



Fort Union National Monument

Southern Plains Network and Southern Plains Fire Group 2013 Vegetation Monitoring Data Summary



Fort Union National Monument

Southern Plains Network and Southern Plains Fire Group 2013 Vegetation Monitoring Data Summary

Authors

Tomye Folts-Zettner¹
Richard Gatewood²
Heidi Sosinski¹

¹National Park Service
Southern Plains Inventory and Monitoring Network
PO Box 329
Johnson City, Texas

²Fire Ecologist - National Park Service
Chihuahuan Desert & Southern Plains Ecoregions
PO Box 987
Artesia, NM 88211

ON THE COVER

Hospital ruins at Fort Union NM. NPS Photo.

Contents

	Page
Introduction	1
Grassland Monitoring Results	1
Exotic Monitoring Results.....	8
Literature Cited	22

Figures

	Page
Figure 1. Layout of plots within each permanent transect.	1
Figure 2. Location of each permanent plot at FOUN monitored in 2013	2
Figure 3. Layout of Vector Blocks and Distance Classes along a vector.	6
Figure 4. Panel 2 numbered vector blocks monitored at FOUN in both 2010 and 2013.....	7
Figure 5. Comparison of exotics detected in 2010 and 2013 grassland monitoring permanent transects at FOUN.....	9

Tables

	Page
Table 1. Plant community and sampling dates for each transect at Fort Union NM in 2013.....	1
Table 2. Ground strata type and percentage for each transect monitored at FOUN in 2013.....	3
Table 3. Species cover sum and frequency for each permanent transect monitored at FOUN in 2013. Exotic species are highlighted in pink.....	4
Table 4. All plant species detected during grassland monitoring in 2010 and exotic monitoring in 2010 and 2013 at FOUN. Exotic species are highlighted in pink.....	5
Table 5. Number and percentage comparison of unit detections of exotic species found in repeated monitoring of vector blocks and permanent transects at FOUN.	8
Table 6. A comparison of the number of blocks containing a given density in 2010 and 2013 in two Distance Classes.....	10
Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class.	11

Introduction

This report contains a data summary of results from all vegetation monitoring conducted by the Southern Plains Network (SOPN) and the Southern Plains Fire Group (SPFG) during 2013 at Fort Union National Monument (FOUN). Data summaries are used to impart current monitoring data until enough years of data have been collected to facilitate trend analysis. A more detailed synthesis report is scheduled to be produced in 2015.

Grassland Monitoring Results

Grassland monitoring occurred during mid July of 2013 (Table 1). Data from the six (6) permanent transects (Figure 2) were collected following the established monitoring protocol *Grassland Monitoring Protocol and Standard Operating Procedures for the Southern Plains I&M Network and Fire Group* (Folts-Zettner et al.) (Figure 1). The protocol calls for a series of permanent 50-meter transects containing five 2x1-meter plots. Species composition, relative cover and ground strata are collected during annual visits.

Table 1. Plant community and sampling dates for each transect at Fort Union NM in 2013.

Group	Transect	Plant community	Date
Steppe	SHORT-LT01	Shortgrass Steppe	07/22
	SHORT-LT02	Shortgrass Steppe	07/21
	SHORT-LT03	Shortgrass Steppe	07/22
	SHORT-LT04	Shortgrass Steppe	07/22
	SHORT-LT05	Shortgrass Steppe	07/21
	SHORT-LT06	Shortgrass Steppe	07/21



Figure 1. Layout of plots within each permanent transect.

