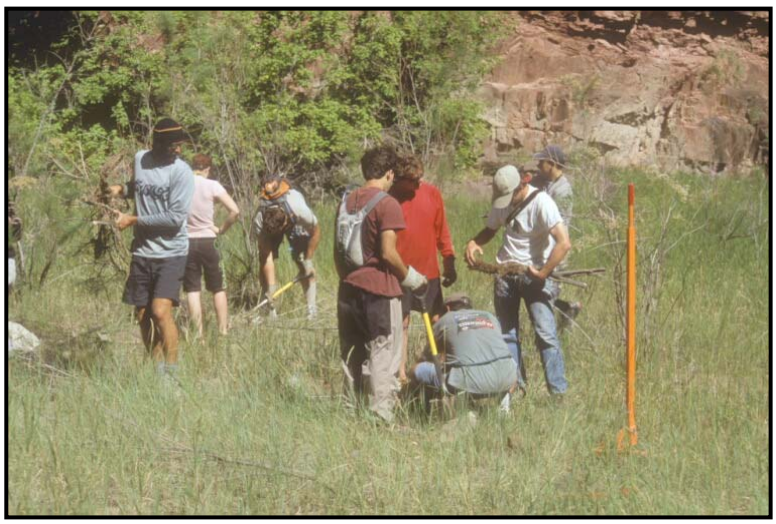


Figure 52. NOLS volunteer group removing *Tamarix ramosissima* at the Kolb campsite along the Green River.

Crew



Figure 53. Steve Dewey pulling *Tamarix ramosissima* seedlings from the Green River near the Kolb river campsite.



Figure 54. NOLS group digging up the roots of a *Tamarix ramosissima* sapling at the Kolb river campsite on the Green River.



Figure 55. NOLS group using a weed wrench to pull out a *Tamarix ramosissima* root at the Kolb river campsite on the Green River.



Figure 56. NOLS group holding a *Tamarix ramosissima* pulled at the Kolb river campsite on the Green River.

Crew

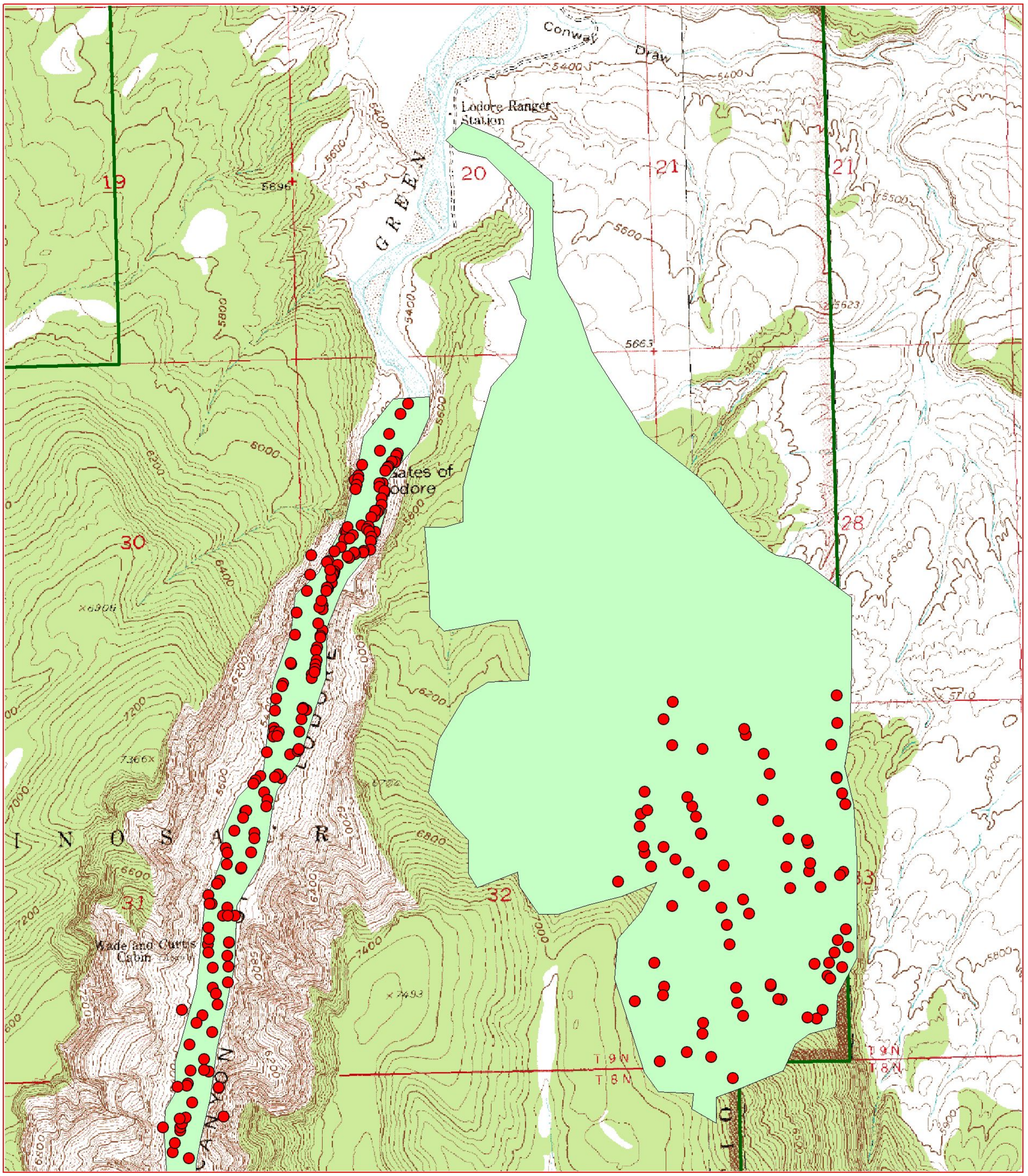


Figure 57. NOLS group removing *Tamarix ramosissima* from the Kolb river campsite on the Green River.

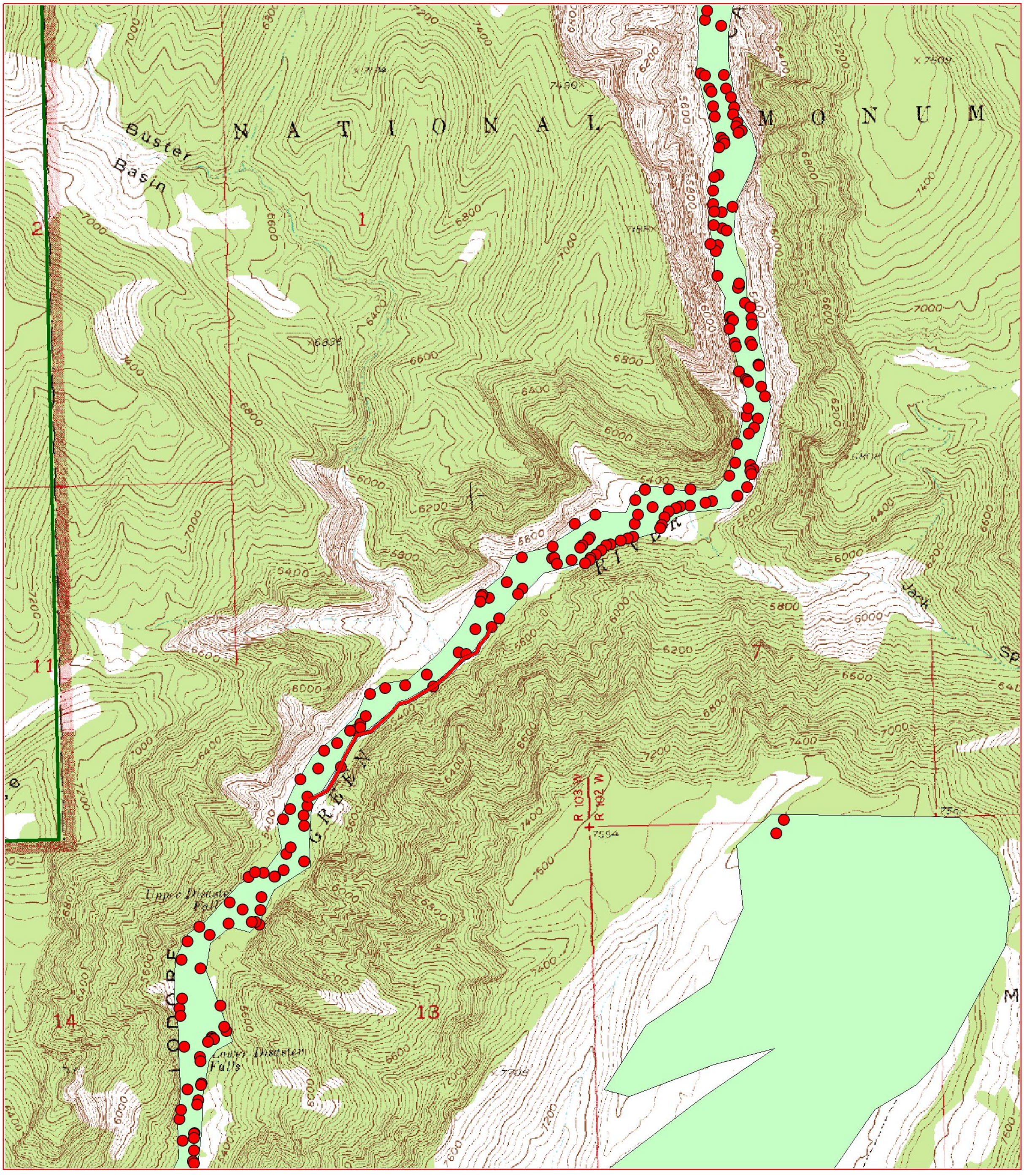


Figure 58. NPS weed warriors and NOLS group at the Kolb river campsite for a *Tamarix ramosissima* removal project on the Green River.

Appendix C. Overall Weed Distribution in Inventoried Areas - Gates of Lodore (Inset A)



Appendix C. Overall Weed Distribution in Inventoried Areas - Lower Disaster Falls (Inset B)



