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Natural Resource Stewardship and Science

Exotic Plant Monitoring in the Chihuahuan Desert Network

2011 Annual Report

Natural Resource Technical Report NPS/CHDN/NRTR—2012/628



ON THE COVER

Buffelgrass (*Pennisetum ciliare*)
Photograph by National Park Service

Exotic Plant Monitoring in the Chihuahuan Desert Network

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Natural Resource Technical Report NPS/CHDN/NRTR—2012/628

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Executive Summary

Human activities such as transportation, migration, and recreation in recent history have introduced invasive exotic species to new areas at an unprecedented rate. For the National Park Service (NPS), the consequences of these invasions present a significant challenge to the management of the agency's natural resources "unimpaired for the enjoyment of future generations." National parks, like other land-management organizations, are deluged by new exotic species arriving through a number of predictable and unexpected anthropogenic pathways.

Invasive exotic plants have been consistently ranked as a top vital sign for long-term monitoring as part of the NPS Inventory & Monitoring (I&M) Program. During final selection of vital signs in 2008, invasive exotic-plant monitoring was recognized across all Chihuahuan Desert Network (CHDN) parks as the most important shared monitoring need. To have the best chance of eradicating an invasive species, we must: (1) detect invasive exotic species early (i.e., find a new species or an incipient population of an existing species while the infestation is small—less than one hectare), and (2) respond rapidly (i.e., implement appropriate management techniques to eliminate the invasive plant and all of its associated regenerative material). As a complement to this strategy, the CHDN has incorporated the following objectives into its monitoring plan for exotic plants: (1) to detect the initial occurrence for a subset of high-priority species, (2) to determine changes in the density, abundance or extent of the high-priority species, and (3) to determine changes in species composition of high-priority species, taking into account any management treatments that occurred between sampling intervals.

In 2010, the CHDN conducted a pilot study to test the methods and results of the Exotic Plant Monitoring Protocol and then in 2011, continued with its first full year of implementation. A total of 3,480 vector blocks (most 50 m long) were sampled along high-invasion-probability vectors (roads and trails) in CHDN parks. Overall, 40 species of exotic plants were observed in CHDN parks. Only five species (Lehmann lovegrass, King Ranch bluestem, Bermudagrass, buffelgrass and Johnsongrass) were detected in 100 or more blocks. Collectively, members of this group were prevalent in all of the network parks, whereas, other species were found in only a single park: chastetree—Amistad National Recreation Area, straggler daisy—Big Bend National Park, lambsquarter—Fort Davis National Historic Site, and common mullein—Guadalupe Mountains National Park. Results of the 2011 effort for each park sampled are presented in this report.

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Chapter 1 Introduction

An invasive exotic plant is a plant species that is not native to an area and is presumed to pose environmental harm to native plant populations or communities. In general, invasive exotic plant species fragment native ecosystems, displace native plants and animals, and alter ecosystem function. Invasive species are second only to habitat loss as threats to global biodiversity (Wilcove et al. 1998). Prevention and early detection are the principal strategies for successful invasive exotic plant management. Invasive plants often undergo a lag period between introduction and subsequent colonization of new areas, thus managers can take advantage of monitoring efforts to detect invasive exotic species early in the introduction phase, and initiate control actions before populations become well established (Welch et al. 2008).

Globalization of commerce, transportation, human migration, and recreation in recent history has introduced invasive exotic species to new areas at an unprecedented rate. Biogeographical barriers that once restricted the location and expansion of species have been circumvented, culminating in the homogenization of Earth's biota (McNeely 2001). Although only 10% of introduced species become established and only 1% become problematic (Williamson 1993, Williamson and Fitter 1996) or invasive, non-native species have profound impacts worldwide on the environment, economies, and human health.

Invasive species have been directly linked to the replacement of dominant native species (Tilman 1999); the loss of rare species (King 1985); changes in ecosystem structure, alteration of nutrient cycles, and soil chemistry (Ehrenfeld 2003); shifts in community productivity (Vitousek 1990); reduced agricultural productivity; and changes in water availability (D'Antonio and Mahall 1991). The damage caused by these species to natural resources is often irreparable, and our understanding of the consequences incomplete. Since invasive species are second only to habitat destruction as a threat to wildland biodiversity (Wilcove et al. 1998), the dynamic relationships among plants, animals, soil, and water established over many thousands of years are at risk of being destroyed in a relatively brief period.

For the National Park Service (NPS), the consequences of these invasions present a significant challenge to the management of the agency's natural resources "unimpaired for the enjoyment of future generations." National parks, like other land-management organizations, are deluged by new exotic species arriving through predictable (e.g., road, trail, and riparian corridors), sudden (e.g., long-distance dispersal through cargo containers and air freight), and unexpected anthropogenic pathways (e.g., weed seeds in restoration planting mixes). Non-native plants claim an estimated 4,600 acres of public lands each year in the United States (Asher and Harmon 1995), significantly altering local flora. For example, exotic plants comprise an estimated 43% and 36% of the flora of the states of Hawai'i and New York, respectively (Rejmanek and Randall 1994). Invasive plants infest an estimated 2.6 million acres of the 83 million acres managed by the NPS (Fraley 2004).

Despite diligent efforts to curtail the problem, more NPS lands are infested daily. Impacts from invasive species have been realized in most parks, resulting in an expressed need to control existing infestations and restore affected ecosystems. Additionally, there is a growing urgency to be proactive—to protect resources not yet impacted by current and future invasive species (Marler 1998). Invasive exotic species will continue to be a management priority for the NPS well into the foreseeable future.

Invasive exotic plants have been consistently ranked as a top vital sign for long-term monitoring as part of the NPS Inventory & Monitoring (I&M) Program. During the vital signs selection process in 2006-2008, Chihuahuan Desert Network (CHDN) park units recognized the need for exotic-plant monitoring (NPS 2010). All seven of the network park units identified invasive exotic plants as among their most important management issues. CHDN parks include

Amistad National Recreation Area (NRA), Big Bend National Park (NP), Carlsbad Caverns NP; Fort Davis National Historic Site (NHS); Guadalupe Mountains NP, Rio Grande Wild and Scenic River (WSR); and White Sands National Monument (NM) (Figure 1).

1.1 Goals and Objectives

Prevention and early detection are the principal strategies for successful invasive exotic plant management. While there is a need for long-term suppression programs to address high-impact species, eradication efforts are most successful for infestations of less than one hectare in size (Rejmanek and Pitcairn 2002). Eradication of infestations larger than 100 hectares is largely unsuccessful, costly, and unsustainable (Rejmanek and Pitcairn 2002). Costs, or impacts, to ecosystem components and processes resulting from invasion also increase dramatically over time, making ecosystem restoration improbable in the later stages of invasion. Further, in their detailed review of the non-native species problem in the United States, the U.S. Congress, Office of Technology Assessment (1993) stated that the environmental and economic benefits of supporting prevention and early detection initiatives significantly outweigh any incurred costs, with the median benefit-to-cost ratio being 17:1 in favor of being proactive. Although preventing the introduction of invasive exotic plants is the most successful and preferred strategy for resource managers, the realities of globalization, tight fiscal constraints, and limited staff time guarantee that invaders will get through park borders. Fortunately, invasive exotic plants quite often undergo a lag period between introduction and subsequent colonization of new areas. Managers, then, can take advantage of early detection monitoring to ensure invasive exotic species are found and successfully eradicated before populations become well established.

This strategy requires resource managers to: (1) detect invasive exotic species early (i.e., find a new species or an incipient population of an existing species while the infestation is small—less than one hectare), and (2) respond rapidly (i.e., implement appropriate management techniques to eliminate the invasive plant and all of its associated regenerative material).

As a complement to this strategy, the CHDN has incorporated the following objectives into its monitoring plan for exotic plants:

(1) Detect the initial occurrence for a set of high-priority species in areas of high and low invasion probability,

(2) Determine changes in the status and trend (density, abundance or extent) of a set of high-priority species in areas of high and low invasion probability, and

(3) Determine changes in species composition of a set of high-priority species in areas of high and low invasion probability, taking into account any management treatments that occurred between sampling intervals.

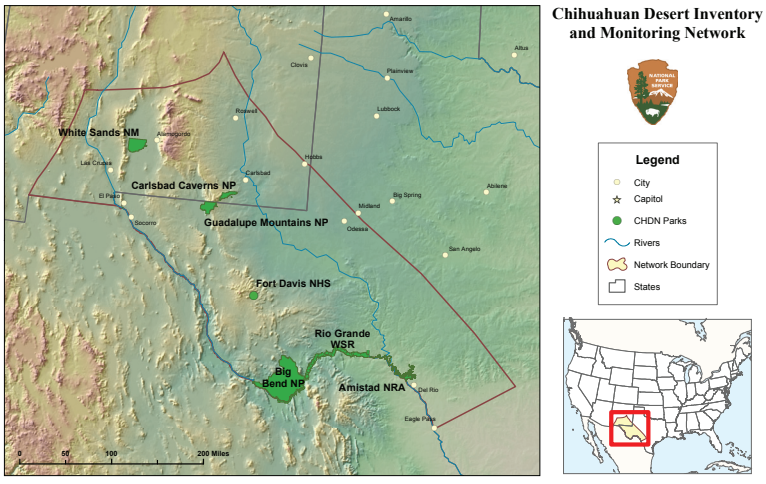


Figure 1. Parks in the Chihuahuan Desert Network.

1.2 Park Overviews

Amistad National Recreation Area

Amistad NRA is located along the Rio Grande River in southwest Texas, and encompasses 23,195 hectares (57,292 acres) of land. Mexico borders the park on the south and shares administration of the lake with the park (Appendix A, Figure A.1). When the reservoir water level is at its conservation elevation of 340 m (1,117 feet), then there is 7,211 ha (17,820 acres) of land in this unit. Amistad NRA includes extends 118 km (74 miles) along the Rio Grande, 22 km (14 miles) up the Pecos River, and 38 km (24 miles) up the Devil's River. Amistad NRA was established as part of a cooperative effort with Mexico to develop a combination of recreation, flood control, water storage, and power generation facilities.

Lake levels have dropped in recent years. Areas now exposed are vegetated by a combination of non-native and primary successional native species. The substrate has been highly altered, and much of the top soil has washed away. Past land-use history, including fire suppression, cattle grazing, bulldozing, root-plowing, chaining, and hand-clearing of woody, native vegetation, has altered the vegetation. Some soils may have been plowed and seeded with non-native grasses such as King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*), Bermudagrass (*Cynodon dactylon*), and buffelgrass (*Pennisetum ciliare*; Poole 2004). Amistad NRA is not fenced along its boundary and the vegetation community is exposed to free-ranging livestock.

A total of 701 vascular plant taxa are present or previously confirmed in the park, including 48 non-native species, according to NPSpecies, the NPS's biodiversity database (Park Species List, accessed July 12, 2012). In addition, a CHDN-initiated vascular plant inventory at Amistad NRA proposed 137 plant species that had a high likelihood of occurring within Amistad NRA due to the presence of appropriate vegetation communities in the park (Poole 2004). Thirteen of these species were non-native. Four species documented at Amistad NRA are also listed on the Texas Noxious Weeds list: giant reed (*Arundo donax*), field bindweed (*Convolvulus arvensis*), hydrilla (*Hydrilla verticillata*), and tamarisk (*Tamarix* spp.).

Big Bend National Park

Big Bend NP is located within the bend of the Rio Grande in southwestern Texas and shares its southern boundary with Mexico (Appendix B, Figure B.1). In the United States much of the adjacent land is private with some state lands. Nearby neighbors to the park include Big Bend Ranch State Park, Black Gap State Wildlife Management Area, State of Texas General Land Office, and the Nature Conservancy. Big Bend NP encompasses 324,641 ha (801,863 acres) of land. Park elevations range from 548 m (1,800 ft) at the Rio Grande to 2,377 m (7,800 ft) atop Emory Peak in the Chisos Mountains. Overall change in elevation is approximately 1,829 m (6,000 ft).

The Rio Grande WSR is managed as a unit of the national park system by Big Bend NP. Rio Grande WSR includes 315 kilometers (196 miles) of river from Mariscal Canyon to the Terrell-Val Verde county line. Vegetation along the Rio Grande is dominated by tamarisk, mesquite (*Prosopis* spp.), cottonwood (*Populus deltoides*), willow (*Salix* spp.), tree tobacco (*Nicotiana glauca*),

Amistad National Recreation Area.



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Santa Elena Canyon at Big Bend National Park.

Bermudagrass, and giant reed (Young et al. 2007).

Formerly extensive desert grass- and shrublands that protected soils, retained moisture, and supported diverse plant and animal communities were damaged by agricultural practices prior to park establishment in 1944. Thin, fragile soils began eroding when grazing, hydrologic alteration for water catchments and other agricultural practices reduced vegetative cover. Loss of topsoil and the slow rate of soil development have resulted in continued degradation despite current land protection policies within park boundaries. Reduced soil cover diminishes organic soil structure and moisture retention. Consequently, when intense thunderstorms create runoff, back-cutting and downstream erosion occur. Increased erosion, in turn, further threatens surviving grass and shrublands. Vegetation reproduction becomes compromised or limited by more disturbance-tolerant, invasive and exotic species. Resource managers also acknowledge a major challenge in managing vegetation at the park is invasion of fire-adapted non-native plant species which threaten to displace native species primarily along the riparian corridor and drainages (NPS 2005).

A total of 1,362 vascular plants, including 92 non-native plant species have been documented in Big Bend NP and Rio Grande WSR according to NPSpecies (accessed on July 12, 2012). Non-native plants that prove the greatest threat include tamarisk, buffelgrass, Bermudagrass, Lehmann lovegrass (*Eragrostis lehmanniana*), Johnsongrass (*Sorghum halepense*), and giant reed (Young et al. 2007). Tamarisk and giant reed are the only species located in Big Bend NP listed on the Texas Noxious Weed list (http://plants.usda.gov/java/noxious?rptType=State&statefips=48, accessed on May 11, 2012).

Carlsbad Caverns National Park

Carlsbad Caverns NP is located in southeastern New Mexico and shares boundaries with private land and public lands managed by the USDA Forest Service (Lincoln National Forest), Bureau of Land Management, and the New Mexico State Lands Office (Appendix C, Figure C.1). Carlsbad Caverns NP covers an area of 18,934 ha (46,766 acres) of Chihuahuan Desert grasslands, shrublands and woodlands. Land use surrounding the park is a mix of cattle ranching, oil and gas development, and irrigated agriculture. The elevation in the park ranges from 1,096 m (3,595 ft) in the desert lowlands to 1,987 m (6,520 ft) atop the Capitan Reef. The total relief is 891 m (2,925 ft). Carlsbad Caverns NP lies in the northern reaches

of the Chihuahuan Desert ecosystem, where desert-scrub and grassland plant communities dominate. Small pockets of coniferous woodland are found at higher elevations in the western third of the park.

A total of 942 vascular plant species have been documented in the park, including 59 plant species that are non-native, according to NPSpecies (accessed on July 12, 2012). Species posing a significant, major, or widespread problem in the park include tree-of-heaven (*Ailanthus altissima*), Johnsongrass and Lehmann lovegrass (NPS 2006). Non-native plants, especially Russian olive (*Elaegnus angustifolia*) and Johnsongrass, are now major components of the vegetation at Rattlesnake Springs. These species may suppress the cottonwood-willow riparian woodlands and native grasses that occur there. Other non-native plants that have potential to spread in disturbed areas include Maltese star-thistle (*Centaurea melitensis*), horehound (*Marrubium vulgare*), and tree-of-heaven. Species on the New Mexico Noxious Weed list (http://www.invasivespeciesinfo.gov/unitedstates/nm.shtml, checked May 11, 2012) include: tree-of-heaven, Maltese star-thistle, yellow starthistle (*C. solstitialis*), Russian olive, scotch thistle (*Onopordum acanthium*), African rue (*Peganum harmala*), tamarisk, and Siberian elm (*Ulmus pumila*).

Fort Davis National Historic Site

Fort Davis NHS, the smallest of the network parks (220 ha; 516 acres), is located at the southeast edge of the Davis Mountains in the Trans-Pecos region of West Texas. The site is bordered to the northwest by Davis Mountain State Park and by private land on the other sides (Appendix D, Figure D.1). The Nature Conservancy is a neighbor in close proximity, as is the McDonald Observatory and the Chihuahuan Desert Research Institute. The elevation at Fort Davis NHS ranges from approximately 1,487 m (4,880 ft) at the Fort to approximately 1,591 m (5,220 ft) in the Davis Mountains. Overall change in elevation is approximately 104 m (340 ft). The park preserves 110 historic buildings, ruins, and foundations and the landscape associated with two forts (active from 1854-1862 and 1867-1891).

The entrance area of the site features the Chihuahuan Desert grassland community common to the Davis Mountains. It also contains a spring and associated historic grove of cottonwood trees. The fort is located in the middle of an alluvial floodplain and natural drainages run through the site. Historic ditches and dikes are maintained for flood control. Behind the main fort area rise the volcanic cliff walls of Hospital Canyon and a rugged steep



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Natural cave entrance at Carlsbad Caverns National Park.



NATURAL HERITAGE NEW MEXICO

Piedmont grassland vista at Fort Davis National Historic Site.

escarpment running north-south that forms the prominent backdrop view from the lower elevations. Mixed vegetative cover is found throughout this zone, where desert-scrubland intermixes with cacti and pinyon-juniper woodland. Flood inflows to Hospital Canyon Arroyo provide potential habitat for exotic plant infiltration.

According to NPSpecies (accessed on July 12, 2012), a total of 368 vascular plants species have been documented in the park. Of this total, 20 species were designated as non-native plant species for FODA, including Maltese star-thistle, Johnsongrass, horehound, barnyard grass (*Echinochloa crus-galli*), and Bermudagrass. This list includes the 16 non-native species documented in Haynie (2000). None of the non-native species in Fort Davis NHS are on the Texas Noxious Weed list.

Guadalupe Mountains National Park

Guadalupe Mountains NP is located in the Trans-Pecos region of west Texas on the south side of the Texas-New Mexico border (Appendix E, Figure E.1). This park encompasses an area of 34,986 ha (86,416 acres). In Texas, most of the lands surrounding Guadalupe Mountains NP are private lands. The only public land is owned by the Texas General Land Office or the Texas Department of Transportation. In New Mexico adjacent land owners include private, State of New Mexico, Bureau of Land Management, and USDA Forest Service lands of the Lincoln National Forest. Guadalupe Mountains NP has the widest range of elevation among the CHDN park units, with ranges from approximately 1,204 m (3,624 ft) on the alkali flats to 2,584 m (8,749 ft) atop Guadalupe Peak, the highest point in Texas.

Forest occurs at higher elevations in the Guadalupe Mountains NP. The mountains contain a number of deep, sheer-sided canyons, distinguished by high levels of biodiversity. The most notable, McKittrick Canyon, contains the park's only perennial stream, McKittrick Creek. The creek, as well as a number of springs, seeps, and ephemeral washes, support riparian plant communities.

The westernmost portion of the park encompasses several square miles of the alkali flats that dominate the valley west of the mountains. Today, wind has eroded sections of the flats, piling quartz and gypsum sand dunes up against the western foothills of the Guadalupe Mountains. The mountain foothills and surrounding plains are characterized by Chihuahuan Desert vegetation, including specialized desert scrub communities found in the salt flat and dune areas.

Out of the 1,016 vascular plants known for Guadalupe Mountains NP, 45 non-native plant species have been documented, according to NPSpecies (accessed on July 12, 2012). Anderson and Mueller (2003) reported the following non-native plant species in a recent baseline inventory at Choza, Smith and Juniper Springs: watercress (*Rorippa nasturtium-aquaticum*), horehound, barnyard grass, and Bermudagrass. Species listed on the Texas

Noxious Weed (http://www.texasinvasives.org/plant_database/index.php, checked on June 11, 2012) list include field bindweed and tamarisk.



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Pine Top at Guadalupe Mountains National Park.

Chapter 2 Methods

In 2011, the CHDN conducted the first season for exotic-plant monitoring using the protocol developed by the Southern Plains Inventory and Monitoring Network (Folts-Zettner et al. in review). CHDN parks were stratified into high- and low-probability areas for invasion, roughly corresponding to roads, trails, streams, and boundaries (high-probability) and interior areas (low-probability). High invasion probability areas are surveyed according to the primary sampling methodology described below while low invasive probability areas were sampled in conjunction with other CHDN monitoring efforts (see secondary sampling methodology section below).

A brief pilot test of the primary sampling methodology was conducted in October-November 2010 prior to implementing the full sampling schedule in March 2011. Sampling was carried out from early March through mid-May (spring), then resumed mid-August through the end of November 2011 (fall). Only species that were actively growing were recorded. Plants that had senesced, or were dormant or dead, were also noted. Folts-Zettner et al. (in review) provides a complete description of the exotic plant monitoring protocol, and Appendix F summarizes the sampling design.

2.1 Primary sampling methodology

The methodology employed in this monitoring was based on a generalized linear model. Fifty-meter sections (vector blocks) of both sides (right [R] and left [L]) of a vector (road or trail) were sampled (Figure 2). Transects ran parallel to the vector, but were set into the roadside along the interior edge of the mow strip, where present, for crew safety (Figure 2). The number of transects surveyed per vector depended on the total length of the vector. Within each 50-meter block, the density class of each exotic species detected was noted within each distance class.

Distance classes from the vector were set as follows:

D1=Roadside–transect (mowed area, approximately 2 m)

D2=Transect–10 meters

D3=10–20 meters into the landscape

D4=>20 meters into the landscape

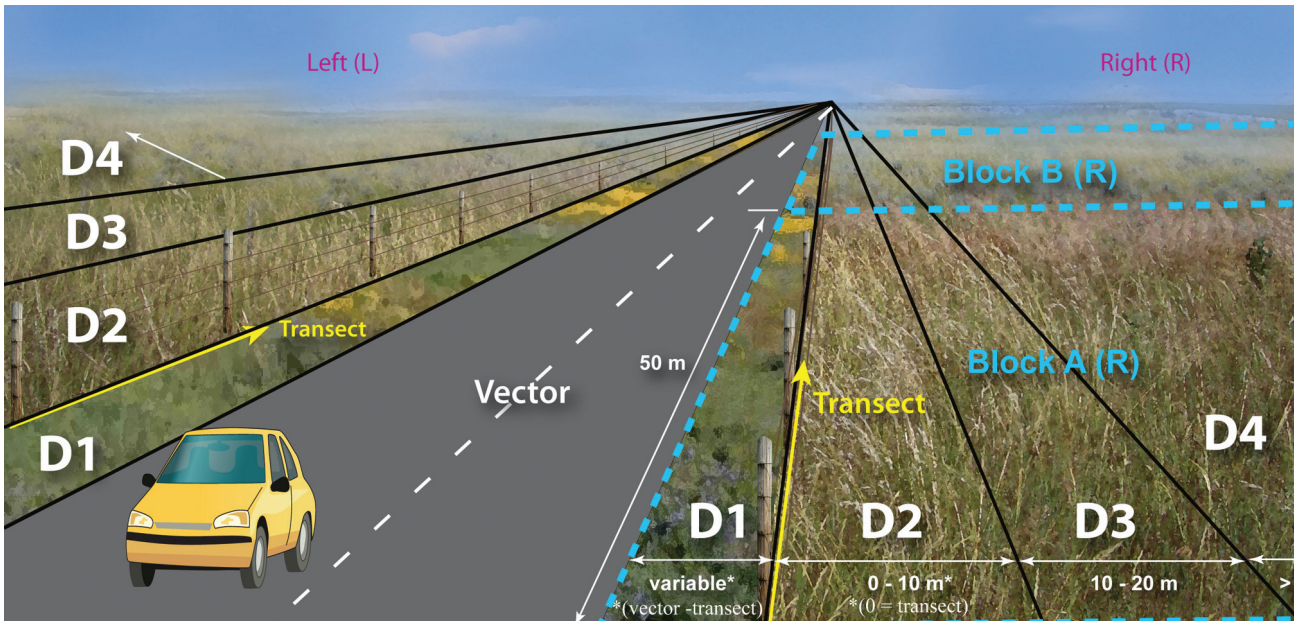


Figure 2. Fifty-meter blocks are sampled on each side of a vector (e.g., roads and trails) in each of four distance classes from the vector (Folts-Zettner 2009).

Four density classes were used to describe exotic species populations. A population may be distributed within a block in one of four ways: (1) less than five plants, (2) scattered throughout the block in a patchy or clumped manner, (3) scattered throughout in an even distribution, or (4) forming a matrix. A matrix equates to an initial introduction, establishment, spread, and complete invasion of the habitat (Figure 3).

This method allowed for a rapid assessment of the density of exotic plants, enabling surveyors to cover more distance along the vector and a greater sampling area. While detailed locations of a given species or population were not recorded, the presence of any species within a 50-meter sample block, in conjunction with the distance class, can be reasonably relocated by management teams. Additionally, the presence of a major species of concern can trigger a more thorough search of the area for additional occurrences.

Detection of some exotic species, particularly low-growing and rosette-stage species, decreases with distance, while other large-mass or tall growing species can easily be seen at a great distance. This limitation should always be taken into consideration when planning management actions. The presence of a species of concern in any given area should trigger a more thorough search prior to eradication efforts. At times, topographic features, such as rises and depressions, will screen the visual field. These disruptions were noted in each sample block in the appropriate distance class as "no data available," to distinguish from areas where no exotic plants were detected.

2.2 Secondary sampling methodology

Areas with low probability of exotic plant invasion (interior habitats away from roads and trails) were searched in conjunction with monitoring spring ecosystems and upland vegetation and soils. Presence/absence and location of exotic plants were noted while conducting riparian vegetation surveys at springs, as part of CHDN's spring ecosystem inventory. The presence of non-native plants was recorded within plots monitored for upland vegetation and soils. The quality assurance and quality control procedures have not been completed on all data sets; consequentially, these spring inventory and upland monitoring plot data will only be discussed where available in this report. All observations of exotic plant species at the secondary sampling sites will be provided to the parks as they become available.

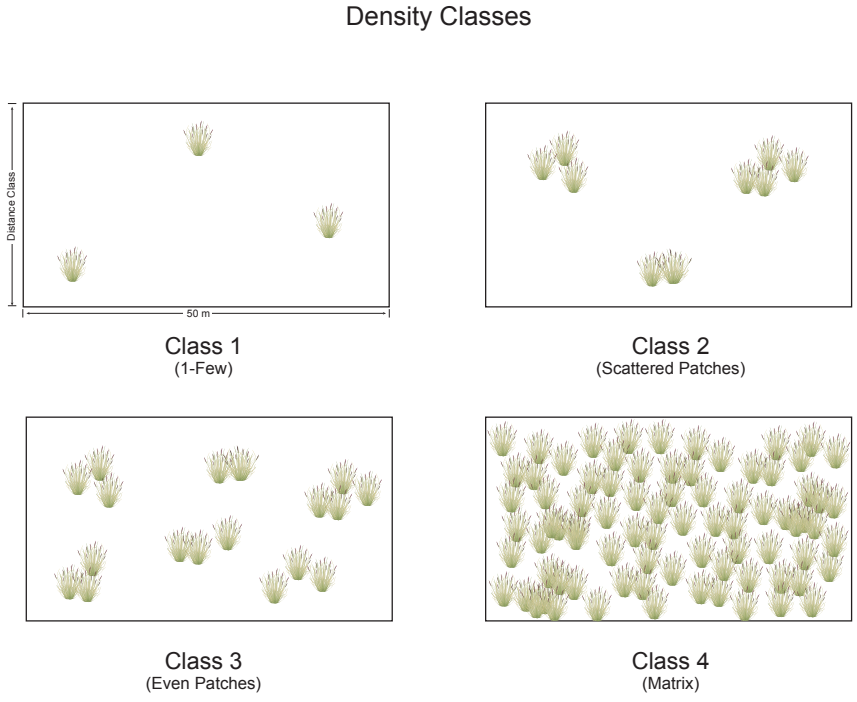


Figure 3. Diagram of four density classes used in describing the distribution of exotic plant species within each 50-meter block (Folts-Zettner 2009).

Chapter 3 Results

During 2010-2011, a total of 3,480 50-m vector blocks were sampled along high-invasion-probability vectors in CHDN parks (Table 1). The 2010 data consisted of a single transect sampled at Big Bend NP at the park's request. Not all of our pilot work is included in the data. The total number of blocks sampled included replicated sampling (spring and fall 2011) on portions of two Fort Davis NHS and four Guadalupe Mountains NP transects. Vectors consisted primarily of paved and unpaved roads and trails. Total kilometers (miles) of roads, trails, and other areas (edges of parking lots, medians, docks, etc.) surveyed in each park were: Amistad NRA—13.0 (8.1), Big Bend NP—29.9 (18.6), Carlsbad Caverns NP—20.4 (12.7), Fort Davis NHS—7.7 (4.8), and Guadalupe Mountains NP—16.1 (10.0). No exotic plant monitoring took place at White Sands NM at the park's request. Additionally, 392 springs in three parks (Big Bend NP, n=327; Carlsbad Caverns NP, n=41; Guadalupe Mountains NP, n=24) were inventoried from spring of 2010 through December 2011.

Overall, 40 species of exotic plants were observed in the blocks surveyed. Nineteen of these species (~48%) are found throughout all or almost all of the lower 48 states (Table 2). The most unique exotic species detected was *Washingtonia* species, a palm tree in Amistad NRA. Should this palm be identified as *Washingtonia robusta* (Washington fan palm), this palm would be classified as a non-native species. If the palm is *Washingtonia filifera* (California fan palm) this would represent an introduction of a native palm.

Results of the 2011 field season for each park sampled are presented below. More detailed findings are presented in the appendices. Appendices A-E are arranged alphabetically by Chihuahuan Desert Network park unit name. Each appendix provides the following information:

- A map of monitoring transect location, vector names and surrounding land ownership; the land ownership designation comes from PAD-US v1.2 (USGS 2012).
- A master table of exotic plant species detected by vector x transect x block .
- Individual vector maps displaying location of exotic plant species by transects and block.
- For Big Bend National Park, there are also vector maps displaying location of *Heteropogon contortus*, a species that has a disputed native plant classification.

Appendix F provides additional details on the sampling design, and sampling design maps for each park.

The entire data set, or just an individual park's dataset and geospatial data can be provided to the park upon request, or most of the information can be downloaded from the Chihuahuan Desert Network's SharePoint site: http://inpchdnms03/CHDN/Exotics/SitePages/Home.aspx.

Table 1. Number of blocks (N=3,480) surveyed by park unit and surface type in 2010 and 2011.

Unit	Total Blocks	Roads		Trails			Burned Area	Other[1]
		Paved	Unpaved	Paved	Unpaved	Metal		
AMIS	520	198	280	0	38	4	0	0
BIBE	1195	977	0	12	176	0	0	30
CAVE	816	280	382	0	154	0	0	0
FODA	308	42	54	0	102	0	110	0
GUMO	641	357	180	0	104	0	0	0

[1]Other areas around facilities such as stores, motel, visitor center, parking lots, or sidewalks

Table 2. Number of 50-meter blocks with a given exotic species by park unit. Total number of blocks (N = 1758) with exotic plant species present.

Scientific Name	Common Name	Primary Growth Habit	Growth Pattern	Total Blocks	% of Blocks	AMIS	BIBE	CAVE	FODA	GUMO
Eragrostis lehmanniana	Lehmann lovegrass	Graminoid	Perennial	347	19.7	n.d.	233	46	n.d.	68
Bothriochloa ischaemum	King Ranch bluestem	Graminoid	Perennial	277	15.8	135	134	n.d.	8	n.d.
Cynodon dactylon[1]	Bermudagrass	Graminoid	Perennial	240	13.7	91	61	3	15	70
Pennisetum ciliare	buffelgrass	Graminoid	Perennial	165	9.4	148	17	n.d.	n.d.	n.d.
Sorghum halepense[1]	Johnsongrass	Graminoid	Perennial	117	6.7	4	26	1	34	52
Marrubium vulgare[1]	horehound	Subshrub	Perennial	94	5.3	n.d.	25	2	8	59
Verbascum thapsus[1]	common mullein	Forb/Herb	Biennial	71	4.0	n.d.	n.d.	n.d.	n.d.	71
Tribulus terrestris[1]	puncturevine	Forb/Herb	Annual	48	2.7	1	14	5	28	n.d.
Melilotus species[1, 2]	sweetclover	Forb/Herb	Annual, Biennial, Perennial	48	2.7	n.d.	n.d.	n.d.	n.d.	48
Portulaca oleracea[1]	little hogweed	Forb/Herb	Annual	46	2.6	n.d.	2	n.d.	44	n.d.
Eragrostis cilianensis[1]	stinkgrass	Graminoid	Annual	37	2.1	n.d.	5	12	5	15
Erodium cicutarium[1]	redstem stork's bill	Forb/Herb	Annual, Biennial	34	1.9	n.d.	2	n.d.	n.d.	32
Nicotiana glauca	tree tobacco	Tree	Perennial	30	1.7	29	1	n.d.	n.d.	n.d.
Vitex agnus-castus	chastetree	Shrub	Perennial	26	1.5	26	n.d.	n.d.	n.d.	n.d.
Calyptocarpus vialis	straggler daisy	Forb/Herb	Perennial	21	1.2	n.d.	21	n.d.	n.d.	n.d.
Chenopodium album[1]	lambsquarters	Forb/Herb	Annual	21	1.2	n.d.	n.d.	n.d.	21	n.d.
Bromus catharticus	rescuegrass	Graminoid	Annual, Perennial	17	1.0	n.d.	3	12	n.d.	2
Paspalum dilatatum	dallisgrass	Graminoid	Perennial	17	1.0	n.d.	17	n.d.	n.d.	n.d.
Arundo donax	giant reed	Graminoid	Perennial	13	0.7	13	n.d.	n.d.	n.d.	n.d.

Table 2. Number of 50-meter blocks with a given exotic species by park unit. Total number of blocks (N = 1758) with exotic plant species present (continued).

Scientific Name	Common Name	Primary Growth Habit	Growth Pattern	Total Blocks	% of Blocks	AMIS	BIBE	CAVE	FODA	GUMO
Salsola tragus[1]	prickly Russian thistle	Forb/Herb	Annual	11	0.6	n.d.	7	n.d.	4	n.d.
Tamarix species	tamarisk	Tree	N/A	11	0.6	10	1	n.d.	n.d.	n.d.
Digitaria sanguinalis[1]	hairy crabgrass	Graminoid	Annual	9	0.5	n.d.	9	n.d.	n.d.	n.d.
Echinochloa colona	jungle rice	Graminoid	Annual	7	0.4	n.d.	7	n.d.	n.d.	n.d.
Taraxacum officinale[1]	common dandelion	Forb/Herb	Perennial	7	0.4	n.d.	5	n.d.	1	1
Ricinus communis	castorbean	Shrub	Perennial	6	0.3	6	n.d.	n.d.	n.d.	n.d.
Salsola kali	Russian thistle	Forb/Herb	Annual	5	0.3	n.d.	n.d.	2	n.d.	3
Verbena brasiliensis	Brazilian vervain	Forb/Herb	Annual	5	0.3	n.d.	5	n.d.	n.d.	n.d.
Xanthium spinosum	spiny cockleburr	Forb/Herb	Annual	5	0.3	n.d.	n.d.	n.d.	n.d.	5
Tragopogon dubius[1]	yellow salsify	Forb/Herb	Annual, Biennial	4	0.2	n.d.	n.d.	n.d.	n.d.	4
Amaranthus blitoides[1]	mat amaranth	Forb/Herb	Annual	3	0.2	n.d.	3	n.d.	n.d.	n.d.
Eragrostis barrelieri	Mediterranean lovegrass	Graminoid	Annual	3	0.2	n.d.	n.d.	3	n.d.	n.d.
Medicago polymorpha	burclover	Forb/Herb	Annual, Perennial	3	0.2	n.d.	3	n.d.	n.d.	n.d.
Centaurea melitensis	Maltese star-thistle	Forb/Herb	Annual, Biennial	2	0.1	1	n.d.	n.d.	n.d.	1
Setaria viridis[1]	green bristlegrass	Graminoid	Annual	2	0.1	n.d.	n.d.	n.d.	n.d.	2
Washingtonia species	palm tree	Tree	Perennial	2	0.1	2	n.d.	n.d.	n.d.	n.d.
Apium graveolens	wild celery	Forb/Herb	Perennial	1	0.1	n.d.	n.d.	n.d.	n.d.	1
Convolvulus arvensis[1]	field bindweed	Vine	Perennial	1	0.1	n.d.	n.d.	1	n.d.	n.d.
Digitaria ciliaris	southern crabgrass	Graminoid	Annual	1	0.1	n.d.	1	n.d.	n.d.	n.d.
Solanum lycopersicum	garden tomato	Forb/Herb	Annual	1	0.1	n.d.	1	n.d.	n.d.	n.d.

n.d. = not detected

[1] Species that are found in all or almost all of the continental U.S. and often considered "naturalized"(Beaulieu 2012)

[2] *Melilotus* species = *Melilotus* species, *M. alba* (1 observation) and *M. officinalis* (1 observation)

3.1 Amistad National Recreation Area

Sampling at Amistad NRA included most of the roadways into boat launch areas and some trails within the park. Transects will be measured annually (Appendix F, Figure F.2). During 2011, 520 vector blocks were monitored across 27 transects at Amistad NRA. Sampling effort occurred over 11 days (6 days in May, 2 days in September and 3 days in October) for a total linear survey effort of 13.0 km (8.1 mi). Both sides of transects were surveyed, where possible. There were no secondary sampling sites, either upland vegetation plots or springs, sampled at Amistad NRA.

Exotic plants were detected in 54.4% (n=283) of the 520 blocks surveyed at Amistad NRA (Table 3).

A total of 12 species of exotic plants were observed at Amistad NRA (Table 4). The Diablo East vector contained the highest number of survey blocks with exotic plants (n=134, 25.8%) followed by the Marina Access Road (n=86, 16.5%) and Rough Canyon (n=81, 15.6%). Appendix A (Table A.1 and Figures A.2 through A.6) details where the individual exotic plant species were observed by survey block.

Buffelgrass was the most commonly found exotic species (28.5%, n=148 blocks), followed closely by King Ranch bluestem (26%, n=135 blocks). The third most common exotic species was Bermudagrass (17.5%, n=91 blocks). These three exotic grass species are of particular concern, as they can spread to form monocultures, and they already occur at higher densities and frequencies than other exotic plant species recorded at the park. Along with the shrub, chastetree (*Vitex agnus-castus*), these species, were found in densities classified as "evenly distributed patches" or forming a "matrix" (uniform continuous invasion).

Several exotic plant species were found in numbers small enough that minimal control measures at this time may preclude major effort in the future. Three species were categorized as having fewer than five plants, and were only detected in a single 50-meter block, single distance category, transect and vector (Maltese star-thistle on the Sunrise Trail, puncture vine in the Diablo East area and

Table 3. Number of 50-meter survey blocks sampled by surface type during 2011, Amistad National Recreation Area.

		Roads		Trails				
Sampling Blocks	**Total Blocks**	**Paved**	**Unpaved**	**Paved**	**Unpaved**	**Metal**	**Burned Area**	**Other**
Total blocks sampled	520	198	280	0	38	4	0	0
Blocks with exotics	283	164	98	0	18	3	0	0
Percent (%) blocks with exotics	54.4	82.8	35.0	0	47.4	75.0	0	0

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Diablo East monitoring transect at Amistad National Recreation Area.



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Collecting an unknown plant specimen at Amistad National Recreation Area.

tree tobacco in Rough Canyon) (Appendix A, Figures A.2, A.5 and A.6). Castorbean and Johnsongrass were limited in distribution to only two or three vectors in the lower density classes (fewer than 5 plants or scattered patches; Appendix A, Table A.1). Some species (Bermudagrass on the Marina Access Road vector, chastetree along the San Pedro vector, palm trees in Rough Canyon and Tamarix species on the Diablo East vector) were only detected in one or two blocks on a single transect and vector; however, they occurred at higher densities (Class 2), and/or at multiple distance classes. The most common situation observed on monitoring transects in the park was the presence of multiple species found at various distance classes and higher densities (Class 2 or greater).