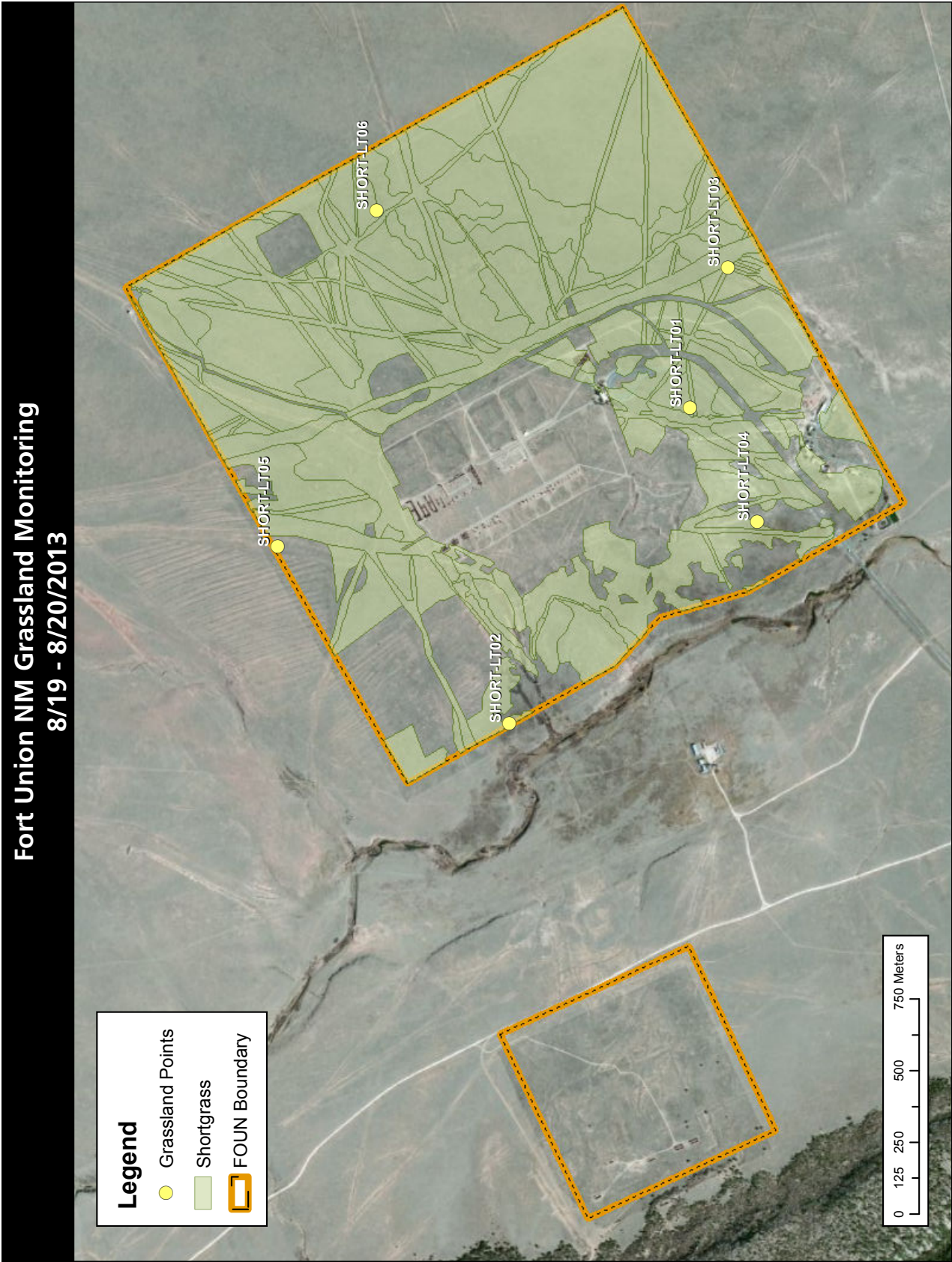


Figure 2. Location of each permanent plot at FOUN monitored in 2013

The type and amount of ground strata (bare soil, litter, rock) influences many aspects of grassland health. The benefits of these influences vary along an east-west gradient. Litter accumulation, for example is considered more beneficial in the western parts of the Southern Great Plains because it protects the soil from erosion by wind and rain, and keeps soil root-zones cooler. These same benefits accrue in the eastern area, but because higher rainfall results in higher vegetative production, the greater accumulation of litter can negatively impact a grassland by limiting seedling recruitment. Ground strata estimates for each transect monitored at FOUN in 2013 can be found in Table 2.

Table 3 contains numerical results of 2013 grassland monitoring at FOUN. Each transect contains five plots. Frequency reflects the number of plots in each transect where a particular species was detected. Exotic plant species are highlighted in pink. Scientific and common names for each plant code, as well as that species attributes can be found in Table 4.

Table 2. Ground strata type and percentage for each transect monitored at FOUN in 2013.

Cover	SHORT-LT01	SHORT-LT02	SHORT-LT03	SHORT-LT04	SHORT-LT05	SHORT-LT06
SOIOPEN	45.4	48	53	65.6	51.4	38
SOILUNDER	1	22	1.6	6.4	7.4	0.75
LITTER	53.4	29.8	51	25.2	36.6	50
WOOD	0	0	0	0	0	0
ROCKSM	0.4	0.2	0	2.6	2.2	7.5
ROCKLG	0	0	0	0.2	0	3.75
LICHEN	0	0	0	0	0	0
MOSS	0	0	0	0	0	0
CRUST	0	0	0.4	0	2.4	0

Table 3. Species cover sum and frequency for each permanent transect monitored at FOUN in 2013. Exotic species are highlighted in pink.

Species Code	SHORT-LT01		SHORT-LT02		SHORT-LT03		SHORT-LT04		SHORT-LT05		SHORT-LT06	
	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency
Forb												
AMBCON	1.5	3	92.5	5	5	4	31.5	3			1	2
ARTLUD							0.5	1				
CHASER2	0.5	1	1	2	0.5	1					1	1
CHELEP											2	3
CIRUND					0.5	1						
CONARV							6.5	3				
ENGPER			1	2	0.5	1						
FRBLNG	0.5	1	0.5	1								
GUTSAR			3.5	2					0.5	1		
LIAPUN									0.5	1		
MACPIN					0.5	1						
MIRLIN					1	2						
OENCOR			0.5	1								
PHYHED					1	1						
POROLE							1.5	2			21.5	5
PSOTEN	0.5	1	1	2								
RATTAG			1	2					0.5	1		
ROSWOO			3.5	2								
SALTRA	0.5	1	1	2	0.5	1						
SPHCOC			12	4	8	5	1.5	3	0.5	1	1	2
SYMERI									0.5	1		
THEMEG			0.5	1								
Grass												
ACHROB			1	1								
ARIPUR									1.5	2		
BOUGRA	121.5	5	112.5	5	96	5	1	1	198	5	30	5
BOUHIR											8.5	2
BUCDAC	11	5			26	4					1	2
DISSPI							1	2				
ELYELY			1	1								
PASSMI			11	3					2	3		
SPOAIR					1	1	0.5	1				
SPOCRY	4	1			0.5	1	3	1			2	3
Subshrub												
ECHCOC									0.5	1		
ECHVIR	1.5	3			0.5	1			1.5	3		

Table 4. All plant species detected during grassland monitoring in 2010 and exotic monitoring in 2010 and 2013 at FOUN. Exotic species are highlighted in pink.