Weed Points

Line Weeds

Areas Inventoried

Park boundary

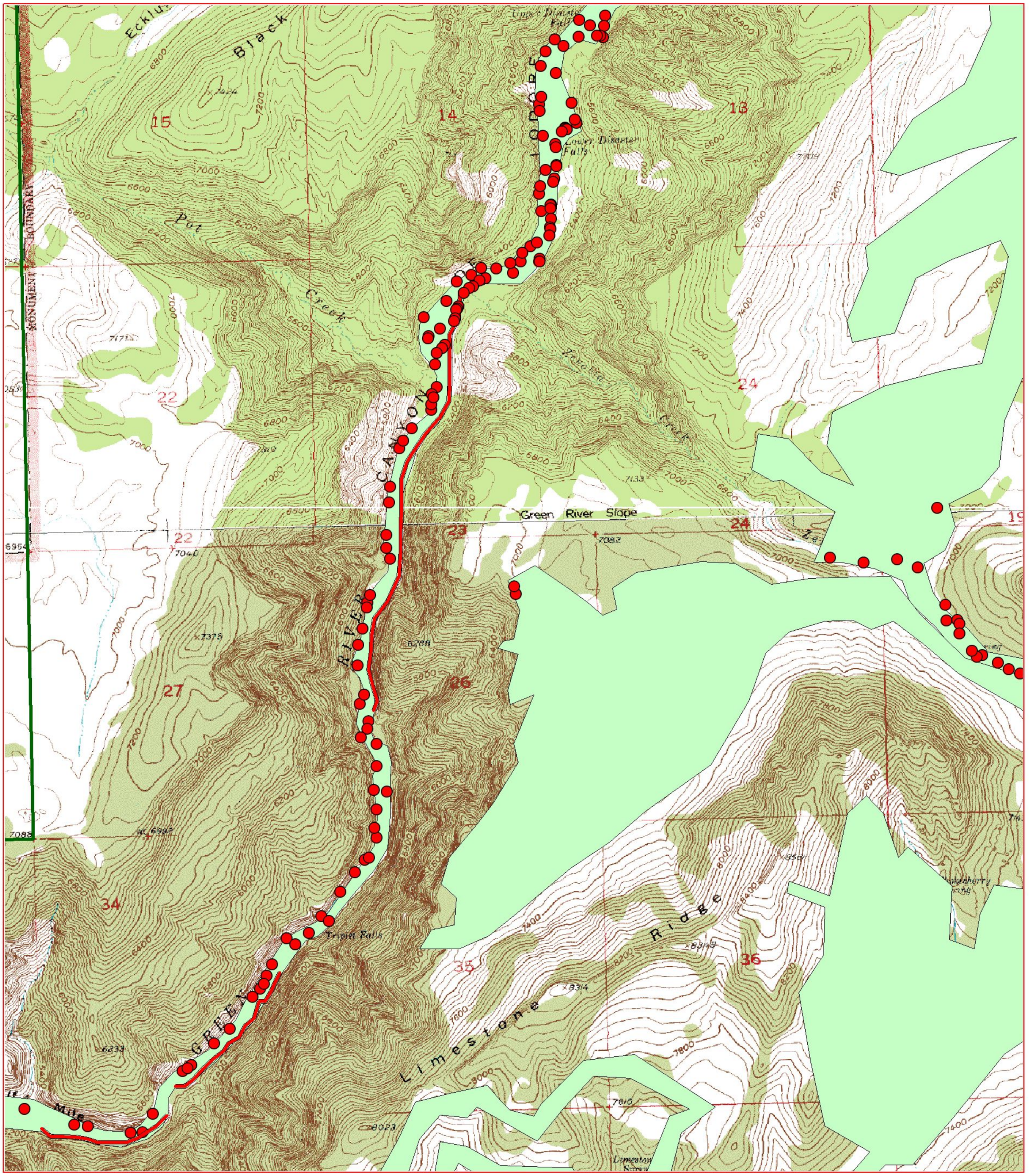
0 2000 4000 Feet

1:24,000 Scale

N

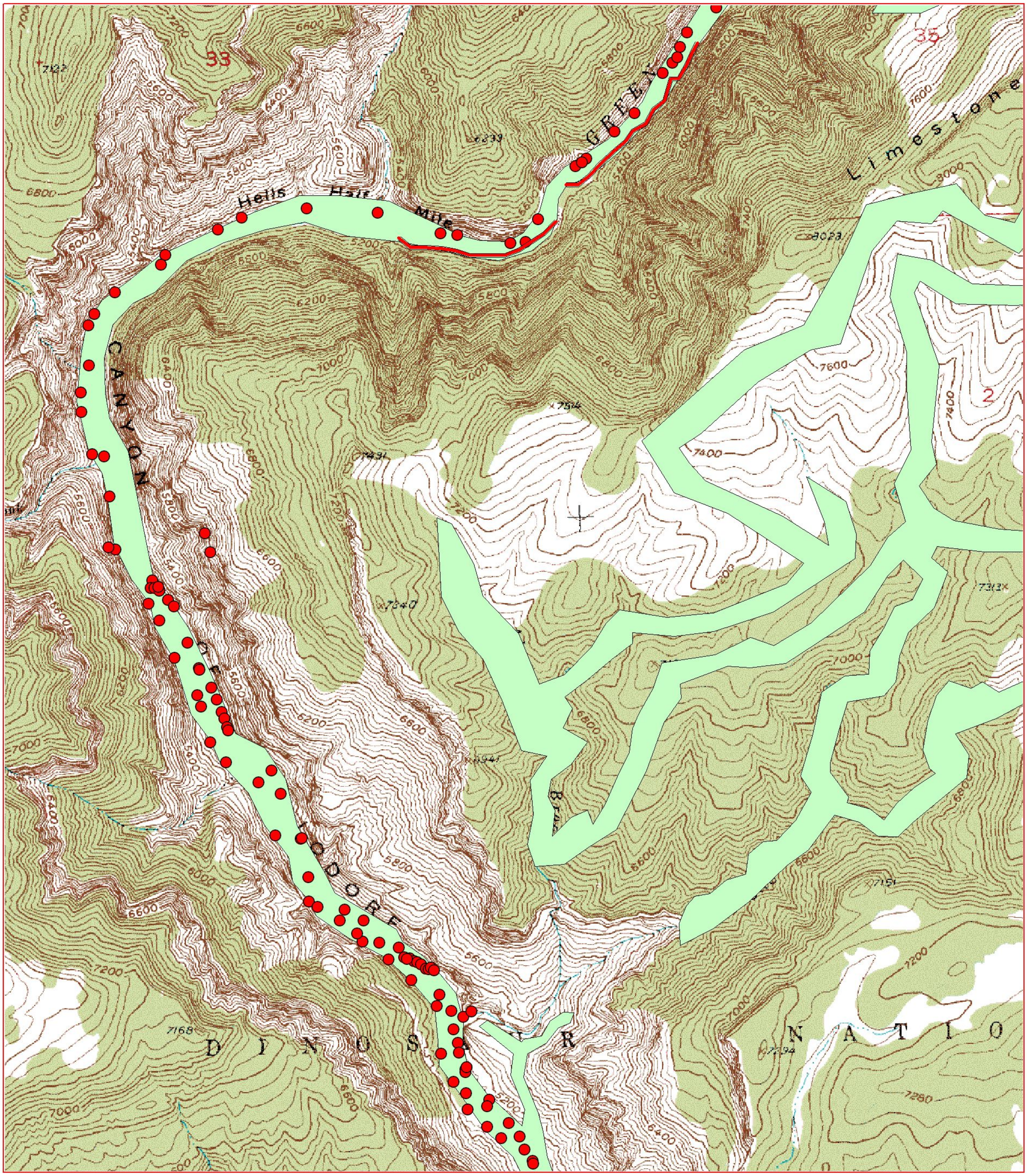
Inset B
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Green River Slope (Inset C)



Inset C
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Hell's Half Mile (Inset D)



0 2000 4000 Feet

1:24,000 Scale

N

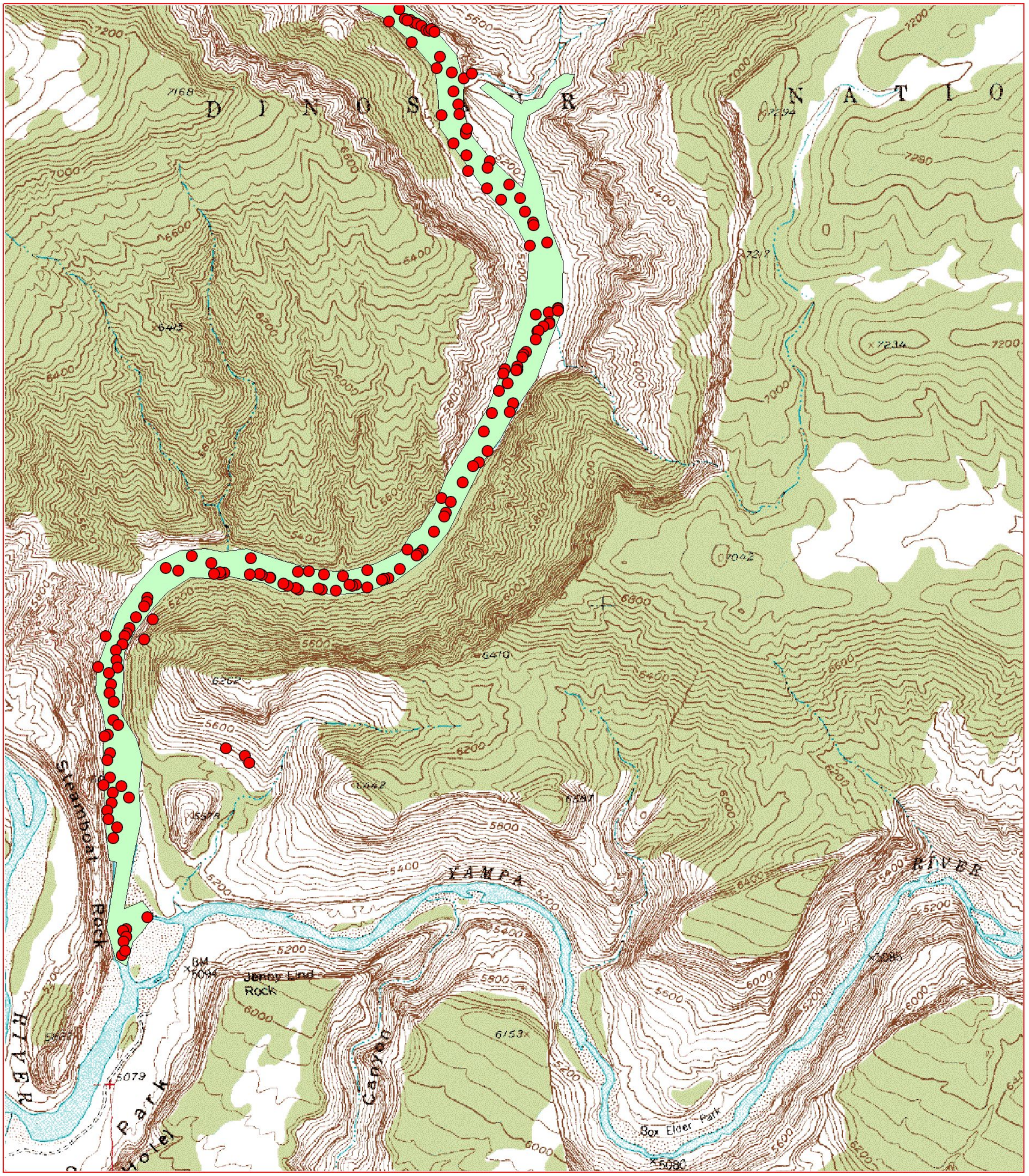
Weed Points

Line Weeds

Areas Inventoried

Inset D
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Steamboat Rock (Inset E)



Weed Points

Areas Inventoried

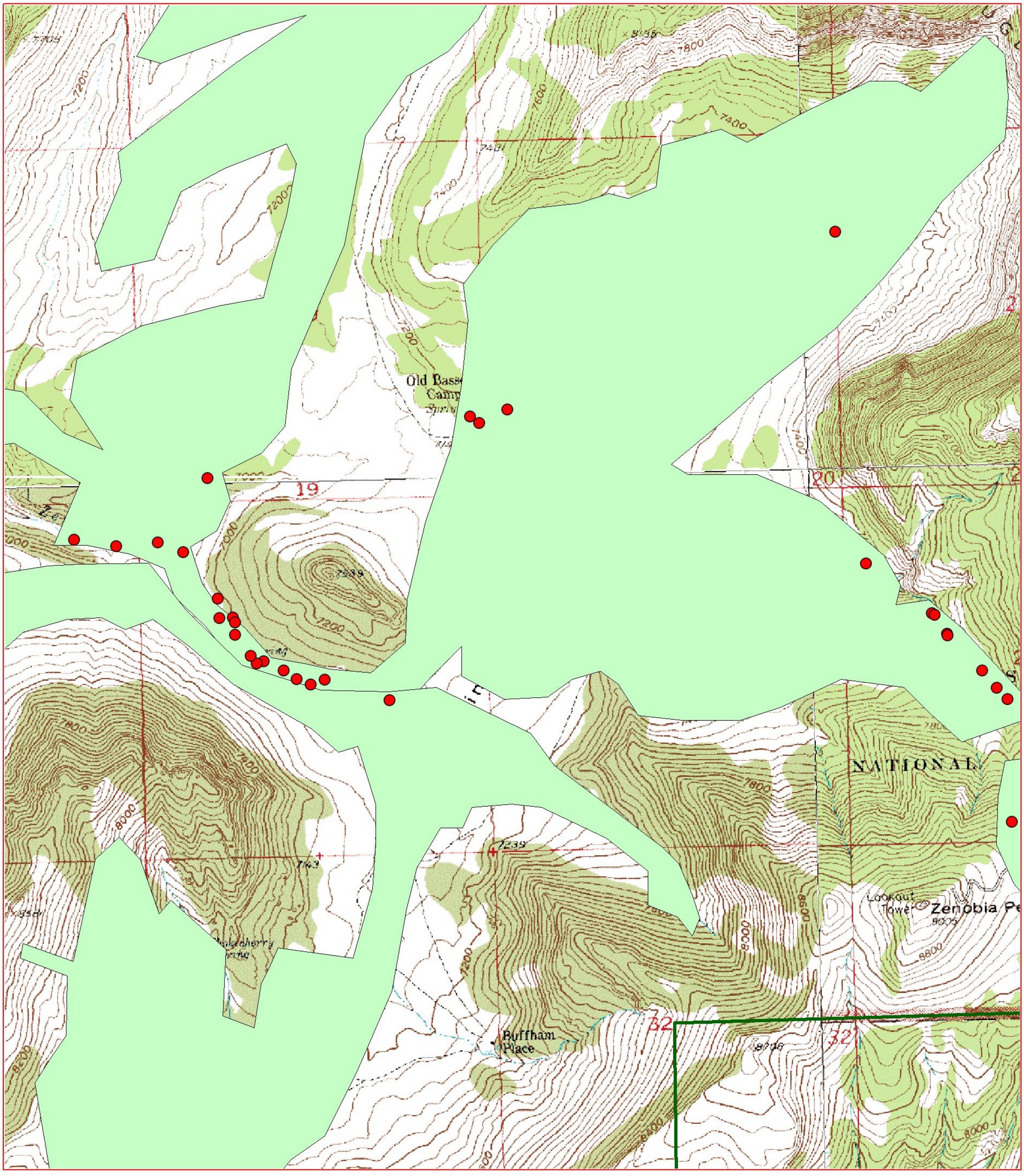
0 2000 4000 Feet

N

1:24,000 Scale

Inset E
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Zenobia Basin (Inset F)