Table 4. Number and percentage (%) of 50-meter survey blocks where exotic plant species were detected, Amistad National Recreation Area, 2011. Total number of survey blocks=520.

Scientific Name	Common Name	Total Number of Blocks	% of Blocks
Pennisetum ciliare	buffelgrass	148	28.5
Bothriochloa ischaemum	King Ranch bluestem	135	26.0
Cynodon dactylon	Bermudagrass	91	17.5
Nicotiana glauca	tree tobacco	29	5.6
Vitex agnus-castus	chastetree	26	5.0
Arundo donax	giant reed	13	2.5
Tamarix spp.	tamarisk	10	1.9
Ricinus communis	castorbean	6	1.2
Sorghum halepense	Johnsongrass	4	0.8
Washingtonia	palm tree	2	0.4
Centaurea melitensis	Maltese star-thistle	1	0.2
Tribulus terrestris	puncturevine	1	0.2

3.2 Big Bend National Park (including the Rio Grande Wild and Senic River)

Overall sampling at Big Bend NP included the primary paved roads around campgrounds and lodging areas in the Chisos Basin, secondary visitor centers, the two entrance roads into the park, and the paved road between the visitor center at Panther Junction and Rio Grande Village. Some trails were also surveyed. Transects are measured on a 1- to 3-year rotation (Appendix F, Figure F.3). During 2010 and 2011, the Chihuahuan Desert Network sampled a total of 1195 blocks within 46 transects located along high-invasion-probability vectors at Big Bend NP. Sampling effort occurred over a period of 4 days in October 2010 on a single transect, and 17 days in 2011 (6 days in May, 7 days in October and 4 days in November). The total linear effort in 2010 and 2011 was 29.9 km (18.6 mi), and, where possible, both sides of transects were surveyed. Through 2011, 327 springs have been surveyed in Big Bend NP, along with 19 uplands monitoring plots.

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Heterpogon contorous at Big Bend National Park.

Overall, approximately 29% (n=344) of the 1195 blocks surveyed at Big Bend NP contained exotic plants (Table 5). From the springs inventory, exotic plant species were detected at 137 springs (41.9%). Four species (giant reed, barnyardgrass, rabbitsfoot grass, and common sowthistle) were detected at springs that had not been previously detected in the exotic plant monitoring. The total number of exotic plants detected at Big Bend NP was 28 species (Table 6).

One additional species, *Heteropogon contortus* (tanglehead), is considered a native, but Big Bend NP resource's staff is interested in tracking its distribution as it may be spreading through the park. There is also some dispute as to the correct status of this species (http://ckwri.tamuk.edu/fileadmin/user_upload/docs/STN/Presentations/Tanglehead.pdf). In the event, this species' status changes to non-native, then the monitoring data may assist in future management decisions. Data for tanglehead are not included in Tables 5 or 6, but will be reported separately in the body of the report.

The Rio Grande Village Road vector contained the highest number of survey blocks with exotic plants (13.6%, n=163) followed by the Chisos Campground area (6.5%, n=78). Persimmon Gap Road (n=62), Chisos Lodge Perimeter (n=59) and Basin Sewer Road (n=57) all had similar rates of infestation, approximately 5% of blocks with exotic plants. Appendix B (Table B.1 and Figures B.2 through B.7) details where the

Table 5. Number of 50-meter survey blocks sampled by surface type during 2010 and 2011, Big Bend National Park.

		Roads		Trails			
Sampling Blocks	**Total Blocks**	**Paved**	**Unpaved**	**Paved**	**Unpaved**	**Burned Area**	**Other[1]**
Total blocks sampled	1,195	977	0	12	176	0	30
Blocks with exotics	344	279	0	0	35	0	30
Percent (%) blocks with exotics	28.8	28.6	0	0	19.9	0	100.0

[1]Other areas around facilities such as stores, motel, visitor center, parking lots, sidewalks



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Chisos Lodge at Big Bend National Park.

individual exotic plant species were observed by survey block.

Lehmann lovegrass was the most commonly found exotic species (19.5%, n=233 blocks), followed closely by King Ranch bluestem (11.2%, n=134 blocks). At a distant third was Bermudagrass (5.1%, n=61 blocks) (Table 6). These three exotic grass species are of particular concern, as they can spread to form monocultures, and they already occur at higher densities and frequencies than other exotic plant species recorded at the park.

Several exotic plant species were found in numbers small enough that targeted control measures at this time may preclude major effort in the future. Three species were found in density class 1 (fewer than 5 plants) in a single 50-meter block (garden tomato [Solanum lycopersicum], tree tobacco on the Basin Sewer Road, and tamarisk on the West Entrance Road; Appendix B, Figures B.3 and B.7). Little hogweed in the Chisos Campground, redstem stork's bill around the Chisos Lodge Perimeter and Chisos Store, Southern crabgrass on the Lower Basin Road, and mat amaranth on the Basin Sewer Road were only detected in three or fewer blocks on a single transect and vector; however, they occurred at density class 2 (scattered patches), while Brazilian vervain was limited in distribution to only three blocks on two vectors and at density class 1 (fewer than 5 plants; Appendix B, Table B.1). The most common situation encountered on monitoring transects in the park was the presence of multiple species found at various distance classes and higher densities (Class 2 or greater).

Tanglehead, a native species of interest to the park, was observed on only 6.7% of all blocks surveyed. These blocks were located on three vectors: Basin Sewer Plant Road–1 block; West Entrance Road–4 blocks; Rio Grande Village Road–74 blocks (Appendix B, Table B.2 and Figures B.8 through B.11).



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Rio Grande Village Road vector had the highest number of survey blocks with exotic plants. The mowed area adjacent to the road is the D1 distance class.

Table 6. Number and percentage (%) of primary (50-meter survey blocks) and secondary (springs) sample units where exotic plant species were detected, Big Bend National Park, 2010 and 2011. Total number of survey blocks was 1,195. Total number of springs surveyed was 327.

		Primary Sample Units (N=1,195)		Secondary Sample Units (N=327)	
Scientific name	**Common name**	**Total**	**% Blocks**	**Total**	**% Springs**
Eragrostis lehmanniana	Lehmann lovegrass	233	19.5	28	8.6
Bothriochloa ischaemum	King Ranch bluestem	134	11.2	n.d.	n.d.
Cynodon dactylon	Bermudagrass	61	5.1	38	11.6
Sorghum halepense	Johnsongrass	26	2.2	17	5.2
Marrubium vulgare	horehound	25	2.1	2	0.6
Calyptocarpus vialis	straggler daisy	21	1.8	n.d.	n.d.
Paspalum dilatatum	dallisgrass	17	1.4	3	0.9
Pennisetum ciliare	buffelgrass	17	1.4	5	1.5
Tribulus terrestris	puncturevine	14	1.2	n.d.	n.d.
Digitaria sanguinalis	hairy crabgrass	9	0.8	n.d.	n.d.
Echinochloa colona	jungle rice	7	0.6	n.d.	n.d.
Salsola tragus	prickly Russian thistle	7	0.6	2[a]	0.6
Eragrostis cilianensis	stinkgrass	5	0.4	n.d.	n.d.
Taraxacum officinale	common dandelion	5	0.4	n.d.	n.d.
Verbena brasiliensis	Brazilian vervain	5	0.4	n.d.	n.d.
Amaranthus blitoides	mat amaranth	3	0.3	n.d.	n.d.
Bromus catharticus	rescuegrass	3	0.3	n.d.	n.d.
Medicago polymorpha	burclover	3	0.3	n.d.	n.d.
Erodium cicutarium	redstem stork's bill	2	0.2	n.d.	n.d.
Portulaca oleracea	little hogweed	2	0.2	n.d.	n.d.
Digitaria ciliaris	southern crabgrass	1	0.1	n.d.	n.d.
Nicotiana glauca	tree tobacco	1	0.1	1	0.3
Solanum lycopersicum	garden tomato	1	0.1	n.d.	n.d.
Tamarix spp.	tamarisk	1	0.1	71[b]	21.7
Arundo donax	giant reed	n.d.	n.d.	4	1.2
Echinochloa crus-galli	barnyardgrass	n.d.	n.d.	1	0.3
Polypogon species	rabbitsfoot grass	n.d.	n.d.	1	0.3
Sonchus oleraceus	common sowthistle	n.d.	n.d.	1	0.3

[a] includes *Salsola* spp. and *S. tragus*

[b] includes *Tamarix* spp. and one *T. chinensis*

n.d. = not detected

3.3 Carlsbad Caverns National Park

Sampling at Carlsbad Caverns NP included the main paved highway through the park that leads to the Visitor Center (Carlsbad Caverns Highway), and Loop Road, the most frequently traveled unpaved road in the park. Some trails and other infrequently-traveled dirt roads were also surveyed. Transects are surveyed on a 1- or 2-year rotation (Appendix F, Figure F.4). During 2011, the CHDN sampled a total of 816 blocks within 21 transects located along eight high-invasion-probability vectors (roads and trails) at Carlsbad Caverns NP. Sampling effort occurred over a period of 15 days (6 days in August, 7 days in September and 2 days in November). The total linear effort in 2011 was 20.4 kilometers (12.7 mi), and, where possible, both sides of transects were surveyed. Forty-one springs were also surveyed. Uplands monitoring will begin at Carlsbad Caverns NP in 2012.

Overall, approximately 9% (n=75) of the 816 blocks surveyed at Carlsbad Caverns NP contained exotic plants (Table 7). From the springs inventory, exotic plant species were detected at seven springs (13.7%). No new species of exotic plants were observed at the spring locations that were not already detected during the exotic plant monitoring (Table 8). The rate of observance of exotic plants at Carlsbad Caverns NP is the lowest among all of the parks in the CHDN.

Ten species of exotic plants were observed at Carlsbad Caverns NP (Table 8). This was also the fewest number of exotic plants species found among all of the large CHDN park units.

No exotic plant species were detected on Rattlesnake Canyon and Yucca Canyon Trails. Only one exotic species was detected along the Sewage Treatment Road (Lehmann lovegrass in a single block), Slaughter Canyon Cave Trail (horehound in a single block), and Slaughter Canyon Road (field bindweed in a single block). Only three vectors had multiple exotic species (Slaughter Canyon Trail with two, the Loop road with three, and Carlsbad Caverns Highway with six). The Loop Road contained the highest number of survey blocks with exotic plants (n=51, 6.3%) followed by the Carlsbad Caverns Highway (n=27, 3.3%), and a distant third was Slaughter Canyon Trail (n=6, 0.7%). Appendix C (Table C.1 and Figures C.2 through C.7) details where the individual exotic plant species were observed by survey block. Exotic plants were detected at seven springs surveyed. Exotic plants were detected at seven springs surveyed (17.1%, n=41). Species included horehound (2 springs), Bermudagrass (3 springs), and Lehmann lovegrass (2 springs) (Table 8).

Lehmann lovegrass was the most commonly found exotic species (5.6%, n=46 blocks) and the only plant found in density class 3, "evenly distributed patches." The second most common (1.5%, n=12 blocks each) exotic species were rescue brome (*Bromus catharticus*) and stinkgrass (*Eragrostis cilianensis*). Combining all other exotic plant species present (n=17 blocks) still did not exceed the level of invasion by Lehmann lovegrass on the Loop Road. In addition to the Carlsbad Caverns Highway and the Loop Road, Lehmann lovegrass was observed in a single survey block adjacent to the Sewage Treatment Road (Appendix C, Table C.1 and Figures C.2 through C.7). Lehmann lovegrass and stinkgrass are of particular concern, as these two species can eventually spread to form monocultures, and they already occur at higher densities and frequencies than any

Table 7. Number of 50-meter survey blocks sampled by surface type during 2011, Carlsbad Caverns National Park.

		Roads		Trails				
Sampling Blocks	**Total Blocks**	**Paved**	**Unpaved**	**Paved**	**Unpaved**	**Metal**	**Burned Area**	**Other**
Total blocks sampled	816	280	382	0	154	0	0	0
Blocks with exotics	75	26	42	0	7	0	0	0
Percent (%) blocks with exotics	9.2	9.3	11.0	0	4.5	0	0	0

other exotic plant species recorded at the park.

Several exotic plant species were found in numbers small enough that minimal control measures at this time may preclude major effort in the future (Appendix C, Table C.1). Russain thistle (*Salsola kali*) was only found along the Loop Road in two survey blocks, in scattered patches or lower density, from the vector to 10 meters into the landscape. Field bindweed was observed in only one survey block along Slaughter Canyon Road in low densities (Appendix C, Figure C.6). Horehound and puncturevine were observed in survey blocks along the Slaughter Canyon Trail, and horehound was also observed on the Slaughter Canyon Cave Trail in density class 1 (five or fewer individual plants). Rescue brome, Bermudagrass, Mediterranean lovegrass (*E. barrelieri*), and Johnsongrass were found exclusively on transects running along the Carlsbad Caverns Highway (Appendix C, Figure C.2), but again at low frequency of occurrences and at moderate densities.

Table 8. Number and percentage (%) of primary (50-meter survey blocks) and secondary (springs) sample units where exotic plant species were detected, Carlsbad Caverns National Park, 2011. Total number of survey blocks was 816. Total number of springs surveyed was 41.

		Primary Sample Units (N=816)		Secondary Sample Units (N=41)	
Scientific name	**Common name**	**Total**	**% Blocks**	**Total**	**% Springs**
Eragrostis lehmanniana	Lehmann lovegrass	46	5.6	2	3.5
Bromus catharticus	rescue brome	12	1.5	n.d.	n.d.
Eragrostis cilianensis	stinkgrass	12	1.5	n.d.	n.d.
Tribulus terrestris	puncturevine	5	0.6	n.d.	n.d.
Cynodon dactylon	Bermudagrass	3	0.4	3	5.2
Eragrostis barrelieri	Mediterranean lovegrass	3	0.4	n.d.	n.d.
Marrubium vulgare	horehound	2	0.2	2	3.5
Salsola kali	Russian thistle	2	0.2	n.d.	n.d.
Convolvulus arvensis	field bindweed	1	0.1	n.d.	n.d.
Sorghum halepense	Johnsongrass	1	0.1	n.d.	n.d.

n.d. = not detected

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Slaughter Canyon Trail at Carlsbad Caverns National Park.

3.4 Fort Davis National Historic Site

Sampling at Fort Davis NHS included the main paved entrance road that leads to the Visitor Center and Administrative Offices, and the most frequently traveled unpaved road (i.e., Hospital Canyon Road) in the park. Several trails and other infrequently traveled dirt roads were also surveyed. Transects are measured twice a year (spring and fall), and annually (Appendix F, Figure F.5). During 2011, the CHDN sampled a total of 250 blocks within seven transects located along roads and trails at Fort Davis NHS. In addition to the roads and trails, 29 short (50-m) transects were surveyed within the area burned by the 2011 Rock House Fire. These small transects were randomly located and each contained two blocks (one left and one right). Sampling effort occurred over a period of 10 days (3 days in April, 5 days in September and 2 days in October). The total linear effort in 2011 was 7.7 km (4.8 mi), and, where possible, both sides of transects were surveyed. No springs were surveyed at Fort Davis, and ten upland plots were sampled in 2011.

Overall, almost 36% (n=110) of the 308 blocks surveyed at Fort Davis NHS contained exotic plants (Table 9).

A total of 10 species of exotic plants were observed at Fort Davis NHS (Table 10).

Only three vectors (out of 7) had significant numbers of survey blocks with exotic plants: Entrance Road (n=59, 19.1%), the Old El Paso-San Antonio Road (n=48, 15.6%) and Rock House Fire area (n=33, 10.7%). Appendix D (Table D.1 and Figures D.2 through D.7) details where the individual exotic plant species were observed by survey block.


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Parade grounds at Fort Davis National Historic Site.

Portulaca oleracea (little hogweed) was the most commonly found exotic species (5.4%, n=44 blocks), followed closely by Johnsongrass (4.2%, n=34 blocks). The third and fourth most common exotic species were puncturevine (3.4%, n=28 blocks) and lambsquarter (2.6%, n=21 blocks). Little hogweed and puncturevine were found in the most vectors (n=5), while common dandelion (*Taraxacum officinale*) was only found in a single block and vector, and at relatively low density. King Ranch bluestem was also detected on a single vector and transect, but in eight blocks with a distribution scattered throughout the block in a patchy or clumped manner (Appendix D, Table D.1).

Blocks on two out of seven vectors had replicated sampling (spring and fall 2011): Old El Paso-San Antonio Road and Entrance Road (Table 11). There were four exotic plants species detected in the spring sampling period, and only one of those species, horehound,

Table 9. Number of 50-meter survey blocks sampled by surface type during 2011, Fort Davis National Historic Site.

		Roads		Trails				
Sampling Blocks	**Total Blocks**	**Paved**	**Unpaved**	**Paved**	**Unpaved**	**Metal**	**Burned Area**	**Other**
Total blocks sampled	308	42	54	0	102	0	110	0
Blocks with exotics	110	28	6	0	38	0	38	0
Percent (%) blocks with exotics	35.7	66.7	11.1	0	37.3	0	34.5	0

was not detected in the fall. All other species were detected in the fall sampling period, and in greater number of blocks (n=70 vs. n=37) (Table 11). For each season, plants that had senesced, or were dormant or dead, were not recorded as detected within a block. Until more replicated sampling across years is conducted, no detailed trends or other analysis can be described.

Table 10. Number and percentage (%) of 50-meter survey blocks where exotic plant species were detected, Fort Davis NHS, 2011. Total number of blocks surveyed was 308.

Scientific Name	Common Name	Total Blocks	% Block
Portulaca oleracea	little hogweed	44	5.4
Sorghum halepense	Johnsongrass	34	4.2
Tribulus terrestris	puncturevine	28	3.4
Chenopodium album	lambsquarters	21	2.6
Cynodon dactylon	Bermudagrass	15	1.8
Bothriochloa ischaemum	King Ranch bluestem	8	1.0
Marrubium vulgare	horehound	8	1.0
Eragrostis cilianensis	stinkgrass	5	0.6
Salsola tragus	prickly Russian thistle	4	0.5
Taraxacum officinale	common dandelion	1	0.1

Table 11. Number of the same 50-meter blocks sampled in the spring and fall 2011, where exotic plant species were detected, Fort Davis National Historic Site, 2011.

				Total Blocks with Species	
Vector Name	**Transect ID**	**Scientific Name**	**Common Name**	**Spring 2011**	**Fall 2011**
Old El Paso-San Antonio Road[1]	FODA_EX_001	*Chenopodium album*	lambsquarters	12	7
		Cynodon dactylon	Bermudagrass	0	1
		Eragrostis cilianensis	stinkgrass	0	2
		Salsola tragus	prickly Russian thistle	0	1
		Sorghum halepense	Johnsongrass	14	7
		Tribulus terrestris	puncturevine	0	4
Entrance Road[2]	FODA_EX_003	*Bothriochloa ischaemum*	King Ranch bluestem	0	8
		Cynodon dactylon	Bermudagrass	7	7
		Eragrostis cilianensis	stinkgrass	0	3
		Marrubium vulgare	horehound	4	0
		Portulaca oleracea	little hogweed	0	7
		Salsola tragus	prickly Russian thistle	0	1
		Sorghum halepense	Johnsongrass	0	10
		Taraxacum officinale	common dandelion	0	1
		Tribulus terrestris	puncturevine	0	11

[1] FODA_EX_001-30 blocks surveyed in spring, 20 blocks surveyed in fall

[2] FODA_EX_003-22 blocks surveyed in spring, 20 blocks surveyed in fall

3.5 Guadalupe Mountains National Park

Sampling at Guadalupe Mountains National Park (NP) included the main paved highway (Highway 62/180) through the park and its median, paved roads through the only campground near the Visitor Center, and to the employees housing area, as well as some of the most frequently traveled unpaved roads (Dog Canyon Road, Frijole Ranch Road) in the park. One trail and other infrequently-traveled dirt roads were also surveyed. Transects are measured on a 1- or 2-year rotation (Appendix F, Figure F.6). During 2011, the CHDN sampled a total of 641 blocks within 15 transects located along high-invasion-probability vectors at Guadalupe Mountains NP (Table 12). Sampling effort occurred over a period of 12 days (6 days in April and 6 days in September). The number of transects surveyed per vector depended on the total length of the vector. The total linear effort in 2011 was 16.1 kilometers (10.0 mi), and, where possible, both sides of transects were surveyed. Twenty-nine springs were also surveyed. Twelve uplands monitoring plots were surveyed between 2010 and 2011 at Guadalupe Mountains NP.

Overall, approximately 42% (n=270) of the 641 blocks surveyed at Guadalupe Mountains NP contained exotic plants (Table 12). From the springs' inventory, exotic plant species were detected at three springs (3.5%). Jamaican sawgrass (*Cladium mariscus* spp. *jamaicense*) was observed at Manzanita and Choza Springs. This species was not detected during the early-detection surveys. Bermudagrass and horehound were also found at Manzanita Spring. Frijole Ranch Spring had the highest number of exotic plants detected: Bermudagrass, Lehmann lovegrass, horehound, and blue panic grass (Table 13). Appendix E (Table E.1) details where the individual exotic plant species were observed by survey block.

A total of 18 species of exotic plants were observed at Guadalupe Mountains NP (Table 13); however, all three species designations of *Melilotus* (*M. alba*, *M. officinalis*, and *M.* species) were combined into *Melilotus* species for analysis purposes.

Only two vectors had a single exotic plant species (Frijole Ranch Road and Pine Camp Loop). All other transects had 4–7 exotic species (Appendix E, Figures E.3 through E.5). Along four vectors, most of the survey blocks had exotic plants: U.S. Highway 62/180 Median (94.6%), Dog Canyon Road (86.5%), U.S. Highway 62/180 (63.9%), and blocks along segments of the old (unpaved) U.S. Highway 62/180 (58.0%). The Tejas Trail was the only trail vector surveyed, and exotic plant species were detected in approximately 50% (64 out of 128) of its blocks. As the monitoring team traveled up the trail, the number of exotic plants decreased (away from the more frequently visited areas), and beyond 500 m, only one instance of *Verbascum thapsus* (common mullein) was recorded.

Common mullein, Bermudagrass and Lehmann lovegrass were the three most common species of exotic plants detected in the park (Table 13). Only one exotic plant species, horehound, was found on almost all vectors (7 out of 8), and Lehmann lovegrass was detected on four vectors. Even though, stinkgrass was detected in <2% of the blocks surveyed (Table 13), Lehmann lovegrass

Table 12. Number of 50-meter survey blocks sampled by surface type during 2011, Guadalupe Mountains National Park.

		Roads		Trails				
Sampling Blocks	**Total Blocks**	**Paved**	**Unpaved**	**Paved**	**Unpaved**	**Metal**	**Burned Area**	**Other**
Total blocks sampled	641	357	180	0	104	0	0	0
Blocks with exotics	270	174	59	0	37	0	0	0
Percent (%) blocks with exotics	42.1	48.7	32.8	0	35.6	0	0	0

and stinkgrass are of particular concern, as these two species are known to spread, and are able to form monocultures. These two grasses occur at higher frequencies than any other exotic plant species recorded at the park (10% of blocks surveyed) (Appendix E, Figure E.5). Blocks on four out of eight vectors had replicated sampling (spring and fall 2011): Employee Road, Dog Canyon Road, Tejas Trail and New Corral Road (Table 14). Most exotic plant species (56.3%, n=9) in Guadalupe Mountains NP were only found on one or two vectors, in only one or two survey blocks, and at Class 1 densities (fewer than five plants) (Table 12, Appendix E, Table E.1).

There were four exotic plants species that were detected in the fall that were not observed in the spring sampling period: Lehman lovegrass, Bermudagrass, yellow salsify (*Tragopogon dubius*) and Russian thistle. All other species were detected in the spring sampling period, and in greater number of blocks (n=138 vs. n=70). For each season, plants that had senesced, or were dormant or dead, were not recorded as detected within a block. Until more replicated sampling across years is conducted, no detailed trends or other analysis can be described.

Table 13. Number and percentage of primary (50-meter survey blocks) and secondary (springs) sample units where exotic plant species were detected, Guadalupe Mountains National Park, 2011.

		Primary Sample Units (N=641)		Secondary Sample Units (N=29)	
Scientific name	**Common name**	**Total**	**% Blocks**	**Total**	**% Springs**
Verbascum thapsus	common mullein	71	8.6	n.d.	n.d.
Cynodon dactylon	Bermuda grass	70	8.5	1[b]	3.4
Eragrostis lehmanniana	Lehmann lovegrass	68	8.3	1	3.4
Marrubium vulgare	horehound	59	7.2	1	3.4
Sorghum halepense	Johnsongrass	52	6.3	n.d.	n.d.
Melilotus species[a]	clover species	48	5.8	n.d.	n.d.
Erodium cicutarium	red-stem stork's bill	32	3.9	n.d.	n.d.
Eragrostis cilianensis	stinkgrass	15	1.8	n.d.	n.d.
Xanthium spinosum	spiny cocklebur	5	0.6	n.d.	n.d.
Tragopogon dubius	yellow salsify	4	0.5	n.d.	n.d.
Salsola kali	Russian thistle	3	0.4	n.d.	n.d.
Bromus catharticus	rescuegrass	2	0.2	n.d.	n.d.
Setaria viridis	green bristlegrass	2	0.2	n.d.	n.d.
Apium graveolens	wild celery	1	0.1	n.d.	n.d.
Centaurea melitensis	Maltese star-thistle	1	0.1	n.d.	n.d.
Panicum antidotale	blue panic grass	n.d.	n.d.	1	3.4
Taraxacum officinale	common dandelion	1	0.1	n.d.	n.d.
Cladium mariscus spp. *jamaicense*	Jamaican sawgrass	n.d.	n.d.	2	6.9

[a]*Melilotus* species=*Melilotus* species, *M. alba* and *M. officinalis*

[b]All four exotic species were found at the same spring (Frijole Ranch Spring)

n.d. = not detected

Table 14. Number of the same 50-meter blocks sampled in the spring and fall 2011, where exotic plant species were detected, Guadalupe Mountains National Park, 2011.

				Total Blocks with Species	
Vector Name	**Transect ID**	**Scientific Name**	**Common Name**	**Spring 2011**	**Fall 2011**
Employee Road[1]	GUMO_EX_009	*Apium graveolens*	wild celery	1	0
		Centaurea melitensis	Maltese star-thistle	1	0
		Cynodon dactylon	Bermudagrass	3	1
		Eragrostis lehmanniana	Lehmann lovegrass	0	5
		Marrubium vulgare	horehound	5	1
		Melilotus spp.	sweetclover	6	0
		Sorghum halepense	Johnsongrass	1	1
Dog Canyon Road[2]	GUMO_EX_011	*Cynodon dactylon*	Bermudagrass	14	5
		Eragrostis cilianensis	stinkgrass	7	0
		Erodium cicutarium	redstem stork's bill	22	0
		Marrubium vulgare	horehound	12	14
		Verbascum thapsus	common mullein	17	14
		Xanthium spinosum	spiny cocklebur	4	0
Tejas Trail[3]	GUMO_EX_012	*Eragrostis cilianensis*	stinkgrass	6	0
		Erodium cicutarium	redstem stork's bill	10	0
		Marrubium vulgare	horehound	7	5
		Taraxacum officinale	common dandelion	1	0
		Tragopogon dubius	yellow salsify	0	4
		Verbascum thapsus	common mullein	16	13
		Xanthium spinosum	spiny cocklebur	1	0
New Corral Road[4]	GUMO_EX_015	*Cynodon dactylon*	Bermudagrass	0	2
		Eragrostis lehmanniana	Lehmann lovegrass	0	3
		Marrubium vulgare	horehound	4	1
		Salsola kali	Russian thistle	0	1

[1]GUMO_EX_009 - 42 blocks surveyed in spring, 40 blocks surveyed in fall
[2]GUMO_EX_011 - 32 blocks surveyed in spring, 32 blocks surveyed in fall
[3]GUMO_EX_012 - 40 blocks surveyed in spring, 24 blocks surveyed in fall
[4]GUMO_EX_015 - 32 blocks surveyed in spring, 28 blocks surveyed in fall

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Tejas Trail at Guadalupe Mountains National Park.

Chapter 4 Discussion

Exotic plant species were detected in almost one-third (n=1115) of the blocks sampled (n=3480) across all parks. Carlsbad Caverns NP had the lowest percentage of blocks with exotic plants (6.7%, n=75), while the other parks surveyed had at an average of 14% (9.9%-25.4%) of blocks with exotic plants. The survey results of Guadalupe Mountains NP and Amistad NRA combined make-up more than 50% of the blocks that contained exotic plants. These two parks are vastly different in environmental conditions and size, yet similar from the perspective of mode of invasion by exotic plants. A major U.S. highway bisects Guadalupe Mountains NP, and over 50% of all of the records of blocks with exotics occur along this corridor. In Amistad NRA, which is primarily a water-based park, high volume traffic is concentrated into the road systems leading to docks and other landing areas. Almost 40% of all of the blocks with exotics occur in these types of areas. These high volume traffic corridors will in general make exotic plant control difficult for these two park units.

Specific exotic species differ among the parks as environmental conditions change along the northwest–southeast gradient. Of the six species which contribute greater than 5% of the total number of occurrences of exotic plants, only two of these (Bermudagrass and Johnsongrass) were found in all CHDN parks that were sampled (Table 2). Almost 58% of exotic plant species occurring in the network were present in <1% of all of the blocks with exotics present. The vast majority of these species were only observed in one or two park units and in an average of 4.6 blocks (Table 2), making control of many individual exotic species a manageable task. Each park within the CHDN has its problematic exotic plants based on an individual park's management issues. In general, both the greatest diversity of exotics and the most established populations occur most frequently within the D1 distance class adjacent to the paved vectors (generally 2 m wide and occasionally mowed). There is also an indication that on some trails (Tejas Trail-Guadalupe Mountains NP, Pinnacles/Laguna Meadows and Amphitheater Trails-Big Bend NP), the number of detections of exotic plants declined further up the trail. On the Pinnacles/Laguna Meadows Trail, over 70% of detections on this transect were within the first 100 meters and 90% of the detections were within the first 200 meters, while on the Amphitheater Trail, 90% of the detections were noted in the first 100 meters. The Tejas Trail was a more gradual decline in the occurrence of exotic plants. Over 50% of the detections occurred in the first 250 meters of the transect, and over 90% of the detections occurred within the first 450 meters of the transect. These types of trends will be considered as additional years of data are acquired. Other trails surveyed had so few to no detections that no trends could be determined.

Each state produces a noxious weed list, but any particular species may not be considered noxious in all states where it is found. In fact, none of the species that occur in CHDN park units at rates >1% are on either the States of New Mexico or Texas' noxious plant lists or on any Federal list (http://plants.usda.gov/java/noxious?rptType=Federal, June 12, 2012). Therefore, a noxious species designation is just one of many components to be considered when determining the level of threat posed by a species. Of greater importance is the displacement of native species through the rate of spread and extent of an exotic, as well as impacts to natural fire regimes and natural vegetation communities.

The CHDN will continue to monitor the introduction, distribution, and spread of exotics in network parks, and maintain a system to rapidly communicate results to parks and the appropriate Exotic Plant Management Teams. It will be important for the CHDN to receive information about management activities relative to specific exotic species, which will help inform the interpretation of future monitoring results.

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Appendix A. Amistad National Recreation Area

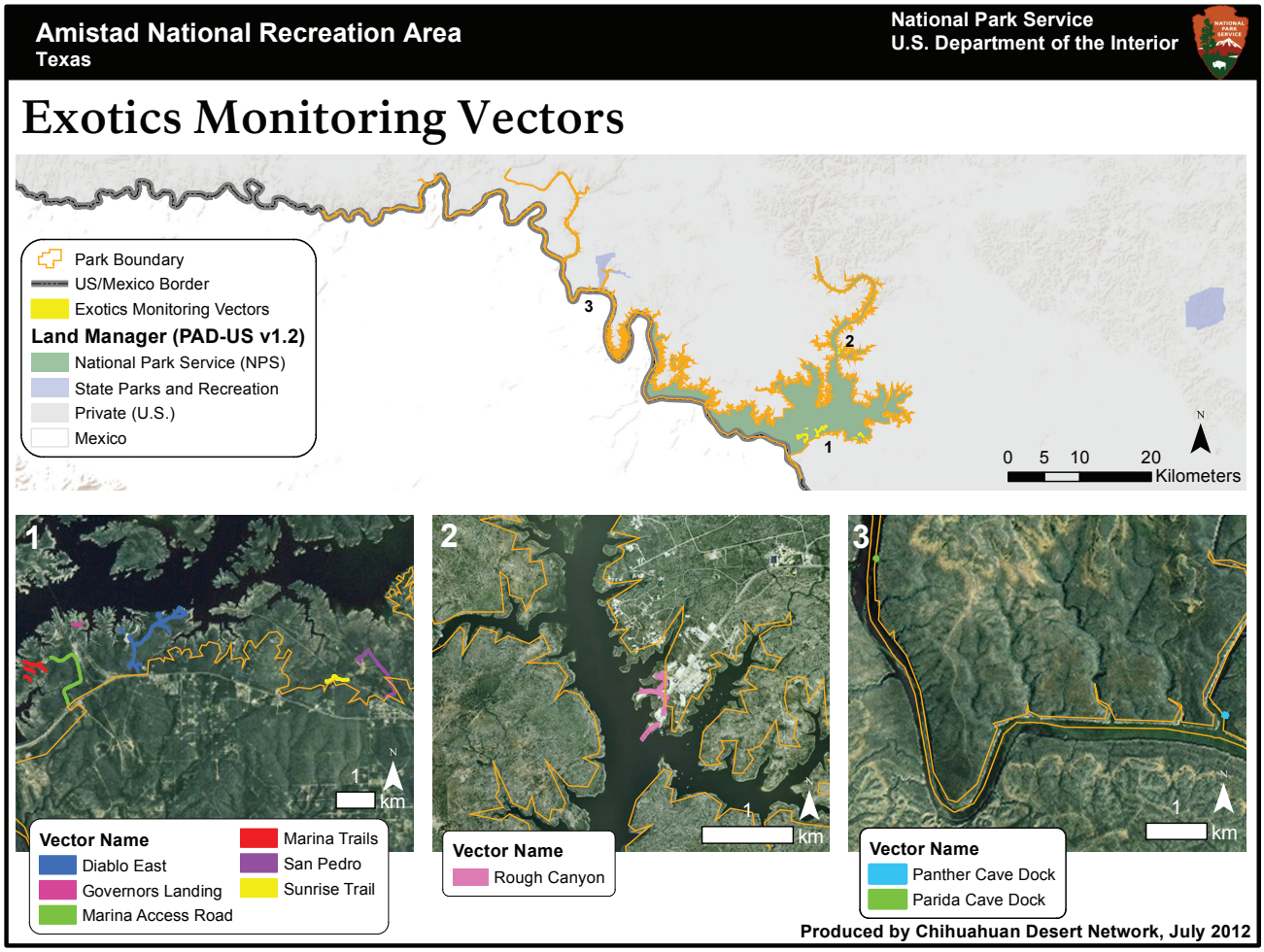


Figure A.1. Map of Amistad National Recreation Area showing monitoring transects and surrounding land ownership.

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011.

