



Fort Union National Monument

Southern Plains Network and Southern Plains Fire Group 2014 Vegetation Monitoring Data Summary



ON THE COVER

Hospital ruins at Fort Union NM. NPS Photo.

Fort Union National Monument

Southern Plains Network and Southern Plains Fire Group 2014 Vegetation Monitoring Data Summary

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Introduction

This report contains a data summary of results from all vegetation monitoring conducted by the Southern Plains I&M Network (SOPN) and the Southern Plains Fire Group (SPFG) during 2014 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. More detailed synthesis reports will be produced in 2015-2017.

Grassland Monitoring Results

Grassland monitoring occurred during early August of 2014 (Table 1). Data from four (4) 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. Additional data is collected during visits that support the SPFG program.

Table 1. Plant community and sampling dates for each transect at Fort Union NM in 2014.

Group	Transect	Plant community	Date
Steppe	SHORT-LT02	Shortgrass Steppe	08/02
	SHORT-LT03	Shortgrass Steppe	08/02
	SHORT-LT04	Shortgrass Steppe	08/02
	SHORT-LT05	Shortgrass Steppe	08/02



Figure 1. Layout of plots within each permanent transect.

Fort Union NM Grassland Monitoring
8/2/2014

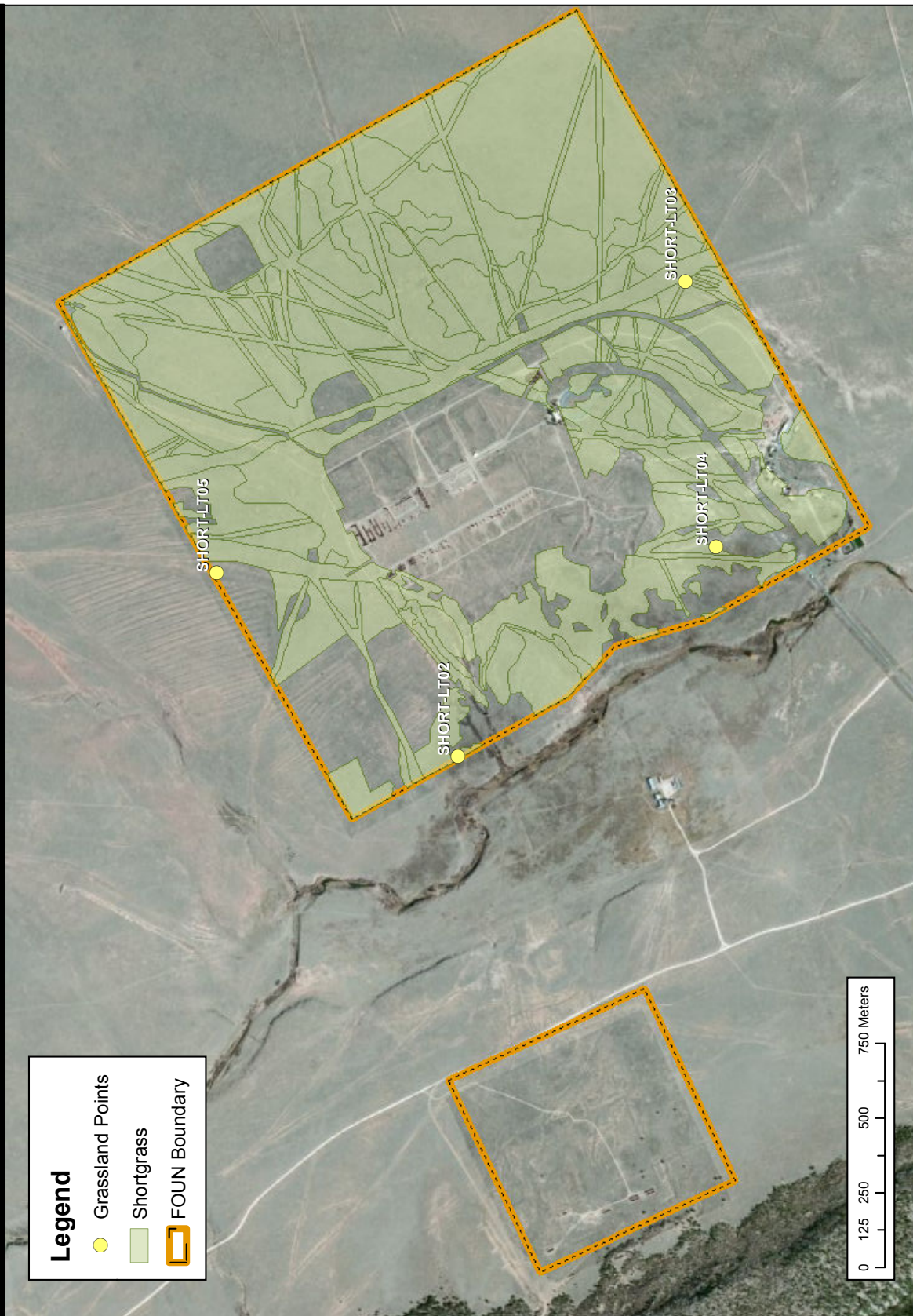


Figure 2. Location of each permanent plot at FOUN monitored in 2014

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 2014 can be found in Table 2.

Table 3 contains numerical results of 2014 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 2014.