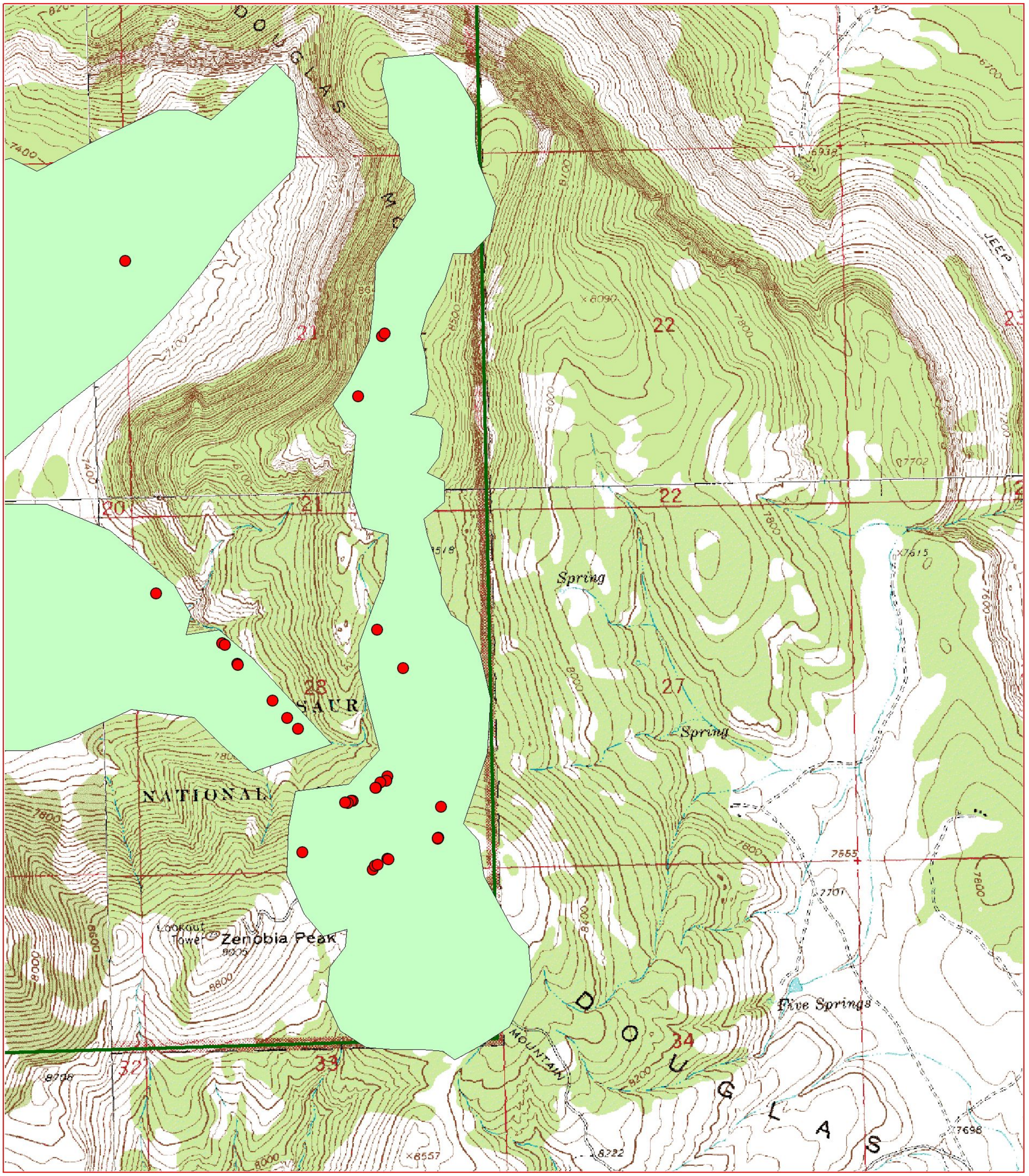
Weed Points

Areas Inventoried

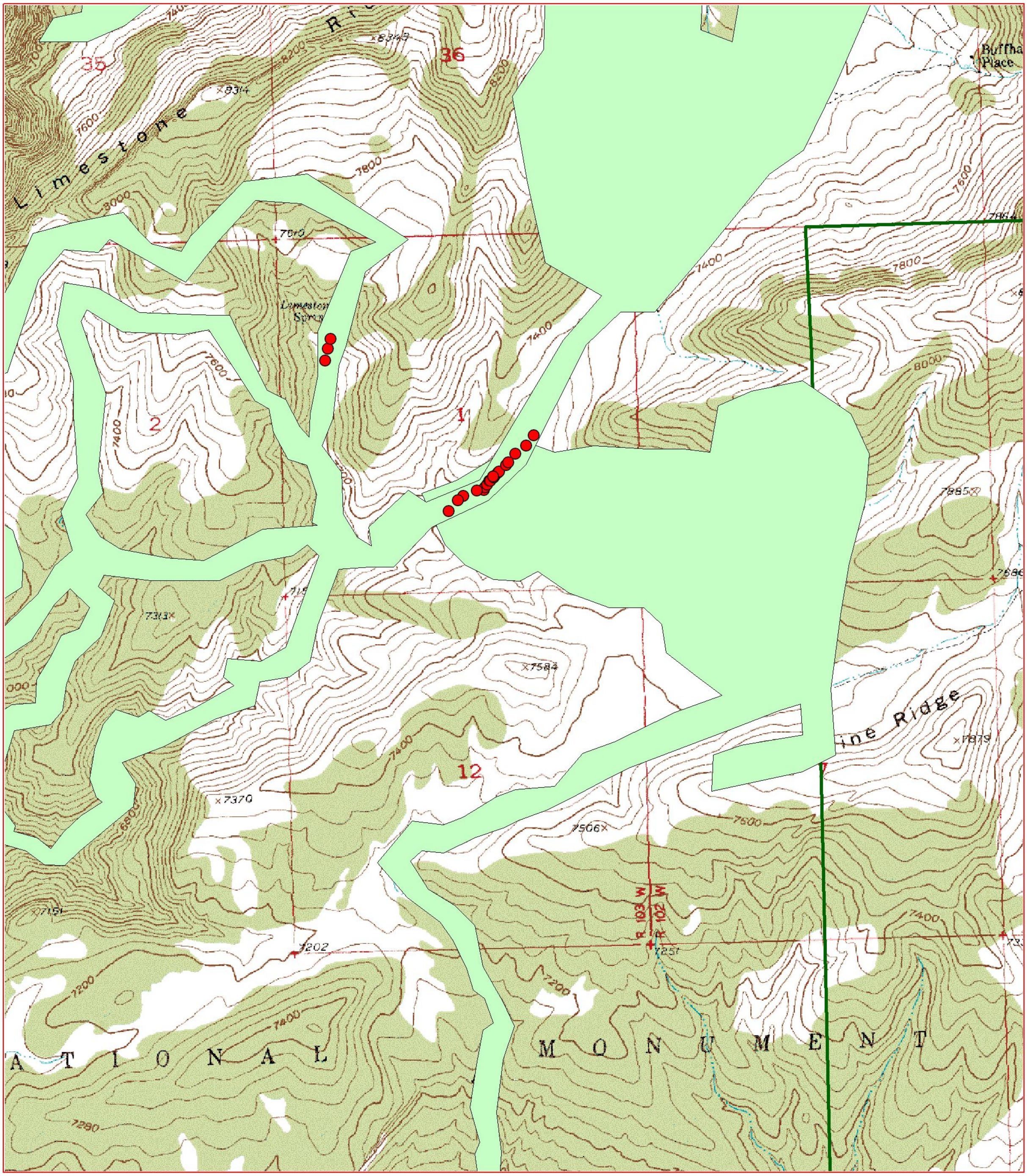
Park boundary

Inset F
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Zenobia Peak (Inset G)



Appendix C. Overall Weed Distribution in Inventoried Areas - Iron Mine Ridge (Inset H)



Weed Points

Areas Inventoried

Park boundary

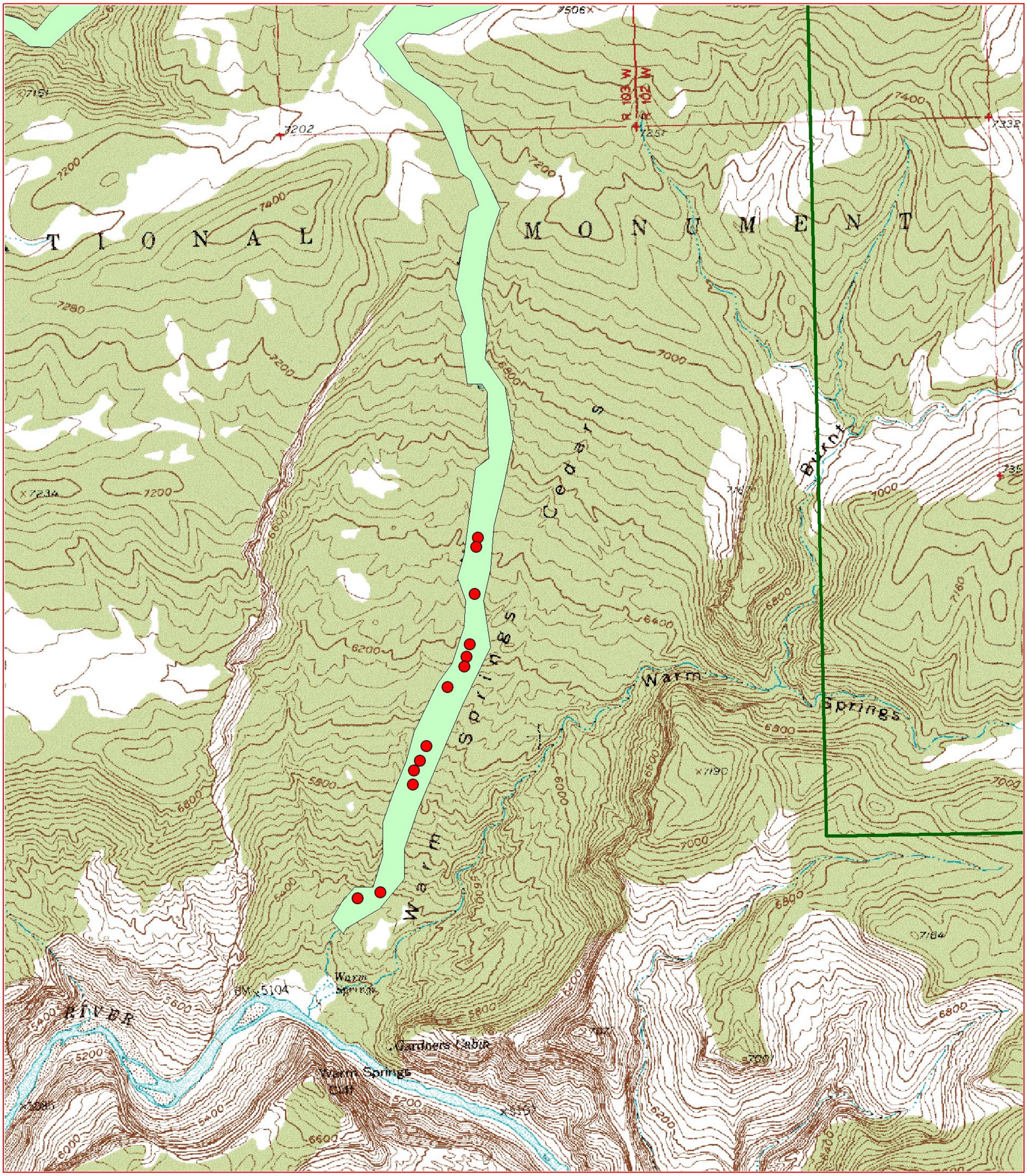
0 2000 4000 Feet

N

1:24,000 Scale

Inset H
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Iron Mine Draw (Inset I)



Weed Points

Areas Inventoried

Park boundary

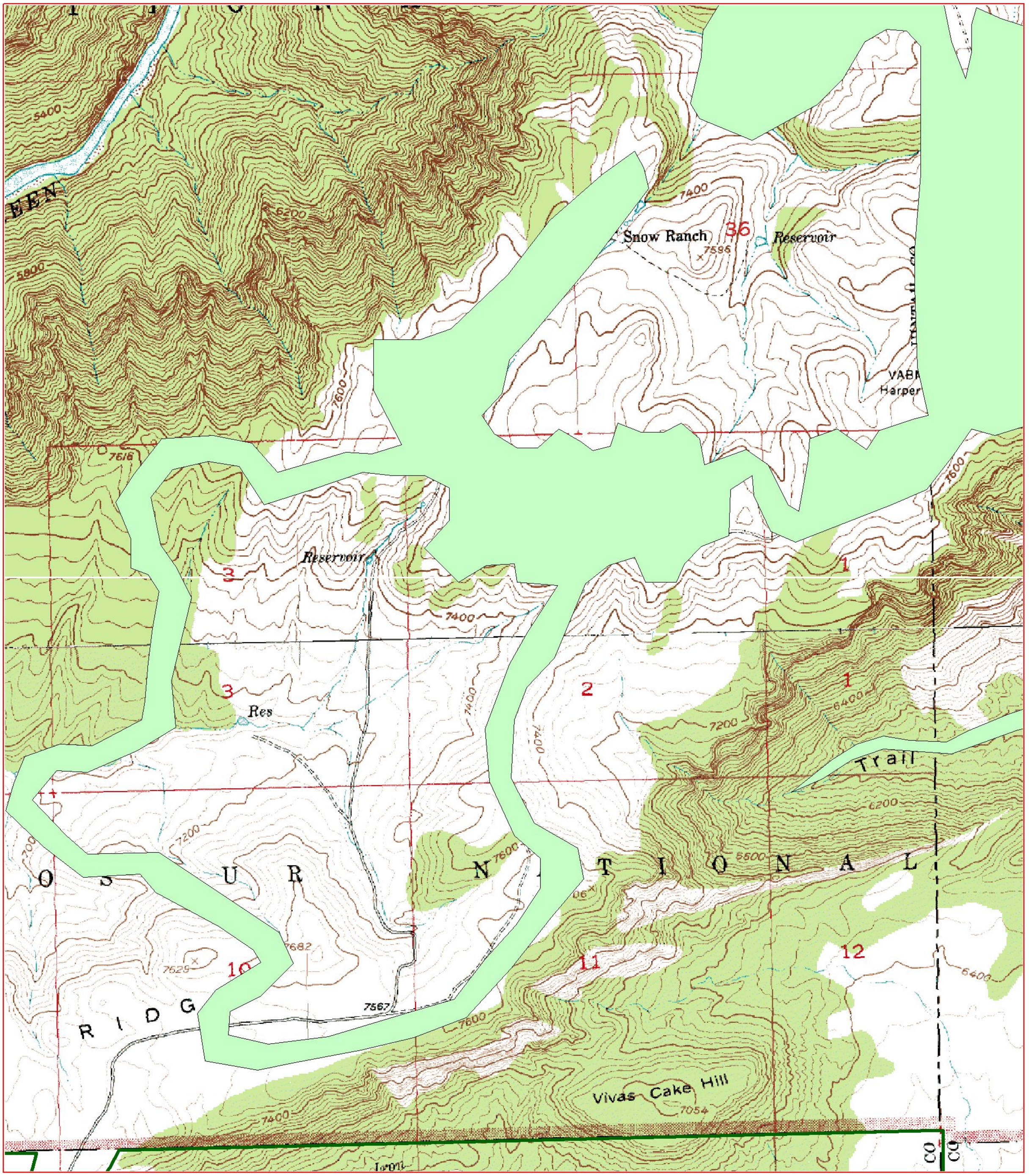
0 2000 4000 Feet

N

1:24,000 Scale

Inset I
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix C. Overall Weed Distribution in Inventoried Areas - Vivas Cake Hill (Inset J)