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Arundo donax	giant reed	San Pedro	AMIS_EX_037	R	010	0[b]	0	0	2
		Rough Canyon	AMIS_EX_045	L	001	0	2	0	0
			AMIS_EX_045	R	001	2	2	0	0
			AMIS_EX_047	L	001	0	0	2	0
			AMIS_EX_047	L	003	0	0	2	2
			AMIS_EX_047	L	004	1	0	0	0
			AMIS_EX_048	R	004	0	0	2	0
			AMIS_EX_048	R	005	0	0	2	0
			AMIS_EX_048	L	006	0	2	X	X
		Panther Cave Dock	AMIS_EX_056	R	001	0	0	2	X
			AMIS_EX_056	R	002	0	2	0	X
		Parida Cave Dock	AMIS_EX_057	L	001	0	2	0	X
			AMIS_EX_057	R	001	0	1	0	X
Bothriochloa ischaemum	King Ranch bluestem	Marina Access Road	AMIS_EX_014	R	001	2	0	0	0
			AMIS_EX_014	L	001	2	1	0	0
			AMIS_EX_014	L	002	1	0	0	0
			AMIS_EX_014	L	003	1	0	0	0
			AMIS_EX_014	R	007	2	0	0	0
			AMIS_EX_014	L	007	1	0	0	0
			AMIS_EX_014	L	009	1	0	0	0
			AMIS_EX_014	L	015	2	0	0	0
			AMIS_EX_014	R	015	2	0	X	X
			AMIS_EX_014	L	016	1	0	0	0
			AMIS_EX_016	R	004	2	0	0	0
		Governors Landing	AMIS_EX_019	L	002	2	0	0	0
			AMIS_EX_019	R	002	2	2	0	X
			AMIS_EX_019	R	003	2	0	0	X
		Marina Trails	AMIS_EX_020	R	006	2	0	X	X
			AMIS_EX_020	R	007	2	2	0	X
			AMIS_EX_021	R	009	2	2	0	X
			AMIS_EX_021	L	009	2	2	2	X
			AMIS_EX_023	R	005	2	2	2	0
			AMIS_EX_023	L	005	2	2	2	X
			AMIS_EX_024	L	004	3	3	3	3
			AMIS_EX_025	R	002	2	2	0	X
			AMIS_EX_025	L	003	2	2	0	0
			AMIS_EX_025	R	003	2	2	2	X
		Diablo East	AMIS_EX_026	R	001	2	0	0	0
			AMIS_EX_026	L	001	2	2	0	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bothriochloa ischaemum (cont.)	King Ranch bluestem	Diablo East	AMIS_EX_026	L	002	2	2	0	0
			AMIS_EX_026	R	003	2	0	0	0
			AMIS_EX_026	L	003	2	2	0	0
			AMIS_EX_026	R	004	2	2	2	2
			AMIS_EX_026	L	004	2	2	0	0
			AMIS_EX_026	R	005	2	0	0	0
			AMIS_EX_026	L	005	1	0	X	X
			AMIS_EX_026	L	006	2	0	X	X
			AMIS_EX_026	R	007	2	2	X	X
			AMIS_EX_026	L	008	2	2	0	X
			AMIS_EX_026	L	009	2	2	X	X
			AMIS_EX_026	L	010	3	0	0	0
			AMIS_EX_026	R	010	2	0	X	X
			AMIS_EX_026	L	012	0	2	2	0
			AMIS_EX_026	L	013	2	0	X	X
			AMIS_EX_026	L	014	2	0	0	0
			AMIS_EX_026	L	016	1	0	0	0
			AMIS_EX_026	L	018	1	0	0	X
			AMIS_EX_026	L	020	0	2	2	0
			AMIS_EX_027	L	001	2	2	X	X
			AMIS_EX_027	R	001	2	2	2	X
			AMIS_EX_027	L	002	2	2	X	X
			AMIS_EX_027	R	003	2	2	X	X
			AMIS_EX_027	L	004	2	2	X	X
			AMIS_EX_027	R	004	2	2	0	X
			AMIS_EX_028	R	016	2	0	0	0
			AMIS_EX_031	R	009	2	2	X	X
			AMIS_EX_031	L	009	2	2	2	X
			AMIS_EX_033	L	001	2	2	2	0
			AMIS_EX_033	L	002	2	0	X	0
			AMIS_EX_034	R	002	1	0	0	0
			AMIS_EX_034	L	003	1	0	0	0
			AMIS_EX_034	R	003	2	2	0	0
			AMIS_EX_034	L	004	2	2	0	0
			AMIS_EX_034	L	005	2	2	0	0
			AMIS_EX_034	L	006	0	2	2	2
		San Pedro	AMIS_EX_036	L	001	2	2	0	0
			AMIS_EX_036	R	001	2	0	0	0
			AMIS_EX_036	L	004	2	2	0	0
			AMIS_EX_036	R	004	2	2	2	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bothriochloa ischaemum (cont.)	King Ranch bluestem	San Pedro	AMIS_EX_036	R	005	2	2	2	X
			AMIS_EX_036	L	005	2	2	0	0
			AMIS_EX_036	L	006	0	2	X	X
			AMIS_EX_036	L	009	0	2	0	0
			AMIS_EX_036	R	015	0	2	0	0
			AMIS_EX_037	L	002	2	2	X	X
			AMIS_EX_037	L	003	0	2	2	0
			AMIS_EX_037	R	006	2	2	2	0
			AMIS_EX_037	L	006	2	0	0	X
			AMIS_EX_037	L	007	2	0	0	X
			AMIS_EX_037	R	007	0	0	2	0
			AMIS_EX_037	L	008	2	0	0	X
			AMIS_EX_037	R	008	2	2	2	0
			AMIS_EX_037	L	009	2	0	0	X
			AMIS_EX_037	R	009	2	2	2	0
			AMIS_EX_037	R	010	2	2	2	0
			AMIS_EX_037	L	010	2	2	0	X
			AMIS_EX_037	L	011	2	2	0	0
			AMIS_EX_037	R	011	3	3	2	3
			AMIS_EX_037	L	012	2	0	0	0
			AMIS_EX_037	R	012	3	3	3	3
			AMIS_EX_037	L	013	2	2	0	0
			AMIS_EX_037	R	013	2	2	0	0
			AMIS_EX_037	R	014	2	2	2	0
			AMIS_EX_037	L	014	2	2	0	0
			AMIS_EX_037	R	015	2	2	2	0
			AMIS_EX_037	L	015	2	0	0	0
			AMIS_EX_037	R	016	2	0	0	0
			AMIS_EX_037	L	016	2	2	0	0
			AMIS_EX_037	L	017	2	2	0	0
			AMIS_EX_037	R	017	2	2	2	0
			AMIS_EX_037	L	018	2	0	2	0
			AMIS_EX_037	R	018	2	2	2	0
			AMIS_EX_037	R	019	0	2	2	3
			AMIS_EX_037	L	019	2	2	2	0
			AMIS_EX_037	R	020	1	2	2	3
			AMIS_EX_037	L	020	2	2	2	0
		Rough Canyon	AMIS_EX_045	L	002	2	2	0	X
			AMIS_EX_045	L	005	2	2	0	X
			AMIS_EX_045	L	006	2	2	0	X

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bothriochloa ischaemum (cont.)	King Ranch bluestem	Rough Canyon	AMIS_EX_045	R	006	2	2	X	X
			AMIS_EX_046	R	001	2	0	X	X
			AMIS_EX_046	L	002	2	2	X	0
			AMIS_EX_046	L	004	2	0	0	0
			AMIS_EX_047	R	001	2	2	2	0
			AMIS_EX_047	L	001	3	3	3	0
			AMIS_EX_047	L	002	3	3	0	0
			AMIS_EX_047	L	003	2	2	0	0
			AMIS_EX_047	R	003	2	2	0	0
			AMIS_EX_048	L	001	2	2	0	X
			AMIS_EX_048	R	001	3	2	2	X
			AMIS_EX_048	R	002	2	2	2	X
			AMIS_EX_048	R	003	3	3	X	X
			AMIS_EX_048	R	004	2	2	2	0
			AMIS_EX_048	R	005	2	2	X	0
			AMIS_EX_048	R	006	2	2	0	0
			AMIS_EX_048	L	006	3	3	X	X
			AMIS_EX_049	L	001	2	0	X	X
			AMIS_EX_049	L	002	3	2	X	X
			AMIS_EX_049	R	002	2	2	X	X
		Sunrise Trail	AMIS_EX_055	L	001	2	2	0	X
			AMIS_EX_055	R	001	2	0	0	X
			AMIS_EX_055	R	002	2	2	0	X
			AMIS_EX_055	L	004	2	2	0	X
			AMIS_EX_055	L	005	2	2	0	X
			AMIS_EX_055	R	005	2	2	2	X
			AMIS_EX_055	L	006	2	2	0	X
			AMIS_EX_055	R	006	2	2	2	X
			AMIS_EX_055	L	007	2	0	0	X
Centaurea melitensis	Maltese star-thistle	Sunrise Trail	AMIS_EX_055	L	004	1	0	0	X
Cynodon dactylon	Bermudagrass	Marina Access Road	AMIS_EX_014	L	007	2	0	0	0
		Marina Trails	AMIS_EX_020	L	001	0	0	0	2
			AMIS_EX_020	L	002	0	0	0	2
			AMIS_EX_020	L	006	2	0	0	0
			AMIS_EX_020	R	007	2	2	0	X
			AMIS_EX_020	L	007	3	X	X	0
			AMIS_EX_021	R	009	2	2	0	X
			AMIS_EX_021	L	009	2	0	0	X
			AMIS_EX_023	R	005	2	2	1	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Cynodon dactylon (cont.)	Bermudagrass	Marina Trails	AMIS_EX_023	L	005	2	2	0	X
			AMIS_EX_024	L	004	2	2	0	0
			AMIS_EX_024	R	004	2	2	0	X
		Diablo East	AMIS_EX_026	L	001	2	0	0	0
			AMIS_EX_026	L	002	2	0	0	0
			AMIS_EX_026	L	003	2	0	0	0
			AMIS_EX_026	L	004	2	0	0	0
			AMIS_EX_026	R	004	2	2	2	2
			AMIS_EX_026	R	005	2	0	0	0
			AMIS_EX_026	L	005	2	0	X	X
			AMIS_EX_026	L	006	1	0	X	X
			AMIS_EX_026	L	007	1	0	0	X
			AMIS_EX_026	L	008	2	0	0	X
			AMIS_EX_026	L	009	2	0	X	X
			AMIS_EX_026	L	011	3	2	0	0
			AMIS_EX_026	L	012	3	3	3	0
			AMIS_EX_026	L	020	3	3	3	0
			AMIS_EX_027	L	001	2	2	X	X
			AMIS_EX_027	R	004	2	2	0	X
			AMIS_EX_027	L	004	2	0	X	X
			AMIS_EX_031	L	009	2	2	2	X
			AMIS_EX_031	R	009	2	2	X	X
			AMIS_EX_033	L	001	2	0	0	0
			AMIS_EX_033	R	001	2	0	0	0
			AMIS_EX_033	L	002	2	0	X	0
			AMIS_EX_033	R	003	1	0	X	X
			AMIS_EX_033	L	003	2	0	X	0
			AMIS_EX_033	R	004	2	2	0	0
			AMIS_EX_033	L	004	2	0	X	X
			AMIS_EX_034	L	001	1	0	0	0
			AMIS_EX_034	R	001	2	0	0	0
		San Pedro	AMIS_EX_037	R	009	2	2	2	0
			AMIS_EX_037	R	010	2	2	2	0
			AMIS_EX_037	L	010	2	2	0	X
			AMIS_EX_037	L	011	2	2	0	0
			AMIS_EX_037	L	013	2	0	0	0
			AMIS_EX_037	R	014	2	0	0	0
			AMIS_EX_037	L	014	2	2	0	0
			AMIS_EX_037	R	015	2	0	0	0
			AMIS_EX_037	L	015	2	0	0	0
			AMIS_EX_037	R	016	3	3	3	3

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Cynodon dactylon (cont.)	Bermudagrass	San Pedro	AMIS_EX_037	R	017	2	2	0	3
			AMIS_EX_037	R	018	2	2	2	4
		Rough Canyon	AMIS_EX_045	R	005	2	2	X	0
			AMIS_EX_045	R	006	3	3	X	X
			AMIS_EX_046	R	001	2	2	X	X
			AMIS_EX_046	L	002	2	2	X	0
			AMIS_EX_046	R	002	2	0	X	X
			AMIS_EX_046	L	003	2	X	0	0
			AMIS_EX_046	R	003	2	0	X	X
			AMIS_EX_046	R	004	2	0	X	X
			AMIS_EX_046	L	004	2	0	0	0
			AMIS_EX_047	L	001	3	3	0	0
			AMIS_EX_047	R	001	2	2	0	0
			AMIS_EX_047	L	002	3	3	3	0
			AMIS_EX_047	R	003	3	3	0	0
			AMIS_EX_047	L	003	2	3	3	0
			AMIS_EX_047	L	004	2	2	0	0
			AMIS_EX_047	R	004	2	2	0	0
			AMIS_EX_047	L	005	2	2	0	0
			AMIS_EX_047	R	005	2	2	0	0
			AMIS_EX_047	L	006	2	2	0	0
			AMIS_EX_048	L	001	2	2	0	X
			AMIS_EX_048	R	001	4	2	2	X
			AMIS_EX_048	R	002	2	2	2	X
			AMIS_EX_048	L	002	2	2	0	X
			AMIS_EX_048	L	003	2	2	X	X
			AMIS_EX_048	R	003	3	3	X	X
			AMIS_EX_048	R	004	2	2	2	0
			AMIS_EX_048	L	004	2	X	X	X
			AMIS_EX_048	L	005	2	X	X	X
			AMIS_EX_048	R	005	2	2	X	0
			AMIS_EX_048	R	006	2	2	0	0
			AMIS_EX_048	L	006	3	3	X	X
			AMIS_EX_049	R	002	2	2	X	X
			AMIS_EX_049	L	002	2	2	X	X
		Sunrise Trail	AMIS_EX_055	L	001	3	3	0	X
			AMIS_EX_055	R	001	2	2	0	X
			AMIS_EX_055	L	005	2	2	0	X
			AMIS_EX_055	L	006	3	0	0	X
			AMIS_EX_055	L	017	1	0	0	X
			AMIS_EX_055	R	017	1	0	0	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Nicotiana glauca	tree tobacco	Marina Access Road	AMIS_EX_014	L	014	0	0	0	2
		Governors Landing	AMIS_EX_019	L	003	0	0	0	2
			AMIS_EX_019	L	005	0	0	0	2
			AMIS_EX_019	R	006	0	0	0	2
		Marina Trails	AMIS_EX_020	L	006	2	2	0	0
			AMIS_EX_020	R	006	1	1	X	X
			AMIS_EX_020	L	007	1	X	X	0
			AMIS_EX_021	L	009	1	1	2	X
			AMIS_EX_021	R	009	2	2	0	X
			AMIS_EX_023	L	005	1	2	0	X
			AMIS_EX_023	R	005	0	1	1	0
			AMIS_EX_024	L	003	0	0	2	2
			AMIS_EX_024	R	004	0	2	2	X
			AMIS_EX_024	L	004	1	2	2	0
			AMIS_EX_025	L	002	0	2	2	2
			AMIS_EX_025	R	003	2	0	0	X
			AMIS_EX_025	L	003	2	2	2	2
		Diablo East	AMIS_EX_027	L	002	0	1	X	X
			AMIS_EX_027	R	004	0	2	0	X
			AMIS_EX_027	L	004	2	2	X	X
			AMIS_EX_029	L	017	0	0	0	2
			AMIS_EX_029	L	018	0	0	0	2
			AMIS_EX_031	L	009	1	2	2	X
			AMIS_EX_031	R	009	0	2	X	X
		Rough Canyon	AMIS_EX_047	L	001	0	0	1	0
		Panther Cave Dock	AMIS_EX_056	R	001	1	0	0	X
			AMIS_EX_056	L	001	2	2	2	2
		Parida Cave Dock	AMIS_EX_057	L	001	2	2	0	X
			AMIS_EX_057	R	001	0	2	2	X
Pennisetum ciliare	buffelgrass	Marina Access Road	AMIS_EX_014	R	001	2	0	0	0
			AMIS_EX_014	R	002	1	0	0	0
			AMIS_EX_014	L	002	2	0	0	0
			AMIS_EX_014	R	004	0	2	0	0
			AMIS_EX_014	L	004	1	0	0	0
			AMIS_EX_014	R	005	0	2	2	0
			AMIS_EX_014	L	005	2	2	2	0
			AMIS_EX_014	R	006	2	3	3	2
			AMIS_EX_014	L	006	2	2	0	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Pennisetum ciliare (cont.)	buffelgrass	Marina Access Road	AMIS_EX_014	R	007	3	3	3	2
			AMIS_EX_014	L	007	2	3	3	0
			AMIS_EX_014	L	008	2	3	3	0
			AMIS_EX_014	R	008	3	3	3	X
			AMIS_EX_014	R	009	3	3	2	X
			AMIS_EX_014	L	009	1	3	3	0
			AMIS_EX_014	L	010	1	3	2	0
			AMIS_EX_014	R	010	2	2	2	X
			AMIS_EX_014	R	011	2	2	2	X
			AMIS_EX_014	L	011	0	2	0	0
			AMIS_EX_014	L	012	0	2	0	0
			AMIS_EX_014	R	012	2	2	2	X
			AMIS_EX_014	R	013	2	2	0	X
			AMIS_EX_014	L	013	0	2	0	0
			AMIS_EX_014	L	014	0	2	2	2
			AMIS_EX_014	R	014	2	2	0	0
			AMIS_EX_014	R	015	2	2	X	X
			AMIS_EX_014	L	015	0	2	2	2
			AMIS_EX_014	L	016	0	2	2	0
			AMIS_EX_014	R	016	2	2	2	2
			AMIS_EX_014	R	017	2	2	2	2
			AMIS_EX_014	L	017	0	2	2	0
			AMIS_EX_014	R	018	2	2	2	2
			AMIS_EX_014	L	018	2	2	0	0
			AMIS_EX_014	R	019	2	3	3	3
			AMIS_EX_014	L	019	0	2	2	0
			AMIS_EX_014	R	020	2	2	2	2
			AMIS_EX_014	L	020	0	2	2	0
			AMIS_EX_015	R	001	2	2	2	0
			AMIS_EX_015	L	001	0	2	0	0
			AMIS_EX_015	L	002	0	2	0	0
			AMIS_EX_015	R	002	2	2	2	0
			AMIS_EX_015	R	003	2	2	0	0
			AMIS_EX_015	R	004	2	2	0	0
			AMIS_EX_015	L	005	0	2	0	0
			AMIS_EX_015	R	005	2	2	0	0
			AMIS_EX_015	R	006	2	2	0	0
			AMIS_EX_015	R	007	2	2	X	X
			AMIS_EX_015	L	007	0	2	0	0
			AMIS_EX_015	R	008	3	2	2	3
			AMIS_EX_015	L	008	0	2	0	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Pennisetum ciliare (cont.)	buffelgrass	Marina Access Road	AMIS_EX_015	L	009	0	2	2	0
			AMIS_EX_015	R	009	3	2	2	2
			AMIS_EX_015	L	010	0	2	2	0
			AMIS_EX_015	R	010	2	2	2	2
			AMIS_EX_015	L	011	0	2	0	0
			AMIS_EX_015	R	012	2	2	0	0
			AMIS_EX_015	R	013	2	2	0	0
			AMIS_EX_015	R	014	2	2	2	2
			AMIS_EX_015	L	014	0	2	0	0
			AMIS_EX_015	L	015	0	2	0	0
			AMIS_EX_015	R	015	2	2	0	0
			AMIS_EX_015	R	016	2	2	0	0
			AMIS_EX_015	L	016	0	2	0	0
			AMIS_EX_015	L	017	2	2	0	0
			AMIS_EX_015	R	017	2	2	X	X
			AMIS_EX_015	R	018	2	2	0	0
			AMIS_EX_015	R	019	2	2	0	0
			AMIS_EX_015	R	020	2	2	0	0
			AMIS_EX_016	L	001	0	2	0	0
			AMIS_EX_016	L	003	0	2	2	0
			AMIS_EX_016	R	004	2	2	0	0
			AMIS_EX_016	L	004	0	2	0	0
			AMIS_EX_016	L	005	2	2	0	0
		Governors Landing	AMIS_EX_019	L	001	2	2	0	0
			AMIS_EX_019	R	001	2	3	3	X
			AMIS_EX_019	R	002	2	2	0	X
			AMIS_EX_019	L	002	2	2	2	0
			AMIS_EX_019	R	003	2	2	2	X
			AMIS_EX_019	L	003	2	0	0	0
			AMIS_EX_019	L	004	2	0	0	0
			AMIS_EX_019	R	004	2	0	X	X
			AMIS_EX_019	R	005	2	2	X	X
			AMIS_EX_019	L	005	2	2	0	0
			AMIS_EX_019	L	006	2	0	0	0
			AMIS_EX_019	R	006	2	2	2	0
		Diablo East	AMIS_EX_026	R	001	2	0	0	0
			AMIS_EX_026	R	002	2	0	0	0
			AMIS_EX_026	L	003	1	2	0	0
			AMIS_EX_026	R	003	2	2	0	0
			AMIS_EX_026	R	004	0	2	2	2

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Pennisetum ciliare (cont.)	buffelgrass	Diablo East	AMIS_EX_026	L	004	0	2	2	0
			AMIS_EX_026	L	005	2	2	X	X
			AMIS_EX_026	R	005	0	2	0	0
			AMIS_EX_026	R	006	0	2	X	X
			AMIS_EX_026	L	006	0	2	X	X
			AMIS_EX_026	R	007	2	2	X	X
			AMIS_EX_026	L	007	2	2	0	X
			AMIS_EX_026	L	008	2	2	0	X
			AMIS_EX_026	R	008	2	2	X	X
			AMIS_EX_026	L	009	0	2	X	X
			AMIS_EX_026	R	010	2	2	X	X
			AMIS_EX_026	L	010	1	0	0	0
			AMIS_EX_026	R	011	2	0	X	X
			AMIS_EX_026	R	012	2	0	X	X
			AMIS_EX_026	L	012	1	2	2	0
			AMIS_EX_026	L	013	2	2	X	X
			AMIS_EX_026	L	014	0	2	0	0
			AMIS_EX_026	L	016	0	2	0	0
			AMIS_EX_026	L	017	0	2	0	X
			AMIS_EX_026	L	020	1	0	0	0
			AMIS_EX_026	R	020	2	2	0	0
			AMIS_EX_027	R	001	2	2	2	X
			AMIS_EX_027	L	001	2	2	X	X
			AMIS_EX_027	L	002	2	2	X	X
			AMIS_EX_027	L	004	2	0	X	X
			AMIS_EX_027	R	004	2	2	0	X
			AMIS_EX_028	R	006	2	0	0	0
			AMIS_EX_028	L	006	2	2	0	0
			AMIS_EX_028	R	007	2	2	0	0
			AMIS_EX_028	L	007	2	0	0	0
			AMIS_EX_028	R	008	2	2	1	0
			AMIS_EX_028	L	013	0	2	2	0
			AMIS_EX_028	R	014	2	0	0	0
			AMIS_EX_028	R	015	2	2	2	2
			AMIS_EX_029	R	004	2	2	2	X
			AMIS_EX_029	L	014	1	0	0	0
			AMIS_EX_032	R	005	1	0	0	X
			AMIS_EX_032	L	006	2	0	0	0
			AMIS_EX_032	L	007	3	2	2	0
			AMIS_EX_032	L	008	2	2	2	0
			AMIS_EX_033	L	001	2	2	0	0

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Pennisetum ciliare (cont.)	buffelgrass	Diablo East	AMIS_EX_033	R	001	2	2	0	0
			AMIS_EX_033	R	002	2	2	X	X
			AMIS_EX_033	L	002	2	2	X	0
			AMIS_EX_034	R	001	2	2	0	0
			AMIS_EX_034	R	002	2	2	0	0
			AMIS_EX_034	R	003	2	0	0	0
			AMIS_EX_034	R	004	1	0	0	0
			AMIS_EX_034	R	005	1	0	0	0
			AMIS_EX_034	R	006	1	0	0	0
		San Pedro	AMIS_EX_036	R	001	2	2	2	0
			AMIS_EX_036	L	001	2	2	0	0
			AMIS_EX_036	L	002	1	0	0	0
			AMIS_EX_036	R	002	2	0	0	X
			AMIS_EX_037	L	014	0	0	2	0
		Rough Canyon	AMIS_EX_047	R	001	2	0	0	0
		Panther Cave Dock	AMIS_EX_056	R	001	1	0	0	X
			AMIS_EX_056	L	001	2	2	2	2
Ricinus communis	castorbean	Governors Landing	AMIS_EX_019	L	003	0	0	0	2
			AMIS_EX_019	L	005	0	0	0	2
			AMIS_EX_019	R	006	0	0	0	2
		Diablo East	AMIS_EX_029	L	018	0	0	0	2
		Parida Cave Dock	AMIS_EX_057	L	001	1	2	0	X
			AMIS_EX_057	R	001	2	2	0	X
Sorghum halepense	Johnsongrass	San Pedro	AMIS_EX_037	R	014	2	2	0	0
			AMIS_EX_037	R	015	1	0	0	0
		Rough Canyon	AMIS_EX_048	R	004	0	0	2	0
			AMIS_EX_048	R	006	2	0	0	0
Tamarix species	tamarisk	Marina Trails	AMIS_EX_021	L	009	0	0	1	X
			AMIS_EX_021	R	009	0	1	2	X
			AMIS_EX_023	L	005	0	1	0	X
			AMIS_EX_023	R	005	0	0	2	2
			AMIS_EX_024	L	003	0	0	0	1
			AMIS_EX_024	L	004	0	0	0	1
			AMIS_EX_025	L	002	0	2	2	2
			AMIS_EX_025	R	003	0	0	1	X
			AMIS_EX_025	L	003	0	2	2	2
		Diablo East	AMIS_EX_027	R	004	2	2	0	X

Table A.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Amistad NRA, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Tribulus terrestris	puncturevine	Diablo East	AMIS_EX_033	R	003	1	0	X	X
Vitex agnus-castus	chastetree	Marina Trails	AMIS_EX_021	L	009	1	0	0	X
			AMIS_EX_021	R	009	0	1	0	X
			AMIS_EX_024	R	004	0	1	1	X
			AMIS_EX_025	L	002	0	0	0	1
		Diablo East	AMIS_EX_027	R	004	0	2	0	X
			AMIS_EX_031	L	009	1	0	0	X
			AMIS_EX_031	R	009	0	2	X	X
		San Pedro	AMIS_EX_037	L	016	0	2	0	0
		Rough Canyon	AMIS_EX_047	L	002	2	2	0	0
			AMIS_EX_047	R	002	0	0	0	2
			AMIS_EX_047	R	003	0	0	0	2
			AMIS_EX_047	L	003	0	0	2	2
			AMIS_EX_047	L	005	0	2	0	0
			AMIS_EX_048	L	003	2	2	X	X
			AMIS_EX_048	L	004	3	X	X	X
			AMIS_EX_048	L	005	3	X	X	X
			AMIS_EX_048	R	005	0	2	X	0
			AMIS_EX_048	L	006	2	2	X	X
			AMIS_EX_048	R	006	2	2	0	0
		Sunrise Trail	AMIS_EX_055	R	001	2	2	0	X
			AMIS_EX_055	L	001	1	1	0	X
			AMIS_EX_055	L	002	1	0	0	X
			AMIS_EX_055	R	003	2	2	1	0
			AMIS_EX_055	L	003	2	0	0	X
			AMIS_EX_055	R	004	2	2	2	X
			AMIS_EX_055	R	008	0	1	1	1
Washingtonia species	palm tree	Rough Canyon	AMIS_EX_045	R	001	0	0	0	1
			AMIS_EX_045	R	004	0	0	X	2

[a] Distance class: 1=from edge of vector to 1.5 or 2 meters in; 2=from transect (at 1.5–2 meters in) to 10 meters; 3=10–20 meters; 4=over 20 meters into the landscape

[b] Density class: 0=species not detected; 1=1–5 plants; 2=scattered patches; 3=evenly distributed patches; 4=matrix; X=no data (topography obscured distance class)

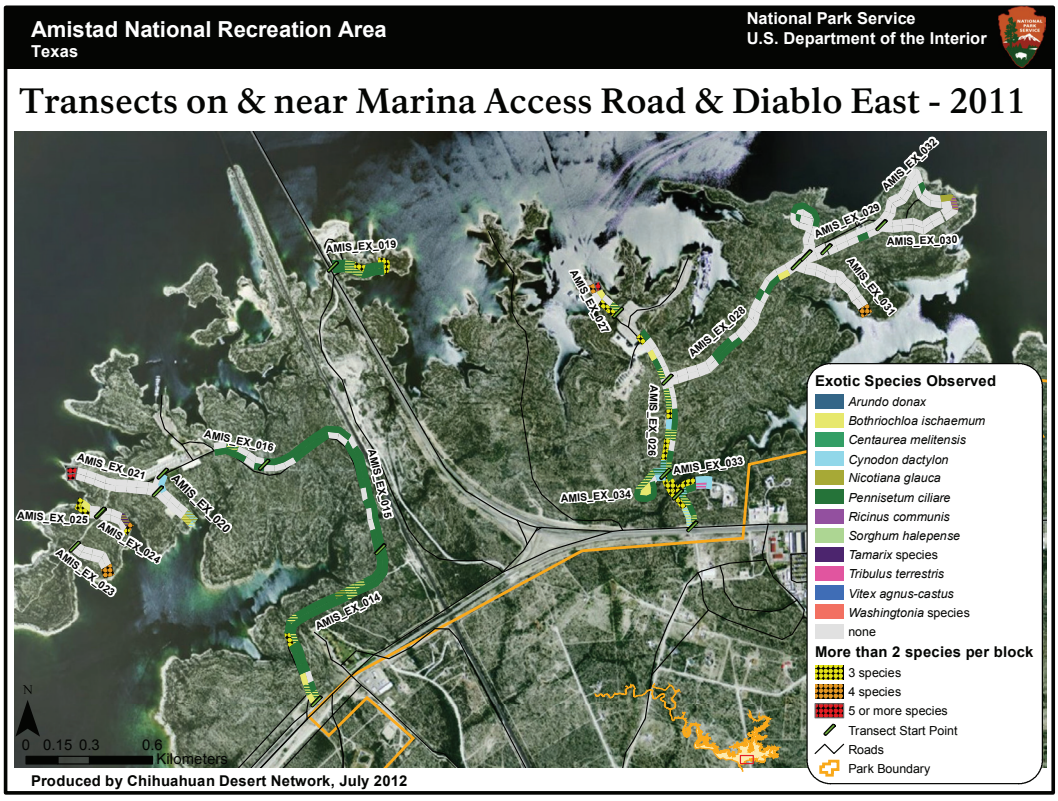


Figure A.2. Exotic plant locations along transects on the Marina Access Road and Diablo East vectors.

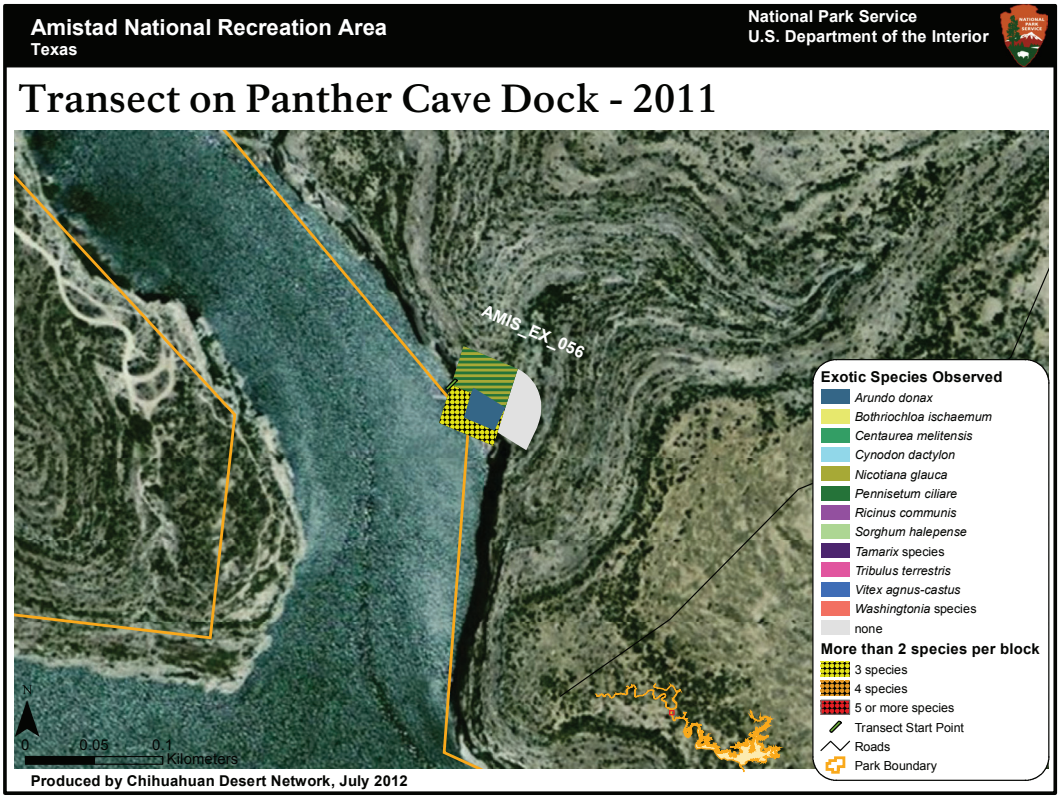


Figure A.3. Exotic plant locations along transects on the Panther Cave Dock vector.

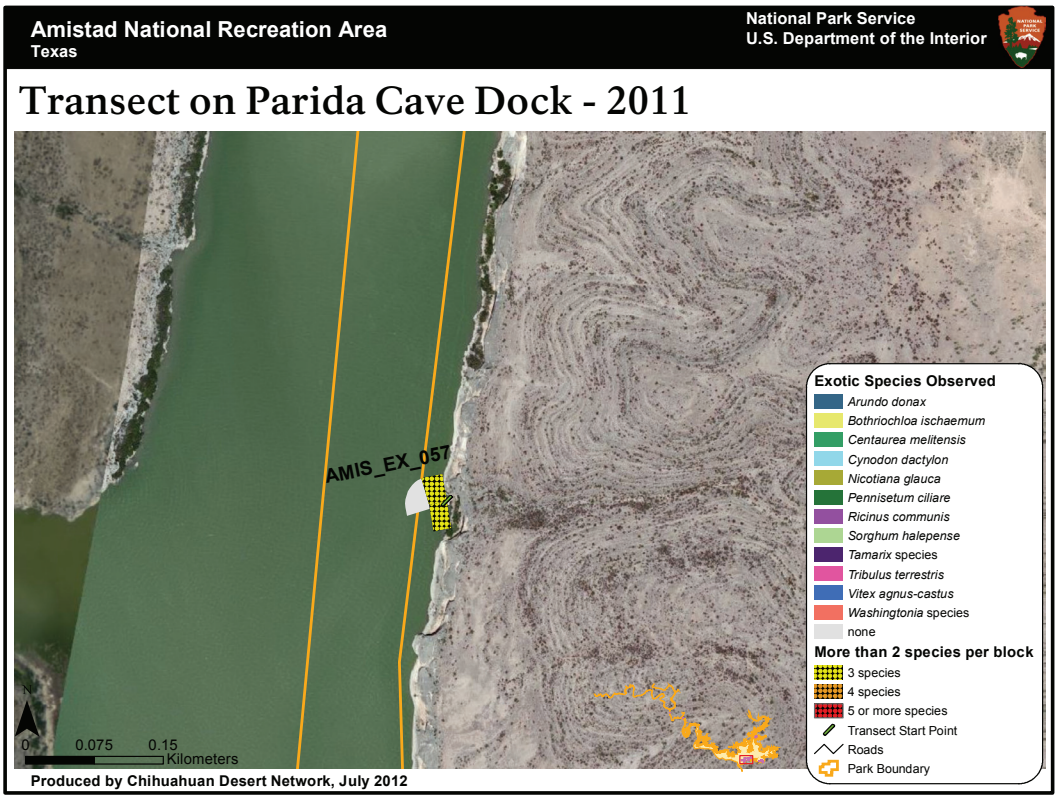


Figure A.4. Exotic plant locations along transects on the Parida Cave Dock vector.

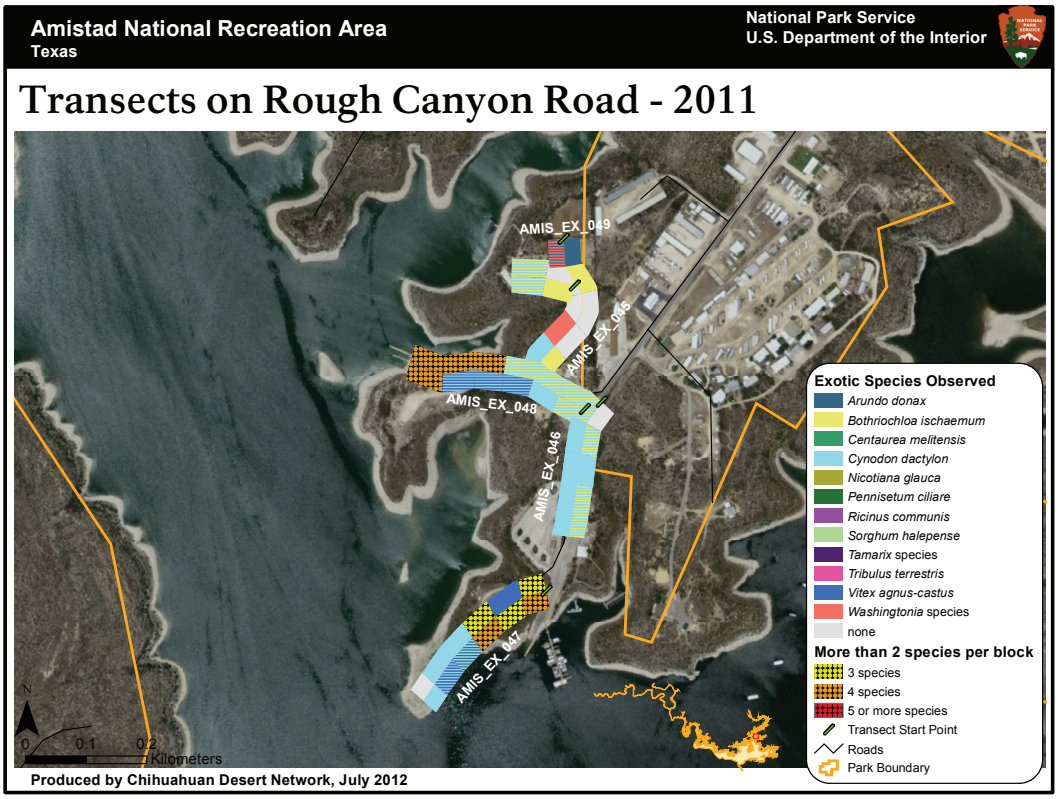


Figure A.5. Exotic plant locations along transects on the Rough Canyon Road vector.

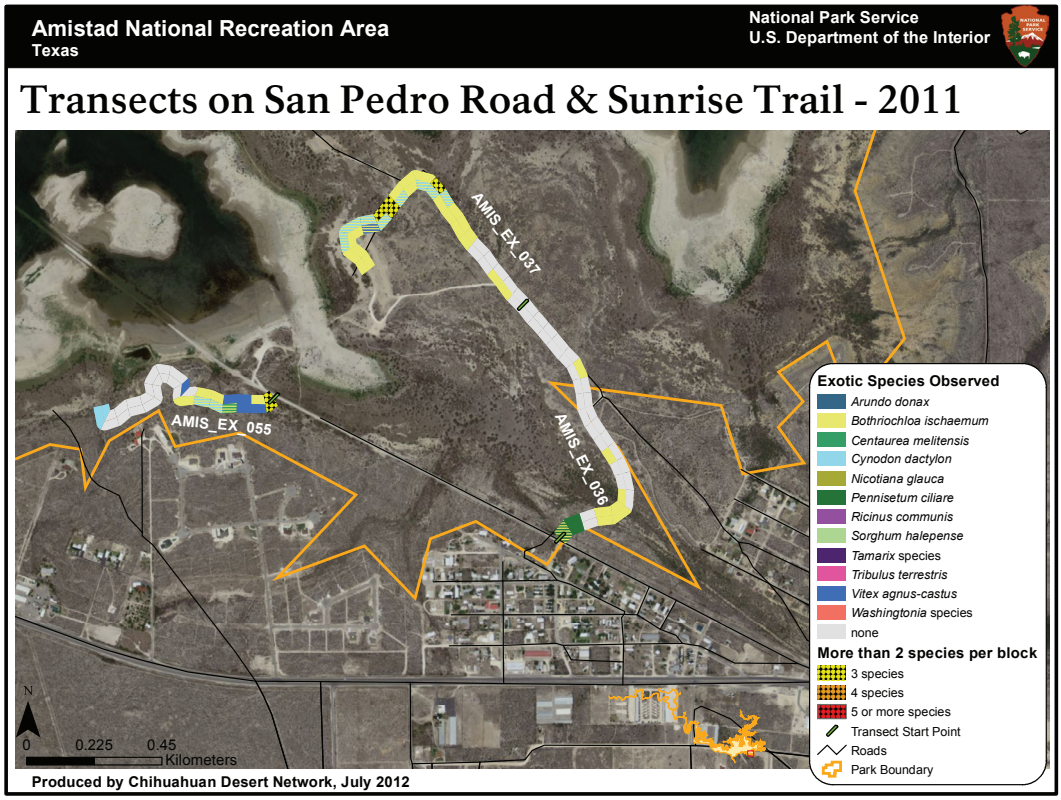


Figure A.6. Exotic plant locations along transects on the San Pedro Road and Sunrise Trail vectors.

Appendix B. Big Bend National Park

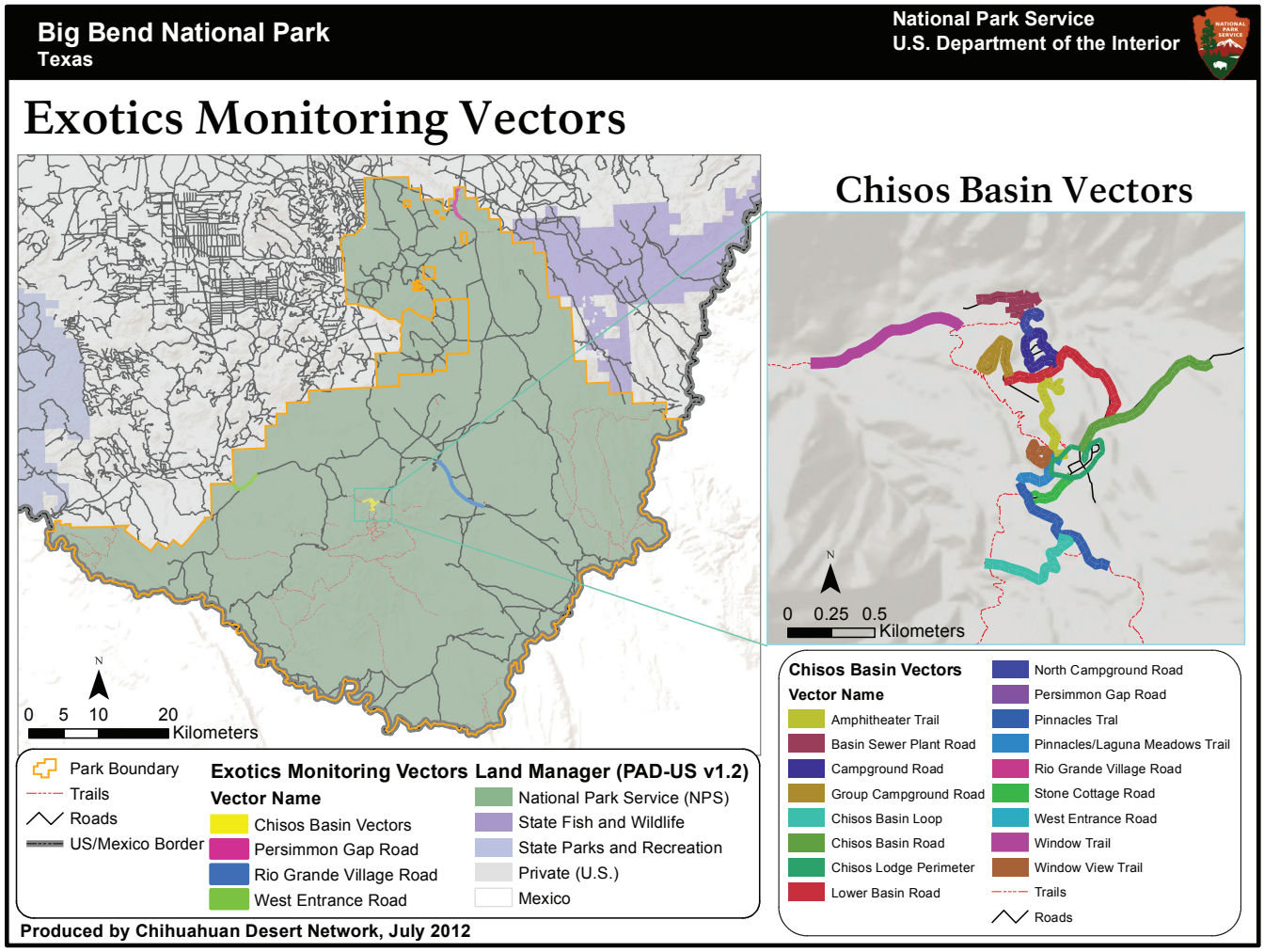


Figure B.1. Map of Big Bend National Park showing monitoring transects and surrounding land ownership.

