



Grassland and Fire Effects Monitoring in the Southern Plains

Southern Plains Network and Southern Plains Fire Group Collaboration Project Report 2010 and 2011

Natural Resource Technical Report NPS/SOPN/NRTR—2012/537



ON THE COVER

Prescribed fire in Bent's Old Fort National Historic Site, 2006. NPS photo.

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Executive Summary

Grassland vegetation is the most widespread vegetation type occurring in the Southern Plains. Exotic species invasions, expanding row-crop agriculture, overgrazing, mineral exploration, and establishment of woodlots and shelterbelts have all contributed to grassland degradation and loss of genetic diversity. Monitoring grassland vegetation communities will help Southern Plains park managers better understand the dynamic nature of these ecosystems and the processes that control them.

From the perspectives of both fire management and ecological health, it is important to understand the effects of fire as a process that shapes our grassland communities. Given the high overlap in each program's goals in monitoring these ecosystems, it makes sense for the Inventory & Monitoring (I&M) Program and the NPS Fire Program to join in a collaborative monitoring effort. This project represents the continuing effort toward establishing that collaboration (Folts-Zettner et al. 2007).

During 2010, a crew funded by both the I&M and Fire programs worked on a pilot of the

collaborative field efforts. In addition to surveying standard Fire Program shrub transects and conducting biomass sampling (USDI National Park Service 2003), the crew fielded by the Southern Plains Fire Group sampled species composition and abundance using methods employed by the Southern Plains Inventory & Monitoring Network. Conditions were such in 2011 that each program had to field a monitoring team, but each team followed the integrated protocol and data was pooled for analysis. A total of 109 permanent transects were monitored across the Southern Plains in 2010, while 96 transects were sampled in 2011.

The results presented in this two-year report represent two field seasons with very different growing conditions. 2010 was a year of average to above normal rainfall and green vegetation, but the winter was dry and the following spring brought no rainfall. 2011 was a year of extreme drought across the southern plains. The combination of limited annual data and very different growing conditions means that no inferences can yet be made to trends or drought effects.

1 Introduction

Grassland vegetation is the most widespread vegetation type occurring in the Southern Plains. Exotic species invasions, expanding row-crop agriculture, overgrazing, mineral exploration, and establishment of woodlots and shelterbelts have all contributed to grassland degradation and loss of genetic diversity. Monitoring grassland vegetation communities will help Southern Plains park managers better understand the dynamic nature of these ecosystems and the processes that control them. Monitoring will also provide an early warning of abnormal conditions, which will allow managers to make effective decisions for mitigation. This effort should also be a source of contributing information to the planning of any prairie restoration efforts.

Fire is a critical natural process and a primary influence on the plant and wildlife communities of national parks and the Southern Plains ecosystem. Fire, along with climate, is also the biggest determinant of whether grasslands preclude forests in the Southern Plains (Axelrod 1985; Anderson 1990). Monitoring the effects

of fire on park ecosystems is an important part of the National Park Service (NPS) Fire Program. Fire managers need to accurately predict fire behavior under varying weather conditions, and predict how fuel loads will affect fire behavior, plant populations, and tree regeneration. From the perspectives of both fire management and ecological health, it is important to understand the effects of fire as a process that shapes our grassland communities. Given the high overlap in each program's goals in monitoring these ecosystems, it makes sense for the Inventory & Monitoring (I&M) Program and the NPS Fire Program to join in a collaborative monitoring effort. This project represents the continuing effort toward establishing that collaboration (Folts-Zettner et al. 2007).



NPS PHOTO
Monitoring grassland vegetation communities will help Southern Plains region park managers better understand the dynamic nature of these ecosystems and the processes that control them.

2 Collaborative Framework

2.1 Goals and objectives

The overall goal of monitoring Southern Plains grassland communities is to help park managers better understand the dynamic nature of grassland vegetation ecosystems and the processes that influence them. The specific monitoring objectives are:

2.1.1 Objective 1

Determine status and trends in plant species composition (richness and diversity) and community structure (relative abundance, frequency, distribution, ground cover) of remnant, disturbed, and/or restored grasslands.

2.1.2 Objective 2

Document the location, extent, and timing of wildland and prescribed fires or other management treatments in Southern Plains parks. The sampling for this objective will combine the program goals of the I&M Program for ecosystem health with the goals of the NPS Fire Program for using fire and other treatments to manage grassland systems.

2.1.3 Objective 3

Determine status and trends in soil structure (erosion potential, infiltration rate,

compaction, texture, stability) and soil chemistry (bulk soil carbon to nitrogen ratios).

2.2 Collaborative model

The collaboration between the I&M and Fire programs is intended to gain efficiency from each program’s strengths, programmatic goals, and legacy (Table 2.1). The I&M Program approaches grassland monitoring with an emphasis on long-term ecosystem health. In contrast, the Fire Program approaches monitoring with an emphasis on understanding the effects of wildland fire, prescribed fire, or mechanical treatment as a management or “natural” treatment on the ecosystem. Not surprisingly, the parameters that would be monitored from each of these perspectives overlap considerably. Furthermore, most of the park units are subject to fire or other treatments at some point in time. Consequently, there is no inherent difference between land managed with fire or other treatments and land for which ecosystem health is being assessed. It also follows that there is considerable efficiency to be gained from a combined effort whereas complementary types of sampling can add value to the sampling designs that might otherwise occur independently.

Table 2-1. Primary roles and contributions of the Inventory & Monitoring and Fire programs toward the collaborative effort

Contribution	Description	Lead Group
Field crew	Oversight	Fire
Field crew	Day-to-day	Fire ¹
Data analysis	As per I&M and Fire needs	I&M
Data management	Maintain database with shared access	I&M
Reporting	See Table 3-1	I&M

¹ I&M will contribute to the cost of one or two field technicians.

3 Methods

3.1 Site selection

The I&M and Fire programs monitor grassland ecosystems though the emphasis differs between both programs. The Fire Program historically emphasized monitoring immediately before, during, and after fire events, with the goal of understanding the response of grasslands to fire. In contrast, the I&M Program monitoring emphasizes long-term ecosystem health, focusing on the cumulative effects of a fire regime, including secondary effects from fire events that manifest themselves over an extended period of time (Figure 3.1). This does not mean the Fire Program is not interested in long-term effects of fire regimes, or that the I&M Program is not interested in the immediate effects of a fire event. Rather, it implies that, with limited resources, there may information needs that require the allotted resources be directed toward the aspects of fire ecology and management that provide the greatest benefit to managers and the public.

During the spring of 2009, representatives of both programs selected grassland monitoring sites for all Southern Plains

parks. The group used vegetation maps of each park to identify grassland communities, areas where type conversions to grassland were occurring, and areas of special concern to the parks—primarily cottonwood communities. In some cases, these communities already contained existing fire-event monitoring transects, which were maintained in the sampling scheme for this monitoring project to provide historic data (Figure 3.2). The group randomly selected additional plots in the same area of the existing fire-event monitoring transects for long-term monitoring, selecting a number of “long-term” transects equal to the number of “fire-event” transects. Every fire-event transect in a particular habitat has a similar long-term transect that “mirrors” it. Fire-event transects will continue to be sampled on the Fire Program’s pre- and post-burn schedule, while long-term transects will be sampled annually to ensure we have samples from all successional stages relative to fire (or other treatment) events and help to interpret the potential confounding effects of year (e.g., environmental effects) and fire events.

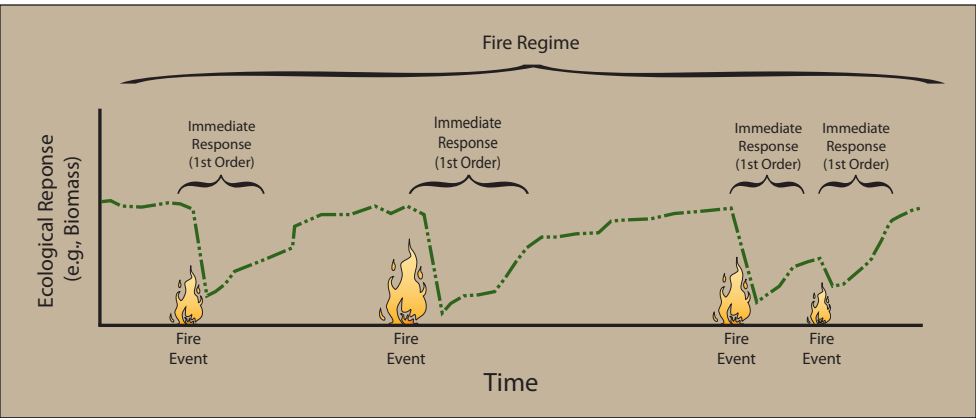


Figure 3.1. The cumulative effects of multiple fires over space and time can be considered a higher order scale of the regime, which may be appropriate for some monitoring objectives.

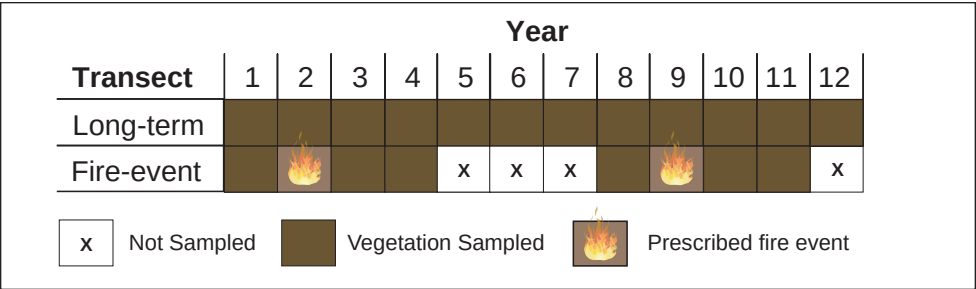


Figure 3.2. All long-term and fire-event transects are subject to fire. Although fire is expected and will even be prescribed on long-term transects, the fire-event sampling pattern is designed to assist the Southern Plains assess our first order immediate response.

3.2 Sampling design

During 2010, a crew funded by both the I&M and Fire programs worked on a pilot of the collaborative field efforts. In addition to surveying standard Fire Program shrub transects and conducting biomass sampling (USDI National Park Service 2003), the crew sampled species composition and abundance using the nested plot method employed by the Southern Plains Inventory & Monitoring Network. This consists of a permanent 50-meter transect with a nested plot sampled at 0-, 10-, 20-, 30- and 40-meters (Figure 3.2). Conditions were such in 2011 that each program had to field a monitoring team, but each team followed the integrated protocol and data was pooled for analysis. Both programs are committed to fielding one team in 2012 as previous obstacles have been overcome.

In general, the monitoring teams consisted of interns from the Student Conservation Association (SCA) and one NPS crew leader, with one NPS employee available for training and assisting the team with clarifications of the protocol and identification of plant species. The interns received training in monitoring techniques and plant identification. Refinements to the monitoring techniques were made throughout the 2010 season in an effort to balance data quality with time efficiency. These refinements have been incorporated into the draft Integrated Grassland Monitoring Protocol.

In 2010, we tested an altered approach to the original 1-m² nested plot. This new approach consisted of four subplots: 1 m² (to provide a crosswalk to earlier data), 2 x 1 m, 4 x 1 m, and 8 x 1 m. This approach was implemented to provide additional data for testing which size of subplot

produced the most robust data for effort expended. Crew leaders and Southern Plains staff quickly determined that the 8 x 1 m subplot provided little additional data for the effort expended and the subplot was dropped from formal quantitative sampling for the remainder of the season. Southern Plains staff frequently visually estimated new species and their cover in this 8 x 1 m subplot: both estimates were low during the remainder of the season, verifying the deletion of the this subplot. The Principal Investigators scrutinized the nested plot data prior to the 2011 field season and made a final determination that the 1m² and 2x1 m plots gained the most efficiency while providing the most robust data for the nested plots. This sampling design was implemented during the 2011 field season and the protocol updated accordingly. Data for 2010 was analyzed based on the subplots used in 2011.

3.3 Hierarchical reporting

Reporting will be hierarchical and intended for multiple audiences and media. The primary delivery system for all reports will be the Internet, via the Learning Center of the American Southwest (LCAS), <http://www.southwestlearning.org>. However, the individual products available on the web site will also be available in a format (PDF) that will facilitate easy printing or enable us to deliver a printed version to appropriate audiences.

Information within the LCAS is organized hierarchically, as a series of products within two major levels, the resource level and the project level. Resource-level products report on the condition of the resource, regardless of the source of information. This is the level that best synthesizes the available information regarding the status and trends of the resource. In

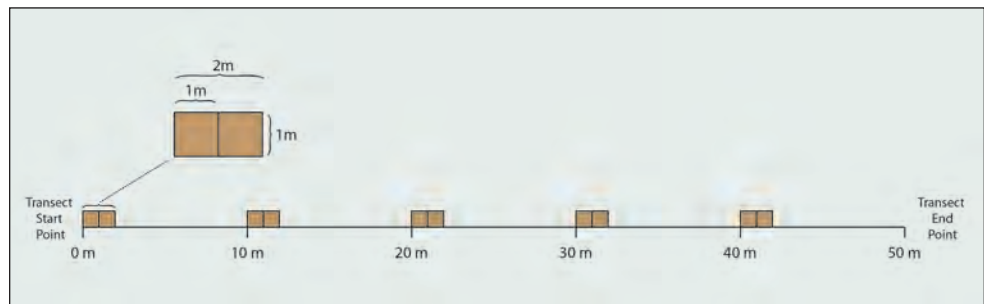


Figure 3.2. Primary sample units for sampling grasslands.

Table 3.3-1. Hierarchy of primary products produced for the collaborative effort

Product	Primary purpose/scope	Primary target audience(s)	Scale	Length	Frequency
Resource brief	Status and trend of grassland habitat	Superintendents/ Resources managers	Park	1 page	Annual
Project summary	Summary of a project; accomplishments and results for a given year, extracted from Annual Report	Resource managers	Park	2 pages	Annual
Annual report	Project accomplishments and results for a given year	Resource managers	Southern Plains with individual park sections	Variable	Annual
Synthesis report	In depth synthesis of data and supporting evidence; primary focus on trends and influence on those trends	Resource managers/ science community	Southern Plains with individual park sections	Variable	Every five years

contrast, project-level products report the available information from a given project, whether it be monitoring, research, etc. Thus, someone looking for the most comprehensive information about status and trend of a resource would find it at the resource level, while someone looking for the specific results from a given project would find it at the project level. I&M monitoring data will contribute to, and sometimes be the only source of information for, resource-level products, and will also be reported at the project level.

For this monitoring effort, we anticipate products at both the resource and project level, each of which are described below and summarized in (Table 3.3-1). At the resource level we expect to produce a resource brief annually. At the project level, we anticipate producing a project summary and report annually, and a synthesis report approximately every five years.

The synthesis report is a more in depth assessment of the status and trend of the resource. This annual report, while also

synthesizing project results, is a generally limited to a data summary and estimates of the core parameters. In contrast, the synthesis report will provide a much more in depth assessment, including more comprehensive analyses and broader interpretation of the implications of the results to other resources.

3.4 Reporting of Spatial Data via the IMR Interactive Map Server

In addition to the hierarchy of reports, we also anticipate spatial products to be disseminated through the Intermountain Region's Interactive Map Service. This enables us to make available to the parks data that would normally be limited to our GIS in the form of downloadable, viewable and printable interactive and scalable maps in "pdf" format. Just as with our GIS, users can designate which layers are turned on or off and at what scale a given map is presented. This is particularly well suited for parks with limited or no GIS capabilities (i.e., most of our parks).

4 Results

The results presented in this two-year report represent two field seasons with very different growing conditions. 2010 was a year of average to above normal rainfall (Figure 4.1- 2010 *Palmer Drought Index*) and green vegetation, but the winter was dry and the following spring brought no rainfall. 2011 was a year of extreme drought across the southern plains (Figure 4.1 2011 - *Palmer Drought Index*). The difficulty identifying dormant grasses increased throughout the field season, with the final parks visited (FOUN, PECO and LAMR) reporting limited data at the genus level. At times, certain grasses could be identified as present, but often it was problematic to quantify accurate cover of specific genuses. This issue will be addressed in the protocol update for future field seasons.

A second refinement was made when looking at the plot substrate. In 2011,

bare soil was divided into two separate categories: bare soil exposed to the elements/open sky (SOIOPEN) and bare soil found under a vegetation canopy (SOILUNDER). Bare soil not protected by a canopy is more susceptible to rain action and wind erosion. 2010 soil measurement (SOILBARE) combined these two measurements.

Additional species have been identified in the 2011 transects. This can be attributed to 1) annual variation of plant species, particularly annuals; 2) minor realignment of the transects when a permanent rebar has been removed; or 3) better identification of species due to improved and/or expanded field identification materials. Some species are difficult to distinguish at particular life stages and efforts continue to refine field materials.

Table 4-1. Numbers of transects of each type monitored at each Southern Plains park, 2010 and 2011

Park	Transects				Total	
	#longterm		#fire-event			
	2010	2011	2010	2011	2010	2011
Bent's Old Fort NHS	13	13	0	0	13	13
Capulin Volcano NM	6	6	0	0	6	6
Chickasaw NRA	9	10	4	2	13	12
Fort Larned NHS	8	8	4	0	12	8
Fort Union NM	6	6	0 ^a	0	6	6
Lake Meredith NRA/ Alibates Flint Quarries NM	25	18	2	2	27	21
Lyndon B. Johnson NHP	2	2	0 ^b	0	2	2
Pecos NHP	8	7	8 ^c	0	8	7
Sand Creek Massacre NHS	12	12	0	0	12	12
Washita Battlefield NHS	9	9	1	0	10	9
Total	98	91	11	4	109	96

Note: Due to the temporal reading of fire plots, not all fire plots will be read in each park in each year. This is especially true if the park does not have a fire program or has not burned in five years.

^a Fire is not used as a prescribed treatment due to high density of cultural resources.

^b Fire is not currently used as a prescribed treatment.

^c Bandelier Fire Group crew monitored fire-event transects.

Figure 4.1. October 2010 and April 2011 and September 2011 Palmer Drought Severity Index.

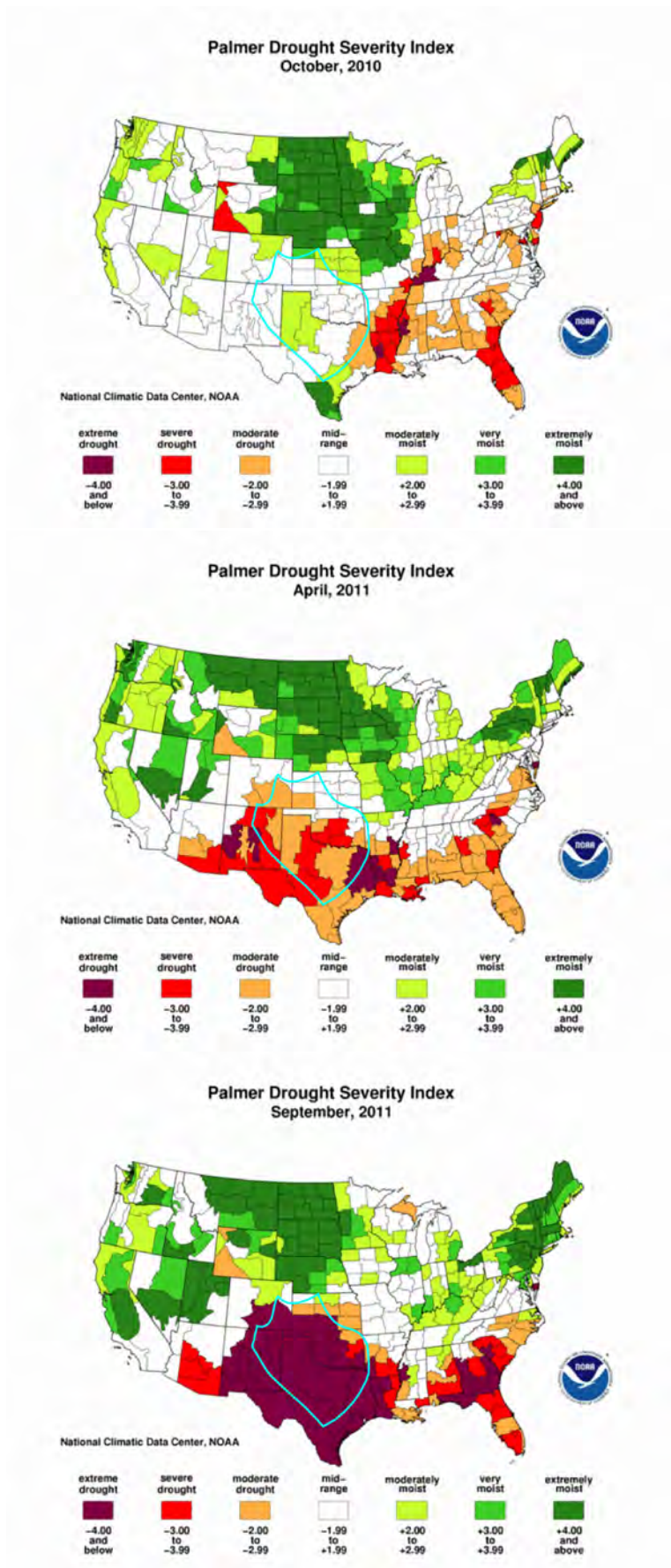


Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring

Vegetation code	Scientific name	Common name	Life cycle	Park unit								WABA
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND
Forb												
ACHMIL	<i>Achillea millefolium</i>	yarrow	P		•	•						
AGAHET	<i>Agalinis heterophylla</i>	prairie false foxglove	P							•		
ALLCER	<i>Allium cernuum</i>	nodding onion	P		•			•				
AMAHYB	<i>Amaranthus hybridus</i>	slim amaranth	A		•							
AMBART	<i>Ambrosia artemisiifolia</i>	annual ragweed	A			•						•
AMBCON	<i>Ambrosia confertiflora</i>	wealeaf bur ragweed	P					•				
AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	A/P	•	•	•	•		•	•	•	•
AMMPOP	<i>Ammoselinum popei</i>	plains sand parsley	A			•						
AMPDRA	<i>Amphiachyris dracunculoides</i>	prairie broomweed	A						•			
APOCAN	<i>Apocynum cannabinum</i>	hemp dogbane	P	•		•						
ARACAN	<i>Arabis canadensis</i>	sicklepod rockcress	B			•						
ARAHIR	<i>Arabis hirsuta</i>	hairy rockcress	A/P		•							
ARESER	<i>Arenaria serpyllifolia</i>	thymeleaf sandwort	A			•						
ARGHIS	<i>Argemone hispida</i>	rough prickly poppy	P		•							
ARGPOL	<i>Argemone polyanthemus</i>	bluestem prickly poppy	A/P						•			
ARNPLA	<i>Arnoglossum plantagineum</i>	groovestem Indian plantain	P			•						
ARTCAR	<i>Artemisia carruthii</i>	Carruth's sagewort	P			•		•				
ASCASP	<i>Asclepias asperula</i>	antelope horns milkweed	P			•					•	
ASCINV	<i>Asclepias involucrata</i>	dwarf milkweed	P					•				
ASCLAT	<i>Asclepias latifolia</i>	broadleaf milkweed	P								•	
ASCOEN	<i>Asclepias oenotheroides</i>	zizotes milkweed	P							•		
ASCPUM	<i>Asclepias pumila</i>	plains milkweed	P				•					
ASCSP	<i>Asclepias speciosa</i>	showy milkweed	P	•							•	
ASCSub	<i>Asclepias subverticillata</i>	horsetail milkweed	P	•					•		•	
ASCSYR	<i>Asclepias syriaca</i>	silky milkweed	P				•					
ASCVIR	<i>Asclepias viridiflora</i>	green comet milkweed	P			•						•
ASTBIS	<i>Astragalus bisulcatus</i>	two-grooved milkvetch	P	•								
ASTBOD	<i>Astragalus bodinii</i>	Bodin's milkvetch	P									•
ASTCAN	<i>Astragalus canadensis</i>	Canada milkvetch	P									•

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
ASTCRA	<i>Astragalus crassicaarpus</i>	ground-plum	P										•
ASTFAL	<i>Aster falcatus</i>	cluster aster	P	•									
ASTFLE	<i>Astragalus flexuosus</i>	pliant milkvetch	P		•								
ASTHUM	<i>Astragalus humistratus</i>	ground cover milkvetch	P									•	
ASTLON	<i>Astragalus lonchocarpus</i>	great rushy milkvetch	P										•
ASTMIS	<i>Astragalus missouriensis</i>	Missouri milkvetch	P	•						•		•	
ASTMOL	<i>Astragalus mollissimus</i>	wooly milkvetch	P				•			•			
ASTPLA	<i>Astragalus plattensis</i>	Platte milkvetch	P										•
ASTPRA	<i>Aster praealtus</i>	willowleaf aster	P			•							
BAP AUS	<i>Baptisia australis</i>	blue wild indigo	P			•							
BAPSPH	<i>Baptisia sphaerocarpa</i>	round wild indigo	P			•							
CALBUS	<i>Callirhoe bushii</i>	bush poppymallow	P									•	
CALINV	<i>Callirhoe involucrata</i>	purple poppymallow	P			•					•		•
CALSER	<i>Calylophus serrulatus</i>	halfshrub sundrop	P			•							
CASINT	<i>Castilleja integra</i>	wholeleaf Indian paintbrush	P		•							•	
CHAALB	<i>Chamaesyce albomarginata</i>	rattlesnake weed	P									•	
CHAERI	<i>Chaetopappa ericoides</i>	baby white aster	P					•		•		•	
CHAFAS	<i>Chamaecrista fasciculata</i>	showy partridge pea	A			•							
CHAFEN	<i>Chamaesyce fendleri</i>	Fendler's sandmat	P		•				•			•	
CHAGLY	<i>Chamaesyce glyptosperma</i>	rib-seed sandmat	A	•									•
CHALAT	<i>Chamaesyce lata</i>	hoary sandmat	P							•			
CHAMAC	<i>Chamaesyce maculata</i>	spotted sandmat	A			•							
CHAMIS	<i>Chamaesyce missurica</i>	prairie sandmat	A			•				•			•
CHANUT	<i>Chamaesyce nutans</i>	nodding spurge	A/P			•					•		
CHAPRO	<i>Chamaesyce prostrata</i>	prostrate sandmat	A/P	•						•			
CHASER1	<i>Chamaesyce serpens</i>	matted sandmat	A/P						•				•
CHASER2	<i>Chamaesyce serpyllifolia</i>	thymeleaf sandmat	A						•				•
CHATAI	<i>Chaerophyllum tainturieri</i>	chervil	A									•	
CHEALB	<i>Chenopodium album</i>	common lambsquarters	A			•				•			•

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
CHEBER	<i>Chenopodium berlandieri</i>	pitseed goosefoot	A	•		•				•			
CHEDES	<i>Chenopodium desiccatum</i>	narrowleaf lambsquarters	A				•						•
CHEGLA	<i>Chenopodium glaucum</i>	oakleaf goosefoot	A			•				•			
CHEHIA	<i>Chenopodium hians</i>	pinyon goosefoot	A									•	
CHEINC	<i>Chenopodium incanum</i>	mealy goosefoot	A					•			•		
CHELEP	<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot	A		•			•					
CHEPAL	<i>Chenopodium pallescens</i>	slimleaf goosefoot	A							•			
CHEPRA	<i>Chenopodium pratericola</i>	desert goosefoot	A		•					•			•
CHESIM	<i>Chenopodium simplex</i>	mapleleaf goosefoot	A			•							
CHEWAT	<i>Chenopodium watsonii</i>	Watson's goosefoot	A									•	
CHRPIL	<i>Chrysopsis pilosa</i>	soft golden aster	A			•							
CIRALT	<i>Cirsium altissimum</i>	roadside thistle	B			•							
CIRNEO	<i>Cirsium neomexicanum</i>	New Mexico thistle	B/P						•			•	
CIRTEX	<i>Cirsium texanum</i>	Texas thistle	B/P								•		
CIRUND	<i>Cirsium undulatum</i>	wavyleaf thistle	B/P		•	•	•	•		•	•	•	•
CLIMAR	<i>Clitoria mariana</i>	Atlantic pigeonwings	P			•							
COMERE	<i>Commelina erecta</i>	erect dayflower	P							•			•
CONARV	<i>Convolvulus arvensis</i>	field bindweed	P	•			•	•	•			•	•
CONCAN	<i>Conyza canadensis</i>	horseweed	A/B	•		•	•	•		•	•	•	
CONRAM	<i>Conyza ramosissima</i>	dwarf horseweed	A							•			
CORTIN	<i>Coreopsis tinctoria</i>	tickseed coreopsis	A/P			•							
CORWRI	<i>Cordylanthus wrightii</i>	Wright's birds-beak	A									•	
CROGLA	<i>Croton glandulosus</i>	vente connigo	A							•			
CROMON	<i>Croton monanthogynus</i>	oneseeded croton	A			•				•	•		
CROTEX	<i>Croton texensis</i>	Texas croton	A	•						•		•	•
CRYCIN	<i>Cryptantha cinerea</i>	James' catseye	P									•	
CUCFOE	<i>Cucurbita foetidissima</i>	buffalo gourd	P	•									•
CUSCUTA	<i>Cuscuta species</i>	dodder									•		
DALAUR	<i>Dalea aurea</i>	golden dalea	P									•	•

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit								
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND
Forb (cont.)												
DALCAN	Dalea candida	slender white prairie clover	P						•			•
DALEA	Dalea species	prairie clover	P									•
DALENN	Dalea enneandra	nine-anther dalea	P			•				•		•
DALFOR	Dalea formosa	feather dalea	P							•		
DALJAM	Dalea jamesii	James dalea	P								•	
DALMUL	Dalea multiflora	roundhead prairie clover	P			•						
DALPUR	Dalea purpurea	purple prairie clover	P			•	•					
DALVIL	Dalea villosa	silky prairie clover	P				•					
DESCOO	Desmanthus coolyei	Cooley's bundleflower	P								•	
DESILL	Desmodium illinoense	Illinois tickclover	P			•	•			•		•
DESPAN	Desmodium paniculatum	narrowleaf tickclover	P			•					•	
DESPIN	Descurainia pinnata	western tansymustard	A/P				•					
DESSES	Desmodium sessilifolium	sessile tickclover	P			•						
DESVEL	Desmanthus velutinus	velvetleaf bundleflower	P			•						
DIAAME	Dianthus ameria	Deptford pink	A/B			•						
DICCAR	Dichondra carolinensis	Carolina ponysfoot	P							•		
DRAAMP	Dracopis amplexicaulis	clasping coneflower	A			•						
DYSPAP	Dyssodia papposa	fetid dogweed	A					•			•	
ENGPER	Engelmannia peristenia	Engelmann's daisy	P					•		•		
EQULAE	Equisetum laevigatum	smooth scouring rush	P							•		
ERIANN1	Erigeron annuus	annual fleabane	A			•				•		•
ERIANN2	Eriogonum annuum	annual buckwheat	A/B							•		•
ERIBEL	Erigeron bellidistrum	western fleabane	A									•
ERICAN	Erigeron canus	hoary fleabane	P								•	
ERIDIV	Erigeron divergens	spreading fleabane	B								•	
ERIFLA	Erigeron flagellaris	trailing fleabane	B		•							
ERIGLA	Erigeron glabellus	streamside fleabane	B/P									•
ERIJAM	Eriogonum jamesii	James buckwheat	P		•						•	
ERILON	Eriogonum longifolium	longleaf buckwheat	P	•		•						

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
ERIMOD	<i>Erigeron modestus</i>	nodding fleabane	P								•		
ERIPHI	<i>Erigeron philadelphicus</i>	Philadelphia fleabane	B/P			•							
ERISTR	<i>Erigeron strigosus</i>	rough fleabane	A/P			•							
EROCIC	<i>Erodium cicutarium</i>	redstem storks-bill	A/B			•							
ERYLEA	<i>Eryngium leavenworthii</i>	Leavenworth's eryngo	A			•							
EUPBIC	<i>Euphorbia bicolor</i>	snow-on-the-prairie	A				•						
EUPDAV	<i>Euphorbia davidii</i>	Davids spurge	A		•					•			
EUPDEN	<i>Euphorbia dentata</i>	toothed spurge	A	•		•				•			•
EUPMAR	<i>Euphorbia marginata</i>	snow-on-the-mountain	A									•	
EUSEXA	<i>Eustoma exaltatum</i>	showy prairie gentian	A/P			•							
EVONUT	<i>Evolvulus nuttallianus</i>	shaggy dwarf morningglory	P										•
GAIPIN	<i>Gaillardia pinnatifida</i>	blanketflower	P									•	
GAIPUL	<i>Gaillardia pulchella</i>	Indian blanket	A/P			•						•	•
GALAPA	<i>Galium aparine</i>	cleavers bedstraw	A					•					
GALSSP	<i>Galactia species</i>	milkpea	P			•							
GAUCOC	<i>Gaura coccinea</i>	scarlet gaura	P	•	•					•	•	•	
GAUDRU	<i>Gaura drummondii</i>	Drummonds beeblossom	P								•		
GAUMOL	<i>Gaura mollis</i>	velvetweed	A	•									•
GAUSUF	<i>Gaura suffulta</i>	roadside beeblossom	A								•		
GAUVIL	<i>Gaura villosa</i>	wooly gaura	P						•				
GEUCAN	<i>Geum canadensis</i>	white avens	P			•							
GLABIP	<i>Glandularia bipinnatifida</i>	Dakota mock vervain	A/P			•						•	
GLYLEP	<i>Glycyrrhiza lepidota</i>	wild licorice	P	•							•		•
GRINUD	<i>Grindelia nuda</i>	curlytop gumweed	A/P									•	
GRIPAP	<i>Grindelia papposa</i>	wax gumweed	A/B					•			•		•
GRISQU	<i>Grindelia squarrosa</i>	curlycup gumweed	A/P	•									
HACBES	<i>Hackelia bessyi</i>	Bessey's stickseed	B/P										•
HEDDRU	<i>Hedeoma drummondii</i>	Drummonds false pennyroyal	A/P				•						
HEDNIG	<i>Hedyotis nigricans</i>	diamondflowers	P			•					•	•	

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit																	
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND	WABA								
Forb (cont.)																					
HELANN	Helianthus annuus	common sunflower	A	•	•					•					•				•		•
HELCON	Heliotropium convolvulaceum	bindweed heliotrope	A								•										
HELHIR	Helianthus hirsutus	hairy sunflower	P					•													
HELLON	Helimeris longifolia	longleaf false goldeneye	A																		•
HELMAX	Helianthus maximiliani	Maximillian's sunflower	P					•	•												
HELMUL	Helimeris multiflora	showy goldeneye	P					•													
HELPEP	Helianthus petiolaris	prairie sunflower	A	•												•			•		•
HELTEN	Heliotropium tenellum	pasture heliotrope	A																		
HETSTE	Heterotheca stenophylla	stiffleaf false goldenaster	P											•							
HETVIL	Heterotheca villosa	hairy false goldenaster	P					•	•							•			•		
HIELON	Hieracium longipilum	hairy hawkweed	P						•												
HOFGLA	Hoffmannseggia glauca	hog potato	P											•							
HYBVER	Hybanthus verticillatus	whorled nodding violet	P						•												
HYMFIL	Hymenopappus filifolius	fineleaf woollywhite	P															•			
HYMRIC	Hymenoxys richardsonii	Colorado rubberweed	P															•			
INDMIN	Indigofera miniata	western indigo	P						•												
IPOLON	Ipomopsis longiflora	whiteflowered skyrocket	A/B																•		
IPORUB	Ipomopsis rubra	standing cypress	B															•			
IVAANG	Iva angustifolia	narrowleaf marshelder	A															•			
IVAANN	Iva annua	annual marshelder	A																		•
KOCSKO	Kochia scoparia	kochia	A	•						•						•		•	•		•
KRALAN	Krameria lanceolata	trailing ratany	P						•						•						
LACSER	Lactuca serriola	prickly lettuce	A/B	•	•				•										•		•
LAPOCC	Lappula occidentalis	western sticktight	A/B		•											•		•			
LATHIR	Lathyrus hirsutus	singletary pea	A						•												
LEPDEN	Lepidium densiflorum	common pepperweed	A/B														•				
LEPOBL	Lepidium oblongum	veiny pepperweed	A/B																		•
LEPVIR	Lepidium virginicum	Virginia pepperweed	A/P							•											
LESCUN	Lespedeza cuneata	sericea lespedeza	P						•												

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
LESPRO	<i>Lespedeza procumbens</i>	trailing lespedeza	P			•							
LESREC	<i>Lesquerella rectipes</i>	straight bladderpod	P								•		
LESVIO	<i>Lespedeza violacea</i>	violet lespedeza	P			•							
LESVIR	<i>Lespedeza virginica</i>	slender lespedeza	P			•							
LIAMUC	<i>Liatis mucronata</i>	narrowleaf gayfeather	P			•							
LIAPUN	<i>Liatis punctata</i>	dotted gayfeather	P		•		•						
LILSP	<i>Liliaceae species</i>	lily family	P	•							•		
LINARI	<i>Linum aristatum</i>	bristle flax	A	•									
LINBER	<i>Linum berlandieri</i>	Berlandier's yellow flax	A/P								•		
LINLEW	<i>Linum lewisii</i>	blue flax	P					•					
LINMED	<i>Linum medium</i>	stiff yellow flax	A/P			•							
LINPRA	<i>Linum pratense</i>	meadow flax	A			•							
LINPUB	<i>Linum puberulum</i>	desert flax	A								•		
LINRIG	<i>Linum rigidum</i>	orange flax	A/P						•				•
LITINC	<i>Lithospermum incisum</i>	fringed puccoon	P									•	
LITMUL	<i>Lithospermum multiflorum</i>	manyflowered stoneseed	P		•						•		
LUPARG	<i>Lupinus argenteus</i>	silver lupine	P		•								
LYGJUN	<i>Lygodesmia juncea</i>	rush skeleton plant	P	•					•		•		
MACPIN	<i>Machaeranthera pinnatifida</i>	lacy tansyaster	P	•	•				•		•		•
MACTAN	<i>Machaeranthera tanacetifolia</i>	tansyleaf tansyaster	A/B	•								•	
MARVUL	<i>Marrubium vulgare</i>	horehound	P		•								
MEDLUP	<i>Medicago lupulina</i>	black medic clover	A/P			•							
MEDMIN	<i>Medicago minima</i>	bur medic clover	A										•
MELALB	<i>Melilotus alba</i>	white sweetclover	A/P	•	•	•				•		•	
MELLEU	<i>Melampodium leucanthum</i>	blackfoot daisy	P						•			•	
MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	A/P			•	•				•		
MENMUL	<i>Mentzelia multiflora</i>	manyflowered blazingstar	B/P		•			•					
MENNUD	<i>Mentzelia nuda</i>	bractless blazingstar	B/P	•	•							•	
MENOLI	<i>Mentzelia oligosperma</i>	chickenthiel	P			•							

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit								
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND
Forb (cont.)												
MENSCA	Menodora scabra	rough menodora	P									•
MIMNUT	Mimosa nuttallii	catclaw sensitivebriar	P			•				•		
MIMRUP	Mimosa rupertiana	western sensitivebriar	P									•
MINMIC	Minuartia michauxii	Texas stitchwort	A/P			•						
MIRLIN	Mirabilis linearis	narrowleaf four o'clock	P		•				•			•
MIRNYC	Mirabilis nyctaginea	heartleaf four o'clock	P	•								
MOLVER	Mollugo verticillata	carpetweed	A			•						
MONCIT	Monarda citriodora	lemon beebalm	A/P			•					•	
MONCLI	Monarda clinopodioides	basil beebalm	A									•
MONFIS	Monarda fistulosa	wild bergamont	P			•						
MONPEC	Monarda pectinata	spotted beebalm	A								•	
NUTTEX	Nuttallanthus texanus	Texas toadflax	A/B			•						
OENSSP	Oenothera	evening primrose										•
OENVIL	Oenothera villosa	hairy evening primrose	B/P	•								
ORTLUT	Orthocarpus luteus	yellow owllover	A		•							
OXASTR	Oxalis stricta	sheep sorrel	P			•	•				•	
PACNEO	Packera neomexicana	New Mexico groundsel	P		•							•
PACOBO	Packera obovata	roundleaf groundsel	P					•				
PACTRI	Packera tridenticulata	lobeleaf groundsel	P									•
PARJAM	Paronychia jamesii	James' nailwort	P							•		
PECANG	Pectis angustifolia	narrowleaf pectis	A		•							
PEDDIG	Pediomelum digitatum	palmleaf Indian breadroot	P							•		•
PENANG	Penstemon angustifolius	broad-beard penstemon	P		•							
PENBAR	Penstemon barbatus	beard-lip penstemon								•		
PENCOB	Penstemon cobaea	cobaea penstemon	P			•						
PENJAM	Penstemon jamesii	James' penstemon	P									•
PENOKL	Penstemon oklahomensis	Oklahoma penstemon	P			•						
PENSPP	Penstemon species	penstemon	P									•
PHAHET	Phacelia heterophylla	variable-leaf scorpionweed	B/P		•							

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
PHLNAN	<i>Phlox nana</i>	Santa Fe phlox	P										
PHYCIN	<i>Physalis cinerascens</i>	smallflower groundcherry	P									•	•
PHYHED	<i>Physalis hederifolia</i>	ivyleaf groundcherry	P						•			•	
PHYHET	<i>Physalis heterophylla</i>	clammy groundcherry	P				•						
PHYLAN	<i>Phyla lanceolata</i>	lanceleaf frogfruit	P										•
PHYLON	<i>Physalis longifolia</i>	longleaf groundcherry	P				•					•	•
PHYSUB	<i>Physalis subulata</i>	New Mexican groundcherry	A	•								•	
PHYVIR	<i>Physalis virginiana</i>	Virginia groundcherry	P	•									
PLAPAT	<i>Plantago patagonica</i>	wooly plaintain	A			•			•			•	•
PLARHO	<i>Plantago rhodosperma</i>	redseed plantain	A							•			
POLDOD	<i>Polansia dodecandra</i>	western clammyweed	A		•								
POLNUT	<i>Polytaenia nuttallii</i>	Nuttal's prairie parsley	P			•							
POROLE	<i>Portulaca oleracea</i>	common purslane	A						•			•	
PSOTEN	<i>Psoraleidium tenuiflorum</i>	slimflower scurfpea	P	•					•			•	
QUILOB	<i>Quincula lobata</i>	purple groundcherry	P										•
RANARB	<i>Ranunculus abortivus</i>	smallflower buttercup	B/P					•					
RATCOL	<i>Ratibida columnifera</i>	redspike Mexican hat	P		•	•						•	•
RATTAG	<i>Ratibida tagetes</i>	green Mexican hat	P	•	•							•	
RAYJAC	<i>Rayjacksonia annua</i>	viscid tansyaster	A	•									
RUDHIR	<i>Rudbeckia hirta</i>	blackeyed Susan	A/P					•				•	
RUMALT	<i>Rumex altissimus</i>	pale dock	P										
RUMCRI	<i>Rumex crispus</i>	curley dock	P	•		•	•						
SABCAM	<i>Sabatia campestris</i>	meadow pink	A			•							
SALCOC	<i>Salvia coccinea</i>	tropical sage	A/P									•	
SALCOL	<i>Salsola collina</i>	slender Russian thistle	A									•	
SALTRA	<i>Salsola tragus</i>	prickly Russian thistle	A	•	•	•			•	•		•	•
SCUDRU	<i>Scutellaria drummondii</i>	Drummond's skullcap	A									•	
SCURES	<i>Scutellaria resinosa</i>	sticky skullcap	P									•	•
SENFLA	<i>Senecio flaccidus</i>	Douglas groundsel	P		•								

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
SCURES	Scutellaria resinosa	sticky skullcap	P							•			•
SENFLA	Senecio flaccidus	Douglas groundsel	P		•							•	
SENSPA	Senecio spartioides	broom groundsel	P					•					
SESHER	Sesbanea herbacea	bigpod sesbania	A/P			•							
SIDABU	Sida abutifolia	prostrate sida	A/P			•					•		
SILANT	Silene antirrhina	sleepy catchfly	A/P				•						
SMSSP	Symphotrichum species	aster species	P										•
SOLCAN	Solidago canadensis	Canada goldenrod	P		•	•	•						•
SOLCAR	Solanum carolinense	Carolina horsenettle	P	•									
SOLDIM	Solanum dimidiatum	western horsenettle	P			•							•
SOLELA	Solanum elaeagnifolium	silverleaf nightshade	P			•			•				•
SOLGIG	Solidago gigantea	giant goldenrod	P			•							
SOLJAM	Solanum jamesii	wild potato	P									•	
SOLMIS	Solidago missouriensis	Missouri goldenrod	P			•							
SOLMOL	Solidago mollis	ashy goldenrod	P					•					
SOLNEM	Solidago nemoralis	grey goldenrod	P			•							
SOLPET	Solidago petiolaris	downy goldenrod	P										•
SOLPTY	Solanum ptychanthum	eastern black nightshade	A			•							
SOLSSP	Solidago species	goldenrod	P									•	
SOLULM	Solidago ulmifolia	elmleaf goldenrod	P			•							
SONASP	Sonchus asper	spiny sowthistle	A			•	•						•
SPHCOC	Sphaeralcea coccinea	scarlet globemallow	B/P	•	•		•	•		•		•	
SPHFEN	Sphaeralcea fendleri	Fendler's globemallow	P									•	
STEMIN	Stephanomeria minor	lesser wirelettuce	P		•								
STISYL	Stillingia sylvatica	Queen's-delight	P							•			
STRLEI	Strophostyles leiosperma	slickseed fuzzybean	A			•							•
SYMERI	Symphotrichum ericoides	white heath aster	P	•		•	•			•		•	
SYMLAN	Symphotrichum lanceolatum	white panicle aster	P					•					
SYMPRA	Symphotrichum praealtum	willowleaf aster	P			•							