0 2000 4000 Feet

No Target Weed Species Detected

Areas Inventoried

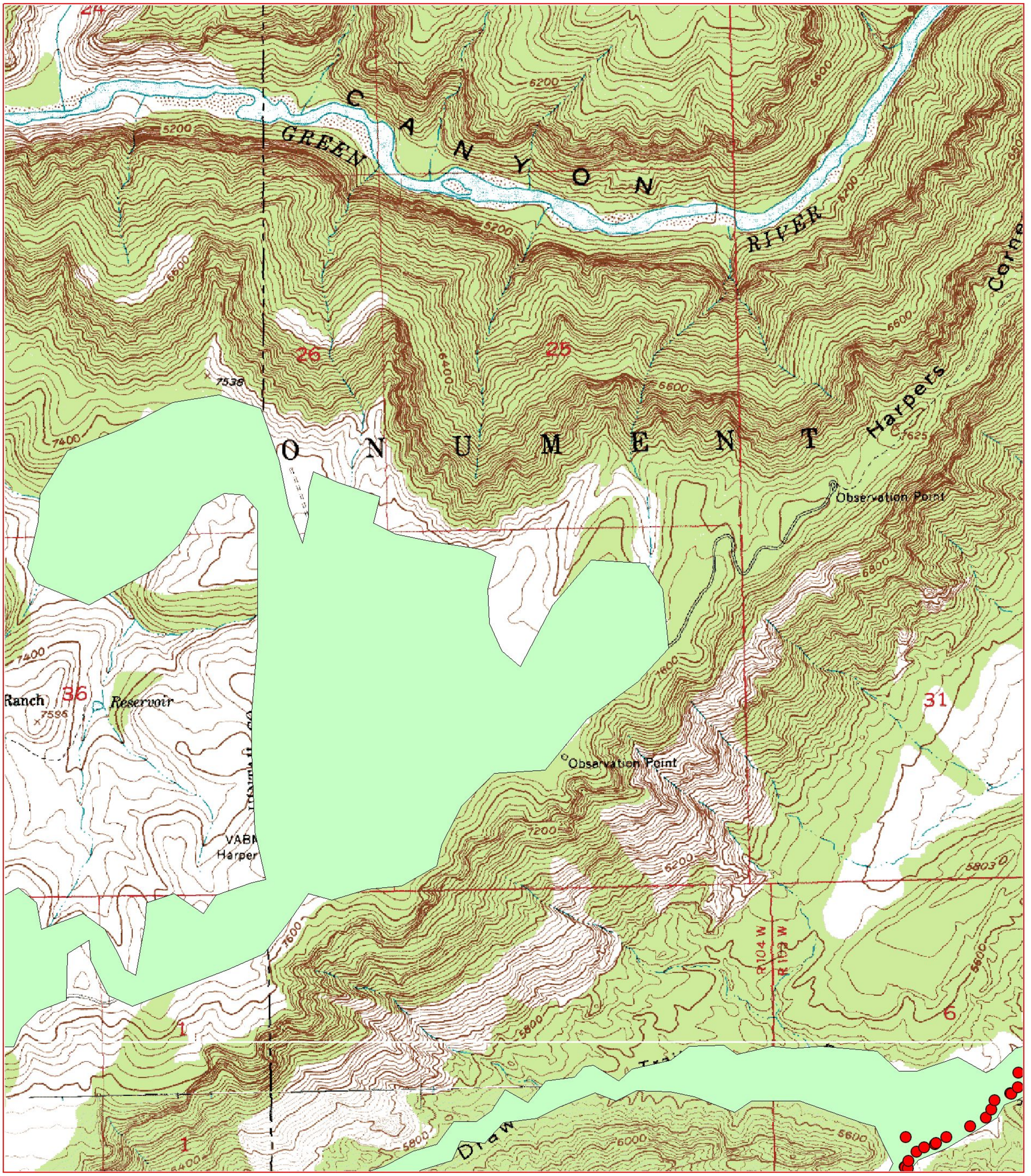
Park boundary

N

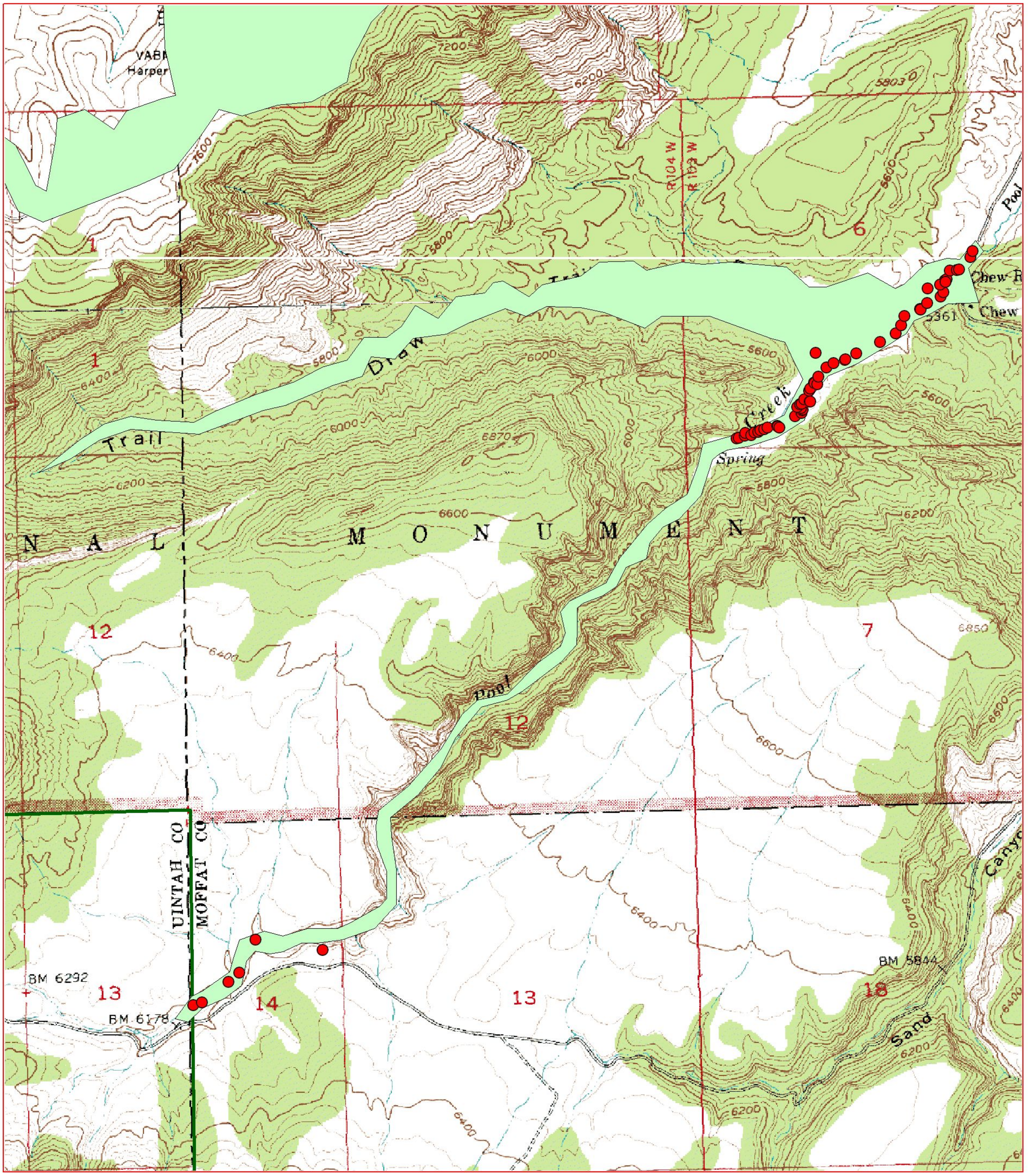
1:24,000 Scale

Inset J
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

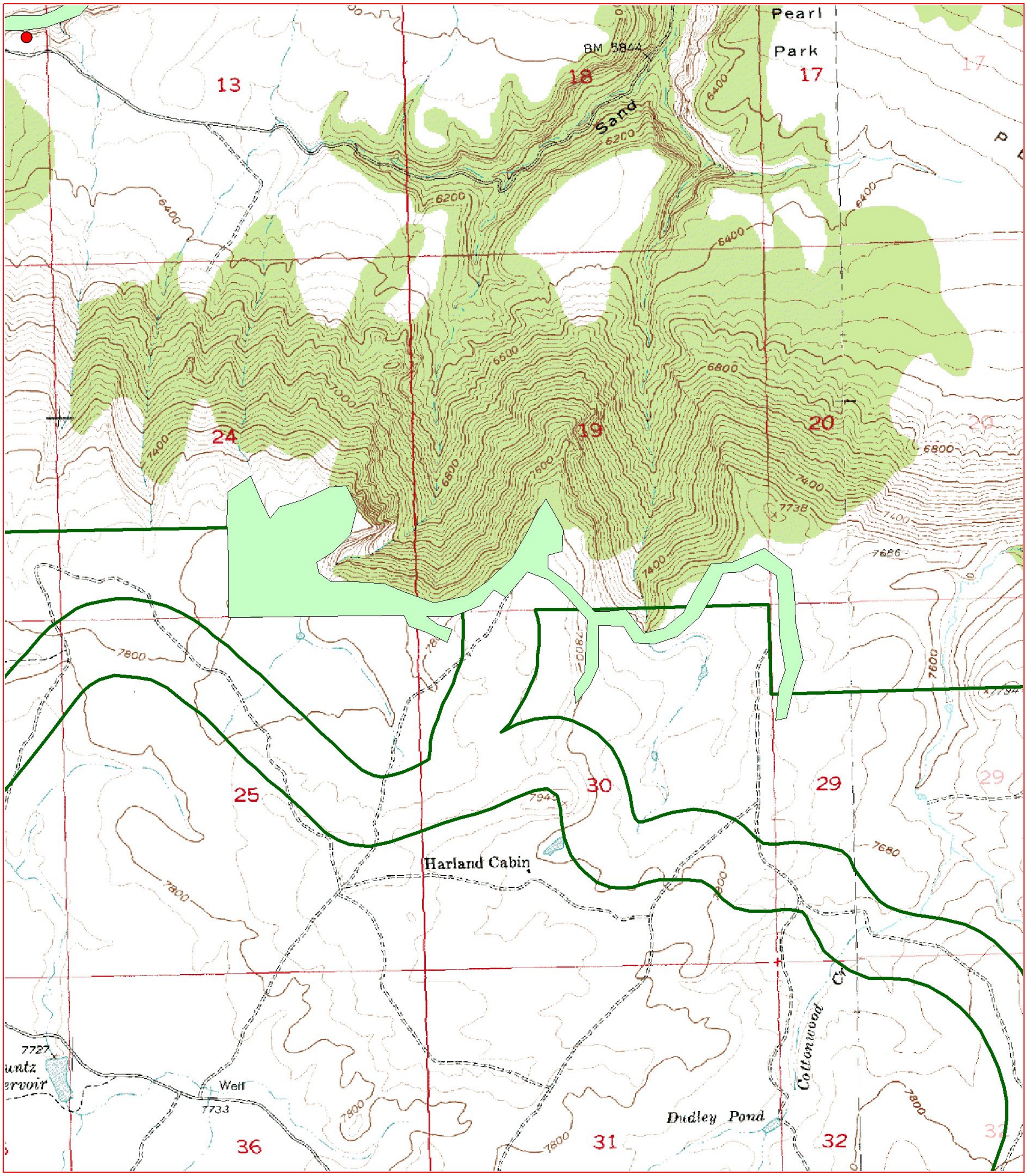
Appendix C. Overall Weed Distribution in Inventoried Areas - Harper's Corner (Inset K)



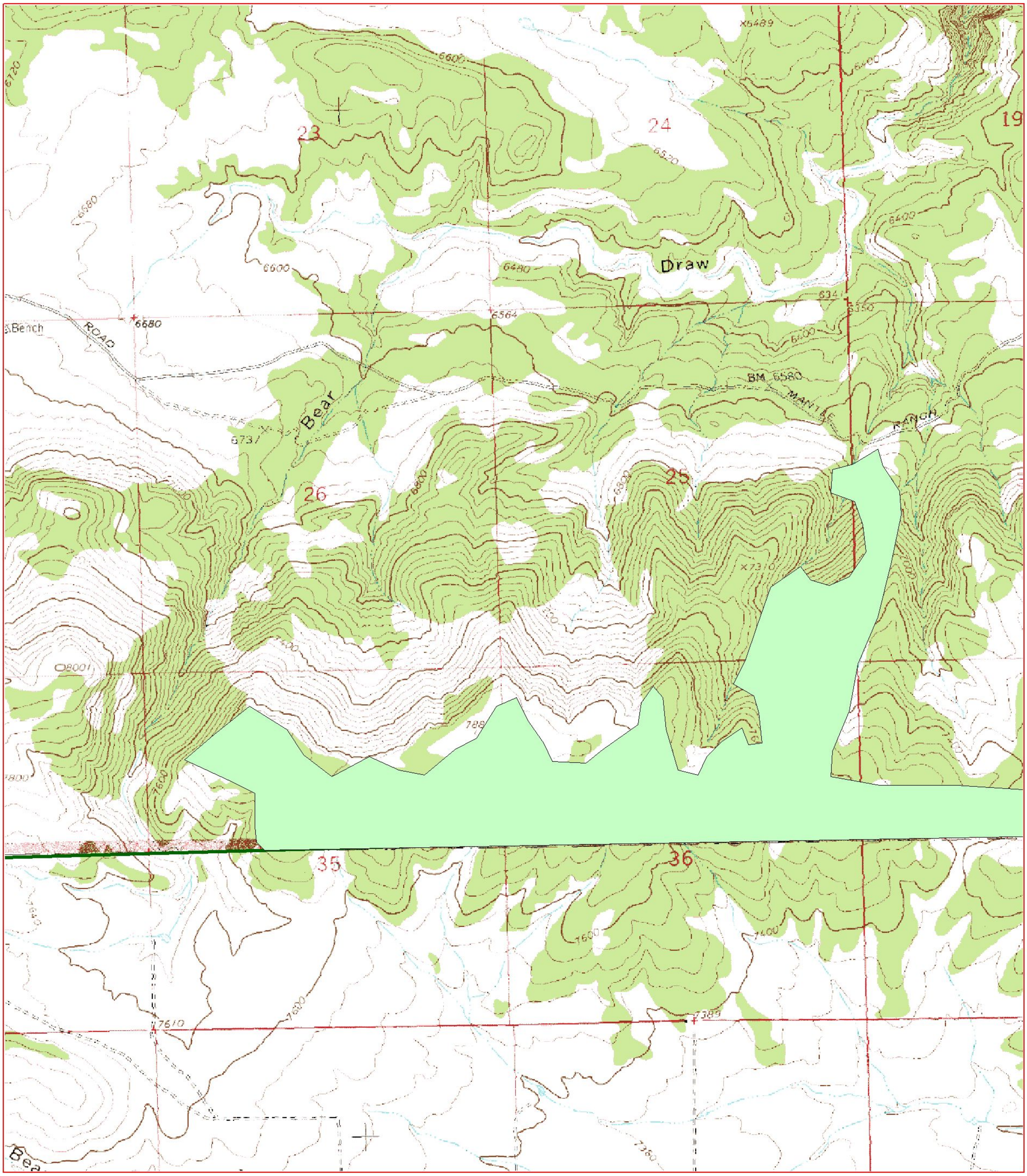
Appendix C. Overall Weed Distribution in Inventoried Areas - Pool Creek (Inset L)



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



Appendix C. Overall Weed Distribution in Inventoried Areas - Bear Draw (Inset N)