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011.

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Amaranthus blitoides	mat amaranth	Basin Sewer Plant Road	BIBE_EX_003	R	007	1[b]	0	0	X
			BIBE_EX_003	R	008	1	0	X	X
			BIBE_EX_003	L	013	2	0	X	X
Bothriochloa ischaemum	King Ranch bluestem	Amphitheater Trail	BIBE_EX_002	L	001	2	2	2	X
			BIBE_EX_002	R	001	2	2	0	0
			BIBE_EX_002	R	002	2	2	2	2
			BIBE_EX_002	L	002	2	2	2	X
			BIBE_EX_002	R	003	0	2	2	0
		Basin Sewer Plant Road	BIBE_EX_003	L	001	1	0	X	X
			BIBE_EX_003	R	008	1	0	X	X
			BIBE_EX_003	L	008	1	0	0	X
			BIBE_EX_003	L	009	2	0	X	X
			BIBE_EX_003	R	009	2	2	X	X
			BIBE_EX_003	R	010	1	0	X	X
			BIBE_EX_003	L	010	2	0	X	X
			BIBE_EX_003	L	011	2	0	X	X
			BIBE_EX_003	R	011	2	0	X	X
			BIBE_EX_003	L	012	2	0	X	X
			BIBE_EX_003	R	012	2	X	X	X
			BIBE_EX_003	R	013	2	0	X	X
		Campground	BIBE_EX_004	R	001	2	2	X	X
			BIBE_EX_004	L	001	2	2	0	X
			BIBE_EX_004	L	002	2	2	X	X
			BIBE_EX_004	R	002	2	2	X	X
			BIBE_EX_004	R	003	2	0	X	X
			BIBE_EX_004	L	003	2	2	0	X
			BIBE_EX_004	L	004	2	2	0	X
			BIBE_EX_004	L	005	2	2	0	X
			BIBE_EX_004	R	005	2	0	X	X
			BIBE_EX_004	R	006	2	0	X	X
			BIBE_EX_004	L	006	2	2	X	X
			BIBE_EX_004	L	007	0	2	2	X
			BIBE_EX_004	R	007	2	0	0	X
			BIBE_EX_004	R	008	2	0	X	X
			BIBE_EX_004	L	009	2	0	X	X
			BIBE_EX_004	R	009	2	2	2	X
			BIBE_EX_004	L	010	2	2	X	X
			BIBE_EX_004	R	010	2	2	X	X
			BIBE_EX_004	L	011	2	2	0	X
			BIBE_EX_004	R	011	1	2	0	X
			BIBE_EX_004	R	012	1	0	0	0

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bothriochloa ischaemum (cont.)	King Ranch bluestem	Campground	BIBE_EX_004	L	012	2	0	0	X
			BIBE_EX_004	L	013	2	2	X	X
			BIBE_EX_004	R	013	2	2	2	0
		North Campground Road	BIBE_EX_005	R	001	2	2	X	X
			BIBE_EX_005	L	001	2	0	X	X
			BIBE_EX_005	R	002	2	2	X	X
			BIBE_EX_005	L	002	2	0	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	R	001	2	0	0	X
			BIBE_EX_006	L	001	2	2	0	X
			BIBE_EX_006	L	002	2	0	0	X
			BIBE_EX_006	L	006	2	0	X	X
			BIBE_EX_006	R	008	2	0	X	X
			BIBE_EX_006	R	009	2	1	X	X
			BIBE_EX_006	L	010	2	0	0	X
			BIBE_EX_006	L	012	2	0	X	X
			BIBE_EX_006	L	013	2	0	0	X
		Chisos Basin Road	BIBE_EX_008	R	001	2	2	0	X
			BIBE_EX_008	L	001	2	2	X	X
			BIBE_EX_008	L	002	2	0	X	X
			BIBE_EX_008	R	002	2	2	0	X
			BIBE_EX_008	L	003	2	0	X	X
			BIBE_EX_008	R	003	2	2	X	X
			BIBE_EX_008	R	004	2	X	X	X
			BIBE_EX_008	R	005	2	X	X	X
			BIBE_EX_008	L	005	1	X	X	X
			BIBE_EX_008	L	009	2	0	X	X
			BIBE_EX_008	R	009	2	0	X	X
			BIBE_EX_008	L	010	2	X	X	X
			BIBE_EX_008	R	016	2	0	X	X
			BIBE_EX_008	R	017	2	0	X	X
		Chisos Lodge Perimeter	BIBE_EX_015	L	001	2	0	X	X
			BIBE_EX_015	L	004	2	2	X	X
			BIBE_EX_015	L	005	0	1	X	X
			BIBE_EX_015	L	006	2	0	X	X
			BIBE_EX_015	L	007	1	X	X	X
			BIBE_EX_015	L	008	2	1	X	X
			BIBE_EX_015	L	009	2	0	X	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bothriochloa ischaemum (cont.)	King Ranch bluestem	Chisos Lodge Perimeter	BIBE_EX_015	L	010	2	0	X	X
			BIBE_EX_015	L	011	1	X	X	X
			BIBE_EX_015	L	014	0	1	0	X
		Lower Basin Road	BIBE_EX_016	L	009	1	0	X	X
			BIBE_EX_016	L	019	2	0	X	X
			BIBE_EX_016	R	019	2	X	X	X
		Persimmon Gap Road	BIBE_EX_018	R	001	1	0	0	0
			BIBE_EX_018	L	001	1	0	0	0
			BIBE_EX_018	R	009	1	0	X	X
			BIBE_EX_018	R	011	1	0	0	0
			BIBE_EX_018	R	012	1	0	0	0
			BIBE_EX_018	L	014	1	0	0	0
			BIBE_EX_018	L	019	1	0	0	0
			BIBE_EX_019	R	010	1	0	X	X
			BIBE_EX_020	L	005	2	0	0	0
			BIBE_EX_021	L	001	2	0	0	0
			BIBE_EX_021	R	012	1	0	0	0
			BIBE_EX_021	R	018	1	0	0	0
			BIBE_EX_021	L	019	2	0	0	0
			BIBE_EX_021	R	019	1	0	0	0
			BIBE_EX_021	L	020	1	0	0	0
			BIBE_EX_021	R	020	1	0	0	0
			BIBE_EX_022	L	002	1	0	0	0
			BIBE_EX_022	L	003	1	1	0	0
			BIBE_EX_022	L	005	1	0	0	0
			BIBE_EX_022	L	009	2	1	0	0
			BIBE_EX_022	R	012	1	0	0	0
			BIBE_EX_022	R	017	1	0	0	0
			BIBE_EX_022	R	018	1	0	0	0
			BIBE_EX_022	R	019	1	0	0	0
			BIBE_EX_022	R	020	1	0	0	0
			BIBE_EX_022	L	020	1	0	0	0
		Pinnacles	BIBE_EX_027	L	003	0	0	2	X
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	L	001	2	2	3	X
			BIBE_EX_028	R	001	2	2	2	2
			BIBE_EX_028	L	002	0	0	0	2
			BIBE_EX_028	L	003	2	2	0	X
			BIBE_EX_028	L	004	1	2	0	X
			BIBE_EX_028	R	005	2	2	0	0

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_028	R	007	2	0	-9	-9
Bothriochloa ischaemum (cont.)	King Ranch bluestem	Rio Grande Village Road	BIBE_EX_033	L	009	2	0	X	X
			BIBE_EX_033	L	016	2	0	0	0
			BIBE_EX_033	L	017	2	0	0	0
			BIBE_EX_033	L	018	2	0	0	0
			BIBE_EX_033	L	020	2	X	X	X
			BIBE_EX_034	L	001	1	0	0	0
			BIBE_EX_034	L	002	2	0	0	0
			BIBE_EX_034	L	003	1	X	X	X
			BIBE_EX_034	L	005	2	0	X	X
			BIBE_EX_034	L	006	1	0	0	0
			BIBE_EX_034	L	007	1	0	0	0
			BIBE_EX_034	L	008	1	0	0	0
			BIBE_EX_036	L	002	2	0	0	0
			BIBE_EX_036	L	013	1	0	X	X
			BIBE_EX_036	L	014	1	0	X	X
		Window View Trail	BIBE_EX_070	R	006	1	0	0	X
			BIBE_EX_070	L	007	2	0	0	0
			BIBE_EX_070	R	007	1	0	0	X
		VC East	BIBE_EX_072		001	2	2	-9	-9
Bromus catharticus	rescuegrass	VC East	BIBE_EX_072		001	2	0	-9	-9
		Motel NE	BIBE_EX_074		001	2	2	-9	-9
		Motel NW	BIBE_EX_075		001	2	0	0	0
Calyptocarpus vialis	straggler daisy	Campground	BIBE_EX_004	L	002	1	0	X	X
			BIBE_EX_004	L	004	1	2	0	X
			BIBE_EX_004	L	005	2	0	0	X
			BIBE_EX_004	L	006	2	0	X	X
			BIBE_EX_004	L	009	0	2	X	X
			BIBE_EX_004	L	010	2	0	X	X
			BIBE_EX_004	R	010	0	2	X	X
			BIBE_EX_004	R	011	1	0	0	X
			BIBE_EX_004	L	012	2	0	0	X
			BIBE_EX_004	L	013	2	0	X	X
		North Campground Road	BIBE_EX_005	R	001	2	0	X	X
			BIBE_EX_005	L	001	1	0	X	X
			BIBE_EX_005	R	002	2	0	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	R	010	1	0	0	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
		Chisos Lodge Perimeter	BIBE_EX_015	L	015	1	0	X	X
Calyptocarpus vialis (cont.)	straggler daisy	Chisos Lodge Perimeter	BIBE_EX_015	L	016	1	0	0	X
		VC East	BIBE_EX_072		001	2	0	-9	-9
		Motel NE	BIBE_EX_074		001	2	0	-9	-9
		Motel NW	BIBE_EX_075		001	2	0	0	0
		Motel SW	BIBE_EX_076		001	2	0	-9	-9
		Parking Median	BIBE_EX_077		001	1	0	-9	-9
Cynodon dactylon	Bermudagrass	Amphitheater Trail	BIBE_EX_002	R	001	2	2	0	0
			BIBE_EX_002	L	001	2	2	2	X
			BIBE_EX_002	R	002	2	2	2	0
			BIBE_EX_002	L	002	3	2	2	X
		Basin Sewer Plant Road	BIBE_EX_003	L	001	2	0	X	X
			BIBE_EX_003	L	002	0	2	X	X
			BIBE_EX_003	L	003	2	2	2	2
			BIBE_EX_003	L	009	1	0	X	X
		Campground	BIBE_EX_004	L	002	2	0	X	X
			BIBE_EX_004	L	004	0	2	0	X
			BIBE_EX_004	L	005	2	2	0	X
			BIBE_EX_004	L	006	2	0	X	X
			BIBE_EX_004	L	010	2	2	X	X
			BIBE_EX_004	R	010	0	2	X	X
			BIBE_EX_004	R	012	2	0	0	0
		North Campground Road	BIBE_EX_005	R	001	2	2	X	X
			BIBE_EX_005	R	002	1	2	X	X
			BIBE_EX_005	L	003	0	2	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	R	008	1	0	X	X
			BIBE_EX_006	L	008	2	2	X	X
			BIBE_EX_006	L	010	2	0	0	X
			BIBE_EX_006	R	010	2	2	0	X
			BIBE_EX_006	R	011	2	2	X	X
			BIBE_EX_006	L	011	2	0	X	X
			BIBE_EX_006	R	012	2	2	0	X
		Chisos Basin Road	BIBE_EX_008	R	016	2	0	X	X
		Chisos Lodge Perimeter	BIBE_EX_015	L	001	2	0	X	X
			BIBE_EX_015	L	002	2	0	X	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_015	L	003	2	X	X	X
Cynodon dactylon (cont.)	Bermudagrass	Chisos Lodge Perimeter	BIBE_EX_015	L	004	2	0	X	X
			BIBE_EX_015	L	011	2	X	X	X
			BIBE_EX_015	L	012	2	0	X	X
			BIBE_EX_015	L	013	2	2	X	X
			BIBE_EX_015	L	014	2	2	0	X
			BIBE_EX_015	L	015	2	2	X	X
			BIBE_EX_015	L	016	2	2	0	X
			BIBE_EX_015	L	017	2	2	X	X
			BIBE_EX_015	L	018	2	2	X	X
		Lower Basin Road	BIBE_EX_016	R	001	2	0	X	X
		Persimmon Gap Road	BIBE_EX_020	L	010	2	0	0	0
			BIBE_EX_022	R	013	2	2	0	0
			BIBE_EX_022	R	014	2	2	0	0
		Pinnacles	BIBE_EX_027	L	003	0	0	2	X
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	R	001	4	4	4	4
			BIBE_EX_028	L	001	4	4	4	X
			BIBE_EX_028	R	002	2	2	2	0
			BIBE_EX_028	L	002	2	0	0	X
		Stone Cottage Road	BIBE_EX_061	R	001	1	X	X	X
			BIBE_EX_061	L	006	2	2	X	X
		Window View Trail	BIBE_EX_070	L	002	2	0	X	X
			BIBE_EX_070	L	005	2	0	0	0
		Chisos Store	BIBE_EX_071		001	2	-9	-9	-9
		VC East	BIBE_EX_072		001	2	0	-9	-9
		Motel NE	BIBE_EX_074		001	2	2	-9	-9
		Motel NW	BIBE_EX_075		001	2	2	0	0
		Motel SW	BIBE_EX_076		001	2	0	-9	-9
		Parking Median	BIBE_EX_077		001	2	0	-9	-9
		Seating Area	BIBE_EX_078		001	2	-9	-9	-9
		Lodge A and B	BIBE_EX_079		001	2	0	-9	-9
		Lodge C	BIBE_EX_080		001	2	0	-9	-9
		Lodge D	BIBE_EX_081		001	2	0	-9	-9
Digitaria ciliaris	southern crabgrass	Lower Basin Road	BIBE_EX_016	L	001	2	0	X	X
Digitaria sanguinalis	hairy crabgrass	Chisos Lodge Perimeter	BIBE_EX_015	L	016	2	0	0	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_015	L	017	2	0	X	X
Digitaria sanguinalis (cont.)	hairy crabgrass	Lower Basin Road	BIBE_EX_016	L	008	2	X	0	0
		Chisos Store	BIBE_EX_071		001	2	-9	-9	-9
		VC East	BIBE_EX_072		001	2	0	-9	-9
		Motel NE	BIBE_EX_074		001	2	0	-9	-9
		Motel NW	BIBE_EX_075		001	2	0	0	0
		Motel SW	BIBE_EX_076		001	2	0	-9	-9
		Parking Median	BIBE_EX_077		001	1	0	-9	-9
Echinochloa colona	jungle rice	Basin Sewer Plant Road	BIBE_EX_003	R	013	1	0	X	X
			BIBE_EX_003	L	013	1	1	X	X
			BIBE_EX_003	L	014	2	0	X	X
			BIBE_EX_003	R	014	1	0	X	X
			BIBE_EX_003	R	015	2	0	X	X
			BIBE_EX_003	L	015	2	2	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	R	011	1	0	X	X
Eragrostis cilianensis	stinkgrass	Basin Sewer Plant Road	BIBE_EX_003	L	003	0	1	0	0
			BIBE_EX_003	R	013	1	0	X	X
			BIBE_EX_003	L	014	2	0	X	X
		Campground	BIBE_EX_004	L	010	1	0	X	X
		North Campground Road	BIBE_EX_005	R	003	1	0	X	X
Eragrostis lehmanniana	Lehmann lovegrass	Amphitheater Trail	BIBE_EX_002	L	001	0	2	2	X
			BIBE_EX_002	R	002	0	2	2	2
			BIBE_EX_002	R	003	0	0	2	2
		Basin Sewer Plant Road	BIBE_EX_003	L	001	2	0	X	X
			BIBE_EX_003	R	001	2	2	X	X
			BIBE_EX_003	R	002	2	2	X	X
			BIBE_EX_003	L	002	2	2	X	X
			BIBE_EX_003	L	003	2	2	2	2
			BIBE_EX_003	R	003	0	2	X	X
			BIBE_EX_003	L	004	2	2	X	X
			BIBE_EX_003	L	005	2	0	X	X
			BIBE_EX_003	L	006	2	1	X	X
			BIBE_EX_003	R	009	2	1	X	X
			BIBE_EX_003	L	009	2	0	X	X
			BIBE_EX_003	L	011	2	0	X	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_003	L	013	0	2	X	X
Eragrostis lehmanniana (cont.)	Lehmann lovegrass		BIBE_EX_003	R	014	2	0	X	X
			BIBE_EX_003	L	014	2	0	X	X
			BIBE_EX_003	R	015	2	0	X	X
			BIBE_EX_003	L	015	2	2	X	X
		Campground	BIBE_EX_004	L	002	1	0	X	X
			BIBE_EX_004	L	003	2	2	0	X
			BIBE_EX_004	L	005	0	1	0	X
			BIBE_EX_004	R	005	2	0	X	X
			BIBE_EX_004	R	006	2	0	X	X
			BIBE_EX_004	R	007	2	0	0	X
			BIBE_EX_004	R	008	2	0	X	X
			BIBE_EX_004	L	008	2	0	X	X
			BIBE_EX_004	L	009	2	0	X	X
			BIBE_EX_004	R	009	2	0	0	X
			BIBE_EX_004	R	010	2	2	X	X
			BIBE_EX_004	L	010	3	2	X	X
			BIBE_EX_004	L	011	0	1	0	X
			BIBE_EX_004	R	011	2	2	2	X
			BIBE_EX_004	L	012	1	0	0	X
			BIBE_EX_004	L	013	1	0	X	X
		North Campground Road	BIBE_EX_005	R	001	1	1	X	X
			BIBE_EX_005	L	002	0	2	X	X
			BIBE_EX_005	R	002	2	2	X	X
			BIBE_EX_005	L	003	2	2	X	X
			BIBE_EX_005	R	003	2	2	X	X
			BIBE_EX_005	L	004	2	2	X	X
			BIBE_EX_005	R	004	2	2	X	X
			BIBE_EX_005	L	005	2	2	X	X
			BIBE_EX_005	R	005	2	2	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	L	001	3	2	2	X
			BIBE_EX_006	R	001	2	0	0	X
			BIBE_EX_006	L	002	2	2	0	X
			BIBE_EX_006	R	002	1	0	0	X
			BIBE_EX_006	R	003	1	0	X	X
			BIBE_EX_006	R	004	2	0	X	X
			BIBE_EX_006	R	006	2	0	X	X
			BIBE_EX_006	L	006	1	0	X	X
			BIBE_EX_006	L	007	2	0	X	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_006	R	007	2	0	X	X
Eragrostis lehmanniana (cont.)	Lehmann lovegrass		BIBE_EX_006	L	008	2	0	X	X
			BIBE_EX_006	R	008	1	2	X	X
			BIBE_EX_006	L	009	2	2	X	X
			BIBE_EX_006	R	009	2	0	X	X
			BIBE_EX_006	R	010	1	0	0	X
			BIBE_EX_006	L	010	2	2	0	X
			BIBE_EX_006	L	011	0	2	X	X
			BIBE_EX_006	R	011	2	2	X	X
			BIBE_EX_006	L	012	2	2	X	X
			BIBE_EX_006	R	012	2	2	0	X
			BIBE_EX_006	L	013	2	0	0	X
			BIBE_EX_006	R	013	2	0	0	X
		Chisos Basin Road	BIBE_EX_008	L	001	2	2	X	X
			BIBE_EX_008	L	003	2	0	X	X
			BIBE_EX_008	L	005	2	X	X	X
			BIBE_EX_008	L	006	2	0	X	X
			BIBE_EX_008	L	007	0	1	X	X
			BIBE_EX_008	R	009	1	0	X	X
			BIBE_EX_008	R	010	2	0	X	X
			BIBE_EX_008	L	012	2	0	X	X
			BIBE_EX_008	L	013	2	0	X	X
			BIBE_EX_008	L	014	2	X	X	X
			BIBE_EX_008	L	015	2	X	X	X
			BIBE_EX_008	L	016	2	2	X	X
			BIBE_EX_008	R	020	2	0	X	X
			BIBE_EX_008	L	020	1	0	X	X
		Chisos Lodge Perimeter	BIBE_EX_015	L	001	2	2	X	X
			BIBE_EX_015	L	002	2	2	X	X
			BIBE_EX_015	L	003	0	2	X	X
			BIBE_EX_015	L	004	0	1	X	2
			BIBE_EX_015	L	005	1	0	X	X
			BIBE_EX_015	L	006	2	2	X	X
			BIBE_EX_015	L	007	2	1	X	X
			BIBE_EX_015	L	008	2	0	X	X
			BIBE_EX_015	L	009	2	0	X	X
			BIBE_EX_015	L	010	2	0	X	X
			BIBE_EX_015	L	012	2	2	X	X
			BIBE_EX_015	L	013	2	2	X	X
			BIBE_EX_015	L	015	0	2	X	X
			BIBE_EX_015	L	016	0	2	0	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_015	L	017	0	2	2	X
Eragrostis lehmanniana (cont.)	Lehmann lovegrass	Chisos Lodge Perimeter	BIBE_EX_015	L	018	2	2	X	X
			BIBE_EX_015	L	019	2	2	0	X
		Lower Basin Road	BIBE_EX_016	L	001	2	3	2	X
			BIBE_EX_016	L	002	1	X	X	X
			BIBE_EX_016	R	002	2	2	X	X
			BIBE_EX_016	L	003	2	2	X	X
			BIBE_EX_016	L	004	1	X	X	X
			BIBE_EX_016	L	005	0	X	2	2
			BIBE_EX_016	L	006	0	0	2	2
			BIBE_EX_016	R	010	1	2	X	X
			BIBE_EX_016	L	013	2	2	X	X
			BIBE_EX_016	L	017	2	X	X	X
			BIBE_EX_016	L	018	1	X	X	X
			BIBE_EX_016	L	020	2	1	X	X
			BIBE_EX_016	R	020	2	X	X	X
			BIBE_EX_016	L	021	2	X	X	X
			BIBE_EX_016	R	021	2	X	X	X
		Persimmon Gap Road	BIBE_EX_018	L	005	1	0	0	0
			BIBE_EX_018	L	014	0	1	0	0
			BIBE_EX_019	L	009	0	1	0	0
			BIBE_EX_019	R	015	1	0	0	0
			BIBE_EX_019	R	016	1	0	0	0
			BIBE_EX_020	R	002	1	0	0	0
			BIBE_EX_020	R	007	1	0	0	0
			BIBE_EX_020	R	008	2	0	0	0
			BIBE_EX_021	R	019	1	0	0	0
			BIBE_EX_022	L	008	1	0	0	0
			BIBE_EX_022	R	013	0	1	0	0
			BIBE_EX_022	L	013	1	2	0	0
			BIBE_EX_022	R	014	0	1	0	0
			BIBE_EX_022	L	015	1	3	0	0
			BIBE_EX_022	L	016	0	3	0	0
			BIBE_EX_022	L	017	1	2	0	0
			BIBE_EX_022	L	018	1	2	0	0
			BIBE_EX_022	L	019	1	1	0	0
		Pinnacles	BIBE_EX_027	L	002	1	0	X	X
			BIBE_EX_027	L	003	0	0	2	X
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	R	001	2	1	2	0
			BIBE_EX_028	L	001	2	3	3	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_028	R	002	2	2	2	0
Eragrostis lehmanniana (cont.)	Lehmann lovegrass	Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	L	002	2	2	0	X
			BIBE_EX_028	L	003	2	0	0	X
			BIBE_EX_028	R	005	2	0	0	0
		Rio Grande Village Road	BIBE_EX_029	R	001	3	3	2	X
			BIBE_EX_029	L	001	0	2	2	0
			BIBE_EX_029	L	002	0	2	2	0
			BIBE_EX_029	R	002	1	2	2	X
			BIBE_EX_029	L	003	0	2	1	0
			BIBE_EX_029	R	003	1	2	2	X
			BIBE_EX_029	R	004	1	2	X	X
			BIBE_EX_029	L	004	0	2	0	0
			BIBE_EX_029	L	005	0	2	1	0
			BIBE_EX_029	R	005	0	2	0	X
			BIBE_EX_029	L	006	0	2	1	0
			BIBE_EX_029	R	006	0	2	2	X
			BIBE_EX_029	R	007	0	2	2	2
			BIBE_EX_029	L	007	0	2	0	0
			BIBE_EX_029	R	012	0	1	X	X
			BIBE_EX_029	R	014	0	1	0	X
			BIBE_EX_029	R	019	0	2	X	X
			BIBE_EX_029	L	019	0	2	0	X
			BIBE_EX_029	L	020	0	2	0	X
			BIBE_EX_029	R	001	0	2	X	0
			BIBE_EX_029	R	002	0	1	0	0
			BIBE_EX_029	L	004	0	1	0	X
			BIBE_EX_029	R	004	0	2	0	0
			BIBE_EX_029	R	005	0	2	0	0
			BIBE_EX_029	L	005	0	2	0	0
			BIBE_EX_029	R	007	0	2	X	X
			BIBE_EX_029	L	013	0	2	2	0
			BIBE_EX_029	L	014	0	2	2	0
			BIBE_EX_029	L	016	0	2	0	0
			BIBE_EX_029	R	016	0	2	0	0
			BIBE_EX_029	R	017	0	2	0	0
			BIBE_EX_029	L	017	0	2	0	0
			BIBE_EX_029	L	018	0	2	0	0
			BIBE_EX_029	R	018	0	2	0	0
			BIBE_EX_029	R	019	0	2	0	0
			BIBE_EX_029	L	019	0	2	2	0
			BIBE_EX_029	R	020	1	2	0	0
			BIBE_EX_029	L	020	0	2	2	0

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
			BIBE_EX_029	L	001	0	2	0	0
Eragrostis lehmanniana (cont.)	Lehmann lovegrass	Rio Grande Village Road	BIBE_EX_029	L	003	0	2	2	0
			BIBE_EX_029	R	004	0	2	0	0
			BIBE_EX_029	L	004	0	2	0	0
			BIBE_EX_029	R	005	-9	-9	-9	-9
			BIBE_EX_029	R	006	0	2	2	0
			BIBE_EX_029	L	006	0	2	2	0
			BIBE_EX_029	R	007	0	2	X	X
			BIBE_EX_029	L	007	2	2	2	0
			BIBE_EX_029	R	008	0	2	0	X
			BIBE_EX_029	L	008	2	2	0	0
			BIBE_EX_029	L	009	2	2	2	0
			BIBE_EX_029	R	009	0	2	0	X
			BIBE_EX_029	R	010	0	2	0	0
			BIBE_EX_029	L	010	2	2	2	0
			BIBE_EX_029	L	011	2	2	0	0
			BIBE_EX_029	R	011	0	2	2	0
			BIBE_EX_029	R	012	0	2	2	0
			BIBE_EX_029	L	012	2	2	2	0
			BIBE_EX_029	L	013	0	2	0	0
			BIBE_EX_029	R	013	0	2	2	0
			BIBE_EX_029	R	014	0	2	2	0
			BIBE_EX_029	L	014	0	2	0	0
			BIBE_EX_029	R	015	0	2	2	0
			BIBE_EX_029	L	015	0	2	0	0
			BIBE_EX_029	R	016	0	2	2	0
			BIBE_EX_029	L	016	0	2	2	0
			BIBE_EX_029	R	001	1	0	0	0
			BIBE_EX_029	R	003	0	2	0	0
			BIBE_EX_029	R	004	0	1	0	0
			BIBE_EX_029	R	012	0	2	0	0
			BIBE_EX_029	R	013	1	0	0	0
			BIBE_EX_029	L	007	1	X	X	X
			BIBE_EX_029	L	011	1	0	0	0
		Stone Cottage Road	BIBE_EX_061	R	001	1	2	X	X
			BIBE_EX_061	R	002	0	1	X	X
		West Entrance Road	BIBE_EX_063	R	007	1	0	X	X
			BIBE_EX_063	R	014	1	0	0	0
		Window	BIBE_EX_067	R	011	2	0	X	X
			BIBE_EX_067	L	011	2	2	X	X
			BIBE_EX_067	R	012	2	2	X	X
			BIBE_EX_067	L	012	2	0	0	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Eragrostis lehmanniana (cont.)	Lehmann lovegrass		BIBE_EX_067	R	013	1	0	X	X
			BIBE_EX_067	R	016	2	0	X	X
			BIBE_EX_067	L	016	1	0	X	X
		Window View Trail	BIBE_EX_070	L	001	0	2	X	X
			BIBE_EX_070	R	001	2	2	2	X
			BIBE_EX_070	L	002	2	0	X	X
			BIBE_EX_070	R	003	2	0	X	X
			BIBE_EX_070	L	003	2	2	X	X
			BIBE_EX_070	L	004	2	2	0	0
			BIBE_EX_070	R	005	2	0	X	X
			BIBE_EX_070	L	005	2	2	0	0
			BIBE_EX_070	L	006	1	0	0	0
			BIBE_EX_070	L	008	2	0	0	0
		Restaurant Cul de Sac	BIBE_EX_073		001	2	X	X	X
Erodium cicutarium	redstem stork's bill	Chisos Lodge Perimeter	BIBE_EX_015	L	017	2	0	X	X
		Chisos Store	BIBE_EX_071		001	2	-9	-9	-9
Marrubium vulgare	horehound	Amphitheater Trail	BIBE_EX_002	L	001	0	0	2	X
		Basin Sewer Plant Road	BIBE_EX_003	L	015	0	1	X	X
		Campground	BIBE_EX_004	L	004	0	1	0	X
			BIBE_EX_004	R	006	0	1	X	X
			BIBE_EX_004	L	009	1	0	X	X
			BIBE_EX_004	L	010	0	2	X	X
			BIBE_EX_004	R	010	0	1	X	X
			BIBE_EX_004	R	011	1	1	0	X
		North Campground Road	BIBE_EX_005	L	001	0	1	X	X
			BIBE_EX_005	R	001	1	0	X	X
			BIBE_EX_005	L	002	1	0	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	L	011	1	1	X	X
			BIBE_EX_006	R	012	0	1	0	X
		Chisos Lodge Perimeter	BIBE_EX_015	L	002	1	2	X	X
			BIBE_EX_015	L	014	1	0	0	X
			BIBE_EX_015	L	015	2	0	X	X
			BIBE_EX_015	L	016	2	1	0	X
			BIBE_EX_015	L	017	2	2	X	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Marrubium vulgare (cont.)	horehound	Lower Basin Road	BIBE_EX_016	R	014	1	X	X	X
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	R	001	0	1	0	0
		Chisos Store	BIBE_EX_071		001	1	-9	-9	-9
		Motel NE	BIBE_EX_074		001	1	0	-9	-9
		Motel NW	BIBE_EX_075		001	0	1	0	0
		Lodge A and B	BIBE_EX_079		001	2	0	-9	-9
		Lodge C	BIBE_EX_080		001	2	0	-9	-9
Medicago polymorpha	burclover	VC East	BIBE_EX_072		001	2	2	-9	-9
		Motel NE	BIBE_EX_074		001	2	0	-9	-9
		Motel NW	BIBE_EX_075		001	2	0	0	0
Nicotiana glauca	tree tobacco	Basin Sewer Plant Road	BIBE_EX_003	L	015	0	1	X	X
Paspalum dilatatum	dallisgrass	Amphitheater Trail	BIBE_EX_002	L	001	0	0	2	X
			BIBE_EX_002	L	002	0	1	0	X
		Chisos Basin Group Campground Road	BIBE_EX_006	R	011	2	0	X	X
			BIBE_EX_006	L	011	0	2	X	X
		Chisos Basin Road	BIBE_EX_008	R	001	2	2	0	X
		Chisos Lodge Perimeter	BIBE_EX_015	L	015	2	0	X	X
			BIBE_EX_015	L	016	2	0	0	X
			BIBE_EX_015	L	017	2	0	X	X
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	R	001	1	0	0	0
			BIBE_EX_028	L	001	2	2	0	X
			BIBE_EX_028	L	002	2	2	0	X
		Chisos Store	BIBE_EX_071		001	2	-9	-9	-9
		VC East	BIBE_EX_072		001	2	0	-9	-9
		Motel NE	BIBE_EX_074		001	2	2	-9	-9
		Motel SW	BIBE_EX_076		001	2	0	-9	-9
		Lodge A and B	BIBE_EX_079		001	1	0	-9	-9
		Lodge C	BIBE_EX_080		001	1	0	-9	-9
Pennisetum ciliare	buffelgrass	Campground	BIBE_EX_004	L	002	1	0	X	X
		Persimmon Gap Road	BIBE_EX_018	L	001	1	0	0	0
			BIBE_EX_018	R	001	0	1	0	0
			BIBE_EX_018	R	018	1	0	0	0
			BIBE_EX_019	R	017	0	2	0	0

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Pennisetum ciliare (cont.)	buffelgrass	Persimmon Gap Road	BIBE_EX_021	R	006	0	2	0	0
			BIBE_EX_021	R	007	1	2	0	0
			BIBE_EX_022	R	014	0	2	2	0
			BIBE_EX_022	R	015	0	2	0	2
			BIBE_EX_022	R	016	0	0	2	2
			BIBE_EX_022	L	016	0	3	0	0
			BIBE_EX_022	R	018	0	0	2	0
			BIBE_EX_022	R	020	0	1	0	0
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	L	001	2	0	0	X
			BIBE_EX_028	L	002	2	0	0	X
		Rio Grande Village Road	BIBE_EX_033	L	007	2	X	X	X
			BIBE_EX_033	L	009	1	0	X	X
Portulaca oleracea	little hogweed	Campground	BIBE_EX_004	L	001	2	0	0	X
			BIBE_EX_004	R	013	1	0	0	0
Salsola tragus	prickly Russian thistle	Campground	BIBE_EX_004	R	010	1	0	X	X
			BIBE_EX_004	L	010	0	1	X	X
		Lower Basin Road	BIBE_EX_016	L	001	0	2	X	X
			BIBE_EX_016	R	001	0	2	X	X
			BIBE_EX_016	R	003	0	2	X	X
			BIBE_EX_016	R	005	0	1	X	0
		Persimmon Gap Road	BIBE_EX_022	L	020	0	1	0	0
Solanum lycopersicum	garden tomato	Basin Sewer Plant Road	BIBE_EX_003	R	015	1	0	X	X
Sorghum halepense	Johnsongrass	Amphitheater Trail	BIBE_EX_002	L	001	2	2	2	X
			BIBE_EX_002	L	002	0	2	0	X
		Basin Sewer Plant Road	BIBE_EX_003	L	003	0	2	2	0
			BIBE_EX_003	L	013	1	0	X	X
		Campground	BIBE_EX_004	L	009	0	2	X	X
			BIBE_EX_004	L	010	0	2	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	L	012	1	2	X	X
		Chisos Basin Road	BIBE_EX_008	R	016	2	2	X	X
		Chisos Lodge Perimeter	BIBE_EX_015	L	005	0	1	X	X
			BIBE_EX_015	L	015	0	2	X	X
			BIBE_EX_015	L	016	0	2	0	X

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Sorghum halepense (cont.)	Johnsongrass	Chisos Lodge Perimeter	BIBE_EX_015	L	017	2	2	X	X
			BIBE_EX_015	L	018	0	2	X	X
		Lower Basin Road	BIBE_EX_016	L	005	2	X	X	X
			BIBE_EX_016	L	006	0	1	X	X
			BIBE_EX_016	R	008	2	X	X	X
			BIBE_EX_016	R	009	2	X	X	X
			BIBE_EX_016	L	010	1	1	X	X
			BIBE_EX_016	R	010	2	X	X	X
			BIBE_EX_016	R	019	1	X	X	X
		Pinnacles/ Laguna Meadows Trail	BIBE_EX_028	L	001	3	3	0	X
			BIBE_EX_028	R	001	2	2	2	0
			BIBE_EX_028	L	002	0	0	0	2
			BIBE_EX_028	R	002	0	0	1	0
			BIBE_EX_028	L	003	0	0	0	2
			BIBE_EX_028	L	004	0	2	0	X
Tamarix species	tamarisk	West Entrance Road	BIBE_EX_062	R	013	0	0	1	0
Taraxacum officinale	common dandelion	Chisos Lodge Perimeter	BIBE_EX_015	L	015	2	0	X	X
			BIBE_EX_015	L	016	2	0	0	X
		VC East	BIBE_EX_072		001	2	0	-9	-9
		Motel NE	BIBE_EX_074		001	2	0	-9	-9
		Motel SW	BIBE_EX_076		001	2	0	-9	-9
Tribulus terrestris	puncturevine	Basin Sewer Plant Road	BIBE_EX_003	L	011	1	0	X	X
			BIBE_EX_003	L	013	1	1	X	X
			BIBE_EX_003	L	014	2	0	X	X
			BIBE_EX_003	R	015	2	0	X	X
			BIBE_EX_003	L	015	2	2	X	X
		Campground	BIBE_EX_004	L	001	2	0	0	X
			BIBE_EX_004	L	010	1	0	X	X
			BIBE_EX_004	R	010	2	0	X	X
			BIBE_EX_004	L	011	1	0	0	X
		Chisos Basin Group Campground Road	BIBE_EX_006	L	011	2	2	X	X
			BIBE_EX_006	L	012	2	0	X	X
		Persimmon Gap Road	BIBE_EX_018	R	015	1	0	0	0
			BIBE_EX_022	R	007	1	0	0	0

Table B.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Tribulus terrestris (cont.)	puncturevine	West Entrance Road	BIBE_EX_062	L	005	1	0	0	0
Verbena brasiliensis	Brazilian vervain	Basin Sewer Plant Road	BIBE_EX_003	L	003	0	1	0	0
		Campground	BIBE_EX_004	R	001	1	0	X	X
			BIBE_EX_004	L	005	1	0	0	X
			BIBE_EX_004	R	010	0	1	X	X
		Chisos Basin Group Campground Road	BIBE_EX_006	R	007	1	0	X	X

[a] Distance class: 1=from edge of vector to 1.5 or 2 meters in; 2=from transect (at 1.5–2 meters in) to 10 meters; 3=10–20 meters; 4=over 20 meters into the landscape

[b] Density class: 0=species not detected; 1=1–5 plants; 2=scattered patches; 3=evenly distributed patches; 4=matrix; X=no data (topography obscured distance class)

Table B.2. Observations of tanglehead (*Heteropogon contortus*) by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011.