Cover	Shortgrass			
	SHORT-LT02	SHORT-LT03	SHORT-LT04	SHORT-LT05
SOIOPEN	18.6	32.6	12.6	43.6
SOILUNDER	21.4	5.8	50.6	9
LITTER	57.4	60.6	35.4	43.8
WOOD	0.8	0	0	0
ROCKSM	1.8	0.6	1.4	2
ROCKLG	0	0	0	0
LICHEN	0	0	0	0
MOSS	0	0.2	0	0
CRUST	0	0.2	0	1.6

Table 3. Species cover sum and frequency for each permanent transect monitored at FOUN in 2014. Exotic species are highlighted in pink.

Species Code	SHORT-LT01		SHORT-LT02		SHORT-LT03		SHORT-LT04	
	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency
Forb								
AMBCON	55	5	17	5	33.5	4	2	3
ARTCAR			1	2	0.5	1	1	2
ARTFRI			0.5	1			0.5	1
ARTLUD	0.5	1			0.5	1		
ASTCRA							0.5	1
CHACOR	0.5	1						
CHAERI			0.5	1				
CHAFEN	1	1						
CHASER	0.5	1						
CHEINC							1.5	3
CHELEP	2	4			0.5	1	1.5	3
CHEPRA	2.5	3			1.5	2		
CHEWAT	0.5	1			5	3		
CIRUND			1	1			1	1
CONARV					7	3		
ENGPOR	2	2	2	3			1.5	2
ERIDIV							4	3
ERYCAP			0.5	1				
EUPDAV	1.5	2			1	2		
GAUCOC	3.5	4	0.5	1				
GRISQU			1	2			1.5	3
GUTSAR	14	2					0.5	1
HELANN	1	1			0.5	1		
HYMFIL			0.5	1			2.5	4
KOCSCO					208	5	0.5	1
LIAPUN			0.5	1			1	2
LINLEW			0.5	1				
MACPIN			0.5	1				
MENMUL	1	2			13	3		
MIRLIN	0.5	1	2	2				
OENCOR					1	1		
PENCOB			1	1				
PHYHED			1	1				
PSOTEN	3	1					0.5	1
RATTAG	3.5	2			0.5	1	1.5	2
ROSWOO	8	2						
SALTRA	6.5	3	1	2	11	5	2.5	4
SENSPA							0.5	1
SPHCOC	11.5	4	10.5	5	1	1	1.5	3
SYMERI			1.5	3				
TEULAC	3.5	4						
THEMEG	1	2					1	2

Table 3. Species cover sum and frequency for each permanent transect monitored at FOUN in 2014. Exotic species are highlighted in pink (continued).