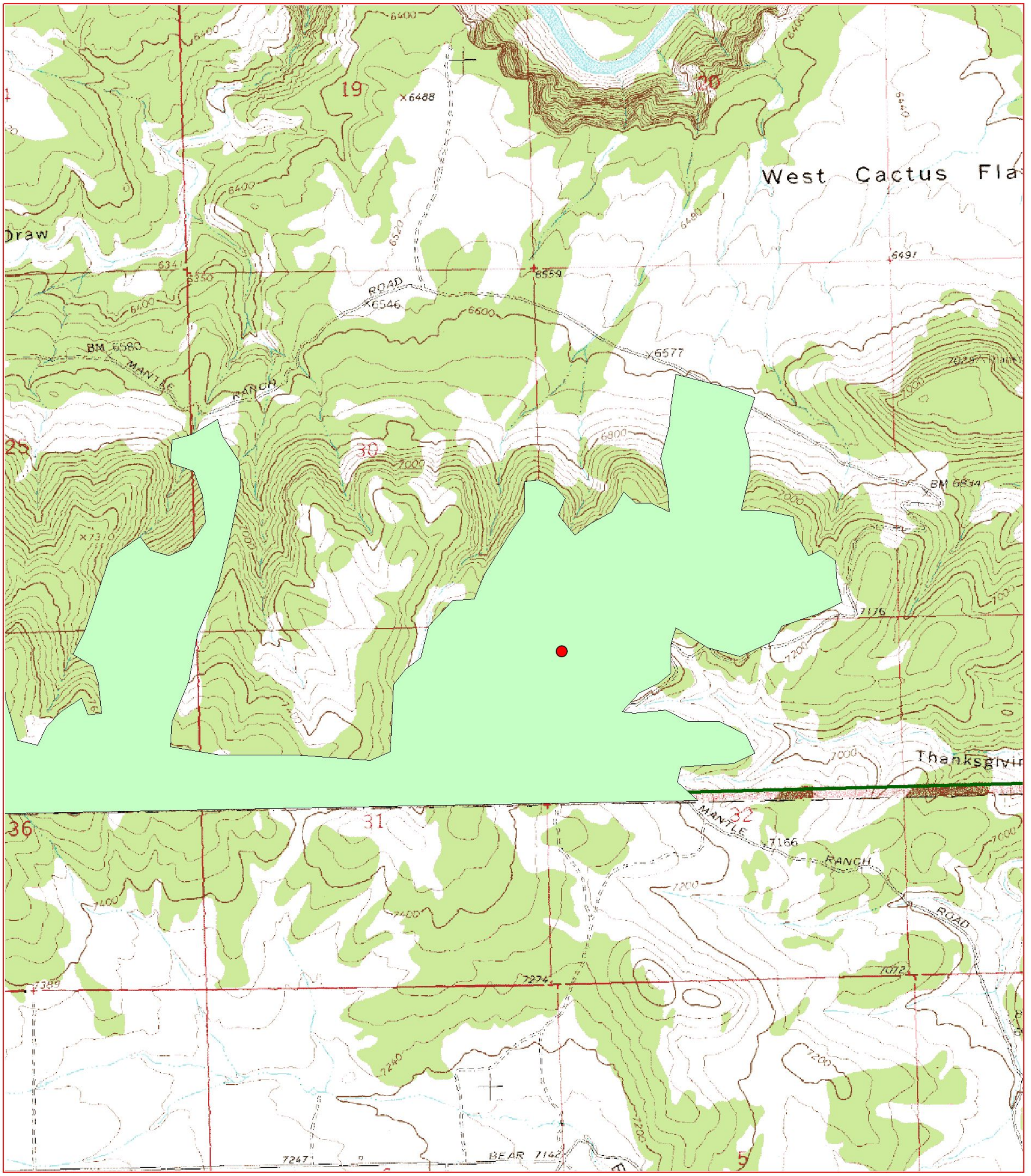
No Target Weed Species Detected

Areas Inventoried

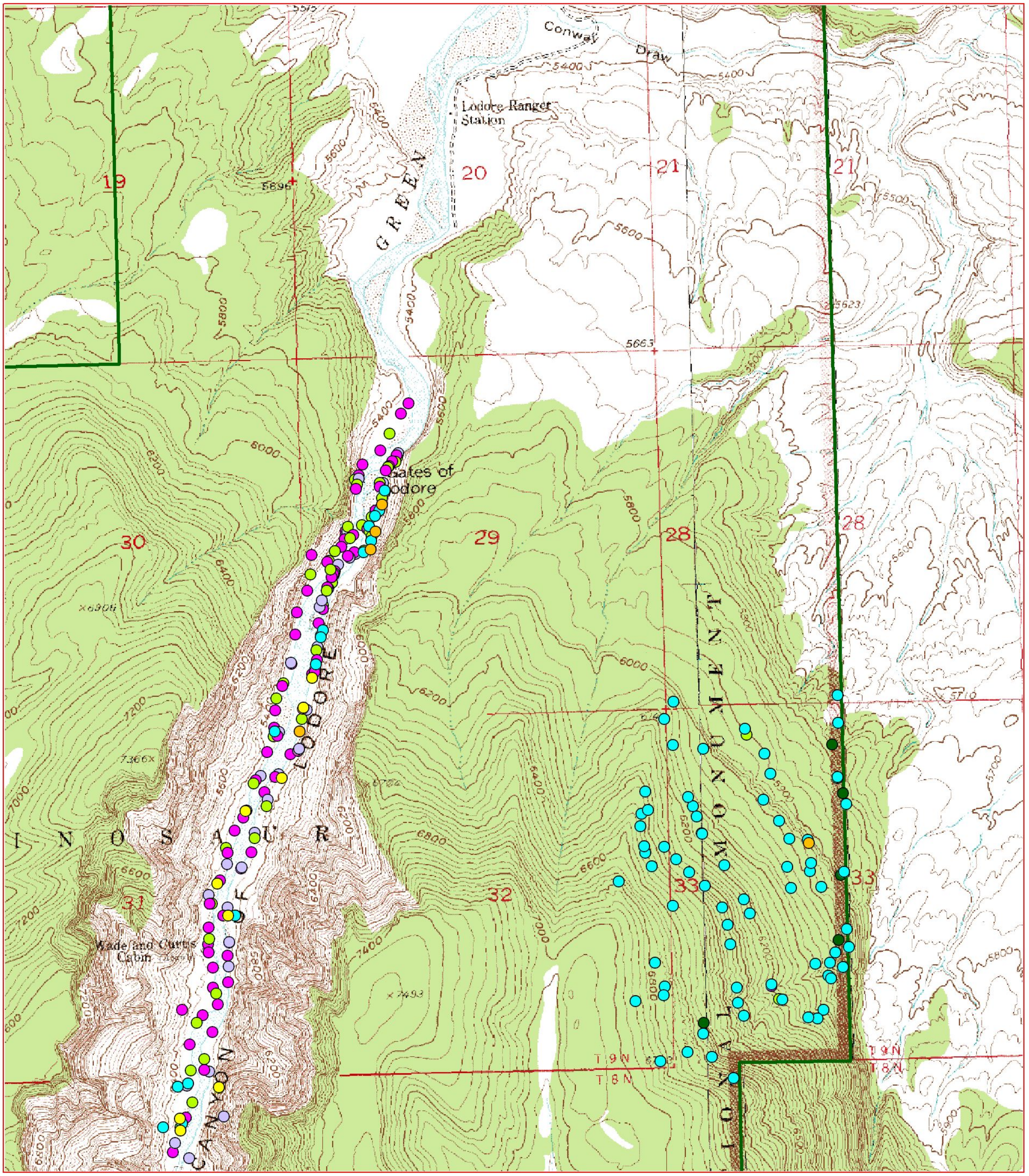
Park boundary

Inset N
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

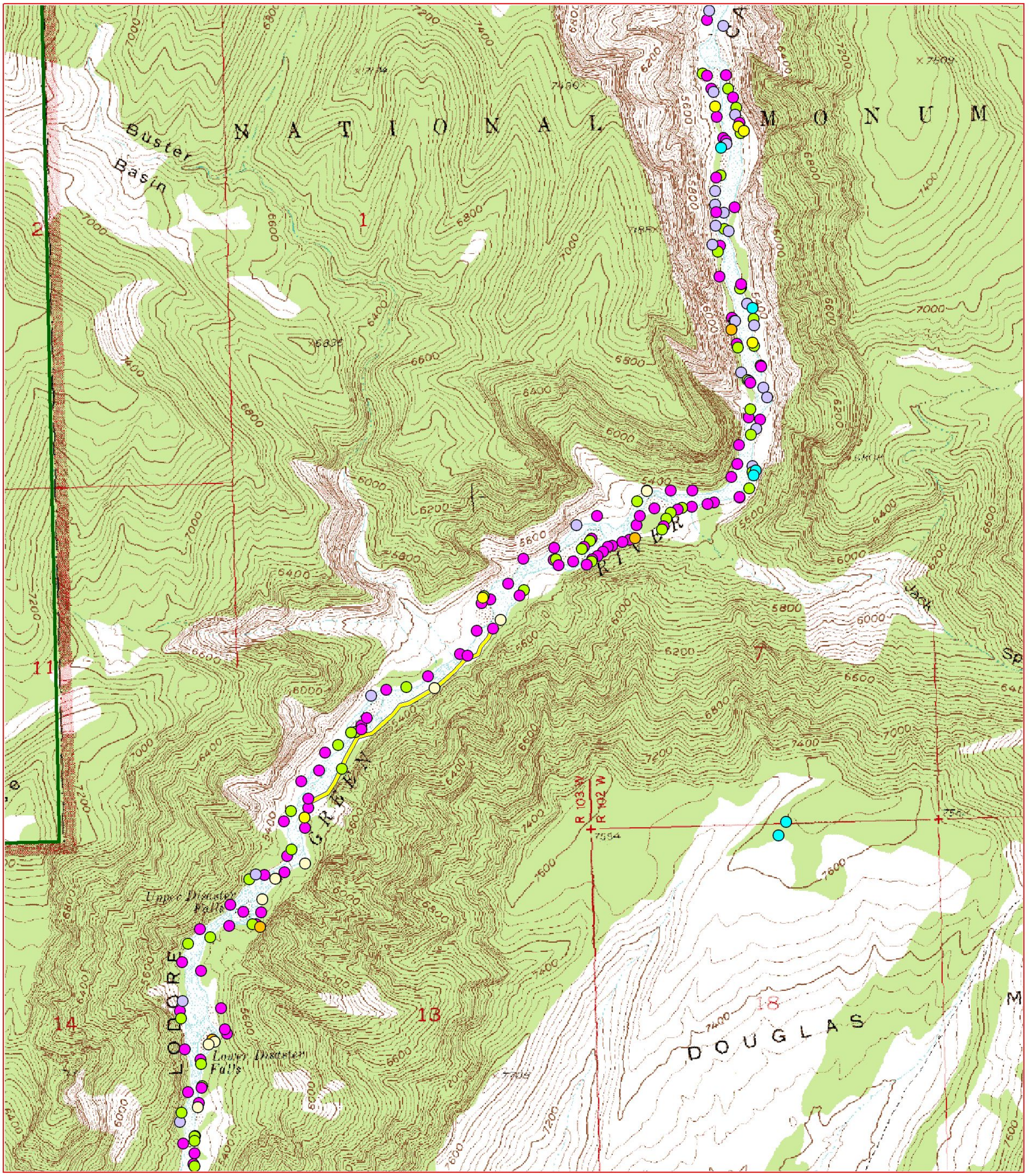
Appendix C. Overall Weed Distribution in Inventoried Areas - West Cactus Flat (Inset O)



Appendix D. Weed Species Detected in Inventoried Areas - Gates of Lodore (Inset A)



Appendix D. Weed Species Detected in Inventoried Areas - Lower Disaster Falls (Inset B)



Carduus nutans

Centaurea repens

Cirsium arvense

Cirsium vulgare

Lepidium latifolium

Melilotus officinalis

Tamarix ramosissima

Tamarix ramosissima

Park boundary

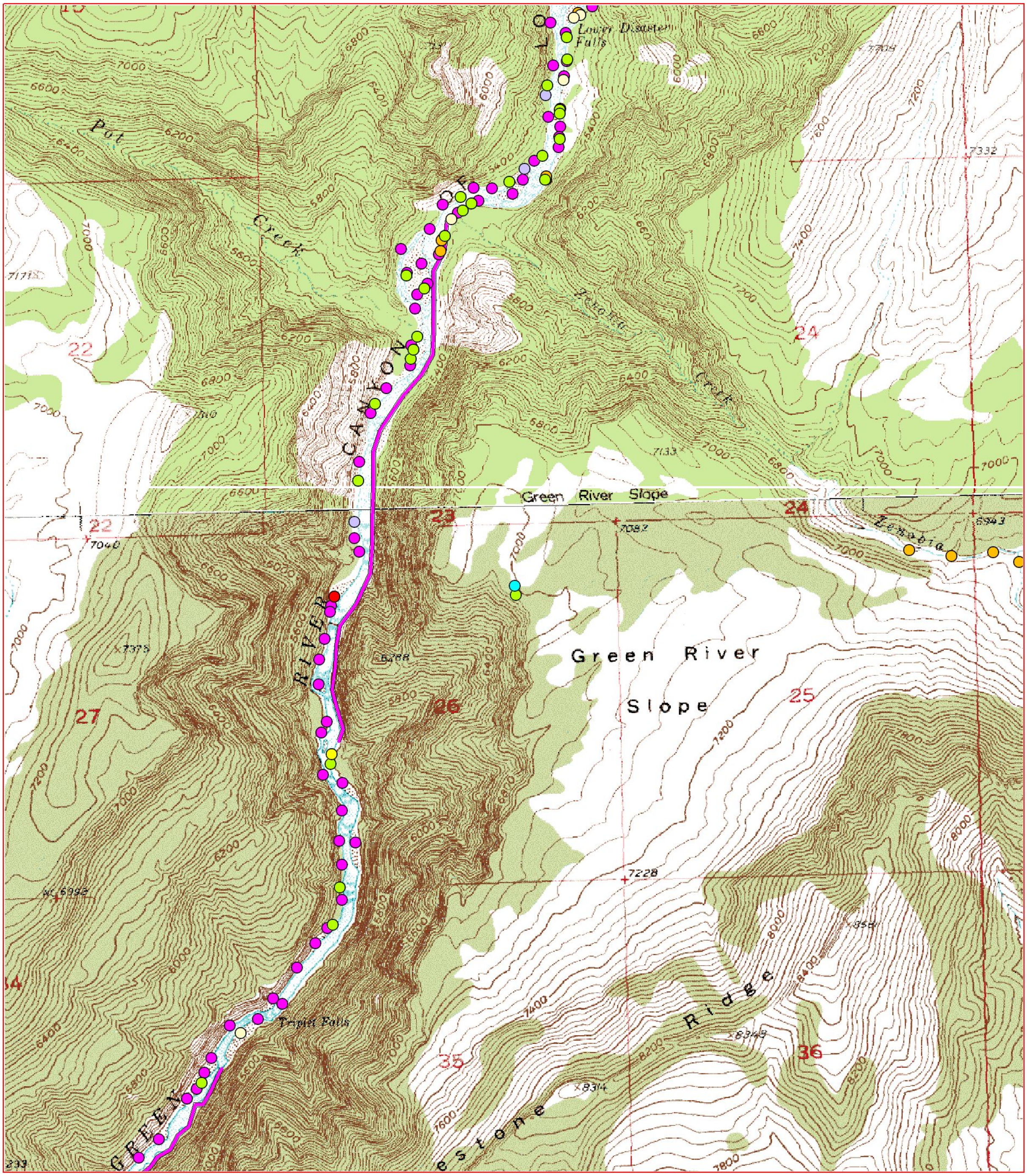
0 2000 4000 Feet

N

1:24,000 Scale

Inset B
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Green River Slope (Inset C)



- *Carduus nutans*
- *Centaurea repens*
- *Cirsium arvense*
- *Cirsium vulgare*
- *Dipsacus fullonum*
- *Lepidium latifolium*
- *Melilotus officinalis*
- *Tamarix ramosissima*
- *Tamarix ramosissima*
- Park boundary