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ALFL	LYJO	PECO	SAND	WABA
Forb (cont.)													
TALPAR	Talinum parviflorum	prairie flameflower	P										•
TETACA	Tetaneuris acaulis	stemless four-nerve daisy	p										•
TETARG	Tetaneuris argentea	perkysue	P										•
TETLIN	Tetaneuris linearifolia	fineleaf fournerv daisy	P	•		•							
TETSCA	Tetaneuris scaposa	stemmy four-nerve daisy	P						•				
TEUCAN	Teucrium canadense	American germander	P			•							
THEMEG	Thelesperma megapotamicum	Hopi tea greenthread	P		•	•				•			•
TORARV	Torilis arvensis	spreading horseparsley	A			•							
TRABRE	Tragia brevispica	shortspike noseburn	P									•	
TRADUB	Tragopogon dubius	western salsify	P	•	•		•					•	
TRARAM	Tragia ramosa	branched noseburn	P			•				•			
TRIDUB	Trifolium dubium	small hop clover	A			•							
TRIHOL	Triodanis holzingeri	western Venus looking-glass	A										•
TRIPER	Triodanis perfoliata	clasping Venus' looking-glass	A			•		•					
TRICAM	Trifolium campestres	agricultural clover	A/B			•							
VERBAL	Vernonia baldwinii	western ironweed	P			•							
VERBRA	Verbena bracteata	bracted vervain	A/P							•		•	
VERHAL	Verbena halei	Texas vervain	P								•		
VERTHA	Verbascum thapsus	common mullein	B		•							•	
VIAAME	Vicia americana	American deervetch	P		•								
VICLUD	Vicia ludoviciana	slim vetch	A			•							
VIOSOR	Viola sororia	hooded blue violet	A/P			•							
ZINGRA	Zinnia grandiflora	plains zinnia	P								•		
Grass													
ACHHYM	Achnatherum hymenoides	Indian ricegrass	P	•									
ACHROB	Achnatherum robustum	sleepygrass	P					•					
ANDGER	Andropogon gerardii	big bluestem	P		•	•			•				
ANDGLO	Andropogon glomeratus	bushy bluestem	P			•							
ANDHAL	Andropogon hallii	sand bluestem	P							•			•

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit										
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA	
Grass (cont.)														
ANDVIR	Andropogon virginicus	broomsedge bluestem	P			•								
ARIPUR	Aristida purpurea	purple threeawn	P	•	•	•	•	•	•	•	•	•	•	•
BOTISC	Bothriochloa ischaemum	K.R. bluestem	P			•						•		
BOTLAG	Bothriochloa laguroides	silver bluestem	P			•				•				•
BOUCUR	Bouteloua curtipendula	sideoats grama	P	•	•	•	•	•	•	•	•	•	•	•
BOUGRA	Bouteloua gracilis	blue grama	P	•	•				•	•			•	
BOUHIR	Bouteloua hirsuta	hairy grama	P			•				•				
BROCAT	Bromus catharticus	rescue brome	A/P			•								
BROINE	Bromus inermis	smooth brome	P				•							
BROJAP	Bromus japonicus	Japanese brome	A			•	•							•
BROPOR	Bromus porteri	Porter brome	P		•									
BROTEC	Bromus tectorum	cheatgrass	A			•								
BUCDAC	Buchloe dactyloides	buffalograss	P		•				•		•		•	
CARALB	Carex albolutescens	greenwhite sedge	P			•								
CARGRA	Carex gravida	heavy sedge	P				•							•
CARPLA	Carex planostachya	cedar sedge	P								•			
CARSPP	Carex species	sedge	P		•	•					•		•	
CHALAT2	Chasmanthium latifolium	Indian wood oats	P			•								
CYNDAC	Cynodon dactylon	Bermuda grass	P			•						•		•
CYPFEN	Cyperus fendlerianus	Fendler flat sedge	P						•				•	
CYPODO	Cyperus odoratus	fragrant flat sedge	P											•
DICACU	Dichanthelium acuminatum	tapered panicgrass	P			•								
DICCLA	Dichanthelium clandestinum	deertongue panicgrass	P			•								
DICLAX	Dichanthelium laxiflorum	openflower panicgrass	P			•								
DICOLI	Dichanthelium oligosanthes	Heller's panicgrass	P								•			
DIGCOG	Digitaria cognata	Carolina crabgrass	P								•			
DISSPI	Distichlis spicata	inland saltgrass	P	•								•	•	•
ELYCAN	Elymus canadensis	Canadian wild rye	P	•		•					•		•	•
ELYELY	Elymus elymoides	bottlebrush squirreltail	P	•	•	•			•	•		•	•	

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit								
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND
Grass (cont.)												
ELYVIR	<i>Elymus virginiana</i>	Virginia wild rye	P									
ERACAP	<i>Eragrostis capillaris</i>	lacegrass	A									
ERAINT	<i>Eragrostis intermedia</i>	plains lovegrass	P									
ERASES	<i>Eragrostis sessilispica</i>	tumble lovegrass	P									
ERASPE	<i>Eragrostis spectabilis</i>	purple lovegrass	P									
FESARI	<i>Festuca arizonica</i>	Arizona fescue	P									
HETCOM	<i>Hesperostipa comata</i>	needle-and-thread	P									
JUNTEN	<i>Juncus tenuis</i>	field rush	P									
LEPFUS	<i>Leptochloa fusca</i>	bearded sprangletop	A/P									
LEPPAN	<i>Leptochloa panicea</i>	mucronate sprangletop	A/P									
LOLPER	<i>Lolium perenne</i>	perennial ryegrass	A/P									
LYCPHL	<i>Lycurus phleoides</i>	common wolfstail	P									
LYCSET	<i>Lycurus setosus</i>	bristly wolfstail	P									
MUHASP	<i>Muhlenbergia asperifolia</i>	alkali muhly	P									
MUHMOM	<i>Muhlenbergia montana</i>	mountain muhly	P									
MUHSYL	<i>Muhlenbergia sylvatica</i>	woodland muhly	P									
MUHTOR	<i>Muhlenbergia torreyi</i>	ring muhly	P									
MUHWRI	<i>Muhlenbergia wrightii</i>	spike muhly	P									
NASLEU	<i>Nassella leucotricha</i>	Texas wintergrass	P									
PANCAP	<i>Panicum capillare</i>	annual witchgrass	A									
PANHAL	<i>Panicum hallii</i>	Hall's panicgrass	P									
PANOB	<i>Panicum obtusum</i>	vine mesquite grass	P									
PANVIR	<i>Panicum virgatum</i>	switchgrass	P									
PASLAE	<i>Paspalum laeve</i>	field paspalum	P									
PASSMI	<i>Pascopyrum smithii</i>	western wheatgrass	P									
PLEJAM	<i>Pleuraphis jamesii</i>	galleta grass	P									
POABIG	<i>Poa bigelovii</i>	Bigelow bluegrass	A									
POAFEN	<i>Poa fendleriana</i>	muttongrass	P									
POAPRA	<i>Poa pratensis</i>	Kentucky bluegrass	P									

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit											
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA		
Grass (cont.)															
SCHAME	<i>Schoenoplectus americanus</i>	American bulrush	P												
SCHPAN	<i>Schedonnardus paniculatus</i>	tumblegrass	P	•											•
SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	P		•					•					•
SETPAR	<i>Setaria parviflora</i>	knotroot bristlegrass	P			•									
SORHAL	<i>Sorghum halepense</i>	Johnsongrass	P			•				•				•	
SORNUT	<i>Sorghastrum nutans</i>	Indiangrass	P			•				•					•
SPHOBT	<i>Sphenopholis obtusata</i>	prairie wedgescale	A/P			•									
SPOAIR	<i>Sporobolus airoides</i>	alkali sacaton	P	•					•					•	
SPOCRY	<i>Sporobolus cryptandrus</i>	sand dropseed	P	•	•				•				•	•	
TRIMUT	<i>Tridens muticus</i>	slim tridens	P			•									
VULOCT	<i>Vulpia octoflora</i>	sixweeks fescue	A												•
Shrub															
ARTFIL	<i>Artemisia filifolia</i>	sand sagebrush	P	•						•				•	
BACSAI	<i>Baccharis salicina</i>	willow baccharis	P	•											
CEPOCC	<i>Cephalanthus occidentalis</i>	buttonbush	P				•								
ERINAU	<i>Ericameria nauseosa</i>	rubber rabbitbrush	P										•		
MIMBOR	<i>Mimosa borealis</i>	fragrant mimosa	P							•					
PRUANG	<i>Prunus angustifolia</i>	Chickasaw plum	P			•									•
RHUCOP	<i>Rhus copallinum</i>	winged sumac	P			•						•			•
RHUGLA	<i>Rhus glabra</i>	smooth sumac	P			•									
RHUTRI	<i>Rhus trilobata</i>	skunkbush sumac	P		•	•				•					
SYMORB	<i>Symphoricarpos orbiculatus</i>	buckbrush	P			•									
SubShrub															
ACAANG	<i>Acacia angustissima</i>	prairie acacia	P			•									
AMBTRI	<i>Ambrosia trifida</i>	Texas giant ragweed	A												•
ARTDRA	<i>Artemisia dracunculus</i>	false tarragon	P		•										
ARTFRI	<i>Artemisia frigida</i>	fringed sagebrush	P		•				•				•	•	
ARTLUD	<i>Artemisia ludoviciana</i>	Louisiana sagewort	P		•	•			•	•					•

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit								
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND
SubShrub (cont.)												
ECHREI	<i>Echinocereus reichenbachii</i>	lace hedgehog cactus	P							•		
ECHSPP	<i>Echinocereus species</i>	hedgehog cactus	P								•	
ECHVIR	<i>Echinocereus viridiflorus</i>	green pitaya	P		•					•		
ESCVIV	<i>Escobaria vivipara</i>	spiny star cactus	P			•						•
GUTSAR	<i>Gutierrezia sarothrae</i>	broom snakeweed	P		•					•	•	
IVAAXI	<i>Iva axillaris</i>	poverty sumpweed	P	•								•
OPUENG	<i>Opuntia engelmannia</i>	Texas pricklypear	P			•						
OPUFRA	<i>Opuntia fragilis</i>	brittle cactus	P									•
OPULEP	<i>Opuntia leptocaulis</i>	pencil cactus	P							•		
OPUMAC	<i>Opuntia macrorhiza</i>	twiatapine pricklypear	P			•						•
OPUPHA	<i>Opuntia phaeacantha</i>	brown spine pricklypear	P						•	•		
OPUPOL	<i>Opuntia polyacantha</i>	plains pricklypear	P		•						•	
ROSFOL	<i>Rosa foliolosa</i>	white prairie rose	P			•						
ROSWOO	<i>Rosa woodsii</i>	woods rose	P						•			
RUBABO	<i>Rubus aboriginum</i>	dewberry	P								•	
RUBFLA	<i>Rubus flagellaris</i>	whiplash dewberry	P			•						
RUBTRI	<i>Rubus trivialis</i>	southern dewberry	P			•					•	
YUCGLA	<i>Yucca glauca</i>	soft soapweed yucca	P		•					•	•	•
Tree												
ACENEG	<i>Acer negundo</i>	box elder	P			•						
BROPAP	<i>Broussonetia papyrifera</i>	Paper mulberry	P			•						
CELLAE	<i>Celtis laevigata</i>	sugarberry	P							•		
CELOCC	<i>Celtis occidentalis</i>	western hackberry	P							•		
CELSSP	<i>Celtus species</i>	hackberry	P			•						
CERCAN	<i>Cercis canadensis</i>	eastern redbud	P			•						
CORDRU	<i>Cornus drummondii</i>	rough leaf dogwood	P			•						
DIOVIR	<i>Diospyros virginiana</i>	common persimmon	P			•						
FRAAME	<i>Fraxinus americana</i>		P			•						

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA
Tree (cont.)													
FRACAR	Frangula caroliniana	Carolina buckthorn	P										
FRAPEN	Fraxinus pennsylvanica	green ash	P							•			
FRAXSSP	Fraxinus species	ash	P									•	•
JUNMON	Juniperus monosperma	oneseed juniper	P									•	
JUNSCO	Juniperus scopulorum	Rocky Mountain juniper	P		•								
JUNVIR	Juniperus virginiana	eastern red cedar	P										
MORRUB	Morus rubra	red mulberry	P										
MORSSP	Morus species	mulberry	P										
PINEDU	Pinus edulis	pinyon pine	P									•	
PINPON	Pinus ponderosa	ponderosa pine	P									•	
PINSSP	Pinus species	pine	P		•					•			
POPDEL	Populus deltoides	plains cottonwood	P	•						•		•	
PROGLA	Prosopis glandulosa	honey mesquite	P							•			
PRUSER	Prunus serotina	black cherry	P							•			
PRUVIR	Prunus virginiana	chokecherry	P							•			
QUEFUS	Quercus fusiformis	escarpment live oak	P									•	
QUEGAM	Quercus gambelii	Gambel oak	P		•								
QUEMAR	Quercus marilandica	blackjack oak	P							•			
QUEMUH	Quercus muhlenbergii	chinkapin oak	P							•			
QUESHU	Quercus shumardii	Shumard oak	P							•			
QUESTE	Quercus stellata	post oak	P							•			
SALEXI	Salix exigua	coyote willow	P	•									
ULMALA	Ulmus alata	winged elm	P							•			•
ULMAME	Ulmus americana	American elm	P							•			
ULMPUM	Ulmus pumila	Siberian elm	P										•
Vine													
COCCAR	Cocculus carolinus	Carolina snailseed	P									•	•
PARQUI	Parthenocissus quinquefolia	Virginia creeper	P									•	

Note: Exotic species are highlighted.

Table 4-2. Plant species observed in specific parks during 2010 and 2011 Southern Plains grassland monitoring, cont.

Vegetation code	Scientific name	Common name	Life cycle	Park unit									
				BEOL	CAVO	CHIC	FOLS	FOUN	LAMR/ ALFL	LYJO	PECO	SAND	WABA
Vine (cont.)													
SMIBON	<i>Smilax bona-nox</i>	saw greenbrier	P								•		
SMIHER	<i>Smilax herbacea</i>	herbaceous greenbrier	P					•					
TOXRAD	<i>Toxicodendron radicans</i>	eastern poison ivy	P					•				•	
VITMUS	<i>Vitis mustangensis</i>	mustang grape	P									•	
VITVUL	<i>Vitis species</i>	grape species	P									•	

Note: Exotic species are highlighted.

4.1 Bent's Old Fort National Historic Site

4.1.1 2010 and 2011 sampling

A total of seven fire and thirteen long-term monitoring transects are slated for monitoring at Bent's Old Fort National Historic Site (BEOL) (Figure 4.1-1). The plant communities monitored at Bent's Old Fort NHS are: Alkali sacaton-inland saltgrass herbaceous vegetation; blue grama-buffalo grass herbaceous vegetation; cottonwood-inland saltgrass woodland; cottonwood temporarily flooded woodland alliance; and a grassland restoration area (Stevens et al. 2007) (Table 4.1-1). Park management is interested in monitoring the cottonwood and restoration communities, though they are not part of Fire Program monitoring and only long-term monitoring will take place in these areas. In 2010 and 2011, all long-term monitoring transects were

monitored at BEOL during July. No fire-event transects were monitored in 2010 or 2011.

4.1.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response.

The native grasslands at BEOL appear to be in fairly good condition. Our opinion is based on the variety and dominance of native perennial grasses - no remnant upland and riparian grasslands have been located to provide a true comparison. While exotic grass species can be found in the park, they do not appear in the transects (except for one small occurrence of Johnsongrass (*Sorghastrum nutans*) and seem to be limited to disturbed areas. The

Table 4.1-1. Plant community and sampling dates for each transect at Bent's Old Fort NHS, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
BOUT_LT_01	<i>Artemisia filifolia/Bouteloua</i> (curtipendula, gracilis) Shrubland	7/23/2010	7/14/2011
BOUT_LT_02	<i>Artemisia filifolia/Bouteloua</i> (curtipendula, gracilis) Shrubland	7/25/2010	7/14/2011
BOUT_LT_03	<i>Artemisia filifolia/Bouteloua</i> (curtipendula, gracilis) Shrubland	7/25/2010	7/13/2011
CWOOD_LT_01	<i>Populus deltoides</i> Temporarily Flooded Woodland Alliance	7/24/2010	7/15/2011
CWOOD_LT_02	<i>Populus deltoides</i> Temporarily Flooded Woodland Alliance	7/23/2010	7/14/2011
CWOOD_03	<i>Populus deltoides</i> Temporarily Flooded Woodland Alliance	7/25/2010	7/13/2011
CWSALT_LT_01	<i>Populus deltoides/Distichlis spicata</i> Woodland	7/22/2010	7/12/2011
REST_E_LT_01	<i>Sporobolus airoides-Distichlis spicata</i> Herbaceous	7/24/2010	7/12/2011
REST_N_LT_01	Reclaimed Agricultural Land	7/22/2010	7/13/2011
REST_S_LT_01	Blacktailed Prairie Dog Town Complex	7/23/2010	7/15/2011
SPOR_LT_01	<i>Sporobolus airoides-Distichlis spicata</i> Herbaceous	7/24/2010	7/15/2011
SPOR_LT_02	<i>Sporobolus airoides-Distichlis spicata</i> Herbaceous	7/25/2010	7/13/2011
SPOR_LT_03	<i>Sporobolus airoides-Distichlis spicata</i> Herbaceous	7/22/2010	7/12/2011

grasses have maintained their coverage well during the 2011 drought, with only minimal cover reduction in a few species.

Of the three restoration areas monitored by the SOPN, only one (RESTN-LT01) seems to be undergoing active restoration. This area has a good diversity of well-established native grasses but fewer forb species than one would anticipate. The presence and expansion of the exotic field bindweed (*Convolvulus arvensis*) is of particular concern but is still in low enough numbers that control may be effective. The two remaining potential restoration areas are south of the Arkansas River and have been active prairie dog towns until affected by plague in the 2010. These areas lack a grass component except for a small amount of inland saltgrass (*Distichlis spicata*). Forbs are present in minimal quantities; those most dominant being exotics.

The annual exotic kochia (*Kochia scoparia*) and perennial field bindweed were the most prevalent exotics found in the interior grasslands, followed closely by prickly Russian thistle (*Salsola tragus*). Kochia is found in varying quantities throughout the park, with greatest coverage in the cottonwood transects, while field bindweed prefers drier upland sites and prairie dog towns. Of greatest concern is the observation at BEOL and other parks within the southern plains in 2011 of field bindweed's strong growth and seed set while native grasses and forbs were primarily drought-dormant. This competitive advantage points to continued expansion of this exotic, particularly if the drought persists, and is reflected by the

doubling of coverage of this noxious weed at BEOL in 2011. Exotic species present at BEOL are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.1.3 Prescribed fire treatments or wildfire occurrence

There were no wildfires or prescribed burns conducted in 2010 or 2011. The last prescribed burn was in 2006 in the northeast quadrant of the park (Figure 4.1-2). A major wildfire in 2002 burned the majority of land south of the Arkansas River. It is unknown at this time when or where the next prescribed fire will be conducted.

4.1.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review) and current results from monitoring within the scope of this project are reported in the previous data table (Table 4.1-2). As monitoring progresses, any noted effects of burning will be presented in this section.

4.1.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with park itself and the the Southern Plains/Chihuahuan Desert Exotic Plant Management Team to map annual treatment areas. Pertinent information will be presented in this section when treatments are known.



NPS PHOTO

Park management is interested in monitoring the cottonwood and restoration communities in Bent's Old Fort NHS.

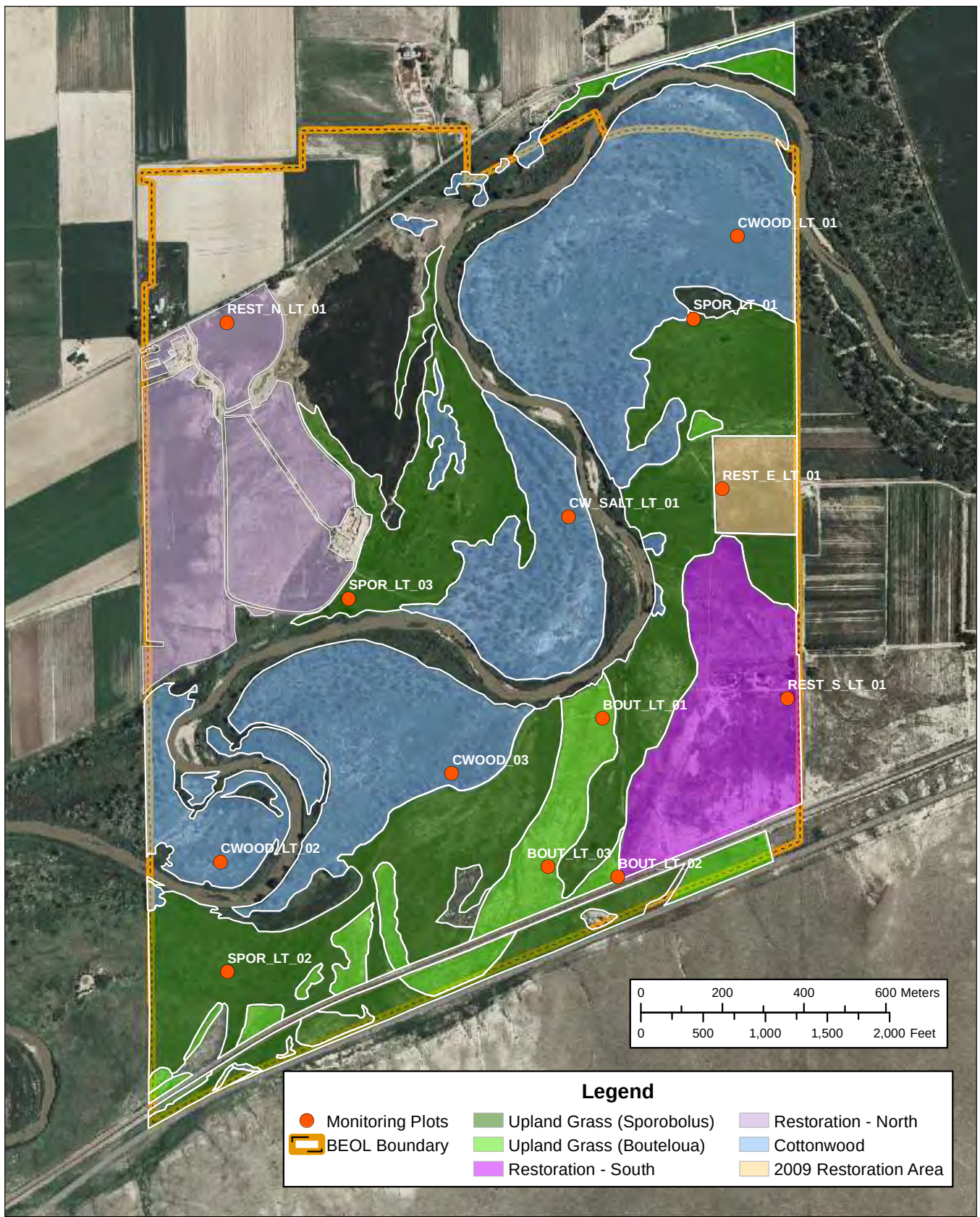


Figure 4.1-1. Monitoring transects, Bent's Old Fort NHS, 2010 and 2011

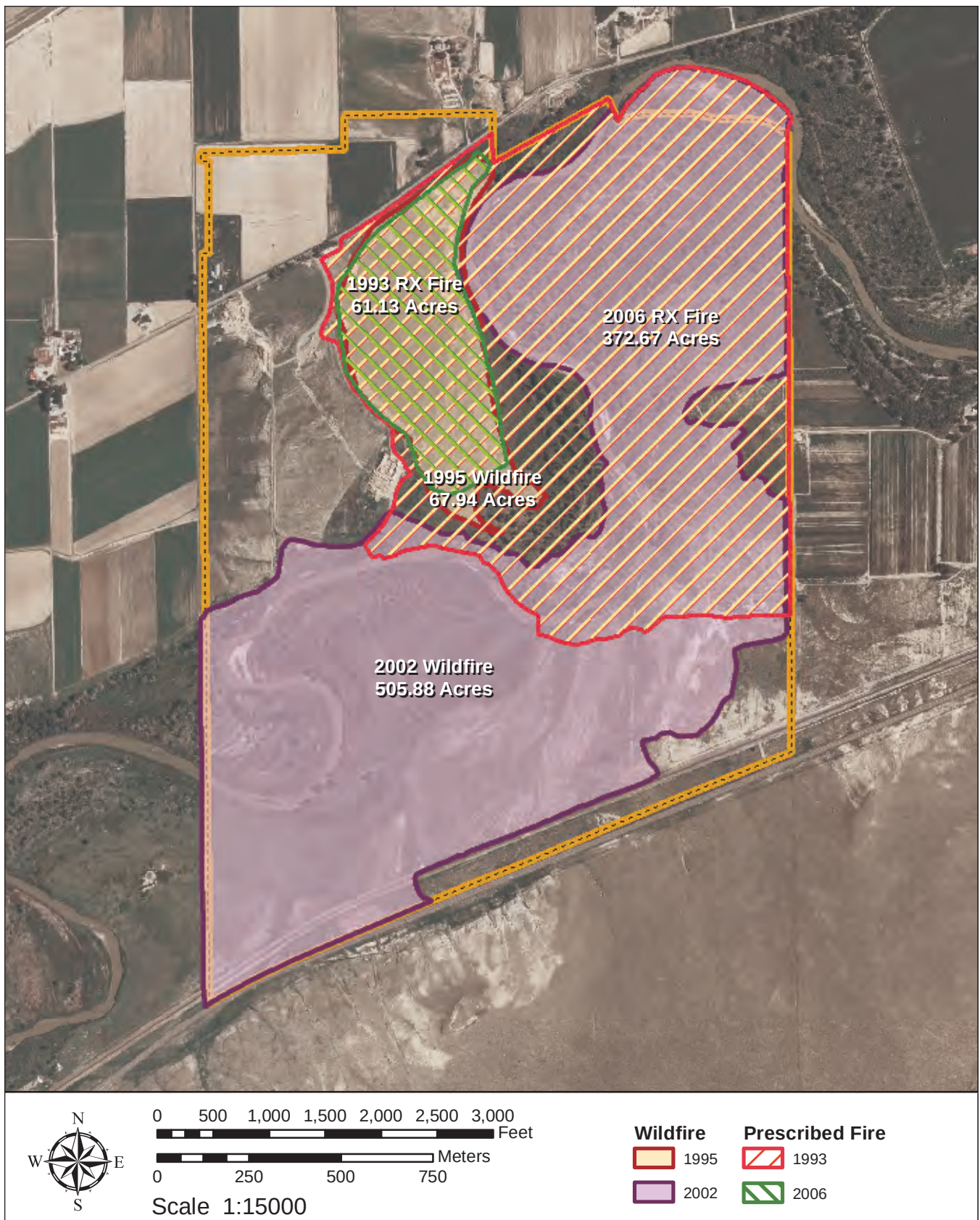


Figure 4.1-2. Prescribed treatment or wildland fires since 1993, Bent's Old Fort NHS.

Table 4.1-2a. Within-plot cover values for each plant species detected during monitoring at each Bouteloua and Cottonwood transect at Bent's Old Fort NHS, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide Values					
		BOUT-LI01		BOUT-LI02		BOUT-LT03		CWOOD-03		CWOOD-LT01		CWOOD-LI02		CWSALT-LI01		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																			
DISPI	P	0	0	1	3.8	0.7	5.2	2.6	15.2	19.7	20.7	0.2	2.1	19	5	11.08	4.44	11.42	3.84
PASSMI	P	0	0	0	0	0	0	8.7	3.5	0	0	0	1	10.4	1.6	4.86	2.30	2.92	1.12
BOUGRA	P	22	19	0	0	1.6	1.6	0	0	0	0	0	0	0	0	2.35	1.72	2.40	1.56
SPOAIR	P	0	0	0	0	0	0	0	0.6	0	0	10	0.2	0	2	2.18	1.38	1.52	1.00
SPOCRY	P	2.6	0.8	0.1	0.3	7.6	6.6	0	0.1	0	0	1.4	2.2	0	0	0.95	0.59	0.77	0.52
ARIPUR	P	0	0	6.4	3.4	1.4	1.4	0	0	0	0	0	1	0	0	0.77	0.51	0.47	0.27
PANOBT	P	0	0	0	0	0	0	0	0	0	0	1.4	3.5	1.6	0	0.48	0.22	0.48	0.30
ELYELY	P	0.6	0.2	0.1	0.1	1.1	0	0	0	0	0	0	0	0	0	0.14	0.09	0.02	0.02
ELYCAN	P	0.1	0	0	0	0	0	0	0	0	0	0	0	1.1	5.4	0.11	0.08	0.42	0.42
MUHASP	P	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0.08	0.08	0.28	0.23
SCHPAN	P	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.00	0.00
ACHHYM	P	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.01	0.01	0.00	0.00
SORHAL	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.00	0.00	0.02	0.02
PLEJAM	P	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.84	0.83	0.29	0.29
FORB																			
KOCSO	A	0	0	4.1	0.9	0.2	0	30.7	7.2	19.4	19.6	10.4	1.2	0.6	4	6.77	2.66	2.80	1.52
HELANN	A	4.1	0	1.4	0	1	0	0.7	0	0	0	0.9	0.1	0.6	0	3.24	1.84	0.01	0.01
RAYANN	A	0	0	0	0	7.7	0	0	0	0	0	0	0	0	0	0.59	0.59	0.00	0.00
CHEBER	A	0	0	0	0	0	0	2	0	0.1	0	0.8	4.2	0	0	0.57	0.33	0.36	0.32
HELPET	A	2.3	0	0	0	3.4	0	0	0	0	0	0	0	0.8	0.6	0.50	0.30	0.16	0.12
CHAGLY	A	0.2	0.2	0.3	1.1	0	0.1	0	0	0	0	0	0	0	0	0.29	0.17	0.16	0.10
SALTRA	A	0.1	0	0.4	0.6	0.3	0	0	0	0	0	1	0	0	0	0.29	0.15	0.06	0.05
LINARI	A	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.00	0.00
EUPDEN	A	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0.02	0.01	0.00	0.00
GAUMOL	A	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.00	0.00	0.01	0.01
TETLIN	A	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.05	0.05
MACTAN	A/B	0.2	0	4.6	0	1.7	0	0	0	0	0	0	0	0	0	0.50	0.37	0.00	0.00

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial.
Mean and SE values are calculated across all plots in the park

Table 4.1-2a. Within-plot cover values for each plant species detected during monitoring at each Bouteloua and Cottonwood transect at Bent's Old Fort NHS, 2010 and 2011 cont.

Vegetation code	Life cycle	Transect												Parkwide Values					
		BOUT-LT01		BOUT-LT02		BOUT-LT03		CWOOD-03		CWOOD-LT01		CWOOD-LT02		CWSALT-LT01		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																			
CONCAN	A/B	0	0	0	0	0	0	0	0	1.5	0.8	0.6	0	0.1	0	0.22	0.12	0.17	0.12
LACSER	A/B	0.2	0	0	0	0	0	0	0	2	0	0	0	0.2	0	0.21	0.15	0.00	0.00
AMBPSI	A/P	0	0	0	0	0	0	0	0	0	0	6	1.1	0	0	0.46	0.46	0.08	0.08
CHAPRO	A/P	0.2	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0.22	0.13	0.12	0.06
GRISQU	A/P	0	0	0.2	0	0	0.1	0	0	0	0	0	0	0	0	0.02	0.02	0.01	0.01
MELALB	A/P	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.01	0.01	0.00	0.00
MENNUD	B/P	0.7	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.06	0.05	0.00	0.00
CONARV	P	0.3	0	2.3	4.6	0	0	0	0	0	0	0	0.1	0	0	1.58	0.74	3.28	1.41
GLYLEP	P	0	0	0	0	0	0	0	0	0	0	7.2	16.6	8.6	7.8	1.22	0.83	1.88	1.36
ASTBIS	P	0	0	0	0	0	0	0	0	0	0	14	2	0	0	1.12	1.07	0.38	0.22
RATTAG	P	0	0	0	0	0	0	0	0	0	0	9.2	7.6	0	0	0.71	0.71	0.58	0.58
SPHCOC	P	1.4	1.4	4.2	5.6	1.3	0.9	0	0	0	0	0	0	0	0	0.69	0.35	0.79	0.45
MACPIN	P	0	0	1.2	5	0.6	0	0	0	0	0	0	0	0	0	0.14	0.10	0.38	0.38
RUMCRI	P	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0	0	0.13	0.08	0.01	0.01
PHYVIR1	P	0	0	0	0	0.1	0	0	0	0	0	0.2	0.2	0	0	0.08	0.05	0.03	0.02
ASCSub	P	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.2	0.08	0.06	0.22	0.12
APOCAN	P	0	0	0	0	0	0	0	0	0	0	0.1	0	0.6	0	0.05	0.05	0.00	0.00
LILSSP	P	0	0	0	0	0	0	0	0	0.1	0.6	0	0	0	0	0.01	0.01	0.05	0.05
LYGJUN	P	0.1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0.02	0.02
MIRNYC	P	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.01	0.01	0.00	0.00
ASCSP	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0.00	0.00	0.05	0.05
SHRUB																			
ARTFIL	P	10.4	10.9	3.2	6.6	8.6	16.4	0	0	0	0	0	0	0	0	2.04	1.00	2.61	1.48
BACSal	P	0	0	0	0	0	0	0	0	0	0	2	2	0	12.6	0.15	0.15	1.12	0.97
SALEXI	P	0	0	0	0	0	0	0	0	0	0	0	0	7.6	0	0.58	0.58	0.00	0.00
TREE																			
POPDEL	P	0	0	0	0	0	0	6	3	0	0	0	0	0.1	0	0.47	0.46	0.23	0.23

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial.

Mean and SE values are calculated across all plots in the park

Table 4.1-2b. Within-plot cover values for each plant species detected during monitoring at each Restoration and Sporobolus transect at Bent's Old Fort NHS, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide Values			
		RESTE-LT01		RESTN-LT01		RESTS-LT01		SPOR-LT01		SPOR-LT02		SPOR-LT03		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																	
DISSPI	P	4.1	0	0.2	2.8	0	0	18.6	17.2	55	43	23	33.4	11.08	4.44	11.42	3.84
PASSMI	P	0	0	9.6	12.6	0	0	4	4.1	1.5	7	29	8.2	4.86	2.30	2.92	1.12
BOUGRA	P	0	0	0	1.2	0	0	7	9.4	0	0	0	0	2.35	1.72	2.40	1.56
SPOAIR	P	0	0	2.2	0.2	0	0	16	13	0	3.7	0.2	0.1	2.18	1.38	1.52	1.00
SPOCRY	P	0	0	0.6	0	0	0	0	0	0	0	0	0	0.95	0.59	0.77	0.52
ARIPUR	P	0	0	2.2	0.3	0	0	0	0	0	0	0	0	0.77	0.51	0.47	0.27
PANOBT	P	0	0	0	0	0	0	2.2	2.1	1	0.6	0	0	0.48	0.22	0.48	0.30
BOUCUR	P	0	0	4.1	5	0	0	0	0	0	0	0	0	0.32	0.32	0.38	0.38
ELYCAN	P	0	0	0	0	0	0	0	0	0.2	0	0	0	0.11	0.08	0.42	0.42
MUHASP	P	0	0	0	0.6	0	0	0	0	0	0	0.1	0	0.08	0.08	0.28	0.23
PANVIR	P	0	0	0	0.6	0	0	0	0	0	0	0	0	0.00	0.00	0.05	0.05
PLEJAM	P	0	0	10.8	3.8	0	0	0	0	0	0	0	0	0.84	0.83	0.29	0.29
FORB																	
KOCSO	A	8.2	0.2	0.2	0	13.8	2.7	0	0	0.2	0.6	0.2	0	6.77	2.66	2.80	1.52
HELANN	A	5.8	0	0	0	0.4	0	2.6	0	24.6	0	0	0	3.24	1.84	0.01	0.01
CHEBER	A	0	0	0	0	0	0	0.2	0.1	0.3	0.2	4	0.2	0.57	0.33	0.36	0.32
HELPET	A	0	0	0	0	0	0	0	0	0	0	0	1.5	0.50	0.30	0.16	0.12
CHAGLY	A	1.3	0.7	0	0	0	0	2	0	0	0	0	0	0.29	0.17	0.16	0.10
SALTRA	A	1.8	0	0	0	0.1	0	0.1	0.2	0	0	0	0	0.29	0.15	0.06	0.05
CONCAN	A/B	0	1.4	0	0	0	0	0.6	0	0	0	0	0	0.22	0.12	0.17	0.12
LACSER	A/B	0	0	0	0	0	0	0.1	0	0.2	0	0	0	0.21	0.15	0.00	0.00
TRADUB	A/B	0	0	0	0	0	0	0.2	0	0	0	0	0	0.02	0.02	0.00	0.00
CHAPRO	A/P	1.3	0.4	0	0	1.3	0.4	0	0	0	0	0	0	0.22	0.13	0.12	0.06
OENVIL	B/P	0.3	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.00	0.00
CONARV	P	1.1	14	2.9	4.3	7.2	14	0	0	7.1	3.7	0	2	1.58	0.74	3.28	1.41
ASTBIS	P	0	0	0.2	0.7	0.3	2.2	0	0.1	0	0	0	0	1.12	1.07	0.38	0.22

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial.
Mean and SE values are calculated across all plots in the park

Table 4.1-2b. Within-plot cover values for each plant species detected during monitoring at each Restoration and Sporobolus transect at Bent's Old Fort NHS, 2010 and 2011 cont.

Vegetation code	Life cycle	Transect												Parkwide Values			
		RESTE-LT01		RESTN-LT01		RESTS-LT01		SPOR-LT01		SPOR-LT02		SPOR-LT03		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
FORB (cont.)																	
SPHCOC	P	0	0	0	0	2.1	2.4	0	0	0	0	0	0	0.69	0.35	0.79	0.45
RUMCRI	P	0.6	0	0	0	0	0	0.9	0	0	0	0	0	0.13	0.08	0.01	0.01
PHYVIR1	P	0	0	0	0	0	0.2	0.1	0	0.7	0	0	0	0.08	0.05	0.03	0.02
ASCSub	P	0.1	1.1	0	0.2	0	1.2	0.8	0.2	0	0	0	0	0.08	0.06	0.22	0.12
ASTMIS	P	0	0	0	0	0	0	0.6	0	0	0	0	0	0.05	0.05	0.00	0.00
ASTFAL	P	0	0	0	0	0	0	0	0	0	0	0.2	0.6	0.02	0.02	0.05	0.05
IVAAXI	P	0	0	0.1	0	0	0	0	0	0	0	0	0	0.01	0.01	0.00	0.00
SOLCAR	P	0	0	0	0	0	0	0.1	0	0	0	0	0	0.01	0.01	0.00	0.00
SYMERI	P	0	0	0	0	0	.	0	0	0.1	0	0	0	0.01	0.01	0.00	0.00
SHRUB																	
ARTFIL	P	0	0	0	0	4.3	0	0	0	0	0	0	0	2.04	1.00	2.61	1.48

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial.
Mean and SE values are calculated across all plots in the park

Table 4.1-3a. Percentage of substrate cover for each Bouteloua and Cottonwood transect at Bent's Old Fort NHS, 2010 and 2011

Cover	Transect														Park Totals			
	BOUT_LT_01		BOUT_LT_02		BOUT_LT_03		CWOOD_03		CWOOD_LT_01		CWOOD_LT_02		CW_SALT_LT_01		Mean	SE	Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	56	0	83.4	0	65.8	0	1	0	5.6	0	8.6	0	0.4	0	30.408	9.5306	0	0
SOILOPEN	0	41.6	0	61	0	48.6	0	3	0	11	0	4	0	3	0	0	26.169	7.6247
SOILUNDER	0	9.4	0	6.6	0	11.2	0	0	0	2	0	3	0	1	0	0	3.785	0.9973
LITTER	42.8	49	17.8	30.4	34	39.6	118.5	95	93.6	86	73	64.4	117	94	70.862	10.269	67.262	8.0141
WOOD	0	0	0	2	0.2	0.6	0.55	2	0.8	1	18.4	28.6	2.6	2	1.812	1.3962	2.785	2.164
ROCKLG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROCKSM	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0.062	0.0615	0	0
CRUST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.092	0.0923	0	0

Table 4.1-3b. Percentage of substrate cover for each Restoration and Sporobolus transect at Bent's Old Fort NHS, 2010 and 2011

Cover	Transect														Park Totals			
	RESTE-LT01		RESTN-LT01		RESTS-LT01		SPOR-LT01		SPOR-LT02		SPOR-LT03		Mean		SE	Mean	SE	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011		
SOILBARE	66	0	2.5	0	82	0	24	0	0	0	0	0	30.408	9.5306	0	0	0	
SOILOPEN	0	56	0	12.4	0	80	0	17.6	0	2	0	0	0	0	26.169	7.6247	0	
SOILUNDER	0	3	0	3	0	4	0	6	0	0	0	0	0	0	3.785	0.9973	0	
LITTER	34	41	97.5	84.6	17.8	16	75.8	76.4	100	98	99.4	100	70.862	10.269	67.262	8.0141	0	
WOOD	0	0	0	0	0.2	0	0.2	0	0	0	0.6	0	1.812	1.3962	2.785	2.164	0	
ROCKLG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ROCKSM	0	0	0	0	0	0	0	0	0	0	0	0	0.062	0.0615	0	0	0	
CRUST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MOSS	0	0	0	0	0	0	0	0	0	0	0	0	0.092	0.0923	0	0	0	

4.2 Capulin Volcano National Monument

4.2.1 2010 and 2011 sampling

A total of six fire and six long-term monitoring transects were established at Capulin Volcano National Monument (CAVO; Figure 4.2-1). The plant communities monitored at Capulin Volcano NM are: shortgrass steppe and pinyon-juniper woodland (Muldavin et al. 2011), which is being thinned and/or type converted to grassland (Table 4.2-1). Thinning treatment has recently been halted as it has been determined that this is a wrong course of action. These transects will continue to be monitored for the foreseeable future. All long-term transects were monitored at CAVO during late-July in 2010 and 2011. There are existing fire transects at CAVO, but no data was collected in 2010/2011 due to the fire program's schedule.

4.2.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response.

The grassland transects monitored at CAVO contain only native perennial grasses but their foliar cover is limited. This may be due to the nature of the soils and/or areas where pinon-juniper has been recently cleared. Patches of disturbance have been observed in the

grasslands throughout the park – some naturally occurring (ie. gophers) but many a result of past land uses and burn scars. These disturbances areas provide ideal establishment areas for exotic plants that can then spread into the surrounding landscape. There is a diverse mix of forbs found in the transects, the majority being perennials.

CAVO habitats are threatened with exotic plants. While no exotic grasses appeared in the transects, it is known that there are patches of various bromes (*Bromus japonicas*, *B. tectorum*, etc.) that have become dominant and are spreading. While exotic forbs were found in transects, none were encountered in great numbers. Mullein is undergoing active control measures which have resulted in obvious reduction of numbers, but it remains to be seen if this effort has long-term effects. Exotic species present at CAVO are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.2.3 Prescribed fire treatments or wildfire occurrence

Prescribed burns and thinning treatments have occurred at CAVO since 2005 (Figure 4.2-2). The majority of the grasslands in the park have received both treatments, but prescribed burning has not occurred since 2008. Thinning of pinon-juniper has occurred since on the toe-slopes and crest of the cinder cone. There has been no wildfire at CAVO (at least on the cone) for the past century.

Table 4.2-1. Plant community and sampling dates for each transect at Capulin Volcano NM in 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
PJ-LT01	Pinyon Juniper	8/5/2010	7/20/2011
PJ-03	Pinyon Juniper	8/7/2010	7/20/2011
PJ-LT03	Pinyon Juniper	8/6/2010	7/21/2011
STEP-LT01	Short Grass	8/6/2010	7/21/2011
STEP-LT02	Short Grass	8/5/2010	7/20/2011
STEP-LT03	Short Grass	8/7/2010	7/21/2011

In 2010, all long-term monitoring plots were established at Capulin Volcano NM during late-July. There are existing fire plots at Capulin Volcano NM, but no data was collected in 2010 or 2011 due to the fire program's schedule.



4.2.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review) and current results from monitoring within the scope of this project are reported in the previous data table (Table 4.2-2). As monitoring progresses, any noted effects of burning will be presented in this section.

4.2.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with the Southern Plains/Chihuahuan Desert Exotic Plant Management Team to map annual treatment areas.

Active exotic control by the EPMT focused on the front prairie, southern toe slope, Boca Trail and Rim Trail this past year. All exotics present were treated mechanically or with herbicide except for cheatgrass (*Bromus tectorum*) which was not at the proper growth stage. Species targeted on the prairie and toe slope included kochia (*Kochia scoparia*), horehound

(*Marrubium vulgare*), sweetclover (*Melilotus officinalis* and *M. alba*) and mullein (*Verbascum thapsus*). Mullein was sprayed in all openings of the Boca Trail; the mullein and horehound along the Rim Trail was hand-pulled. The developed area received herbicide treatment for field bindweed (*Convolvulus arvensis*) and redstem stork's-bill (*Erodium cicutarium*) but were only partially completed due to rain.

The park itself has been actively controlling mullein for the past two years by hand-pulling in an extensive area. The potential for re-growth exists due to the long-lived seedbank but this treatment should be able to reduce numbers if control efforts continue to be performed.

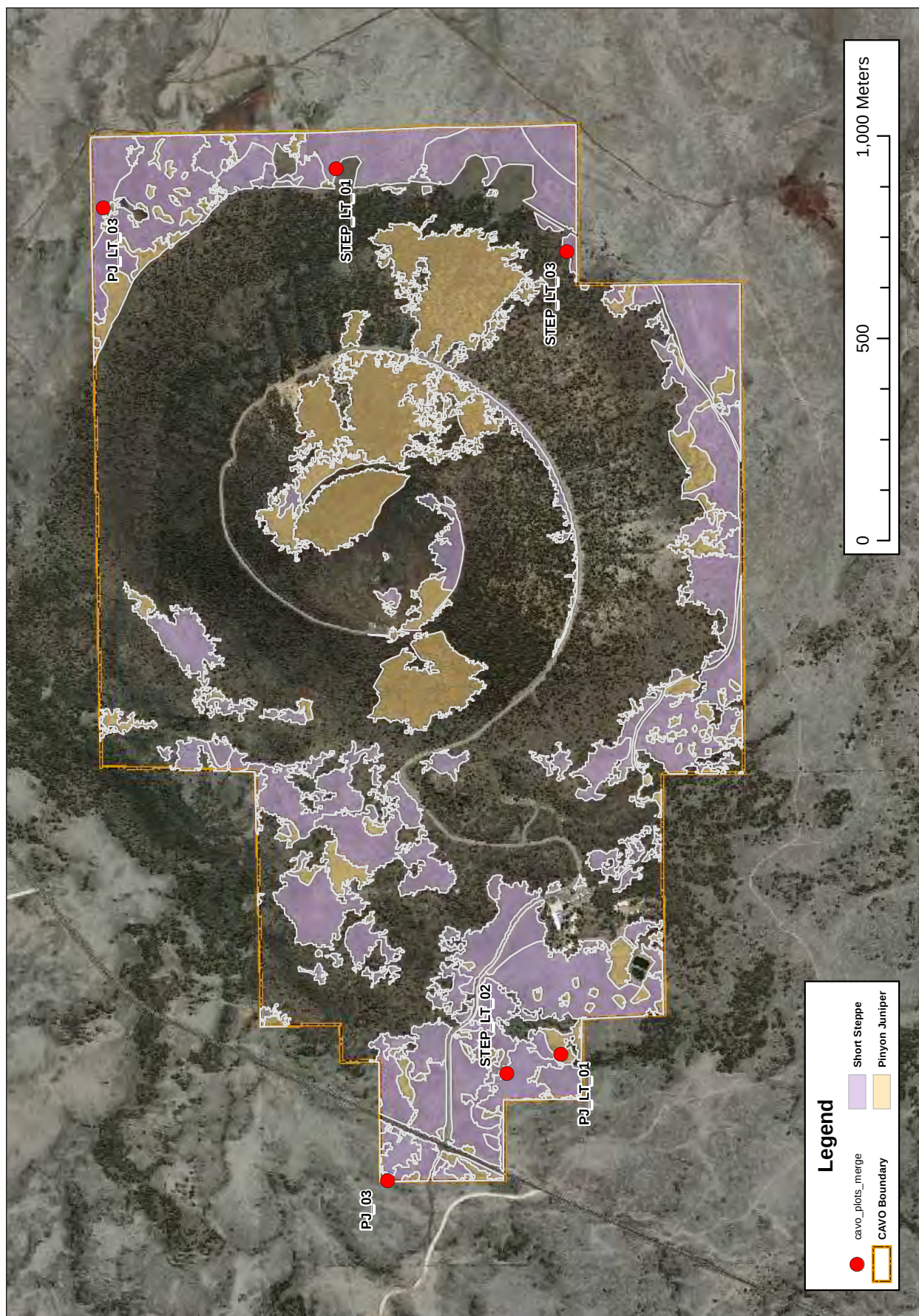


Figure 4.2-1. Monitoring transects, Capulin Volcano NM 2010 and 2011.