Species Code	SHORT-LT01		SHORT-LT02		SHORT-LT03		SHORT-LT04	
	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency	Cover Sum	Frequency
Grass								
ARIPUR			1.5	3				
BOUCUR			0.5	1				
BOUGRA	83	5	75	5	2	3	140	5
DISSPI					0.5	1		
ELYELY	5	1						
MUHREP					1	1		
MUHTOR			3	4			3	1
MUHWRI			1	2			3	1
PASSMI	7	3			0.5	1	1.5	2
SPOAIR					26	2		
SPOCRY			8	2				
Subshrub								
ECHCOC							0.5	1
ECHVIR			1.5	1			1	1

Table 4. All plant species detected during grassland monitoring in 2011 and exotic monitoring in 2011 and 2014 at FOUN. Exotic species are highlighted in pink.

Species Code	LifeForm	Scientific Name	Common Name	Primary Duration
AMARET	Forb	<i>Amaranthus retroflexus</i>	redroot pigweed	Annual
AMBCON	Forb	<i>Ambrosia confertiflora</i>	weakleaf burr ragweed	Perennial
ARIPUR	Grass	<i>Aristida purpurea</i>	purple threeawn	Perennial
ARTCAR	Forb	<i>Artemisia carruthii</i>	carruth's sagewort	Perennial
ARTFRI	Forb	<i>Artemisia frigida</i>	fringed sagebrush	Perennial
ARTLUD	Forb	<i>Artemisia ludoviciana</i>	louisiana sagewort	Perennial
ASTCRA	Forb	<i>Astragalus crassicaupus</i>	ground-plum	Perennial
BOUCUR	Grass	<i>Bouteloua curtipendula</i>	sideoats grama	Perennial
BOUGRA	Grass	<i>Bouteloua gracilis</i>	blue grama	Perennial
BROCAT	Grass	<i>Bromus catharticus</i>	rescue grass	Annual/Perennial
CHACOR	Forb	<i>Chamaesaracha coronopus</i>	green false nightshade	Perennial
CHAERI	Forb	<i>Chaetopappa ericoides</i>	baby white aster	Perennial
CHAFEN	Forb	<i>Chamaesyce fendleri</i>	fendler's sandmat	Perennial
CHASER	Forb	<i>Chamaesyce serpyllifolia</i>	thyme-leaf sandmat	Annual
CHEALB	Forb	<i>Chenopodium album</i>	common lambsquarters	Annual
CHEINC	Forb	<i>Chenopodium incanum</i>	mealy goosefoot	Annual
CHELEP	Forb	<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot	Annual
CHEPRA	Forb	<i>Chenopodium pratericola</i>	desert goosefoot	Annual
CHEWAT	Forb	<i>Chenopodium watsonii</i>	watson's 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
EHCOC	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
ENGP	Forb	<i>Engelmannia peristenia</i>	engelmann's daisy	Perennial
ERABAR	Grass	<i>Eragrostis barrelieri</i>	mediterranean lovegrass	Annual
ERIDIV	Forb	<i>Erigeron divergens</i>	spreading fleabane	Biennial
EROCIC	Forb	<i>Erodium cicutarium</i>	red stem storksbill	Annual
ERYCAP	Forb	<i>Erysimum capitatum</i>	western wallflower	Biennial
EUPDAV	Forb	<i>Euphorbia davidii</i>	davids spurge	Annual
GAUCOC	Forb	<i>Gaura coccinea</i>	scarlet guara	Perennial
GRISQU	Forb	<i>Grindelia squarrosa</i>	curlytop gumweed	Perennial
GUTSAR	Forb	<i>Gutierrezia sarothrae</i>	broom snakeweed	Perennial
HELANN	Forb	<i>Helianthus annuus</i>	common sunflower	Annual
HYMFIL	Forb	<i>Hymenopappus filifolius</i>	fineleaf woollywhite	Perennial
KOCSCO	Forb	<i>Kochia scoparia</i>	kochia	Annual
LACSER	Forb	<i>Lactuca serriola</i>	prickly lettuce	Annual
LIAPUN	Forb	<i>Liatris punctata</i>	dotted gayfeather	Perennial
LINLEW	Forb	<i>Linum lewisii</i>	blue flax	Perennial
MACPIN	Forb	<i>Machaeranthera pinnatifida</i>	lacy tansyaster	Perennial
MARVUL	Forb	<i>Marrubium vulgare</i>	horehound	Perennial

Table 4. All plant species detected during grassland monitoring in 2011 and exotic monitoring in 2011 and 2014 at FOUN. Exotic species are highlighted in pink. (continued).