Species Code	LifeForm	Scientific Name	Common Name	Primary Duration
ACHROB	Grass	<i>Achnatherum robustum</i>	sleepygrass	Perennial
AMBCON	Forb	<i>Ambrosia confertiflora</i>	wealeaf burr ragweed	Perennial
ARIPUR	Grass	<i>Aristida purpurea</i>	purple threeawn	Perennial
ARTLUD	Forb	<i>Artemisia ludoviciana</i>	louisiana sagewort	Perennial
BOUGRA	Grass	<i>Bouteloua gracilis</i>	blue grama	Perennial
BOUHIR	Grass	<i>Bouteloua hirsuta</i>	hairy grama	Perennial
BROCAR	Grass	<i>Bromus carinatus</i>	mountain brome	Annual/Perennial
BUCDAC	Grass	<i>Buchloe dactyloides</i>	buffalograss	Perennial
CARNUT	Forb	<i>Carduus nutans</i>	nodding musk thistle	Biennial/Perennial
CHASER2	Forb	<i>Chamaesyce serpyllifolia</i>	thyme-leaf sandmat	Annual
CHEALB	Forb	<i>Chenopodium album</i>	common lambsquarters	Annual
CHELEP	Forb	<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot	Annual
CIRUND	Forb	<i>Cirsium undulatum</i>	wavyleaf thistle	Biennial
CONARV	Forb	<i>Convolvulus arvensis</i>	field bindweed	Perennial
DISSPI	Grass	<i>Distichlis spicata</i>	inland saltgrass	Perennial
ECHCOC	Subshrub	<i>Echinocereus coccineus</i>	scarlet hedgehog cactus	Perennial
ECHVIR	Subshrub	<i>Echinocereus viridiflorus</i>	nylon hedgehog cactus	Perennial
ELYELY	Grass	<i>Elymus elymoides</i>	bottlebrush squirreltail	Perennial
ENGPER	Forb	<i>Engelmannia peristenia</i>	engelmann's daisy	Perennial
EUPDAV	Forb	<i>Euphorbia davidii</i>	toothed spurge	Annual
FRBLNG	Forb	<i>Forb seedling</i>	forb seedling	N/Annual
GUTSAR	Forb	<i>Gutierrezia sarothrae</i>	broom snakeweed	Perennial
KOCSKO	Forb	<i>Kochia scoparia</i>	kochia	Annual
LIAPUN	Forb	<i>Liatris punctata</i>	dotted gayfeather	Perennial
MACPIN	Forb	<i>Machaeranthera pinnatifida</i>	lacy tansyaster	Perennial
MARVUL	Forb	<i>Marrubium vulgare</i>	horehound	Perennial
MELOFF	Forb	<i>Melilotus officinalis</i>	yellow sweetclover	Annual
MIRLIN	Forb	<i>Mirabilis linearis</i>	narrowleaf four o'clock	Perennial
OENCOR	Forb	<i>Oenothera coronopifolia</i>	crownleaf evening primrose	Perennial
PASSMI	Grass	<i>Pascopyrum smithii</i>	western wheatgrass	Perennial
PHYHED	Forb	<i>Physalis hederifolia</i>	ivyleaf groundcherry	Perennial
POROLE	Forb	<i>Portulaca oleracea</i>	common purslane	Annual
PSOTEN	Forb	<i>Psoraleidium tenuiflorum</i>	slimflower scurfpea	Perennial
RATTAG	Forb	<i>Ratibida tagetes</i>	green mexican hat	Perennial
ROSWOO	Forb	<i>Rosa woodsii</i>	woods rose: western wildrose	Perennial
SALTRA	Forb	<i>Salsola tragus</i>	prickly russian thistle	Annual
SPHCOC	Forb	<i>Sphaeralcea coccinea</i>	scarlet globemallow	Perennial
SPOAIR	Grass	<i>Sporobolus airoides</i>	alkali sacaton	Perennial
SPOCRY	Grass	<i>Sporobolus cryptandrus</i>	sand dropseed	Perennial
SYMERI	Forb	<i>Symphotrichum ericoides</i>	white heath aster	Perennial
THEMEG	Forb	<i>Thelesperma megapotamicum</i>	hopi tea greenthread	Perennial
TRADUB	Forb	<i>Tragopogon dubius</i>	yellow salsify	Annual
ULMPUM	Tree	<i>Ulmus pumila</i>	Siberian elm	Perennial

Exotic Monitoring Results

Exotic plant monitoring followed the protocol *Multi-Network Exotic Plant Monitoring Protocol and Standard Operating Procedures* (Folts-Zettner et al. 2013). Methodology requires a series of discreet 50-meter blocks along designated vectors chosen for high-probability of introduction. Exotic species detected within each block are assigned densities, and their proximity to the vector itself is divided into various Distance Classes (Figure 3).

Monitoring occurred July 9-11, 2013 and included areas around the Old Fort site, the two-tracks to the water tower and to the northwest of the Fort (Figure 4). These vectors have been previously monitored July 6-8, 2010, although additional vector blocks were added in 2013. It should be noted that 2010 was a year of above average precipitation, followed by consecutive years of extreme drought, including 2013. Data summarized in this report compares the results of 2013 monitoring to that detected in 2010.