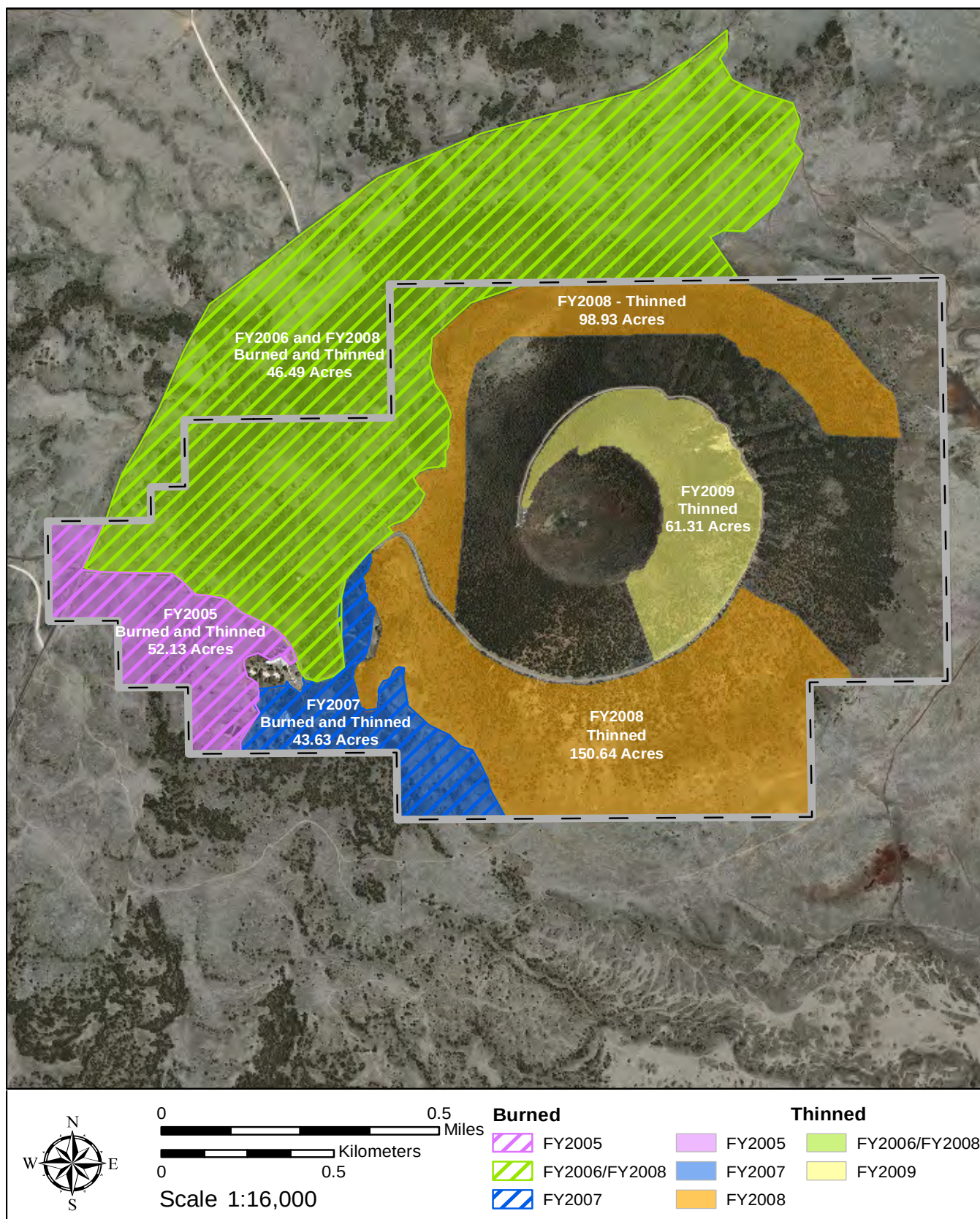


Figure 4.2-2. Prescribed treatment or wildland fires since 2005, Capulin Volcano NM.

Table 4.2-2. Within-plot cover values for each plant species detected during monitoring at each transect, Capulin Volcano NM, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values			
		PJ_03		PJ_LT_01		PJ_LT_03		STEP_LT_01		STEP_LT_02		STEP_LT_03		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																	
BOUGRA	P	10.8	4.2	6	5	4.2	0	5.1	1	3.9	3.6	0	0	5	1.4318	2.3	0.9103
ANDGER	P	3.8	1.4	11	2.8	1.6	2.8	8.6	4.8	3	1.4	0.1	0.9	4.6833	1.726	2.35	0.5864
LYCSET	P	7	0	7	0	0	0	0	0	8.2	0	0	0	3.7	1.6643	0	0
ELYELY	P	4.2	5	1	1	4.4	0.4	3.6	0.4	4.9	0.6	2	1.6	3.35	0.6228	1.5	0.7243
BOUCUR	P	3.1	3	4	3.8	2.4	3.2	3.7	0.2	6.1	1.5	0.1	0.4	3.2333	0.8073	2.0167	0.6253
SCHSCO	P	1.2	5.2	0	0.8	10	7.6	7	11	0.1	4	0	0	3.05	1.7761	4.7667	1.6942
ARIPUR	P	0.8	0.2	8	1.6	0	0	1.4	3	0.4	1	0.8	1.3	1.9	1.2348	1.1833	0.443
PASSMI	P	0.8	0.3	1.3	0.3	2	1.1	0	0.2	5.6	0.6	0	0.7	1.6167	0.8565	0.5333	0.1382
MUHMON	P	0.6	0.3	3.4	2.3	0	0	0	0	3.8	2.2	0	0	1.3	0.7353	0.8	0.4612
BROPOR	P	0	0	0	0	0	0	0.1	0	0	0	3.2	0	0.55	0.5303	0	0
CARSSP	P	0.6	0	0	0	1.1	0.8	0	0	0	0	0	0	0.2833	0.1905	0.1333	0.1333
POAFEN	P	0	0	0.2	0.4	0.6	0	0	0	0	0	0	0	0.1333	0.0989	0.0667	0.0667
SPOCRY	P	0.6	0	0	0	0.1	0.2	0	0	0	0	0	0	0.1167	0.098	0.0333	0.0333
FESARI	P	0	0	0	0	0.3	0	0	0	0	0	0	0	0.05	0.05	0	0
BUCDAC	P	0	0	0	0	0	0.6	0	0.1	0	0	0	0	0	0	0.1167	0.098
FORB																	
HELANN	A	0.3	0	1.4	0	0.8	0	9	0.2	2.3	0	4.4	0	3.0333	1.3308	0.0333	0.0333
HETVIL	P	5.4	3.4	0	0	3	1.2	1.4	0.1	0.1	0.6	0	0	1.65	0.8906	0.8833	0.5382
LUPARG	P	1.2	0.6	2.6	0.2	0	0	0.1	0	0.2	0	0	0	0.6833	0.4262	0.1333	0.0989
ERIJAM	P	0.6	0.2	0	0	3	0.2	0	0	0	0	0	0	0.6	0.4899	0.0667	0.0422
SALTRA	A	0	0	0	0	0.2	0.2	0.6	0.6	0	0	2.7	2.8	0.5833	0.4339	0.6	0.4502
PECANG	A	0	0	0	0	0	0	0	0	0	0	3	0.2	0.5	0.5	0.0333	0.0333
MENNUD	B/P	0.1	0	0	0	0	0	0.6	0.1	0	0	2	0	0.45	0.3243	0.0167	0.0167
THEMEG	P	1.2	0.7	0	0	0	0	0.9	0	0.5	0.1	0	0	0.4333	0.214	0.1333	0.1145
PHYSUB	A	0	0	0	0	0	0	0.1	0	0	0	2.4	0	0.4167	0.397	0	0
LACSER	A/B	0.6	0	0.2	0	0	0	0.1	0	1.1	0.1	0.3	0	0.3833	0.1662	0.0167	0.0167
PHAHET	B/P	0	0	0	0	0	0	0	0	0	0	2	0	0.3333	0.3333	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial.

Mean and SE values are calculated across all plots in the park

Table 4.2-2. Within-plot cover values for each plant species detected during monitoring at each transect, Capulin Volcano NM for 2010 and 2011 cont.

Vegetation code	Life cycle	Transect												Parkwide values					
		PJ_03		PJ_LT_01		PJ_LT_03		STEP_LT_01		STEP_LT_02		STEP_LT_03		Mean	SE	Mean	SE		
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011						
Forb (cont.)																			
LIAPUN	P	1	0	0.2	0	0	0	0	0	0	0	0	0	0.2667	0.1606	0	0		
GUTSAR	P	0.8	0.1	0	0	0	0	0	0	0	0	0	0	0.25	0.1586	0.0167	0.0167		
VIAAME	P	0.3	0	0.4	0	0	0	0	0	0	0	0	0	0.1833	0.0833	0	0		
PSOTEN	P	1	0.1	0	0	0	0	0	0	0	0	0	0	0.1667	0.1667	0.0167	0.0167		
HELMUL	P	0	0	0	0	0.3	0	0.6	0.1	0	0	0	0	0.15	0.1025	0.0167	0.0167		
CHEPRA	A	0	0	0.6	0	0	0	0	0	0.2	0	0	0	0.1333	0.0989	0	0		
PENANG	P	0	0	0	0	0.2	0	0.6	0	0	0	0	0	0.1333	0.0989	0	0		
SPHCOC	P	0	0.1	0	0	0	0	0	0	0.8	0.5	0	0	0.1333	0.1333	0.1	0.0816		
AMAHYB	A	0	0	0	0	0	0	0.2	0.1	0	0	0	0	0.1	0.0683	0.0167	0.0167		
ARTLUD	P	0	0	0	0	0.6	0.1	0	0	0	0	0	0	0.1	0.1	0.0167	0.0167		
STEMIN	P	0	0	0	0	0	0	0	0	0.6	0.1	0	0	0.1	0.1	0.0167	0.0167		
TRADUB	A/B	0.2	0	0	0	0	0	0.1	0	0.2	0	0.1	0	0.1	0.0365	0	0		
CIRUND	B/P	0	0	0.2	0.1	0	0	0	0	0.3	0.1	0	0	0.0833	0.0543	0.0333	0.0211		
CHELEP	A	0	0	0	0	0.3	0	0.1	0.8	0	0	0	0	0.0667	0.0494	0.1333	0.1333		
EUPDAV	A	0	0	0	0	0	0	0.2	0	0	0	0.2	0	0.0667	0.0422	0	0		
POLDOD	A	0	0	0.1	0	0	0	0.3	0	0	0	0	0	0.0667	0.0494	0	0		
ERIFLA	B	0	0	0	0	0.3	0	0	0	0	0	0	0	0.05	0.05	0	0		
GAUCOC	P	0.1	0.2	0.1	0.3	0	0	0	0	0.1	0.3	0	0	0.05	0.0224	0.1333	0.0615		
LITMUL	P	0	0	0.3	0	0	0	0	0	0	0	0	0	0.05	0.05	0	0		
MIRLIN	P	0	0	0	0	0	0	0	0	0.3	0	0	0	0.05	0.05	0	0		
PACNEO	P	0.2	0	0	0	0	1.4	0.1	0.1	0	0	0	0	0.05	0.0342	0.25	0.2306		
SOLCAN	P	0	0	0	0	0	0	0	0	0.3	0	0	0	0.05	0.05	0	0		
VERTHA	B	0	0	0	0	0	0	0	0	0.3	0	0	0	0.05	0.05	0	0		
ALLCER	P	0.1	0.2	0	0	0.1	0	0	0	0	0	0	0	0.0333	0.0211	0.0333	0.0333		
ARGHIS	P	0	0	0	0	0	0	0.2	0	0	0	0	0.2	0.0333	0.0333	0.0333	0.0333		
MARVUL	P	0	0	0	0	0	0	0	0	0	0	0.2	0	0.0333	0.0333	0	0		
ASTFLE	P	0.1	0	0	0	0	0	0	0	0	0	0	0	0.0167	0.0167	0	0		

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial.
Mean and SE values are calculated across all plots in the park

Table 4.2-2. Within-plot cover values for each plant species detected during monitoring at each transect, Capulin Volcano NM for 2010 and 2011 cont.

Vegetation code	Life cycle	Transect												Parkwide values			
		PJ_03		PJ_LT_01		PJ_LT_03		STEP_LT_01		STEP_LT_02		STEP_LT_03		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (Cont.)																	
CHAFEN	P	0	0	0	0	0	0	0.1	0	0	0	0	0	0.0167	0.0167	0	0
LAPOCC	A/B	0	0	0	0	0.1	0	0	0	0	0	0	0	0.0167	0.0167	0	0
RATTAG	P	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0.0167	0.0167	0.0167	0.0167
SENFLA	P	0	0	0	0	0	0	0.1	0	0	0	0	0	0.0167	0.0167	0	0
VERENC	A	0	0	0	0	0	0	0	0	0	0	0.1	0	0.0167	0.0167	0	0
ACHMIL	P	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.0167	0.0167
ARAHIR	A/P	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.0167	0.0167
ARTDRA	P	0	0.1	0	0	0	0	0	0.2	0	0.2	0	0	0	0	0.0833	0.0401
CASINT	P	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0.0333	0.0333
CHASER2	A	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0.0333	0.0211
MACPIN	P	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.0167	0.0167
MENMUL	B/P	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.0167	0.0167
ORTLUT	A	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.0167	0.0167
SHRUB																	
ARTFRI		6	2.6	3.3	1.3	6.1	2.1	9	6	11.1	5.7	0	0	5.9167	1.6152	2.95	0.9855
RHUTRI		0	0	0	0	0	0	0	0	0	0	18	4.3	3	3	0.7167	0.7167
YUCGLA		0	0.1	0	0.2	5.5	5	1.7	2.3	0	0.1	6.4	5	2.2667	1.201	2.1167	0.9741
ECHVIR		0	0	0	0	0	0	0	0	0.2	0.6	0	0	0.0333	0.0333	0.1	0.1
TREE																	
QUEGAM		0	0	0	0	0	0	0	0	0	0	26	27	4.3333	4.3333	4.5	4.5
JUNSCO		0	0	12	6	0	0	0	0	0	0	0	0	2	2	1	1
PINSSP		0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.0333	0.0333

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial.

Mean and SE values are calculated across all plots in the park

Table 4.2-3a. Percentage of substrate cover for each Pinyon-Juniper transect sampled, Capulin Volcano NM, 2010 and 2011

Cover	Transect						Park Totals			
	PJ_03		PJ_LT_01		PJ_LT_03		Mean	SE	Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	15.3	0	14.8	0	20	0	15.717	3.9962	0	0
SOIOPEN	0	5	0	7.8	0	13.4	0	0	11.367	2.9917
SOILUNDER	0	8	0	2.6	0	1	0	0	3.6	1.4142
LITTER	56.8	56.8	72.2	68	32.4	48.6	47.5	6.8574	51.8	4.6361
WOOD	0	0	0	0	0.2	0.6	3.701	2.3292	4.733	4.6144
ROCKLG	26.9	29	22	20	38	33.8	17.083	5.8486	19	4.2624
ROCKSM	0	0	0	0	8	2.6	16.9	10.0807	8.867	5.2821
CRUST	0	0	0	0	0	0	0	0	0	0
LICHEN	1.2	1.2	3.01	1.6	1.4	0	0.968	0.4787	0.633	0.294
MOSS	0	0	0	0	0	0	0	0	0	0

Table 4.2-3b. Percentage of substrate cover for each Steppe transect sampled, Capulin Volcano NM, 2010 and 2011

Cover	Transect						Park Totals			
	STEP-LT01		STEP-LT02		STEP-LT03		Mean	SE	Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	14	0	30.2	0	0	0	15.717	3.9962	0	0
SOIOPEN	0	10.6	0	25	0	6.4	0	0	11.367	2.9917
SOILUNDER	0	1	0	8	0	1	0	0	3.6	1.4142
LITTER	25.6	48.4	50	55.2	48	33.8	47.5	6.8574	51.8	4.6361
WOOD	0.004	0	9.8	0	12.2	27.8	3.701	2.3292	4.733	4.6144
ROCKLG	0	11.4	9.2	10.8	6.4	9	17.083	5.8486	19	4.2624
ROCKSM	60.4	28.6	0.6	0	32.4	22	16.9	10.0807	8.867	5.2821
CRUST	0	0	0	0	0	0	0	0	0	0
LICHEN	0	0	0.2	1	0	0	0.968	0.4787	0.633	0.294
MOSS	0	0	0	0	0	0	0	0	0	0

4.3 Chickasaw National Recreation Area

4.3.1 2010 and 2011 sampling

A total of ten fire and ten long-term monitoring transects have been established at Chickasaw National Recreation Area (CHIC; Figure 4.3-1). The plant communities monitored are: upland grasslands comprising little bluestem–sideoats grama–blue grama herbaceous vegetation; little bluestem–Indiangrass–sideoats grama herbaceous vegetation; hairy grama–sideoats grama herbaceous vegetation; and seep muhly–sideoats grama–Illinois bundleflower herbaceous vegetation; and an Old Field habitat which contains the Johnsongrass semi-natural herbaceous association (Table 4.3-1). The Old Field habitat is slowly being restored by the park to native grasslands and is an area of specific concern to management. In 2010, four fire and nine long-term transects were monitored in June and September, while 2011 saw all long-term transects and two fire transects monitored in June.

4.3.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and

should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response.

The grasslands at CHIC continue to undergo transformation in an effort to re-establish midgrass savannah determined to have been an historic state (Hoagland and Johnson 1999). Intensive clearing of eastern red cedar (*Juniperus virginiana*) and an active prescribed burn program result in a mosaic of grasslands in varying succession. While grasses continue to respond favorably to these burns, the overall shift appears to be to shrubland; thickets of various sumacs (*Rhus* species), dewberries (*Rubus* species), green catbriar (*Smilax bona-nox*) and poison ivy (*Toxicodendron radicans*) quickly spring up. Thirty-seven species of grass have been identified in monitoring transects through 2011, the majority being perennial natives, and forbs are quite diverse throughout the grassland.

Vegetation management activity is taking place throughout the park, and active restoration is being undertaken on a large Johnsongrass (*Sorghum halepense*) hayfield in the Guy Sandy area. This area has been seeded with “placeholder” species while Johnsongrass is being

Table 4.3-1. Plant community and sampling dates for each transect at Chickasaw NRA, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
LAKE-01	Upland Grass	9/6/2010	6/19/2011
LAKE-F02	Upland Grass	6/12/2010	Not Sampled
LAKE-02	Upland Grass	9/5/2010	6/18/2011
LAKE-LT01	Upland Grass	6/11/2010	6/22/2011
LAKE-LT02	Upland Grass	6/11/2010	6/22/2011
LAKE-03	Upland Grass	6/12/2010	6/21/2011
NH-LT01	Old Field	6/10/2010	6/23/2011
NH-LT02	Old Field	6/10/2010	6/23/2011
WH-F03	Upland Grass	6/15/2010	Not Sampled
WH-01	Upland Grass	6/13/2010	6/23/2011
WH-LT01	Upland Grass	6/13/2010	6/20/2011
WH-LT02	Upland Grass	Not Sampled	6/24/2011
WH-LT03	Upland Grass	6/15/2010	6/20/2011
WH-LT05	Upland Grass	6/10/2010	6/21/2011

eradicated. Progress is being made but this will be a slow process until good rainfall returns and native grasses can be restored. While eastern red cedar is being thinned in areas of the park, most of this activity is taking place in deciduous woodlands and not within the scope of our sampling.

Various exotic plant species are widespread throughout CHIC. The perennial Johnsongrass is prevalent in many areas as remnants of past agricultural use and other disturbances. Another agricultural remnant, sericea lespedeza (*Lespedeza cuneata*) is widespread throughout the park, found wherever there are deeper soils and sunlight. There are a number of native *Lespedeza* species at CHIC, often intermixed with sericea lespedeza, so control of the exotic will be very difficult. Exotic species present at CHIC are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.3.3 Prescribed fire treatments or wildfire occurrence

CHIC supports an active prescribed burning and thinning program. A prescribed burn has taken place in 2009 in the northeastern sector covering 50 acres (Figure 4.3-2). Earlier burns have taken place in the Guy Sandy area and north of Veteran's Lake, but no details have been given. Recent prescribed burns have been delayed due to weather conditions.

Thinning (over 2500 acres) and defensible space clearing (164.6 acres) have taken place in 2009 and 2010 in conjunction with ARRA funding in the area behind the Nature Center, the Guy Sandy area and around Lake of the Arbuckles (Figure 4.3-3).

4.3.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review) and current results from monitoring within the scope of this project are reported in the previous data table (Table 4.1-2). As monitoring progresses, any noted effects of burning will be presented in this section.

4.3.5 Known treatments for exotics

CHIC is a member of the Southeastern Exotic Plant Management Team and performs the majority of exotic plant control themselves. A reporting system has been set up with the park for these treatments and it is anticipated that a similar system will be in place for the SE-EPMT. This information will inform SOPN monitoring programs of potential impact on monitoring transects and provide the park and EPMT supplemental information on the effectiveness of their treatments. In 2011, extensive herbicidal control was implemented by the park for Johnsongrass (Figure 4.3-4).



A total of ten fire and ten long-term monitoring transects were established at Chickasaw NRA.

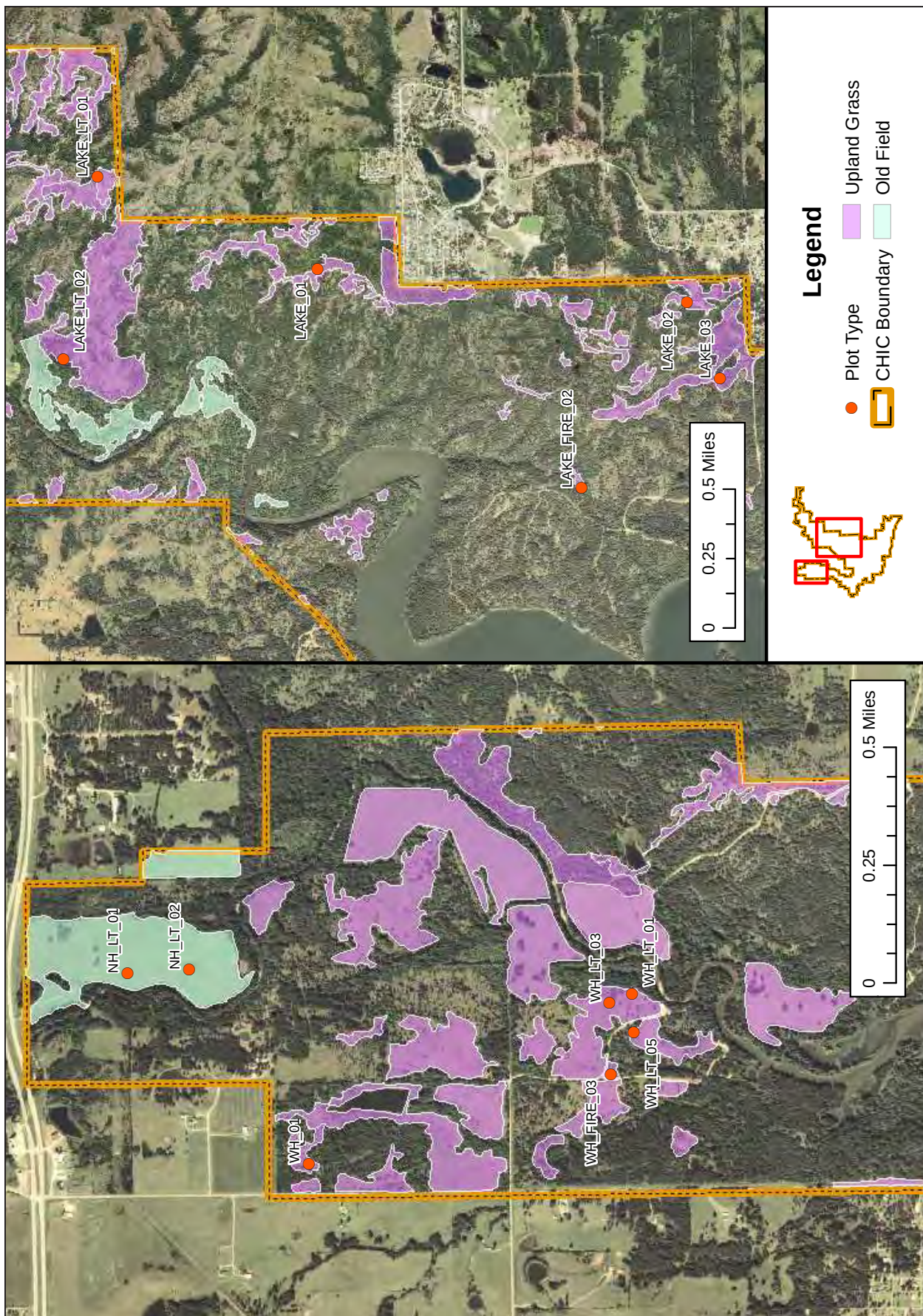


Figure 4.3-1. Monitoring transects, Chickasaw NRA, 2010 and 2011.

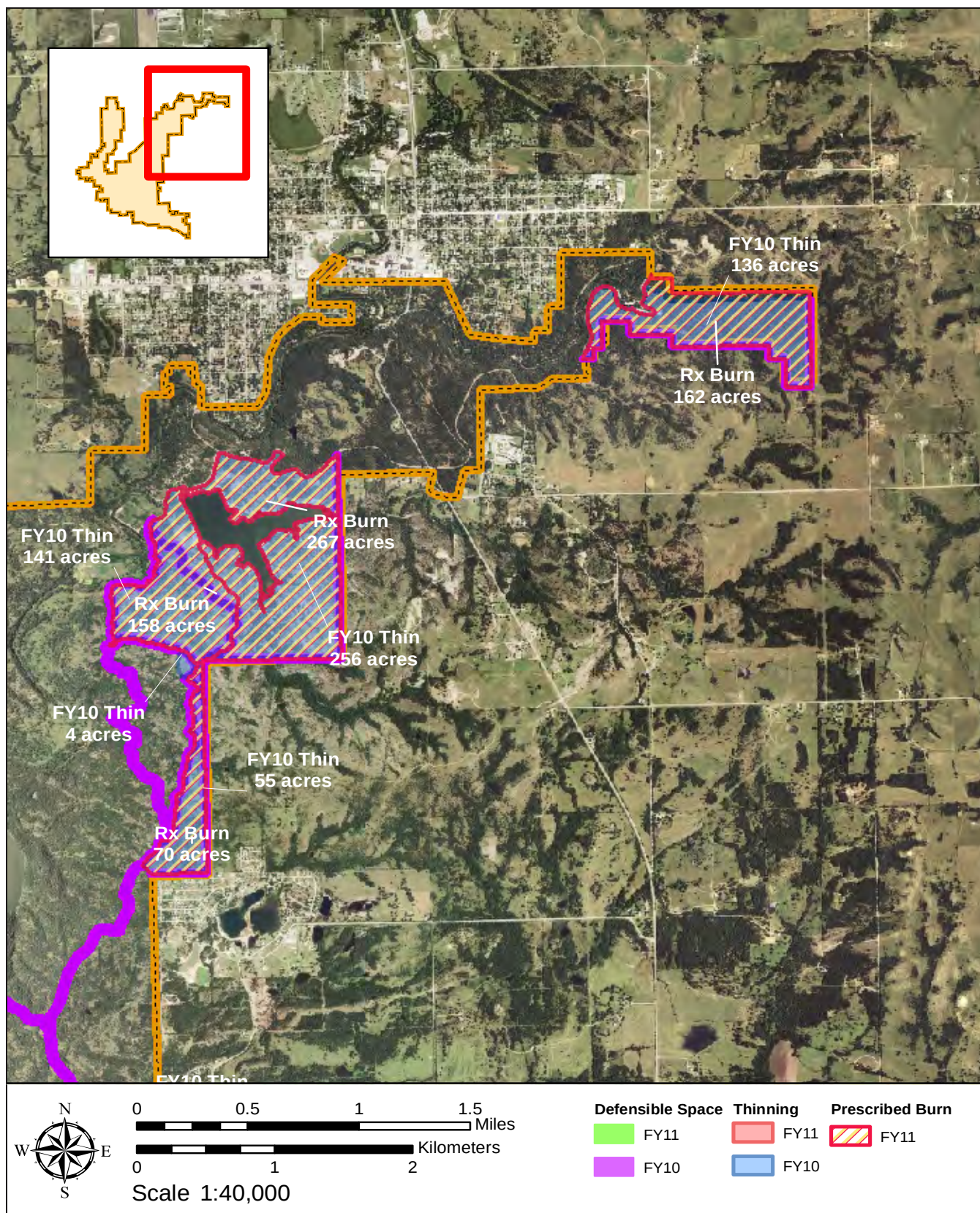


Figure 4.3-2. Prescribed treatment or wildland fires since 2009, eastern Chickasaw NRA, 2009 and 2010.

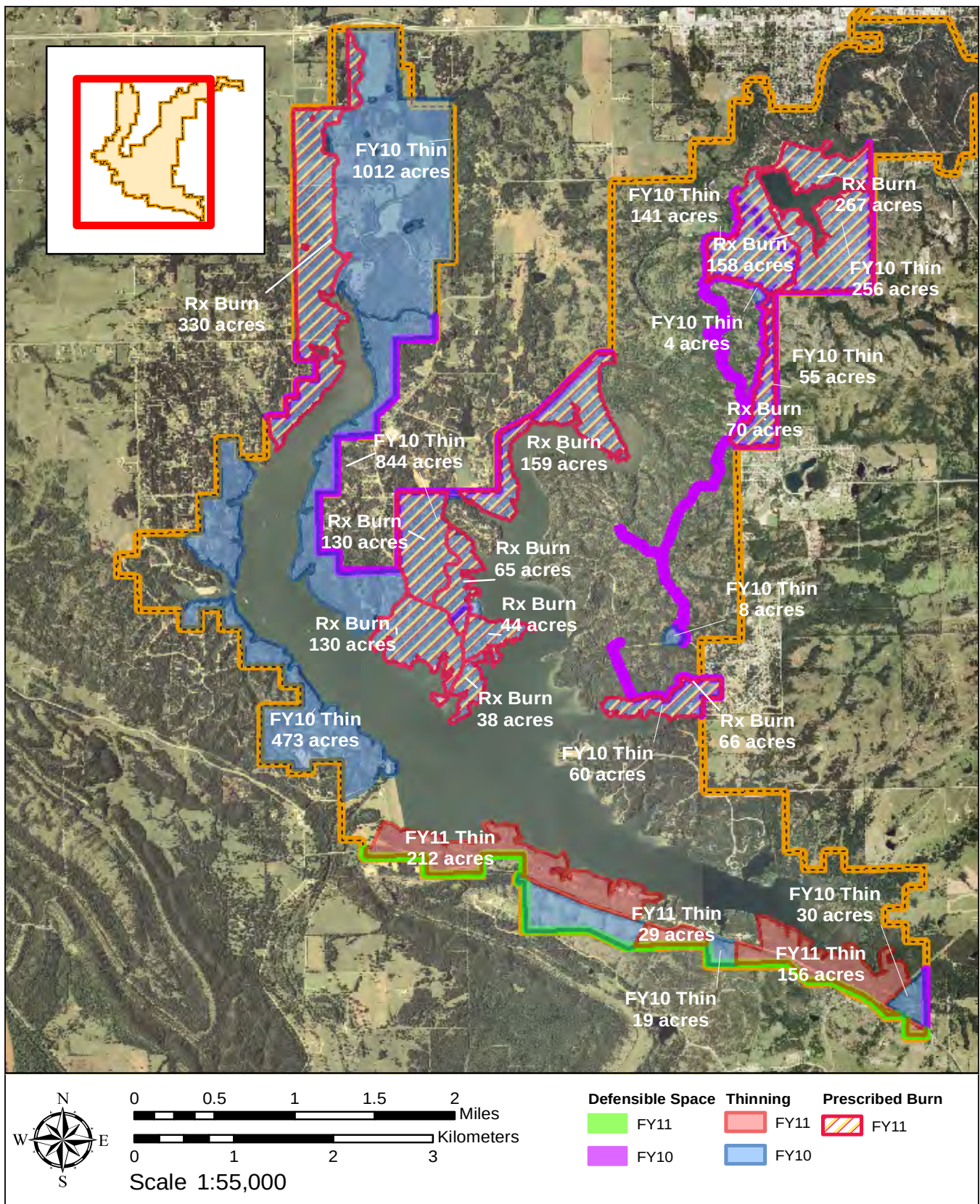


Figure 4.3-3. Prescribed treatment or wildland fires since 2009, western Chickasaw NRA, 2009 and 2010.



Figure 4.3-4. Johnsongrass treatment areas in Chickasaw NRA, 2001.

Table 4.3-2a. Within-plot cover values for each plant species detected during monitoring at each Five Lakes transect, Chickasaw NRA, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values			
		LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																	
SCHSCO	P	7.7	0	7.4	0	0	0	0.2	NS	12.3	5	10.7	16.7	8.5769	1.8331	10.475	3.3443
DICACU	P	0	0	0	0	17.1	10.1	5.3	NS	0.3	2.7	0	0	1.9	1.3277	2.2417	1.202
SORNUT	P	0	1.4	0	1.1	0	0.6	0.4	NS	0.1	3.2	0.2	0	1.5769	0.6808	1.2667	0.3274
CARSSP	P	0	0.2	0.1	0	5.5	0.6	1.3	NS	1.1	0.1	0.2	0.3	1.4462	0.5026	0.7083	0.2144
ARIPUR	P	0	0	0	0	0.2	0.7	0	NS	10.8	2	1.7	0.6	1.1077	0.8263	0.3083	0.169
ERACAP	A	0	0	0	0	0	0	0.1	NS	0	0	0	0	1.0231	0.802	0	0
SORHAL	P	0.3	0	7.6	0	0	0	0	NS	0.4	0.1	0	0	1	0.5856	1.9417	1.2917
LEPPAN	A/P	0	0	0	0	0	0	9	NS	0	0	0	0	0.6923	0.6923	0	0
DICCLA	P	0	1.4	0	0.3	0	0	0.6	NS	0	0	0.7	0	0.6692	0.3684	0.2417	0.1454
PANVIR	P	0	0	0	0	2.4	1	0	NS	0.8	0	2.8	1.2	0.5538	0.2662	0.2417	0.13
ELYCAN	P	2.4	0	3.1	0	0	0	0.7	NS	0	0	0	0	0.5231	0.2829	0.0667	0.0667
BOTISC	P	0	0	0	0	0	0	0	NS	4	3	0	0	0.3077	0.3077	0.375	0.2692
NASLEU	P	0	0	0	0	0	0	0.1	NS	0	0.1	2.1	0	0.1692	0.1611	0.0083	0.0083
BOTLAG	P	0	0	0	0	0	0	1.6	NS	0	0.1	0	0	0.1231	0.1231	0.025	0.0179
BOUHIR	P	0.1	0	0	0	0	0	0	NS	1	0	0.4	1.4	0.1231	0.0794	0.125	0.1162
ANDVIR	P	0	0	0	0	1.3	4.3	0	NS	0	0	0	0	0.1	0.1	0.3583	0.3583
BOUCUR	P	0	0	0	0	0	0	0	NS	0.1	0.2	0.5	1.1	0.0923	0.0571	0.1167	0.0911
SPOCRY	P	0	0	0	0	0	0	0	NS	0.6	0	0	0	0.0462	0.0462	0	0
TRIMUT	P	0	0	0	0	0	0	0.6	NS	0	0	0	0	0.0462	0.0462	0	0
CYNDAC	P	0	0	0	0	0	0	0	NS	0.2	0.6	0	0	0.0154	0.0154	0.05	0.05
ERASPE	P	0	0	0.2	0	0	0	0	NS	0	0	0	0	0.0154	0.0154	0	0
POAARA	P	0.1	0	0	0	0	0	0	NS	0	0	0	0	0.0077	0.0077	0	0
ANDGER	P	0	21.7	0	4.4	0	0	0	NS	0	0	0	0	0	0	2.175	1.8122
ANDGLO	P	0	0	0	0	0	2	0	NS	0	0	0	0	0	0	0.1667	0.1667
CARALB	P	0	0	0	0.2	0	0	0	NS	0	0	0	0	0	0	0.0167	0.0167
ELYELY	P	0	0	0	0.2	0	0	0	NS	0	0	0	0	0	0	0.0167	0.0167

Notes: Exotic species are highlighted.

A = annual; B = biennial; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.3-2a. Within-plot cover values for each plant species detected during monitoring at each Five Lakes transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values			
		LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Grass (cont.)																	
JUNTEN	P	0	0	0	0	0	0.2	0	NS	0	0	0	0	0	0	0.0167	0.0167
MUHSYL	P	0	0	0	0	0	0	0	NS	0	0.2	0	0	0	0	0.0167	0.0167
FORB																	
LESCUN	P	0	0	0	2.7	0.2	0.7	0	NS	0	0	0	0	3.0692	2.2716	2.9333	1.4132
DESILL	P	0	0	0	0	0	0.6	0	NS	0.2	0.9	0	0	1.4462	1.2354	0.1417	0.0857
AMBPSI	A/P	0	0.1	1.1	2	2.6	1	0.1	NS	2	1.4	1.5	2.7	1.3769	0.4387	2.425	1.2689
LESPRO	P	0	0	0	0.6	0.2	0.4	0	NS	0	0	0	0	1.3692	1.1985	0.225	0.1207
ASTPRA	P	0	0	0	0.7	0	0	0.2	NS	0	0	0	0	1.2462	0.9405	1.6	1.1316
TRIDUB	A	0	0	0	0	0	0	0.1	NS	0	0	0	0	0.8769	0.7316	0	0
RUDHIR	A/P	0	0	0	0	0.2	0	0	NS	0	0	0	0	0.4692	0.3563	0.0833	0.0575
SYMPRA	P	0	0	0	.	0.1	2.5	0	NS	0	0	0	0	0.4462	0.1996	0.2545	0.2254
CIRUND	B/P	0	0	0	0	0	0	0	NS	5.6	8	0	0	0.4385	0.4302	0.6667	0.6667
OXASTR	P	0	0	0	0	0	0.1	0.3	NS	0	0	0	0	0.4308	0.3583	0.025	0.0131
CROMON	A	0	0	0.2	0	0.2	0.4	3.5	NS	0.2	0.1	0.2	0.1	0.4077	0.2685	0.075	0.0329
VERBAL	P	0	0	0	0	5.1	1.5	0	NS	0	0	0	0	0.3923	0.3923	0.125	0.125
POLNUT	P	0	0	0	0	0	0	0	NS	0.1	0	0	0	0.3462	0.2657	0	0
ACHMIL	P	0	0	0	0.1	0	0	0	NS	0	0	0	0	0.2923	0.1412	0.45	0.1877
MELALB	A/P	0	0	0	0	3.6	0	0	NS	0	0	0	0	0.2769	0.2769	0	0
CORTIN	A/P	0	0	0	0	0	0	0	NS	3.2	0	0.1	0	0.2538	0.2456	0	0
GAIPUL	A/P	0	0	0	0	0	0	0	NS	3.2	0	0	0	0.2462	0.2462	0.0083	0.0083
TORARV	A	0	0	0	0	1.8	6.4	0	NS	0.2	0	0	0	0.2385	0.1509	0.5417	0.5326
LATHIR	A	0	0	0	0	0.1	0	0	NS	0	0	0	0	0.2231	0.2149	0.0833	0.0833
BAPAU5	P	0	0	0	0	0	0	0.1	NS	0	0	2.6	1.4	0.2077	0.1995	0.1167	0.1167
MONCIT	A/P	0	0	0	0	2.6	0	0	NS	0	0	0	0	0.2077	0.1995	0	0
DALENN	P	0	0.1	0	0	0.2	0	1.1	NS	0.6	0.8	0.3	0.3	0.1846	0.0912	0.1	0.0685
CONCAN	A/B	0	0	0	0	0.3	0.2	0.1	NS	0	0	0	0	0.1462	0.0998	0.1833	0.0895
ERIANN1	A	0	0	0	0	0	0	0	NS	0.1	0	0	0	0.1308	0.0923	0.2167	0.1637

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2a. Within-plot cover values for each plant species detected during monitoring at each Five Lakes transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values					
		LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																	
GALSSP	A/P	0	0	1.7	0	0	0	0	NS	0	0	0	0	0.1308	0.1308	0	0
HYBVER	P	0	0	0	0	0	0	0	NS	1	0	0	0	0.1077	0.0772	0	0
CHRPIL	A	0	0	0	0	0	0	0	NS	0	0	0	0	0.1	0.0531	0	0
RUMALT	P	0	0	0	0	0	0	0	NS	0	0	0	0	0.0846	0.0608	0	0
SOLCAN	P	0.3	0	0.7	0	0	0	0	NS	0	0	0	0	0.0769	0.0568	0	0
CALSER	P	0	0	0	0	0	0	0	NS	0	0	0	1.4	0.0615	0.0615	0.1167	0.1167
CLIMAR	P	0	0	0	0	0	0	0	NS	0	0	0	0	0.0615	0.0474	0	0
ERILON	P	0	0	0	0	0.1	0	0	NS	0	0	0	0.4	0.0615	0.046	0.0333	0.0333
SIDABU	A/P	0	0	0	0	0	0	0	NS	0.7	0	0	0	0.0615	0.0538	0	0
MONFIS	P	0	0.1	0	0	0.7	0	0	NS	0	0	0	0	0.0538	0.0538	0.0083	0.0083
ACAANG	P	0	0.1	0	0.2	0.2	0.2	0	NS	0.1	0.4	0.2	0.1	0.0462	0.0215	0.1	0.0348
AMBART	A	0	0	0	0	0	0	0	NS	0.6	0	0	0	0.0462	0.0462	0	0
LINPRA	A/P	0	0	0	0	0	0	0	NS	0.6	0	0	0	0.0462	0.0462	0	0
SOLELA	P	0	0	0	0	0	0	0	NS	0.2	0	0	0	0.0308	0.0175	0	0
TRIPER	A	0	0	0	0	0.3	0	0	NS	0	0	0	0	0.0308	0.0237	0	0
ASCVIR	P	0	0	0	0.7	0.1	0.1	0	NS	0	0	0	0	0.0231	0.0122	0.175	0.1023
CALINV	P	0	0	0	0	0	0	0	NS	0	0	0	0	0.0231	0.0122	0.0083	0.0083
CHAMIS	A	0	0	0	0	0	0	0	NS	0.1	1.2	0.1	0	0.0231	0.0122	0.1	0.1
GRIPAP	A/B	0	0	0	0	0	0	0	NS	0.2	0	0	0.3	0.0231	0.0166	0.025	0.025
HELHIR	P	0	0	0	0	0	0	0	NS	0	0	0	0	0.0231	0.0166	0	0
LINMED	A/P	0	0	0	0	0	0	0	NS	0	0	0	0	0.0231	0.0166	0	0
MEDLUP	A/P	0	0	0	0	0	0	0	NS	0.3	0	0	0	0.0231	0.0231	0	0
MOLVER	A	0	0	0	0	0.1	0	0	NS	0	0	0	0	0.0231	0.0122	0	0
SONASP	A	0	0	0	0	0	0	0	NS	0	0	0	0	0.0231	0.0231	0	0
DALPUR	P	0	0.1	0	0	0	0	0	NS	0.1	0.1	0	0	0.0154	0.0104	0.0167	0.0112
HEDNIG	P	0	0	0	0	0	0	0	NS	0	0	0	0	0.0154	0.0104	0	0
HETVIL	P	0	0	0	0	0.1	0	0	NS	0	0	0	0	0.0154	0.0104	0	0