Species Code	LifeForm	Scientific Name	Common Name	Primary Duration
MELALB	Forb	<i>Melilotus alba</i>	white sweetclover	Annual
MELOFF	Forb	<i>Melilotus officinalis</i>	yellow sweetclover	Annual
MENMUL	Forb	<i>Mentzelia multiflora</i>	manyflowered blazingstar	Biennial
MIRLIN	Forb	<i>Mirabilis linearis</i>	narrowleaf four o'clock	Perennial
MUHREP	Grass	<i>Muhlenbergia repens</i>	creeping muhly	Perennial
MUHTOR	Grass	<i>Muhlenbergia torreyi</i>	ring muhly	Perennial
MUHWRI	Grass	<i>Muhlenbergia wrightii</i>	spike muhly	Perennial
OENCOR	Forb	<i>Oenothera coronopifolia</i>	crownleaf evening primrose	Perennial
PASSMI	Grass	<i>Pascopyrum smithii</i>	western wheatgrass	Perennial
PENCOB	Forb	<i>Penstemon cobaea</i>	cobaea penstemon	Perennial
PHYHED	Forb	<i>Physalis hederifolia</i>	ivy leaf groundcherry	Perennial
POLARE	Forb	<i>Polygonum arenastrum</i>	prostrate knotweed	Annual/Perennial
PSOTEN	Forb	<i>Psoralea 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
RUMCRI	Forb	<i>Rumex crispus</i>	curley dock	Perennial
SALTRA	Forb	<i>Salsola tragus</i>	prickly russian thistle	Annual
SCOLAC	Forb	<i>Scorzonera laciniata</i>	cutleaf vipergrass	Perennial
SENSPA	Forb	<i>Senecio spartioides</i>	broom groundsel	Perennial
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
TAROFF	Forb	<i>Taraxacum officinale</i>	dandelion	Perennial
TEULAC	Forb	<i>Teucrium laciniatum</i>	lacy germander	Perennial
THEMEG	Forb	<i>Thelesperma megapotamicum</i>	hopi tea greenthread	Perennial
TRADUB	Forb	<i>Tragopogon dubius</i>	western salsify	Annual
TRITER	Forb	<i>Tribulus terrestris</i>	puncturevine	Annual
VERTHA	Forb	<i>Verbascum thapsus</i>	common mullein	Biennial

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 discrete 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 22, 2014 and included the entrance and service road of the park (Figure 4). These vectors have been previously monitored July 18, 2011. It should be noted that 2011 was the beginning of years of severe to exceptional drought, including early 2014. Data summarized in this report compares the results of 2014 monitoring to that detected in 2011.