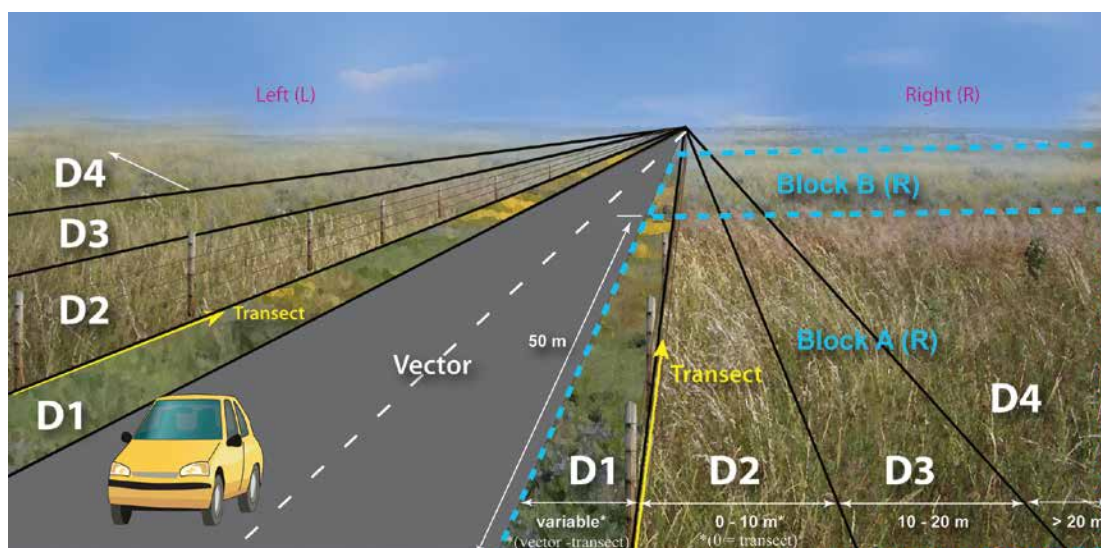


Figure 3. Layout of Vector Blocks and Distance Classes along a vector.

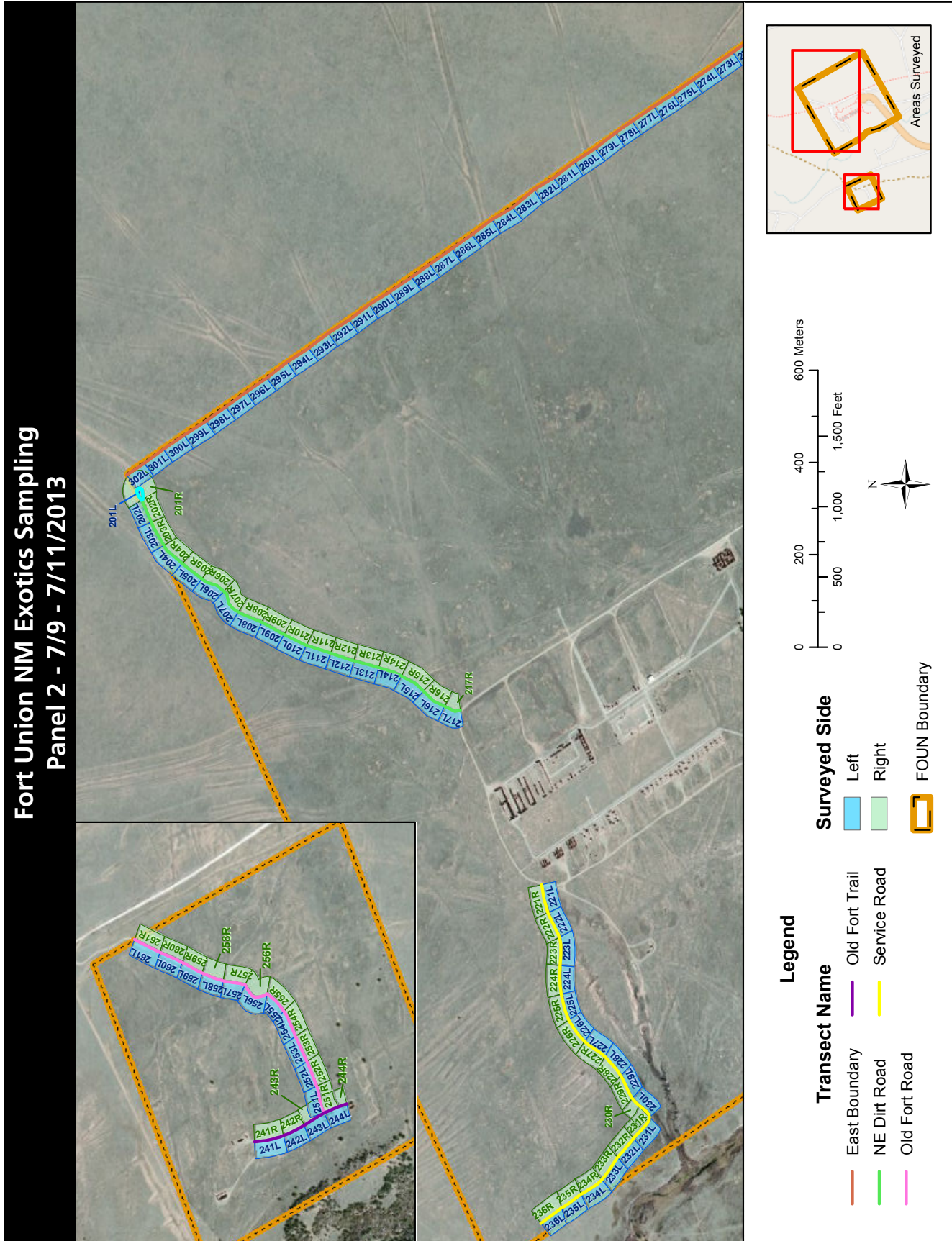


Figure 4. Panel 2 numbered vector blocks monitored at FOUN in both 2010 and 2013.