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Heteropogon contortus	tanglehead	Basin Sewer Plant Road	BIBE_EX_003	L	003	0[b]	1	0	0
		Rio Grande Village Road	BIBE_EX_029	R	007	0	2	0	2
			BIBE_EX_029	R	008	0	3	2	2
			BIBE_EX_029	R	009	0	2	2	2
			BIBE_EX_029	R	010	0	2	X	X
			BIBE_EX_029	L	012	0	2	X	X
			BIBE_EX_029	R	013	0	2	0	X
			BIBE_EX_029	L	014	0	2	0	X
			BIBE_EX_029	L	016	0	2	0	X
			BIBE_EX_029	L	017	0	2	0	0
			BIBE_EX_029	L	019	0	2	0	X
			BIBE_EX_029	R	019	0	2	X	X
			BIBE_EX_029	L	020	0	2	2	X
			BIBE_EX_029	R	020	0	2	0	0
			BIBE_EX_030	R	001	0	2	X	0
			BIBE_EX_030	L	001	0	0	2	2
			BIBE_EX_030	R	002	0	2	0	0
			BIBE_EX_030	L	003	2	2	X	X
			BIBE_EX_030	R	003	0	2	X	0
			BIBE_EX_030	L	004	2	2	2	X
			BIBE_EX_030	R	004	0	2	0	0
			BIBE_EX_030	L	005	0	2	0	0
			BIBE_EX_030	L	006	0	2	0	0
			BIBE_EX_030	R	006	0	2	0	0
			BIBE_EX_030	R	007	0	2	X	X
			BIBE_EX_030	L	007	0	2	X	X
			BIBE_EX_030	R	008	0	2	X	X
			BIBE_EX_030	L	008	0	2	X	X
			BIBE_EX_030	R	009	0	2	X	X
			BIBE_EX_030	L	009	0	1	X	X
			BIBE_EX_030	R	010	0	2	0	0
			BIBE_EX_030	L	011	2	2	2	0
			BIBE_EX_030	L	012	0	2	2	0
			BIBE_EX_030	R	012	0	2	2	0
			BIBE_EX_030	L	013	0	2	2	0
			BIBE_EX_030	R	013	0	2	2	0
			BIBE_EX_030	L	014	0	2	2	0
			BIBE_EX_030	R	014	0	2	2	2
			BIBE_EX_030	R	015	0	1	0	0
			BIBE_EX_030	L	015	0	2	2	2
			BIBE_EX_030	L	016	0	2	2	0

Table B.2. Observations of tanglehead (*Heteropogon contortus)* by vector, transect and block with density class observed at each distance class, Big Bend NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Heteropogon contortus (cont.)	tanglehead	Rio Grande Village Road	BIBE_EX_030	R	016	0	2	0	0
			BIBE_EX_030	L	017	0	2	2	0
			BIBE_EX_030	L	018	0	2	2	0
			BIBE_EX_030	R	018	0	1	0	0
			BIBE_EX_030	R	019	0	2	0	0
			BIBE_EX_030	L	019	0	2	2	0
			BIBE_EX_030	L	020	0	2	2	0
			BIBE_EX_031	L	001	0	2	2	0
			BIBE_EX_031	L	002	0	2	2	0
			BIBE_EX_031	R	003	0	2	2	0
			BIBE_EX_031	L	004	0	2	0	0
			BIBE_EX_031	R	005	-9	-9	-9	-9
			BIBE_EX_031	R	006	0	2	2	0
			BIBE_EX_031	L	006	0	2	0	0
			BIBE_EX_031	L	007	0	2	2	0
			BIBE_EX_031	R	007	0	2	X	X
			BIBE_EX_031	R	008	0	2	2	X
			BIBE_EX_031	L	008	2	2	2	0
			BIBE_EX_031	L	009	0	2	2	0
			BIBE_EX_031	R	009	0	2	2	X
			BIBE_EX_031	R	010	0	2	2	0
			BIBE_EX_031	L	010	2	2	2	0
			BIBE_EX_031	R	011	0	2	2	0
			BIBE_EX_031	L	011	2	2	0	0
			BIBE_EX_031	L	012	2	2	2	0
			BIBE_EX_031	R	012	0	2	2	0
			BIBE_EX_031	L	013	0	2	0	0
			BIBE_EX_031	R	013	0	2	2	0
			BIBE_EX_031	R	014	0	2	2	0
			BIBE_EX_031	L	014	0	2	0	0
			BIBE_EX_031	R	015	0	2	2	0
			BIBE_EX_031	L	015	0	2	2	0
			BIBE_EX_031	R	016	0	2	2	0
			BIBE_EX_031	L	016	0	2	2	0
		West Entrance Road	BIBE_EX_063	R	003	0	1	0	X
			BIBE_EX_063	R	007	0	1	X	X
			BIBE_EX_063	R	008	1	0	0	0
			BIBE_EX_063	R	009	1	0	X	X
			BIBE_EX_063	R	020	1	0	0	0

[a] Distance class: 1=from edge of vector to 1.5 or 2 meters in; 2=from transect (at 1.5–2 meters in) to 10 meters; 3=10–20 meters; 4=over 20 meters into the landscape

[b] Density class: 0=species not detected; 1=1–5 plants; 2=scattered patches; 3=evenly distributed patches; 4=matrix; X=no data (topography obscured distance class)

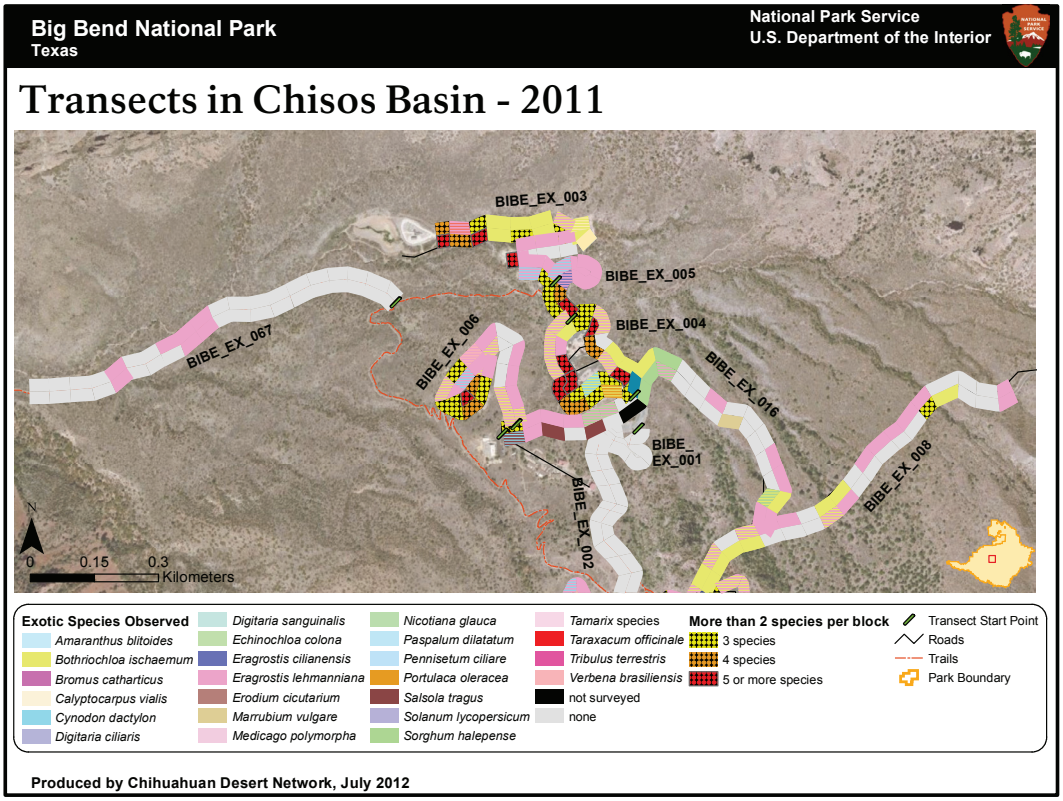


Figure B.2. Exotic plant locations along transects on the Chisos Basin (north side) vector.

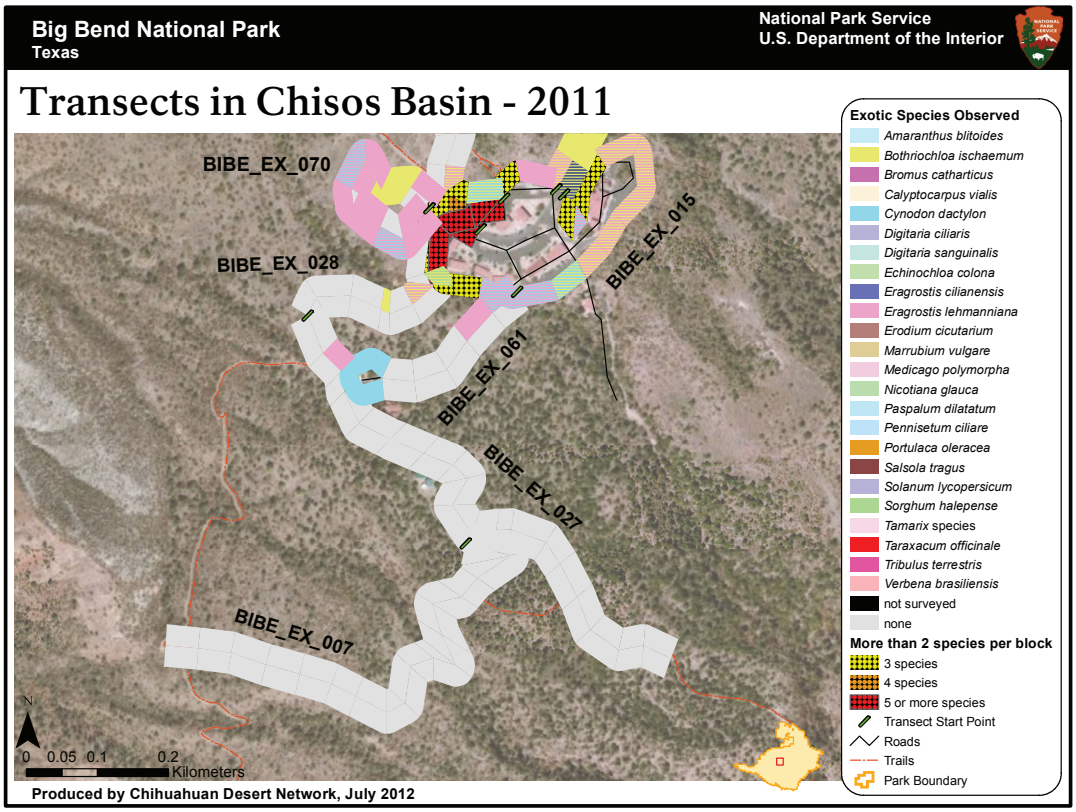


Figure B.3. Exotic plant locations along transects on the Chisos Basin (south side) vector.

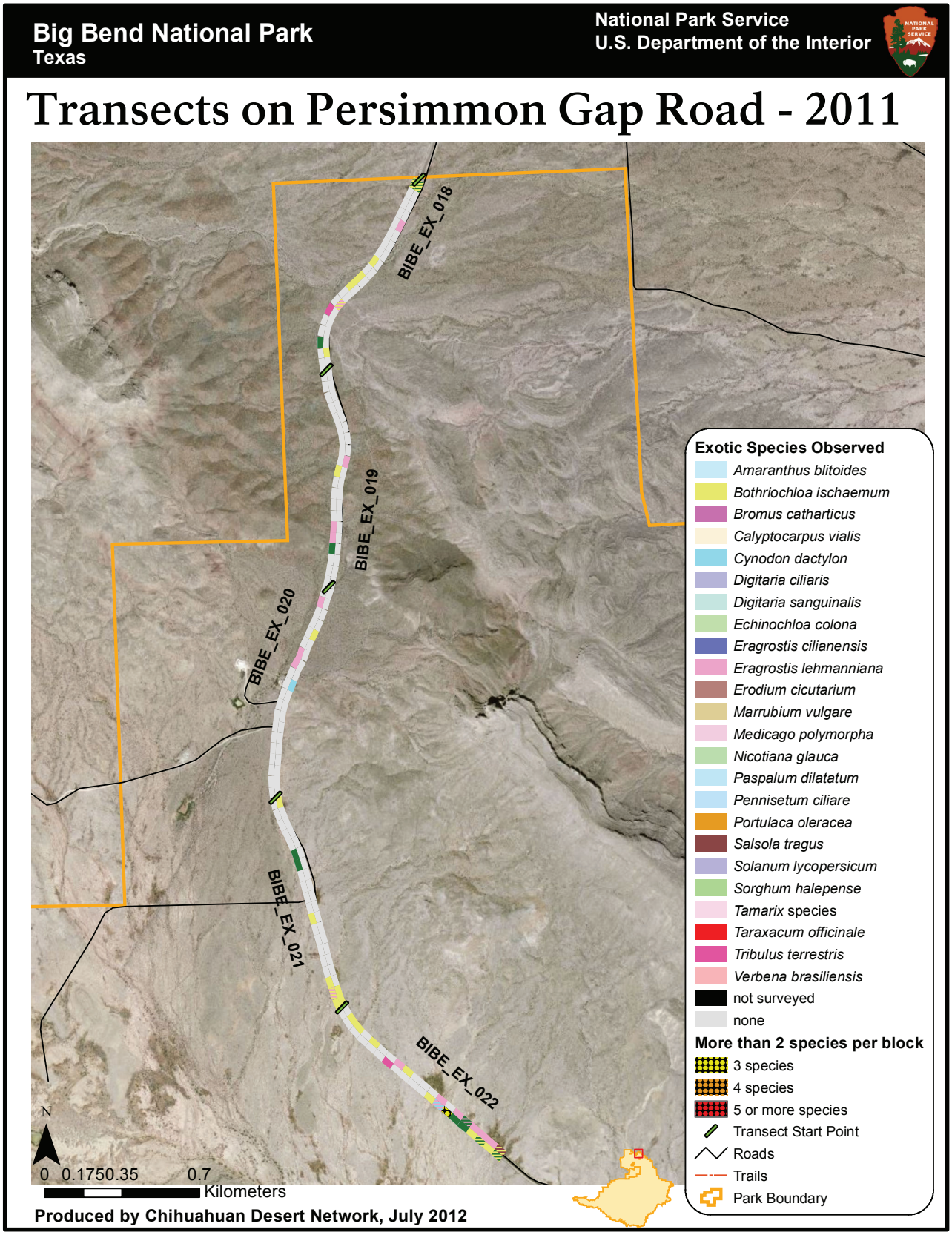


Figure B.4. Exotic plant locations along transects on the Persimmon Gap Road vector.

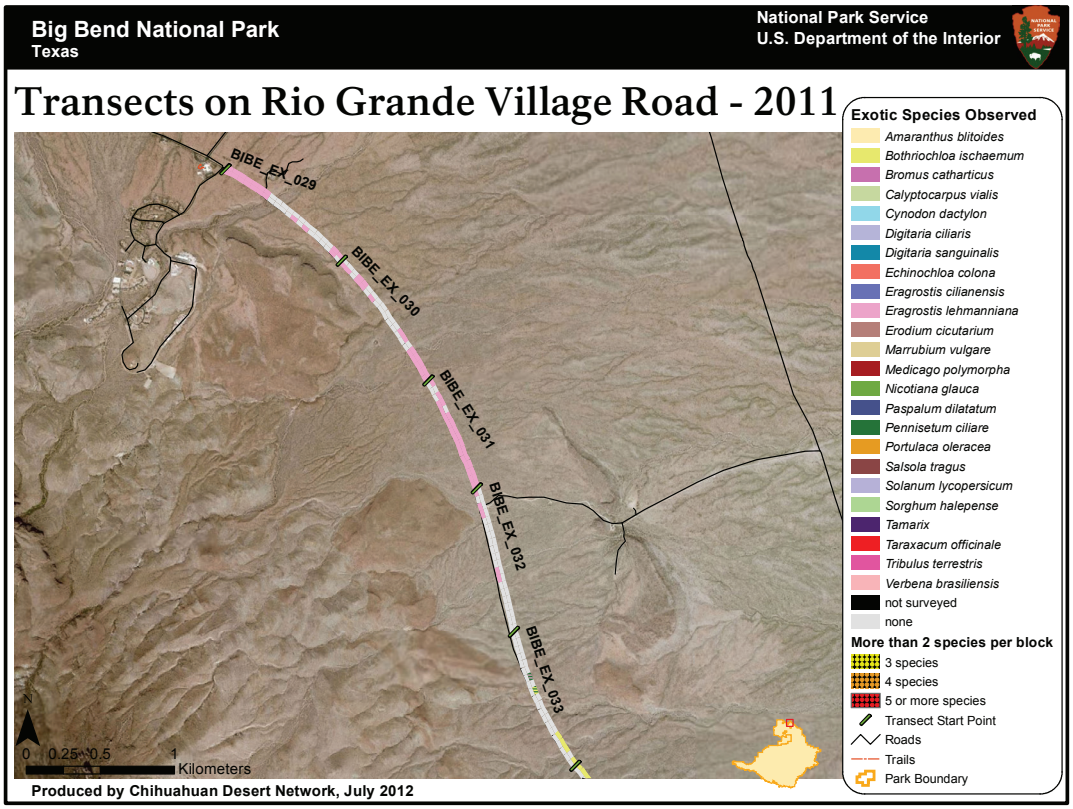


Figure B.5. Exotic plant locations along transects on the Rio Grande Village Road (west end) vector.

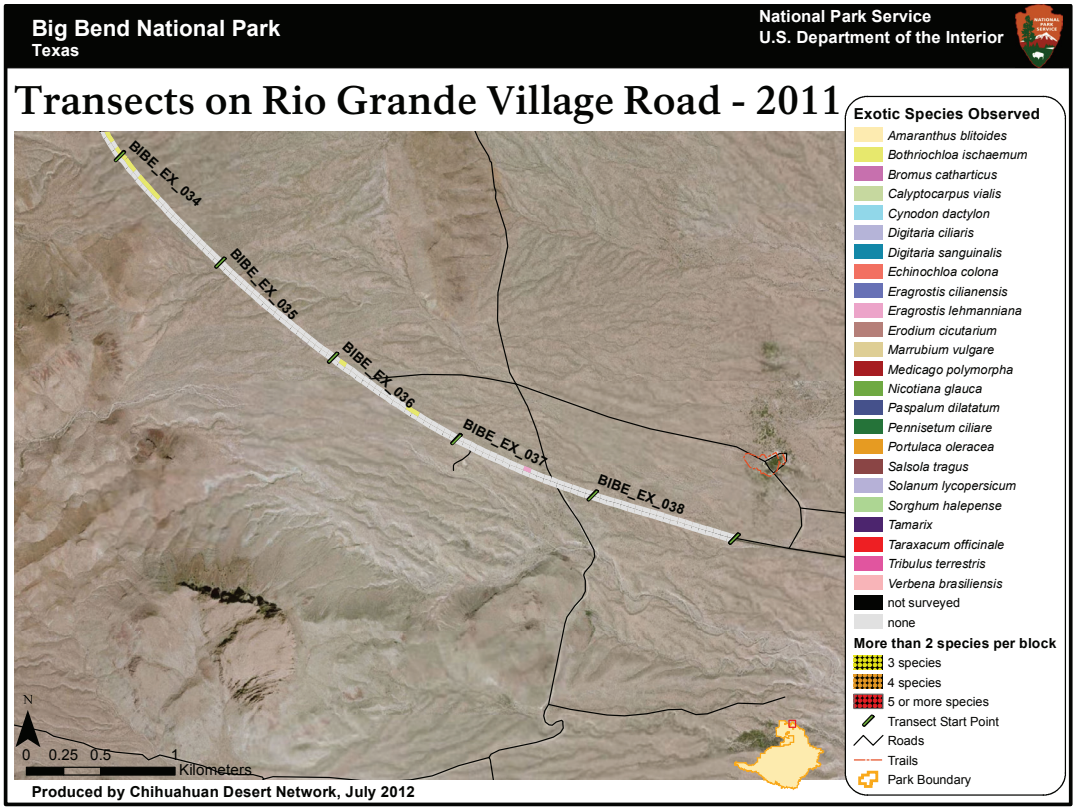


Figure B.6. Exotic plant locations along transects on the Rio Grande Village Road (east end) vector.

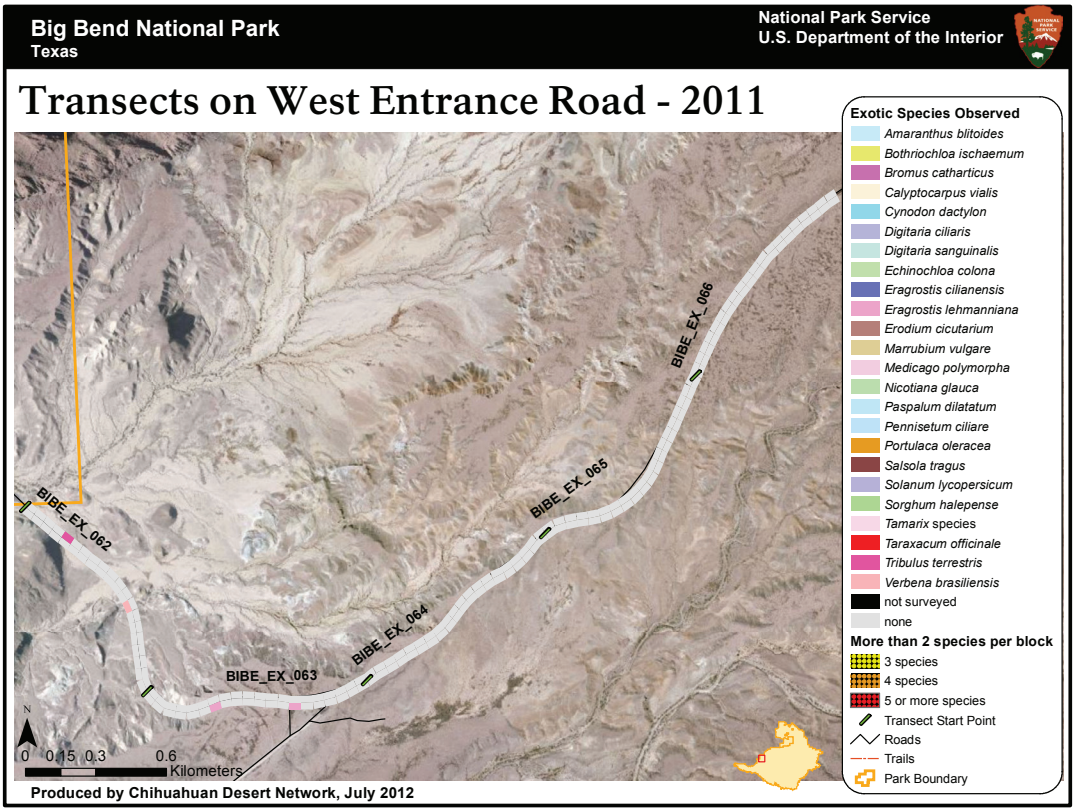


Figure B.7. Exotic plant locations along transects on the West Entrance Road vector.



Figure B.8. Location of *Heteropogon contortus* (tanglehead) along transects on the Chisos Basin vector.

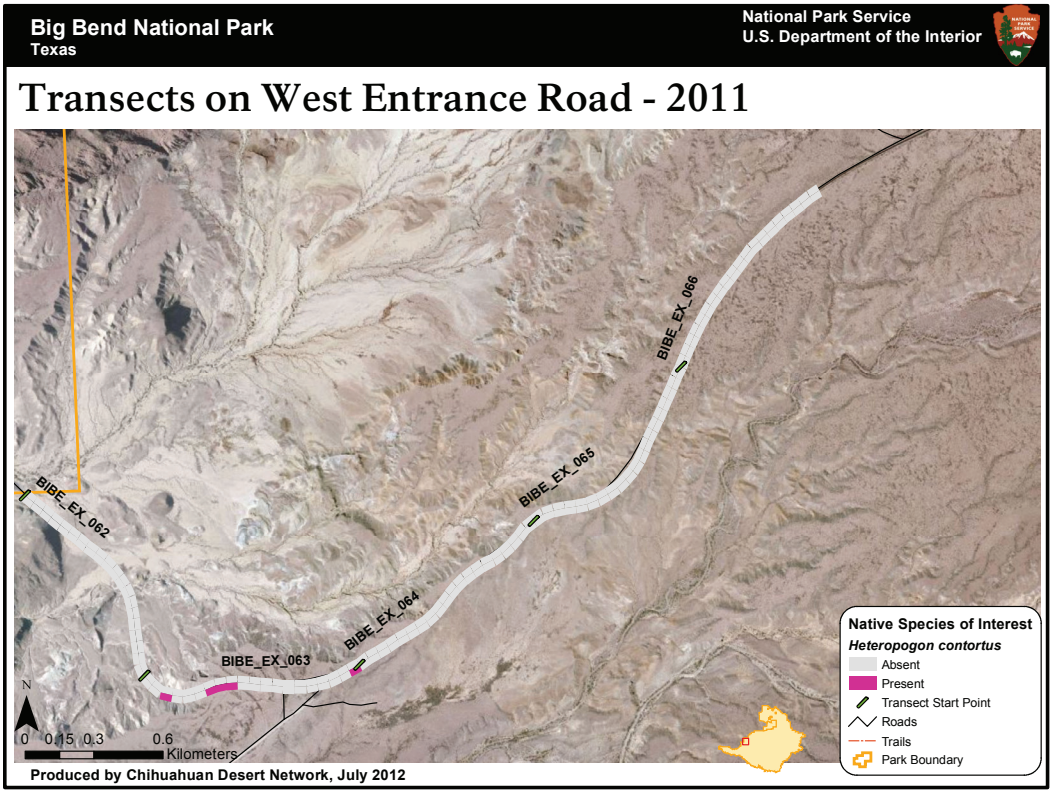


Figure B.9. Location of *Heteropogon contortus* (tanglehead) along transects on the West Entrance vector.

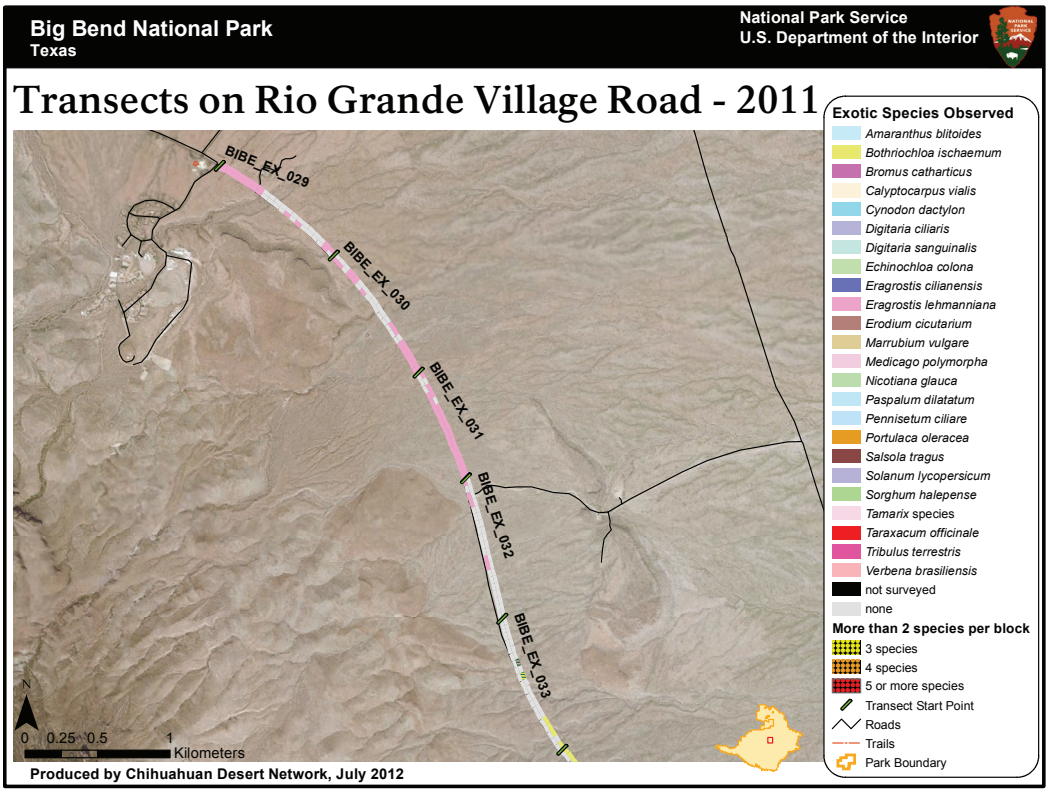


Figure B.10. Location of *Heteropogon contortus* (tanglehead) along transects on the Rio Grande Village Road (west end) vector.

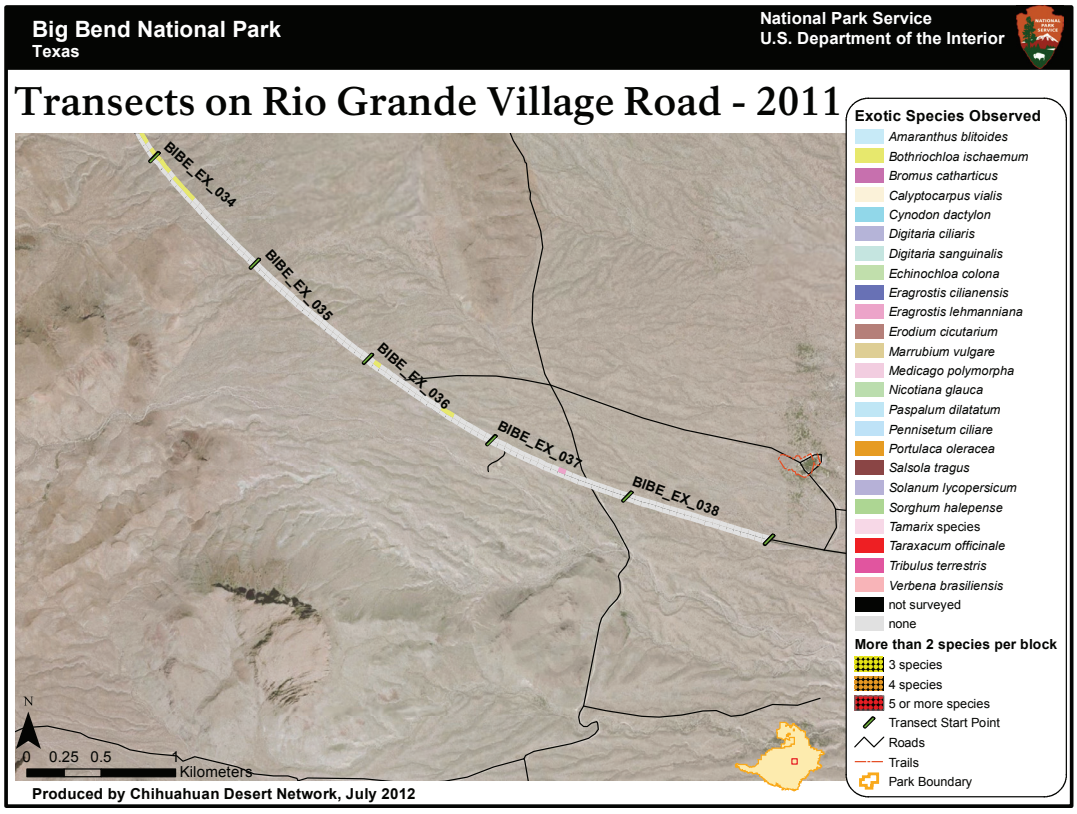


Figure B.11. Location of *Heteropogon contortus* (tanglehead) along transects on the Rio Grande Village Road (east end) vector.

Appendix C. Carlsbad Caverns National Park

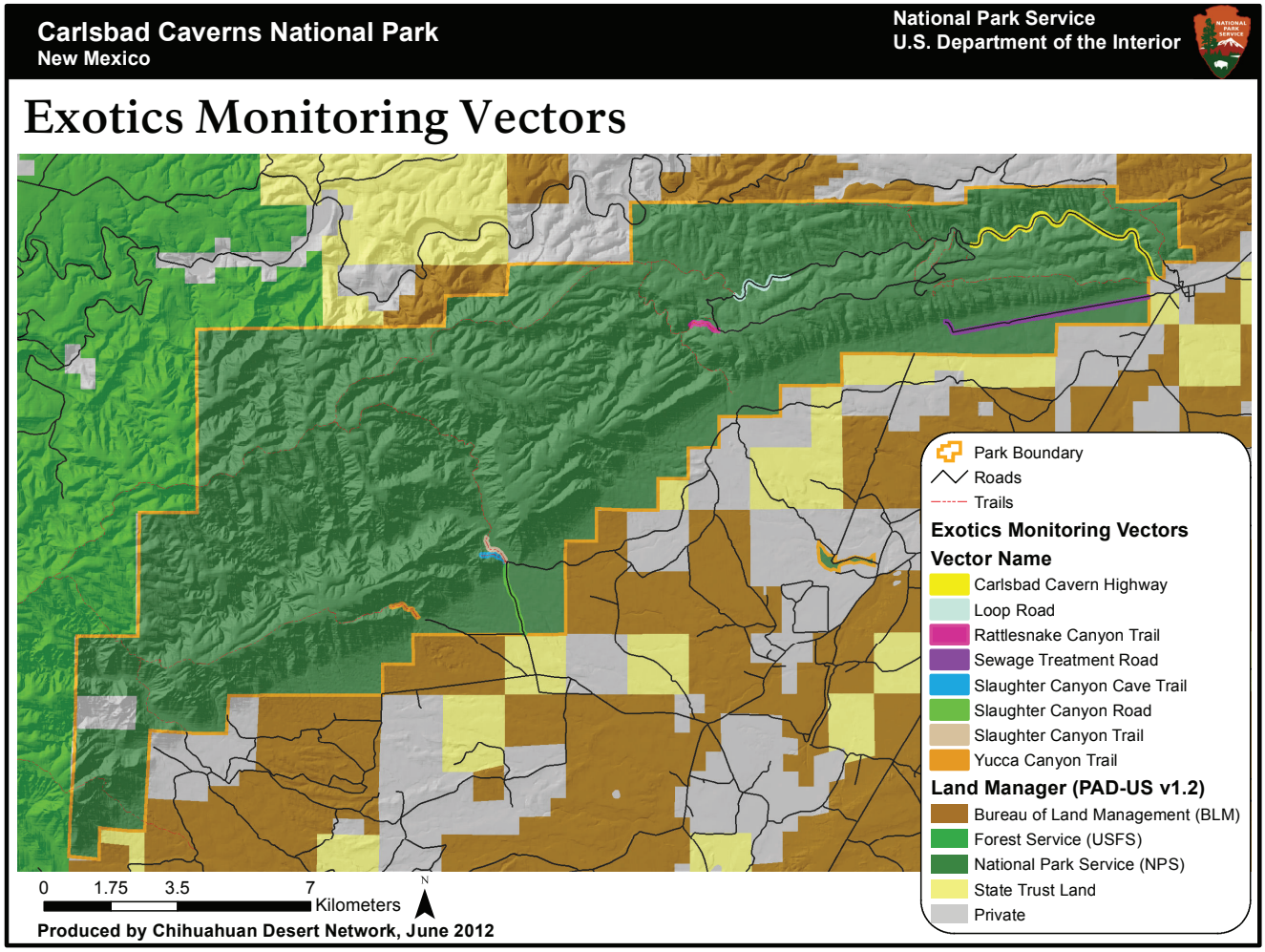


Figure C.1. Map of Carlsbad Caverns National Park showing monitoring transects and surrounding land ownership.

Table C.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Carlsbad Caverns NP, 2011.

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bromus catharticus	rescuegrass	Carlsbad Cavern Highway	CAVE_EX_001	L	011	1[b]	0	0	0
			CAVE_EX_001	L	013	1	0	0	0
			CAVE_EX_001	L	014	1	0	0	0
			CAVE_EX_001	L	019	1	0	0	0
			CAVE_EX_001	L	020	1	0	0	0
			CAVE_EX_002	R	001	1	0	0	0
			CAVE_EX_002	R	003	2	0	0	0
			CAVE_EX_002	L	005	1	0	0	0
			CAVE_EX_003	R	016	1	0	0	0
			CAVE_EX_004	L	012	2	0	0	0
			CAVE_EX_005	R	017	2	0	0	0
			CAVE_EX_007	R	018	2	0	0	X
Convolvulus arvensis	field bindweed	Slaughter Canyon Road	CAVE_EX_024	L	012	1	0	0	0
Cynodon dactylon	Bermudagrass	Carlsbad Cavern Highway	CAVE_EX_001	R	002	0	2	0	0
			CAVE_EX_001	R	003	2	2	0	0
			CAVE_EX_006	R	001	2	0	0	0
Eragrostis barrelieri	Mediterranean lovegrass	Carlsbad Cavern Highway	CAVE_EX_002	R	016	1	X	X	0
			CAVE_EX_002	R	017	1	0	X	0
			CAVE_EX_002	R	018	2	0	0	X
Eragrostis cilianensis	stinkgrass	Carlsbad Cavern Highway	CAVE_EX_001	L	001	0	1	0	0
		Loop Road	CAVE_EX_029	R	001	1	0	0	0
			CAVE_EX_029	R	002	0	2	0	0
			CAVE_EX_029	R	003	2	2	0	0
			CAVE_EX_029	R	004	0	2	2	0
			CAVE_EX_029	R	005	0	2	2	0
			CAVE_EX_029	R	006	0	2	2	0
			CAVE_EX_029	R	009	0	2	2	0
			CAVE_EX_030	R	001	0	2	2	0
			CAVE_EX_030	R	007	0	2	2	0
			CAVE_EX_030	L	008	2	0	0	0
			CAVE_EX_030	R	008	0	2	0	0
Eragrostis lehmanniana	Lehmann lovegrass	Carlsbad Cavern Highway	CAVE_EX_001	R	001	2	0	0	0
			CAVE_EX_001	L	001	0	1	0	0
			CAVE_EX_001	L	009	1	0	0	0
			CAVE_EX_002	L	012	1	0	X	X
			CAVE_EX_006	R	020	1	0	0	0
			CAVE_EX_007	L	011	2	0	0	0
			CAVE_EX_007	L	012	2	0	0	0

Table C.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Carlsbad Caverns NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Eragrostis lehmanniana	Lehmann lovegrass	Sewage Treatment Road	CAVE_EX_017	R	008	2	0	0	0
		Loop Road	CAVE_EX_029	R	002	0	2	0	0
			CAVE_EX_029	R	003	2	2	2	0
			CAVE_EX_029	R	004	2	2	0	0
			CAVE_EX_029	R	005	2	2	0	0
			CAVE_EX_029	R	006	2	3	3	0
			CAVE_EX_029	L	006	0	2	2	0
			CAVE_EX_029	R	007	0	2	2	0
			CAVE_EX_029	R	008	0	2	2	0
			CAVE_EX_029	R	009	0	2	2	0
			CAVE_EX_029	L	010	2	0	0	0
			CAVE_EX_029	R	010	2	2	2	0
			CAVE_EX_029	R	011	2	2	2	X
			CAVE_EX_029	L	014	1	0	0	0
			CAVE_EX_029	R	015	1	2	2	0
			CAVE_EX_029	L	017	0	1	0	0
			CAVE_EX_029	L	018	0	1	0	0
			CAVE_EX_029	R	020	0	2	0	0
			CAVE_EX_029	L	020	2	2	2	0
			CAVE_EX_030	R	001	1	2	2	0
			CAVE_EX_030	R	007	0	2	2	0
			CAVE_EX_030	R	008	2	2	2	0
			CAVE_EX_030	L	008	2	3	3	0
			CAVE_EX_030	R	009	2	0	0	X
			CAVE_EX_030	L	009	0	2	3	2
			CAVE_EX_030	L	010	0	2	3	3
			CAVE_EX_030	L	012	0	2	2	0
			CAVE_EX_030	R	012	0	1	0	X
			CAVE_EX_030	L	013	2	2	2	0
			CAVE_EX_030	R	013	2	2	2	X
			CAVE_EX_030	R	014	1	2	2	2
			CAVE_EX_030	L	014	2	2	0	0
			CAVE_EX_030	L	016	1	0	0	0
			CAVE_EX_030	R	016	0	0	2	2
			CAVE_EX_030	R	017	0	2	2	2
			CAVE_EX_030	R	018	0	1	2	2
			CAVE_EX_030	L	018	0	1	0	0
			CAVE_EX_030	R	019	0	2	2	2
			CAVE_EX_030	R	020	0	2	2	2
Marrubium vulgare	horehound	Slaughter Canyon Cave Trail	CAVE_EX_022	L	006	0	1	0	0
		Slaughter Canyon Trail	CAVE_EX_023	L	011	0	1	1	0

Table C.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Carlsbad Caverns NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Salsola kali	Russian thistle	Loop Road	CAVE_EX_029	R	001	1	0	0	0
			CAVE_EX_030	L	004	2	1	0	0
Sorghum halepense	Johnsongrass	Carlsbad Cavern Highway	CAVE_EX_006	L	015	0	1	1	0
Tribulus terrestris	puncturevine	Slaughter Canyon Trail	CAVE_EX_023	R	012	1	0	0	0
			CAVE_EX_023	L	013	1	0	0	0
			CAVE_EX_023	R	013	1	0	0	0
			CAVE_EX_023	L	014	1	0	0	0
			CAVE_EX_023	L	017	1	0	0	0

[a] Distance class: 1=from edge of vector to 1.5 or 2 meters in; 2=from transect (at 1.5–2 meters in) to 10 meters; 3=10–20 meters; 4=over 20 meters into the landscape

[b] Density class: 0=species not detected; 1=1–5 plants; 2=scattered patches; 3=evenly distributed patches; 4=matrix; X=no data (topography obscured distance class)

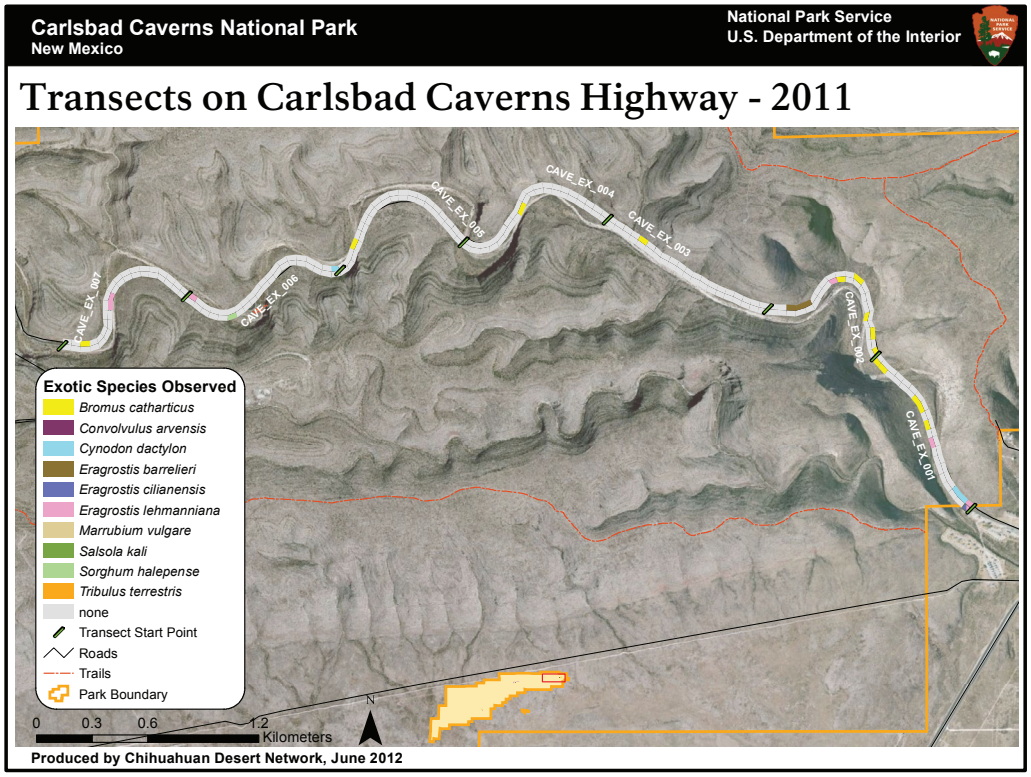


Figure C.2. Exotic plant locations along transects on the Carlsbad Caverns Highway vector.