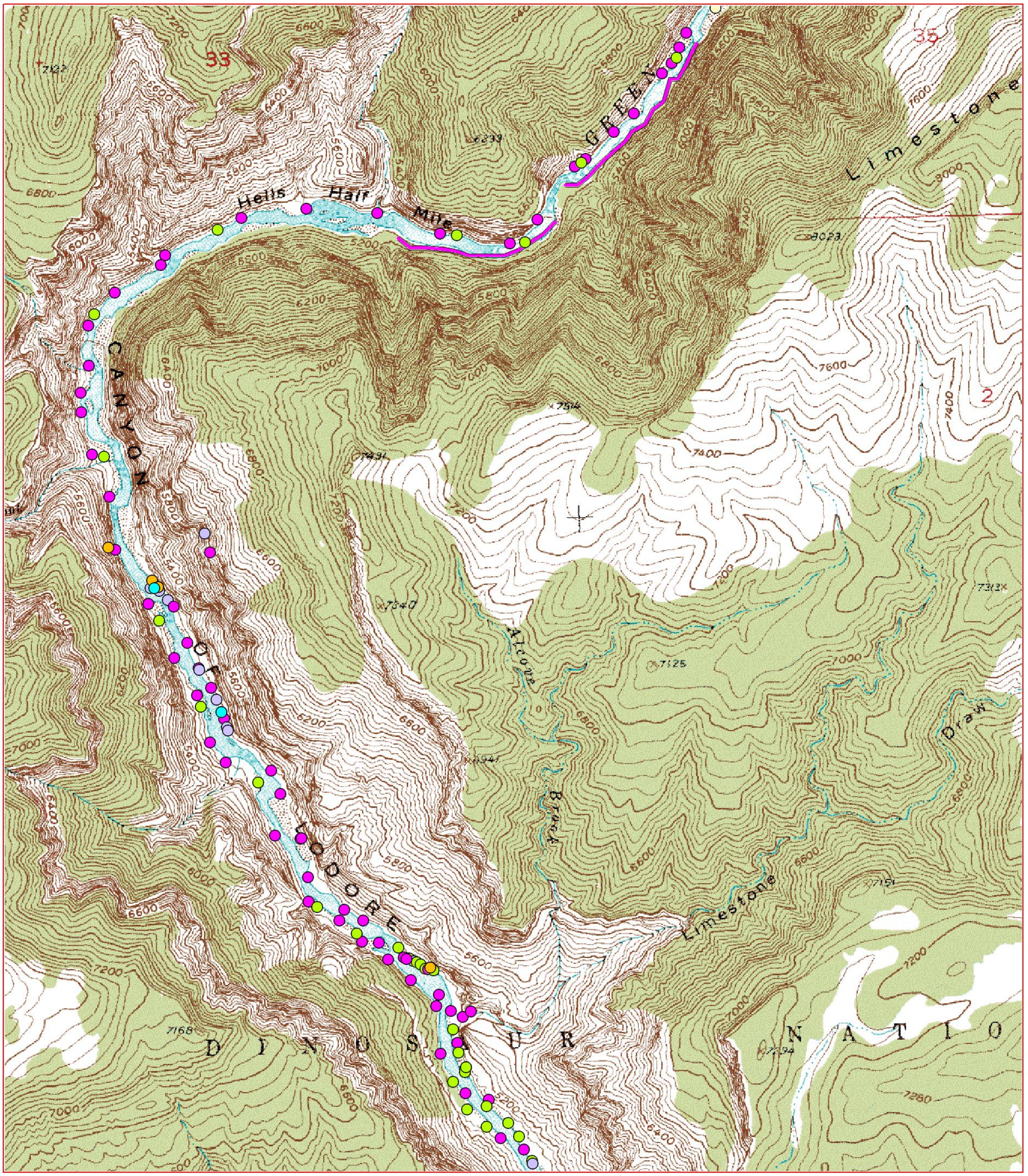
0 2000 4000 Feet

N

1:24,000 Scale

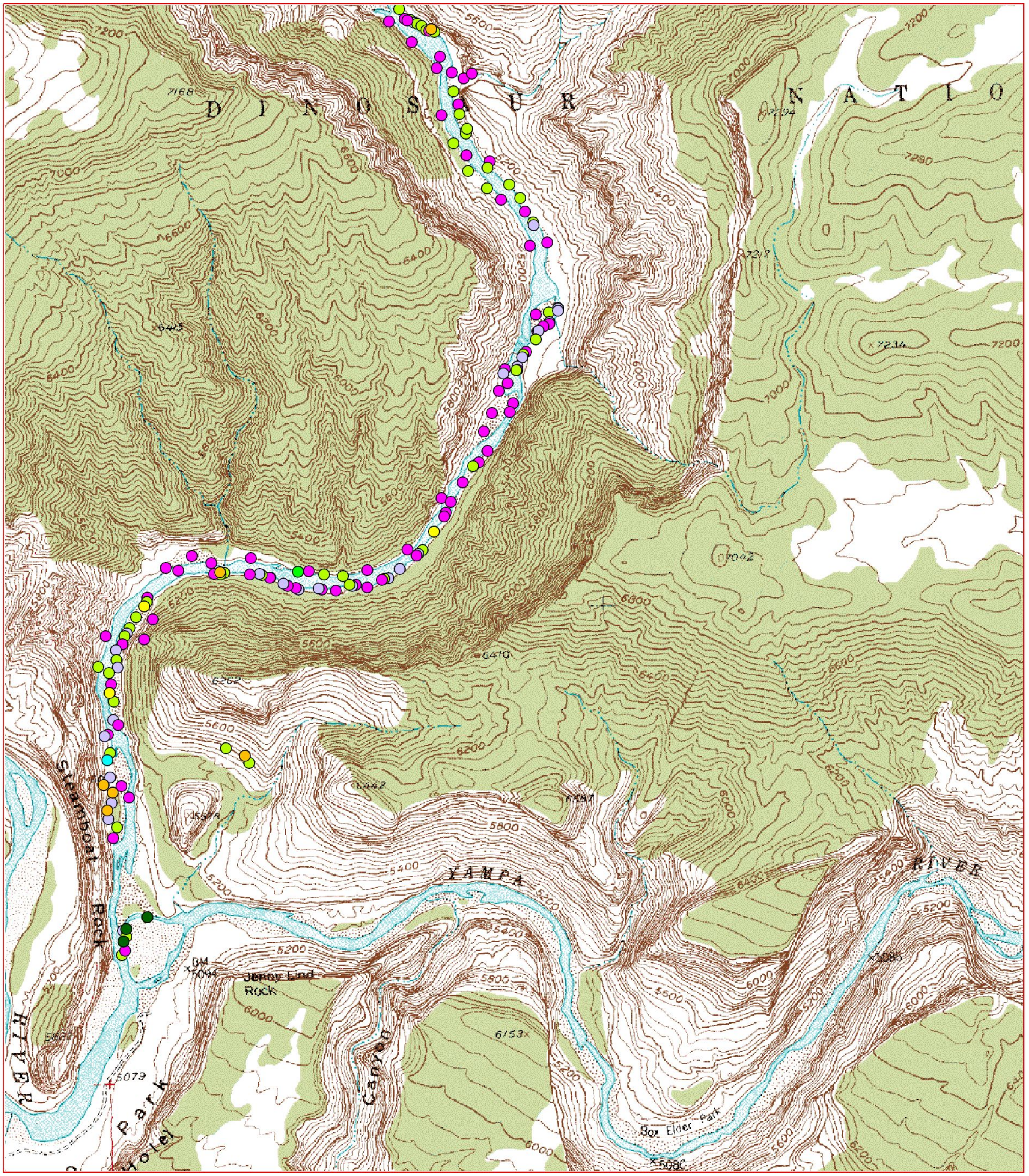
Inset C
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Hell's Half Mile (Inset D)



Inset D
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Steamboat Rock (Inset E)



- *Carduus nutans*
- *Centaurea repens*
- *Cirsium arvense*
- *Cirsium vulgare*
- *Lepidium latifolium*
- *Sonchus arvensis*
- *Tamarix ramosissima*
- *Verbascum thapsus*

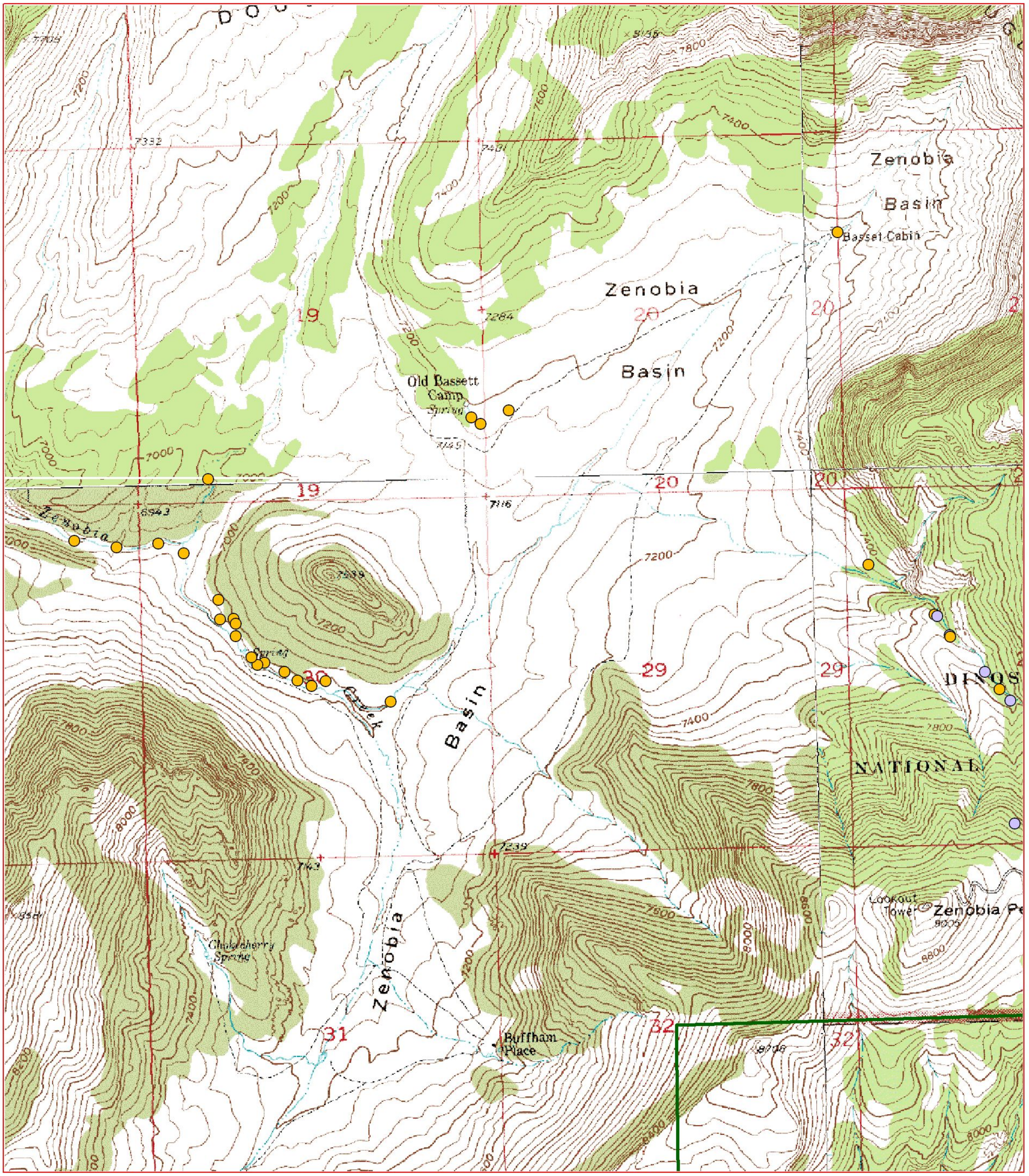
0 2000 4000 Feet

1:24,000 Scale

N

Inset E
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Zenobia Basin (Inset F)



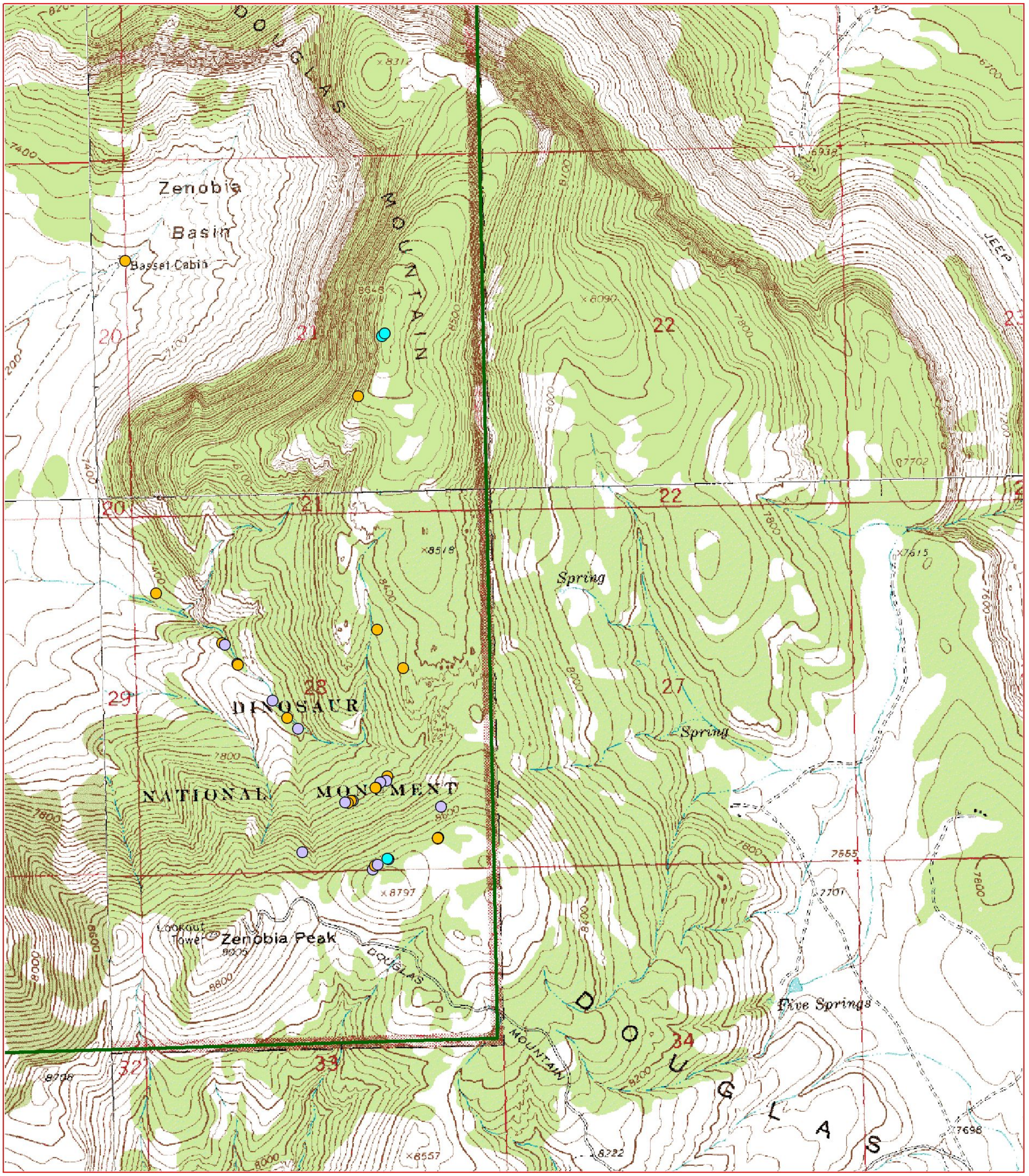
Cirsium arvense

Cirsium vulgare

Park boundary

Inset F
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Zenobia Peak (Inset G)



Carduus nutans

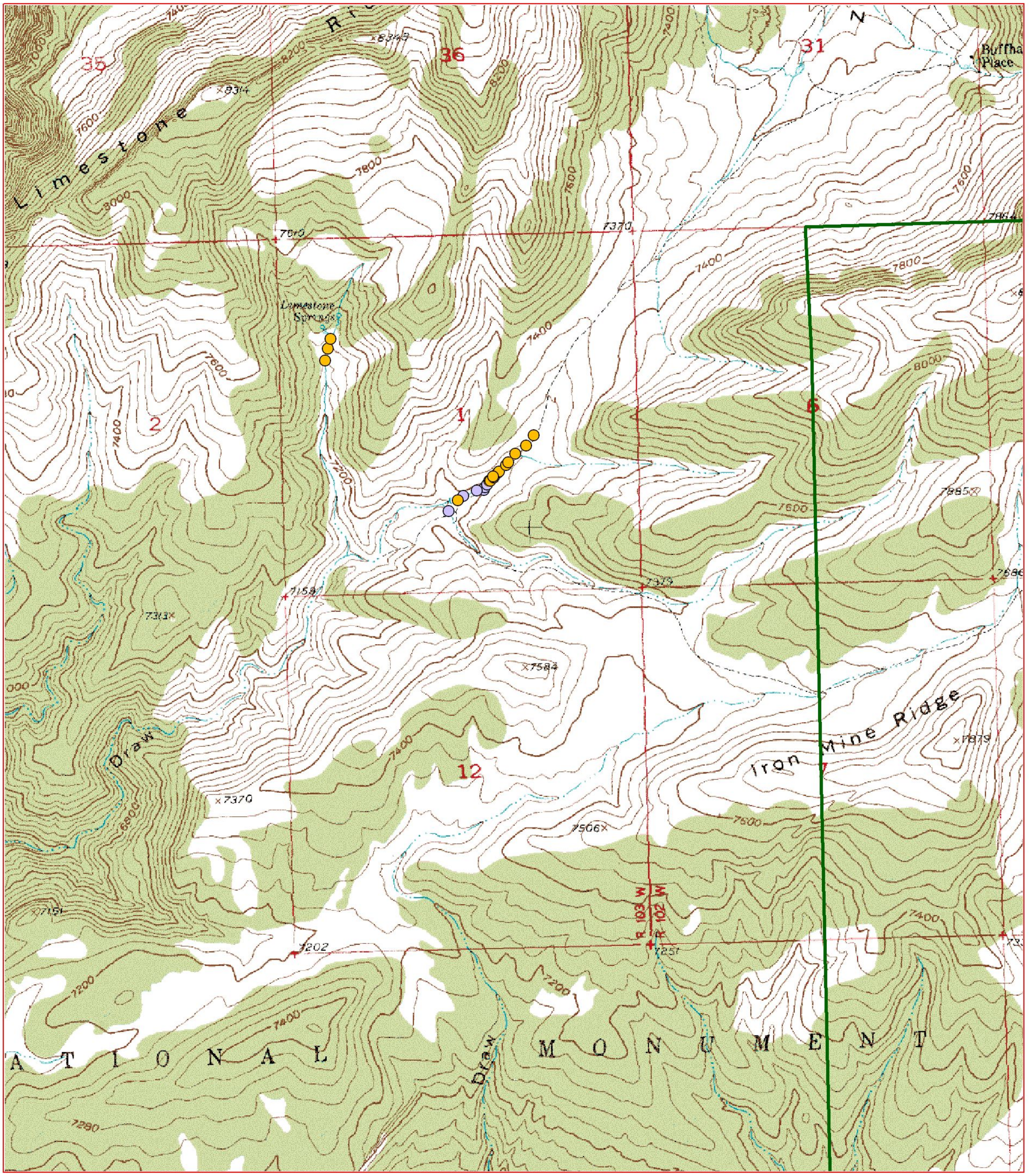
Cirsium arvense

Cirsium vulgare

Park boundary

Inset G
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Iron Mine Ridge (Inset H)