Table 5 presents all exotic species detected during both exotic and grassland (secondary transects) monitoring in both years as well as the number and percentage of vector blocks (N=128) and transects (N=6)(Figure 5) in which these species were found. The effect of drought is easily seen.

Table 5. Number and percentage comparison of unit detections of exotic species found in repeated monitoring of vector blocks and permanent transects at FOUN.

Scientific Name	Common Name	2010		2013		2010		2013	
		Primary Blocks (N=96)		Primary Blocks (N=128)		Secondary Transects (N=6)		Secondary Transects (N=6)	
		Total	% Blocks	Total	% Blocks	Total	% Blocks	Total	% Blocks
<i>Bromus carinatus</i>	mountain brome	1	1%	–	–	–	–	–	–
<i>Carduus nutans</i>	nodding musk thistle	3	3%	–	–	–	–	–	–
<i>Chenopodium album</i>	lambsquarters	–	–	20	16%	–	–	–	–
<i>Convolvulus arvensis</i>	field bindweed	9	9%	6	5%	–	–	1	17%
<i>Euphorbia davidii</i>	toothed spurge	2	2%	–	–	3	50%	–	–
<i>Kochia scoparia</i>	kochia	57	59%	9	7%	1	17%	–	–
<i>Marrubium vulgare</i>	horehound	1	1%	–	–	–	–	–	–
<i>Melilotus officinalis</i>	yellow sweetclover	15	16%	–	–	–	–	–	–
<i>No Plant</i>	No Plant	–	–	66	52%	–	–	–	–
<i>Salsola tragus</i>	prickly Russian thistle	77	80%	48	38%	3	50%	3	50%
<i>Tragopogon dubius</i>	western salsify	12	13%	–	–	–	–	–	–
<i>Ulmus pumila</i>	Siberian elm	1	1%	2	2%	–	–	–	–

Fort Union NM - Secondary Exotics 2010 vs. 2013

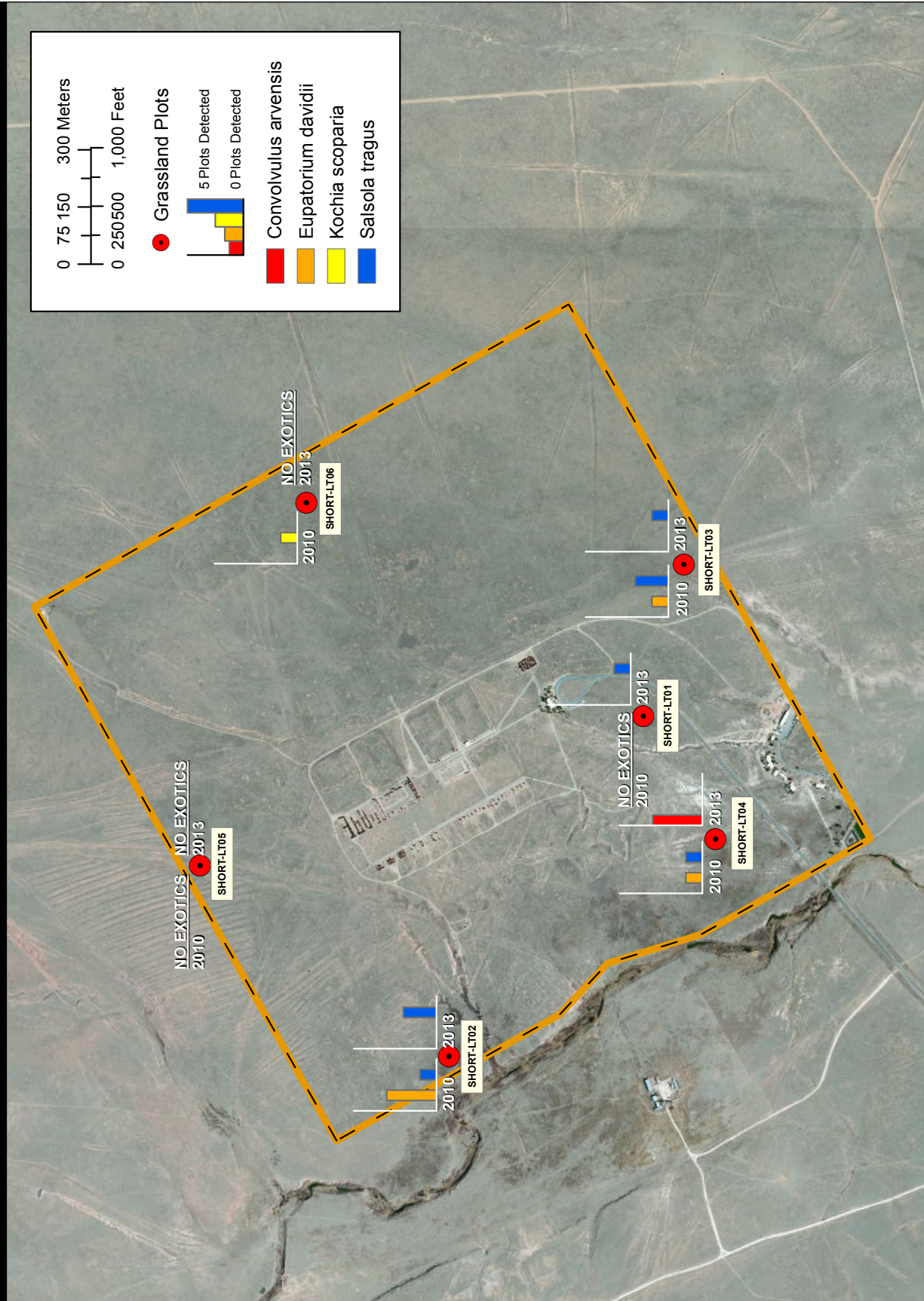


Figure 5. Comparison of exotics detected in 2010 and 2013 grassland monitoring permanent transects at FOUN.