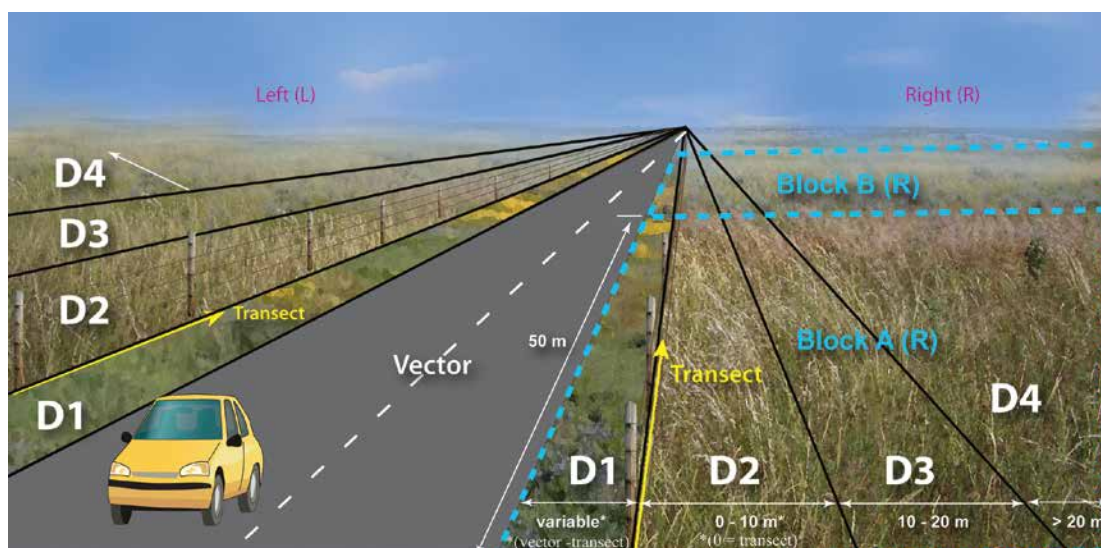


Figure 3. Layout of Vector Blocks and Distance Classes along a vector.