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2a. Within-plot cover values for each plant species detected during monitoring at each Five Lakes transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values					
		LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																	
INDMIN	P	0	0	0	0	0	0	0.1	NS	0	0	0.1	0	0.0154	0.0104	0	0
LESVIR	P	0	0	0.1	0	0	0	0	NS	0	0	0	0	0.0154	0.0104	0	0
PACOB0	P	0	0	0	0	0	0	0.2	NS	0	0	0	0	0.0154	0.0154	0	0
PENCOB	P	0	0	0	0	0	0	0	NS	0.1	0	0.1	0	0.0154	0.0104	0	0
RANARB	B/P	0	0	0	0	0	0	0.1	NS	0	0	0	0	0.0154	0.0104	0	0
SALTRA	A	0	0	0.2	0	0	0	0	NS	0	0	0	0	0.0154	0.0154	0	0
ASCASP	P	0	0	0	0	0	0	0	NS	0.1	0	0	0	0.0077	0.0077	0	0
CHAMAC	A	0	0	0	0	0	0	0	NS	0	0	0.1	0	0.0077	0.0077	0	0
CHEBER	A	0	0	0.1	0	0	0	0	NS	0	0	0	0	0.0077	0.0077	0	0
CHESIM	A	0	0	0	0	0	0	0.1	NS	0	0	0	0	0.0077	0.0077	0	0
CIRALT	B	0	0	0	0	0.1	0	0	NS	0	0	0	0	0.0077	0.0077	0.05	0.05
DESPAN	P	0	0	0	0	0	0	0	NS	0	0	0	0.2	0.0077	0.0077	0.0167	0.0167
EUPDEN	A	0	0	0	0	0	0	0.1	NS	0	0	0	0	0.0077	0.0077	0	0
GLABIP	A/P	0	0	0	0	0	0	0	NS	0.1	0	0	0	0.0077	0.0077	0	0
MINMIC	A/P	0	0	0	0	0	0	0	NS	0.1	0	0	0	0.0077	0.0077	0	0
NUTTEX	A/B	0	0	0	0	0	0	0.1	NS	0	0	0	0	0.0077	0.0077	0	0
PENOKL	P	0	0	0	0	0	0	0	NS	0	0	0.1	0	0.0077	0.0077	0	0
ARTLUD	P	0	0	0	0.1	0	0	0	NS	0	0	0	0	0	0	0.0083	0.0083
ERYLEA	A	0	0	0	0	0	0	0	NS	0	0.2	0	0	0	0	0.0167	0.0167
EUPBIC	A	0	0	0	0	0	0	0	NS	0	0	0	0.1	0	0	0.025	0.0131
KRALAN	P	0	0.2	0	0.1	0	0	0	NS	0	0	0	0	0	0	0.025	0.0179
LACSER	A/B	0	0	0	0	0	0	0	NS	0	0	0	0.1	0	0	0.0083	0.0083
MELOFF	A/P	0	0	0	0	0	0.1	0	NS	0	0	0	0	0	0	0.0083	0.0083
SOLULM	P	0	0	0	0.1	0	0	0	NS	0	0	0	0	0	0	0.0083	0.0083
STRLEI	A	0	0.4	0	0	0	0.1	0	NS	0	0	0	0	0	0	1.8833	1.1847
TEUCAN	P	0	0	0	0	0	10	0	NS	0	0	0	0	0	0	0.8333	0.8333
TRARAM	P	0	0	0	0	0	0	0	NS	0	0.2	0	0.1	0	0	0.025	0.0179

Notes: Exotic species are highlighted.
A = annual; B = biennial; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2a. Within-plot cover values for each plant species detected during monitoring at each Five Lakes transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values			
		LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Shrub/Subshrub																	
RHUCOP	P	0	0	6.7	0.3	11	19.1	0	NS	0	0	0	0	3.1846	1.218	7	3.4768
RHUGLA	P	0	0	0	0	0	3.2	0	NS	0	0	0	0	1.5385	1.0659	0.4833	0.3279
SYMORB	P	0	0	0	0	0	0	0.3	NS	0	0	1	0	0.9538	0.5081	0.7083	0.2953
OPUENG	P	0	0	0.7	0	0	0	0	NS	0	0.4	0	0.6	0.0538	0.0538	0.0833	0.0575
OPUMAC	P	0	0	0	0	0	0	0	NS	0.5	0	0.1	0	0.0462	0.0386	0	0
ESCVIV	P	0	0	0	0	0	0	0	NS	0	0.2	0	0	0	0	0.0167	0.0167
RHUTRI	P	0	0	0	0.6	0	0	0	NS	0	0	0	0	0	0	0.0583	0.0499
VINE																	
SMIBON	P	0	0.2	1	0.9	5	15.2	0.3	NS	0	0.6	0	0	0.8385	0.4366	5.025	2.8123
SMIHER	P	0	0	0	0	3	5.2	2.1	NS	1	0	0	0	0.6692	0.3137	0.4333	0.4333
PARQUI	P	0	0	0	0.1	0	0	0	NS	0	0	0	0	0.1231	0.1231	0.0583	0.0499
VITSSP	P	0	0	0	0	0	0	0.2	NS	0	0	0	0	0.0923	0.0772	0	0
TOXRAD	P	0	0	0	0	0	0.1	0	NS	0	0	0	0	0.0077	0.0077	0.425	0.416
TREE																	
ULMALA	P	0	0	4.2	1.2	1.4	1.8	10	NS	0.1	0	15.1	2.2	3.8231	1.4119	2.1833	1.1927
FRASSP	P	0	0	0	0	1.8	14.6	16.1	NS	0	0	0	0.6	1.3769	1.2347	1.2667	1.2131
QUESHU	P	0	0	0	0	0	0	1.8	NS	0	0	14	0	1.2154	1.0743	0	0
CERCAN	P	0	0	0	0	9	17	0.3	NS	0	0	0.6	0	0.8846	0.688	1.5333	1.4109
QUEMAR	P	0	0	5.8	6.2	0	0	0	NS	0	0	0	0	0.4462	0.4462	0.5167	0.5167
FRAPEN	P	0	0	0	0	4	1.4	0	NS	0	0	0	0	0.3077	0.3077	0.1167	0.1167
CORDRU	P	0	0	0	0	0	0	0	NS	0	0	0.6	0	0.3538	0.3073	0.8333	0.747
JUNVIR	P	0	0	0	0	0	0	0.3	NS	0	0	0.1	0.2	0.2615	0.2294	0.1	0.0835
QUESTE	P	0	0	0	0	0.4	0.6	1.6	NS	0	0	0	0	0.1538	0.1244	0.0667	0.0512
BROPAP	P	0	0	0.6	1	0	0	0	NS	0	0	0	0	0.0462	0.0462	0.0833	0.0833
FRACAR	P	0	0	0	0	0	0	0.2	NS	0	0	0	0	0.0154	0.0154	0	0
PRUSER	P	0	0	0	0	0	0	0	NS	0	0	0.1	0	0.0077	0.0077	0	0
ACENEG	P	0	0	0	0	0	4.2	0	NS	0	0	0	0	0	0	0.35	0.35

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2a. Within-plot cover values for each plant species detected during monitoring at each Five Lakes transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values					
		LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE		
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011		
		Tree (cont.)																	
FRAAME	P	0	0	0	0.2	0	0	0	NS	0	0	0	0	0	0	0.0167	0.0167		
PRUVIR	P	0	0	0	0.6	0	0	0	NS	0	0	0	0	0	0	0.05	0.05		
ULMAME	P	0	0	0	1.2	0	0	0	NS	0	0	0	0	0	0	0.1	0.1		

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2b. Within-plot cover values for each plant species detected during monitoring at each West Hunting transect, Chickasaw NRA, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values			
		WH-01		WH-F03		WH-LT01		WH-LT02		WH-LT03		WH-LT05		Mean	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																	
SCHSCO	P	12.1	17	15.6	NS	18.6	25.6	29.6	NS	14.7	6.6	12.2	25	8.5769	1.8331	10.475	3.3443
DICACU	P	0	0	0.6	NS	0.7	0.7	1.4	NS	0.7	11.8	0	0.2	1.9	1.3277	2.2417	1.202
SORNUT	P	7.2	0.8	4	NS	5.6	3	2.5	NS	0.9	0.7	2.1	1.8	1.5769	0.6808	1.2667	0.3274
DICLAX	P	6.6	6.6	0	NS	0	0	0	NS	0	0	0	0	1.5538	1.0569	4.7083	3.5922
CARSSP	P	1.7	0.5	3.5	NS	4.2	0.3	1.6	NS	0.7	0.8	0.2	1.5	1.4462	0.5026	0.7083	0.2144
ARIPUR	P	0	0.2	1.7	NS	0	0	0	NS	0	0.1	0	0	1.1077	0.8263	0.3083	0.169
ERACAP	A	0	0	0	NS	0	0	0	NS	0	0	2.8	0	1.0231	0.802	0	0
SORHAL	P	2	0	0	NS	0	0	0	NS	2	5.1	0	0	1	0.5856	1.9417	1.2917
DICCLA	P	0	0	0.3	NS	0	0	0	NS	4.2	0	2.9	1.2	0.6692	0.3684	0.2417	0.1454
PANVIR	P	0	0	0	NS	0	0	0	NS	0.4	0	0.8	0.7	0.5538	0.2662	0.2417	0.13
ELYCAN	P	0.4	0	0	NS	0.1	0.8	0	NS	0.1	0	0	0	0.5231	0.2829	0.0667	0.0667
BOTISC	P	0	0	0	NS	0	0	1.5	NS	0	0	0	0	0.3077	0.3077	0.375	0.2692
BROJAP	A	1.4	0	0	NS	0	0	0	NS	0	0.3	0	0	0.1692	0.1195	0.2667	0.2147
BOTLAG	P	0	0	0	NS	0	0	0.2	NS	0	0	0	0	0.1231	0.1231	0.025	0.0179
BOUHIR	P	0	0	0	NS	0	0	0.1	NS	0	0	0	0	0.1231	0.0794	0.125	0.1162
BOUCUR	P	0	0.1	0	NS	0	0	0	NS	0	0	0.6	0	0.0923	0.0571	0.1167	0.0911
PASLAE	P	0.6	0	0	NS	0	0	0	NS	0	0	0	0	0.0462	0.0462	0	0
CHALAT2	P	0.2	0	0	NS	0	0	0	NS	0	0	0	0	0.0154	0.0154	0	0
BROTEC	A	0	0	0	NS	0	0	0	NS	0	1.6	0	0	0.0077	0.0077	0.1333	0.1333
BROCAT	A/P	0	0.1	0	NS	0	0	0	NS	0	0	0	0	0	0	0.0083	0.0083
ELYVIR	P	0	0	0	NS	0	1	0	NS	0	0	0	0	0	0	0.0833	0.0833
SETPAR	P	0	0.1	0	NS	0	0	0	NS	0	0	0	0	0	0	0.0083	0.0083
FORB																	
LESCUN	P	0	0	0.1	NS	3.3	5.3	1.1	NS	29.5	14.6	6.8	10.8	3.0692	2.2716	2.9333	1.4132
BAPSPH	P	19	17.6	0	NS	0	0	1.5	NS	0	0	0	0	1.4615	1.4615	1.5917	1.4606
DESILL	P	1.6	0.2	16.2	NS	0.2	0	0	NS	0.3	0	0.3	0	1.4462	1.2354	0.1417	0.0857

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2b. Within-plot cover values for each plant species detected during monitoring at each West Hunting transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values			
		WH-01		WH-F03		WH-LT01		WH-LT02		WH-LT03		WH-LT05		Mean	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Forb (cont.)																	
AMBPSI	A/P	2.1	15.6	0.3	NS	0.1	0	4.9	NS	5.3	0.2	2.8	1.2	1.3769	0.4387	2.425	1.2689
LESPRO	P	0	0	0.7	NS	1.2	0.2	1.4	NS	15.7	0.1	0	0	1.3692	1.1985	0.225	0.1207
ASTPRA	P	3.4	0	0.1	NS	0	0	0	NS	0.4	13	12.1	5.5	1.2462	0.9405	1.6	1.1316
ARTCAR	P	5.1	6.9	2	NS	1	0.4	0	NS	4.5	4.8	0	0	0.9692	0.5003	1.0083	0.6663
RUDHIR	A/P	0	0	0	NS	0.1	0	0	NS	0.4	0	0.1	0	0.4692	0.3563	0.0833	0.0575
SYMPRA	P	1.6	0	0.6	NS	0.1	0	0	NS	0.2	0.2	2.3	0.1	0.4462	0.1996	0.2545	0.2254
OXASTR	P	0	0	0	NS	0	0.1	0	NS	0.1	0	0	0	0.4308	0.3583	0.025	0.0131
SOLMIS	P	0	0	0	NS	0	0	0	NS	0	0	5.3	8.8	0.4231	0.4067	0.7333	0.7333
CROMON	A	0	0	0	NS	0	0	0.1	NS	0	0	0	0.1	0.4077	0.2685	0.075	0.0329
POLNUT	P	0	0	0	NS	0	0	0	NS	3.4	0	1	0	0.3462	0.2657	0	0
ACHMIL	P	0.8	0.3	0.1	NS	0.4	0	0.7	NS	0.2	1.4	0.2	0.2	0.2923	0.1412	0.45	0.1877
TORARV	A	0	0	0	NS	0.1	0	0	NS	0	0	0	0	0.2385	0.1509	0.5417	0.5326
MONCIT	A/P	0	0	0.1	NS	0	0	0	NS	0	0	0	0	0.2077	0.1995	0	0
DALENN	P	0	0	0	NS	0	0	0	NS	0.2	0	0	0	0.1846	0.0912	0.1	0.0685
CONCAN	A/B	0	0.5	0	NS	0	0	0.4	NS	0	0.1	0	0	0.1462	0.0998	0.1833	0.0895
LIAMUC	P	0	0	1.7	NS	0.2	0.2	0.8	NS	0	0	0	0	0.1462	0.1304	0.0833	0.0672
ERIANN1	A	0.1	0	0	NS	0	0.1	0.1	NS	0	0	0.3	0.2	0.1308	0.0923	0.2167	0.1637
CUSCUTA	P	0	0	0	NS	0	0	0	NS	1.4	0	0	0	0.1077	0.1077	0	0
CHRPIL	A	0	0	0	NS	0.6	0	0	NS	0	0	0.4	0	0.1	0.0531	0	0
ERISTR	A/P	0.9	0	0	NS	0.2	0	0	NS	0	0	0	0	0.0846	0.0697	0	0
RUMALT	P	0	0	0.1	NS	0	0	0	NS	0.1	0	0	0	0.0846	0.0608	0	0
SABCAM	A	1.1	0	0	NS	0	0	0	NS	0	0	0	0	0.0846	0.0846	0	0
DESSES	P	0	0	0	NS	0.8	0	0.8	NS	0.2	0	0	0	0.0769	0.0622	0.0667	0.0667
EUSEXA	A/P	0	0	1	NS	0	0	0	NS	0	0	0	0	0.0769	0.0769	0	0
VICLUD	A	0	0	0	NS	0.1	0	0	NS	0	0	0	0	0.0692	0.0472	0	0
ERILON	P	0	0	0.6	NS	0	0	0	NS	0	0	0	0	0.0615	0.046	0.0333	0.0333
ACAANG	P	0	0	0	NS	0	0	0.1	NS	0	0	0.1	0.1	0.0462	0.0215	0.1	0.0348

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2b. Within-plot cover values for each plant species detected during monitoring at each West Hunting transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values					
		WH-01		WH-F03		WH-LT01		WH-LT02		WH-LT03		WH-LT05		Mean	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Forb (cont.)																	
SOLELA	P	0	0	0	NS	0.1	0	0	NS	0	0	0	0	0.0308	0.0175	0	0
ASCVIR	P	0	1.1	0	NS	0	0.2	0	NS	0	0.1	0	0	0.0231	0.0122	0.175	0.1023
CALINV	P	0	0	0	NS	0.1	0.1	0	NS	0	0.1	0	0	0.0231	0.0122	0.0083	0.0083
HELHIR	P	0	0	0	NS	0	0	0	NS	0	0	0	0.2	0.0231	0.0166	0	0
MOLVER	A	0	0	0	NS	0.1	0	0	NS	0	0	0	0	0.0231	0.0122	0	0
AMMPOP	A	0.2	0	0	NS	0	0	0	NS	0	0	0	0	0.0154	0.0154	0	0
ARNPLA	P	0.2	0	0	NS	0	0	0	NS	0	0	0	0	0.0154	0.0154	0	0
DALMUL	P	0	0	0.2	NS	0	0	0	NS	0	0	0	0	0.0154	0.0154	0	0
HEDNIG	P	0	0	0.1	NS	0	0	0	NS	0	0	0	0	0.0154	0.0104	0	0
LESVIR	P	0	0	0	NS	0.1	0	0	NS	0	0	0	0	0.0154	0.0104	0	0
RANARB	B/P	0	0	0	NS	0.1	0	0	NS	0	0	0	0	0.0154	0.0104	0	0
SOLGIG	P	0	0	0	NS	0	0	0	NS	0	0	0	0.2	0.0154	0.0154	0	0
CHEGLA	A	0	0	0.1	NS	0	0	0	NS	0	0	0	0	0.0077	0.0077	0	0
DESPAN	P	0	0	0	NS	0	0	0	NS	0	0.1	0	0	0.0077	0.0077	0.0167	0.0167
HELMAX	P	0	0	0.1	NS	0	0	0	NS	0	0	0	0	0.0077	0.0077	0	0
MIMNUT	P	0	0	0.1	NS	0	0	0	NS	0	0	0	0	0.0077	0.0077	0	0
RATCOL	P	0	0	0	NS	0	0	0	NS	0	0	0	0.1	0.0077	0.0077	0	0
SOLPTY	A	0	0	0.1	NS	0	0.1	0	NS	0	0	0	0	0.0077	0.0077	0.0583	0.0499
APOCAN	P	0	0	0	NS	0	0.7	0	NS	0	0	0	0	0	0	0.0583	0.0583
CHAFAS	A	0	0	0	NS	0	0.1	0	NS	0	0	0	0	0	0	0.0167	0.0112
EUPBIC	A	0	0.1	0	NS	0	0	0	NS	0	0	0	0	0	0	0.025	0.0131
GEUCAN	P	0	0	0	NS	0	0	0	NS	0	0	0	0	0	0	0.0083	0.0083
LESVIO	P	0	0	0	NS	0	1.6	0	NS	0	0	0	0	0	0	0.1333	0.1333
SESHER	A/P	0	0	0	NS	0	0.1	0	NS	0	0	0	0	0	0	0.0083	0.0083
SOLNEM	P	0	0	0	NS	0	0	0	NS	0	0	0	0	0	0	0.0167	0.0167
STRLEI	A	0	0	0	NS	0	11.1	0	NS	0	10.2	0	0.6	0	0	1.8833	1.1847
SYMERI	P	0	1.7	0	NS	0	0.2	0	NS	0	0	0	0	0	0	0.6417	0.3009

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.3-2b. Within-plot cover values for each plant species detected during monitoring at each West Hunting transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values			
		WH-01		WH-F03		WH-LT01		WH-LT02		WH-LT03		WH-LT05		Mean	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Shrub/Subshrub																	
RHUCOP	P	0	0	5.6	NS	0	18	NS	0	10.1	37.6	8	9	3.1846	1.218	7	3.4768
RHUGLA	P	0	0	8	NS	12	2.6	NS	0	0	0	0	0	1.5385	1.0659	0.4833	0.3279
SYMORB	P	5	1.3	0	NS	1	2.6	NS	0.6	0.1	1.4	5	2.6	0.9538	0.5081	0.7083	0.2953
RUBFLA	P	0.2	0	1.1	NS	0.8	3.4	NS	0.6	0	0	8.1	0.8	0.7846	0.6176	0.4	0.2839
RUBTRI	P	0	0	0.1	NS	0	0	NS	0	0	19.2	0	0	0.0077	0.0077	1.6	1.6
RHUTRI	P	0	0	0	NS	0	0	NS	0	0	0.1	0	0	0	0	0.0583	0.0499
VINE																	
SMIBON	P	0	0	1.1	NS	3.4	12.4	NS	0	0.1	31	0	0	0.8385	0.4366	5.025	2.8123
SMIHER	P	0	0	0	NS	2.6	0	NS	0	0	0	0	0	0.6692	0.3137	0.4333	0.4333
COCCAR	P	0	0	0	NS	0.2	0.3	NS	0	3.7	1	0	0	0.3	0.2837	0.1083	0.0848
PARQUI	P	0	0	0	NS	1.6	0.6	NS	0	0	0	0	0	0.1231	0.1231	0.0583	0.0499
VITSSP	P	1	0	0	NS	0	0	NS	0	0	0	0	0	0.0923	0.0772	0	0
TOXRAD	P	0	0	0	NS	0	0	NS	0	0.1	5	0	0	0.0077	0.0077	0.425	0.416
VITVUL	P	0	0	0	NS	0	0	NS	0	0	1.4	0	0	0	0	0.1167	0.1167
TREE																	
ULMALA	P	0.2	0.2	2.8	NS	11.3	14.6	NS	1.7	0.4	0.1	4.2	4.4	3.8231	1.4119	2.1833	1.1927
CERCAN	P	1.6	1.4	0	NS	0	0	NS	0	0	0	0	0	0.8846	0.688	1.5333	1.4109
CORDRU	P	0	0	0	NS	4	9	NS	0	0	1	0	0	0.3538	0.3073	0.8333	0.747
MORSSP	P	0	0	0	NS	3	0	NS	0	0	0	0	0	0.2308	0.2308	0	0
JUNVIR	P	0	0	0	NS	3	1	NS	0	0	0	0	0	0.2615	0.2294	0.1	0.0835
DIOVIR	P	0	0	2.4	NS	0	0	NS	0	0	0	0	0	0.1846	0.1846	0	0
QUESTE	P	0	0	0	NS	0	0.2	NS	0	0	0	0	0	0.1538	0.1244	0.0667	0.0512
PRUANG	P	0	0	0	NS	0	3	NS	0	0	0	0.6	0.6	0.0462	0.0462	0.3	0.2505
CELSSP	P	0.2	0	0	NS	0	0	NS	0	0	0	0	0	0.0154	0.0154	0	0
MORRUB	P	0	0	0	NS	0.1	0	NS	0	0	0	0	0	0.0077	0.0077	0	0
QUEMUH	P	0	0	0	NS	0	3	NS	0	0	0	0	0	0	0	0.25	0.25

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.3-2c. Within-plot cover values for each plant species detected during monitoring at each North Hunting transect, Chickasaw NRA, 2010 and 2011

Vegetation code	Life cycle	Transect				Parkwide values			
		NH-LT01		NH-LT02		Mean	SE	MEAN	SE
		2010	2011	2010	2011	2010	2010	2011	2011
GRASS									
SCHSCO	P	0	0	0	0.2	8.5769	1.8331	10.475	3.3443
SORNUT	P	0	0	0	0.1	1.5769	0.6808	1.2667	0.3274
DICLAX	P	12.7	43.4	0.9	6.5	1.5538	1.0569	4.7083	3.5922
CARSSP	P	0	0.2	0.3	2.4	1.4462	0.5026	0.7083	0.2144
ARIPUR	P	0	0.1	0	0	1.1077	0.8263	0.3083	0.169
ERACAP	A	0.1	0	10.3	0	1.0231	0.802	0	0
SORHAL	P	0	2.9	0.7	15.2	1	0.5856	1.9417	1.2917
LOLPER	A/P	0	0	4	0	0.3077	0.3077	0	0
BROJAP	A	0	0.3	0.8	2.6	0.1692	0.1195	0.2667	0.2147
BOUHIR	P	0	0	0.1	0	0.1231	0.0794	0.125	0.1162
BROTEC	A	0	0	0.1	0	0.0077	0.0077	0.1333	0.1333
FORB									
TRICAM	A/B	61	4.8	27	14.5	6.7692	4.9706	1.6083	1.2378
TRIDUB	A	1.8	0	9.5	0	0.8769	0.7316	0	0
RUDHIR	A/P	4.7	0.6	0.6	0.4	0.4692	0.3563	0.0833	0.0575
SYMPRA	P	0.7	0	0.2	0	0.4462	0.1996	0.2545	0.2254
CIRUND	B/P	0	0	0.1	0	0.4385	0.4302	0.6667	0.6667
OXASTR	P	0.5	0	4.7	0.1	0.4308	0.3583	0.025	0.0131
SOLMIS	P	0	0	0.2	0	0.4231	0.4067	0.7333	0.7333
CROMON	A	0	0	1	0.1	0.4077	0.2685	0.075	0.0329
ACHMIL	P	0.3	0.7	1.8	2	0.2923	0.1412	0.45	0.1877
GAIPUL	A/P	0	0.1	0	0	0.2462	0.2462	0.0083	0.0083
TORARV	A	0	0	1	0.1	0.2385	0.1509	0.5417	0.5326
LATHIR	A	0	0	2.8	1	0.2231	0.2149	0.0833	0.0833
DIAARM	A/B	0	0	2	0.1	0.1538	0.1538	0.0083	0.0083
CONCAN	A/B	0.2	1	1.3	0	0.1462	0.0998	0.1833	0.0895
LIAMUC	P	0	0	0	0	0.1462	0.1304	0.0833	0.0672
ERIANN1	A	0	2	1.2	0.2	0.1308	0.0923	0.2167	0.1637
CHRPIL	A	0	0	0.2	0	0.1	0.0531	0	0
RUMALT	P	0.1	0	0.8	0	0.0846	0.0608	0	0
VICLUD	A	0.6	0	0.2	0	0.0692	0.0472	0	0
EROCIC	A	0	0	0.6	0	0.0462	0.0462	0	0
LEPVIR	A/P	0.5	0	0	0	0.0385	0.0385	0	0
PLAPAT	A	0.4	0.3	0.1	0	0.0385	0.0311	0.025	0.025
SOLELA	P	0	0	0.1	0	0.0308	0.0175	0	0
ASCVIR	P	0	0	0.1	0	0.0231	0.0122	0.175	0.1023
CHAMIS	A	0	0	0.1	0	0.0231	0.0122	0.1	0.1

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.3-2c. Within-plot cover values for each plant species detected during monitoring at each North Hunting transect, Chickasaw NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect				Parkwide values			
		NH-LT01		NH-LT02		Mean	SE	MEAN	SE
		2010	2011	2010	2011	2010	2010	2011	2011
FORB (cont.)									
LINMED	A/P	0	0	0.2	0	0.0231	0.0166	0	0
HEDDRU	A/P	0	0	0.2	0	0.0154	0.0154	0	0
ARESER	A	0	0	0.1	0	0.0077	0.0077	0	0
CHANUT	A/P	0	0	0.1	0	0.0077	0.0077	0	0
CIRALT	B	0	0	0	0.6	0.0077	0.0077	0.05	0.05
MENOLI	P	0.1	0	0	0	0.0077	0.0077	0	0
TETLIN	A	0	0	0.1	0	0.0077	0.0077	0	0
EUPBIC	A	0	0	0	0.1	0	0	0.025	0.0131
RUMCRI	P	0	0	0	0.5	0	0	0.0417	0.0417
SOLDIM	P	0	1.6	0	0.2	0	0	0.15	0.1329
SYMERI	P	0	2.8	0	2.4	0	0	0.6417	0.3009

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.3-3a. Percentage of substrate cover for each Five Lakes transect sampled, Chickasaw NRA, 2010 and 2011

Cover	Transect																		Park Totals			
	LAKE-01		LAKE-02		LAKE-03		LAKE-F02		LAKE-LT01		LAKE-LT02		MEAN	SE	MEAN	SE						
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2010	2011						
SOILBARE	0	0	0.8	0	10.8	0	30	NS	26.4	0	3	0	10.754	2.6329	0	0						
SOILOPEN	0	0	0	4	0	0.4	0	NS	0	39.2	0	6	0	0	7.783	4.0278						
SOILUNDER	0	0	0	6.2	0	3.4	0	NS	0	14.8	0	1	0	0	10.5	2.4674						
LITTER	47.4	40	79.2	80.8	77.2	63.2	59.58	NS	62.2	23	90.3	66.8	80.268	4.2017	67.433	6.6754						
WOOD	52.6	60	20	7	12	33	10	NS	0.1	1	0.3	0.8	7.538	4.1457	8.5	5.4165						
ROCKLG	0	0	0	0	0	0	0	NS	1.4	3.7	6.2	24.8	0.585	0.4801	2.375	2.0616						
ROCKSM	0	0	0	0	0	0	0.2	NS	3.9	8.3	0	0.4	0.362	0.2986	0.725	0.6894						
CRUST	0	0	0	0	0	0	0	NS	0	0	0	0	0	0	0	0						
LICHEN	0	0	0	0	0	0	0.1	NS	0	0	0	0	0.008	0.0077	0	0						
MOSS	0	0	0	0	0	0	0.12	NS	6	10	0.2	0.2	0.486	0.4598	0.85	0.832						

NS = Not Sampled

Table 4.3-3b. Percentage of substrate cover for each North Hunting and West Hunting Lakes transect sampled, Chickasaw NRA, 2010 and 2011

Cover	Transect																		Park Totals					
	NH-LT01		NH-LT02		WH-01		WH-F03		WH-LT01		WH-LT02		WH-LT03		WH-LT05		Mean	SE	MEAN	SE				
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011				
SOILBARE	3.4	0	9.8	0	8.8	0	18.4	NS	7.8	0	NS	0	16	0	0	0	10.754	2.6329	0	0				
SOILOPEN	0	1	0	1	0	6.2	0	NS	0	0	NS	35.2	0	0	0.4	0	0	0	7.783	4.0278				
SOILUNDER	0	4.8	0	20	0	23	0	NS	0	19.6	NS	16.8	0	1	0	15.4	0	0	10.5	2.4674				
LITTER	96.6	94.2	90.2	79	91.2	50.8	81	NS	89.2	80.4	NS	47.8	95.4	99	84	84.2	80.268	4.2017	67.433	6.6754				
WOOD	0	0	0	0	0	0	0	NS	3	0	NS	0.2	0	0	0	0	7.538	4.1457	8.5	5.4165				
ROCKLG	0	0	0	0	0	0	0	NS	0	0	NS	0	0	0	0	0	0.585	0.4801	2.375	2.0616				
ROCKSM	0	0	0	0	0	0	0.6	NS	0	0	NS	0	0	0	0	0	0.362	0.2986	0.725	0.6894				
CRUST	0	0	0	0	0	0	0	NS	0	0	NS	0	0	0	0	0	0	0	0	0				
LICHEN	0	0	0	0	0	0	0	NS	0	0	NS	0	0	0	0	0	0.008	0.0077	0	0				
MOSS	0	0	0	0	0	0	0	NS	0	0	NS	0	0	0	0	0	0.486	0.4598	0.85	0.832				

NS = Not Sampled

4.4 Fort Larned National Historic Site

4.4.1 2010 and 2011 sampling

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response. A total of seven fire-event transects and eight longterm monitoring transects were established at Fort Larned National Historic Site (FOLS; Figure 4.4-1). The plant communities monitored at FOLS are: restored grasslands consisting of smooth brome semi-natural herbaceous alliance and planted semi-natural restored grassland prairie, and a prairie dog town grassland complex (Cogan et al. 2007) (Table 4.4-1). Prescribed fire is not a part of the management plan within the prairie dog town and the area does not require a fire-event transect. In 2010, four fire and all longterm monitoring transects were monitored at Fort Larned NHS during early-June. 2011 saw all longterm transects monitored, but no fire transects. Park management informed us that all areas north of the Pawnee River had undergone a prescribed burn in late March 2010 and plans are in place to use prescribed fire on all areas south of the Pawnee were burned in spring 2011.

4.4.2 Results and discussion

The grasslands of FOLS consist, almost exclusively, of perennial graminoids, the majority of species being native grasses. However, exotic smooth brome (*Bromus inermis*) continues to be the most dominant grass with only small patches of native grasses present. Forbs are evenly divided between annual and perennial forms and show adequate diversity, but there are many exotic forbs established throughout the area, most of them annual species.

Prairie restoration efforts have been ongoing at FOLS for several decades and the oldest areas of restoration show the most success, with fair stands of native bunch grass. Continued control efforts on smooth brome will help these areas recover but progress is expected to remain slow.

Exotic plants pose a severe threat at FOLS, primarily due to the extreme past disturbance and the park being surrounded by agriculture. As mentioned earlier, smooth brome continues to greatly dominate the grasslands, while field bindweed is well-established in areas of the park. Rainy years bring flushes of yellow sweetclover (*Melilotus officianalis*). Kochia (*Kochia scoparia*), poison hemlock (*Conium maculatum*) and dandelion (*Taraxacum officinale*)

Table 4.4-1. Habitat type, plant community, and sampling dates for each transect at Fort Larned NHS, 2010 and 2011.

Transect	Plant community	Date visited	
		2010	2011
BU02A-LT01	Upland Restoration	6/4/2010	6/28/2011
BU02A-02	Upland Restoration	6/3/2010	Not Sampled
BU02B-LT01	Upland Restoration	6/3/2010	6/28/2011
BU04-F01	Upland Restoration	6/2/2010	Not Sampled
BU04-LT01	Upland Restoration	6/2/2010	6/27/2011
BU05A-LT01	Upland Restoration	6/3/2010	6/27/2011
BU06-LT01	Upland Restoration	6/5/2010	6/27/2011
BU07-F01	Upland Restoration	6/5/2010	Not Sampled
BU07-LT01	Upland Restoration	6/4/2010	6/27/2011
BU08-F01	Upland Restoration	6/1/2010	Not Sampled
BU08-LT01	Upland Restoration	6/1/2010	6/27/2011
RUT-LT01	Upland Prairie Dog Town	6/4/2010	6/28/2011



NPS PHOTO

A total of seven fire-event transects and eight long-term monitoring transects were established at Fort Larned NHS.

have all found their niches and flourish. The Ruts Unit contains the usual suite of exotics normally found in active prairie dog towns. Exotic species present at FOLS are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.4.3 Prescribed fire treatments or wildfire occurrence

FOLS is under the Midwest Region Fire Management Office and is not served by the Southern Plains Fire Group. Prescribed burns are carried out in cooperation with Quivera National Wildlife Refuge crew. Prescribed fire has been used at FOLS since 1968, with intermittent breaks. In 2009, the park lands north of the Pawnee River were burned under prescription, while the area to the south of the Pawnee River was burned in 2010. Only a few wildland fires have occurred at the NHS since NPS took possession of the land, none of an extensive nature. At this time we have no map of the fire history but hope to generate one from park records in the year ahead.

4.4.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol

(Folts-Zettner et al. in review) and current results from monitoring within the scope of this project are reported in the previous data table (Table 4.6-2). As monitoring progresses, any noted effects of burning will be presented in this section.

4.4.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications are being developed with the park to map annual treatment areas. There is no Exotic Plant Management Team assigned to FOLS, therefore all exotic treatment is conducted by the park. Pertinent information will be presented in this section when treatments are known.

Current knowledge of treatments includes: eradication of poison hemlock in 2009 within the oxbow area, spraying in 2010 for field bindweed in the southern section of the park, and prescribed burns to control exotics.

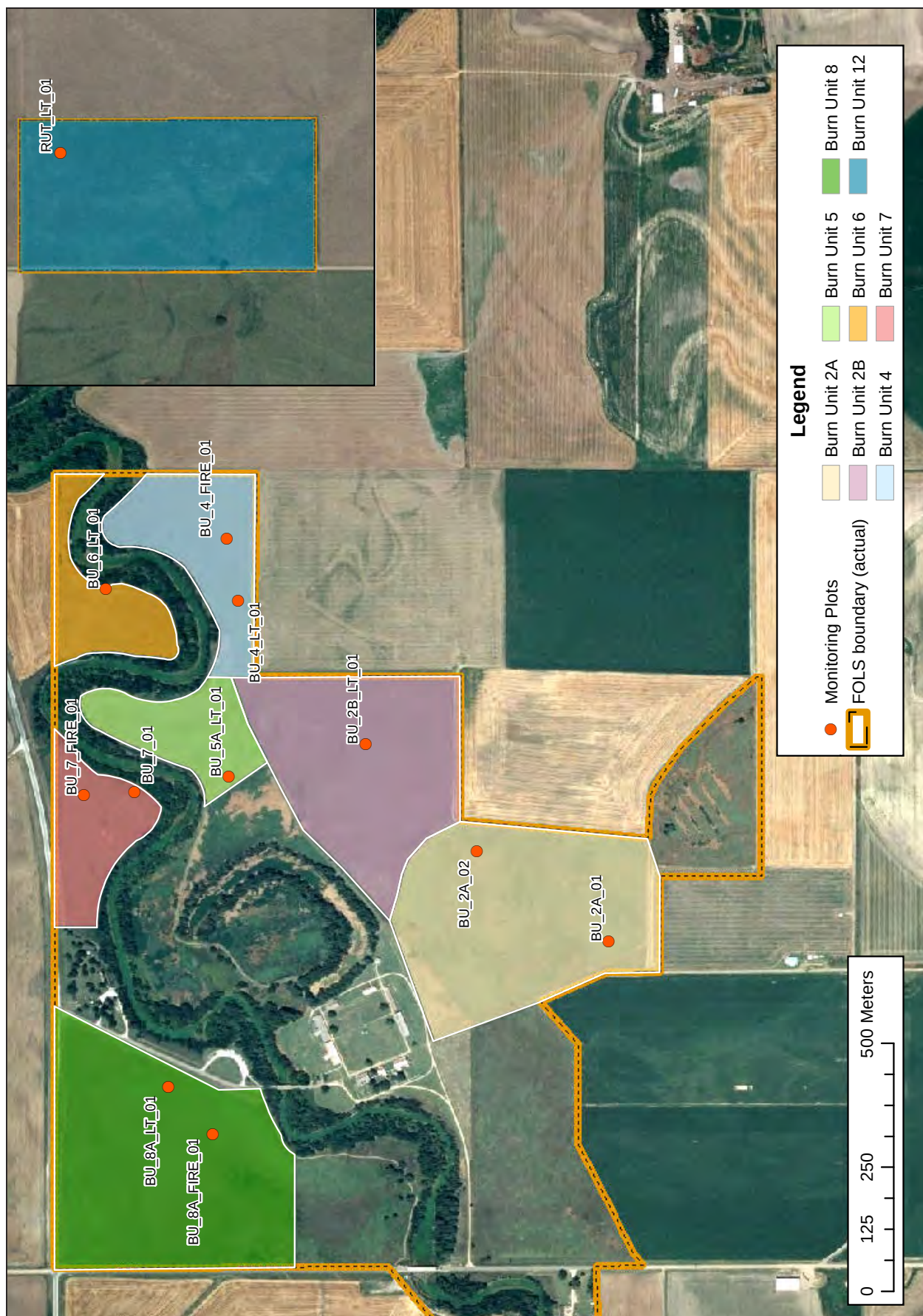


Figure 4.4-1. Monitoring transects, Fort Larned NHS, 2010. and 2011

Table 4.4-2a. Within-plot cover values for each plant species detected during monitoring at each transect (part 1), Fort Larned NHS, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values			
		BU02A-F02		BU02A-LT01		BU02B-LT01		BU04-F01		BU04-LT01		BU05-LT01		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																	
BROINE	P	0	NS	0	0.2	52	15.2	51	NS	52	44.4	71	31	33.8	6.7602	21.65	5.8454
BOUCUR	P	14.2	NS	15.6	19.4	0	0	2	NS	8.6	0	0.7	1.2	5.3083	1.5764	4.375	2.3624
PANVIR	P	30	NS	10.3	16.2	0	0.1	6.6	NS	8.7	2.3	0	0.5	5.0917	2.5247	2.65	1.9555
SORNUT	P	0.2	NS	3.3	10.7	0	0	7.3	NS	0	0	0.2	0	2.9333	1.0924	2.8125	1.4291
ANDGER	P	0.1	NS	0	0	0	0	0.2	NS	0	0	0	0	0.875	0.7613	0.0875	0.0875
SCHSCO	P	0.1	NS	4	9	0	0	0	NS	0	0	0.2	1.2	0.7583	0.3924	4.0875	2.0339
PASSMI	P	0	NS	0	0	0	0	0.6	NS	0	0	0	0.1	0.55	0.3829	0.065	0.0522
FORB																	
CONARV	P	4.2	NS	1.1	0.6	4.8	5.3	0.7	NS	0.1	0.2	0	0	3.5167	1.4991	2.0125	0.8019
AMBPSI	A	0	NS	8	2.2	0	0	0	NS	0	0	0	0	2.2667	1.6765	0.4875	0.3226
MELOFF	A/P	0.2	NS	9.1	0.3	0	0	0.2	NS	12.2	0	0	0	2.1083	1.2018	0.4375	0.3964
HELPET	A	0.3	NS	18.2	8.7	0	0	0	NS	0	0	0	0	1.5417	1.5146	1.0875	1.0875
CIRUND	B/P	5	NS	0.1	0.2	0	0	0	NS	0	0	0	0	0.425	0.416	0.025	0.025
KOCSO	A	1.5	NS	0	0	0	0	0	NS	0	0	0	0	0.35	0.2473	0.5375	0.5375
CHEALB	A	0.2	NS	3	2.2	0	0.2	0	NS	0	0	0	0.1	0.2667	0.249	0.4	0.2706
OXASTR	P	0	NS	0	0	0	0	0	NS	0	0	0	0	0.25	0.25	0.0375	0.0375
PHYLON	P	0.4	NS	0	0	0	0	0	NS	0	0	0	0	0.2	0.132	0	0
CALINV	A	0	NS	0	0	0	0	0	NS	0.1	0	0	0	0.175	0.1661	0.0125	0.0125
SPHCOC	P	0	NS	0	0	0	0	0.2	NS	0.6	0.2	0	0	0.075	0.0509	0.025	0.025
CONCAN	A/B	0	NS	0.1	0.6	0	0	0.6	NS	0	0	0	0	0.0583	0.0499	0.075	0.075
SOLCAN	P	0	NS	0.3	0	0	0	0	NS	0	0	0	0	0.0417	0.0288	0	0
SILANT	A	0	NS	0	0	0	0	0	NS	0.1	0	0	0	0.0333	0.0256	0	0
DESILL	P	0	NS	0	0	0	0	0	NS	0	0	0.1	0	0.025	0.0179	0	0
DESPIN	A/P	0.2	NS	0.1	0	0	0	0	NS	0	0	0	0	0.025	0.0179	0	0
EUPDEN	A	0.3	NS	0	0	0	0	0	NS	0	0	0	0	0.025	0.025	0	0
GAUVIL	P	0	NS	0.2	0.6	0	0	0	NS	0	0	0	0	0.0167	0.0167	0.075	0.075
DALPUR	P	0	NS	0	0	0	0	0.1	NS	0	0	0	0	0.0083	0.0083	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.4-2a. Within-plot cover values for each plant species detected during monitoring at each transect (part 1), Fort Larned NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values						
		BU02A-F02		BU02A-LT01		BU02B-LT01		BU04-F01		BU04-LT01		BU05-LT01		MEAN	SE	MEAN	SE	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	
Forb (cont.)																		
SYMERI	P	0	NS	0.1	2	0	0	0	0	NS	0	0	0	0	0.0083	0.0083	0.25	0.25
TRADUB	A/B	0.1	NS	0	0	0	0	0	0	NS	0	0	0	0	0.0083	0.0083	0	0
Shrub/Subshrub																		
CEPOCC	P	0	NS	0	0	0	0	0	0	NS	0.1	0	0	0	0.0083	0.0083	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.4-2b. Within-plot cover values for each plant species detected during monitoring at each transect (part 2), Fort Larned NHS, 2010 and 2011

Vegetation code	Life cycle	Transect										Parkwide values					
		BU06-LT01		BU07-LT01		BU07-F01		BU08-F01		BU08-LT01		RUTS-LT01		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011
GRASS																	
BROINE	P	31	35	46	32.4	33	NS	42	NS	27.6	15	0	0	33.8	6.7602	21.65	5.8454
BOUCUR	P	2.9	6	1	1.2	0.3	NS	4	NS	9.8	0.1	4.6	7.1	5.3083	1.5764	4.375	2.3624
PANVIR	P	5.2	1.4	0.3	0.1	0	NS	0	NS	0	0.6	0	0	5.0917	2.5247	2.65	1.9555
SORNUT	P	6.8	0.6	0	5.4	9.2	NS	0.1	NS	8.1	5.8	0	0	2.9333	1.0924	2.8125	1.4291
CARGRA	P	0	0	0	0	0	NS	0	NS	0	0	24.2	12.6	2.0167	2.0167	1.575	1.575
ANDGER	P	0	0	0	0	0	NS	1	NS	9.2	0.7	0	0	0.875	0.7613	0.0875	0.0875
SCHSCO	P	1.1	0.1	0	7.2	3.1	NS	0.6	NS	0	15.2	0	0	0.7583	0.3924	4.0875	2.0339
PASSMI	P	0	0	0	0	0.1	NS	0.1	NS	1.2	0	4.6	0.42	0.55	0.3829	0.065	0.0522
POAPRA	P	0	0	0	0	0	NS	0	NS	0	0	2.1	0.2	0.175	0.175	0.025	0.025
BOTLAG	P	0	0	0	0	0	NS	0	NS	1	0	0	0	0.0833	0.0833	0	0
BROJAP	A	0	0	0	0	0	NS	0	NS	0	0	0.2	0	0.0167	0.0167	0	0
FORB																	
CONARV	P	0.7	1.4	2.9	3.6	11.6	NS	0	NS	0	0	16.1	5	3.5167	1.4991	2.0125	0.8019
AMBPSI	A	0	0	0	0	0	NS	0	NS	0	0	19.2	1.7	2.2667	1.6765	0.4875	0.3226
MELOFF	A/P	0	0	0	0	0	NS	0.1	NS	3.5	3.2	0	0	2.1083	1.2018	0.4375	0.3964
KOCSCO	A	0	0	0	0	0	NS	0	NS	0	0	2.7	4.3	0.35	0.2473	0.5375	0.5375
CHEALB	A	0	0.7	0	0	0	NS	0	NS	0	0	0	0	0.2667	0.249	0.4	0.2706
OXASTR	P	0	0	0	0	0	NS	0	NS	0	0	3	0.3	0.25	0.25	0.0375	0.0375
PHYLON	P	0.2	0	0.1	0	0	NS	0.1	NS	0	0	1.6	0	0.2	0.132	0	0
CALINV	A	0	0	0	0	0	NS	0	NS	0	0	2	0.1	0.175	0.1661	0.0125	0.0125
HELMAX	P	1.6	0	0	0	0	NS	0	NS	0	0	0	0	0.1333	0.1333	0	0
CONRAM	A	0	0	0	0	0	NS	0	NS	0	0	1.2	0	0.1	0.1	0	0
SPHCOC	P	0	0	0	0	0	NS	0.1	NS	0	0	0	0	0.075	0.0509	0.025	0.025
SONASP	A	0	0	0	0	0	NS	0	NS	0	0	0.7	0	0.0583	0.0583	0	0
SOLCAN	P	0.2	0	0	0	0	NS	0	NS	0	0	0	0	0.0417	0.0288	0	0
SILANT	A	0	0	0	0	0	NS	0	NS	0	0	0.3	0	0.0333	0.0256	0	0
DESILL	P	0.2	0	0	0	0	NS	0	NS	0	0	0	0	0.025	0.0179	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.4-2b. Within-plot cover values for each plant species detected during monitoring at each transect (part 2), Fort Larned NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values					
		BU06-LT01		BU07-LT01		BU07-F01		BU08-F01		BU08-LT01		RUTS-LT01		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																	
LEPDEN	A/B	0	0	0	0	0	NS	0	NS	0	0	0.3	0	0.025	0	0	0
ASCSYR	P	0	0	0	0	0	NS	0	NS	0	0	0.2	0	0.0167	0	0	0
GALAPA	A	0	0	0	0	0	NS	0	NS	0	0	0.2	0	0.0167	0	0	0
TRIPER	A	0	0	0	0	0	NS	0	NS	0	0	0.2	0	0.0167	0	0	0
ASCPUM	P	0	0	0	0	0	NS	0	NS	0	0	0.1	0	0.0083	0	0	0
LIAPUN	P	0	0	0	0	0	NS	0.1	NS	0	0	0	0	0.0083	0	0	0
PHYHET	P	0	0	0	0	0	NS	0	NS	0	0	0.1	0	0.0083	0	0	0
ASTMOL	P	0	0	0	0	0	NS	0	NS	0	1	0	0	0	0	0.125	0.125
CHEDES	A	0	0	0	0	0	NS	0	NS	0	0	0	0.1	0	0	0.0125	0.0125

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.4-3a. Percentage of substrate cover for each transect sampled (part 1), Fort Larned NHS, 2010 and 2011

Cover	Transect												Park Totals			
	BU02A-F02		BU02A-LT01		BU02B-LT01		BU04-F01		BU04-LT01		BU05-LT01		MEAN	SE	MEAN	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011
SOILBARE	2	NS	1.2	0	0	0	12	NS	16	0	0	0	19.9	7.1007	0	0
SOIOPEN	0	NS	0	2.4	0	2.2	0	NS	0	0	0	0	0	0	2.675	1.1364
SOILUNDER	0	NS	0	0.8	0	0	0	NS	0	0	0	0	0	0	0.35	0.2062
LITTER	97	NS	98.4	96.8	100	97.8	88	NS	84	100	100	100	74.833	7.6311	94.475	2.9459
WOOD	1	NS	0	0	0	0	0	NS	0	0	0	0	6.817	6.6538	0	0
ROCKLG	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0
ROCKSM	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0
CRUST	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0
LICHEN	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0
MOSS	0	NS	0	0	0	0	0	NS	0	0	0	0	0.008	0.0083	0	0

NS = Not Sampled

Table 4.4-3b. Percentage of substrate cover for each transect sampled (part 2), Fort Larned NHS, 2010 and 2011

Cover	Transect												Park Totals			
	BU06-LT01		BU07-LT01		BU07-F01		BU08-F01		BU08-LT01		RUTS-LT01		MEAN	SE	MEAN	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011
SOILBARE	30	0	36	0	13.4	NS	49.8	NS	78.4	0	0	0	19.9	7.1007	0	0
SOILOPEN	0	2.6	0	4	0	NS	0	NS	0	9.8	0	0.4	0	0	2.675	1.1364
SOILUNDER	0	0.4	0	0	0	NS	0	NS	0	1.6	0	0	0	0	0.35	0.2062
LITTER	70	97	64	76	86.6	NS	50	NS	20	88.6	40	99.6	74.833	7.6311	94.475	2.9459
WOOD	0	0	0	0	0	NS	0	NS	0.8	0	80	0	6.817	6.6538	0	0
ROCKLG	0	0	0	0	0	NS	0	NS	0	0	0	0	0	0	0	0
ROCKSM	0	0	0	0	0	NS	0	NS	0	0	0	0	0	0	0	0
CRUST	0	0	0	0	0	NS	0	NS	0	0	0	0	0	0	0	0
LICHEN	0	0	0	0	0	NS	0	NS	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	NS	0.1	NS	0	0	0	0	0.008	0.0083	0	0

NS = Not Sampled

4.5 Fort Union National Monument

4.5.1 2010 and 2011 sampling

A total of six long-term transects were established at Fort Union National Monument (FOUN; Figure 4.5-1). No fire event transects will be established due to the exclusion of fire as a management tool at the park for safety reasons. The plant communities monitored at FOUN comprise shortgrass steppe fringed sage/blue grama dwarf-shrub herbaceous vegetation; blue grama-purple threeawn herbaceous vegetation; western wheatgrass-blue grama herbaceous vegetation; blue grama herbaceous vegetation; fringed sage/sleepygrass dwarf-shrub herbaceous vegetation; and fringed sage/hairy grama dwarf-shrub herbaceous vegetation (Muldavin et al. 2009) (Table 4.5-1). In both 2010 and 2011, all six long-term transects were established and monitored.