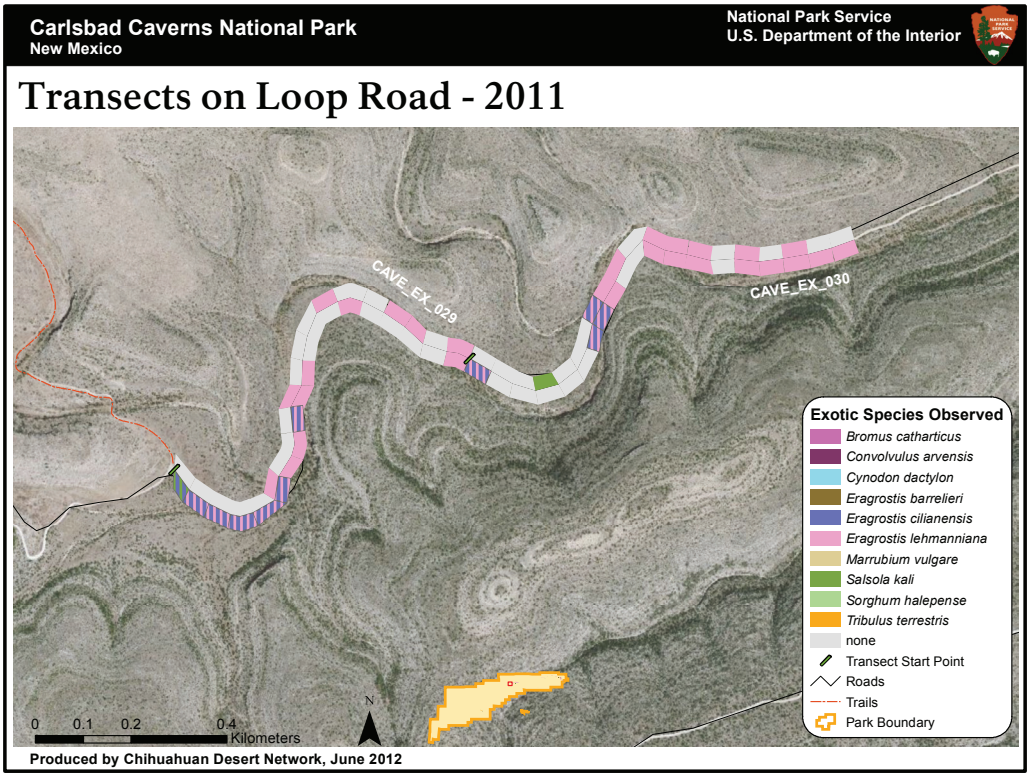


Figure C.3. Exotic plant locations along transects on the Loop Road vector.

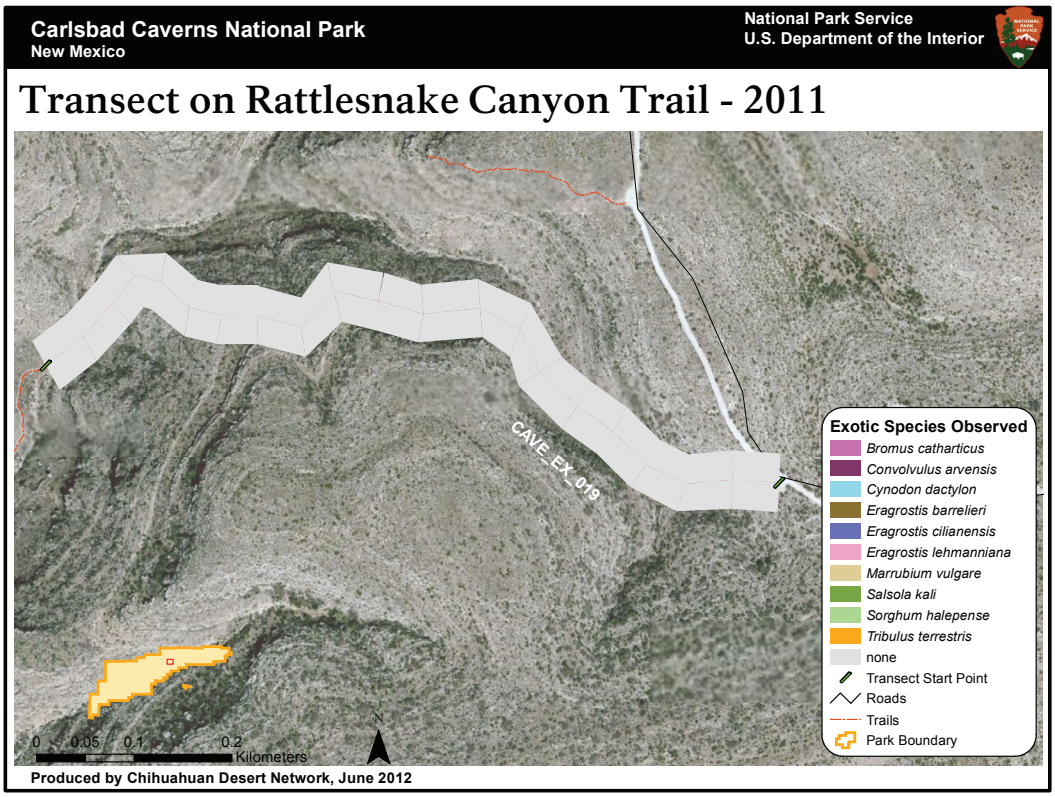


Figure C.4. Exotic plant locations along transects on the Rattlesnake Canyon Trail vector.

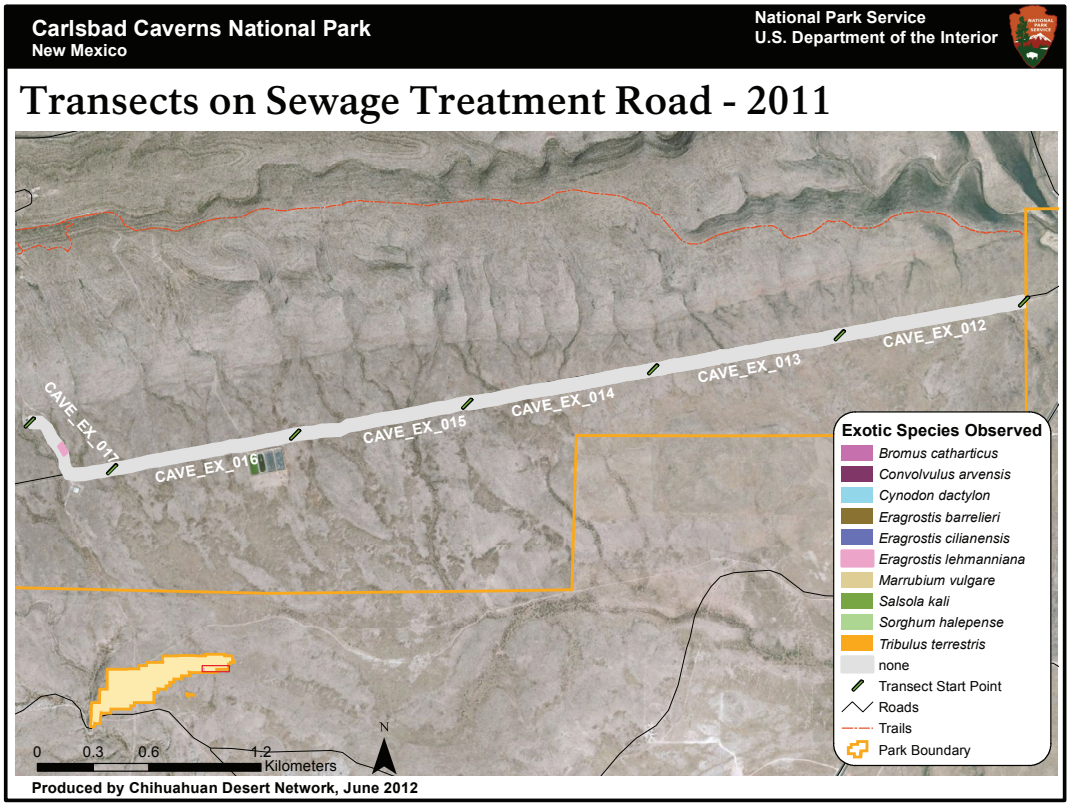


Figure C.5. Exotic plant locations along transects on the Sewage Treatment Road vector.

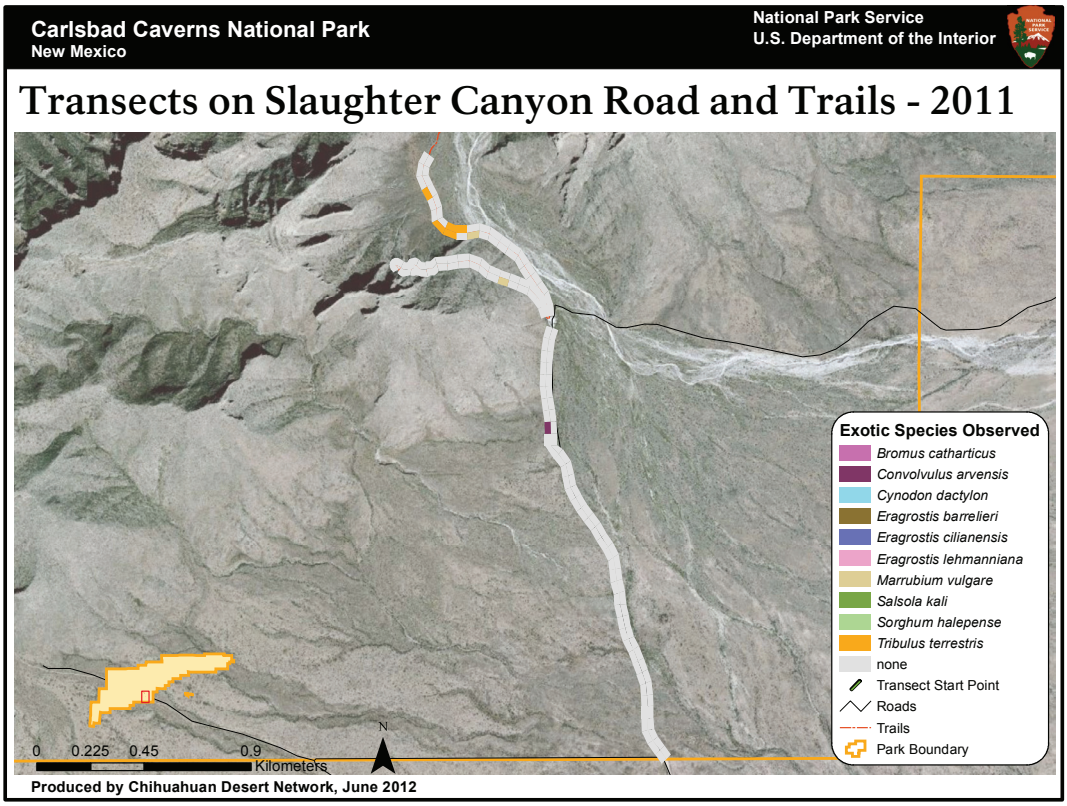


Figure C.6. Exotic plant locations along transects of the Slaughter Canyon Road and Trail vectors.

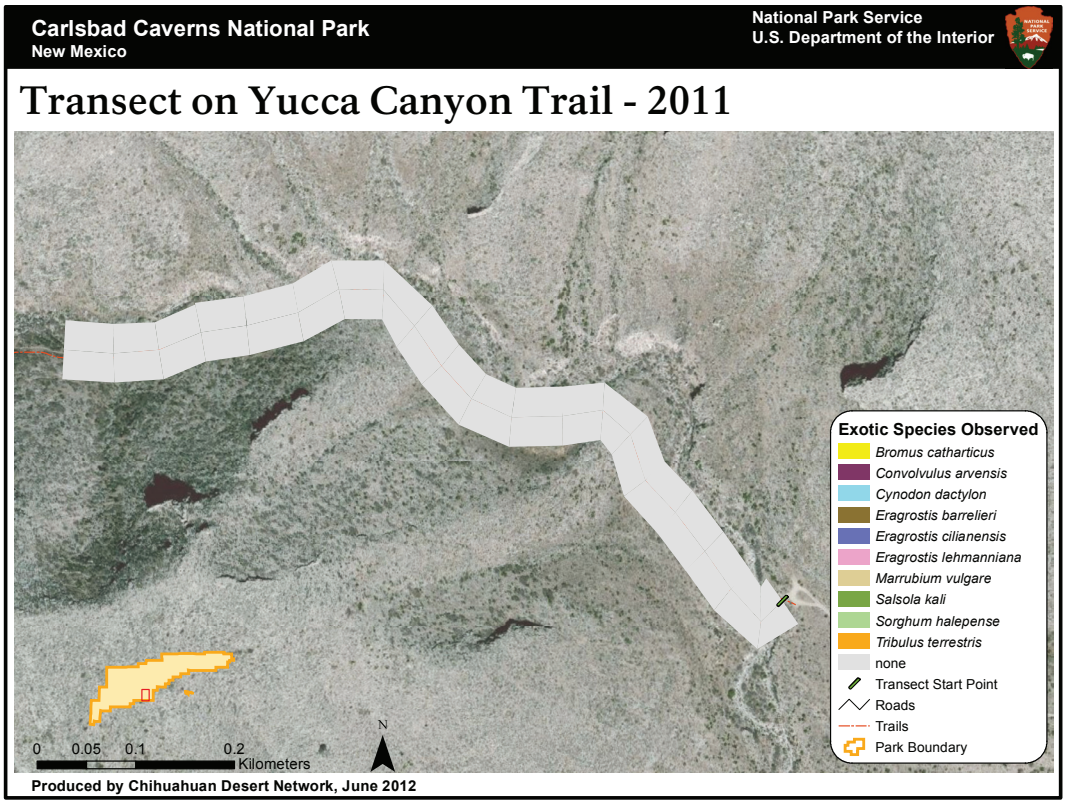


Figure C.7. Exotic plant locations along transects on the Yucca Canyon Trail vector.

Appendix D. Fort Davis National Historic Site

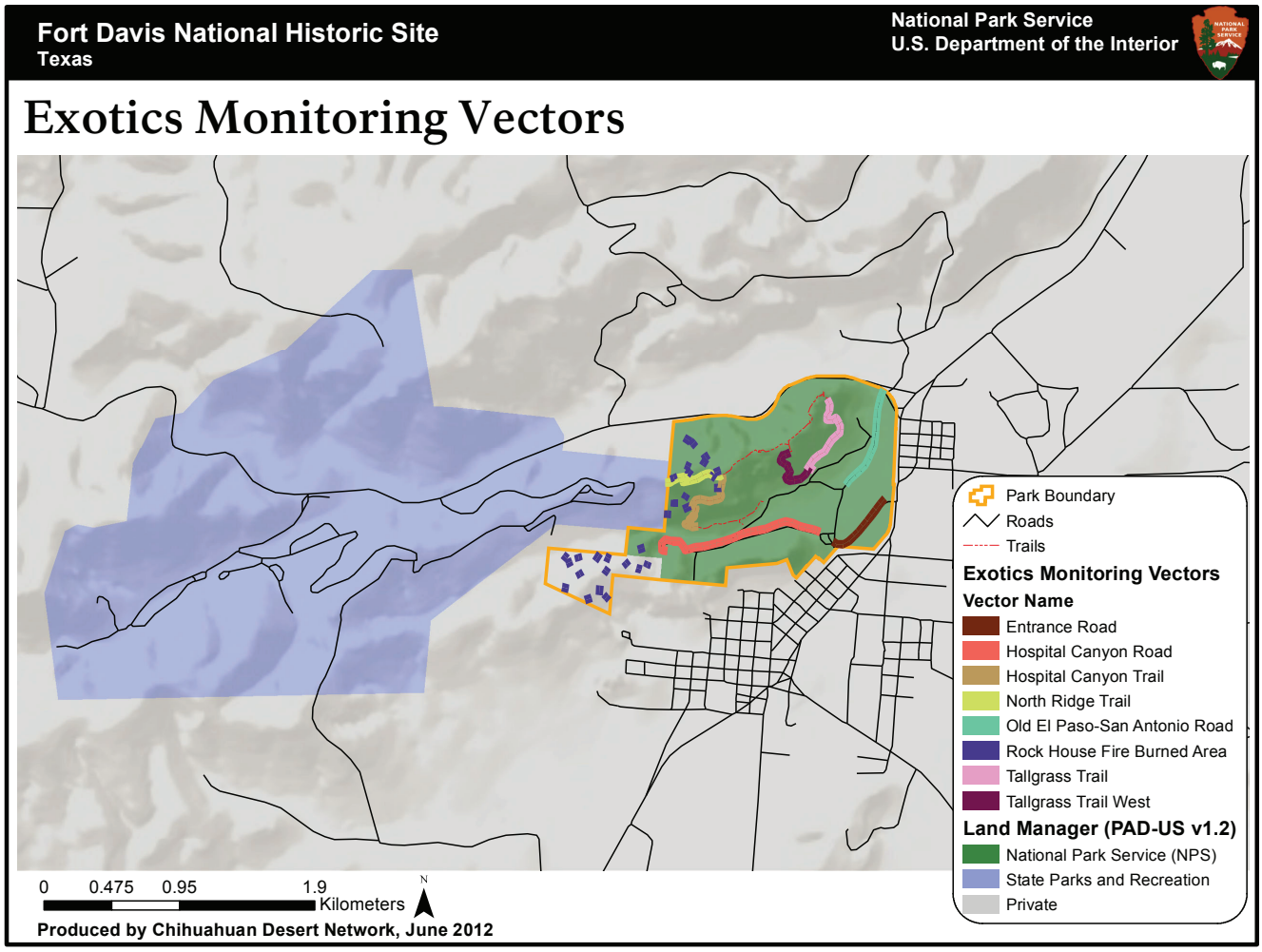


Figure D.1. Map of Fort Davis National Historic Site showing monitoring transects and surrounding land ownership.

Table D.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Fort Davis NHS, 2011.

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Bothriochloa ischaemum	King Ranch bluestem	Entrance Road	FODA_EX_003	R	001	0[b]	0	0	2
			FODA_EX_003	L	001	2	2	0	0
			FODA_EX_003	L	002	2	0	0	0
			FODA_EX_003	R	003	2	0	0	0
			FODA_EX_003	R	008	2	0	0	0
			FODA_EX_003	R	009	0	2	0	0
			FODA_EX_003	L	010	2	0	0	0
			FODA_EX_003	R	010	1	0	0	0
Chenopodium album	lambsquarters	Old El Paso-San Antonio Road	FODA_EX_001	R	004	2	2	2	X
			FODA_EX_001	R	004	0	2	0	X
			FODA_EX_001	L	004	1	1	0	0
			FODA_EX_001	R	005	2	0	X	X
			FODA_EX_001	R	005	2	2	2	0
			FODA_EX_001	L	005	0	2	0	0
			FODA_EX_001	R	006	1	2	0	X
			FODA_EX_001	L	006	0	2	0	0
			FODA_EX_001	L	006	2	2	0	0
			FODA_EX_001	R	006	2	2	2	0
			FODA_EX_001	R	007	2	2	0	0
			FODA_EX_001	L	007	2	2	0	0
			FODA_EX_001	L	007	2	0	0	X
			FODA_EX_001	R	007	3	3	0	0
			FODA_EX_001	L	008	2	1	0	0
			FODA_EX_001	L	008	1	0	0	X
			FODA_EX_001	L	009	2	1	0	0
			FODA_EX_001	L	011	0	1	0	0
			FODA_EX_001	L	013	2	0	0	0
		Tallgrass Trail	FODA_EX_004	R	002	0	1	0	0
			FODA_EX_004	R	011	0	2	X	X
Cynodon dactylon	Bermudagrass	Old El Paso-San Antonio Road	FODA_EX_001	R	006	2	0	0	X
		Entrance Road	FODA_EX_003	L	006	2	0	0	0
			FODA_EX_003	L	006	2	0	0	0
			FODA_EX_003	R	006	3	0	0	0
			FODA_EX_003	R	007	3	0	0	0
			FODA_EX_003	R	007	3	3	3	0
			FODA_EX_003	L	007	2	0	0	0
			FODA_EX_003	L	008	3	2	0	0
			FODA_EX_003	R	008	2	0	0	0
			FODA_EX_003	R	008	3	3	2	2
			FODA_EX_003	R	009	2	0	0	0
			FODA_EX_003	R	009	2	2	2	0

Table D.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Fort Davis NHS, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Cynodon dactylon (cont.)	Bermudagrass	Entrance Road	FODA_EX_003	L	009	3	0	0	0
			FODA_EX_003	R	010	3	0	0	0
			FODA_EX_003	R	011	2	0	0	0
Eragrostis cilianensis	stinkgrass	Old El Paso-San Antonio Road	FODA_EX_001	R	001	2	0	X	X
			FODA_EX_001	R	009	1	0	0	0
		Entrance Road	FODA_EX_003	L	002	0	0	0	1
			FODA_EX_003	L	005	0	1	0	0
			FODA_EX_003	R	008	0	0	0	1
Marrubium vulgare	horehound	Hospital Canyon Road	FODA_EX_002	L	006	0	0	0	3
			FODA_EX_002	R	011	1	0	0	0
			FODA_EX_002	L	012	1	2	0	0
			FODA_EX_002	L	013	2	2	0	0
		Entrance Road	FODA_EX_003	L	005	1	0	0	0
			FODA_EX_003	L	007	0	2	0	0
			FODA_EX_003	R	009	0	0	0	2
			FODA_EX_003	R	010	0	0	0	2
Portulaca oleracea	little hogweed	Entrance Road	FODA_EX_003	R	005	2	2	0	2
			FODA_EX_003	L	006	0	2	0	0
			FODA_EX_003	R	006	0	1	0	0
			FODA_EX_003	R	008	1	0	0	1
			FODA_EX_003	L	009	0	1	0	0
			FODA_EX_003	R	009	0	2	0	0
			FODA_EX_003	L	010	0	1	0	0
		Hospital Canyon Trail	FODA_EX_501	R	002	1	X	X	X
			FODA_EX_501	L	007	1	0	0	X
			FODA_EX_501	R	010	1	0	X	X
			FODA_EX_501	L	011	1	0	0	X
		North Ridge Trail	FODA_EX_502	R	002	2	0	0	X
			FODA_EX_502	R	003	2	2	0	X
			FODA_EX_502	L	003	2	2	0	X
			FODA_EX_502	R	006	1	0	X	X
			FODA_EX_502	L	006	1	0	X	X
			FODA_EX_502	R	009	2	0	0	X
			FODA_EX_502	L	010	1	0	X	X
			FODA_EX_502	R	010	2	1	0	X
			FODA_EX_502	L	011	1	0	X	X
		Tallgrass Trail West	FODA_EX_504	L	011	2	0	X	X
		Rock House Fire	FODA_EX_RH001	L	001	2	2	0	X
			FODA_EX_RH002	R	001	2	0	0	X
			FODA_EX_RH002	L	001	1	0	0	X

Table D.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Fort Davis NHS, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Portulaca oleracea (cont.)	little hogweed	Rock House Fire	FODA_EX_RH006	L	001	1	2	0	X
			FODA_EX_RH007	L	001	1	0	0	X
			FODA_EX_RH007	R	001	1	0	0	X
			FODA_EX_RH012	R	001	1	0	0	X
			FODA_EX_RH013	L	001	2	0	0	X
			FODA_EX_RH013	R	001	2	0	0	0
			FODA_EX_RH015	L	001	1	0	0	X
			FODA_EX_RH015	R	001	2	2	0	0
			FODA_EX_RH016	R	001	2	0	0	X
			FODA_EX_RH016	L	001	0	1	0	x
			FODA_EX_RH020	R	001	1	0	0	X
			FODA_EX_RH020	L	001	1	0	0	X
			FODA_EX_RH024	L	001	2	2	X	X
			FODA_EX_RH024	R	001	1	2	X	X
			FODA_EX_RH025	R	001	1	0	0	X
			FODA_EX_RH025	L	001	2	0	0	X
			FODA_EX_RH026	R	001	1	1	0	X
			FODA_EX_RH029	L	001	1	0	0	X
			FODA_EX_RH034	R	001	1	0	0	0
			FODA_EX_RH034	L	001	2	0	0	X
Salsola tragus	prickly Russian thistle	Old El Paso-San Antonio Road	FODA_EX_001	R	005	2	0	X	X
		Hospital Canyon Road	FODA_EX_002	R	008	0	1	0	X
			FODA_EX_002	R	020	0	1	0	X
		Entrance Road	FODA_EX_003	L	008	0	2	0	0
Sorghum halepense	Johnsongrass	Old El Paso-San Antonio Road	FODA_EX_001	R	001	2	2	0	0
			FODA_EX_001	R	002	2	2	0	0
			FODA_EX_001	R	003	2	2	0	0
			FODA_EX_001	L	003	2	0	0	0
			FODA_EX_001	L	003	2	0	0	0
			FODA_EX_001	R	004	2	2	0	X
			FODA_EX_001	R	005	2	2	0	0
			FODA_EX_001	L	005	2	0	0	0
			FODA_EX_001	L	006	2	2	0	0
			FODA_EX_001	R	006	2	2	2	0
			FODA_EX_001	R	006	2	2	0	X
			FODA_EX_001	R	007	3	3	0	0
			FODA_EX_001	R	007	2	0	0	0
			FODA_EX_001	R	008	2	2	0	0
			FODA_EX_001	L	008	2	0	0	0
			FODA_EX_001	L	008	0	1	0	X

Table D.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Fort Davis NHS, 2011 (continued).

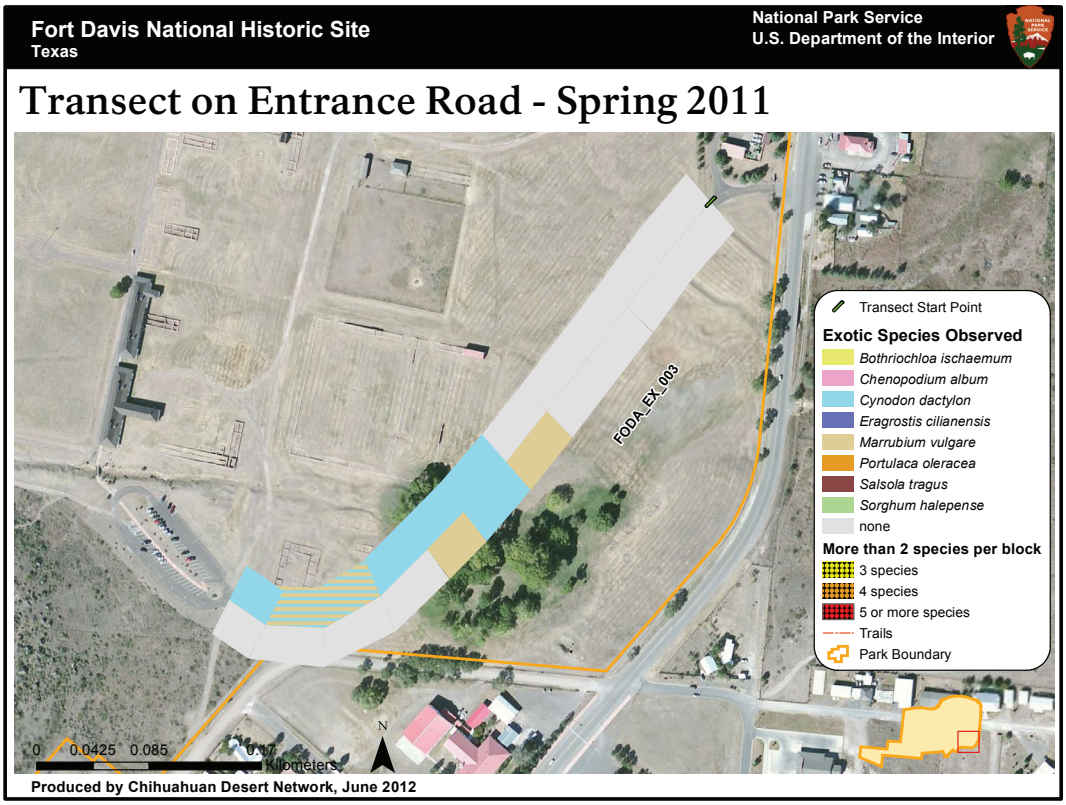
Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Sorghum halepense (cont.)	Johnsongrass	Old El Paso-San Antonio Road	FODA_EX_001	R	008	3	2	0	0
			FODA_EX_001	R	009	2	2	0	0
			FODA_EX_001	R	009	2	0	0	0
			FODA_EX_001	R	013	2	2	0	0
			FODA_EX_001	R	014	0	2	0	0
		Entrance Road	FODA_EX_003	L	001	0	0	2	2
			FODA_EX_003	L	002	0	0	0	2
			FODA_EX_003	L	004	0	0	0	2
			FODA_EX_003	L	005	0	2	2	2
			FODA_EX_003	R	006	0	2	0	0
			FODA_EX_003	L	006	0	2	2	0
			FODA_EX_003	R	007	0	2	2	0
			FODA_EX_003	R	008	0	1	0	2
			FODA_EX_003	L	009	0	0	0	2
			FODA_EX_003	L	010	0	0	2	0
		Tallgrass Trail	FODA_EX_004	R	006	0	0	0	2
			FODA_EX_004	R	008	0	0	0	2
			FODA_EX_004	R	009	0	0	0	2
Taraxacum officinale	common dandelion	Entrance Road	FODA_EX_003	L	006	0	0	0	2
Tribulus terrestris	puncturevine	Old El Paso-San Antonio Road	FODA_EX_001	L	007	2	0	0	X
			FODA_EX_001	R	007	2	0	0	0
			FODA_EX_001	L	008	1	0	0	X
			FODA_EX_001	R	009	1	0	0	0
		Entrance Road	FODA_EX_003	L	001	0	1	1	0
			FODA_EX_003	L	002	0	2	0	0
			FODA_EX_003	R	002	0	2	2	0
			FODA_EX_003	R	003	0	0	2	0
			FODA_EX_003	R	004	0	0	0	2
			FODA_EX_003	R	005	0	0	0	2
			FODA_EX_003	L	005	1	2	0	0
			FODA_EX_003	L	006	1	2	0	0
			FODA_EX_003	R	006	0	2	0	0
			FODA_EX_003	R	008	1	2	0	0
			FODA_EX_003	L	008	0	2	0	0
		Hospital Canyon Trail	FODA_EX_501	R	008	1	0	X	X
		Tallgrass Trail West	FODA_EX_504	R	001	1	0	X	X
			FODA_EX_504	L	001	1	0	X	X
		Rock House Fire	FODA_EX_RH007	R	001	1	1	0	X
			FODA_EX_RH007	L	001	1	0	0	X
			FODA_EX_RH016	L	001	1	0	0	x

Table D.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Fort Davis NHS, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Tribulus terrestris (cont.)	puncturevine	Rock House Fire	FODA_EX_RH016	R	001	1	1	0	X
			FODA_EX_RH024	L	001	0	1	X	X
			FODA_EX_RH025	L	001	2	2	0	X
			FODA_EX_RH025	R	001	2	2	0	X
			FODA_EX_RH032	L	001	1	0	0	X
			FODA_EX_RH034	R	001	2	2	0	0
			FODA_EX_RH034	L	001	2	2	0	X

[a] Distance class: 1=from edge of vector to 1.5 or 2 meters in; 2=from transect (at 1.5–2 meters in) to 10 meters; 3=10–20 meters; 4=over 20 meters into the landscape

[b] Density class: 0=species not detected; 1=1–5 plants; 2=scattered patches; 3=evenly distributed patches; 4=matrix; X=no data (topography obscured distance class)



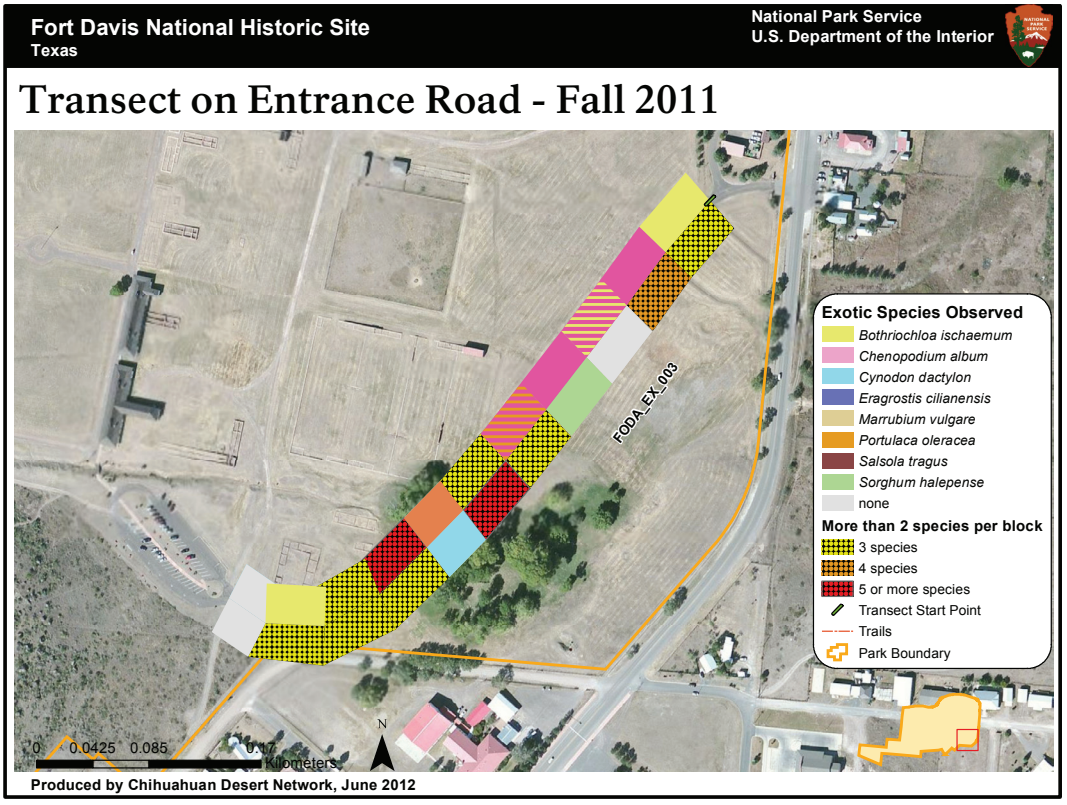


Figure D.2. Exotic plant locations along transects of the Entrance Road vector, during spring (top) and fall (bottom). Twenty of 22 blocks along this transect were resurveyed in the fall.

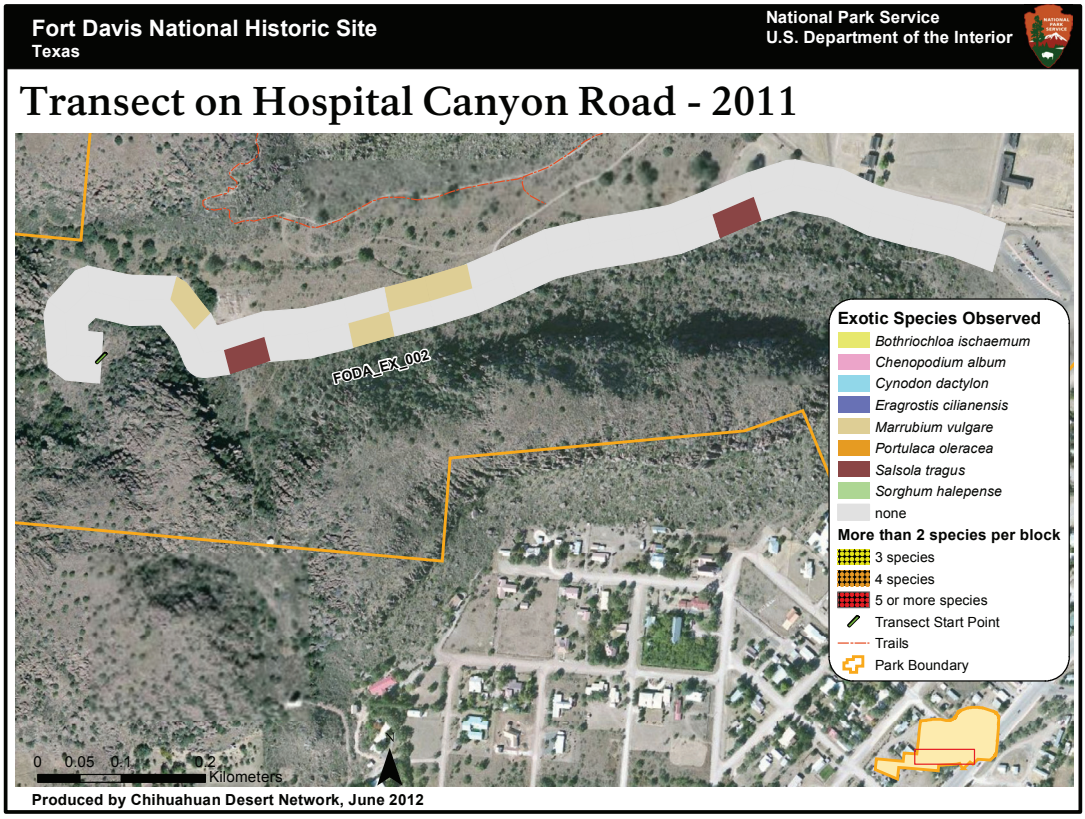


Figure D.3. Exotic plant locations along transects on the Hospital Canyon Road vector.