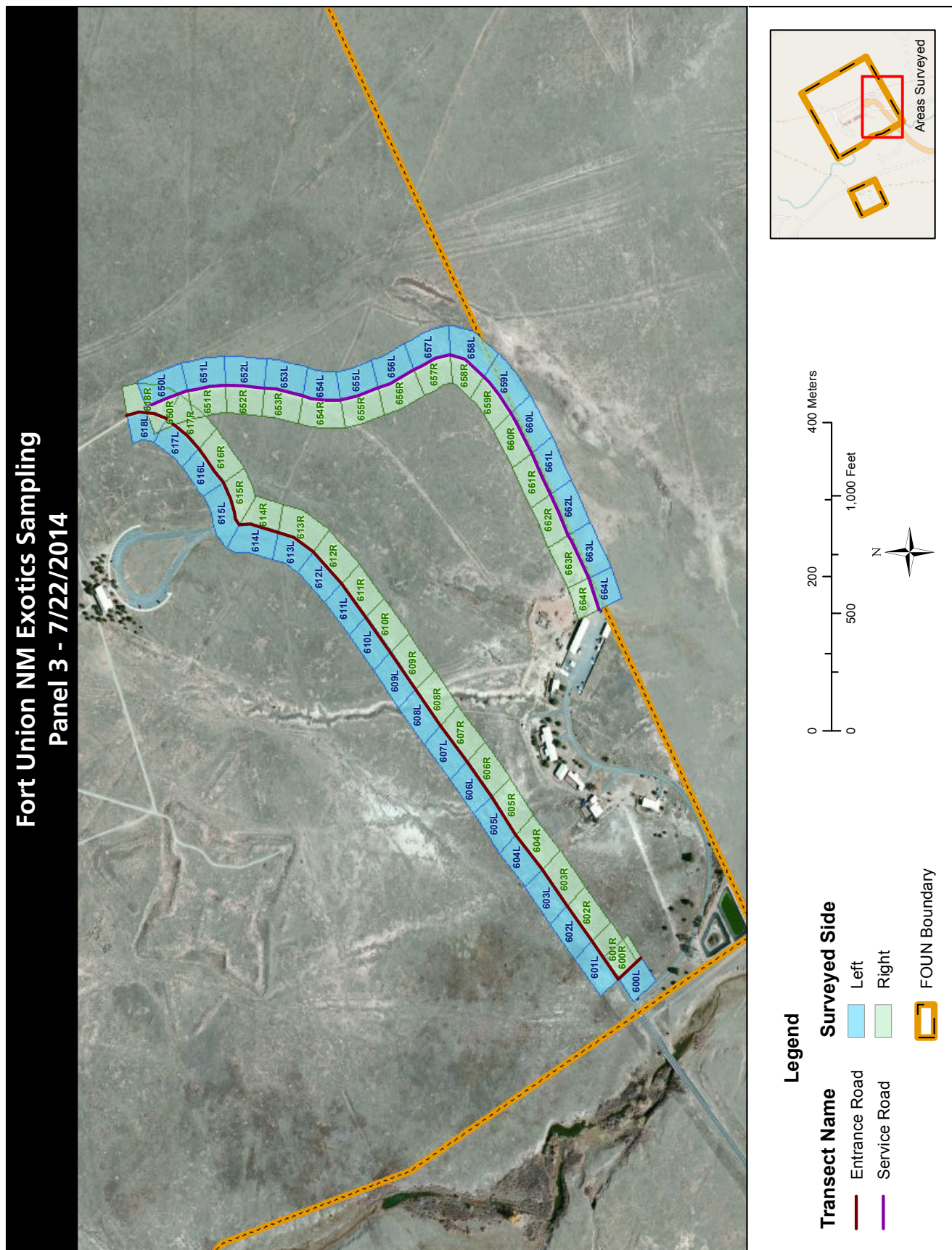


Figure 4. Panel 3 numbered vector blocks monitored at FOUN in both 2011 and 2014.

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=68) and transects (N=4)(Figure 5) in which these species were found.

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	2011		2014		2011		2014	
		Primary Blocks (N=68)		Primary Blocks (N=68)		Secondary Transects (N=6)		Secondary Transects (N=4)	
		Total	% Blocks	Total	% Blocks	Total	% Blocks	Total	% Blocks
<i>Amaranthus retroflexus</i>	redroot pigweed	–	–	1	1.47%	–	–	–	–
<i>Bromus catharticus</i>	rescue grass	–	–	2	2.94%	–	–	–	–
<i>Chenopodium album</i>	common lambsquarters	–	–	5	7.35%	–	–	–	–
<i>Convolvulus arvensis</i>	field bindweed	37	54.41%	44	64.71%	1	16.67%	1	25.00%
<i>Eragrostis barrelieri</i>	mediterranean lovegrass	–	–	1	1.47%	–	–	–	–
<i>Erodium cicutarium</i>	red stem storksbill	11	16.18%	9	13.24%	–	–	–	–
<i>Euphorbia davidii</i>	davids spurge	–	–	1	1.47%	–	–	2	50.00%
<i>Kochia scoparia</i>	kochia	29	42.65%	36	52.94%	2	33.33%	2	50.00%
<i>Lactuca serriola</i>	prickly lettuce	–	–	2	2.94%	–	–	–	–
<i>Marrubium vulgare</i>	horehound	–	–	1	1.47%	–	–	–	–
<i>Melilotus officinalis</i>	white sweetclover	–	–	2	2.94%	–	–	–	–
<i>Melilotus officinalis</i>	yellow sweetclover	7	10.29%	2	2.94%	–	–	–	–
<i>No Plant</i>	no plant	7	10.29%	–	–	1	16.67%	–	–
<i>Polygonum arenastrum</i>	prostrate knotweed	–	–	1	1.47%	–	–	–	–
<i>Rumex crispus</i>	curley dock	1	1.47%	1	1.47%	–	–	–	–
<i>Salsola tragus</i>	prickly Russian thistle	52	76.47%	66	97.06%	4	66.67%	4	100.00%
<i>Scorzonera laciniata</i>	cutleaf vipergrass	–	–	3	4.41%	–	–	–	–
<i>Taraxacum officinale</i>	dandelion	–	–	3	4.41%	–	–	–	–
<i>Tragopogon dubius</i>	western salsify	–	–	5	7.35%	–	–	–	–
<i>Tribulus terrestris</i>	puncturevine	–	–	1	1.47%	–	–	–	–
<i>Verbascum thapsus</i>	common mullein	4	5.88%	–	–	–	–	–	–