The density of a detection of any given exotic species informs us of the invasion stage of that area. A Density Code of 1 will point to either a new introduction in an area or a lack of suitable resources for that species to establish and spread. Conversely, a Density Code of 4 denotes a matrix of the exotic species that has successfully colonized the site and pushed out all native species. Table 6 is a comparison of the number of blocks containing that density in 2010 and 2013 in two Distance Classes. Distance Class 1 is from immediately along the vector to 2 meters into the landscape or the depth of the mowed verge (whichever is greater). Distance Class 2 is a constant 10 meters into the landscape beginning at the interior edge of Distance Class 1. This minimum depth of 12 meters will give the resource manager an idea of the ability of a given exotic species to invade into the interior of a landscape.

Table 6. A comparison of the number of blocks containing a given density in 2010 and 2013 in two Distance Classes.

Species Code	Scientific Name	Common Name	Density Code	Distance Class 1			Distance Class 2		
				2010	Same 2013	New 2013	2010	Same 2013	New 2013
BROCAR	<i>Bromus carinatus</i>	mountain brome	2	–	–	–	1	–	–
CARNUT	<i>Carduus nutans</i>	nodding musk thistle	1	1	–	–	1	–	–
CHEALB	<i>Chenopodium album</i>	common lambsquarters	1	–	11	–	–	4	–
			2	–	8	–	–	2	–
CONARV	<i>Convolvulus arvensis</i>	field bindweed	1	–	2	1	1	2	–
			2	4	1	–	6	1	–
EUPDAV	<i>Euphorbia davidii</i>	davids spurge	1	2	–	–	–	–	–
KOCSCO	<i>Kochia scoparia</i>	kochia	1	6	2	2	6	–	1
			2	10	3	–	40	5	–
			3	1	–	–	1	–	–
MARVUL	<i>Marrubium vulgare</i>	horehound	2	–	–	–	1	–	–
MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	1	7	–	–	9	–	–
			2	–	–	–	2	–	–
SALTRA	<i>Salsola tragus</i>	prickly Russian thistle	1	18	16	8	16	4	5
			2	25	7	11	34	8	4
			3	4	–	–	6	–	–
			4	1	–	–	–	–	–
TRADUB	<i>Tragopogon dubius</i>	western salsify	1	4	–	–	9	–	–
ULMPUM	<i>Ulmus pumila</i>	Siberian elm	1	–	–	–	–	1	–

Density Code Key: 1 = one to five individual plants; 2 = scattered patches; 3 = evenly distributed patches; 4 = matrix; X = non-detect.

Table 7 is included for the benefit of those resource managers with an active exotic management program. This table lists the specific species found in each vector block and the Density Code of that species in each Distance Class. The comparison of current detections to that those from 2010 underscores the current drought effect – the more herbaceous species have disappeared, while the drought tolerant exotics (ie: bindweed, kochia, prickly Russian thistle) appear and often have increased.

Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class.

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
201L	N/A	No Plant	0	0	0	0	0	0	0	0
201R	N/A	No Plant	0	0	X	X				
	<i>Salsola tragus</i>	prickly Russian thistle					0	1	2	2
	<i>Ulmus pumila</i>	Siberian elm					0	1	1	0
202L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	0	1	0				
202R	<i>Carduus nutans</i>	nodding musk thistle	0	1	0	0				
	N/A	No Plant					0	0	0	0
203L	N/A	No Plant	0	0	0	0	0	0	0	0
203R	<i>Melilotus officinalis</i>	yellow sweetclover	1	0	0	0				
	N/A	No Plant					0	0	0	0
204L	N/A	No Plant	0	0	0	0	0	0	0	0
204R	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				
205L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0				
205R	<i>Melilotus officinalis</i>	yellow sweetclover	1	1	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0	0	2	0	0
206L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				
206R	<i>Kochia scoparia</i>	kochia	0	0	0	1				
	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0	0	2	0	0
207L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	1	2	0	0
207R	<i>Kochia scoparia</i>	kochia	0	0	1	0				
	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	1	2	0	0
208L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				
208R	<i>Kochia scoparia</i>	kochia	0	0	1	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				
209L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0				
209R	N/A	No Plant	0	0	0	0	0	0	0	0
210L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
210R	<i>Kochia scoparia</i>	kochia	0	0	0	2				
	N/A	No Plant					0	0	0	0
211L	<i>Convolvulus arvensis</i>	field bindweed					0	1	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				
211R	<i>Kochia scoparia</i>	kochia	0	0	0	2				
	N/A	No Plant					0	0	0	0
212L	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0	1	0	0	0
212R	<i>Kochia scoparia</i>	kochia	0	0	0	1				
	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
213L	<i>Convolvulus arvensis</i>	field bindweed	0	2	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0				
213R	<i>Kochia scoparia</i>	kochia	0	1	1	0				
	<i>Salsola tragus</i>	prickly Russian thistle					0	1	0	0
214L	<i>Convolvulus arvensis</i>	field bindweed	0	2	0	0				
	<i>Melilotus officinalis</i>	yellow sweetclover	1	0	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				
214R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	1	0	0
215L	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0				
	<i>Euphorbia davidii</i>	David's spurge	1	0	0	0				
	<i>Kochia scoparia</i>	kochia	0	1	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	3	0	0	1	0	0	0
215R	<i>Chenopodium album</i>	lambsquarters					1	1	0	0
	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	1	1	0	0
	<i>Euphorbia davidii</i>	David's spurge	1	0	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	1	2	0	1	0	0	0
216L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0				
216R	<i>Convolvulus arvensis</i>	field bindweed					1	0	0	0
	<i>Kochia scoparia</i>	kochia	0	0	1	1				
	<i>Melilotus officinalis</i>	yellow sweetclover	0	1	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0				
217L	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0				
	<i>Kochia scoparia</i>	kochia					2	0	0	0
	<i>Melilotus officinalis</i>	yellow sweetclover	0	1	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
217R	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0				
	<i>Kochia scoparia</i>	kochia	0	2	0	0	0	2	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0				
218L	<i>Kochia scoparia</i>	kochia	2	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
218R	<i>Kochia scoparia</i>	kochia	3	3	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				
221L	<i>Kochia scoparia</i>	kochia	2	2	2	0	2	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	2	0				
221R	<i>Kochia scoparia</i>	kochia	2	2	2	2	2	2	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	0	1	0				
222L	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0				
222R	<i>Kochia scoparia</i>	kochia	0	0	1	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	1	1	0				
223L	<i>Kochia scoparia</i>	kochia	0	2	2	2				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0				
223R	<i>Kochia scoparia</i>	kochia	1	1	1	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0				
224L	<i>Convolvulus arvensis</i>	field bindweed	0	2	0	0				
	<i>Marrubium vulgare</i>	horehound	0	2	0	0				
	<i>Melilotus officinalis</i>	yellow sweetclover	0	2	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	2	0				
224R	<i>Kochia scoparia</i>	kochia	0	1	0	0				
	<i>Melilotus officinalis</i>	yellow sweetclover	0	2	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	1	1	0	0	0
225L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0				
225R	<i>Kochia scoparia</i>	kochia	0	1	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	0				
226L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0				
226R	<i>Kochia scoparia</i>	kochia	0	2	1	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0				
227L	<i>Melilotus officinalis</i>	yellow sweetclover	0	1	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0				
227R	<i>Kochia scoparia</i>	kochia	0	2	0	0				
	<i>Melilotus officinalis</i>	yellow sweetclover	1	0	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0				