4.5.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in some change in plant response. The grasslands at FOUN are comprised predominately of perennial grasses, with blue grama (*Bouteloua gracilis*) being most dominant. This is a fairly stable system but has undergone a full year of extreme drought, resulting in dormancy of most grasses. The monitoring crew experienced

difficulty in determining cover of many of these grasses, and therefore gave a cover reading on “dead” or dormant grass. There is a fairly diverse mix of mainly perennial forbs throughout the transects, although many of the native annuals were not detected in 2011, likely due to drought conditions.

Exotic plant species are present primarily within the fort ruins, housing area and along the entrance road, but a few are found in the prairie. Of greatest concern is field bindweed (*Convolvulus arvensis*), a perennial that has the ability to impact the grasslands. Kochia (*Kochia scoparia*) and prickly Russian thistle (*Salsola tragus*) are ubiquitous within the park boundaries. During drought years, these three have exhibited continued growth and seed set, giving them a competitive edge over the native plants. Exotic species present at CAVO are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.5.3 Prescribed fire treatments or wildfire occurrence

The Bandelier Fire Group is responsible for prescribed fire treatments at FOUN. Prescribed burning is not considered an option in the park and no wildfires have occurred in recent history. Fuel reduction is carried out only around the cultural areas in the form of mowing.

4.5.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol

Table 4.5-1. Plant community and sampling dates for each transect at Fort Union NM, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
SHORT-LT01	Short Grass Steppe	8/19/2010	7/24/2011
SHORT-LT02	Short Grass Steppe	8/19/2010	7/25/2011
SHORT-LT03	Short Grass Steppe	8/20/2010	7/24/2011
SHORT-LT04	Short Grass Steppe	8/20/2010	7/24/2011
SHORT-LT05	Short Grass Steppe	8/19/2010	7/25/2011
SHORT-LT06	Short Grass Steppe	8/20/2010	7/24/2011



MULDavin

In 2010, all six long-term plots were established and monitored at Fort Union NM.

(Folts-Zettner et al. in review). As monitoring progresses, any noted effects of burning or treatment will be presented in this section.

4.5.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may

have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with the Southern Plains/ Chihuahuan Desert Exotic Plant Management Team and the park to map annual treatment areas. Pertinent information will be presented in this section when treatments are known.

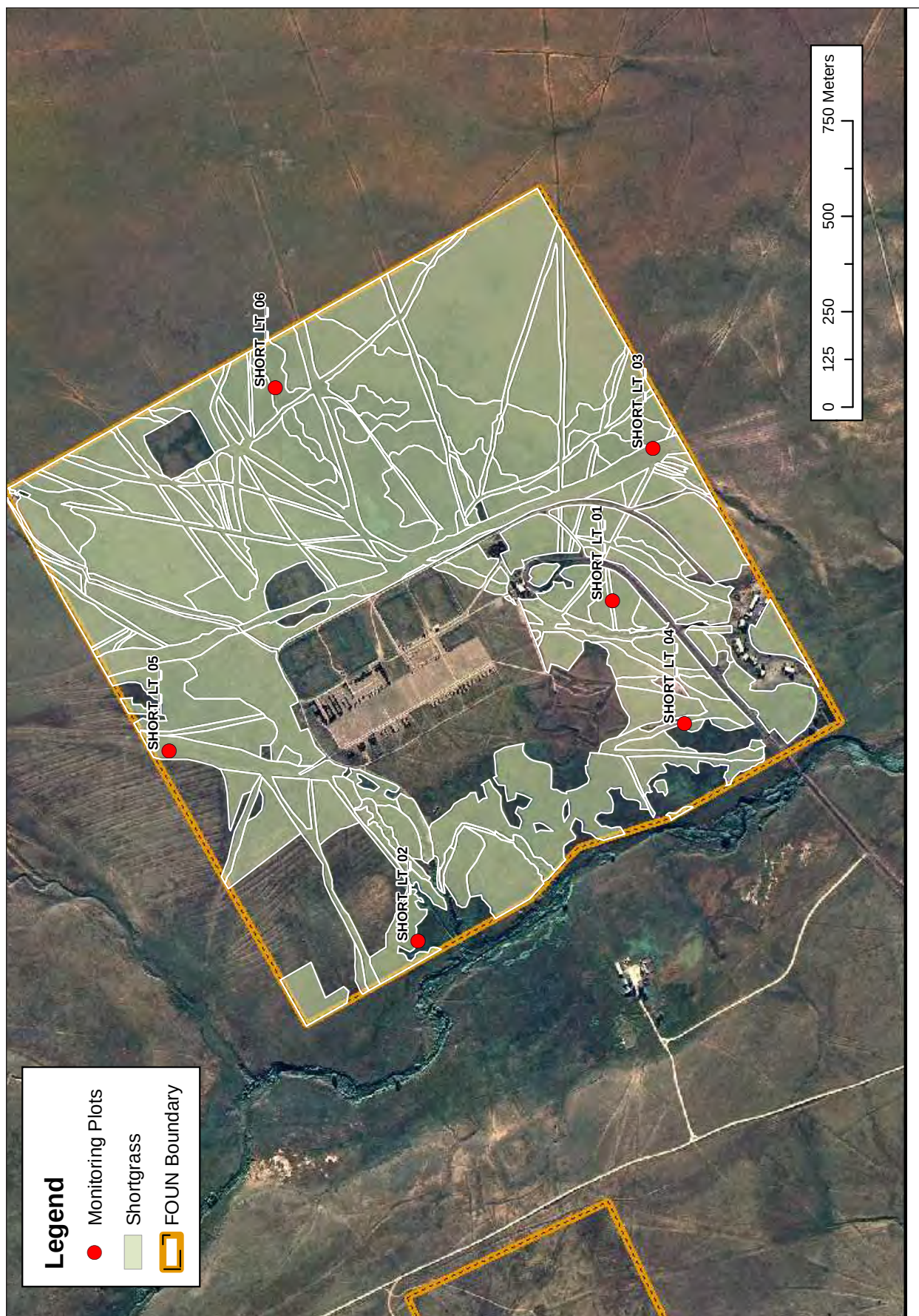


Figure 4.5-1. Monitoring transects, Fort Union NM, 2010 and 2011.

Table 4.5-2. Within-plot cover values for each plant species detected during monitoring at each transect, Fort Union NM, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values			
		SHORT-LT01		SHORT-LT02		SHORT-LT03		SHORT-LT04		SHORT-LT05		SHORT-LT06		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
GRASS																	
BOUGRA	P	38	10.1	22.8	9.1	28.6	•	20.6	0.6	47	32	25	36	30.3333	4.1613	17.56	6.9405
ARIPUR	P	4.2	•	0	0	8.3	•	3.2	0	0.7	0	0	0	2.7333	1.322	0	0
BUCDAC	P	1.6	0.2	0	0	5.2	•	0	0	2.6	8	0.8	19	1.7	0.8095	5.44	3.722
PASSMI	P	0.2	0	5.2	0.3	0	0	3.4	0	1.1	0	0	2	1.65	0.8853	0.3833	0.327
SPOCRY	P	0	0	0	0	0.6	0	1.2	0.1	1	0	2.6	0.7	0.9	0.3958	0.1333	0.1145
LYCPHL	P	0	0	0	0	2.6	0	1.1	0	0.8	0	0	0	0.75	0.4177	0	0
MUHTOR	P	0	0	0	0	0.3	0	3.2	4.4	0	0	0	0	0.5833	0.5256	0.7333	0.7333
ELYELY	P	0.2	0	1.6	0	0	0.1	0.6	0	0.4	0	0	0	0.4667	0.2459	0.0167	0.0167
CYPFEN	P	0	0	0.1	0	0	0	0	0	1.2	0	0	0	0.2167	0.1973	0	0
ACHROB	P	0	0	0.2	0	0	0	0	0	0	0	0	0	0.0333	0.0333	0	0
BOUCUR	P	0	0	0	0	0.1	•	0	0	0	0	0	0	0.0167	0.0167	0	0
DEAD	P	0	6	0	3	0	3	0	0	0	1	0	5	0	0	3	0.9309
FORBS																	
AMBCON	P	6.3	0.1	13.7	5.7	4.4	2.6	7	2.9	1.8	0	18.2	0.1	8.5667	2.5159	1.9	0.9313
SPHCOC	P	0.8	0	2.8	2.3	5	1	1	0.2	0.8	0.2	5.1	0.6	2.5833	0.8384	0.7167	0.3487
GUTSAR	P	0.2	0	0.8	1.6	4.9	1	0.3	0	0	0.1	0	0	1.0333	0.7826	0.45	0.2802
EUPDAV	A	0	0	3.7	0	0.1	0	0.2	0	0	0	0	0	0.6667	0.6075	0	0
PSOTEN	P	0.3	0.2	0.6	0.2	0	3.2	2.6	0	0	0	0	0	0.5833	0.4151	0.6	0.5215
ARTCAR	P	0	0	1.6	0.2	1.6	0	0	0	0.1	0.1	0	0	0.55	0.3324	0.05	0.0342
SYMLAN	P	0	0	0	0	0	0	2	0	0	0	0	0	0.3333	0.3333	0	0
ZINGRA	P	1.6	0	0	0	0	0	0.3	0	0	0	0	0	0.3167	0.2613	0	0
ARTLUD	P	0	0	1.8	0.1	0	0	0	0.3	0	0	0	0	0.3	0.3	0.0667	0.0494
CHASER1	A	0.2	0	0.4	0.1	0	0	0	0	0.7	0	0	0	0.2167	0.1167	0.0167	0.0167
CHELEP	A	0.4	0	0.7	0	0	0	0	0	0.2	0	0	0	0.2167	0.1167	0	0
LINLEW	P	0	0	1.1	0.7	0	0	0	0	0	0	0	0	0.1833	0.1833	0.1167	0.1167
SALTRA	A	0	0	0.1	0.1	0.7	0.1	0.2	3.2	0	0	0	0.2	0.1667	0.1116	0.6	0.5209
PHYHED	P	0	0	0	0	0.8	0	0	0	0	0	0	0	0.1333	0.1333	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

• = detected but no cover assigned

Mean and SE values are calculated across all plots in the park

Table 4.5-2. Within-plot cover values for each plant species detected during monitoring at each transect, Fort Union NM, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values						
		SHORT-LT01		SHORT-LT02		SHORT-LT03		SHORT-LT04		SHORT-LT05		SHORT-LT06		MEAN	SE	MEAN	SE	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	
FORBS (cont.)																		
ENGP	P	0.1	0	0.1	0.7	0.2	0	0.2	0	0	0	0	0	0	0.1	0.0365	0.1167	0.1167
SOLMOL	P	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0
CIRUND	B/P	0	0	0	0	0.2	0.6	0.3	0	0	0	0.1	0	0	0.0833	0.0543	0.1167	0.098
RATTAG	P	0	0	0.2	0	0.1	0.1	0.1	0	0	0	0	0	0	0.0833	0.0307	0.0167	0.0167
THEMEG	P	0	0	0.2	0.1	0	0.9	0.1	0	0.2	0	0	0	0	0.0833	0.0401	0.1667	0.1476
MIRLIN	P	0	0	0	0	0.1	0	0.2	0	0.1	0	0	0	0	0.0667	0.0333	0	0
CHEINC	A	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.0333	0.0333	0	0
DALCAN	P	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.0333	0.0333	0	0
GAUCOC	P	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0.0333	0.0211	0	0
LYGJUN	P	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.0333	0.0333	0	0
MENMUL	B/P	0	0	0.2	0	0	0	0	0.6	0	0	0	0	0	0.0333	0.0333	0.1	0.1
ALLCER	P	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.0167	0.0167	0	0
ASCINV	P	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.0167	0.0167	0	0
CHAERI	P	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0.0167	0.0167	0.0167	0.0167
DYSPAP	A	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.0167	0.0167	0	0
ERIANN2	A/B	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.0167	0.0167	0	0
KOCSO	A	0	0	0	0	0	0	0	7.8	0	0	0	0.1	0.2	0.0167	0.0167	1.3333	1.2937
MACPIN	P	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.0167	0.0167	0	0
PLAPAT	A	0	0	0	0	0	0.2	0	0	0.1	0	0	0	0	0.0167	0.0167	0.0333	0.0333
POROLE	A	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.0167	0.0167	0	0
SENSPA	P	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.0167	0.0167	0	0
CONARV	P	0	0	0	0	0	0	0	4.6	0	0	0	0	0	0	0	0.7667	0.7667
HETVIL	P	0	0	0	0	0	0.8	0	0	0	0.1	0	0	0	0	0	0.15	0.131
LEPDEN	A/B	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.0167	0.0167
LIAPUN	P	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0	0	0.2	0.2
SHRUB/SUBSHRUB																		
ARTFRI	P	0.8	0.1	0.2	0.3	0.2	0.1	1.2	0	1	0	0	0	0	0.5667	0.2028	0.0833	0.0477

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

• = detected but no cover assigned

Mean and SE values are calculated across all plots in the park

Table 4.5-2. Within-plot cover values for each plant species detected during monitoring at each transect, Fort Union NM, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values				
		SHORT-LT01		SHORT-LT02		SHORT-LT03		SHORT-LT04		SHORT-LT05		SHORT-LT06		MEAN	SE	MEAN	SE	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	
SHRUB/SUBSHRUB (cont.)																		
ROSWOO	P	0	0	1.2	0.4	0	0	0	0	0	0	0	0	0.2	0.2	0.0667	0.0667	
ECHVIR	P	0.1	0.8	0	0	0.2	0	0	0	0	0.6	0.3	0	0.4	0.15	0.0957	0.25	0.131
OPUPOL	P	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.0167	0.0167	0	0

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
• = detected but no cover assigned
Mean and SE values are calculated across all plots in the park

Table 4.5-3. Percentage of substrate cover for each transect sampled, Fort Union NM, 2010 and 2011

Cover	Transect												Park Totals		
	SHORT_LT_01		SHORT_LT_02		SHORT_LT_03		SHORT_LT_04		SHORT_LT_05		SHORT_LT_06		SE	MEAN	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011			
SOILBARE	41	0	40	0	41	0	55	0	28.8	0	25.6	0	38.567	4.2719	0 0
SOIOPEN	0	28.6	0	32.6	0	38.6	0	39	0	34.4	0	10	0	0	30.533 4.402
SOILUNDER	0	5	0	7.8	0	9	0	14	0	9	0	7	0	0	8.633 1.2333
LITTER	59	66.2	78.6	56.4	58.6	50.4	41.8	44.8	69	52.4	73	82	63.333	5.365	58.7 5.4961
WOOD	0	0	0	1.4	0	1	0	0	0	0.4	0	0	0	0	0.467 0.2459
ROCKLG	0	0	0	0	0	0	1.6	0.2	0	1	0	0	0.267	0.2667	0.2 0.1633
ROCKSM	0	0.2	1.4	1.8	0.4	1	1.6	2	0.2	2.6	1.4	1	0.833	0.2894	1.433 0.3518
CRUST	0	0	0	0	0	0	0	0	1.4	0	0	0	0.233	0.2333	0 0
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0
MOSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0

4.6 Lake Meredith National Recreation Area/Alibates Flint Quarries National Monument

4.6.1 2010 and 2011 Sampling

A total of 26 fire-event transects and 26 long-term monitoring transects were established at Lake Meredith National Recreation Area (LAMR)/Alibates Flint Quarries National Monument (ALFL) (Figure 4.6-1). The plant communities monitored at Lake Meredith NRA/Alibates Flint Quarries NM are: upland grasslands consisting of blue grama-buffalograss herbaceous vegetation, sand sagebrush/ (sideoats grama, hairy grama) shrubland, and upland sloped/rolling hills vegetation complex; perennial bottomland consisting of perennial bottomland grassland complex and perennial bottomland/upper terrace, valley floor grassland complex; honey mesquite shrubland which is being type-converted to grassland; and cottonwood galleries which are of special concern to the park (Fenton et al. 2007) (Table 4.6-1). In 2010, two fire and twenty-five long-term transects were monitored. It was determined that the effort, while valid, was too ambitious given the time

and budget constraints; therefore eight long-term transects have been dropped from the monitoring schedule. In 2011, 18 long-term transects and two fire transects were sampled in August.

4.6.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response. Most vegetation at the time of monitoring was dead or dormant, often resulting in difficulty identifying species or accurately determining cover. When a grass could be identified in its dormant state, its coverage was estimated as normal; when unable to identify other than presence, its coverage was listed under DEAD (even though it may just be dormant). Further refinement of monitoring during extreme drought will be made to the protocol to address these issues.

The grasslands at LAMR/ALFL are currently under major drought-stress and it remains to be seen how they will react to an extended drought. In 2010, a wide variety of native perennial grasses

A total of 26 fire-event transects and 26 long-term monitoring transects were established at Lake Meredith NRA/Alibates Flint Quarries NM.



were found in the transects, although many in the bottomlands had been affected by aerial spraying conducted for saltcedar (*Tamarisk*) control; drought stress made it impossible to determine if they had recovered in 2011. Active gas drilling within park boundaries has caused fragmentation of the grasslands

and added to the issue of exotic plant introduction and spread. There is a great diversity of forbs throughout the various plant communities, with two-thirds of them perennial.

There are currently no active restoration areas within the park, but this will change

Table 4.6-1. Plant community and sampling dates for each transect at Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
BLAND-LT01	Perennial Bottomland	9/27/2010	8/4/2011
BLAND-LT02	Perennial Bottomland	9/21/2010	8/4/2011
BLAND-LT03	Perennial Bottomland	9/11/2010	8/3/2011
BLAND-LT04	Perennial Bottomland	9/26/2010	Not Sampled
CWOOD-LT01	Cottonwood	9/18/2010	8/3/2011
CWOOD-LT02	Cottonwood	9/21/2010	8/4/2011
CWOOD-LT03	Cottonwood	8/29/2010	Not Sampled
CWOOD-LT04	Cottonwood	9/27/2010	8/4/2011
HONEY-F01	Honey Mesquite Shrubland	5/26/2010	Not Sampled
HONEY-F06	Honey Mesquite Shrubland	6/28/2010	6/6/2011
HONEY-F09	Honey Mesquite Shrubland	Not Sampled	6/15/2011
HONEY-01	Honey Mesquite Shrubland	9/25/2010	8/3/2011
HONEY-LT01	Honey Mesquite Shrubland	8/28/2010	Not Sampled
HONEY-LT02	Honey Mesquite Shrubland	8/28/2010	8/5/2011
HONEY-LT04	Honey Mesquite Shrubland	6/29/2010	Not Sampled
HONEY-LT05	Honey Mesquite Shrubland	9/14/2010	Not Sampled
HONEY-LT06	Honey Mesquite Shrubland	9/19/2010	8/5/2011
HONEY-LT07	Honey Mesquite Shrubland	7/27/2010	8/2/2011
HONEY-LT08	Honey Mesquite Shrubland	9/19/2010	Not Sampled
HONEY-LT09	Honey Mesquite Shrubland	6/29/2010	8/1/2011
HONEY-LT10	Honey Mesquite Shrubland	6/28/2010	8/1/2011
ULAND-02	Upland Grass	9/14/2010	8/2/2011
ULAND-03	Upland Grass	8/9/2010	6/7/2011
ULAND-LT01	Upland Grass	9/20/2010	Not Sampled
ULAND-LT02	Upland Grass	7/27/2010	8/2/2011
ULAND-LT03	Upland Grass	8/29/2010	8/5/2011
ULAND-LT05	Upland Grass	7/28/2010	8/1/2011
ULAND-LT06	Upland Grass	8/29/2010	8/1/2011
ULAND-LT07	Upland Grass	Not Sampled	8/2/2011

in future years. If relatively healthy patches of grassland can be located at LAMR/ALFL, these could serve as seed sources for restoration.

Exotic forbs found in the transects were annuals, with prickly Russian thistle (*Salsola tragus*) being found in all plant communities and the most abundant forb overall. It has been observed blanketing well sites throughout the park and combined with its characteristics of widespread dispersal of numerous seeds and ease of dispersal on well roads will likely insure it is a permanent component of the park flora. There are many exotic species at LAMR/ALFL and with the long, linear nature of the park, control of these species will be problematic.

4.6.3 Prescribed fire treatments or wildfire occurrence

There has been an active prescribed burn program at LAMR for many years. 2009 saw burning on either side of the dam (Figure 4.6-3) with a goal of reducing mesquite. Four parcels in the Mullinaw Crossing area and one parcel of the Rosita area were burned in 2010 (Figure 4.6-4).

Earlier treatments have taken place but no information is available at this time.

4.6.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review) and current results from monitoring within the scope of this project are reported in the previous data table (Table 4.6-2). As monitoring progresses, any noted effects of burning will be presented in this section.

4.6.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with the Southern Plains/Chihuahuan Desert Exotic Plant Management Team to map annual treatment areas. Pertinent information will be presented in this section when treatments are known. Saltcedar (*Tamarisk*) removal and spraying for kochia occurred in 2010 in the Cedar Canyon area.

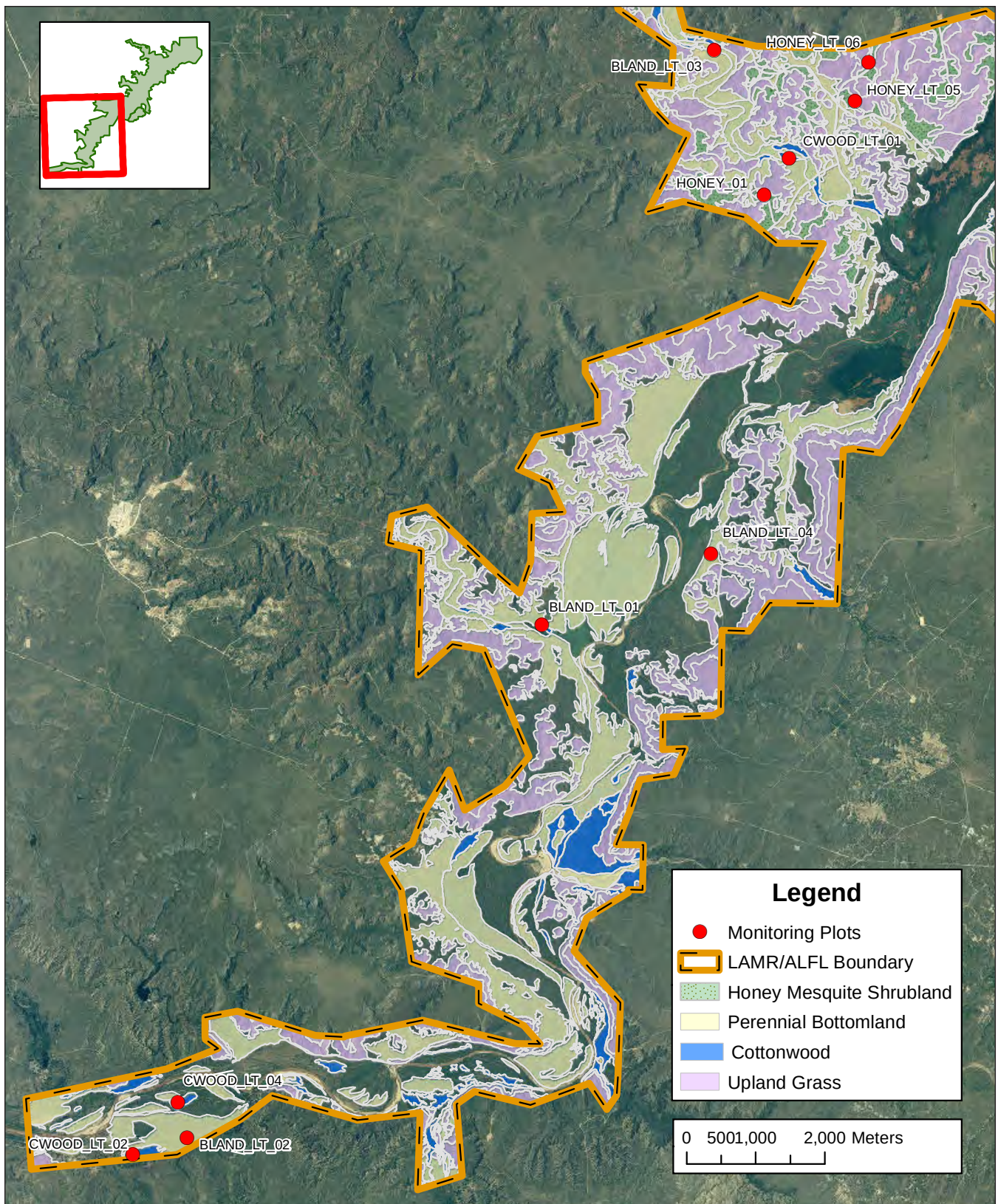


Figure 4.6-1. Monitoring plots, Lake Meredith NRA and Alibates Flint Quarries NM, Lower, 2010 and 2011

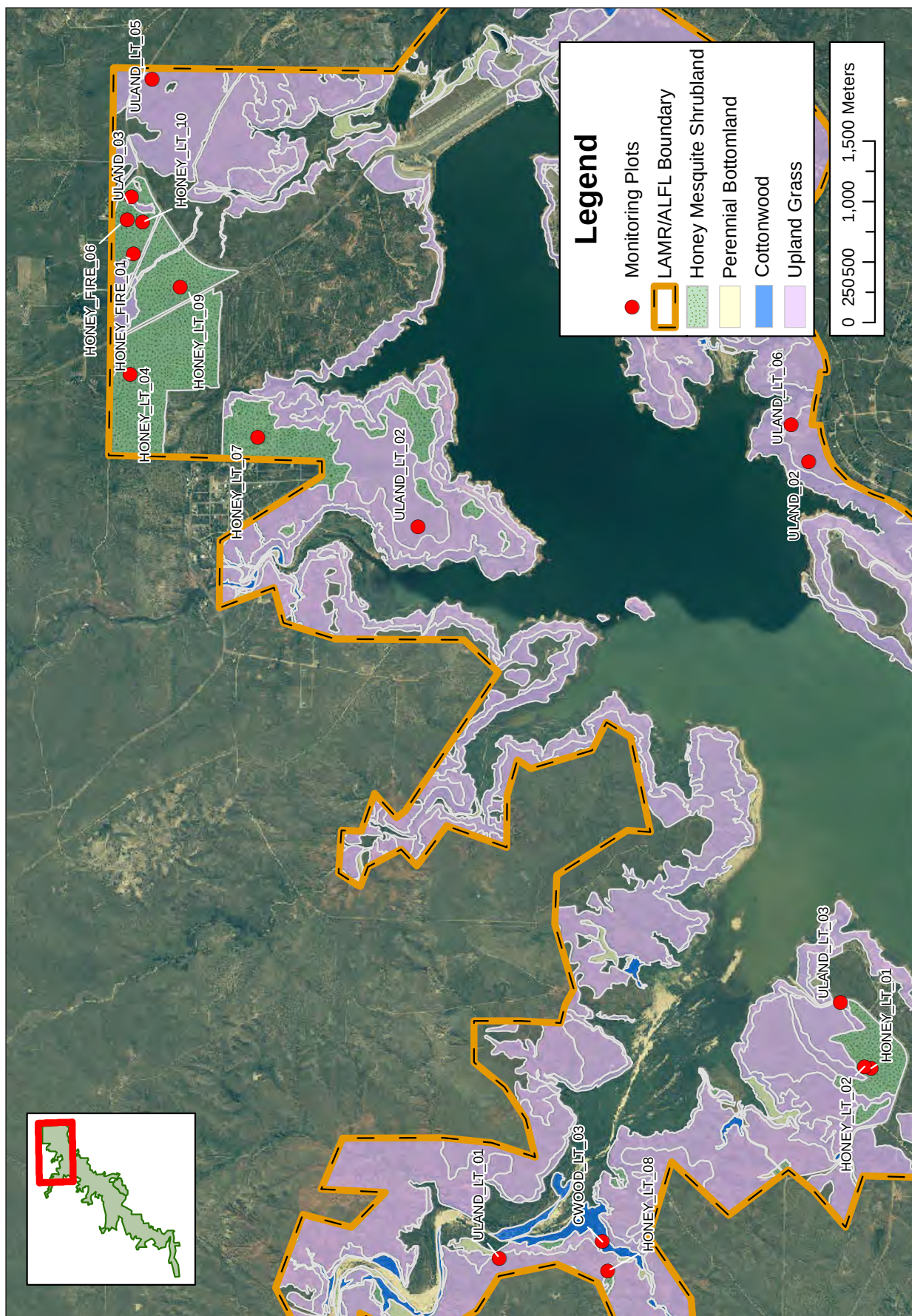


Figure 4.6-2. Monitoring plots, Lake Meredith NRA and Alibates Flint Quarries NM, Upper, 2010 and 2011.

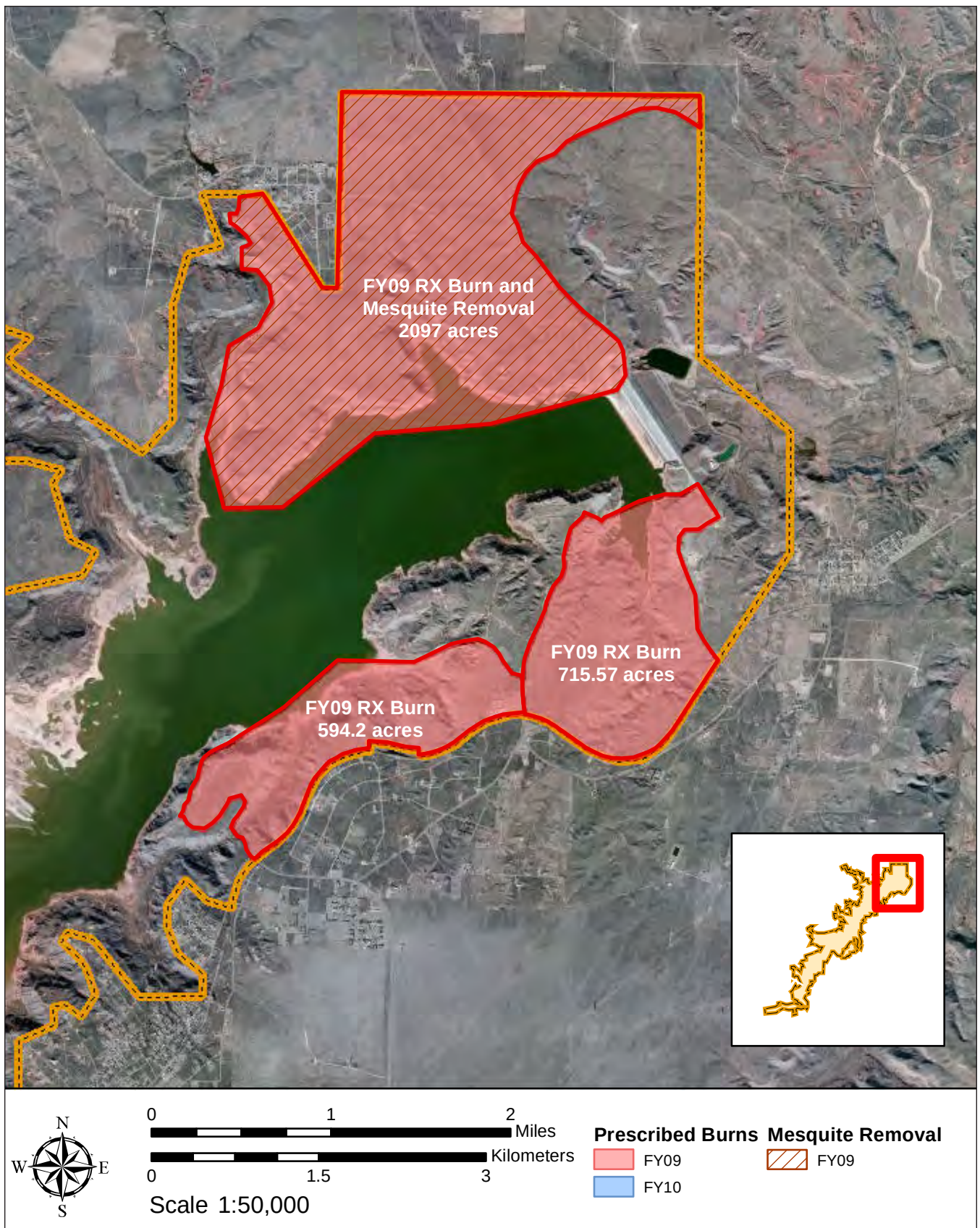


Figure 4.6-3. Prescribed treatment or wildland fires since 2009, Upper Lake Meredith NRA/Alibates Flint Quarries NM, 2009..

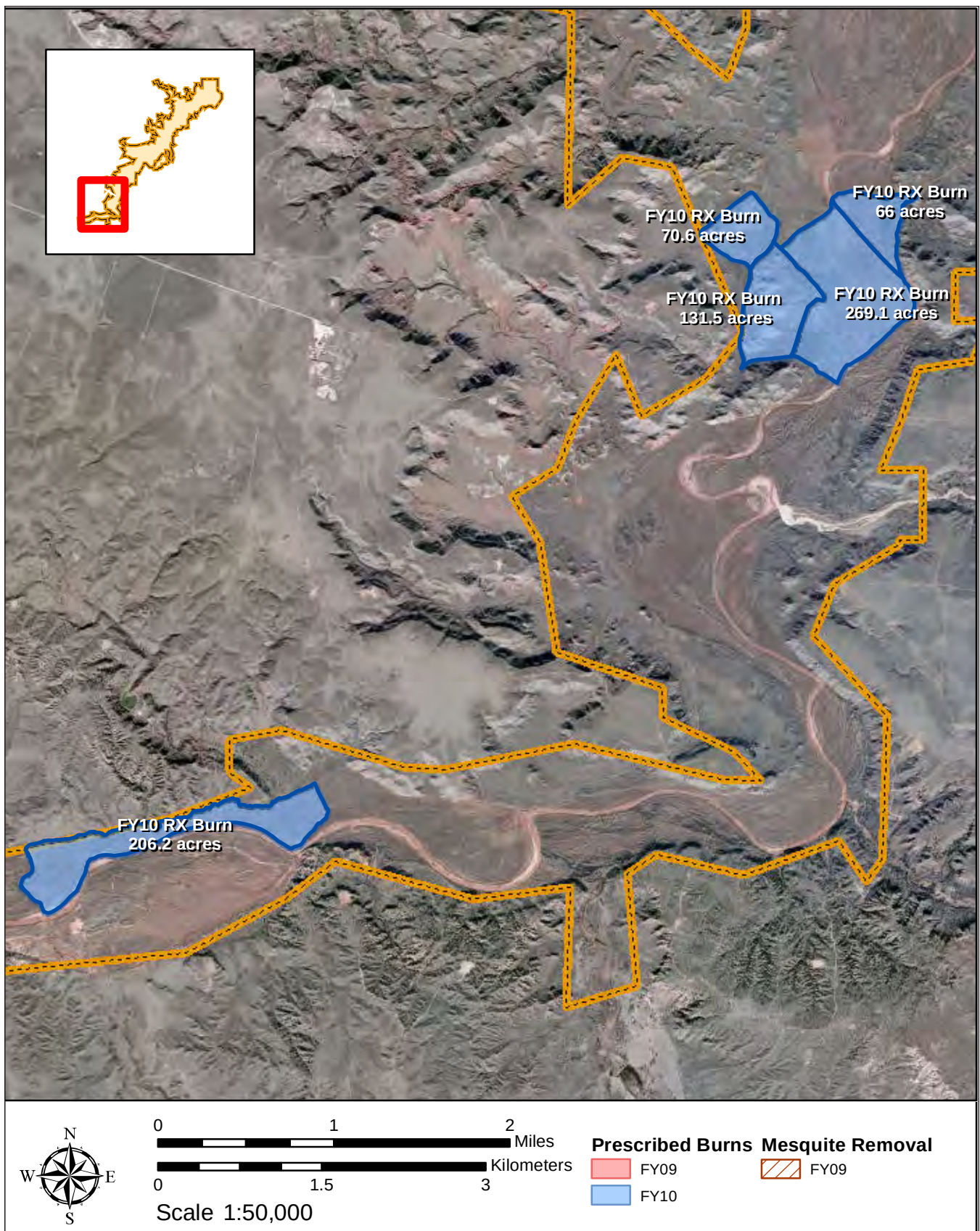


Figure 4.6-4. Prescribed treatment or wildland fires since 2009, Lower Lake Meredith NRA/Alibates Flint Quarries NM, 2010.

Table 4.6-2a. Within-plot cover values for each plant species detected during monitoring at each Upland-Honey Mesquite Shrubland transect, (part 1), Lake Meredith NRA, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values					
		HONEY-01		HONEY-F01		HONEY-F06		HONEY-F09		HONEY-LT01		HONEY-LT02		HONEY-LT04		MEAN	SE		
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011		
GRASS																			
BOUGRA	P	0	0	19.8	NS	11.7	3.6	NS	0	5.2	NS	8	.	10.2	NS	4.5519	1.4288	0.8444	0.3627
SPOCRY	P	1	2.7	8.1	NS	4.2	2.8	NS	0	21.8	NS	4.1	.	6.7	NS	3.5852	1.0004	0.4267	0.2479
BOUCUR	P	4.5	4.8	3.4	NS	0	0	NS	0	0	NS	0	0	7.6	NS	2.8593	0.5762	2.9389	1.4126
BUCDAC	P	0	0	0.2	NS	22	12.6	NS	0.9	4.6	NS	9.4	0	4.6	NS	2.1889	0.8863	0.675	0.6292
PANOBT	P	0.3	1	0	NS	1.6	0.8	NS	0	5	NS	0	0	0	NS	1.4519	0.6916	0.11	0.064
ARIPUR	P	0	0	3.8	NS	0.8	0	NS	0	1.2	NS	1.7	.	1.7	NS	1.2815	0.4732	0.3778	0.2275
LYCPHL	P	0	0	0	NS	0	0	NS	0	3.6	NS	0	0	0	NS	0.1333	0.1333	0	0
PANHAL	P	0	0	0	NS	0	0	NS	0	0.7	NS	0.8	0	0	NS	0.1148	0.0485	0.0476	0.0476
BOUHIR	P	0	0	0	NS	0.1	0	NS	1	0	NS	0	0	0	NS	0.0852	0.0511	0.0526	0.0526
DEAD	A/P	0	15	0	NS	0	0	NS	0	0	NS	0	17	0	NS	0	0	10.3125	2.2055
FORB																			
SALTRA	A	1.2	1	5.7	NS	4.8	0.8	NS	0.4	2.8	NS	0.9	0	0.8	NS	3.4333	1.0888	0.2714	0.1024
CHAERI	P	0	0	8.6	NS	1.6	3.4	NS	1	2.6	NS	2.3	0	4.8	NS	1.5815	0.6842	0.2476	0.1674
GUTSAR	P	1	0	0	NS	0	0	NS	0	0	NS	4	3	0	NS	1.0519	0.54	0.8048	0.4992
AMBPSI	A/P	3.3	0	0.9	NS	0.2	0	NS	0	0	NS	1.6	0.1	0.2	NS	1.0296	0.2425	0.2048	0.0898
MACPIN	P	0	0	0.2	NS	0.5	0.1	NS	0	0	NS	0	0	1.3	NS	0.8037	0.3389	0.16	0.0626
CHEPRA	A	0	0	0	NS	1.5	0	NS	0	0	NS	0	0	1	NS	0.3963	0.1843	0.0095	0.0095
KRALAN	P	0	0	0.1	NS	1.8	0.6	NS	0	0	NS	0	0	5.6	NS	0.337	0.2151	0.081	0.0429
SPHCOC	P	0	0	0	NS	0	0	NS	1.2	0.3	NS	1.6	1.2	0	NS	0.3222	0.1315	0.3714	0.1838
KOCSO	A	0	0	0	NS	0	0.2	NS	0	0	NS	0.2	0	0	NS	0.2556	0.0979	0.0667	0.034
CHALAT	P	0.1	0.7	0.8	NS	0	0	NS	0	0.6	NS	0.6	0	2	NS	0.2	0.0806	0.119	0.0689
THEMEG	P	0	0	0	NS	0.1	0	NS	0	0	NS	0	0	0.3	NS	0.137	0.0645	0.09	0.075
CROTEX	A	0	0.1	0	NS	0.4	0	NS	0	0.9	NS	0.3	0	0	NS	0.1148	0.0491	0.019	0.0112
CHEPAL	A	0	0	3	NS	0	0	NS	0	0	NS	0	0	0	NS	0.1111	0.1111	0	0
SOLELA	P	0	0.5	0	NS	0	0	NS	0.1	0	NS	0	0	0	NS	0.1037	0.0865	0.48	0.3977
GRIPAP	A/B	0	0	0	NS	0	0	NS	0	1.9	NS	0.2	0	0	NS	0.0963	0.0705	0.0286	0.0286

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2a. Within-plot cover values for each plant species detected during monitoring at each Upland-Honey Mesquite Shrubland transect, (part 1), Lake Meredith NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values								
		HONEY-01		HONEY-F01		HONEY-F06		HONEY-F09		HONEY-LT01		HONEY-LT02		HONEY-LT04		MEAN	SE	MEAN	SE	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	
FORB (cont.)																				
ERILON	P	0	0	0	NS	0.1	0.1	NS	0	0	NS	0	0	NS	0	0	0.0926	0.043	0.0714	0.0421
CIRUND	B/P	0	0	1	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0407	0.0371	0.0095	0.0095
HETSTE	P	0	0	0.6	NS	0.1	0	NS	0	0	NS	0	0	NS	0	0	0.0333	0.0233	0.0048	0.0048
CROMON	A	0.6	0.1	0	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0296	0.0232	0.0048	0.0048
HETCOM	P	0	0	0	NS	0	0	NS	0	0	NS	0	0	NS	0.2	0	0.0296	0.0232	0	0
CUSCUTA	P	0	0	0	NS	0.6	0	NS	0	0	NS	0	0	NS	0	0	0.0222	0.0222	0	0
CROGLA	A	0	0	0.2	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0148	0.0088	0	0
LYGJUN	P	0	0	0	NS	0	0	NS	0	0	NS	0	0.2	NS	0	0	0.0111	0.0082	0	0
MIMNUT	P	0	0	0	NS	0.1	0.1	NS	0	0	NS	0	0	NS	0	0.1	0.0111	0.0062	0.0048	0.0048
PLAPAT	A	0	0	0.3	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0111	0.0111	0.0571	0.0394
GAUCOC	P	0	0	0.2	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0074	0.0074	0.019	0.0112
HELCON	A	0	0	0.1	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0037	0.0037	0	0
LAPOCC	A/B	0	0	0.1	NS	0	0.2	NS	0.6	0	NS	0	0	NS	0	0	0.0037	0.0037	0.0381	0.0297
LEPDEN	A/B	0	0	0.1	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0037	0.0037	0	0
STISYL	P	0	0	0.1	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.0037	0.0037	0	0
CONRAM	A	0	1	0	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0	0	0.0476	0.0476
DESSES	P	0	0	0	NS	0	0	NS	0.7	0	NS	0	0	NS	0	0	0	0	0.0333	0.0333
HOFGLA	P	0	0	0	NS	0	0	NS	0.1	0	NS	0	0	NS	0	0	0	0	0.0048	0.0048
SHRUB/SUBSHRUB																				
YUCGLA	P	2	3.6	2.5	NS	1	3	NS	0	0	NS	0	6.2	6	0	0	2.1333	0.6565	3.2333	1.2127
ARTFIL	P	0	0	0.1	NS	0	0	NS	0	0	NS	0	0	NS	0	0	0.8074	0.4544	0.6	0.4536
OPULEP	P	0	0	0	NS	0	0	NS	0	1.6	NS	0	1	0	0	0	0.5111	0.4168	0	0
OPUPOL	P	0.2	0.6	0	NS	0	0	NS	0	0.1	NS	0	2.6	3	0	0	0.2259	0.1464	0.1857	0.1441
TREE																				
PROGLA	P	7.6	3.4	9	NS	0	0	NS	4	0	NS	6	5	1	NS	2.0148	0.7272	2.5238	0.9495	

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2b. Within-plot cover values for each plant species detected during monitoring at each Upland-Honey Mesquite Shrubland transect, (part 2), Lake Meredith NRA, 2010 and 2011

Vegetation code	Life cycle	Transect										Parkwide values					
		HONEY-LT05		HONEY-LT06		HONEY-LT07		HONEY-LT08		HONEY-LT09		HONEY-LT10		MEAN	SE	2011	2011
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																	
BOUGRA	P	0	NS	0	0.2	25.6	3	0	NS	0	0	18.2	.	4.5519	1.4288	0.8444	0.3627
SPOCRY	P	1.8	NS	0	0	3.6	.	0	NS	0.9	0.1	4.4	0	3.5852	1.0004	0.4267	0.2479
BOUCUR	P	2.2	NS	0.1	5.2	2.6	0	0.3	NS	4.2	.	1.4	.	2.8593	0.5762	2.9389	1.4126
BUCDAC	P	0	NS	0	0	0.1	0	0	NS	0.8	0	4.2	.	2.1889	0.8863	0.675	0.6292
ARIPUR	P	0	NS	0.1	1	0	0	0	NS	0.6	0	0.2	0	1.2815	0.4732	0.3778	0.2275
SCHSCO	P	2.6	NS	0	0	0	0	5.1	NS	0	0	0	0	0.8444	0.3101	0.6789	0.365
PANHAL	P	0	NS	0	0	0	0	0	NS	0.6	0	0	0	0.1148	0.0485	0.0476	0.0476
BOUHIR	P	0	NS	0	0	1	.	0.1	NS	0	0	0.1	.	0.0852	0.0511	0.0526	0.0526
ELYELY	P	0	NS	0	0	0	0	0	NS	0.1	0	0	0	0.063	0.0592	0	0
ERASES	P	0	NS	0	0	0.2	0	0	NS	0	0	0	0	0.0074	0.0074	0	0
DEAD	A/P	0	NS	0	6	0	13	0	NS	0	16	0	8	0	0	10.3125	2.2055
FORB																	
SALTRA	A	0	NS	0	0	19	1.6	0.6	NS	8	0	22.8	0.1	3.4333	1.0888	0.2714	0.1024
CHAERI	P	0.1	NS	0	0.1	0	0	0.2	NS	16.6	0	0	0	1.5815	0.6842	0.2476	0.1674
GUTSAR	P	3.2	NS	13.6	10	0	0	4.5	NS	0	0	0	0	1.0519	0.54	0.8048	0.4992
AMBPSI	A/P	1.3	NS	0.6	0	0.2	0.1	2.1	NS	0.2	0	0.2	0	1.0296	0.2425	0.2048	0.0898
MACPIN	P	0	NS	0	0	2.6	1	0	NS	2.1	0.1	1.7	0.2	0.8037	0.3389	0.16	0.0626
CHEPRA	A	0.1	NS	0	0	0	0	0	NS	1.5	0	4.1	0	0.3963	0.1843	0.0095	0.0095
KRALAN	P	0	NS	0.7	0.1	0	0	0	NS	0	0	0.6	0.1	0.337	0.2151	0.081	0.0429
SPHCOC	P	0	NS	0	0	1.2	0	0	NS	1.9	0	0	0	0.3222	0.1315	0.3714	0.1838
TETSCA	P	0	NS	0.2	0.3	0	0	0	NS	0	0	0	0	0.3148	0.2201	0.0238	0.0168
KOCSO	A	1.6	NS	0.2	0	0.2	0	0.1	NS	0	0	0	0	0.2556	0.0979	0.0667	0.034
MELLEU	P	0	NS	0	0	0	0	0.6	NS	0.1	0	0	0	0.2407	0.1261	0	0
CHALAT	P	0	NS	0.1	1.2	0.1	0	0	NS	0.2	0	0	0	0.2	0.0806	0.119	0.0689
THEMEG	P	0.2	NS	0.1	0	0	0	0	NS	0.1	0	1.6	0	0.137	0.0645	0.09	0.075
SOLELA	P	0	NS	0	0.2	0.5	0	0	NS	0	0	0	0	0.1037	0.0865	0.48	0.3977

Notes: Exotic species are highlighted.