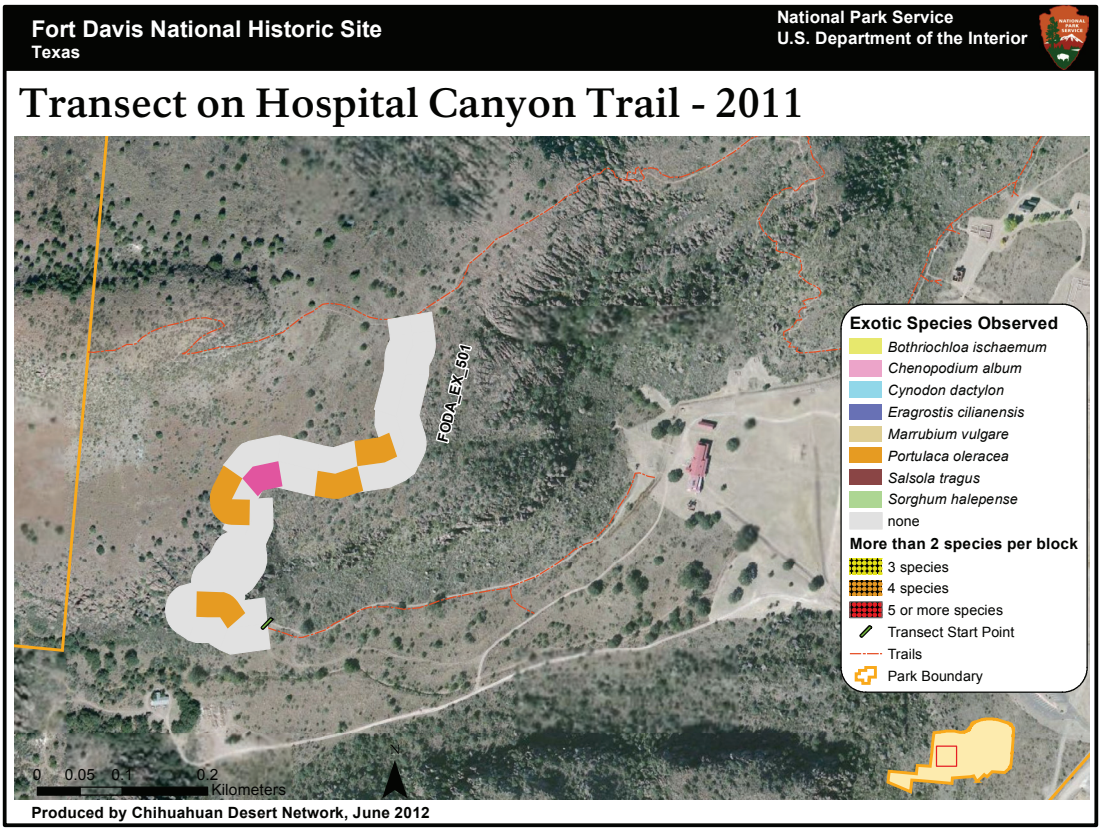


Figure D.4. Exotic plant locations along transects on the Hospital Canyon Trail vector.

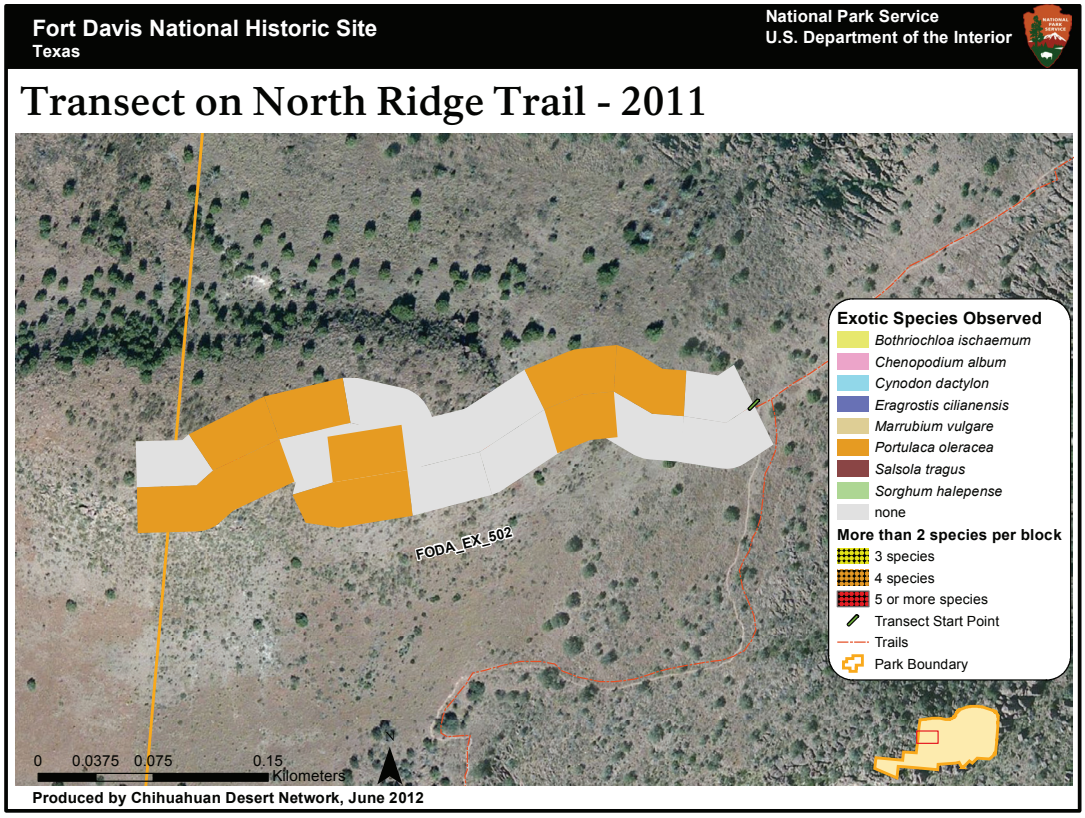


Figure D.5. Exotic plant locations along transects on the North Ridge Trail vector.

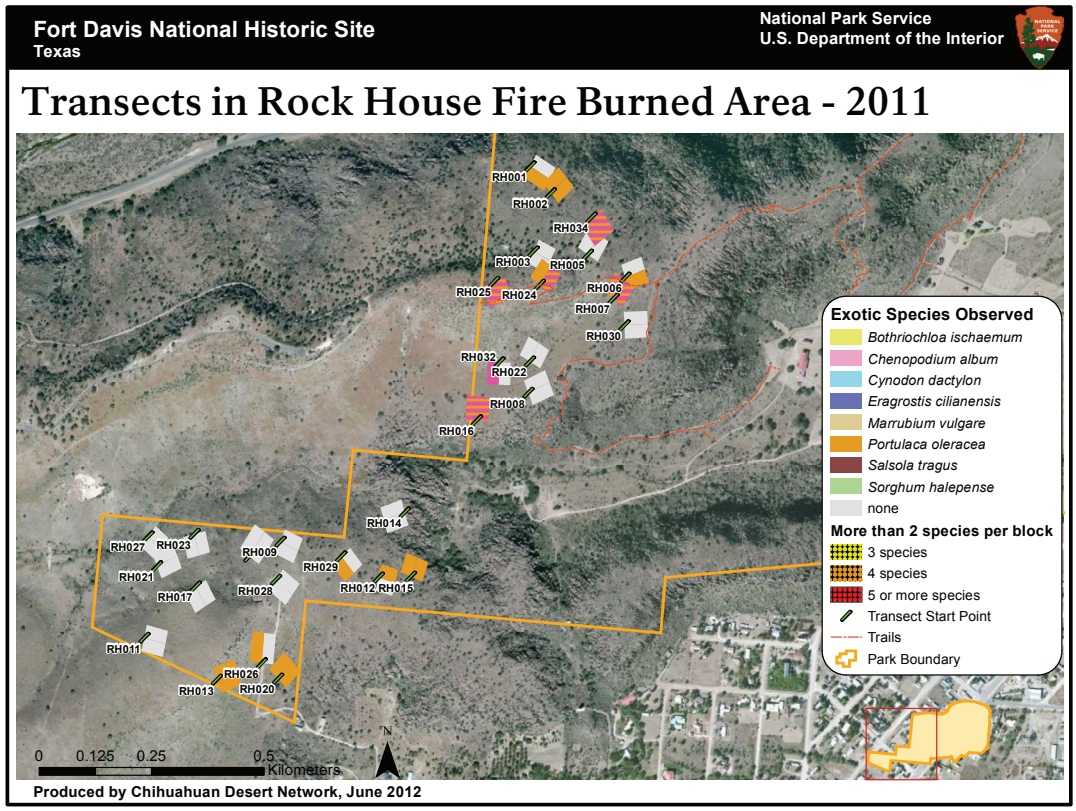
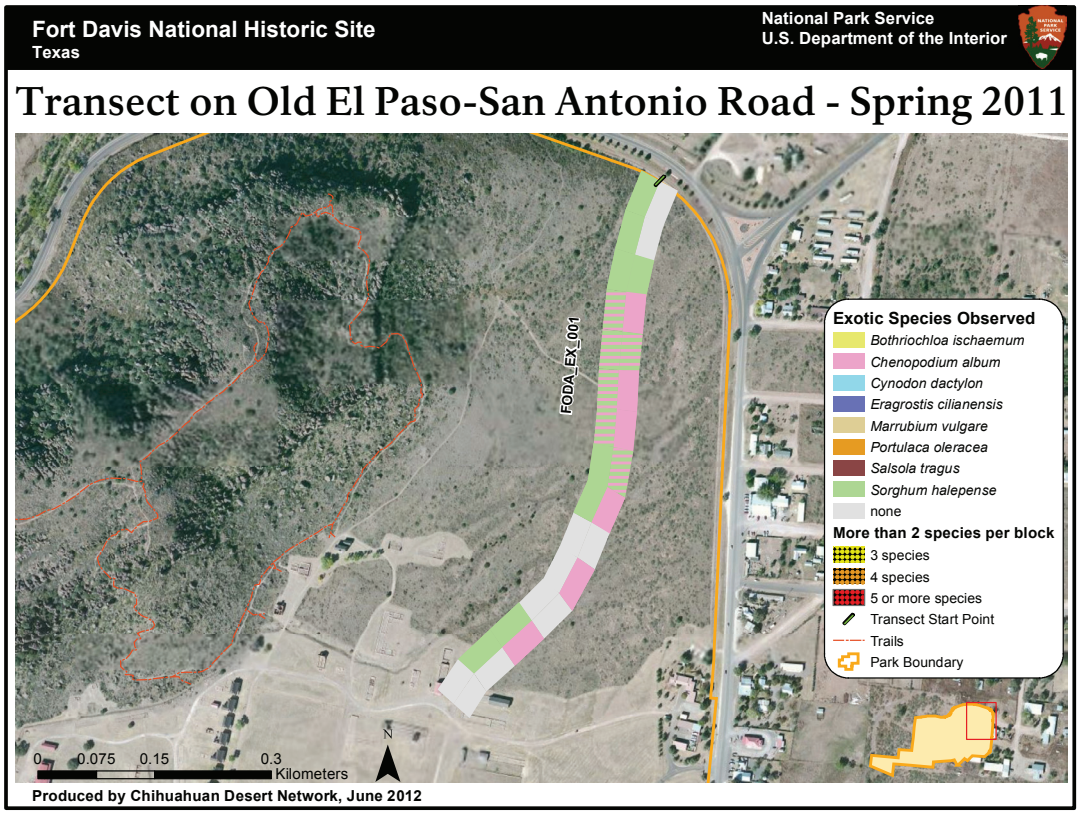


Figure D.6. Exotic plant locations along transects on the Rock House Fire Burned Area vector.



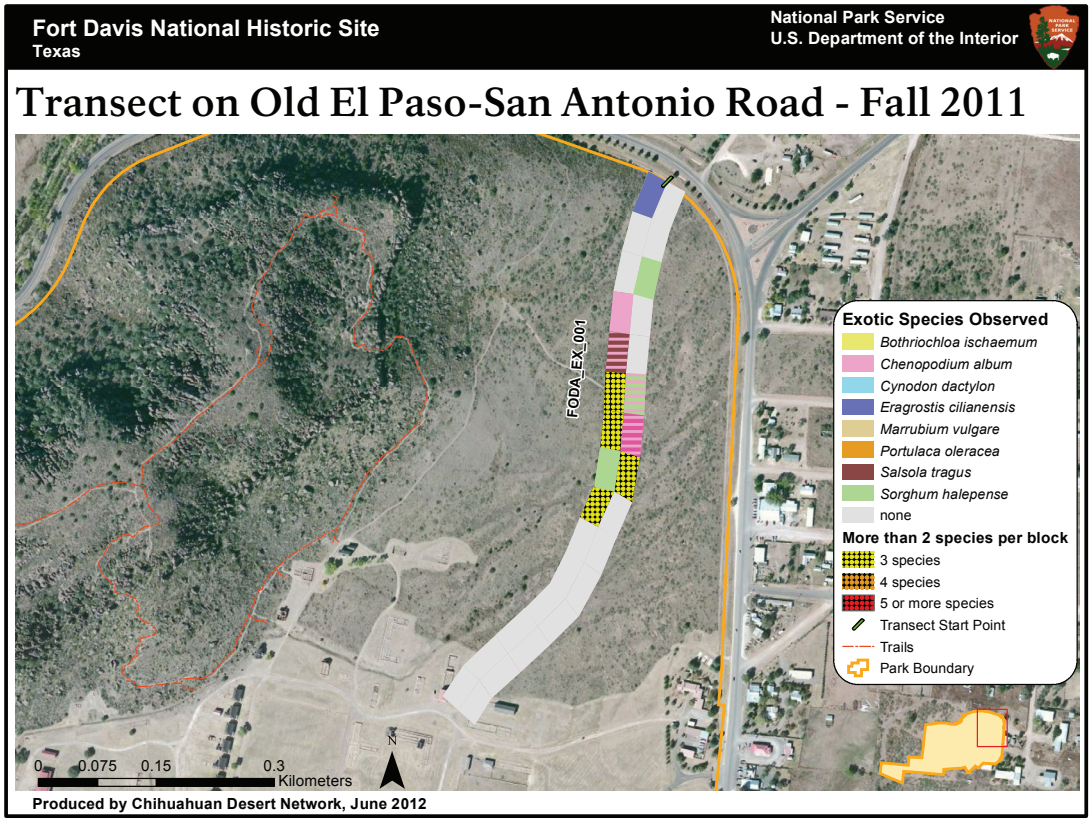


Figure D.7. Exotic plant locations along transects of the Old El Paso-San Antonio Road vector, during spring (top) and fall (bottom). Twenty of 30 blocks along this transect were resurveyed in the fall.

Appendix E. Guadalupe Mountains National Park

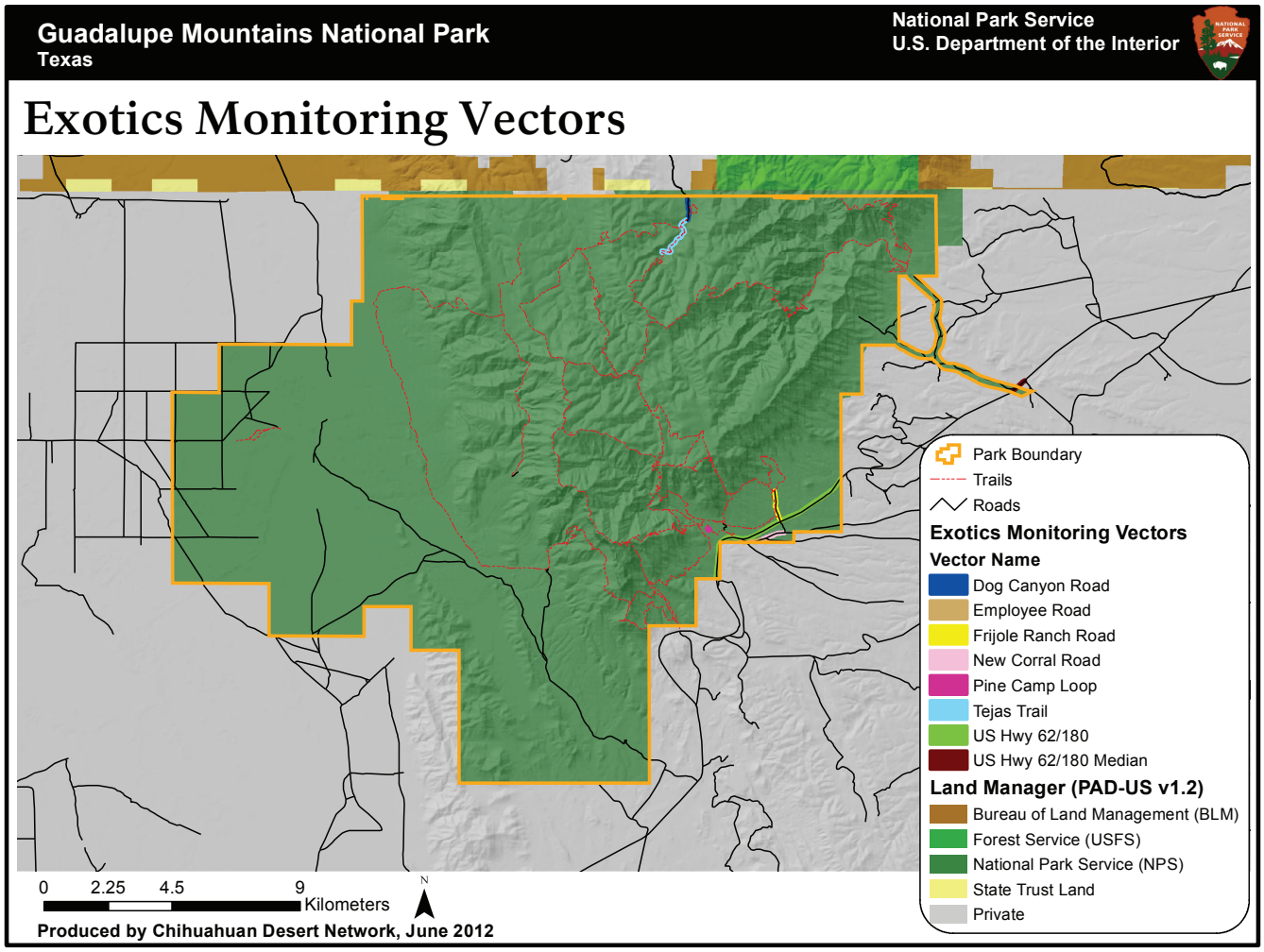


Figure E.1. Map of Guadalupe Mountains National Park showing monitoring transects and surrounding land ownership.

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011.

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Apium graveolens	wild celery	Employee Road	GUMO_EX_009	L	012	1[b]	0	0	0
Bromus catharticus	rescuegrass	Pine Camp Loop	GUMO_EX_008	L	005	1	0	0	0
			GUMO_EX_008	R	006	1	X	X	X
Centaurea melitensis	Maltese star-thistle	Employee Road	GUMO_EX_009	L	013	0	1	0	X
Cynodon dactylon	Bermudagrass	US Hwy 62/180	GUMO_EX_001	R	001	2	0	0	0
			GUMO_EX_001	R	002	2	0	0	0
			GUMO_EX_001	R	004	2	2	0	0
			GUMO_EX_001	R	005	2	2	0	0
			GUMO_EX_001	R	006	2	0	0	0
			GUMO_EX_001	R	010	2	2	0	0
			GUMO_EX_001	R	011	2	0	X	X
			GUMO_EX_001	L	011	2	X	X	X
			GUMO_EX_001	L	012	2	X	X	X
			GUMO_EX_001	R	012	2	0	X	X
			GUMO_EX_001	L	014	2	2	0	0
			GUMO_EX_001	L	015	2	2	2	0
			GUMO_EX_001	L	016	3	X	X	X
			GUMO_EX_001	L	017	2	X	X	X
			GUMO_EX_001	L	018	2	X	X	X
			GUMO_EX_002	R	001	2	2	0	0
			GUMO_EX_002	R	002	2	2	0	0
			GUMO_EX_002	R	004	2	2	0	0
			GUMO_EX_002	R	005	2	2	0	0
			GUMO_EX_002	R	006	2	0	0	0
			GUMO_EX_002	R	007	2	0	0	0
			GUMO_EX_002	R	010	2	0	0	0
			GUMO_EX_002	R	011	1	1	0	0
			GUMO_EX_002	R	013	2	0	0	0
			GUMO_EX_002	R	014	1	0	0	X
			GUMO_EX_002	L	014	2	0	0	0
			GUMO_EX_002	R	015	2	0	0	0
			GUMO_EX_002	L	018	2	2	0	0
			GUMO_EX_002	L	019	2	2	0	0
			GUMO_EX_002	L	020	2	0	0	0
			GUMO_EX_002	R	020	2	2	0	0
			GUMO_EX_003	R	002	1	0	0	0
			GUMO_EX_003	R	003	2	0	0	0
			GUMO_EX_003	R	006	0	1	0	0
			GUMO_EX_003	L	007	2	0	0	0
			GUMO_EX_003	R	008	1	0	0	0
			GUMO_EX_003	L	014	3	0	X	X
			GUMO_EX_004	R	016	2	0	0	0

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Cynodon dactylon (cont.)	Bermudagrass	US Hwy 62/180	GUMO_EX_004	R	017	2	0	0	0
			GUMO_EX_005	L	001	2	0	0	0
			GUMO_EX_005	R	001	2	0	0	0
			GUMO_EX_006	R	015	2	X	X	X
			GUMO_EX_006	R	016	2	0	0	0
			GUMO_EX_007	R	004	2	0	0	0
			GUMO_EX_007	R	005	2	2	0	0
		Employee Road	GUMO_EX_009	L	007	2	0	0	0
			GUMO_EX_009	L	013	0	4	4	X
			GUMO_EX_009	L	019	2	0	X	X
			GUMO_EX_009	L	020	1	0	X	X
		Dog Canyon Road	GUMO_EX_011	L	001	1	0	0	X
			GUMO_EX_011	R	004	1	0	0	X
			GUMO_EX_011	R	005	1	0	0	X
			GUMO_EX_011	L	005	1	0	X	X
			GUMO_EX_011	L	007	1	0	X	X
			GUMO_EX_011	R	007	3	0	0	0
			GUMO_EX_011	R	008	2	2	0	0
			GUMO_EX_011	L	008	2	0	0	0
			GUMO_EX_011	R	008	3	0	0	X
			GUMO_EX_011	R	009	2	2	2	0
			GUMO_EX_011	R	009	3	2	0	X
			GUMO_EX_011	R	010	2	2	0	0
			GUMO_EX_011	R	010	3	2	0	X
			GUMO_EX_011	R	011	3	0	0	0
			GUMO_EX_011	R	013	2	0	0	0
			GUMO_EX_011	R	014	3	2	2	2
			GUMO_EX_011	R	015	3	0	0	0
			GUMO_EX_011	R	016	3	2	3	0
			GUMO_EX_011	L	016	2	0	X	X
		New Corral Road	GUMO_EX_015	L	009	1	1	0	0
			GUMO_EX_015	R	014	0	2	2	X
Eragrostis cilianensis	stinkgrass	Dog Canyon Road	GUMO_EX_011	L	008	1	0	0	X
			GUMO_EX_011	L	009	2	2	0	X
			GUMO_EX_011	L	010	2	2	X	X
			GUMO_EX_011	L	011	0	2	X	X
			GUMO_EX_011	L	014	0	2	X	X
			GUMO_EX_011	L	015	1	2	X	X
			GUMO_EX_011	L	016	0	2	X	X
		Tejas Trail	GUMO_EX_012	L	002	2	0	0	X
			GUMO_EX_012	L	003	0	2	0	X

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Eragrostis cilianensis (cont.)	stinkgrass	Tejas Trail	GUMO_EX_012	L	004	2	3	0	0
			GUMO_EX_012	L	005	3	3	0	0
			GUMO_EX_012	L	006	3	3	0	0
			GUMO_EX_012	L	007	2	2	X	X
		US Hwy 62/180 Median	GUMO_EX_014	L	007	0	1	X	X
			GUMO_EX_014	R	007	0	2	X	X
Eragrostis lehmanniana	Lehmann lovegrass	US Hwy 62/180	GUMO_EX_001	R	001	1	2	0	0
			GUMO_EX_001	L	006	1	0	0	0
			GUMO_EX_001	L	009	0	2	2	0
			GUMO_EX_001	L	014	0	2	2	0
			GUMO_EX_001	R	015	1	0	0	0
			GUMO_EX_002	R	001	0	1	0	0
			GUMO_EX_002	L	003	2	1	0	0
			GUMO_EX_002	R	007	2	1	0	0
			GUMO_EX_002	L	008	2	2	X	0
			GUMO_EX_002	R	009	2	2	0	0
			GUMO_EX_002	R	011	2	2	0	0
			GUMO_EX_002	R	013	1	0	0	0
			GUMO_EX_002	L	016	2	2	0	0
			GUMO_EX_002	L	017	2	2	0	0
			GUMO_EX_002	L	018	2	2	0	0
			GUMO_EX_002	L	019	2	2	0	0
			GUMO_EX_002	R	019	0	2	3	2
			GUMO_EX_002	L	020	2	2	2	0
			GUMO_EX_002	R	020	0	2	2	0
			GUMO_EX_003	L	001	2	2	2	0
			GUMO_EX_003	R	001	0	2	2	0
			GUMO_EX_003	R	002	1	2	2	0
			GUMO_EX_003	L	002	2	2	2	0
			GUMO_EX_003	R	003	1	2	2	2
			GUMO_EX_003	L	003	2	2	1	0
			GUMO_EX_003	L	004	2	2	0	0
			GUMO_EX_003	R	004	1	2	2	2
			GUMO_EX_003	L	005	2	0	0	0
			GUMO_EX_003	R	005	2	2	2	0
			GUMO_EX_003	R	006	2	2	0	0
			GUMO_EX_003	R	007	2	2	2	0
			GUMO_EX_003	L	007	2	0	0	0
			GUMO_EX_006	L	018	2	0	x	0
			GUMO_EX_006	L	019	2	2	0	0
			GUMO_EX_006	L	020	2	0	0	0

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Eragrostis lehmanniana (cont.)	Lehmann lovegrass	US Hwy 62/180	GUMO_EX_007	L	001	2	0	0	0
			GUMO_EX_007	L	002	2	0	0	0
			GUMO_EX_007	L	004	2	2	0	0
			GUMO_EX_007	R	004	1	1	0	0
			GUMO_EX_007	R	005	2	0	0	0
			GUMO_EX_007	R	006	2	0	X	X
			GUMO_EX_007	L	006	2	X	X	X
		Employee Road	GUMO_EX_009	L	005	0	2	2	0
			GUMO_EX_009	L	006	0	2	0	0
			GUMO_EX_009	L	007	0	2	0	0
			GUMO_EX_009	L	016	1	0	0	0
			GUMO_EX_009	L	021	0	1	0	0
		US Hwy 62/180 Median	GUMO_EX_014	R	001	3	X	X	X
			GUMO_EX_014	L	001	2	2	X	X
			GUMO_EX_014	L	002	2	3	X	X
			GUMO_EX_014	R	002	3	X	X	X
			GUMO_EX_014	L	003	2	2	X	X
			GUMO_EX_014	R	003	2	2	X	X
			GUMO_EX_014	R	004	2	2	X	X
			GUMO_EX_014	L	004	2	2	X	X
			GUMO_EX_014	L	005	2	2	X	X
			GUMO_EX_014	R	005	2	2	X	X
			GUMO_EX_014	L	007	1	2	X	X
			GUMO_EX_014	R	008	0	2	X	X
			GUMO_EX_014	L	008	0	2	X	X
			GUMO_EX_014	L	009	1	2	X	X
			GUMO_EX_014	R	010	2	0	X	X
			GUMO_EX_014	R	011	3	X	X	X
			GUMO_EX_014	L	011	2	2	X	X
			GUMO_EX_014	R	012	2	X	X	X
		New Corral Road	GUMO_EX_015	L	004	1	0	0	0
			GUMO_EX_015	L	007	1	0	0	0
			GUMO_EX_015	R	014	0	2	2	X
Erodium cicutarium	redstem stork's bill	Dog Canyon Road	GUMO_EX_011	L	002	2	0	0	X
			GUMO_EX_011	R	003	1	0	0	0
			GUMO_EX_011	R	004	2	0	0	X
			GUMO_EX_011	L	006	1	0	X	X
			GUMO_EX_011	L	007	1	0	X	X
			GUMO_EX_011	L	008	2	0	0	X
			GUMO_EX_011	R	008	2	0	0	X

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Erodium cicutarium (cont.)	redstem stork's bill	Dog Canyon Road	GUMO_EX_011	L	009	2	2	0	X
			GUMO_EX_011	L	010	3	0	X	X
			GUMO_EX_011	R	010	2	0	0	X
			GUMO_EX_011	L	011	3	0	X	X
			GUMO_EX_011	R	011	2	0	0	0
			GUMO_EX_011	L	012	1	0	0	X
			GUMO_EX_011	R	012	2	0	0	0
			GUMO_EX_011	R	013	2	0	0	0
			GUMO_EX_011	L	013	2	2	X	X
			GUMO_EX_011	R	014	2	2	2	0
			GUMO_EX_011	L	014	3	2	X	X
			GUMO_EX_011	L	015	1	0	X	X
			GUMO_EX_011	R	015	2	0	0	0
			GUMO_EX_011	R	016	2	2	0	0
			GUMO_EX_011	L	016	2	0	X	X
		Tejas Trail	GUMO_EX_012	L	001	2	2	0	X
			GUMO_EX_012	R	001	2	2	2	0
			GUMO_EX_012	R	002	2	0	0	0
			GUMO_EX_012	R	004	2	2	0	0
			GUMO_EX_012	R	005	3	2	0	0
			GUMO_EX_012	R	006	2	2	0	0
			GUMO_EX_012	L	009	2	2	X	X
			GUMO_EX_012	R	009	2	2	0	0
			GUMO_EX_012	L	010	2	0	X	X
			GUMO_EX_012	R	010	2	2	0	0
Marrubium vulgare	horehound	US Hwy 62/180	GUMO_EX_002	L	002	2	2	0	0
			GUMO_EX_002	R	005	0	2	2	0
			GUMO_EX_002	R	006	0	2	2	0
			GUMO_EX_005	R	008	1	0	0	X
			GUMO_EX_005	R	013	1	X	0	X
			GUMO_EX_005	R	020	2	1	0	X
			GUMO_EX_006	R	001	2	X	0	X
		Employee Road	GUMO_EX_009	R	012	1	0	0	0
			GUMO_EX_009	R	012	0	2	0	0
			GUMO_EX_009	L	013	0	0	2	X
			GUMO_EX_009	L	014	0	2	0	0
			GUMO_EX_009	L	017	0	0	0	1
			GUMO_EX_009	L	019	0	1	X	X
		Frijole Ranch Road	GUMO_EX_010	R	021	0	2	1	X
		Dog Canyon Road	GUMO_EX_011	L	002	0	2	0	X
			GUMO_EX_011	L	008	2	2	0	0

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Marrubium vulgare (cont.)	horehound	Dog Canyon Road	GUMO_EX_011	R	008	1	1	0	0
			GUMO_EX_011	L	008	2	2	0	X
			GUMO_EX_011	L	009	2	2	0	X
			GUMO_EX_011	L	009	2	2	0	0
			GUMO_EX_011	L	010	2	1	X	X
			GUMO_EX_011	L	010	2	2	0	0
			GUMO_EX_011	L	011	1	1	X	X
			GUMO_EX_011	R	011	1	2	0	0
			GUMO_EX_011	L	012	1	0	0	X
			GUMO_EX_011	L	012	0	1	0	X
			GUMO_EX_011	R	012	1	2	0	0
			GUMO_EX_011	L	013	2	3	X	X
			GUMO_EX_011	L	013	2	2	X	X
			GUMO_EX_011	R	013	1	2	0	0
			GUMO_EX_011	L	014	2	2	X	X
			GUMO_EX_011	R	014	2	2	0	0
			GUMO_EX_011	L	014	2	3	X	X
			GUMO_EX_011	R	014	2	2	0	0
			GUMO_EX_011	L	015	0	1	X	X
			GUMO_EX_011	L	015	2	2	X	X
			GUMO_EX_011	L	016	0	1	2	0
			GUMO_EX_011	L	016	0	1	X	X
			GUMO_EX_011	R	016	1	2	0	0
			GUMO_EX_011	R	016	2	2	2	0
		Tejas Trail	GUMO_EX_012	L	001	1	2	1	X
			GUMO_EX_012	L	001	2	2	0	0
			GUMO_EX_012	R	001	1	1	0	0
			GUMO_EX_012	R	001	2	2	2	0
			GUMO_EX_012	L	002	0	1	2	X
			GUMO_EX_012	L	002	2	2	0	0
			GUMO_EX_012	R	002	1	1	0	0
			GUMO_EX_012	R	004	2	2	0	0
			GUMO_EX_012	L	004	1	0	0	0
			GUMO_EX_012	R	005	2	2	0	0
			GUMO_EX_012	R	005	2	2	1	2
			GUMO_EX_012	L	007	2	2	X	X
		US Hwy 62/180 Median	GUMO_EX_014	R	006	2	2	X	X
			GUMO_EX_014	L	007	0	1	X	X
		New Corral Road	GUMO_EX_015	L	004	2	0	0	X
			GUMO_EX_015	L	004	0	2	0	0
			GUMO_EX_015	L	006	2	0	0	X

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Marrubium vulgare (cont.)	horehound	New Corral Road	GUMO_EX_015	L	008	-9	2	-9	-9
			GUMO_EX_015	L	010	0	0	3	X
Melilotus species	sweetclover	US Hwy 62/180	GUMO_EX_003	L	020	1	0	0	0
			GUMO_EX_004	L	008	1	0	0	0
			GUMO_EX_004	L	014	1	0	0	0
			GUMO_EX_004	R	016	2	0	0	0
			GUMO_EX_004	L	017	1	0	0	0
			GUMO_EX_004	R	017	1	0	0	0
			GUMO_EX_004	R	018	2	0	0	0
			GUMO_EX_004	L	018	1	0	0	0
			GUMO_EX_004	L	019	1	0	0	0
			GUMO_EX_004	R	019	1	0	0	0
			GUMO_EX_004	R	020	2	0	0	0
			GUMO_EX_004	L	020	1	0	0	0
			GUMO_EX_005	R	001	2	0	0	0
			GUMO_EX_005	R	002	1	0	0	0
			GUMO_EX_005	R	004	1	0	0	0
			GUMO_EX_005	L	005	2	0	0	0
			GUMO_EX_005	R	005	2	2	0	0
			GUMO_EX_005	R	006	1	0	0	0
			GUMO_EX_005	R	008	2	0	0	X
			GUMO_EX_005	R	009	1	X	0	X
			GUMO_EX_005	R	020	1	0	0	X
			GUMO_EX_006	R	006	1	0	0	0
			GUMO_EX_006	L	007	1	0	0	0
			GUMO_EX_006	R	007	1	0	0	X
			GUMO_EX_006	R	008	1	0	0	0
			GUMO_EX_006	L	009	1	0	0	X
			GUMO_EX_006	R	009	1	0	0	X
			GUMO_EX_006	R	010	2	0	0	X
			GUMO_EX_006	L	011	2	0	X	X
			GUMO_EX_006	R	011	2	0	X	X
			GUMO_EX_006	L	012	1	0	X	X
			GUMO_EX_006	R	012	1	0	X	X
			GUMO_EX_006	L	013	2	0	X	X
			GUMO_EX_006	R	013	2	1	X	X
			GUMO_EX_006	L	014	2	1	X	X
			GUMO_EX_006	R	014	2	0	X	X
			GUMO_EX_006	R	015	3	X	X	X
			GUMO_EX_006	L	015	2	1	0	0
			GUMO_EX_006	R	016	2	1	X	X
			GUMO_EX_006	L	016	2	1	0	X
		Employee Road	GUMO_EX_009	R	001	1	0	0	0

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Melilotus species (cont.)	sweetclover	Employee Road	GUMO_EX_009	R	002	2	1	0	0
			GUMO_EX_009	L	003	2	0	0	0
			GUMO_EX_009	R	003	2	1	0	0
			GUMO_EX_009	R	004	2	1	0	0
			GUMO_EX_009	R	007	1	0	0	0
Melilotus alba	white sweetclover	US Hwy 62/180	GUMO_EX_002	R	006	1	0	0	0
Melilotus officinalis	yellow sweetclover	US Hwy 62/180	GUMO_EX_002	R	008	1	0	0	0
Salsola kali	Russian thistle	US Hwy 62/180	GUMO_EX_001	L	020	1	0	X	X
		US Hwy 62/180 Median	GUMO_EX_014	L	008	0	1	X	X
		New Corral Road	GUMO_EX_015	L	010	0	1	0	0
Setaria viridis	green bristlegrass	US Hwy 62/180	GUMO_EX_002	R	012	0	1	0	0
		US Hwy 62/180 Median	GUMO_EX_014	R	006	0	1	X	X
Sorghum halepense	Johnsongrass	Employee Road	GUMO_EX_009	L	008	0	0	0	1
			GUMO_EX_009	L	014	0	2	0	0
		US Hwy 62/180	GUMO_EX_001	R	002	1	2	0	0
			GUMO_EX_001	R	003	2	2	0	0
			GUMO_EX_001	R	004	0	1	0	0
			GUMO_EX_001	R	008	0	1	0	0
			GUMO_EX_001	R	009	0	2	2	0
			GUMO_EX_001	L	010	2	2	0	0
			GUMO_EX_001	R	010	1	2	2	0
			GUMO_EX_001	L	011	2	X	X	X
			GUMO_EX_001	L	012	2	X	X	X
			GUMO_EX_001	R	012	0	1	X	X
			GUMO_EX_001	L	013	2	X	X	X
			GUMO_EX_001	R	013	0	1	X	X
			GUMO_EX_001	L	014	2	2	1	0
			GUMO_EX_001	R	015	1	1	0	0
			GUMO_EX_001	L	015	2	2	1	0
			GUMO_EX_001	L	016	2	X	X	X
			GUMO_EX_001	L	017	2	X	X	X
			GUMO_EX_001	R	017	0	1	X	0
			GUMO_EX_001	L	018	2	X	X	X
			GUMO_EX_001	L	019	2	X	X	X
			GUMO_EX_002	R	001	0	2	0	0
			GUMO_EX_002	R	002	0	2	0	0
			GUMO_EX_002	R	003	0	1	1	0
			GUMO_EX_002	R	004	2	2	0	0
			GUMO_EX_002	R	005	2	2	0	0
			GUMO_EX_002	R	006	2	2	2	0

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Sorghum halepense (cont.)	Johnsongrass	US Hwy 62/180	GUMO_EX_002	R	007	0	2	0	0
			GUMO_EX_002	R	013	0	1	0	0
			GUMO_EX_002	R	018	0	1	0	0
			GUMO_EX_002	L	019	2	0	0	0
			GUMO_EX_003	R	009	0	1	0	0
			GUMO_EX_003	R	010	0	1	0	0
			GUMO_EX_003	R	011	0	1	0	0
			GUMO_EX_005	R	004	0	2	0	0
			GUMO_EX_005	R	005	1	1	0	0
			GUMO_EX_005	R	008	0	4	0	X
			GUMO_EX_007	R	002	0	1	1	0
			GUMO_EX_007	R	005	1	0	0	0
			GUMO_EX_007	R	006	1	0	X	X
		US Hwy 62/180 Median	GUMO_EX_014	L	001	1	0	X	X
			GUMO_EX_014	L	005	0	2	X	X
			GUMO_EX_014	R	006	0	2	X	X
			GUMO_EX_014	R	007	2	2	X	X
			GUMO_EX_014	L	007	0	1	X	X
			GUMO_EX_014	R	008	2	2	X	X
			GUMO_EX_014	L	008	0	1	X	X
			GUMO_EX_014	L	009	2	2	X	X
			GUMO_EX_014	R	009	2	1	X	X
			GUMO_EX_014	L	010	2	2	X	X
			GUMO_EX_014	R	010	2	0	X	X
Taraxacum officinale	common dandelion	Tejas Trail	GUMO_EX_012	L	007	1	0	X	X
Tragopogon dubius	yellow salsify	Tejas Trail	GUMO_EX_012	R	006	1	0	0	0
			GUMO_EX_012	R	008	1	0	0	0
			GUMO_EX_012	L	009	1	0	0	0
			GUMO_EX_012	R	009	1	0	0	0
Verbascum thapsus	common mullein	US Hwy 62/180	GUMO_EX_004	L	009	1	0	0	0
			GUMO_EX_004	R	012	0	1	0	0
			GUMO_EX_005	L	008	1	X	X	0
			GUMO_EX_005	R	009	1	X	0	X
			GUMO_EX_005	L	019	1	0	0	0
			GUMO_EX_005	R	020	2	0	0	X
			GUMO_EX_005	L	020	1	0	0	0
			GUMO_EX_006	R	011	0	1	X	X
			GUMO_EX_006	R	016	0	1	0	0
			GUMO_EX_007	R	001	0	0	1	0
		Dog Canyon Road	GUMO_EX_011	L	001	1	0	0	X
			GUMO_EX_011	L	002	0	2	0	X

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Verbascum thapsus (cont.)	common mullein	Dog Canyon Road	GUMO_EX_011	L	004	1	2	X	X
			GUMO_EX_011	L	005	0	2	X	X
			GUMO_EX_011	R	007	1	2	0	0
			GUMO_EX_011	R	008	2	0	0	X
			GUMO_EX_011	L	008	2	2	2	0
			GUMO_EX_011	R	008	1	2	1	0
			GUMO_EX_011	L	008	2	2	0	X
			GUMO_EX_011	L	009	0	2	0	0
			GUMO_EX_011	L	009	0	2	0	X
			GUMO_EX_011	L	010	2	1	X	X
			GUMO_EX_011	L	010	2	2	0	0
			GUMO_EX_011	R	010	1	0	0	X
			GUMO_EX_011	R	011	0	2	1	0
			GUMO_EX_011	R	012	1	2	1	0
			GUMO_EX_011	L	013	1	0	X	X
			GUMO_EX_011	L	013	1	0	X	X
			GUMO_EX_011	R	013	2	0	0	0
			GUMO_EX_011	L	014	2	2	X	X
			GUMO_EX_011	R	014	2	2	0	0
			GUMO_EX_011	L	014	2	3	X	X
			GUMO_EX_011	R	014	2	2	2	0
			GUMO_EX_011	R	015	0	2	2	0
			GUMO_EX_011	L	015	1	2	X	X
			GUMO_EX_011	R	015	0	2	0	0
			GUMO_EX_011	L	015	2	2	X	X
			GUMO_EX_011	R	016	2	2	0	0
			GUMO_EX_011	R	016	0	2	1	0
			GUMO_EX_011	L	016	2	1	0	0
			GUMO_EX_011	L	016	2	1	X	X
		Tejas Trail	GUMO_EX_012	R	001	1	1	0	0
			GUMO_EX_012	L	001	1	2	1	X
			GUMO_EX_012	R	001	2	2	2	0
			GUMO_EX_012	L	001	2	2	0	0
			GUMO_EX_012	R	003	2	2	0	0
			GUMO_EX_012	R	003	1	2	0	0
			GUMO_EX_012	R	004	2	0	0	0
			GUMO_EX_012	L	004	2	2	0	0
			GUMO_EX_012	R	004	0	0	1	1
			GUMO_EX_012	R	005	2	2	0	0
			GUMO_EX_012	L	005	2	2	0	0
			GUMO_EX_012	R	005	2	1	0	0
			GUMO_EX_012	L	005	2	2	0	0
			GUMO_EX_012	R	006	2	2	0	0

Table E.1. Exotic plant species observations by vector, transect and block with density class observed at each distance class, Guadalupe Mountains NP, 2011 (continued).