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
228L	<i>Convolvulus arvensis</i>	field bindweed	0	1	0	0				
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	2	0	1	0	0	0
228R	<i>Kochia scoparia</i>	kochia	2	2	2	1				
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	1	0	0	0
229L	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0				
229R	<i>Carduus nutans</i>	nodding musk thistle	0	0	0	1				
	<i>Kochia scoparia</i>	kochia	1	2	0	0				
	<i>Melilotus officinalis</i>	yellow sweetclover	1	1	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	0	1	1				
230L	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0				
	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
230R	<i>Kochia scoparia</i>	kochia	2	2	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	2	2				
231L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	3	3	3	3				
	<i>Ulmus pumila</i>	Siberian elm	0	0	0	1				
231R	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	4	3	3	2				
232L	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	3	3	3	3				
232R	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	3	3	2	2				
233L	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	3	3	3	0				
233R	<i>Melilotus officinalis</i>	yellow sweetclover	0	1	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	2	1				
234L	N/A	No Plant	0	0	0	0	0	0	0	0
234R	<i>Melilotus officinalis</i>	yellow sweetclover	0	1	0	0				
	N/A	No Plant					0	0	0	0
235L	<i>Kochia scoparia</i>	kochia	1	0	0	0				
	N/A	No Plant					0	0	0	0
235R	<i>Melilotus officinalis</i>	yellow sweetclover	0	1	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	0	0	1				

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
236L	N/A	No Plant					0	0	0	0
236R	<i>Chenopodium album</i>	lambsquarters					1	0	0	0
241L	<i>Kochia scoparia</i>	kochia	0	2	2	2				
	N/A	No Plant					0	0	0	0
	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
241R	<i>Kochia scoparia</i>	kochia	0	2	0	0	0	2	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	0	1	2	0	0
242L	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	0	2	0				
242R	<i>Bromus carinatus</i>	mountain brome	0	2	0	0				
	<i>Carduus nutans</i>	nodding musk thistle	1	0	0	0				
	<i>Convolvulus arvensis</i>	field bindweed	0	2	0	0	0	2	0	0
	<i>Kochia scoparia</i>	kochia	2	2	2	1	1	2	2	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	0	2	2	2	0
	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
243L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	0	0	2	0				
243R	<i>Chenopodium album</i>	lambsquarters					0	2	2	0
	<i>Kochia scoparia</i>	kochia	2	2	2	2				
	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0				
244L	<i>Kochia scoparia</i>	kochia	2	2	2	2				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0				
244R	<i>Chenopodium album</i>	lambsquarters					1	2	2	0
	<i>Kochia scoparia</i>	kochia	0	2	2	2	1	2	2	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	0	0	2	2	0
251L	<i>Chenopodium album</i>	lambsquarters					1	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				
251R	<i>Chenopodium album</i>	lambsquarters					1	0	0	0
	<i>Kochia scoparia</i>	kochia	2	2	2	2				
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				
252L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	0	2	0	0	2	0	0	0
252R	<i>Kochia scoparia</i>	kochia	0	2	2	2				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	1	1	0				
253L	<i>Chenopodium album</i>	lambsquarters					1	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	2				
	<i>Salsola tragus</i>	prickly Russian thistle	1	2	2	0	2	0	0	0