A = annual; B = biennial; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2b. Within-plot cover values for each plant species detected during monitoring at each Upland-Honey Mesquite Shrubland transect, (part 2), Lake Meredith NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values					
		HONEY-LT05		HONEY-LT06		HONEY-LT07		HONEY-LT08		HONEY-LT09		HONEY-LT10		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																	
ERILON	P	0	NS	0.8	0.8	0	0	0	NS	0.1	0	0	0	0.0926	0.043	0.0714	0.0421
CIRUND	B/P	0	NS	0	0	0	0	0	NS	0	0	0.1	0	0.0407	0.0371	0.0095	0.0095
HETSTE	P	0	NS	0	0	0	0	0	NS	0	0	0.2	0	0.0333	0.0233	0.0048	0.0048
HETCOM	P	0	NS	0	0	0	0	0	NS	0.6	0	0	0	0.0296	0.0232	0	0
AMPDRA	A	0	NS	0	0	0.6	0	0	NS	0	0	0	0	0.0222	0.0222	0	0
CHELEP	A	0	NS	0.6	0	0	0	0	NS	0	0	0	0	0.0222	0.0222	0	0
DESILL	P	0.3	NS	0	0	0	0.2	0	NS	0	0	0	0	0.0185	0.012	0.0667	0.0575
ASCSUB	P	0	NS	0.1	0.1	0	0	0	NS	0	0	0	0	0.0111	0.0082	0.0143	0.0078
MIMNUT	P	0	NS	0	0	0	0	0	NS	0.1	0	0	0	0.0111	0.0062	0.0048	0.0048
PLAPAT	A	0	NS	0	0.6	0	0	0	NS	0	0.6	0	0	0.0111	0.0111	0.0571	0.0394
CHAPRO	A/P	0	NS	0	0	0	0.2	0	NS	0	0	0	0	0	0	0.0238	0.0168
HEDNIG	P	0	NS	0	0.1	0	0	0	NS	0	0	0	0	0	0	0.019	0.0148
TRARAM	P	0	NS	0	0.6	0	0	0	NS	0	0	0	0	0	0	0.0286	0.0286
SHRUB/SUBSHRUB																	
YUCGLA	P	4.6	NS	2.6	6.6	0.2	0	0	NS	0.2	0.6	0.1	1.4	2.1333	0.6565	3.2333	1.2127
ARTFIL	P	0.6	NS	0	0	0	0	0	NS	0	0	0	0	0.8074	0.4544	0.6	0.4536
RHUTRI	P	0	NS	0	0	0	0	0	NS	0	0	0	0	0.3407	0.2422	0	0
OPUPOL	P	0	NS	3.1	0.3	0	0	0	NS	0	0	0	0	0.2259	0.1464	0.1857	0.1441
MIMBOR	P	0.6	NS	0	10	0.1	0	0	NS	0.6	0	0	0	0.0481	0.0308	0.8095	0.5674
ECHREI	P	0	NS	0.1	0	0	0	0	NS	0	0	0	0	0.0037	0.0037	0	0
OPUPHA	P	0	NS	0	3	0	0	0	NS	0	0	0	0	0	0	0.1429	0.1429
TREE																	
PROGLA	P	0	NS	0	0	5	8	0	NS	14.2	15.6	8.6	11.6	2.0148	0.7272	2.5238	0.9495

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2c. Within-plot cover values for each plant species detected during monitoring at each Floodplain-Perennial Bottomland and Riparian-Cottonwood transect, Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011

Vegetation code	Life cycle	Transect																Parkwide values			
		BLAND-LT01		BLAND-LT02		BLAND-LT03		BLAND-LT04		CWOOD-LT01		CWOOD-LT02		CWOOD-LT03		CWOOD-LT04		MEAN	SE	2010	2011
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011						
GRASS																					
SPOCRY	P	0.9	0	1	0	0	0	1.4	NS	0	0	0	0	7.8	NS	0	0.7	3.5852	1.0004	0.4267	0.2479
BOUCUR	P	0	0	7.9	0	9.4	25	0	NS	0	0.8	6.6	6.6	1	NS	0	0.6	2.8593	0.5762	2.9389	1.4126
BUCDAC	P	0	0	0	0	0	0	0	NS	0	0	0	0	3.4	NS	0	0	2.1889	0.8863	0.675	0.6292
PANOBT	P	0.4	0	0	0	0	0	7.9	NS	0	0	0	0	0	NS	0	0	1.4519	0.6916	0.11	0.064
ARIPUR	P	0	0	0	0	0	0.6	0	NS	3.2	0	0	0	0	NS	0	0	1.2815	0.4732	0.3778	0.2275
SCHSCO	P	0	0	0	0	4.8	0.6	0	NS	0	0.1	3.7	3	0	NS	2.8	6.2	0.8444	0.3101	0.6789	0.365
ANDGER	P	0	0	0	0	0	0	0	NS	7	4.3	5	3.7	0	NS	7.8	2	0.7333	0.414	0.4762	0.2735
SORNUT	P	0	0	3.6	0	0	1	0	NS	0	0.6	7.1	0	0	NS	2.2	0.6	0.4778	0.2973	0.1048	0.0596
SORHAL	P	0	0	0	0	0	0	0	NS	9.4	2.1	0	0	0	NS	0	0	0.3556	0.3479	0.1	0.1
DISSPI	P	0	0	0.2	3.7	0	0	3.1	NS	2.8	0.7	0.1	3	0	NS	0	3.6	0.2556	0.1515	0.5238	0.2689
SPOAIR	P	0	0	0	0	6.8	0.8	0	NS	0	0	0	0	0	NS	0	0	0.2519	0.2519	0.04	0.04
PANHAL	P	0	0	0.6	0	0	0	0	NS	0	0	0.4	1	0	NS	0	0	0.1148	0.0485	0.0476	0.0476
BOTLAG	P	0	0	0.1	1.6	0	0	0	NS	0	0	2	0.1	0	NS	0	0	0.0778	0.074	0.081	0.0761
ANDHAL	P	0	0	0.3	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0.0704	0.0599	0	0
ELYCAN	P	0	0	0	0	0.4	1	0	NS	0	5.1	0	0	0	NS	0	0	0.0148	0.0148	0.2905	0.2451
DEAD	A/P	0	.	0	.	0	25	0	NS	0	10	0	.	0	NS	0	4	0	0	10.3125	2.2055
PANVIR	P	0	0	0	0	0	0.3	0	NS	0	1.8	0	0	0	NS	0	0	0	0	0.1	0.0862
PASSMI	P	0	3.1	0	0	0	0	0	NS	0	0.6	0	0.2	0	NS	0	0	0	0	0.1857	0.1487
FORB																					
SALTRA	A	0	0.6	0.4	0	0	0	2.6	NS	0.6	0	2.7	0	0	NS	1.8	0	3.4333	1.0888	0.2714	0.1024
GUTSAR	P	0	0	0	0.1	0	0	0	NS	0	0	0	0	0	NS	0	0.4	1.0519	0.54	0.8048	0.4992
AMBPSI	A/P	0	0	2.1	1.1	0.2	0	0	NS	0	0	0.6	1.3	3.8	NS	1.6	1.1	1.0296	0.2425	0.2048	0.0898
MACPIN	P	0	0	0.5	0.6	0	0	0	NS	0	0	0	0	0	NS	0	0	0.8037	0.3389	0.16	0.0626
KOCSO	A	0.6	0.6	0.1	0.3	1.2	0	0.6	NS	0	0	0	0	0	NS	0	0	0.2556	0.0979	0.0667	0.034
MELLEU	P	0	0	0	0	0	0	1.4	NS	0	0	0	0	0	NS	0	0	0.2407	0.1261	0	0
THEMEG	P	0	0	0.8	1.5	0.1	0.1	0	NS	0	0	0	0	0	NS	0	0	0.137	0.0645	0.09	0.075
CROTEX	A	0	0	0	0	0	0	0	NS	0	0	0	0	0.1	NS	0	0	0.1148	0.0491	0.019	0.0112

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2c. Within-plot cover values for each plant species detected during monitoring at each Floodplain-Perennial Bottomland and Riparian-Cottonwood transect, Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect																Parkwide values					
		BLAND-LT01		BLAND-LT02		BLAND-LT03		BLAND-LT04		CWOOD-LT01		CWOOD-LT02		CWOOD-LT03		CWOOD-LT04		MEAN	SE	MEAN	SE		
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011		
		Forb (cont.)																					
SOLELA	P	0	8	0	0	0	0	0	0	NS	0	0	0	0	0	0	0	0	0.1037	0.0865	0.48	0.3977	
GRIPAP	A/B	0	0	0.2	0.6	0	0	0	0	NS	0	0	0	0	0	0	0	0	0.0963	0.0705	0.0286	0.0286	
CIRUND	B/P	0	0	0	0	0	0	0	0	NS	0	0	0	0.2	0	NS	0	0	0.0407	0.0371	0.0095	0.0095	
DESILL	P	0	0	0.1	1.2	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0.0185	0.012	0.0667	0.0575	
EQUJAE	P	0	0	0.3	2.8	0	0	0	0	NS	0	0	0	0	0	NS	0.2	4.8	0.0185	0.0131	0.3619	0.2588	
CROGLA	A	0	0	0	0	0	0	0	0	0.1	NS	0	0	0	0	NS	0	0	0.0148	0.0088	0	0	
ASCSUB	P	0	0	0	0.1	0	0	0	0	NS	0	0	0	0.1	0	NS	0	0	0.0111	0.0082	0.0143	0.0078	
GAUCOC	P	0	0	0	0.1	0	0	0	0	NS	0	0	0	0	0	NS	0	0.2	0.0074	0.0074	0.019	0.0112	
ASTMIS	P	0	0	0	0	0	0	0	0	NS	0	0	0.2	0	2.3	NS	0	0	0	0	0.119	0.1095	
CHEALB	A	0	1	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0476	0.0476	
CHEGLA	A	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0048	0.0048	
CONRAM	A	0	1	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0476	0.0476	
GAUVIL	P	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0095	0.0066	
GLYLEP	P	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0286	0.0286	
HEDNIG	P	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.019	0.0148	
LIAPUN	P	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0095	0.0066	
MELALB	A/P	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.581	0.4507	
SYMERI	P	0	0	0	NS	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	0	0	0.0571	0.0388	
SHRUB/SUBSHRUB																							
ARTFIL	P	0	0	0	0	0	0	0	0	NS	0	0	0	0	0	3.6	NS	0	0	0.8074	0.4544	0.6	0.4536
RHUTRI	P	0	0	0	0	0	0	0	0	NS	0	0	0	0	0	3.6	NS	0	0	0.3407	0.2422	0	0
TREE																							
FRAPEN	P	0	0	0	0	0	0	0	0	NS	0	0	0	0	0	7.2	NS	0	0	0.2667	0.2667	0	0
CELLAE	P	3.4	0.1	0	0	0	0	0	0	NS	0.8	0	0	0	0	0	NS	0	0	0.1556	0.1283	0.0048	0.0048
CELOCC	P	0	0	0	0	0	0	0	0	NS	0	0	0.5	0	0	0	NS	0	0	0	0	0.0238	0.0238
POPDEL	P	0	0	0	0	0	0	0	0	NS	0	0	.	0	0.2	0	NS	0	0	0	0	0.01	0.01

Notes: Exotic species are highlighted.
A = annual; B = biennial; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2d. Within-plot cover values for each plant species detected during monitoring at each Upland Grass transect, Lake Meredith NRA, 2010 and 2011

Vegetation code	Life cycle	Transect														Parkwide values					
		ULAND-02		ULAND-03		ULAND-LT01		ULAND-LT02		ULAND-LT03		ULAND-LT05		ULAND-LT06		ULAND-LT07		MEAN	SE	2010	2011
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS																					
BOUGRA	P	1.2	4.9	0.6	0	0.1	NS	16.2	0.1	3.8	.	0.6	0	1.7	0.9	NS	2.5	4.5519	1.4288	0.8444	0.3627
SPOCRY	P	0	0	0	0	0.2	NS	7.6	.	15.8	0.1	4.3	.	1.2	.	NS	.	3.5852	1.0004	0.4267	0.2479
BOUCUR	P	4.4	6.2	5	1.1	0	NS	0	0	6.2	0	4.6	.	5.8	2.6	NS	0	2.8593	0.5762	2.9389	1.4126
BUCDAC	P	1.6	0	4	0	0	NS	0	0	0	0	0	0	4.2	0	NS	0	2.1889	0.8863	0.675	0.6292
PANOBT	P	0	0	15	0	0	NS	0	0	8.8	.	0	0	0.2	0.4	NS	0	1.4519	0.6916	0.11	0.064
ARIPUR	P	5.2	4	1.6	0	0.1	NS	0	0	0	.	3	.	11.4	1	NS	0.2	1.2815	0.4732	0.3778	0.2275
SCHSCO	P	0.6	0.5	0	2.5	0	NS	0	0	0	0	3	.	0.2	0	NS	.	0.8444	0.3101	0.6789	0.365
SORHAL	P	0	0	0.2	0	0	NS	0	0	0	0	0	0	0	0	NS	0	0.3556	0.3479	0.1	0.1
DISSPI	P	0	0	0.6	0	0	NS	0	0	0	0	0	0	0.1	0	NS	0	0.2556	0.1515	0.5238	0.2689
BOUHIR	P	0	0	0	0	0	NS	0	0	0	0	1	0	0	0	NS	0	0.0852	0.0511	0.0526	0.0526
ANDHAL	P	0	0	0	0	0	NS	0	0	0	0	1.6	0	0	0	NS	0	0.0704	0.0599	0	0
ELYELY	P	0	0	0	0	0	NS	1.6	.	0	0	0	0	0	0	NS	0	0.063	0.0592	0	0
DEAD	A/P	0	3	0	0	0	NS	0	.	0	30	0	0	0	12	NS	.	0	0	10.3125	2.2055
FORB																					
SALTRA	A	0	0	4.5	1.1	0.1	NS	9.7	0	1.4	0	0.1	0	2.2	0	NS	0.1	3.4333	1.0888	0.2714	0.1024
CHAERI	P	1.8	0	0	0	1.4	NS	0	0	1.5	0.7	0	0	1.2	0	NS	0	1.5815	0.6842	0.2476	0.1674
GUTSAR	P	0	0	0	0.2	0	NS	0	0	1.2	3	0.8	0.2	0.1	0	NS	0	1.0519	0.54	0.8048	0.4992
AMBPSI	A/P	0.1	0	3.2	0.2	1.3	NS	0	0	0.2	0.3	3.9	0.1	0	0	NS	0	1.0296	0.2425	0.2048	0.0898
MACPIN	P	0.1	0.1	4.2	0.2	0	NS	8	.	0	0	0.3	0.7	0.2	0.2	NS	0	0.8037	0.3389	0.16	0.0626
CHEPRA	A	0	0	2.4	0	0	NS	0	0	0	0	0.1	0.2	0	0	NS	0	0.3963	0.1843	0.0095	0.0095
KRALAN	P	0	0	0	0	0	NS	0	0	0	0	0	0.7	0.3	0.2	NS	0	0.337	0.2151	0.081	0.0429
SPHCOC	P	0	0.2	0	0.2	0	NS	2.3	3.4	1.4	1.6	0	0	0	0	NS	0	0.3222	0.1315	0.3714	0.1838
TETSCA	P	5.2	0	0	0	0	NS	0	0	0	0	0	0	3.1	0.2	NS	0	0.3148	0.2201	0.0238	0.0168
KOCSCO	A	0.1	0	0	0.3	0	NS	0.1	0	0	0	0	0	1.9	0	NS	0	0.2556	0.0979	0.0667	0.034
MELLEU	P	2.8	0	0	0	0	NS	0	0	0	0	0	0	1.6	0	NS	0	0.2407	0.1261	0	0
CHALAT	P	0	0	0.2	0	0	NS	0.2	0	0.2	0.6	0	0	0.3	0	NS	0	0.2	0.0806	0.119	0.0689

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2d. Within-plot cover values for each plant species detected during monitoring at each Upland Grass transect, Lake Meredith NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect														Parkwide values					
		ULAND-02		ULAND-03		ULAND-LT01		ULAND-LT02		ULAND-LT03		ULAND-LT05		ULAND-LT06		ULAND-LT07		MEAN	SE	2010	2011
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
		Forb (cont.)																			
PARJAM	P	0	0	0	0	0	0	0	0	0	0	4	0	0.8	0	NS	0	0.1778	0.15	0	0
THEMEG	P	0.1	.	0	0	0	0	0	0	0	0	0	0	0.2	0	NS	0	0.137	0.0645	0.09	0.075
CROTEX	A	0.1	0.1	0.4	0	0	0	0	0	0.9	0.2	0	0	0	0	NS	0	0.1148	0.0491	0.019	0.0112
SOLELA	P	0	0.6	0	0	NS	2.3	.	0	0	0.2	0	0	0	0	NS	0	0.1037	0.0865	0.48	0.3977
SCURES	P	0	0	0	0	NS	0	0	0	0	0	2.7	0	0	0	NS	0	0.1	0.1	0	0
GRIPAP	A/B	0	0	0	0	NS	0.1	0	0.2	0	0	0	0	0	0	NS	0	0.0963	0.0705	0.0286	0.0286
LINRIG	A/P	0	0	0	0	NS	0	0	0	0	0	2.6	0.1	0	0	NS	0	0.0963	0.0963	0.0048	0.0048
ERILON	P	0.6	0.2	0	0	NS	0	0	0	0	0	0.1	0	0.7	0.4	NS	0	0.0926	0.043	0.0714	0.0421
PEDDIG	P	0	0	0	0	NS	0	0	0	0	0	1.4	0	0	0	NS	0	0.0519	0.0519	0	0
CHAMIS	A	0	0	0	0	NS	0	0	0	0	0	1.3	0	0	0	NS	0	0.0481	0.0481	0	0
HETSTE	P	0	0	0	0	NS	0	0	0	0	0	0	0	0	0.1	NS	0	0.0333	0.0233	0.0048	0.0048
COMERE	P	0	0	0.6	0	NS	0	0	0	0	0	0.2	0	0	0	NS	0	0.0296	0.0232	0	0
CROMON	A	0	0	0.2	0	NS	0	0	0	0	0	0	0	0	0	NS	0	0.0296	0.0232	0.0048	0.0048
ERIANN2	A/B	0	0	0	0	NS	0	0	0	0.7	0	0	0	0	0	NS	0	0.0259	0.0259	0	0
DESILL	P	0	0	0	0	NS	0	0	0	0	0	0	0	0	0	NS	0	0.0185	0.012	0.0667	0.0575
ARTLUD	P	0	0	0	0	NS	0.4	0	0	0	0	0	0	0	0	NS	0	0.0148	0.0148	0.005	0.005
CROGLA	A	0	0	0	0	NS	0	0	0	0	0	0.1	0	0	0	NS	0	0.0148	0.0088	0	0
ASCSUB	P	0	0	0	0	NS	0	0	0	0.2	0	0	0	0	0	NS	0	0.0111	0.0082	0.0143	0.0078
LYGJUN	P	0	0	0	0	NS	0	0	0	0.1	0	0	0	0	0	NS	0	0.0111	0.0082	0	0
GAUCOC	P	0	0	0	0	NS	0	0	0	0	0	0	0	0	0	NS	0	0.0074	0.0074	0.019	0.0112
PLARHO	A	0	0	0	0	NS	0.2	0	0	0	0	0	0	0	0	NS	0	0.0074	0.0074	0	0
ARGPOL	A/P	0	0	0	0	NS	0	0	0	0	0	0	0	0	0.1	NS	0	0.0037	0.0037	0	0
DALENN	P	0	0	0	0	NS	0	0	0	0.1	0	0	0	0	0	NS	0	0.0037	0.0037	0	0
ERIANN1	A	0	0	0	0	NS	0	0	0	0	0	0.1	0	0	0	NS	0	0.0037	0.0037	0	0
ERIMOD	P	0	0	0	0	NS	0	0	0	0	0	0	0	0	0.1	NS	0	0.0037	0.0037	0	0
HELANN	A	0	0	0	0	NS	0	0	0	0	0	0	0	0	0.1	NS	0	0.0037	0.0037	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-2d. Within-plot cover values for each plant species detected during monitoring at each Upland Grass transect, Lake Meredith NRA, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect														Parkwide values					
		ULAND-02		ULAND-03		ULAND-LT01	ULAND-LT02	ULAND-LT03	ULAND-LT05	ULAND-LT06		ULAND-LT07		MEAN	SE	MEAN	SE				
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
		Forb (cont.)																			
ASTMOL	P	0	0	0	0	0	NS	0	0	0	0	0	0	0.1	NS	0	0	0.0048	0.0048		
CHAPRO	A/P	0	0	0	0	0	NS	0	0	0	0	0	0	0.3	NS	0	0	0.0238	0.0168		
CHEGLA	A	0	0	0	0	0	NS	0	0	0	0	0.1	0	0	NS	0	0	0.0048	0.0048		
LIAPUN	P	0	0	0	0	0	NS	0	0	0	0	0	0	0.1	NS	0	0	0.0095	0.0066		
PENBAR	P	0	0	0	0	0	NS	0	0	0	0	3.6	0	0	NS	0	0	0.1714	0.1714		
VERBRA	A/P	0	0.6	0	0	0	NS	0	0	0	0	0	0	0	NS	0	0	0.0286	0.0286		
SHRUB/SUBSHRUB																					
YUCGLA	P	12	17.6	0	0.9	4	NS	0.2	0	6.8	5.2	11.2	19.6	0	0	NS	3.4	2.1333	0.6565	3.2333	1.2127
ARTFIL	P	0.1	0	11.4	9	3.8	NS	0	0	0	0	2.2	3.6	0	0	NS	0	0.8074	0.4544	0.6	0.4536
OPULEP	P	0	0	0	0	0	NS	0	0	0	0	0	0	11.2	0	NS	0	0.5111	0.4168	0	0
OPUPOL	P	0	0	0	0	0.1	NS	0	0	0	0	0	0	0	0	NS	0	0.2259	0.1464	0.1857	0.1441
DALFOR	P	0	0	0	0	0	NS	0	0	0	0	0	0	1.8	4.1	NS	0	0.0667	0.0667	0.1952	0.1952
MIMBOR	P	0	0	0	0	0	NS	0	0	0	0	0	0	0	7	NS	0	0.0481	0.0308	0.8095	0.5674
TREE																					
PROGLA	P	0	0	1.6	4	0	NS	0	0	1.4	1.4	0	0	0	0	NS	0	2.0148	0.7272	2.5238	0.9495
PINSSP	P	0.2	0	0	0	0	NS	0	0	0	0	0	0	0	0	NS	0	0.0074	0.0074	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.6-3a. Percentage of substrate cover for each Upland-Honey Mesquite Shrubland transect sampled (part 1), Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011

Cover	Transect																Park Totals			
	HONEY-01		HONEY-F01		HONEY-F06		HONEY-F09		HONEY-LT01		HONEY-LT02		HONEY-LT04		Mean	SE	Mean	SE		
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011		
SOILBARE	16	0	73	NS	43.9	0	NS	0	NS	8	NS	5.2	0	33.8	NS	29.841	4.252	0	0	
SOIOPEN	0	21	0	NS	0	13.6	NS	17.2	0	NS	0	3.6	0	NS	NS	0	0	19.267	2.5071	
SOILUNDER	0	1.6	0	NS	0	0	NS	3.6	0	NS	0	6.4	0	NS	NS	0	0	6.114	1.4981	
LITTER	77	74.8	4.4	NS	56	85.8	NS	65.6	92	NS	94.8	89.6	65.6	NS	65.97	4.6394	67.8	3.8479	67.8	3.8479
WOOD	0	0.6	1.4	NS	0.1	0.6	NS	12.8	0	NS	0	0	0.6	NS	1.337	0.408	4.21	1.3831	4.21	1.3831
ROCKLG	0	0	0	NS	0	0	NS	0	NS	0	NS	0	0	NS	0.141	0.0832	0.61	0.4516	0.61	0.4516
ROCKSM	0	2	1.1	NS	0	0	NS	0	NS	0	NS	0	0.4	NS	0.722	0.3318	1.676	0.9816	1.676	0.9816
CRUST	7	0	0	NS	0	0	NS	0.2	0	NS	0	0	0	NS	0.541	0.3101	0.248	0.1673	0.248	0.1673
LICHEN	0	0	0	NS	0	0	NS	0	NS	0	NS	0	0	NS	0	0	0	0	0	0
MOSS	0	0	0	NS	0	0	NS	0	NS	0	NS	0	0	NS	0	0	0	0	0	0

*The transects for Lake Meredith NRA/Alibates Flint Quarries NM are split into multiple tables, but these values cover all parkwide values.

NS = Not Sampled

Table 4.6-3b. Percentage of substrate cover for each Upland-Honey Mesquite Shrubland transect sampled (part 2), Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011

Cover	Transect																Park Totals			
	HONEY-LT05		HONEY-LT06		HONEY-LT07		HONEY-LT08		HONEY-LT09		HONEY-LT10		Mean		SE		Mean		SE	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	19.6	NS	8	0	46	0	19.4	NS	53.6	0	55.6	0	29.841	4.252	0	0	19.267	2.5071	0	0
SOIOPEN	0	NS	0	11.8	0	18.4	0	NS	0	25	0	31.8	0	0	0	0	6.114	1.4981	0	0
SOILUNDER	0	NS	0	9.2	0	10.6	0	NS	0	5.6	0	14.6	0	0	0	0	6.114	1.4981	0	0
LITTER	78.4	NS	80.6	62.6	49.8	65	79	NS	39.6	43.6	40	45.8	65.97	4.6394	67.8	3.8479	67.8	3.8479	67.8	3.8479
WOOD	0	NS	2	2.4	4.6	5.2	0	NS	6.8	25.8	4.4	7.6	1.337	0.408	4.21	1.3831	4.21	1.3831	4.21	1.3831
ROCKLG	0.6	NS	0	4	0	0	0	NS	0	0	0	0	0.141	0.0832	0.61	0.4516	0.61	0.4516	0.61	0.4516
ROCKSM	1	NS	4.6	7	0.6	0.8	0	NS	0	0	0	0.2	0.722	0.3318	1.676	0.9816	1.676	0.9816	1.676	0.9816
CRUST	0.4	NS	4.8	3	0	0	1.6	NS	0	0	0	0	0.541	0.3101	0.248	0.1673	0.541	0.3101	0.248	0.1673
LICHEN	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0	0	0	0	0

*The transects for Lake Meredith NRA/Alibates Flint Quarries NM are split into multiple tables, but these values cover all parkwide values.

NS = Not Sampled

Table 4.6-3c. Percentage of substrate cover for each Floodplain-Perennial Bottomland, Riparian-Cottonwood transect sampled, Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011

Cover	Transect																Park Totals			
	BLAND-LT01		BLAND-LT02		BLAND-LT03		BLAND-LT04		CWOOD-LT01		CWOOD-LT02		CWOOD-LT03		CWOOD-LT04		Mean	SE	Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
SOILBARE	26.4	0	77	0	0.6	0	23.6	NS	0	0	0	0	3.4	NS	51	0	29.841	4.252	0	0
SOIOPEN	0	23.8	0	33.6	0	0.6	0	NS	0	0	0	0	1.2	0	NS	0	0	0	19.267	2.5071
SOILUNDER	0	3	0	5.4	0	0	0	NS	0	0	0	0	0	0	NS	0	0	0	6.114	1.4981
LITTER	73	71.4	23	61	99.4	97.6	76.4	NS	95	90.6	98	96.2	95.6	NS	49	56	65.97	4.6394	67.8	3.8479
WOOD	0.6	1.8	0	0	0	1.8	0	NS	5	9.4	2	2.6	1	NS	0	0	1.337	0.408	4.21	1.3831
ROCKLG	0	0	0	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0.141	0.0832	0.61	0.4516
ROCKSM	0	0	0	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0.722	0.3318	1.676	0.9816
CRUST	0	0	0	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0.541	0.3101	0.248	0.1673
LICHEN	0	0	0	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0	NS	0	0	0	0	0	NS	0	0	0	0	0	0

*The transects for Lake Meredith NRA/Alibates Flint Quarries NM are split into multiple tables, but these values cover all parkwide values.
NS = Not Sampled

Table 4.6-3d. Percentage of substrate cover for each Upland-Upland Grass transect sampled, Lake Meredith NRA/Alibates Flint Quarries NM, 2010 and 2011

Cover	Transect																Park Totals			
	ULAND-02		ULAND-03		ULAND-LT01		ULAND-LT02		ULAND-LT03		ULAND-LT05		ULAND-LT06		ULAND-LT07		Mean	SE	Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
SOILBARE	26	0	50.4	0	24	NS	43.8	0	17.8	0	46.6	0	33	0	NS	0	29.841	4.252	0	0
SOIOPEN	0	33	0	35.8	0	NS	0	18	0	10.4	0	30.4	0	19.4	NS	25	0	0	19.267	2.5071
SOILUNDER	0	5.4	0	0	0	NS	0	29	0	5.6	0	8.8	0	6.6	NS	0	0	0	6.114	1.4981
LITTER	54	56.8	48	62	71.8	NS	49.8	41	81.4	83.6	52.2	55.8	57.4	44.6	NS	74.4	65.97	4.6394	67.8	3.8479
WOOD	0	0.6	0.6	2.2	0	NS	6.4	12	0	0	0	1.8	0.6	0.6	NS	0.6	1.337	0.408	4.21	1.3831
ROCKLG	0	0	1	0	0	NS	0	0	0	0	0.2	0	2	8.8	NS	0	0.141	0.0832	0.61	0.4516
ROCKSM	0	2.2	0	0	4.2	NS	0	0	0	0.4	1	2.2	7	20	NS	0	0.722	0.3318	1.676	0.9816
CRUST	0	2	0	0	0	NS	0	0	0.8	0	0	0	0	0	NS	0	0.541	0.3101	0.248	0.1673
LICHEN	0	0	0	0	0	NS	0	0	0	0	0	0	0	0	NS	0	0	0	0	0
MOSS	0	0	0	0	0	NS	0	0	0	0	0	0	0	0	NS	0	0	0	0	0

*The transects for Lake Meredith NRA/Alibates Flint Quarries NM are split into multiple tables, but these values cover all parkwide values.
NS = Not Sampled

4.7 Lyndon B. Johnson National Historical Park

4.7.1 2010 and 2011 sampling

A total of two long-term monitoring transects were established at Lyndon B. Johnson National Historical Park (LYJO; Figure 4.7-1). No fire monitoring transects were established due to the exclusion of fire as a management tool at the park. The plant community monitored at Lyndon B. Johnson NHP is restored grassland (Cogan 2007a) (Table 4.7-1). In 2010 and 2011, both transects were monitored.

4.7.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response. The restoration prairie at LYJO contains numerous perennial grasses with all but three being native. This area has been seeded repeatedly through the years but past land-use and a lack of consistent follow-up maintenance has kept the prairie from reaching its full potential. The most recent seeding took place in Fall 2010; while germination was good the following drought has impacted seedling establishment. It remains to be seen if any native seedlings persist. One varietal grass and two exotics are threatening the health of the grassland (see below). The varietal ‘Alamo’ switch grass (*Panicum virgatum*) is a durable drought-tolerant switchgrass that dominates the prairie, causing an imbalance in the system. There is a diverse mix of forbs present, the majority being short-lived or fully perennial and native.

The prairie area is threatened by the exotic grass K.R. bluestem (*Bothriochloa*

ischaemum). This mat-forming grass outcompetes other natives and can successfully form monocultures. Control is problematic and it appears to be limited only by hot summer fires. Johnsongrass (*Sorghum halepense*) is found in patches throughout the prairie but responds to treatment when administered. Additional herbicide control has been administered to the ‘Alamo’ switchgrass but consistent treatment will be required to eradicate it from the site. Exotic species present at LYJO are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.7.3 Prescribed fire treatments or wildfire occurrence

Prescribed burning is currently not an option at LYJO due to the urban location of the restoration prairie. No wildfires have occurred in recent history.

4.7.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review). Should prescribed fire again become an option at LYJO, any noted effects of burning will be presented in this section.

4.7.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications must be established with the park to map annual treatment areas. Pertinent information will be presented in this section when treatments are known. In 2010, herbicide treatment was implemented on Johnsongrass and ‘Alamo’ switchgrass throughout the restoration area.

Table 4.7-1. Plant community and sampling dates for each transect at Lyndon B. Johnson NHP, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
REST-LT01	Old Field	9/15/2010	6/16/2011
REST-LT02	Old Field	9/14/2010	6/14/2011

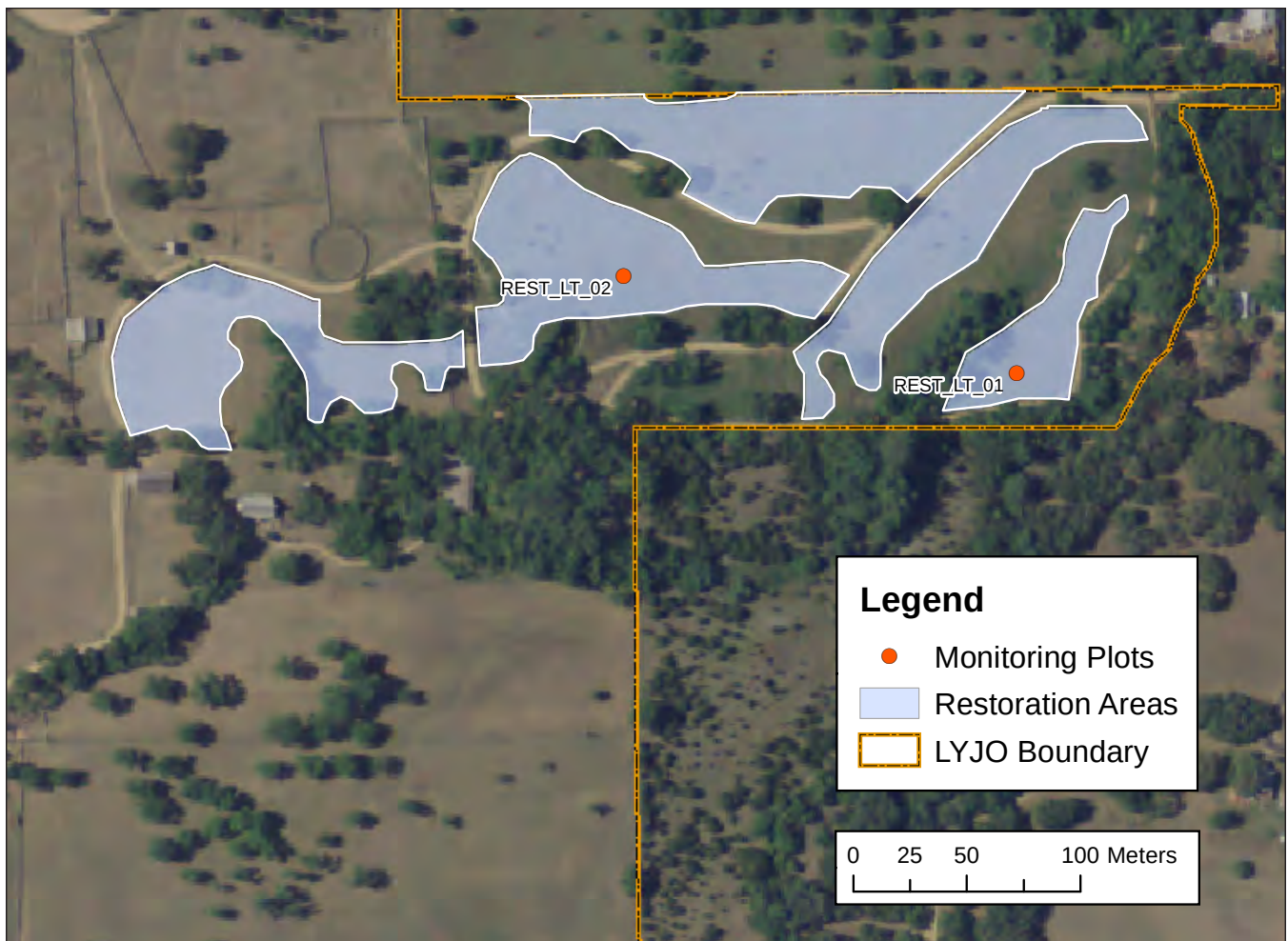


Figure 4.7-1. Monitoring transects, Lyndon B. Johnson NHP, 2010 and 2011.



A total of two long-term monitoring transects were established at Lyndon B. Johnson NHP.

Table 4.7-2. Within-plot cover values for each plant species detected during monitoring at each transect, Lyndon B. Johnson NHP, 2010 and 2011

Vegetation code	Life cycle	Transect				Parkwide values			
		REST-LT01		REST-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2010	2011	2011
GRASS									
BOUCUR	P	18.6	3.8	1.2	0.1	9.9	8.7	1.95	1.85
BOTISC	P	1.8	0.2	14.6	3.4	8.2	6.4	1.8	1.6
SCHSCO	P	0	2	14.2	19.8	7.1	7.1	10.9	8.9
SORHAL	P	0	0	10	0.6	5	5	0.3	0.3
SORNUT	P	3	3	0	1.4	1.5	1.5	2.2	0.8
ARIPUR	P	0	5.3	1.6	0.2	0.8	0.8	2.75	2.55
BOTLAG	P	0	0	1	0.1	0.5	0.5	0.05	0.05
CARSSP	P	0.1	0	0.8	0	0.45	0.35	0	0
DIGCOG	P	0.7	0	0.3	0	0.45	0.25	0	0
DICOLI	P	0.8	0.5	0	0	0.4	0.4	0.25	0.25
CYNDAC	P	0	0	0.2	0	0.1	0.1	0	0
NASLEU	P	0	0	0.2	0.3	0.1	0.1	0.15	0.15
ELYCAN	P	0.1	0	0	0	0.05	0.05	0	0
CARPLA	P	0	0.2	0	1.5	0	0	0.85	0.65
DISSPI	P	0	0	0	2	0	0	1	1
ELYVIR	P	0	0.3	0	0.2	0	0	0.25	0.05
LEPPAN	A/P	0	0	0	0.6	0	0	0.3	0.3
PANVIR	P	0	0	0	0.6	0	0	0.3	0.3
FORB									
IVAANG	A/B	24	6.9	7.6	0	15.8	8.2	3.45	3.45
CROMON	A	25.6	0	5.2	0	15.4	10.2	0	0
AGAHET	A	6.2	0	1.4	0	3.8	2.4	0	0
RATCOL	P	0.6	1.9	6.6	4.7	3.6	3	3.3	1.4
DESILL	P	5.2	0.7	0	0	2.6	2.6	0.35	0.35
SALCOC	A/P	0	0	5	0.1	2.5	2.5	0.05	0.05
ERAINT	P	2.7	0	0	0	1.35	1.35	0	0
HEDNIG	P	2.5	1	0	0.1	1.25	1.25	0.55	0.45
DICCAR	P	1.8	0	0	0	0.9	0.9	0	0
AMBPSI	A/P	0	0.3	1.6	2.8	0.8	0.8	1.55	1.25
GAUDRU	P	1.6	0	0	0	0.8	0.8	0	0
GRINUD	A/P	1.2	0.8	0	0	0.6	0.6	0.4	0.4
GLABIP	A/P	0.9	0.6	0	0	0.45	0.45	0.3	0.3
SYMERI	P	0.2	0.1	0.7	0.2	0.45	0.25	0.15	0.05
TRABRE	P	0.2	0	0.2	0.1	0.2	0	0.05	0.05
HYBVER	P	0.3	0.6	0	0.2	0.15	0.15	0.4	0.2
SCUDRU	A	0	0.2	0.3	0	0.15	0.15	0.1	0.1
CHANUT	A/P	0.1	0	0.1	0	0.1	0	0	0
CIRTEX	B/P	0.1	0	0.1	0.1	0.1	0	0.05	0.05

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.7-2. Within-plot cover values for each plant species detected during monitoring at each transect, Lyndon B. Johnson NHP, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect				Parkwide values			
		REST-LT01		REST-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2010	2011	2011
Forb (cont.)									
EUPDEN	A	0.2	0	0	0	0.1	0.1	0	0
EUPMAR	A	0.1	0	0.1	0	0.1	0	0	0
IPORUB	B/P	0.1	0.2	0.1	0	0.1	0	0.1	0.1
SIDABU	A/P	0	0.1	0.2	0.1	0.1	0.1	0.1	0
CALINV	P	0.1	0.4	0	0	0.05	0.05	0.2	0.2
CHATAI	A	0	0	0.1	0	0.05	0.05	0	0
CONCAN	A/B	0.1	0	0	0	0.05	0.05	0	0
OXASTR	P	0.1	0.1	0	0	0.05	0.05	0.05	0.05
DESPAN	P	0	0	0	0.1	0	0	0.05	0.05
ENGPER	P	0	0.4	0	0	0	0	0.2	0.2
GAIPUL	A/P	0	2.4	0	0.3	0	0	1.35	1.05
GAUCOC	P	0	0.1	0	0	0	0	0.05	0.05
GAUSUF	A	0	0	0	0.1	0	0	0.05	0.05
LINBER	A/P	0	0.1	0	0.1	0	0	0.1	0
MONCIT	A/P	0	0	0	0.1	0	0	0.05	0.05
PHYCIN	P	0	0	0	0.1	0	0	0.05	0.05
RUDHIR	A/P	0	0.2	0	0.1	0	0	0.15	0.05
SYMPRA	P	0	0.1	0	0	0	0	0.05	0.05
TRARAM	P	0	0	0	0.1	0	0	0.05	0.05
VERHAL	P	0	0	0	0.1	0	0	0.05	0.05
SHRUB/SUBSHRUB									
RUBABO	P	3	0	1.4	0	2.2	0.8	0	0
RHUCOP	P	0.6	0	0	0	0.3	0.3	0	0
OPULEP	P	0	0.1	0	0	0	0	0.05	0.05
RUBTRI	P	0	0.8	0	0.6	0	0	0.7	0.1
TREE									
QUEFUS	P	0	0	0	4	0	0	2	2
VINE									
VITMUS	P	0	0	6.1	0.2	3.05	3.05	0.1	0.1
SMIBON	P	0.1	0.2	0.6	0.1	0.35	0.25	0.15	0.05
COCCAR	P	0	0.1	0	0.1	0	0	0.1	0
TOXRAD	P	0	0	0	0.1	0	0	0.05	0.05

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.7-3. Percentage of substrate cover for each transect sampled, Lyndon B. Johnson NHP, 2010 and 2011

Cover	Transect				Park Totals			
	REST-LT01		REST-LT02		MEAN	SE	MEAN	SE
	2010	2011	2010	2011	2010	2010	2011	2011
SOILBARE	63	0	12	0	37.5	25.5	0	0
SOILOPEN	0	20.4	0	5	0	0	12.7	7.7
SOILUNDER	0	3.6	0	0.8	0	0	2.2	1.4
LITTER	29.6	70.8	88	94.2	58.8	29.2	82.5	11.7
WOOD	7	5	0	0	3.5	3.5	2.5	2.5
ROCKLG	0	0	0	0	0	0	0	0
ROCKSM	0.4	0.2	0	0	0.2	0.2	0.1	0.1
CRUST	0	0	0	0	0	0	0	0
LICHEN	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0	0

4.8 Pecos National Historical Park

4.8.1 2010 and 2011 sampling

A total of eight fire and eight long-term monitoring transects were established at Pecos National Historical Park (PECO; Figure 4.8-1). The plant community monitored at Pecos NHP is shortgrass steppe. The vegetation map for Pecos NHP is not final, but preliminary data furnished by the cooperator was used for sample selection. In 2010 and 2011, all long-term transects were monitored. No fire-event transects were monitored by SOPN crew during this time.