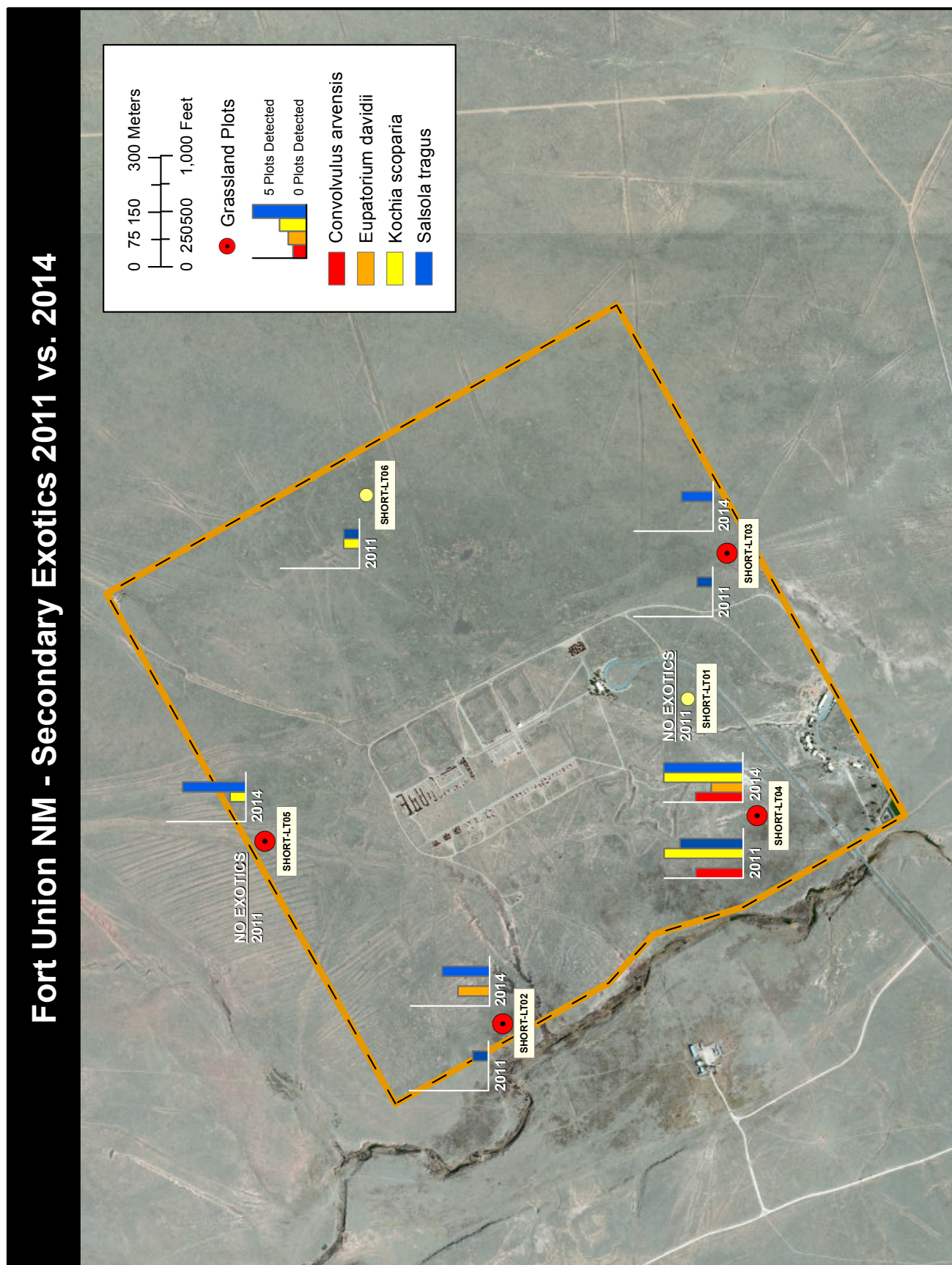


Figure 5. Comparison of exotics detected in 2011 and 2014 grassland monitoring permanent transects at FOUN.

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 2011 and 2014 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 2011 and 2014 in two Distance Classes.