Cirsium arvense

Cirsium vulgare

Park boundary

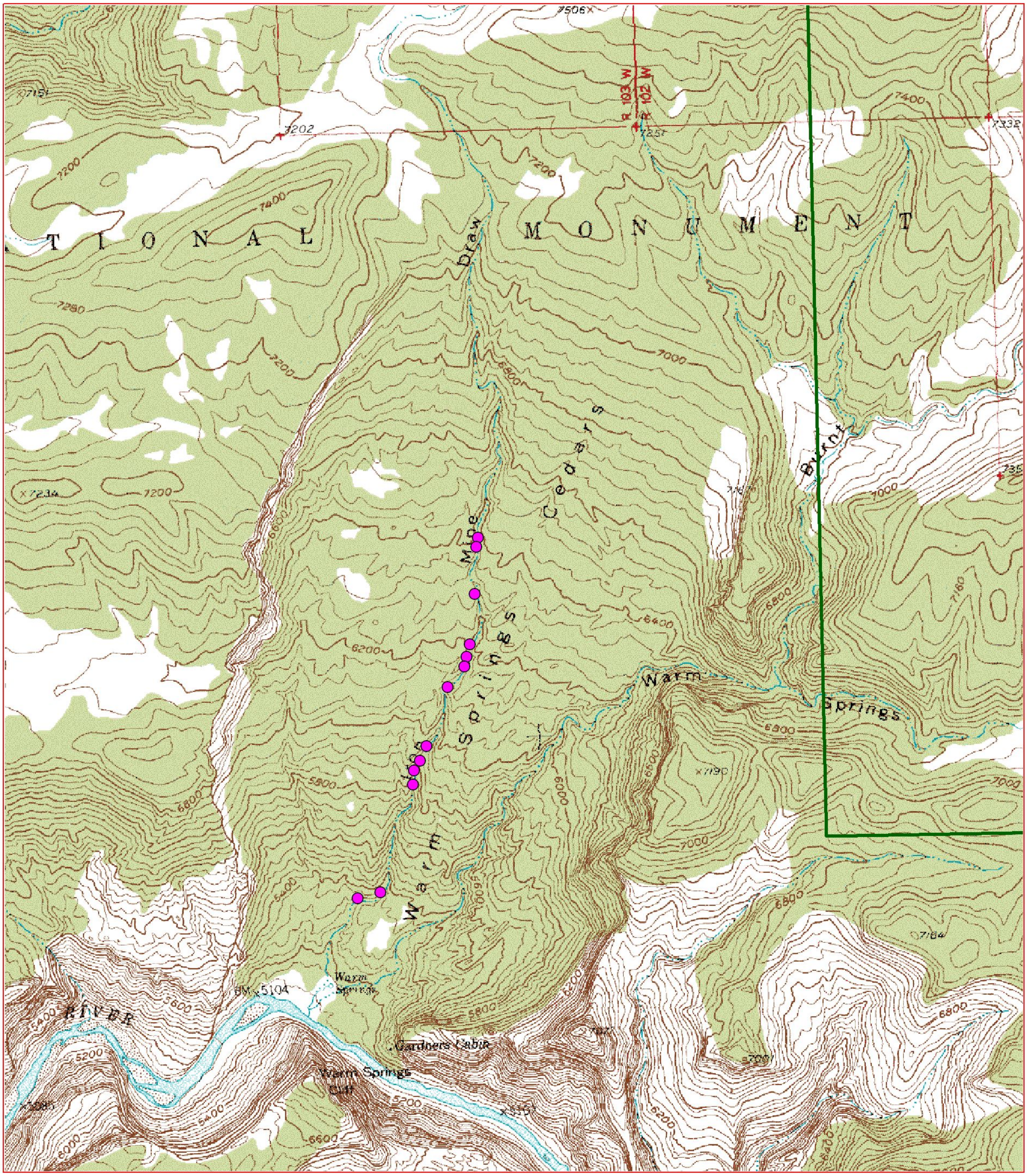
0 2000 4000 Feet

N

1:24,000 Scale

Inset H
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Iron Mine Draw (Inset I)



0 2000 4000 Feet

Tamarix ramosissima

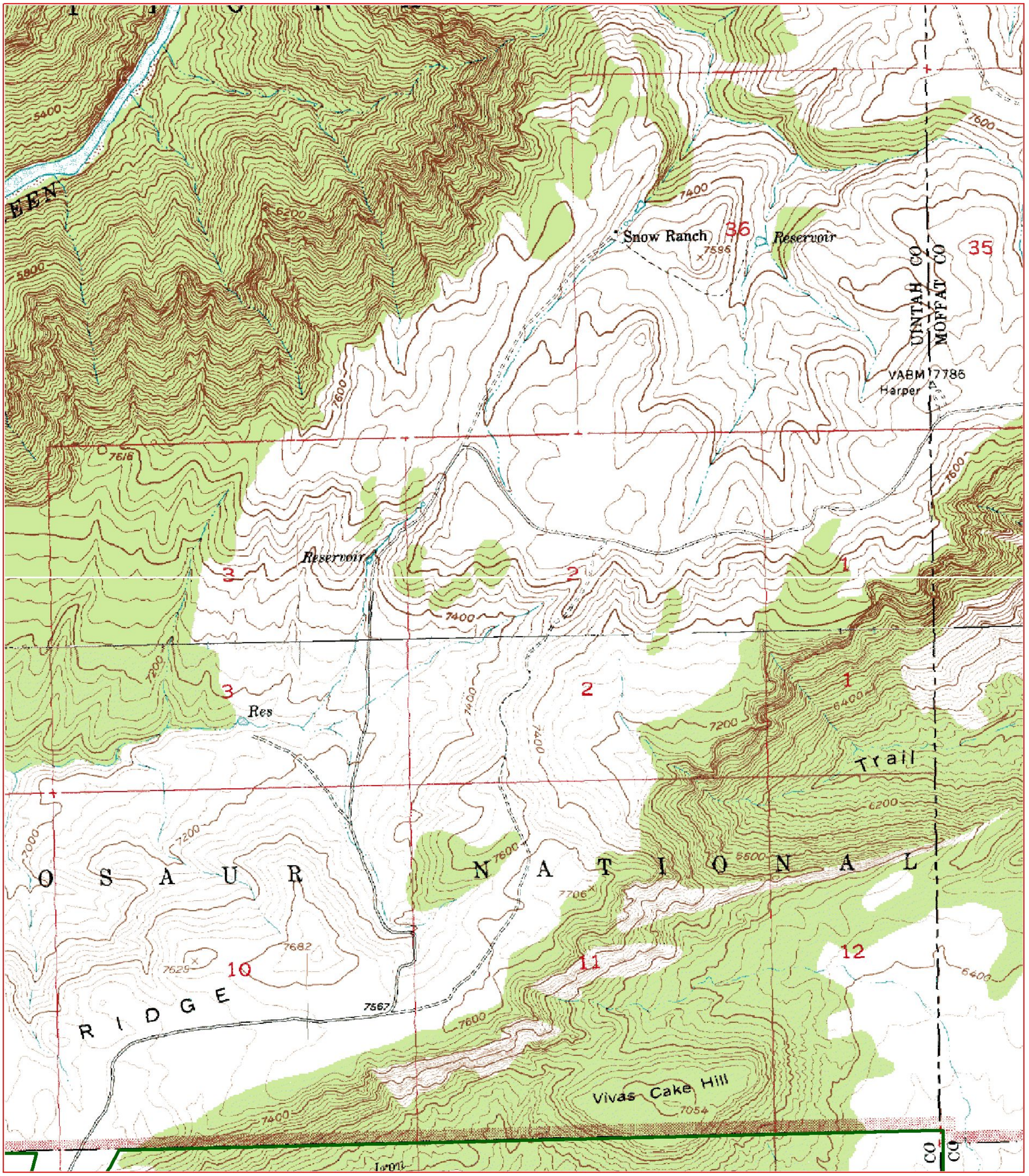
Park boundary

N

1:24,000 Scale

Inset I
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Vivas Cake Hill (Inset J)



0 2000 4000 Feet

* No Target Weed Species Detected

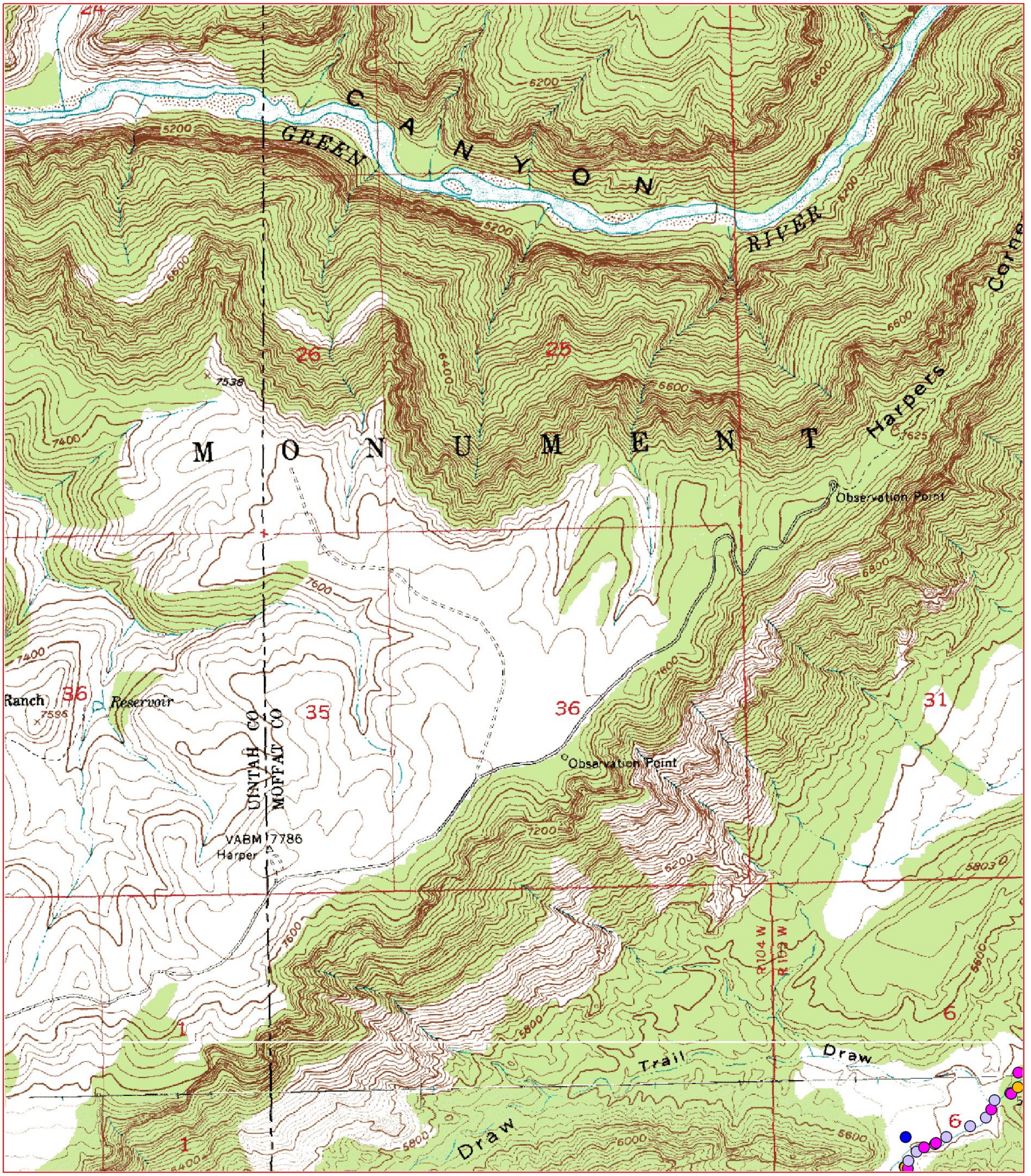
Park boundary

N

1:24,000 Scale

Inset J
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Harper's Corner (Inset K)



- *Cirsium arvense*
- *Cirsium vulgare*
- *Convolvulus arvensis*
- *Tamarix ramosissima*