4.8.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response. The grasslands at PECO are primarily native perennial grasses dominated by blue grama (*Bouteloua gracilis*). Areas within our transects appear to be healthy with no exotic grasses present, although areas with exotic species of grass are known to occur elsewhere in the park. The ground strata is about evenly divided between

litter and bare soil; it is often observed that bare soil areas are suffering from wind erosion, resulting in pedestaled grass bases. Roughly two-thirds of the forbs monitored are perennial and there is good diversity of species.

The two most frequently encountered exotics are prickly lettuce (*Lactuca serriola*) and western salsify (*Tragopogon dubius*), both annuals or biennials. When prickly lettuce was found in fewer transects but in higher numbers, while western salsify was widespread. These exotics have similar seed dispersal mechanisms (windborne) and will likely continue to increase until control measures are in place. Exotic species present at CAVO are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.8.3 Prescribed fire treatments or wildfire occurrence

Fire events at PECO are overseen by the Bandelier Fire Group (BFG), a separate unit from the Southern Plains Fire Group. An agreement to share monitoring data has been reached and will be implemented within the next year. Prescribed fire is actively used in PECO and a map of historic burns is being produced for reference. Prescribed burns were planned



A total of eight fire and eight long-term monitoring transects were established at Pecos NHP.

for 2011 but environmental conditions precluded activity until Fall. There have been no wildfires in PECO within the past 5 years.

4.8.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review). As monitoring progresses, any noted effects of burning will be presented in this section.

4.8.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with the Southern Plains/ Chihuahuan Desert Exotic Plant Management Team to map annual treatment areas. Previous years have seen treatments of Scotch thistle (*Onopordum acanthium*).

Table 4.8-1. Plant community and sampling dates for each transect at Pecos NHP, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
LT04	Blue Grama/Treatment	8/22/2010	7/28/2011
LT05	Blue Grama/Treatment	8/23/2010	7/27/2011
LT07	Blue Grama/Treatment	8/21/2010	7/27/2011
LT10	Blue Grama/Treatment	8/22/2010	7/28/2011
LT12	Blue Grama/Treatment	8/21/2010	7/27/2011
LT16	Blue Grama/Treatment	8/23/2010	7/28/2011
LT17	Blue Grama/Treatment	8/23/2010	7/27/2011
LT19	Blue Grama/Old Field	8/22/2010	7/28/2011

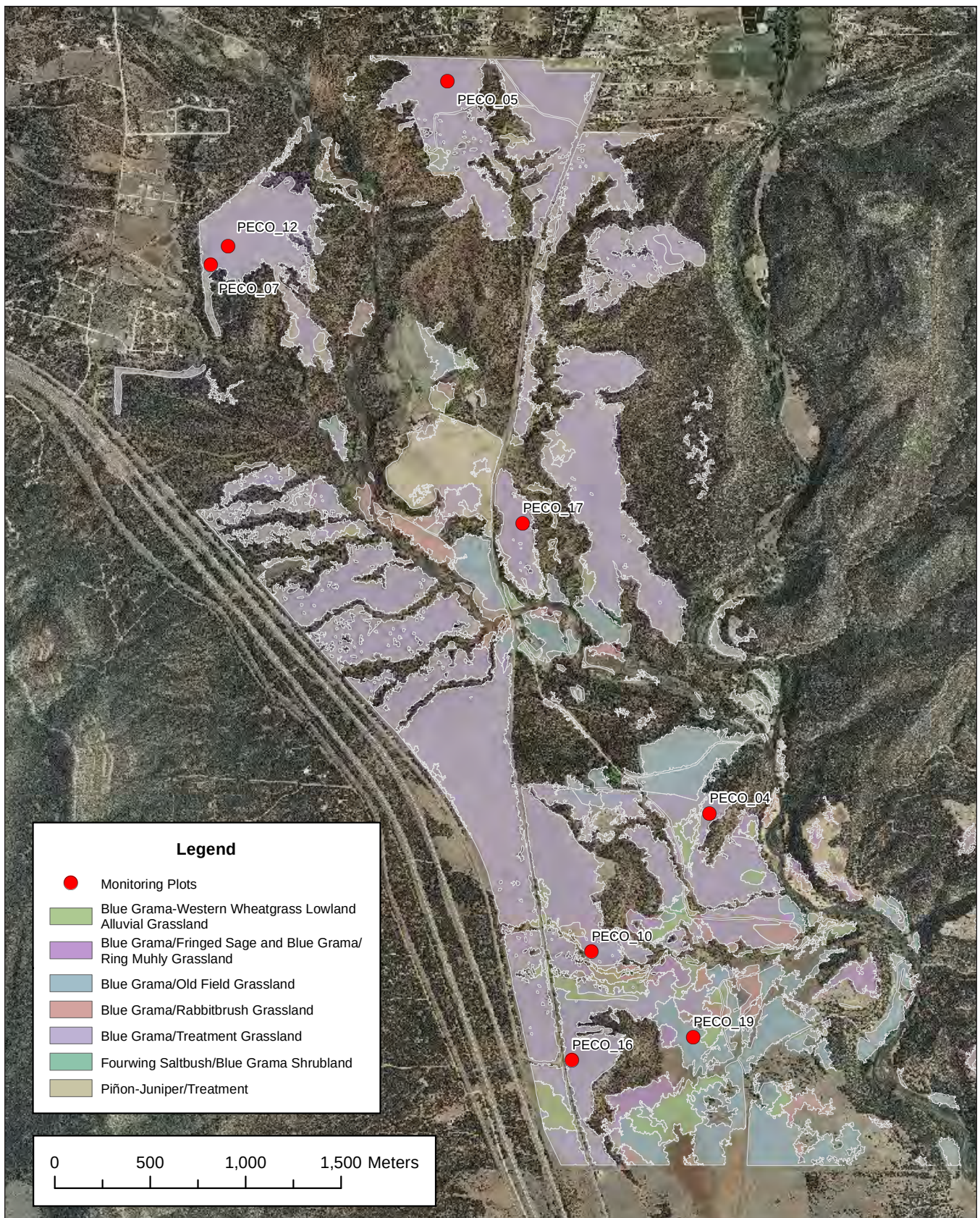


Figure 4.8-1. Monitoring transects, Pecos NHP, 2010 and 2011.

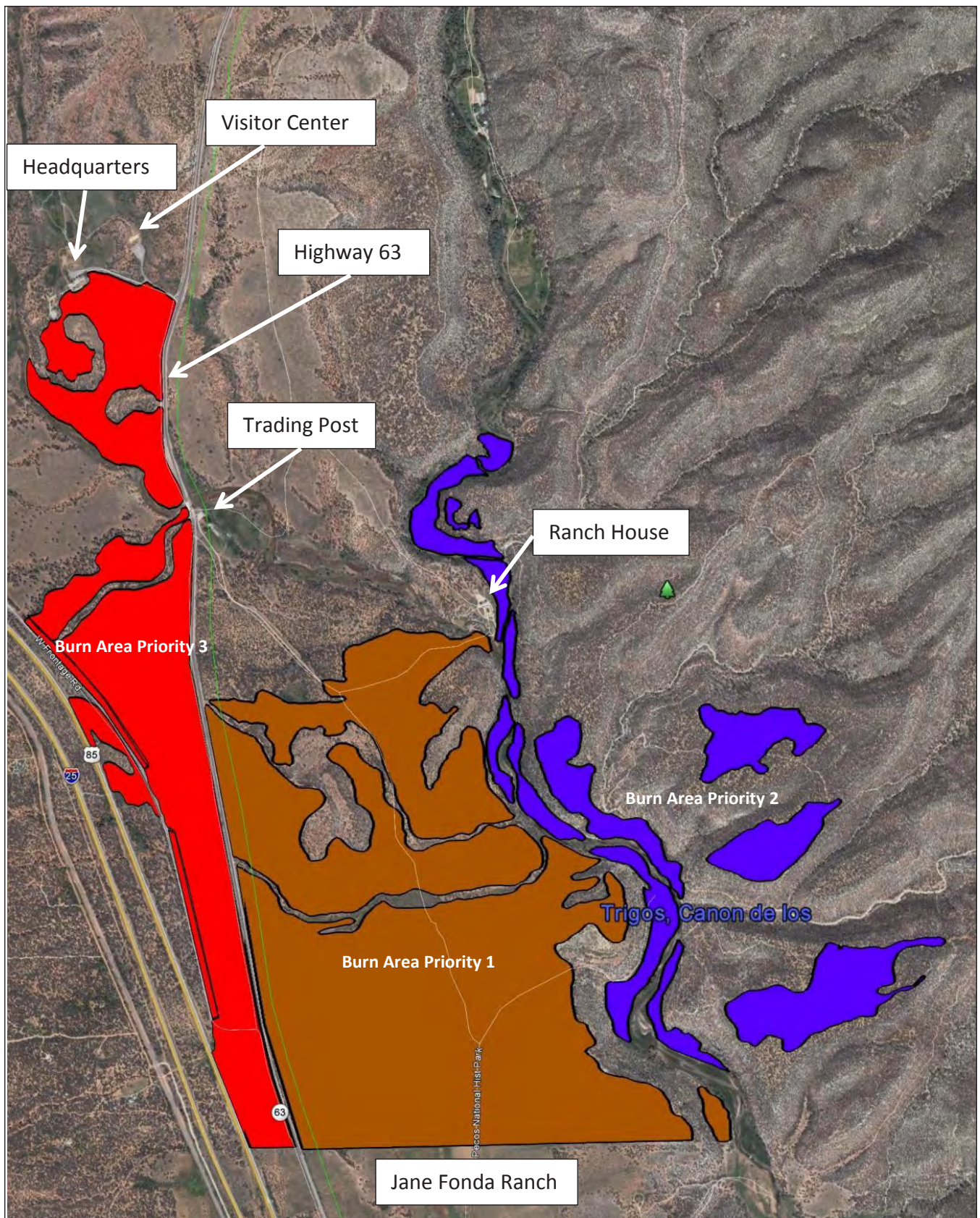


Figure 4.8-2. Potential prescribed treatment or wildland fires, Pecos NHP, 2011.

Table 4.8-2. Within-plot cover values for each plant species detected during monitoring at each transect, Pecos NHP, 2010 and 2011

Vegetation code	Life cycle	Transect												Parkwide values							
		LT04		LT05		LT07		LT10		LT12		LT16		LT17		LT19		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
GRASS																					
BOUGRA	P	4.2	2.2	5.7	1.6	17.2	4.2	14.6	10.2	21.8	1.5	14	18.6	11	3.7	30	25	14.8125	2.9764	8.375	3.1477
ELYELY	P	1.5	1.2	9.7	2.4	6.7	1	3	2.1	3.3	0	6.7	0.8	1.8	0.4	0.2	0	4.1125	1.1494	0.9875	0.3165
BOUCUR	P	4.3	4.6	0	0	6.4	1.8	2.8	0	3.6	1	0	0.6	13.2	2.4	0	0	3.7875	1.5796	1.3	0.5669
LYCSET	P	0.2	0	1.2	0	2	0	0.6	0	1.2	0	1	0	3	0	0	0	1.15	0.3459	0	0
ARIPUR	P	2	4.3	0	0	2.7	5.6	0.6	0.6	1	0	0	0	0	0	0	0	0.7875	0.3705	1.3125	0.8065
BUCDAC	P	0	0	0	0	0	0	0	0	3.6	0	0	0	0	0	0.6	0	0.525	0.4455	0	0
PASSMI	P	0	0.6	0	0.8	0	•	0	0.7	0	•	0	0	0	0	4	0.1	0.5	0.5	0.3667	0.152
MUHTOR	P	0	0	1.2	0.1	0	0	2.2	0	0	0	0	0	0.1	0.1	0	0	0.4375	0.2915	0.025	0.0164
SPOCRY	P	0.8	0.6	0	0	0	0	0	0.6	0	0	0.2	0	0	0	0	0	0.125	0.0996	0.15	0.0982
POAFEN	P	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0	0.1125	0.1125	0	0
MUHWRI	P	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0	0
PANCAP	A	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.0125	0.0125	0	0
PLEJAM	P	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.0125	0.0125	0	0
POABIG	A	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0	0
DEAD	P	0	0	0	14	0	•	0	4	0	12	0	0	0	0	0	2	0	0	5	2.1492
MUHMOM	P	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0.0125	0.0125
FORB																					
MENSCA	P	6	1.4	1.6	5	0	0	12.2	0	0.8	0.1	1.7	2	0.8	0	0	0	2.8875	1.4933	1.0625	0.6259
ERIFLA	B	0	0	0.3	0	1.6	0	0	0	8.6	0	12.5	0	0	0	0	0	2.875	1.7255	0	0
CORWRI	A	17.4	0.1	0	0.6	0	0	0	0	0	0	0	0	4.7	0	0	0	2.7625	2.1704	0.0875	0.0743
GUTSAR	P	6.8	0.7	4	0.2	0.2	0.2	0	1.4	0.6	1.5	5.3	6.8	0.5	1.3	0.1	0.1	2.1875	0.9702	1.525	0.7805
ERIJAM	P	0.6	2.1	5	0	0	0	1.6	0.6	0.3	0.7	0	0	9.2	3.2	0	0	2.0875	1.1786	0.825	0.4237
HETVIL	P	0	0	5	0	0.9	0.9	0.6	0.1	1	0.2	0.1	0	3.7	0	0	0	1.4125	0.6669	0.15	0.1102
TETARG	P	6.8	1	0	0	0.6	2.8	1.5	0	0.1	0.7	0.3	0.1	1.2	3.2	0	0	1.3125	0.8085	0.975	0.4624
MACPIN	P	0	0	0	0	3.2	1	1	0.4	0.3	0.7	4	4.6	0.6	0.6	0.1	0	1.15	0.5529	0.9125	0.543
CHAFEN	P	0.4	1	0.5	0	3.2	1.9	0.4	0.6	1.1	0.3	0	0	1.6	1.6	0.1	0	0.9125	0.3763	0.675	0.2664
DALCAN	P	0	0	0.2	0	0	0	0	0	0.1	0	0	0	6	1.1	0	0	0.7875	0.7451	0.1375	0.1375

Table 4.8-2. Within-plot cover values for each plant species detected during monitoring at each transect, Pecos NHP 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values							
		LT04		LT05		LT07		LT10		LT12		LT16		LT17		LT19		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																					
ERIANN2	A/B	0	0	1	0.2	3.1	0	0.2	0	1	0	0.1	0	0.1	0	0	0	0.6875	0.3753	0.025	0.025
PHLNAN	P	0	0	0	0	0.2	0	0	0	0.7	0	0	0	4.2	0	0	0	0.6375	0.5161	0	0
HYMRIC	P	1	0.3	0	2.6	1.3	0.6	0	0.6	0.7	0	0	0.6	0	0	0.3	0	0.4125	0.1846	0.5875	0.3038
CIRNEO	B/P	0	0	0	0.6	2.6	3.2	0.3	0.6	0.1	0.6	0	0	0	0	0	0	0.375	0.32	0.625	0.3825
THEMEG	P	1.1	0.3	0.8	0.1	0	0	0.8	0	0	0.2	0	0	0.3	0.4	0	0	0.375	0.1612	0.125	0.0559
ERIDIV	B	0	0	0.2	0.2	0	0	0	0	0.1	0.1	0.6	0	0	0	2	0	0.3625	0.2449	0.0375	0.0263
LACSER	A/B	0	0	1.9	0	0.7	0	0.2	0	0	0	0	0	0	0	0	0	0.35	0.2375	0	0
SPHFEN	P	0	0	0.2	1.6	0	0	0	0	2	0.6	0	0	0	0	0	0	0.275	0.2477	0.275	0.2033
TRADUB	A/B	0	0	0.1	0	0.3	0.1	0.1	0	0.1	0.2	0.9	0	0.4	0.1	0	0	0.2375	0.1068	0.05	0.0267
RATTAG	P	0	0	0	0.1	0	0	0	0	0	0	1.5	0	0	0.2	0	0	0.1875	0.1875	0.0375	0.0263
CHAERI	P	0	0	0	0	0.4	0.1	0.3	0	0	0	0.3	0	0.2	1.7	0	0	0.15	0.0598	0.225	0.2111
CHEPAL	A	0	0	0	0	0.2	0.6	0.1	0	0	0	0.8	0	0.1	0	0	0	0.15	0.0964	0.075	0.075
MIMRUP	P	1.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0.15	0.025	0.025
DALJAM	P	0	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0.1375	0.1375	0	0
ERICAN	P	0	0	0	0	0	0	0.1	0	0	1	0	0	1	0.5	0	0	0.1375	0.1238	0.1875	0.1315
GAIPIN	P	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.125	0.125	0	0
GAUCOC	P	0.1	0.5	0	1.2	0.1	2	0.1	4.4	0	0	0	3	0.6	0.4	0.1	0	0.125	0.0701	1.4375	0.5619
MELLEU	P	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.125	0.125	0.125	0.125
PLAPAT	A	0	0.2	0	0	0	0.2	0	0	0	0	0.8	0	0	0	0.2	0	0.125	0.0996	0.05	0.0327
CRYCIN	P	0	2.2	0.1	0	0	0	0	0	0	0	0.8	0.6	0	0	0	0	0.1125	0.099	0.35	0.2745
POROLE	A	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0.7	0	0.1125	0.0854	0	0
PSOTEN	P	0.6	1.8	0.1	0	0	0	0.1	0.6	0.1	0	0	0	0	0	0	0	0.1125	0.0718	0.3	0.2268
HELPET	A	0	0	0.2	0	0	0	0	0	0	0	0	0	0.6	0.1	0	0	0.1	0.0756	0.0125	0.0125
PENJAM	P	0	0	0	0	0.1	0	0	0	0.3	0	0	0	0.3	0	0	0	0.0875	0.0479	0	0
TALPAR	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0.2	0.0875	0.0875	0.025	0.025
VERBRA	A/P	0	0	0.2	0.6	0	0	0.1	0	0.3	0	0	0	0.1	0	0	0	0.0875	0.0398	0.075	0.075
ASCSUB	P	0	0	0	0	0.6	0.7	0	0	0	0	0	0	0	0	0	0	0.075	0.075	0.0875	0.0875

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
• = detected but no cover assigned
Mean and SE values are calculated across all plots in the park

Table 4.8-2. Within-plot cover values for each plant species detected during monitoring at each transect, Pecos NHP 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values							
		LT04		LT05		LT07		LT10		LT12		LT16		LT17		LT19		MEAN	SE	2010	2011
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011						
Forb (cont.)																					
ASTMOL	P	0	0	0.6	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.075	0.075	0.0125	0.0125
CHEWAT	A	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0.075	0.075	0	0
SPHCOC	P	0.6	0.6	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.075	0.075	0.0875	0.0743
ASTMIS	P	0	0.4	0	0.6	0	0.1	0	0	0	0.2	0.1	0.6	0.1	0.1	0	0	0.05	0.0267	0.2375	0.0905
HYMFIL	P	0.1	0	0	0	0.1	0	0	0	0	0.1	0	0	0.1	0	0	0	0.05	0.0189	0	0
LILSSP	P	0	0	0	0	0.2	0	0	0	0	0.2	0	0	0	0	0	0	0.05	0.0327	0	0
PHYSUB	A	0	0	0.2	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0.0375	0.0263	0.0125	0.0125
SALTRA	A	0	1	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0.0375	0.0375	0.125	0.125
CHAALB	P	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0.025	0.0164	0	0
CHEHIA	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0.025	0.025	0	0
DALAU	P	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.025	0.025	0	0
MIRLIN	P	0	0	0	0	0	0.1	0	0	0	0.1	0.3	0	0.1	0.6	0	0	0.025	0.0164	0.125	0.0773
PENSPP	P	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.025	0.025	0	0
PHYHED	P	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.025	0.0164	0	0
CONCAN	A/B	0	0	0	0	0	0	0	1	0	0	0	0.1	0	0	0	0	0.0125	0.0125	0.1375	0.1238
LAPOCC	A/B	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0	0
LESREC	A/B	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0	0
LINPUB	A	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0.0125	0.0125
ASTHUM	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.0125	0.0125
CASINT	P	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125
CIRUND	B/P	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.025	0.025
DESCOO	P	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.075	0.075
HACBES	B/P	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0.1	0.0756
KOCSO	A	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125
LITMUL	P	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125
MELOFF	A/P	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.0125	0.0125
SENFLA	P	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.375	0.2631

Notes: Exotic species are highlighted.
A = annual; B = biannual; P = perennial. NS = Not Sampled
• = detected but no cover assigned
Mean and SE values are calculated across all plots in the park

Table 4.8-2. Within-plot cover values for each plant species detected during monitoring at each transect, Pecos NHP 2010 and 2011, cont.

Vegetation code	Life cycle	Transect																Parkwide values			
		LT04		LT05		LT07		LT10		LT12		LT16		LT17		LT19		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)																					
TETACA	P	0	0	0	0	0	0	0	4.4	0	0	0	0	0	0	0	0	0	0	0.55	0.55
SHRUB/SUBSHRUB																					
ERINAU	P	4	0.1	0	0	0	0	0.8	0	1.4	0	0.8	0	0	0	0	0	0.875	0.4839	0.0125	0.0125
ARTFRI	P	0	0.6	0.6	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0.0875	0.0743	0.0875	0.0743
OPUPOL	P	0.1	0.1	0	0	0	0	0.2	0.4	0	0	0	0	0.2	0	0.1	0.1	0.075	0.0313	0.075	0.0491
ECHSPP	P	0	0	0	0	0.2	0	0	0	0	0	0.1	0	0	0	0	0	0.0375	0.0263	0	0
OPUPHA	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0.075	0.075
YUCGLA	P	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125
TREE																					
JUNMON	P	3	1.4	2	2.6	0	0.1	0	0	0	0	0	0	0	0	0	0	0.625	0.4199	0.5125	0.3441
PINEDU	P	0	0	0	0	0.1	0.2	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0.025	0.025
PINPON	P	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0125	0.0125	0	0
FRASSP	P	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0.025

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

• = detected but no cover assigned

Mean and SE values are calculated across all plots in the park

Table 4.8-3a. Percentage of substrate cover for each transect sampled (part 1), Pecos NHP, 2010 and 2011

Cover	Transect								Park Totals			
	LT04		LT05		LT07		LT10		MEAN	SE	MEAN	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011
SOILBARE	54.6	0	47.6	0	34.4	0	60	0	50.35	3.2629	0	0
SOIOPEN	0	46.4	0	30	0	29.6	0	54	0	0	39.075	3.8571
SOILUNDER	0	2	0	7	0	4	0	1	0	0	4.625	1.3355
LITTER	35.8	28.2	35	44	55.8	57.4	34	30.6	42.225	3.0551	45.45	4.8163
WOOD	6.4	13.4	12.9	17	4.5	8	5.2	13	4.65	1.5791	8.425	2.1861
ROCKLG	2.7	5.4	0	0	0	0	0	0	0.338	0.3375	0.675	0.675
ROCKSM	0.6	4.6	0.1	0	0	0	0.9	1.4	0.35	0.1282	0.875	0.5593
CRUST	0	0	1.4	2	3.3	1	0	0	0.962	0.4097	0.875	0.3504
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0	0	0.425	0.425	0	0

Table 4.8-3b. Percentage of substrate cover for each transect sampled (part 2), Pecos NHP, 2010 and 2011

Cover	Transect								Park Totals			
	LT12		LT16		LT17		LT19		MEAN	SE	MEAN	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2010	2011	2011
SOILBARE	52.4	0	40.8	0	51.4	0	61.6	0	50.35	3.2629	0	0
SOIOPEN	0	36.6	0	22.8	0	47	0	46.2	0	0	39.075	3.8571
SOILUNDER	0	8	0	4	0	11	0	0	0	0	4.625	1.3355
LITTER	39.4	42.8	54	68.6	45.8	39.2	38	52.8	42.225	3.0551	45.45	4.8163
WOOD	7.6	10.6	0.2	4.6	0.4	0.2	0	0.6	4.65	1.5791	8.425	2.1861
ROCKLG	0	0	0	0	0	0	0	0	0.338	0.3375	0.675	0.675
ROCKSM	0	0	0	0	0.6	0.6	0.6	0.4	0.35	0.1282	0.875	0.5593
CRUST	0.6	2	0.6	0	1.8	2	0	0	0.962	0.4097	0.875	0.3504
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	0	3.4	0	0	0	0	0	0.425	0.425	0	0

4.9 Sand Creek Massacre National Historic Site

4.9.1 2010 and 2011 Sampling

A total of 11 fire and 11 long-term monitoring transects were established at SandCreekMassacreNationalHistoricSite (SAND). Plant communities monitored at SAND are: upland grasslands consisting of blue grama-buffalograss herbaceous vegetation and alkali sacaton-saltgrass herbaceous vegetation; upland sage consisting of sand sage/ sideoats grama-blue grama shrubland and sand sage/sand bluestem shrubland, which are considered for type conversion; restoration consisting of reclaimed agricultural land which is of particular management interest to the park; cottonwood galleries containing cottonwood/western wheatgrass-switchgrass woodland, also of special interest to the park (Neid et al. 2007) (Table 4.9-1). All long-term transects were

monitored and no fire monitoring sites were monitored in 2010 or 2011.

4.9.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response. The grassland communities monitored at SAND contain native perennial grasses; no exotic grass species were detected in the transects although cheatgrass (*Bromus tectorum*) is to be found along the county road boundary. These stable grasslands contain a diverse mix of primarily perennial forbs. Roughly two-thirds of the ground strata is litter, which provides shade and moisture retention in this arid environment.

Table 4.9-1. Plant community and sampling dates for each transect at Sand Creek Massacre NHS, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
CWOOD-LT01	<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> - <i>Panicum virgatum</i> Woodland	7/9/2010	7/8/2011
CWOOD-LT02	<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> - <i>Panicum virgatum</i> Woodland	7/9/2010	7/9/2011
CWOOD-LT03	<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> - <i>Panicum virgatum</i> Woodland	7/11/2010	7/9/2011
RESTN-02	Reclaimed Agricultural Land	7/9/2010	7/6/2011
RESTS-LT01	<i>Artemisia filifolia</i> / <i>Andropogon hallii</i> Shrubland	7/9/2010	7/6/2011
UGRASS-05	<i>Sporobolus airoides</i> - <i>Distichlis spicata</i> Herbaceous	7/12/2010	7/7/2011
UGRASS-LT01	<i>Boutaloua gracilis</i> - <i>Buchloe dactyloides</i> Herbaceous	7/11/2010	7/9/2011
UGRASS-LT02	<i>Sporobolus airoides</i> - <i>Distichlis spicata</i> Herbaceous	7/10/2010	7/8/2011
UGRASS-LT04	<i>Boutaloua gracilis</i> - <i>Buchloe dactyloides</i> Herbaceous	7/9/2010	7/7/2011
UGRASS-LT05	<i>Boutaloua gracilis</i> - <i>Buchloe dactyloides</i> Herbaceous	7/12/2010	7/7/2011
USAGE-LT01	<i>Artemisia filifolia</i> / <i>Andropogon hallii</i> Shrubland	7/11/2010	7/8/2011
USAGE-LT02	<i>Artemisia filifolia</i> / <i>Andropogon hallii</i> Shrubland	7/12/2010	7/7/2011

Restoration efforts on two parcels of grassland show varying results. The older restoration at the north end of the park on CRP land shows better conversion to native forbs and grasses. The southern restoration area was in ruderal exotics and is just beginning establishment and has been limited by moisture. This area of loose sandy loam is subject to wind erosion and continued efforts at stabilization and exotic control will be needed for success.

In addition to the cheatgrass mentioned above, several annual forbs are found throughout the park. *Kochia* (*Kochia scoparia*) and prickly Russian thistle (*Salsola tragus*) are long established components of the agricultural suite of exotics and are easily spread throughout the landscape. The perennial field bindweed (*Convolvulus arvensis*) is present in restoration and upland sites and is of particular concern. The current drought has no effect on its ability to produce copious amounts of seed, giving it a competitive edge over the drought-dormant natives. Exotic species present at CAVO are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.9.3 Prescribed fire treatments or wildfire occurrence

The use of prescribed fire is being considered at SAND but has not been implemented. To date, mowing and debris removal are being used for fuels reduction. No wildfires have occurred during the last 5 years.

4.9.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review). As monitoring progresses, any noted effects of burning will be presented in this section.

4.9.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with both the park and the Southern Plains/ Chihuahuan Desert Exotic Plant Management Team to map annual treatment areas. Pertinent information will be presented in this section when treatments are known.

A total of 11 fire and 11 long-term monitoring transects were established at Sand Creek Massacre NHS.



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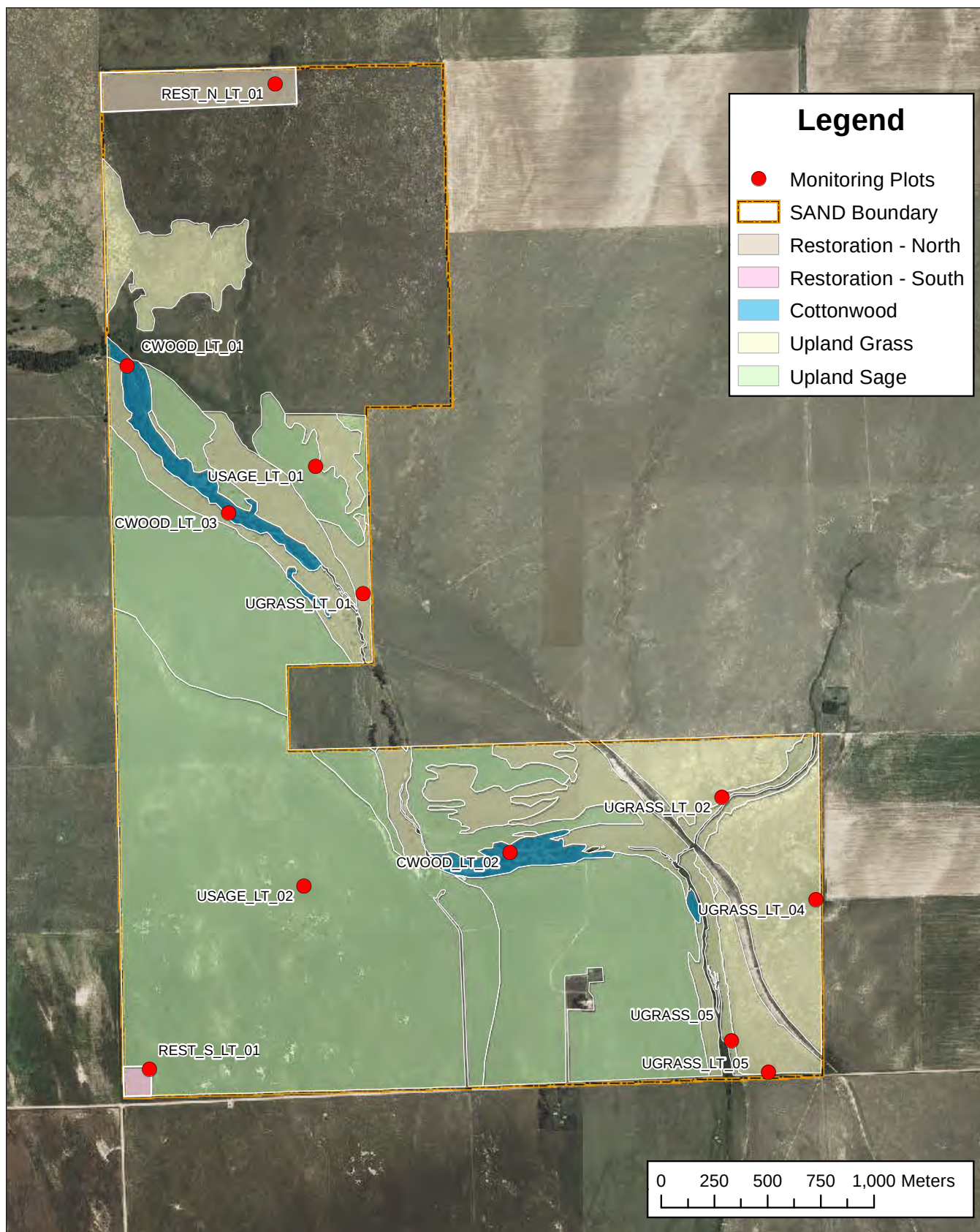


Figure 4.9-1. Monitoring transects, Sand Creek Massacre NHS 2010. and 2011

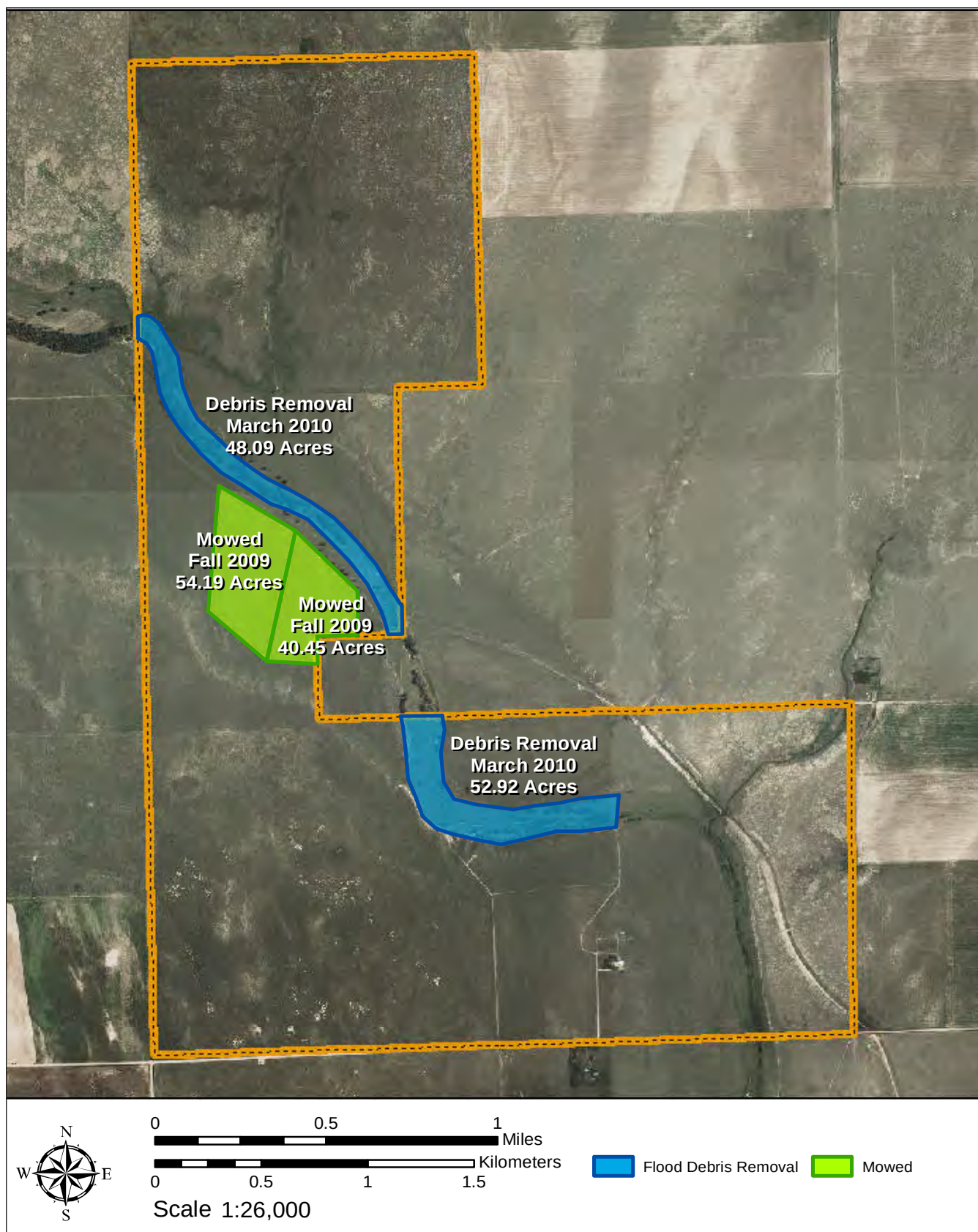


Figure 4.9-2. Prescribed treatment or wildland fires since 2009, Sand Creek Massacre NHS, 2010 and 2011

Table 4.9-2a. Within-plot cover values for each plant species detected during monitoring at each Cottonwood and Restoration transect, Sand Creek Massacre NHS, 2010 and 2011

Vegetation code	Life cycle	Transect									Parkwide values					
		CWOOD-LT01		CWOOD-LT02		CWOOD-LT03		RESTN-LT02		RESTS-LT01		MEAN	SE	MEAN	SE	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011					
GRASS																
BOUGRA	P	0	0	0	0	0	0	0	0	0	11	5.3	7.2917	3.799	2.125	1.284
PASSMI	P	32.1	19.1	5.7	8.6	0.8	0	4	0	0	0	0	7.1583	2.9004	7.275	3.0759
BOUCUR	P	0	0	0	0	0	0	0	33	34	5	1.6	5.75	3.3761	6.525	3.8538
DISSPI	P	0.1	9.6	0	2.6	3.8	1.3	0	0	0	0	0	2.4333	2.0753	3.4	1.8372
SPOAIR	P	0	0	0	0.6	1	1.6	0	0	0	0	0	2.1833	1.7367	1.7417	1.3506
SPOCRY	P	0	0	3.4	2	0	0.6	0.8	6.1	0	8	5.8	1.6833	0.7638	4.2917	1.8786
ARIPUR	P	0	0	0	0	0	0	0	0	0.3	0.4	8.8	1.5167	0.9464	4.35	1.983
BUCDAC	P	0	0	5.6	2.8	0	0	1.4	1.4	0	0	0	1.2667	0.5132	0.9833	0.3833
PANVIR	P	0	0	2.6	6	5.2	11	0	0	0	0	0	0.8417	0.4814	2.4667	1.0658
SCHAME	P	0	0	0	0	6	4	0	0	0	0	0	0.5	0.5	0.3333	0.3333
ELYELY	P	0	0	2.2	0	0	0	0	0.7	0.6	0	0.4	0.325	0.1843	0.3083	0.1685
ELYCAN	P	0.4	0	0	0	2.6	2	0	0	0	0	0	0.25	0.2162	0.1667	0.1667
CARSSP	P	0	0	0	0	0.2	0	0	0	0	0.2	0	0.0333	0.0225	0	0
PANCAP	A	0	0	0	0	0.1	0	0	0	0	0	0	0.0083	0.0083	0	0
FORB																
SPHCOC	P	0	0	0	0	0	0	0	0.1	0.2	2.2	1.8	2.2083	1.3953	0.9667	0.4859
KOCSCO	A	0.2	0	0	0.1	0	0	0	2.4	0.4	0	0.1	2.1583	1.1359	0.1917	0.0917
CONCAN	A/B	0	0	0	0	0	0	0	0.1	4.1	9.1	0.1	1.425	0.7941	0.6417	0.4215
CONARV	P	0	0	0	0	0	0	0	0	0	0	0	1.3	1.3	0.4167	0.4167
PHYLAN	P	0	0	0	0.6	0	0	0	0	0	0	0	1	1	0.05	0.05
AMBPSI	A/P	0	0	1.3	2.3	7.4	2.8	0	0	0	0.9	0.5	0.8917	0.6076	0.5667	0.2882
SYMERI	P	0	0	0.3	0	0.1	0	0	1.1	0	0	0	0.7083	0.4498	0.2667	0.249
GRIPAP	A/B	0	0	0.1	0.8	0	0	0	0	0	1.2	0.1	0.6417	0.5147	0.2917	0.22
ERIANN2	A	0.1	0	0	0	0	0	0	0	0	1.4	0	0.4917	0.3648	0	0
SALTRA	A	0	0	0	0	0	0	0	0.1	0	0	0	0.325	0.162	0.1833	0.1336
CALINV	P	0	0	0.1	0.1	0	0	0	0	0	0	0	0.2583	0.2314	0.1917	0.15
GLYLEP	P	0	0	0	0	3	2	0	0	0	0	0	0.25	0.25	0.1667	0.1667

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

• = detected but no cover assigned

Mean and SE values are calculated across all plots in the park

Table 4.9-2a. Within-plot cover values for each plant species detected during monitoring at each Cottonwood and Restoration transect, Sand Creek Massacre NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values			
		CWOOD-LT01		CWOOD-LT02		CWOOD-LT03		RESTN-LT02		RESTS-LT01		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Forb (cont.)															
HELANN	A	0.1	0	0	0	0.1	0	1.5	0	0	0	0.15	0.1234	0	0
PSOTEN	P	0	0	0	0	0	0	0	0	0.8	0	0.15	0.1019	0	0
ASCSub	P	0.6	0.9	0	0.4	1	2.8	0	0	0	0	0.1417	0.0925	0.3417	0.2369
CIRUND	B/P	0	0	0.6	1.2	0.7	1.4	0	0	0	0	0.1417	0.0712	0.3	0.1451
ERIBEL	A	0	0	0	0	0	0	0	0	1.5	0	0.125	0.125	0	0
MACPIN	P	0	0	0	0	0	0	0	0.1	0.1	0.1	0.125	0.0897	0.0417	0.0193
MELALB	A/P	0	0	0	0	0	0	0	0	0	0	0.1167	0.1167	0	0
ASCSPe	P	0.8	1.2	0.2	0.1	0	0	0	0	0	0	0.1083	0.0668	0.1583	0.1069
LYGJUN	P	0	0	0	0	0	0	0	0.1	0.1	0.2	0.1083	0.0596	0.0583	0.0288
ASTBOD	P	0	0	0	0.3	0	0	0	0	0	0	0.0583	0.0499	0.025	0.025
CHASER1	A/P	0.2	0	0.1	0.1	0.3	0.2	0	0	0	0	0.0583	0.0288	0.025	0.0179
PHYLON	P	0.2	0	0.1	0	0.2	0	0	0	0	0	0.0583	0.0229	0	0
RATCOL	P	0	0	0	1	0.1	1	0	0	0	0	0.0417	0.0149	0.1667	0.1124
MELOFF	A/P	0.3	0.1	0.1	0	0	0	0	0	0	0	0.0333	0.0256	0.0083	0.0083
DYSPAP	P	0.1	0	0	0	0	0	0	0	0.2	0	0.025	0.0179	0	0
EVONUT	P	0	0	0	0	0	0	0	0	0.2	1	0.0167	0.0167	0.1083	0.0848
HELPET	A	0	0	0	0	0	0	0	0	0.2	0.1	0.0167	0.0167	0.0083	0.0083
CHEALB	A	0.1	0	0	0	0	0	0	0.2	0	0	0.0083	0.0083	0.0167	0.0167
DALSSP	P	0	0	0.1	0	0	0	0	0	0	0	0.0083	0.0083	0	0
ERIGLA	B/P	0	0	0	0	0	0	0.1	0	0	0	0.0083	0.0083	0	0
LACSER	A/B	0	0	0.1	0	0	0	0	0	0	0	0.0083	0.0083	0	0
PACNEO	P	0	0	0.1	0	0	0	0	0	0	0	0.0083	0.0083	0	0
SOLSSP	P	0	0	0	0	0.1	0	0	0	0	0	0.0083	0.0083	0	0
ASCVIR	P	0	0	0	0	0	0.2	0	0	0	0	0	0	0.0167	0.0167
CHAMIS	A	0	0	0	0	0	0	0	0	0	1.2	0	0	0.1	0.1
CHEWAT	A	0	0	0	0	0	0.2	0	0	0	0	0	0	0.0167	0.0167
CROTEX	A	0	0	0	0	0	0	0	0	0	0.2	0	0	0.025	0.0179

Notes: Exotic species are highlighted.
A = annual; B = biennial; P = perennial. NS = Not Sampled
• = detected but no cover assigned
Mean and SE values are calculated across all plots in the park

Table 4.9-2a. Within-plot cover values for each plant species detected during monitoring at each Cottonwood and Restoration transect, Sand Creek Massacre NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values			
		CWOOD-LT01		CWOOD-LT02		CWOOD-LT03		RESTN-LT02		RESTS-LT01		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Forb (cont.)															
MACTAN	A/B	0	0	0	0	0	0	0	0	0	0.6	0	0	0.05	0.05
MENNUD	B/P	0	0	0	0	0	0	0	0	0	0.1	0	0	0.0083	0.0083
SHRUB/SUBSHRUB															
ARTFIL	P	0	0	0	0	0	0	0	0	9.6	10	3.25	2.1948	2.7917	1.7759
ESCVIV	P	0	0	0	0	0	0	0	0	0.2	0	0.025	0.0179	0	0
OPUPOL	P	0	0	0	0	0	0	0.1	0.2	0	0	0.0167	0.0112	0.025	0.0179
YUCGLA	P	0	0	0	0	0	0	0	0	0.1	0.1	0.0167	0.0112	0.0083	0.0083
TREE															
POPDEL	P	48	•	9	0	0	•	0	0	0	0	4.75	4.0021	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