Scientific Name	Common Name	Vector	Transect	Side	Block	D1[a]	D2	D3	D4
Verbascum thapsus (cont.)	common mullein	Tejas Trail	GUMO_EX_012	L	006	2	2	0	0
			GUMO_EX_012	L	006	3	3	0	0
			GUMO_EX_012	R	006	2	2	0	0
			GUMO_EX_012	L	007	2	2	0	0
			GUMO_EX_012	L	007	2	2	X	X
			GUMO_EX_012	R	007	2	1	0	0
			GUMO_EX_012	R	007	2	2	0	0
			GUMO_EX_012	R	008	1	2	0	0
			GUMO_EX_012	L	008	0	1	0	0
			GUMO_EX_012	R	009	2	2	0	0
			GUMO_EX_012	L	009	2	2	1	X
			GUMO_EX_012	R	009	1	1	0	0
			GUMO_EX_012	R	010	2	0	0	0
			GUMO_EX_012	L	010	1	0	X	X
			GUMO_EX_012	R	011	0	1	0	0
			GUMO_EX_013	R	003	1	0	0	X
Xanthium spinosum	spiny cocklebur	Dog Canyon Road	GUMO_EX_011	L	002	1	0	0	X
			GUMO_EX_011	L	009	1	2	0	X
			GUMO_EX_011	L	010	1	1	X	X
			GUMO_EX_011	R	016	0	2	2	0
		Tejas Trail	GUMO_EX_012	L	003	0	1	0	X

[a] Distance class: 1=from edge of vector to 1.5 or 2 meters in; 2=from transect (at 1.5–2 meters in) to 10 meters; 3=10–20 meters; 4=over 20 meters into the landscape

[b] Density class: 0=species not detected; 1=1–5 plants; 2=scattered patches; 3=evenly distributed patches; 4=matrix; X=no data (topography obscured distance class)

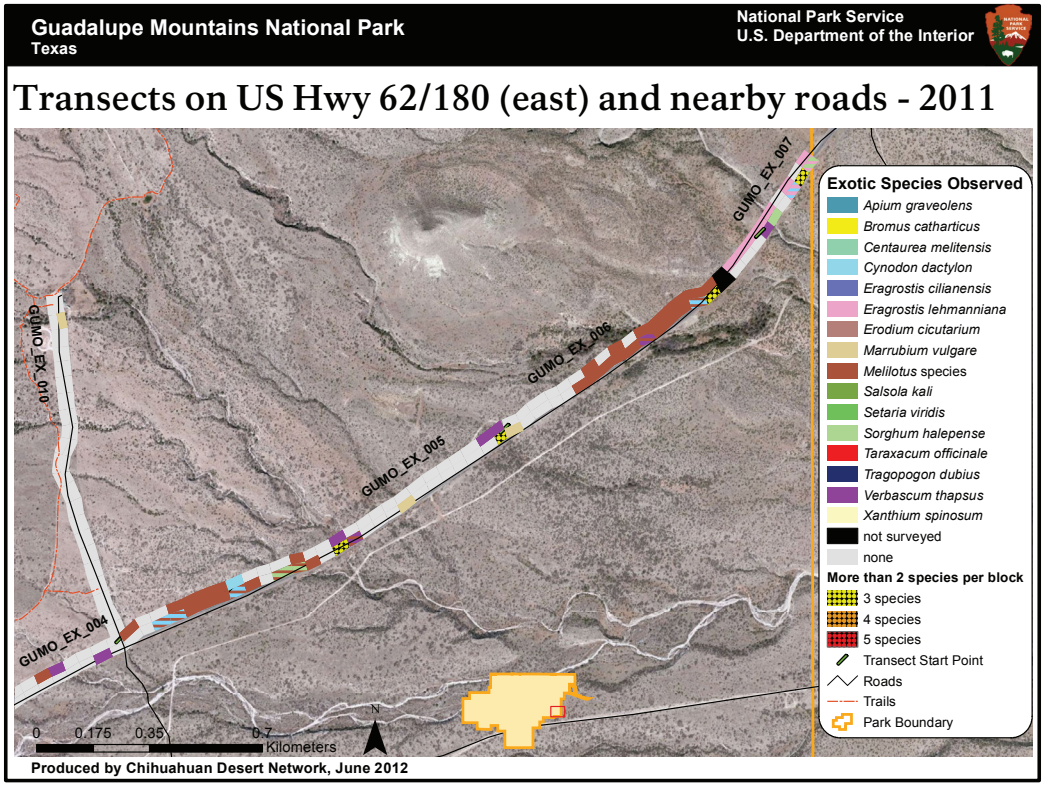


Figure E.2. Exotic plant locations along transects on U.S. Highway 62/180 (east) and Frijole Ranch Road vectors.

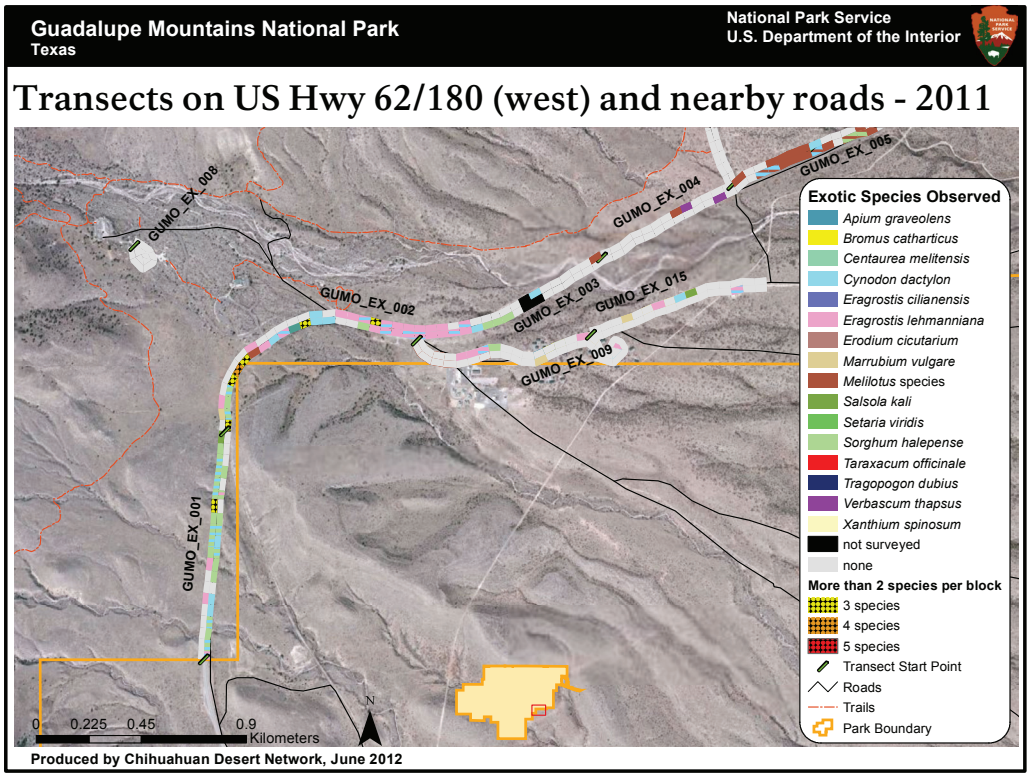
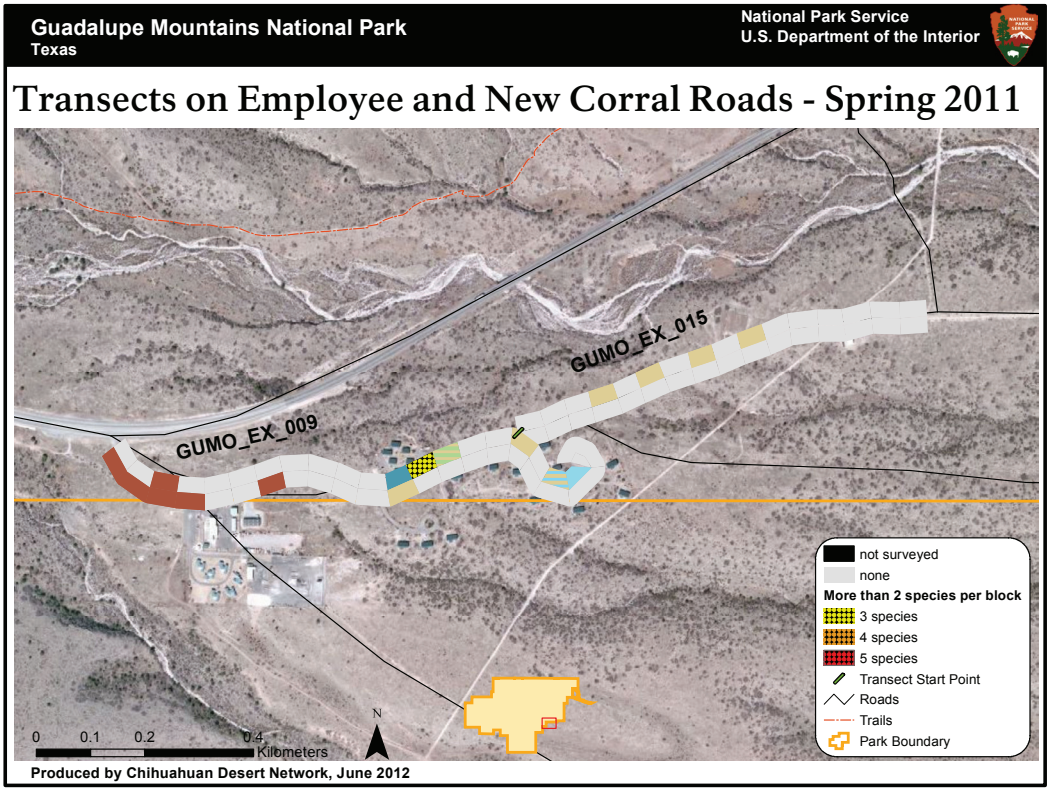


Figure E.3. Exotic plant locations along transects on U.S. Highway 62/180 (west) and Pine Camp Loop vectors.



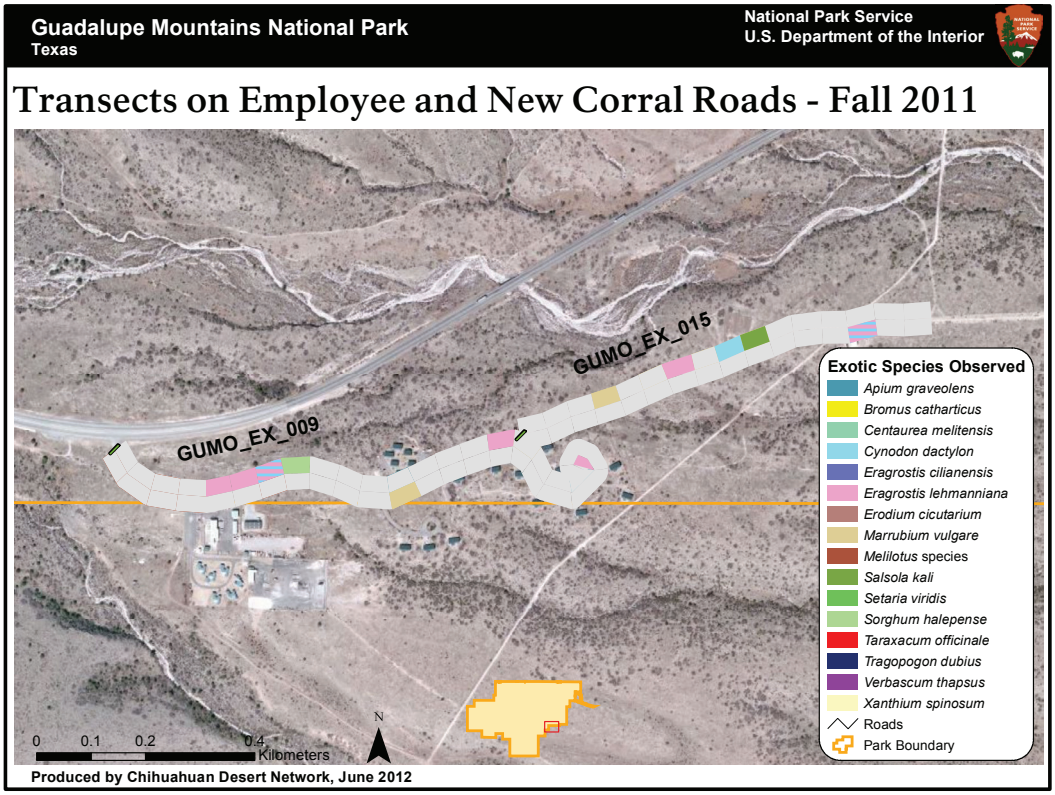
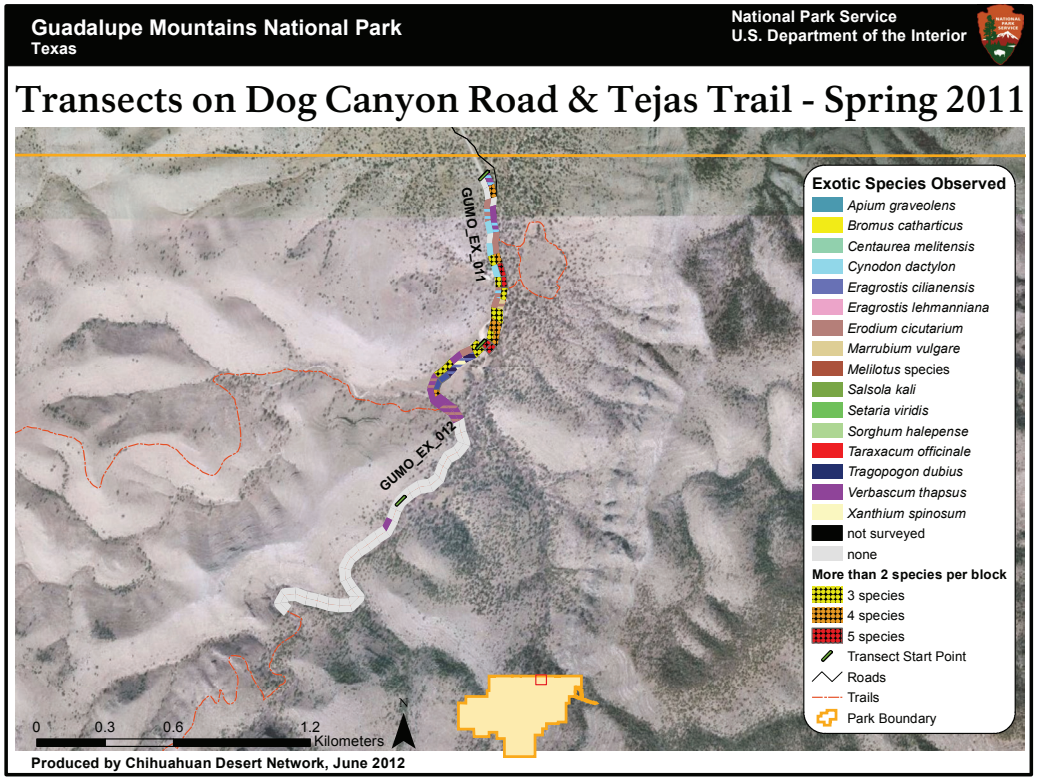


Figure E.4. Exotic plant locations along transects of the Employee and New Corral Roads vectors, during spring (top) and fall (bottom). For transect, GUMO_EX_009, 42 blocks were surveyed in the spring, and 40 blocks resurveyed in the fall. For transect, GUMO_EX_015, 32 blocks were surveyed in the spring, and 28 blocks resurveyed in the fall.



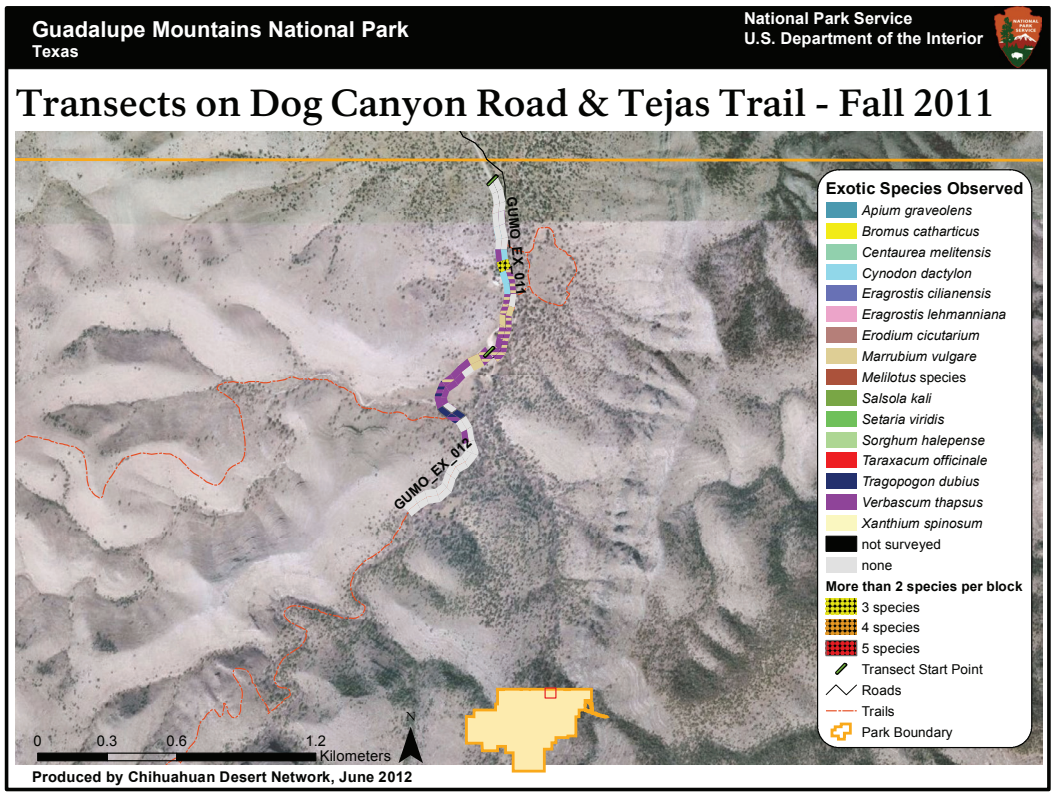


Figure E.5. Exotic plant locations along transects of the Dog Canyon Road and Tejas Trail vectors, during spring (top) and fall (bottom). For transect, GUMO_EX_011, 32 blocks were surveyed in the spring, and 32 blocks surveyed in the fall. For transect, GUMO_EX_012, 40 blocks were surveyed in the spring, and 24 blocks surveyed in the fall.

Appendix F. Details on Sampling Design

The Chihuahuan Desert Network intends to implement the exotic plant protocol on a park by park basis, focusing efforts on areas that are high risk vectors, and are potentially good habitat for exotics. For each park, sampling panels will be determined using knowledge of what exotic plants already exist in each area, ongoing park treatments (if applicable), and priority areas of management concern. The field effort will be tailored to enable the most ground to be covered each year at all parks monitored. Our approach is intended for early detection of invasive plants along the highest risk invasion vectors (e.g., roads, trails, and waterways) of our parks. High risk vectors that are known to have high densities of exotic plants may be excluded from this effort due to low probability of new species entering these systems, and to the low level of new information that would be gained. Seasonality of the surveys will be adapted to best capture the exotic flora's phenological window and to nest within CHDN's other monitoring schedules. No exotic monitoring will take place at White Sands National Monument, at the parks request. Yearly monitoring of all vectors of concern will take place at Guadalupe Mountains and Carlsbad Caverns National Parks. All other parks will be monitored under a one- to three-year rotation.

A Hierarchical Approach

Our overall approach incorporates the following components of sampling, each intended to complement each other:

Systematic Rotating Panel Design for the Highest Risk Vectors

Highest risk vectors would be monitoring using a rapid sampling technique. This approach assigns each high priority invasive plant species observed to one of four density and distance (perpendicular from the vector) classes for 50 m blocks along the vector. The net result is a repeated (every one to three years) sample of each block such that trends over time can be estimated using a categorical data analysis approach, but the results can also be represented spatially and quickly communicated to park management or EPMTs.

Systematic Monitoring of Interior Sites

Interior habitats away from high-risk vectors are monitored as part of our other upland vegetation monitoring, and as part of our springs' ecosystem inventory.

Although this approach will not provide a comprehensive monitoring of interior (e.g., back country) habitats, it will provide a financially feasible means for early detection of the highest risk species along the highest risk vectors. Sampling designs for each of these tiers are presented below.

Rotating Panel Design for the Highest Risk Vectors

Preliminary pilot efforts in 2010 indicated that we are able to sample approximately 40 blocks per day, one linear kilometer for vectors with two sides (interior trails and roads). This will enable all of the highest risk vectors to be sampled on a one to 3-year rotation (Figure F.1).

We expect to refine our panels based on better estimates of the time required and further discussions with parks. Some of the anticipated refinements might be:

- Adjustments based on the actual time required to complete a panel.
- Changes in the investment of time that allows us to do more (or less) within a given year (panel).
- Changes in the rotation (e.g., a longer rotation for larger parks enabling more panels to be sampled).
- Changes in the inclusion or exclusion of vectors as primary or secondary.

The following figures display the sampling regime for the five parks in the CHDN where exotic plant species monitoring is occurring (Figures F.2-F.6).

Panel	Sampling Occasion											
	1	2	3	4	5	6	7	8	9	10	11	12
1	■			■			■			■		
2		■			■			■			■	
3			■			■			■			■
	Full Park Sample			Full Park Sample			Full Park Sample			Full Park Sample		

Figure F.1. Example of a basic three-year rotating panel design, where a full sample of each park is completed and repeated every three years.

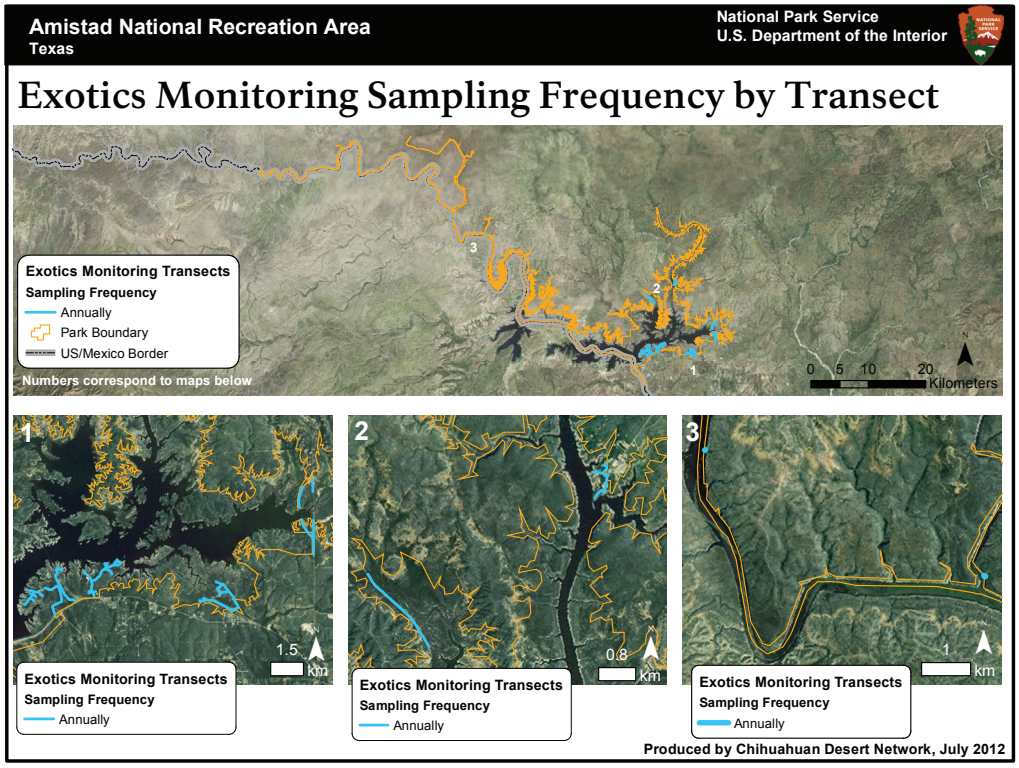


Figure F.2. Sampling frequency for Amistad National Recreation Area.

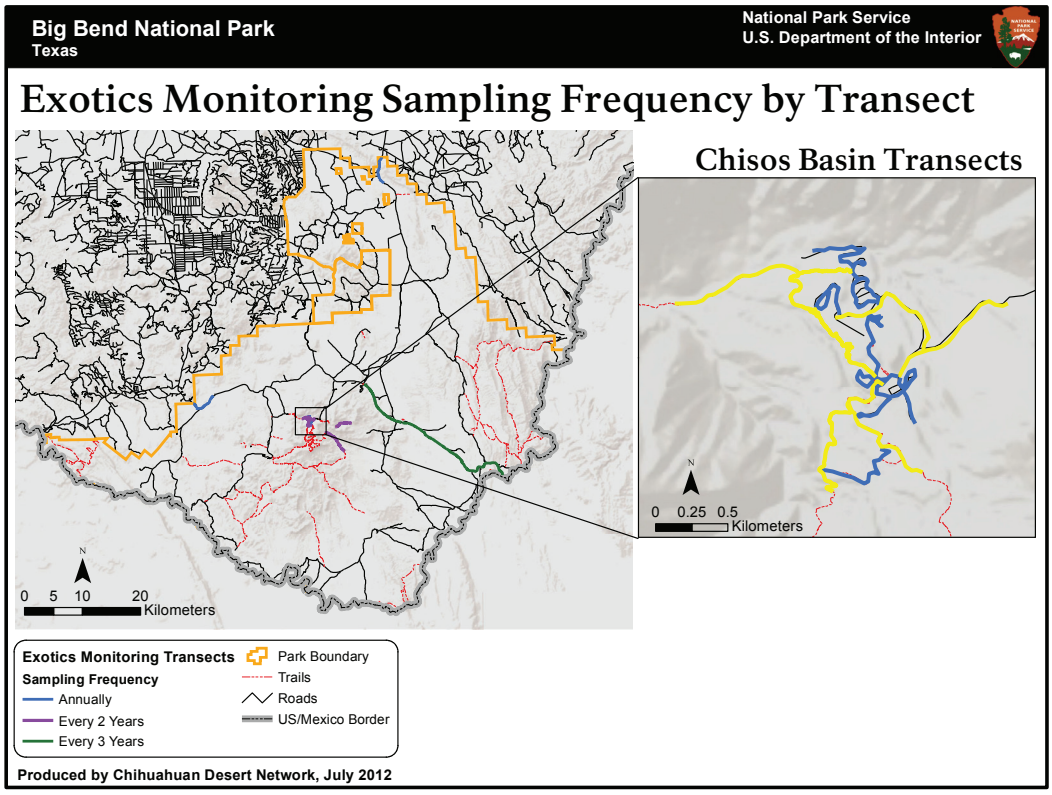


Figure F.3. Sampling frequency for Big Bend National Park.

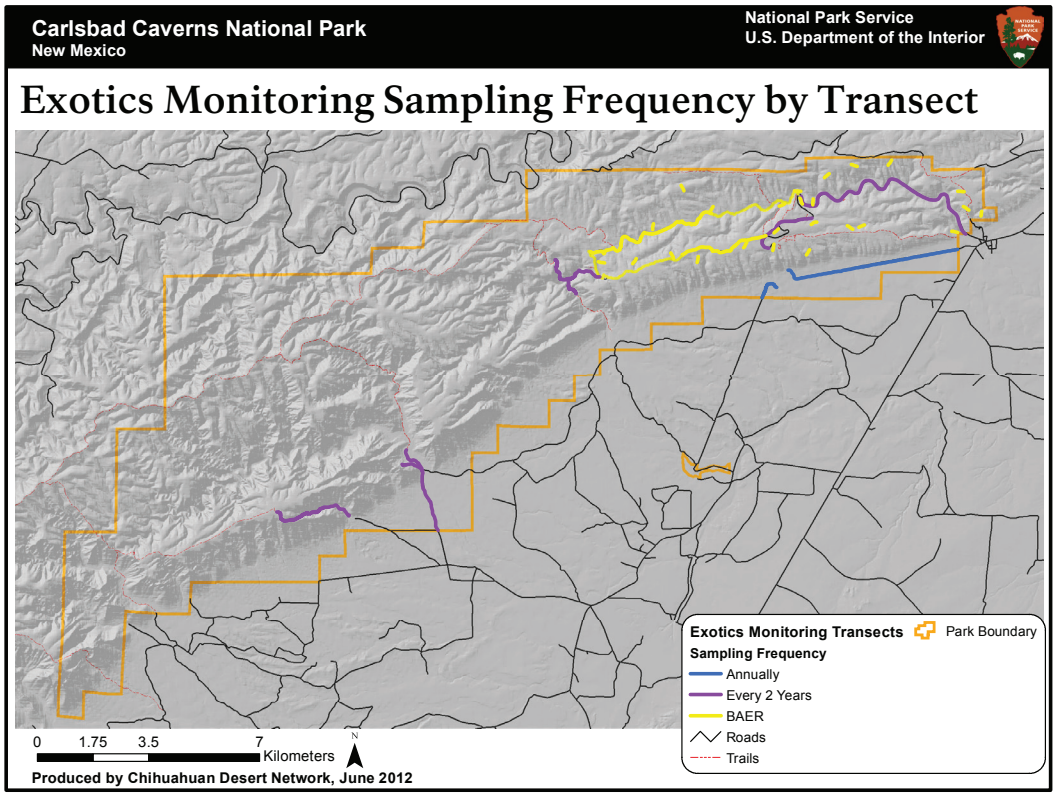


Figure F.4. Sampling frequency for Carlsbad Caverns National Park.

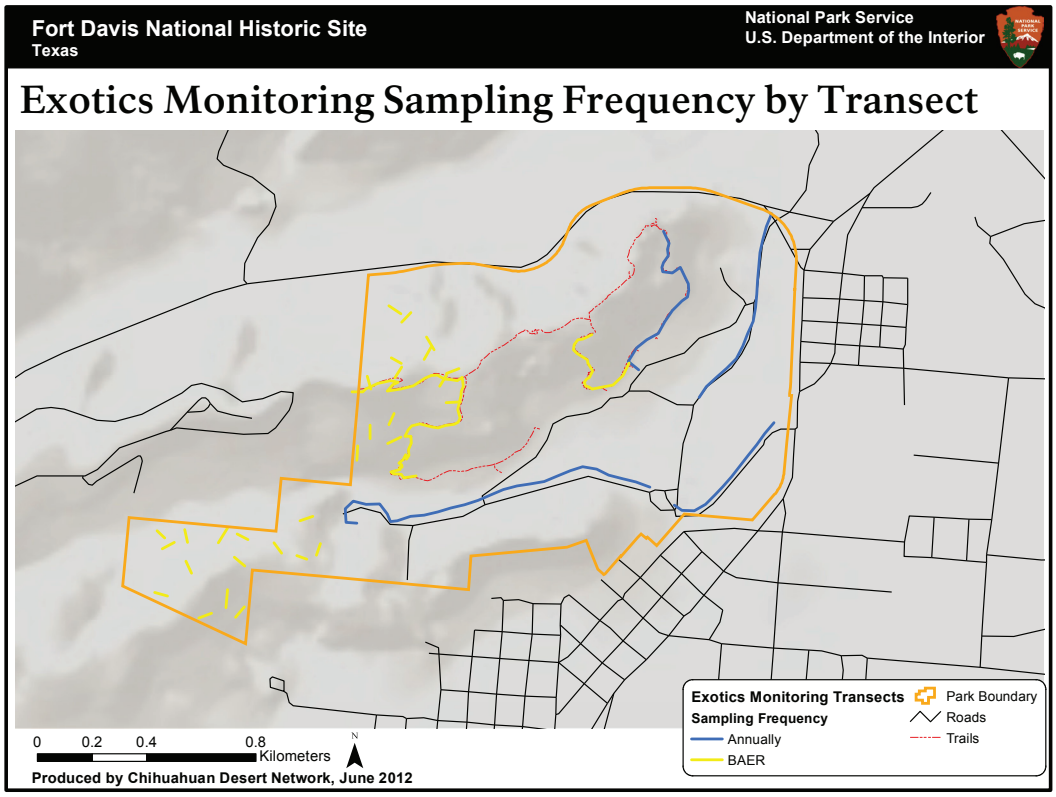


Figure F.5. Sampling frequency for Fort Davis National Historic Site.

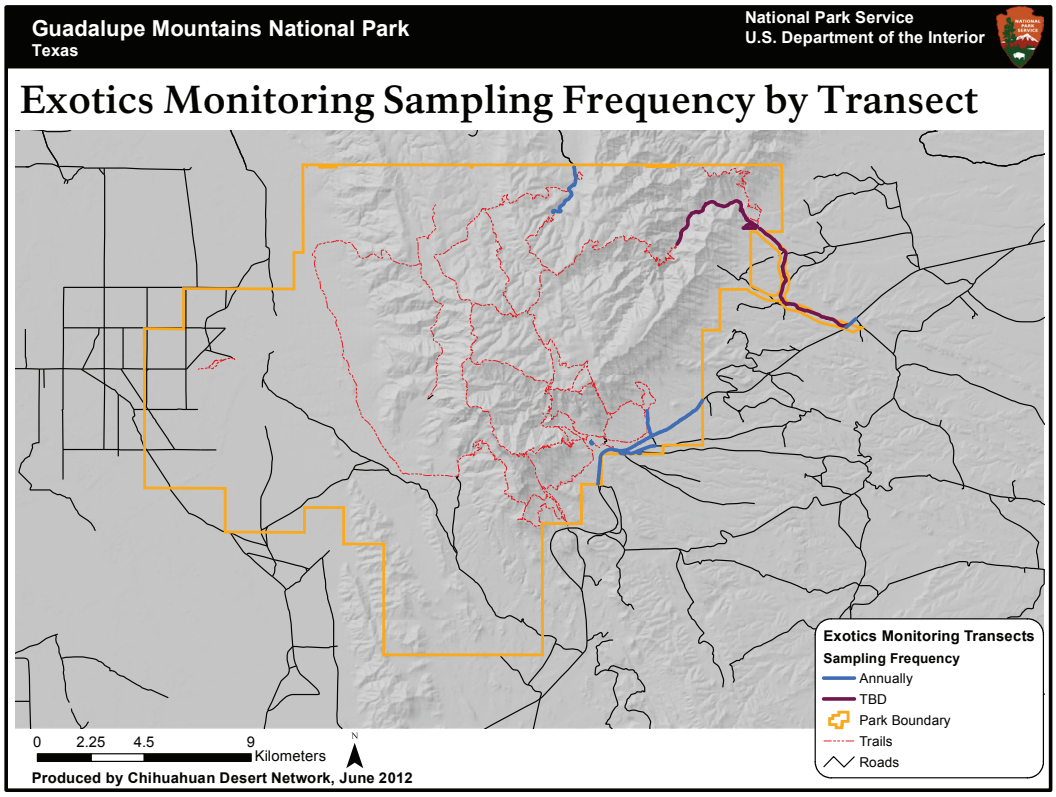


Figure F.6. Sampling frequency for Guadalupe Mountains National Park.

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

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