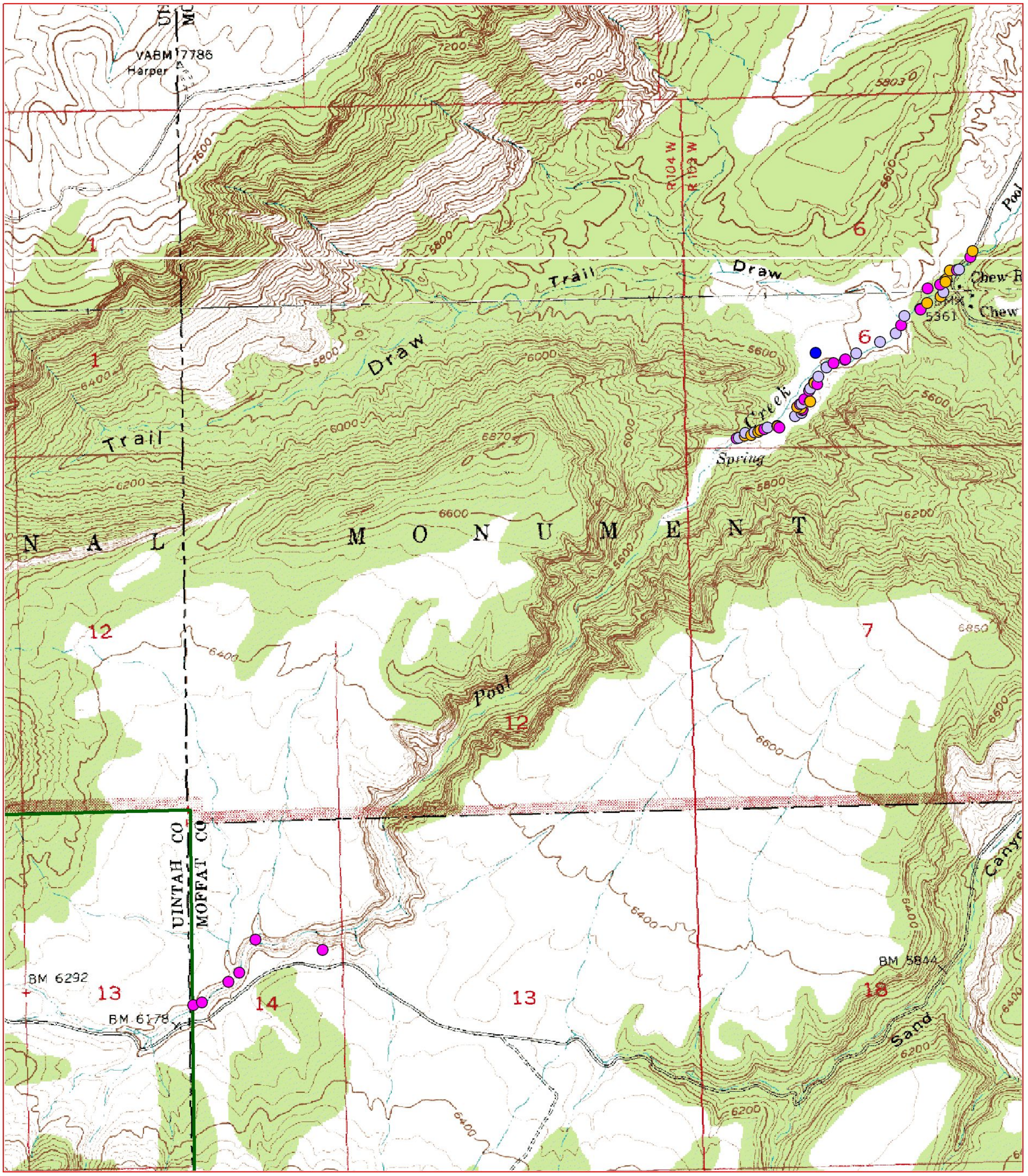
0 2000 4000 Feet

N

1:24,000 Scale

Inset K
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Pool Creek (Inset L)



Cirsium arvense

Cirsium vulgare

Convolvulus arvensis

Tamarix ramosissima

Park boundary

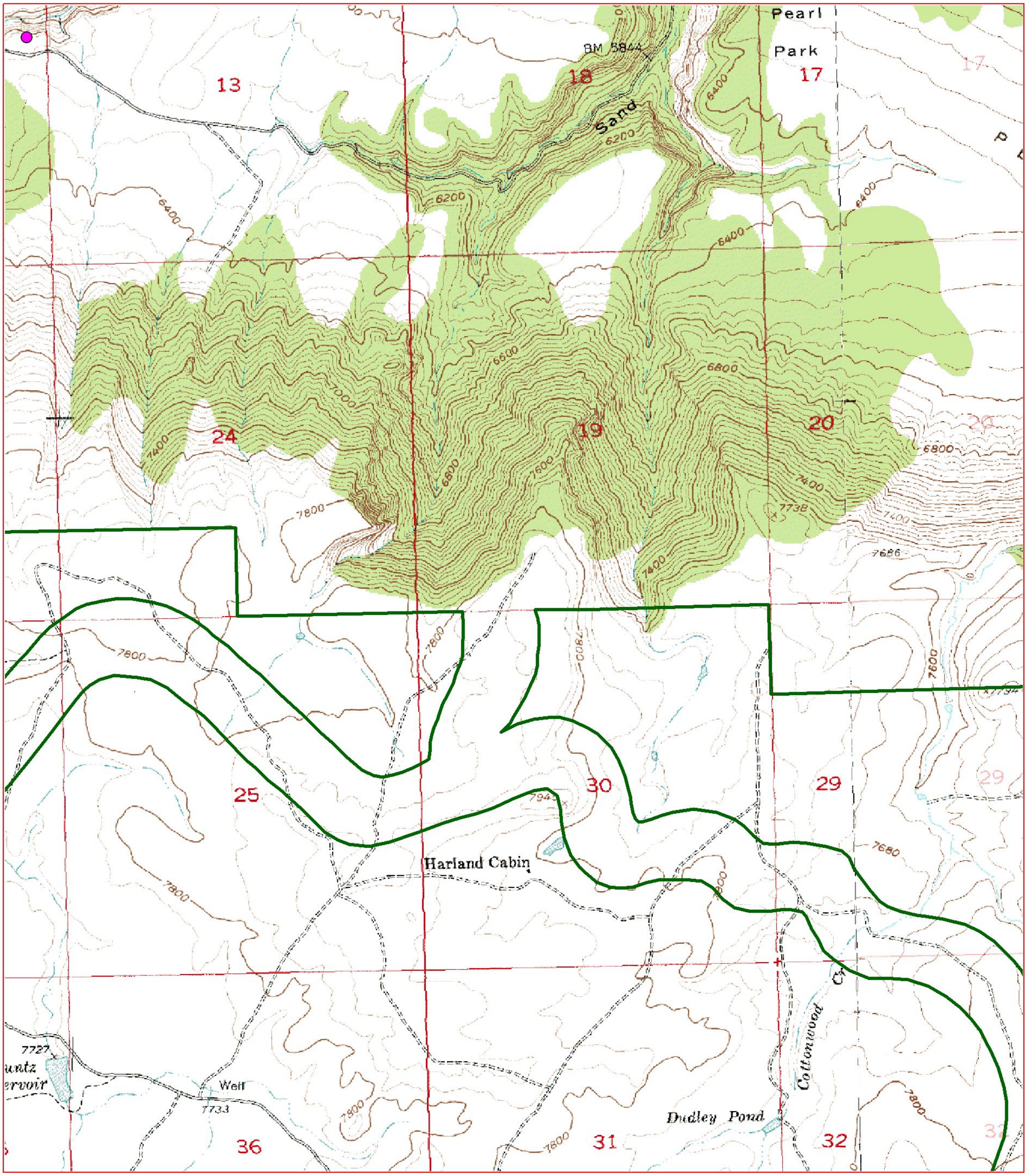
0 2000 4000 Feet

1:24,000 Scale

N

Inset L
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

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



✱ No Target Weed Species Detected

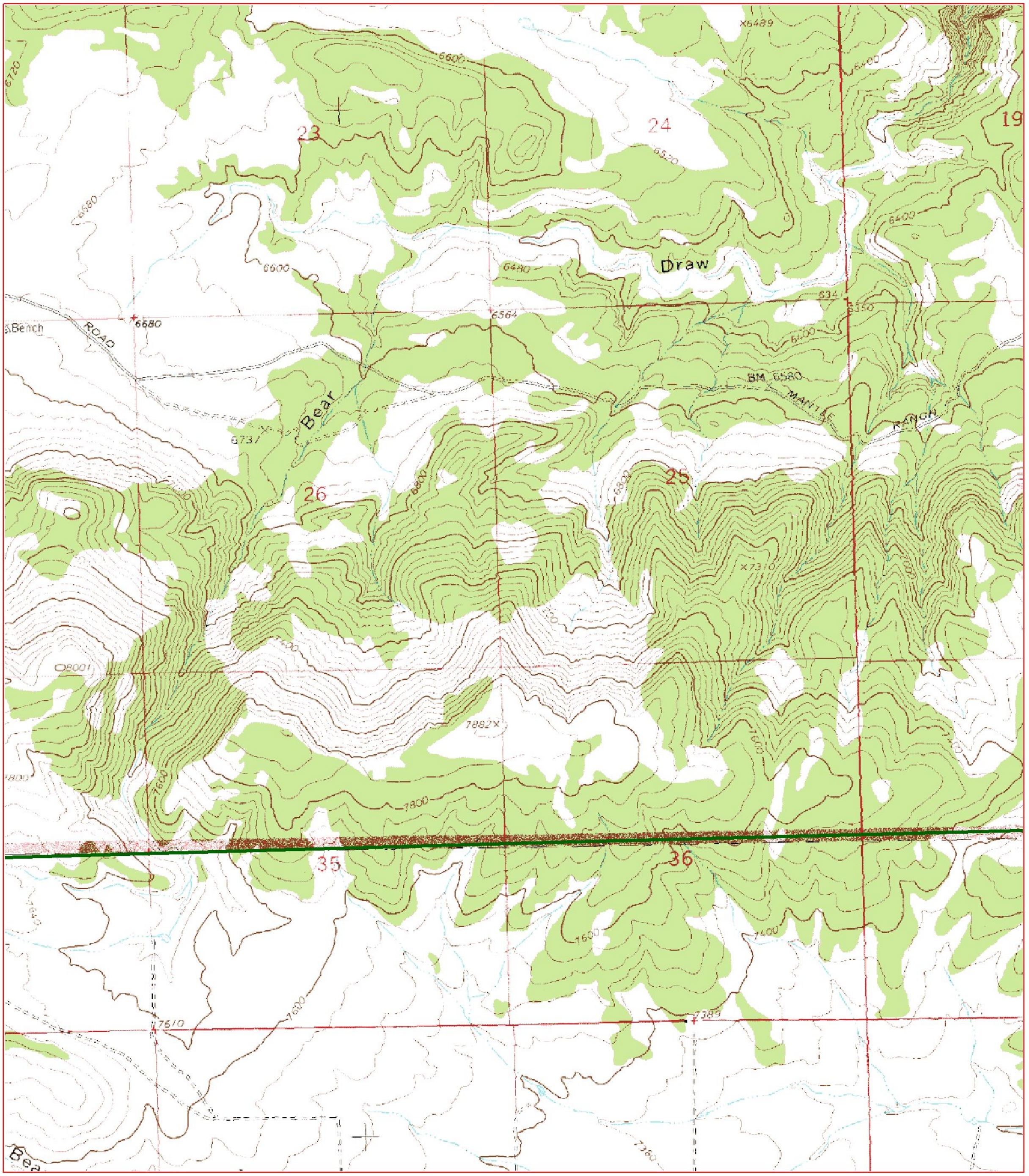
Park boundary

N

1:24,000 Scale

Inset M
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - Bear Draw (Inset N)



* No Target Weed Species Detected

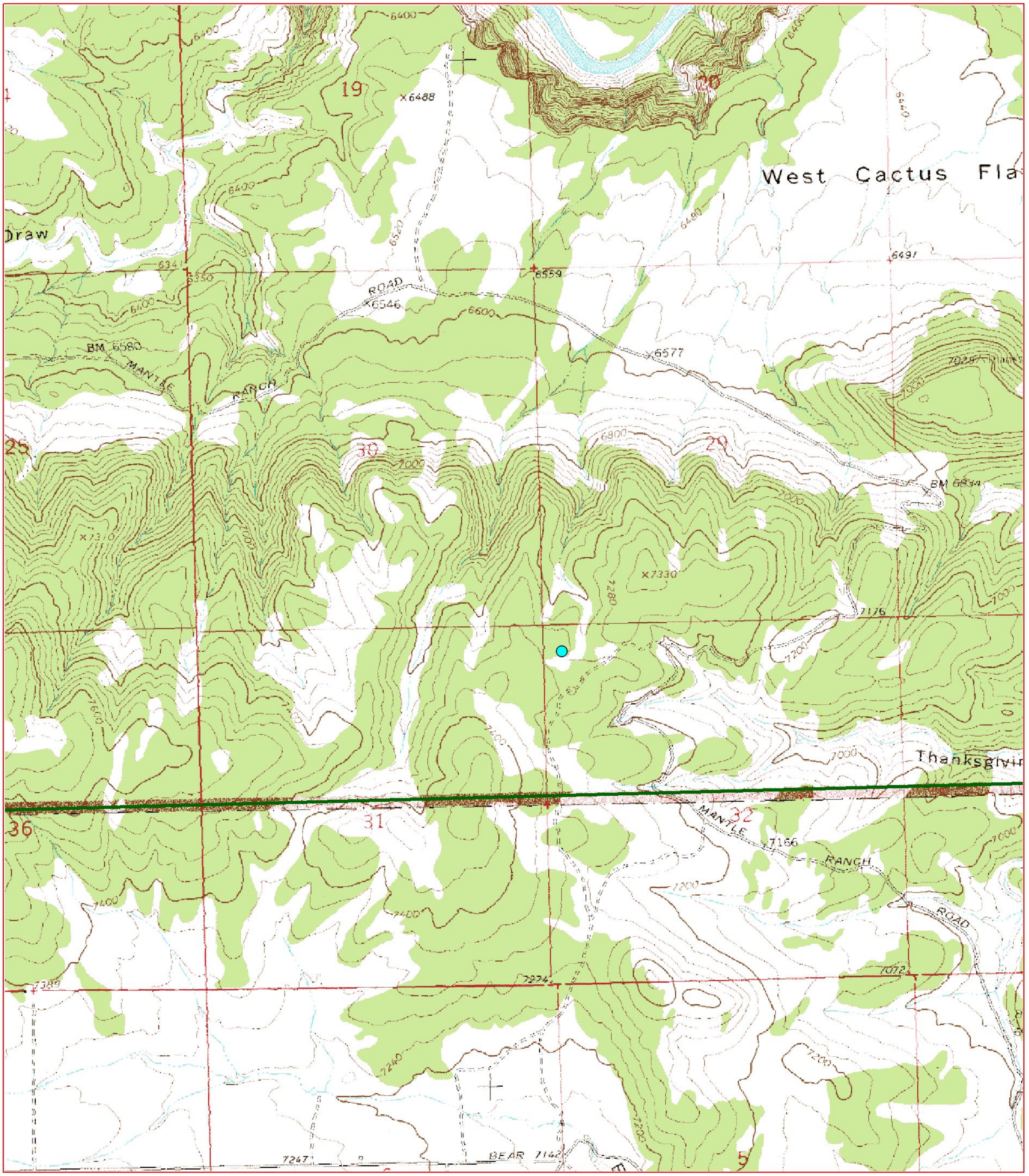
Park boundary

N

1:24,000 Scale

Inset N
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

Appendix D. Weed Species Detected in Inventoried Areas - West Cactus Flat (Inset O)



Carduus nutans

Park boundary

Inset O
Dinosaur National Monument
Utah State University
2005 Invasive Non-native Plant Inventory
Northern Colorado Plateau Network

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 Dinosaur National Monument.

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					*Bromus inermis*			X		
Conium maculatum				X		*Bromus tectorum*			X		
Convolvulus arvensis	X					*Descurainia sophia*			X		
Cynoglossum officinale				X		*Dipsacus follonum*	X				
Dactylis glomerata					X	*Kochia scoparia*			X		
Elaeagnus angustifolia				X		*Lactuca serriola*			X		
Euphorbia esula				X		*Melilotus officinalis*		X			
Halogeton glomeratus				X		*Polygonum aviculare*			X		
Hyoscyamus niger				X		*Sisymbrium altissimum*			X		
Isatis tinctoria				X		*Sonchus arvensis*	X				
Iva xanthifolia					X	*Sonchus oleraceus*			X		

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