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Table 7. Comparison of 2010 vs. 2013 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
253R	<i>Chenopodium album</i>	lambsquarters					1	0	1	0
	<i>Kochia scoparia</i>	kochia	1	2	2	2				
	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	2	0	0	0
	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
254L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	0	0	0
254R	<i>Kochia scoparia</i>	kochia	1	1	0	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0				
255L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	0	0	0
255R	<i>Chenopodium album</i>	lambsquarters					1	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				
	<i>Tragopogon dubius</i>	western salsify	1	0	0	0				
256L	<i>Chenopodium album</i>	lambsquarters					1	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	1	0	0	0
	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
256R	<i>Chenopodium album</i>	lambsquarters					1	1	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0				
257L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
257R	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0				
	<i>Tragopogon dubius</i>	western salsify	1	0	0	0				
258L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	1	0	0	0
258R	<i>Chenopodium album</i>	lambsquarters					1	1	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	1				
	<i>Melilotus officinalis</i>	yellow sweetclover	1	0	0	0				
	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0				
	<i>Tragopogon dubius</i>	western salsify	1	0	0	0				
259L	<i>Chenopodium album</i>	lambsquarters					2	0	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	0				
259R	<i>Chenopodium album</i>	lambsquarters					2	1	0	0
	<i>Kochia scoparia</i>	kochia	0	2	2	2				

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
259R	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	1	1	1	0
(cont.)	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
260L	<i>Kochia scoparia</i>	kochia	0	2	2	0				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0				
260R	<i>Kochia scoparia</i>	kochia	2	2	2	2				
	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	1	2	1	0
	<i>Tragopogon dubius</i>	western salsify	1	1	0	0				
261L	<i>Kochia scoparia</i>	kochia	1	0	0	0				
	N/A	No Plant					0	0	0	0
261R	<i>Kochia scoparia</i>	kochia	0	2	2	2				
	N/A	No Plant					0	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0				
	<i>Tragopogon dubius</i>	western salsify	0	1	0	0				
271L	N/A	No Plant					0	0	0	0
272L	N/A	No Plant					0	0	0	0
273L	N/A	No Plant					0	0	0	0
274L	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
275L	<i>Salsola tragus</i>	prickly Russian thistle					2	0	0	0
276L	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
277L	N/A	No Plant					0	0	0	0
278L	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
279L	N/A	No Plant					0	0	0	0
280L	<i>Salsola tragus</i>	prickly Russian thistle					2	0	0	0
281L	N/A	No Plant					0	0	0	0
282L	N/A	No Plant					0	0	0	0
283L	N/A	No Plant					0	0	0	0
284L	N/A	No Plant					0	0	0	0
285L	N/A	No Plant					0	0	0	0
286L	<i>Salsola tragus</i>	prickly Russian thistle					2	1	0	0
287L	<i>Kochia scoparia</i>	kochia					1	1	0	0
	<i>Salsola tragus</i>	prickly Russian thistle					2	2	0	0
288L	<i>Salsola tragus</i>	prickly Russian thistle					2	0	0	0
289L	<i>Kochia scoparia</i>	kochia					1	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
290L	<i>Salsola tragus</i>	prickly Russian thistle					2	0	0	0
291L	<i>Salsola tragus</i>	prickly Russian thistle					1	1	0	0
292L	<i>Salsola tragus</i>	prickly Russian thistle					2	1	0	0
293L	<i>Salsola tragus</i>	prickly Russian thistle					2	2	0	0
294L	<i>Salsola tragus</i>	prickly Russian thistle					2	2	0	0
295L	N/A	No Plant					0	0	0	0
296L	<i>Salsola tragus</i>	prickly Russian thistle					2	0	0	0
297L	<i>Salsola tragus</i>	prickly Russian thistle					0	2	0	0
298L	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Block	Scientific Name	Common Name	2010				2013			
			D1	D2	D3	D4	D1	D2	D3	D4
299L	<i>Salsola tragus</i>	prickly Russian thistle					1	0	0	0
300L	N/A	No Plant					0	0	0	0
301L	<i>Salsola tragus</i>	prickly Russian thistle					1	1	0	0
302L	<i>Convolvulus arvensis</i>	field bindweed					1	0	0	0
	<i>Salsola tragus</i>	prickly Russian thistle					2	1	0	0
	<i>Ulmus pumila</i>	Siberian elm					0	0	1	0

Distance Class Key: D1 = edge of vector to 2 meters into the landscape (or inner edge of mow line); D2 = interior edge of D1 to 10 meters; D3 & D4 = each additional 10 meters into the landscape.

Density Code Key: 0 = no plants; 1 = 1–5 plants; 2 = scattered patches; 3 = even distributed patches; 4 = matrix; X = non-detect

Literature Cited

Folts–Zettner, T., R. Gatewood, R. Bennetts and K. Cherwin No date. Grassland monitoring protocol and standard operating procedures for the Southern Plains I&M Network and Fire Group. Natural Resource Technical Report. National Park Service, Fort Collins, Colorado. In review.

Folts–Zettner, T., R. Bennetts, K. Gallo, S. Studd, M. Powell, K. Beaupre, and H. Sosinski. 2013. Multi–Network Exotic Plant Monitoring Protocol and Standard Operating Procedures : A collaboration among the Southern Plains, Chihuahuan Desert and Sonoran Desert Networks Natural Resource Technical Report NPS/SOPN/NRTR—2013/XXX. National Park Service, Fort Collins, Colorado.

National Park Service
U.S. Department of the Interior



Southern Plains Inventory and Monitoring Network

100 Ladybird Lane (physical)

P.O. Box 329 (mailing)

Johnson City, TX 78636

<http://science.nature.nps.gov/im/units/sopn/index.cfm>