• = detected but no cover assigned

Mean and SE values are calculated across all plots in the park

Table 4.9-2b. Within-plot cover values for each plant species detected during monitoring at each Upland Grass and Upland Sage transect, Sand Creek Massacre NHS, 2010 and 2011

Vegetation code	Life cycle	Transect										Parkwide values							
		UGRASS-05		UGRASS-LT01		UGRASS-LT02		UGRASS-LT04		UGRASS-LT05		USAGE-LT01		USAGE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
GRASS																			
BOUGRA	P	9.6	0	46	15.2	0	0	0	0	0.3	2.8	11.2	2.2	9.4	0	7.2917	3.799	2.125	1.284
PASSMI	P	7	5	0	0	10.6	34.6	20.3	14.3	9.4	1.6	0	0.1	0	0	7.1583	2.9004	7.275	3.0759
BOUCUR	P	1	3.4	0	0.1	0.6	1.4	0	0	0	0	28	36	1.4	1.8	5.75	3.3761	6.525	3.8538
DISSPI	P	0	0	0.3	6.2	25	21.1	0	0	0	0	0	0	0	0	2.4333	2.0753	3.4	1.8372
SPOAIR	P	0	0	3.6	16.4	21	2.3	0.6	0	0	0	0	0	0	0	2.1833	1.7367	1.7417	1.3506
SPOCRY	P	2.1	11.8	0.4	3.8	0	0	0	0	0	0	0	0	5.5	21.4	1.6833	0.7638	4.2917	1.8786
ARIPUR	P	1.3	3.8	0	0.1	0.2	1.4	11.1	21.2	4.5	14	0	0	0.7	2.6	1.5167	0.9464	4.35	1.983
BUCDAC	P	2.8	1.2	1.7	2.6	0	0	0	0	0	0.2	3.1	0	0.6	3.6	1.2667	0.5132	0.9833	0.3833
PANVIR	P	2.3	2	0	3.6	0	7	0	0	0	0	0	0	0	0	0.8417	0.4814	2.4667	1.0658
SCHAME	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0.3333	0.3333
ELYELY	P	0.6	0.6	0	0	0.1	2	0	0	0.1	0.1	0.2	0	0	0	0.325	0.1843	0.3083	0.1685
SCHPAN	P	0	0	0	0	0.3	0	0	0	0.1	2.6	0	0	0	0.6	0.0333	0.0256	0.2667	0.2179
FORB																			
SPHCOC	P	0.1	0	0.2	0.6	0.1	0.2	8.2	3.7	15.6	5	0	0	0	0.1	2.2083	1.3953	0.9667	0.4859
KOCSGO	A	0	0	0.2	0.1	12.1	1	1.2	0	8.4	0.6	0	0	1.4	0	2.1583	1.1359	0.1917	0.0917
CONCAN	A/B	0	0	4.3	0	0.1	0	1.2	3.4	0	0	0.1	0	2.2	0.1	1.425	0.7941	0.6417	0.4215
CONARV	P	0	0	0	0	0	0	15.6	5	0	0	0	0	0	0	1.3	1.3	0.4167	0.4167
PHYLAN	P	0	0	0	0	0	0	0	0	12	0	0	0	0	0	1	1	0.05	0.05
AMBPSI	A/P	0.1	0	0	0	0	0	0	0	0	0	0	0	1	1.2	0.8917	0.6076	0.5667	0.2882
SYMERI	P	1.5	3	0	0	0	0	5.4	0.2	0	0	0	0	0.1	0	0.7083	0.4498	0.2667	0.249
GRIPAP	A/B	0.1	0	0	0	0	0	0	0	0.1	2.6	0	0	6.2	0	0.6417	0.5147	0.2917	0.22
ASTLON	P	0	0	0	0	0	0	0	0	0	0	6.5	0.1	0	0	0.5417	0.5417	0.0083	0.0083
ERIANN2	A	0	0	0.1	0	0	0	0	0	0	0	0	0	4.3	0	0.4917	0.3648	0	0
IVAAXI	P	0	0	0	0	0	0	0	0	5	5	0	0	0	0.1	0.4167	0.4167	0.425	0.416
SALTRA	A	1.9	1.6	0.7	0.2	0	0	0.2	0.4	0.3	0	0	0	0.7	0	0.325	0.162	0.1833	0.1336
DALCAN	P	3.4	1.4	0	0	0	0	0	0	0	0	0	1.3	0	0	0.2833	0.2833	0.225	0.1518
CALINV	P	0	0	0.1	0	0	0	2.8	1.8	0	0	0	0	0.1	0.4	0.2583	0.2314	0.1917	0.15

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.9-2b. Within-plot cover values for each plant species detected during monitoring at each Upland Grass and Upland Sage transect, Sand Creek Massacre NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect												Parkwide values						
		UGRASS-05		UGRASS-LT01		UGRASS-LT02		UGRASS-LT04		UGRASS-LT05		USAGE-LT01		USAGE-LT02		MEAN	SE	MEAN	SE	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011					
Forb (cont.)																				
HELANN	A	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0.1234	0	0
PSOTEN	P	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.15	0.1019	0	0
ASCSub	P	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1417	0.0925	0.3417	0.2369
CIRUND	B/P	0	0	0.1	0.1	0	0	0.2	0.6	0	0	0	0	0	0.1	0.3	0.1417	0.0712	0.3	0.1451
HETVIL	P	0	0	0	0	0	0	1.5	0	0	0	0	0	0	0	0	0.125	0.125	0	0
MACPIN	P	0.1	0	0	0	0	0	0	0.1	1.1	0	0.1	0.2	0.1	0	0	0.125	0.0897	0.0417	0.0193
MELALB	A/P	0	0	0	0	1.4	0	0	0	0	0	0	0	0	0	0	0.1167	0.1167	0	0
ASCSPe	P	0	0	0	0	0.2	0.6	0.1	0	0	0	0	0	0	0	0	0.1083	0.0668	0.1583	0.1069
LYGJUN	P	0	0	0.7	0.3	0.3	0.1	0.1	0	0.1	0	0	0	0	0	0	0.1083	0.0596	0.0583	0.0288
GAUCOC	P	0	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0	0.1	0.1	0	0
ASTCRA	P	0	0	0	0	0	0	1	0.2	0	0	0	0	0	0	0	0.0833	0.0833	0.0167	0.0167
CHASER1	A/P	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.0583	0.0288	0.025	0.0179
PHYLON	P	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.0583	0.0229	0	0
RATCOL	P	0.1	0	0.1	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.0417	0.0149	0.1667	0.1124
VERBRA	A/P	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.2	0	0.0333	0.0225	0	0
EUPMAR	A	0	0.2	0	0	0	0	0.2	0.6	0	0	0	0	0	0	0	0.0167	0.0167	0.0667	0.0512
EVONUT	P	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0.0167	0.0167	0.1083	0.0848
ASCASP	P	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0083	0.0083	0	0
ASCLAT	P	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0083	0.0083	0	0
CALBUS	P	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.0083	0.0083	0	0
LITINC	P	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.0083	0.0083	0	0
PEDDIG	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.0083	0.0083	0	0
PHYCIN	P	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.0083	0.0083	0	0
QUILOB	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.0083	0.0083	0	0
CROTEX	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.025	0.0179
SHRUB/SUBSHRUB																				
ARTFIL	P	3.1	1.8	0.6	1.6	0	0	0	0	0	0	0	0	0	25.7	20.1	3.25	2.1948	2.7917	1.7759

Notes: Exotic species are highlighted.
A = annual; B = biennial; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.9-2b. Within-plot cover values for each plant species detected during monitoring at each Upland Grass and Upland Sage transect, Sand Creek Massacre NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values							
		UGRASS-05		UGRASS-LT01		UGRASS-LT02		UGRASS-LT04		UGRASS-LT05		USAGE-LT01		USAGE-LT02		MEAN	SE	MEAN	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Shrub/Subshrub (cont.)																			
ESCIV	P	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.025	0.0179	0	0
OPUPOL	P	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0.0167	0.0112	0.025	0.0179
YUCGLA	P	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.0167	0.0112	0.0083	0.0083
OPUFRA	P	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0.0083	0.0083	0.0083	0.0083
ARTFRI	P	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.9-3a. Percentage of substrate cover for each Cottonwood and Restoration transect sampled, Sand Creek Massacre NHS, 2010 and 2011

Cover	Transect												Park Totals			
	CWOOD-LT01						CWOOD-LT02						RESTS-LT01		RESTN-LT02	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	19.2	0	11	0	11	0	38.4	0	33	0	26.275	3.7988	0	0	19.65	4.1284
SOIOPEN	0	13	0	16.4	0	0	0	25	0	35	0	0	0	0	6.583	1.576
SOILUNDER	0	0	0	3	0	0.6	0	7	0	9	0	0	0	0	68.467	3.7363
LITTER	64.8	65	75.2	54.8	83.4	86.4	72.6	68	69.2	56	71.425	3.5105	5.133	2.7566	0	0
WOOD	16	22	13.8	25.8	5.6	13	0	0	1.4	0	3.067	1.6672	0	0	0	0
ROCKLG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROCKSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRUST	0	0	0	0	0	0	0	0	0.4	0	0.567	0.3691	0	0	0	0
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.9-3b. Percentage of substrate cover for each Upland Grass and Upland Sage transect sampled, Sand Creek Massacre NHS, 2010 and 2011

Cover	Transect														Park Totals			
	UGRASS-05							UGRASS-LT01							USAGE-LT01		USAGE-LT02	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	40.6	0	22.2	0	10.6	0	34	0	21.8	0	51.4	0	22.1	0	26.275	3.7988	0	0
SOIOPEN	0	45.6	0	8.4	0	6	0	14.4	0	37	0	28	0	7	0	0	19.65	4.1284
SOILUNDER	0	2	0	6	0	20	0	11	0	8.8	0	4.6	0	7	0	0	6.583	1.576
LITTER	57.4	51.6	78.6	85.6	89.4	74	66	74.6	78.2	54.2	44.4	65.4	77.9	86	71.425	3.5105	68.467	3.7363
WOOD	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	3.067	1.6672	5.133	2.7566
ROCKLG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROCKSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRUST	2	0	0.2	0	0	0	0	0	0	0	4.2	0	0	0	0.567	0.3691	0	0
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

4.10 Washita Battlefield National Historic Site

4.10.1 2010 and 2011 Sampling

A total of four fire and nine long-term monitoring transects were established at Washita Battlefield National Historic Site (WABA; Figure 4.10-1). The plant communities monitored at Washita Battlefield NHS are: upland grasslands consisting of sand bluestem-giant sandreed herbaceous vegetation, big bluestem-Indiangrass herbaceous vegetation, little bluestem-sideoats grama herbaceous vegetation, blue grama-sideoats grama herbaceous vegetation, and western wheatgrass herbaceous alliance; restoration grasslands consisting of reclaimed agricultural fields undergoing active prairie restoration; and disturbed grasslands consisting of cheatgrass semi-natural herbaceous vegetation, Johnsongrass herbaceous vegetation, and Bermudagrass vegetation (Cogan 2007b). The disturbed grasslands have been considered for bison reintroduction and are of special interest to the park. In 2010, one fire and nine long-term transects

were monitored. 2011 saw all long-term transects monitored, but any fire transects monitored were outside of the scope of this project.

4.10.2 Results and discussion

These early-monitoring results provide a baseline to measure future trends and should not be viewed as trends themselves. The extreme rainfall variation between the 2010 and 2011 field season has resulted in noticeable changes in plant response.

The grasslands at WABA have been plowed in the past and are in varying states of recovery. There are some areas of the southeastern uplands that are quite good, while areas around the old homestead and railroad embankment continue to harbor major exotic plant components. The 20 species of grass found in the transects are mainly perennial but there are three problematic exotic grass species found among the natives. Little bluestem continues to be the most abundant grass, found in all transects. This native bunchgrass is highly desirable for its

Table 4.10-1. Plant community and sampling dates for each transect at Washita Battlefield NHS, 2010 and 2011

Transect	Plant community	Date visited	
		2010	2011
DIST-01	<i>Bromus tectorum</i> Semi-Natural Herbaceous	6/26/2010	7/1/2011
RESTE-LT01	<i>Andropogon gerardii</i> - <i>Sorghastrum nutans</i> Herbaceous	6/24/2010	7/2/2011
RESTE-LT02	<i>Andropogon gerardii</i> - <i>Sorghastrum nutans</i> Herbaceous	6/24/2010	7/2/2011
RESTW-LT01	<i>Andropogon gerardii</i> - <i>Sorghastrum nutans</i> Herbaceous	6/25/2010	6/30/2011
RESTW-LT02	<i>Iva annua</i> - (<i>Xanthium strumarium</i>) Temporarily Flooded	6/25/2010	7/1/2011
UPLAND-F03	<i>Schizachyrium scoparium</i> - <i>Bouteloua curtipendula</i> Herbaceous	6/26/2010	Not Sampled
UPLAND-LT01	<i>Bromus tectorum</i> Semi-Natural Herbaceous	6/24/2010	6/30/2011
UPLAND-LT02	<i>Andropogon hallii</i> - <i>Calamovilfa gigantea</i> Herbaceous	6/27/2010	7/3/2011
UPLAND-LT03	<i>Bouteloua gracilis</i> - <i>Bouteloua curtipendula</i> Herbaceous	6/27/2010	7/2/2011
UPLAND-LT04	<i>Schizachyrium scoparium</i> - <i>Bouteloua curtipendula</i> Herbaceous	6/25/2010	6/30/2011

extensive root system and wildlife habitat. The forbs are evenly divided between annuals and perennials and very diverse. The bare ground/litter ratio appears stable but may reflect the lack of prescribed fire for the past few years.

The fields in the floodplain of the Washita River have been undergoing restoration for many years and do have a good mix of perennial grasses, but they lack a good forb component. This area experiences inundation every few years and has experienced much disturbance over the past century. Exotic grasses and trees continue to be problematic in this area from local and upstream propagules.

Exotic plants are a problem at WABA but an active eradication program may help restore balance to the grasslands. Johnsongrass (*Sorghum halepense*), and KR bluestem (*Bothriochloa ischaemum*) are two perennial grasses that threaten grassland health, in addition to the exotic bromes (*Bromus japonicus* and *B. tectorum*). Siberian elm (*Ulmus pumila*) continues to invade the grasslands due to their numerous seed production and their historic planting in shelter belts. Exotic species present at WABA are discussed in greater detail in the Exotic Plant Monitoring Annual Report (Folts-Zettner et al., in prep).

4.10.3 Prescribed fire treatments or wildfire occurrence

Prescribed fire has been a management tool over the past eight years at WABA (Figure 4.10-2), with the majority of the

park having been burned between 2003 to 2007. Since that time, environmental conditions have not allowed additional burning. No wildland fires have been reported in recent history.

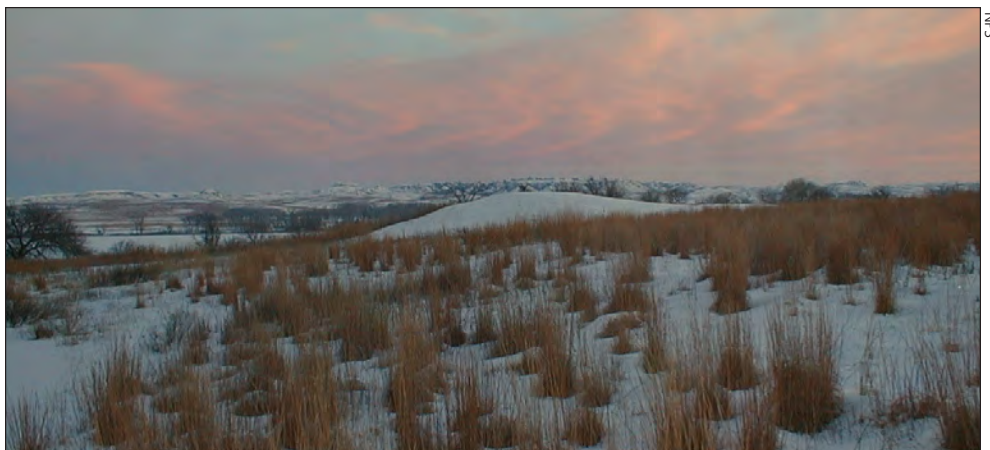
4.10.4 Fire effects

Fire effects monitoring is an integral part of the Grassland Monitoring Protocol (Folts-Zettner et al. in review) and current results from monitoring within the scope of this long-term project are reported in the previous data table (Table 4.10-2). As monitoring progresses, any noted effects of burning will be presented in this section.

4.10.5 Known treatments for exotics

The treatment of exotic plant species on grasslands in the southern plains may have a short-term effect on long-term monitoring transects. In order to inform monitoring results, communications have been developed with the Southern Plains/Chihuahuan Desert Exotic Plant Management Team to map annual treatment areas. Pertinent information will be presented in this section when treatments are known.

The EPMT has been very active at WABA. Past years have seen saltcedar (*Tamarisk* species) removal throughout the riparian area, treatment of Siberian elm and control of bromes and sweetclover (*Melilotus* species). Treatment maps are being developed to inform the SOPN of potential impacts to permanent transects.



The disturbed grasslands of Washita Battlefield NHS have been considered for bison reintroduction and are of special interest to the park.

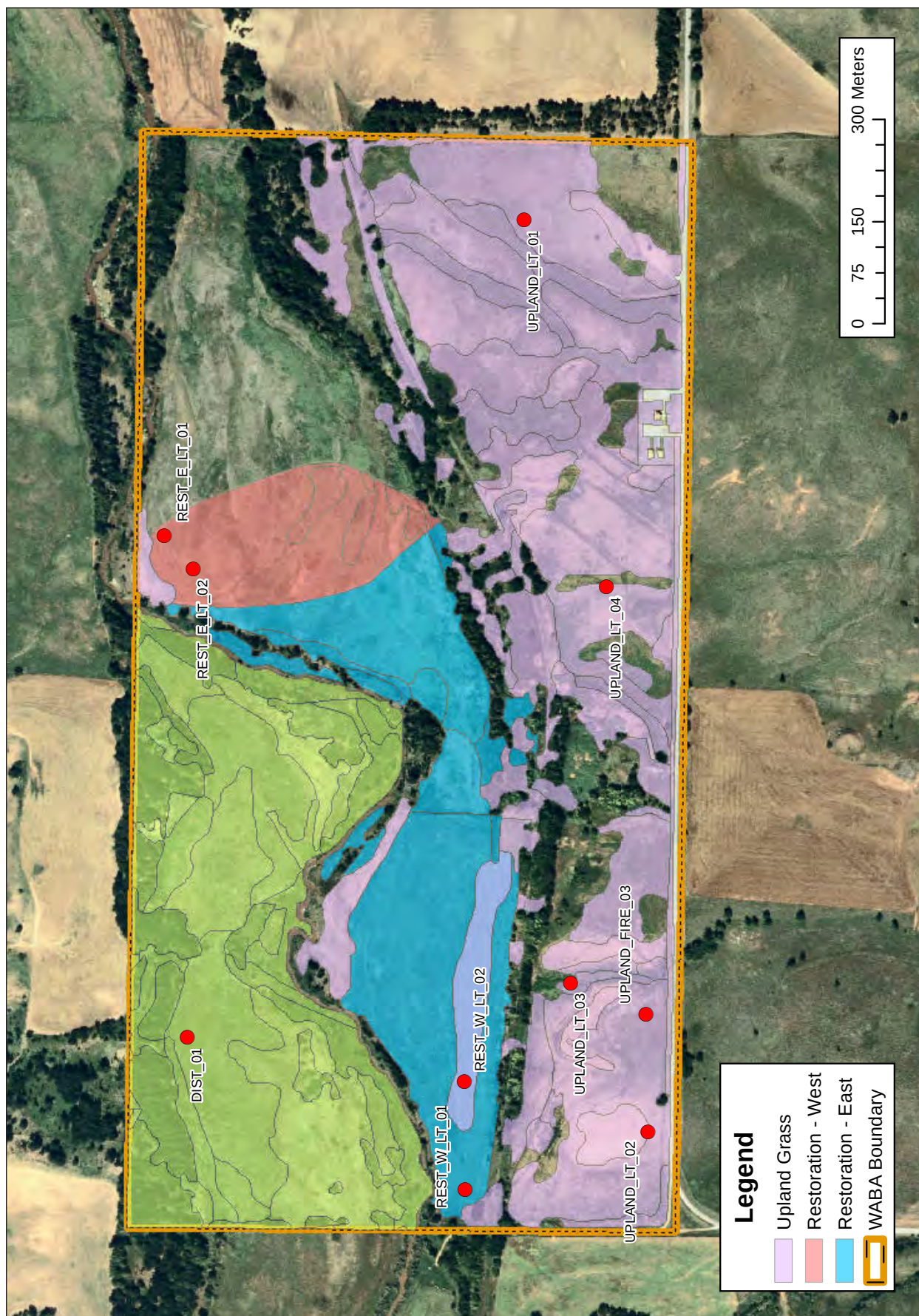


Figure 4.10-1. Monitoring transects, Washita Battlefield NHS, 2010. and 2011

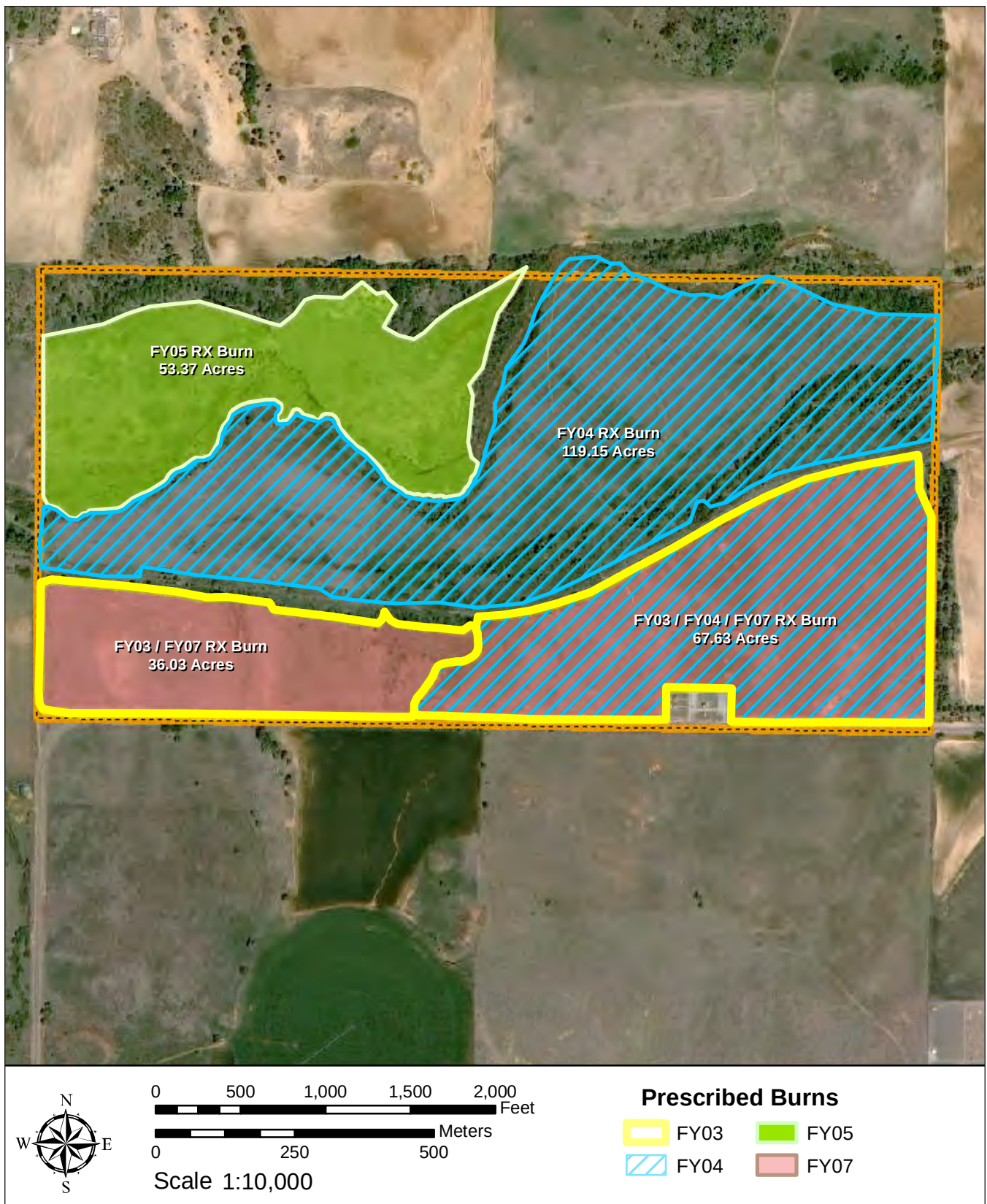


Figure 4.10-2. Prescribed treatment or wildland fires since 2003, Washita Battlefield NHS, 2010 and 2011.

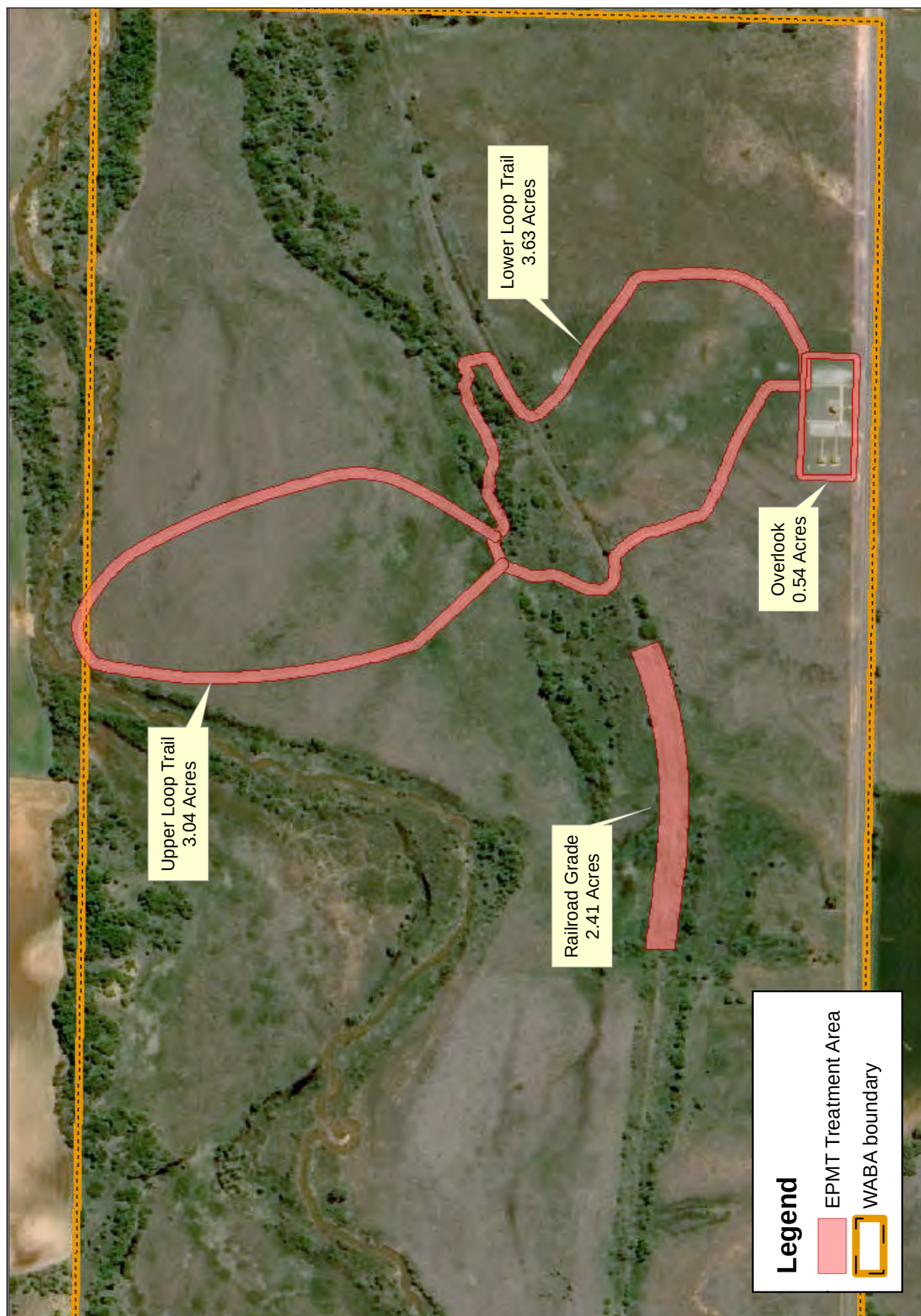


Figure 4. 10-3 Treatments for exotics by Southern Plains/Chihuahuan Desert EPMT, Washita Battlefield NHS, 2010 and 2011

Table 4.10-2a. Within-plot cover values for each plant species detected during monitoring at each Disturbed and Restoration transect, Washita Battlefield NHS, 2010 and 2011

Vegetation code	Life cycle	Transect										Parkwide values			
		DIST_01		REST_E_LT_01		REST_E_LT_02		REST_W_LT_01		REST_W_LT_02		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
GRASS															
SCHSCO	P	3.3	9.3	22	30	14	31	20	17.6	1.7	11	11.84	2.5304	18.1667	3.5597
BOUCUR	P	0	0	15	2.2	2.4	7	21.6	3	1.3	3.6	8.5	3.0443	4.4333	2.1587
SORHAL	P	0	0	1	0	0	0	0.1	3	11.6	9	3.17	1.6868	1.3667	1.0088
SORNUT	P	0	0	10.8	8.5	4	1.6	2.4	5.2	10.3	4	3.04	1.3213	2.2556	1.0042
PANVIR	P	6	0.9	6.8	12	4.2	2.8	1.7	10	5	10.7	2.51	0.8611	4.0667	1.7414
SPOCRY	P	0	0	0	0	0	0	0.1	0.1	0	0	2.21	1.7165	0.0889	0.0655
LEPFUS	A	0.2	0	0	0	0	0	2	0	7.6	0	1.64	0.9337	0	0
CYPODO	A/P	10.6	13.5	0	0	0	0	0	0	0	0	1.38	1.0727	1.5	1.5
ANDHAL	P	0	0	0.6	0.2	6.7	6.6	0	0	0	0	0.86	0.6608	0.8222	0.7253
PASSMI	P	0	0	0	0	0.6	0	0	0	0	0	0.73	0.5918	0	0
ARIPUR	P	0	0	0	0	0.1	0	0	0	0	0	0.61	0.599	1.8556	1.3044
ELYCAN	P	0.2	0	0	0	0	0	0	0	0	0	0.23	0.2087	0	0
BOTLAG	P	0	0.4	0	0	0	0	0.4	0.2	1.6	4.7	0.21	0.1595	0.5889	0.516
ERASPE	P	0	0	0.8	0	0.1	0	0	0	0	0	0.09	0.0795	0	0
BROJAP	A	0	7.4	0	0	0	0	0.2	0.3	0.2	1.2	0.07	0.026	2.8333	1.3225
DISSPI	P	0	0	0	0	0	0	0	0.2	0	0	0	0	0.5111	0.462
FORB															
AMBPSI	A/P	2.9	8	0	0	0	0	0.6	2.1	0	0	1.08	0.5696	1.4667	0.8896
ARTLUD	P	8.1	4	0	0	0	0	0.1	0	0	0	1.05	0.7959	0.5111	0.4411
CIRUND	B/P	0	0	0.1	0	0	0	0	0	0	0	0.01	0.01	0	0
CONARV	P	0	0	0	0	0	0	0	0	0	0	0.14	0.1194	0.0111	0.0111
CROTEX	A	0	0	0	0	0.2	0	0	0	0	0	0.02	0.02	0	0
DESILL	P	30	0.4	13.5	13.4	5.9	3.7	0.8	0.7	0.5	0.3	5.33	3.0562	2.1333	1.4602
ERIANN2	A/B	0.1	0	0.1	0	0.1	0	0	0	0	0	0.05	0.0167	0	0
GAUMOL	A	0.6	0.2	0	0	0	0	0	0	0	0	0.06	0.06	0.0222	0.0222

Notes: Exotic species are highlighted.
A = annual; B = biennial; P = perennial.
Mean and SE values are calculated across all plots in the park

Table 4.10-2a. Within-plot cover values for each plant species detected during monitoring at each Disturbed and Restoration transect, Washita Battlefield NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values			
		DIST_01		REST_E_LT_01		REST_E_LT_02		REST_W_LT_01		REST_W_LT_02		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Forb (cont.)															
GRIPAP	A/B	0	0	0	0	0	0	0	0	0	0	0.04	0.0306	0	0
HELANN	A	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0.0111	0.0111
HELLON	A	0	0.1	0	0	0	0	0	0	0	0	0	0	0.0111	0.0111
HELPET	A	0	0.7	0	0.6	0	0	0	0	0	0	0	0	0.1444	0.0959
I/AANN	A	0	0	0	0	0	0	0	0	1	2.6	0.11	0.0994	0.2889	0.2889
LINRIG	A/P	0	0	0	0	0	0	0.2	0	0	0	0.02	0.02	0	0
MACPIN	P	0.2	0	0	0	0	0	0	0	0	0	0.22	0.1988	0	0
OENSSP	P	0	0	0	0	0.1	0	0	0	0	0	0.01	0.01	0	0
PHYCIN	P	0	0	0	0	0	0	0	0	0	0	0.09	0.0795	0	0
PHYLON	P	0.1	0	0	0	0	0	0	0	0	0	0.02	0.0133	0	0
PLAPAT	A	0	0	0.1	0.1	0.2	0.2	0	0	0	0	0.03	0.0213	0.0444	0.0242
SOLDIM	P	1.1	1.8	0	0	0	0	0	0	0	0	0.11	0.11	0.2	0.2
SOLELA	P	0	0	0	0.2	0	0	0	0	0	0	0.44	0.2486	0.2667	0.2075
SOLPET	P	1.4	0.1	0	0	0	0	0	0	0	0	0.14	0.14	0.0111	0.0111
SONASP	A	0	0	0	0	0.1	0	0	0	0	0	0.02	0.0133	0	0
STRLEI	A	0.2	0	0	0	0	0	0	0	0	0	0.03	0.0213	0	0
SYMSSP	P	0	0	0	0	0	0	0	0.3	0	0.1	0	0	0.2222	0.1754
TEUCAN	P	0.6	0	0	0	0	0	0	0	0	0	0.06	0.06	0	0
TRIHOL	A	0	0	0	0	0	0	0	0	0.2	0	0.02	0.02	0	0
VINE															
COCCAR	P	0.2	0	0.4	0	0.5	0	0.5	0	3.8	0	0.82	0.3479	0	0
CUCFOE	P	0	0	0	0	0	0	0.2	0	0.1	0	0.12	0.0696	0.0333	0.0236
TREE															
PRUANG	P	8.1	11.1	0	0	0	0	0	0	0	0	0.81	0.81	1.2333	1.2333
ULMPUM	P	0.8	0.5	0.3	0.6	0	0	0.4	1.1	4.3	6.3	0.7	0.4153	1.2444	0.6702

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial.

Mean and SE values are calculated across all plots in the park

Table 4.10-2b. Within-plot cover values for each plant species detected during monitoring at each Upland transect, Washita Battlefield NHS, 2010 and 2011

Vegetation code	Life cycle	Transect										Parkwide values			
		UPLAND-F03		UPLAND-LT01		UPLAND-LT02		UPLAND-LT03		UPLAND-LT04		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
GRASS															
SCHSCO	P	7.4	NS	13.8	15.6	19.4	19	0.6	0	16.2	30	11.84	2.5304	18.1667	3.5597
BOUCUR	P	26.1	NS	0	0	5.6	3.5	1	0	12	20.6	8.5	3.0443	4.4333	2.1587
SORHAL	P	14	NS	0	0	0	0	5	0.3	0	0	3.17	1.6868	1.3667	1.0088
SORNUT	P	0	NS	0	0	0.8	0.7	0	0.2	2.1	0.1	3.04	1.3213	2.2556	1.0042
PANVIR	P	0	NS	0	0	0	0	0	0	1.4	0.2	2.51	0.8611	4.0667	1.7414
SPOCRY	P	0	NS	17	0.6	0	0.1	5	0	0	0	2.21	1.7165	0.0889	0.0655
LEPFUS	A	0	NS	0	0	0	0	0	0	6.6	0	1.64	0.9337	0	0
CARGRA	P	0	NS	0	0	0	0	15.4	0	0	0	1.54	1.54	0	0
CYPODO	A/P	3.2	NS	0	0	0	0	0	0	0	0	1.38	1.0727	1.5	1.5
ANDHAL	P	0	NS	0	0	1.2	0.6	0	0	0.1	0	0.86	0.6608	0.8222	0.7253
PASSMI	P	6	NS	0	0	0	0	0	0	0.7	0	0.73	0.5918	0	0
ARIPUR	P	0	NS	6	11	0	0	0	0	0	5.7	0.61	0.599	1.8556	1.3044
ELYCAN	P	0	NS	0	0	0	0	2.1	0	0	0	0.23	0.2087	0	0
BOTLAG	P	0.1	NS	0	0	0	0	0	0	0	0	0.21	0.1595	0.5889	0.516
BROJAP	A	0	NS	0.1	10.6	0	0	0.1	5.4	0.1	0.6	0.07	0.026	2.8333	1.3225
CARSSP	P	0	NS	0.6	0	0	0	0	0.2	0.1	0	0.07	0.0597	0.0222	0.0222
VULOCT	A	0.2	NS	0	0	0	0	0	0	0	0	0.02	0.02	0	0
CYNDAC	P	0	NS	0	0	0	0	0	0.2	0	0	0	0	0.0222	0.0222
DISSPI	P	0	NS	0	4.2	0	0	0	0	0	0.2	0	0	0.5111	0.462
FORB															
AMBART	A	0	NS	0	0	0	0	0	0	1.6	0.2	0.16	0.16	0.0222	0.0222
AMBPSI	A/P	2	NS	5.3	2.8	0	0	0	0	0	0.3	1.08	0.5696	1.4667	0.8896
AMBTRI	A	0	NS	0	0	0	0	0.7	0	0	0	0.07	0.07	0	0
ARTLUD	P	1.4	NS	0.3	0.6	0	0	0	0	0.6	0	1.05	0.7959	0.5111	0.4411
ASTPLA	P	0	NS	0	0	1.6	0	0	0	0	0	0.16	0.16	0	0
CHAGLY	A	0	NS	0.2	0	0	0	0	0	0	0	0.02	0.02	0	0

Notes: Exotic species are highlighted.

A = annual; B = biennial; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.10-2b. Within-plot cover values for each plant species detected during monitoring at each Upland transect, Washita Battlefield NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values			
		UPLAND-F03		UPLAND-LT01		UPLAND-LT02		UPLAND-LT03		UPLAND-LT04		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011				
Forb (cont.)															
CHEDES	A	0	NS	0	0	0	0	26	0	0	0	2.6	2.6	0	0
CONARV	P	1.2	NS	0	0	0	0	0.2	0.1	0	0	0.14	0.1194	0.0111	0.0111
DALAU	P	0	NS	0	0	3.8	0	0	0	0	0	0.38	0.38	0	0
DALENN	P	0	NS	0	0	0	6.3	0	0	0	0	0	0	0.7	0.7
DESILL	P	0	NS	0	0	0	0	2.6	0.7	0	0	5.33	3.0562	2.1333	1.4602
ERIANN1	A	0	NS	0	0	0.2	0	0	0	0	0	0.02	0.02	0	0
ERIANN2	A/B	0.1	NS	0.1	0	0	0	0	0	0	0	0.05	0.0167	0	0
ERIBEL	A	0	NS	0	0.1	0	0	0	0	0	0	0	0	0.0111	0.0111
EUPDEN	A	0	NS	0	0	0	0	0.1	0	0	0	0.01	0.01	0	0
GAIPUL	A/P	0	NS	3	0.6	0	0	0	0	0	0	0.3	0.3	0.0667	0.0667
GRIPAP	A/B	0.1	NS	0.3	0	0	0	0	0	0	0	0.04	0.0306	0	0
HELANN	A	0	NS	0	0	0	0	1.7	0.1	0	0	0.17	0.17	0.0111	0.0111
IVAANN	A	0	NS	0	0	0	0	0	0	0	0.1	0.11	0.0994	0.2889	0.2889
KOCSO	A	0	NS	0	0	0	0	5.8	9.6	0	0	0.58	0.58	1.0667	1.0667
LACSER	A/B	0	NS	0	0	0	0	0	0.1	0	0	0	0	0.0111	0.0111
MACPIN	P	0	NS	0	0	0	0	0	0	2	0	0.22	0.1988	0	0
MEDMIN	A	0	NS	0	0	0.7	0.2	0.6	0	0	0	0.13	0.087	0.0222	0.0222
PHYCIN	P	0.1	NS	0	0	0	0	0.8	0	0	0	0.09	0.0795	0	0
PHYLYN	P	0	NS	0	0	0	0	0.1	0	0	0	0.02	0.0133	0	0
PLAPAT	A	0	NS	0	0.1	0	0	0	0	0	0	0.03	0.0213	0.0444	0.0242
SALTRA	A	0	NS	0.2	0.1	0	0	0	0	0	2.6	0.02	0.02	0.3	0.2877
SOLCAN	P	0	NS	0.7	0	0	0	0	0	0	0	0.07	0.07	0	0
SOLELA	P	1.1	NS	1	0.3	0	0	2.3	1.9	0	0	0.44	0.2486	0.2667	0.2075
SONASP	A	0	NS	0	0	0	0	0.1	0	0	0	0.02	0.0133	0	0
STRLEI	A	0	NS	0.1	0	0	0	0	0	0	0	0.03	0.0213	0	0
SYMSSP	P	0	NS	0	0	0	0	0	0	0	1.6	0	0	0.2222	0.1754

Notes: Exotic species are highlighted.

A = annual; B = biennial; P = perennial. NS = Not Sampled
Mean and SE values are calculated across all plots in the park

Table 4.10-2b. Within-plot cover values for each plant species detected during monitoring at each Upland transect, Washita Battlefield NHS, 2010 and 2011, cont.

Vegetation code	Life cycle	Transect										Parkwide values			
		UPLAND-F03		UPLAND-LT01		UPLAND-LT02		UPLAND-LT03		UPLAND-LT04		Mean	SE	Mean	SE
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SHRUB/SUBSHRUB															
RHUCOP	P	0	NS	0	0	0	0	0	2.6	0	0	0	0	0.2889	0.2889
OPUMAC	P	0	NS	0.6	1.4	0	0	0	0	0	0	0.06	0.06	0.1556	0.1556
VINE															
COCCAR	P	0.6	NS	1.2	0	0.2	0	0	0	0.8	0	0.82	0.3479	0	0
CUCFOE	P	0	NS	0.7	0.1	0	0	0	0	0.2	0.2	0.12	0.0696	0.0333	0.0236
TREE															
ULMPUM	P	0.2	NS	0	0	0	0.6	0	0	1	2.1	0.7	0.4153	1.2444	0.6702
FRASSP	P	0	NS	0	0	0	0	5	0	0	0	0.5	0.5	0	0

Notes: Exotic species are highlighted.

A = annual; B = biannual; P = perennial. NS = Not Sampled

Mean and SE values are calculated across all plots in the park

Table 4.10-3a. Percentage of substrate cover for each Disturbed and Restoration transect sampled, Washita Battlefield NHS, 2010 and 2011

Cover	Transect		Park Totals									
	DIST 01		REST_E_LT_01		REST_E_LT_02		REST_W_LT_01		REST_W_LT_02		Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	5	0	25.2	0	19	0	22.4	0	1.4	0	13.92	5.3467
SOIOPEN	0	9.2	0	6	0	20.8	0	14.6	0	0.6	0	12.711
SOILUNDER	0	4	0	4	0	9.2	0	2.6	0	1	0	4.422
LITTER	95	86.8	174.8	90	81	70	176.6	82.8	97.8	98.4	85.26	5.4593
WOOD	0	0	0	0	0	0	0.8	0	0.8	0	0.6	0.4351
ROCKLG	0	0	0	0	0	0	0	0	0	0	0	0
ROCKSM	0	0	0	0	0	0	0	0	0	0	0.12	0.12
CRUST	0	0	0	0	0	0	0	0	0	0	0.08	0.08
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0.2	0	0	0	0.02	0.02

Table 4.10-3b. Percentage of substrate cover for each Upland transect sampled, Washita Battlefield NHS, 2010 and 2011

Cover	Transect		Park Totals									
	UPLAND-LT01		UPLAND-LT02		UPLAND-LT03		UPLAND-LT04		Mean		Mean	SE
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
SOILBARE	10	0	58.2	0	10.4	0	6.8	0	13.92	5.3467	0	0
SOIOPEN	0	18	0	32	0	10.2	0	3	0	0	12.711	3.2781
SOILUNDER	0	3	0	11.4	0	4.6	0	0	0	0	4.422	1.2277
LITTER	90	79	39.8	56.2	88.8	77.2	88.8	97	85.26	5.4593	81.933	4.4461
WOOD	0	0	0	0	0.8	8	4.4	0	0.6	0.4351	0.889	0.8889
ROCKLG	0	0	0	0	0	0	0	0	0	0	0	0
ROCKSM	0	0	1.2	0.4	0	0	0	0	0.12	0.12	0.044	0.0444
CRUST	0	0	0.8	0	0	0	0	0	0.08	0.08	0	0
LICHEN	0	0	0	0	0	0	0	0	0	0	0	0
MOSS	0	0	0	0	0	0	0	0	0.02	0.02	0	0

5 Discussion

We have now completed two years of data collection on this long-term monitoring project. With so little data at hand no inferences can yet be made to trends or drought effects. A competitive advantage was observed in several common exotic species that may have an effect should the extreme drought continue for several years and this will be watched very closely.

The 2012 field season will again be one combined team of monitors, as it was in 2010. Both the I&M and Fire Effects programs are committed to making this collaborative monitoring successful for

each program. All initial conflicts have now been resolved and this project is on track for another successful field season.

Of particular importance for the next year is to set in place reporting procedures for the parks regarding both fire and exotic treatments. The type and extent of treatment in a given area can affect monitoring plots and needs to be tracked to correctly understand and interpret monitoring data. Any additional historic information that parks may have regarding treatments should be communicated to the SOPN for inclusion in the GIS base data.

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