Species Code	Scientific Name	Common Name	Density Code	Distance Class 1		Distance Class 2	
				2011	2014	2011	2014
AMARET	<i>Amaranthus retroflexus</i>	redroot pigweed	2		1		1
BROCAT	<i>Bromus catharticus</i>	rescue grass	1		1		1
			2		1		1
CHEALB	<i>Chenopodium album</i>	common lambsquarters	1		3		3
			2		2		
CONARV	<i>Convolvulus arvensis</i>	field bindweed	1	8	7	8	
			2	25	36	15	15
			3		1		
ERABAR	<i>Eragrostis barrelieri</i>	mediterranean lovegrass	2		1		1
EROCIC	<i>Erodium cicutarium</i>	red stem storksbill	1	6			3
			2	5	9		
EUPDAV	<i>Euphorbia davidii</i>	davids spurge	1		1		
KOCSKO	<i>Kochia scoparia</i>	kochia	1	5		6	
			2	22	26	18	30
			3		4		
LACSER	<i>Lactuca serriola</i>	prickly lettuce	1		1		1
MARVUL	<i>Marrubium vulgare</i>	horehound	2				1
MELALB	<i>Melilotus alba</i>	white sweetclover	1		2		
MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	1	4	2		
			2	3		1	
POLARE	<i>Polygonum arenastrum</i>	prostrate knotweed	2		1		
RUMCRI	<i>Rumex crispus</i>	curley dock	1	1			1
SALTRA	<i>Salsola tragus</i>	prickly Russian thistle	1	25	1	15	1
			2	26	58	21	65
			3		2		
SCOLAC	<i>Scorzonera laciniata</i>	cutleaf vipergrass	1		1		1
			2		2		2
TAROFF	<i>Taraxacum officinale</i>	dandelion	1		3		2
TRADUB	<i>Tragopogon dubius</i>	western salsify	1		4		1
TRITER	<i>Tribulus terrestris</i>	puncturevine	1		1		1
VERTHA	<i>Verbascum thapsus</i>	common mullein	1	4			

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.

Table 7. Comparison of 2011 vs. 2014 detections for each individual Vector Block, detailing the given Density Code for each Distance Class.

Block	Scientific Name	Common Name	2011				2014			
			D1	D2	D3	D4	D1	D2	D3	D4
600L	<i>Bromus catharticus</i>	rescue grass					1	1	0	0
600L	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	2	0	0
600L	<i>Erodium cicutarium</i>	red stem storksbill	2	0	0	0	2	2	0	0
600L	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
600L	<i>Polygonum arenastrum</i>	prostrate knotweed					2	0	0	0
600L	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
600R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	2	0	0
600R	<i>Erodium cicutarium</i>	red stem storksbill					2	0	0	0
600R	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
600R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
600R	<i>Scorzonera laciniata</i>	cutleaf vipergrass					2	2	0	0
600R	<i>Taraxacum officinale</i>	dandelion					1	1	0	0
600R	<i>Verbascum thapsus</i>	common mullein	1	0	0	0				
601L	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	0	0	0
601L	<i>Erodium cicutarium</i>	red stem storksbill	2	0	0	0	2	0	0	0
601L	<i>Kochia scoparia</i>	kochia	2	1	0	0	2	2	2	2
601L	<i>Melilotus officinalis</i>	yellow sweetclover	2	0	0	0				
601L	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
601L	<i>Taraxacum officinale</i>	dandelion					1	0	0	0
601L	<i>Verbascum thapsus</i>	common mullein	1	0	0	0				
601R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	2	0	0
601R	<i>Erodium cicutarium</i>	red stem storksbill					2	2	0	0
601R	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
601R	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	2	2	2	2
601R	<i>Scorzonera laciniata</i>	cutleaf vipergrass					2	2	0	0
601R	<i>Taraxacum officinale</i>	dandelion					1	1	0	0
601R	<i>Tragopogon dubius</i>	western salsify					1	0	0	0
602L	<i>Convolvulus arvensis</i>	field bindweed	1	1	0	0				
602L	<i>Erodium cicutarium</i>	red stem storksbill	1	0	0	0	2	0	0	0
602L	<i>Kochia scoparia</i>	kochia					0	2	2	2
602L	<i>Melilotus officinalis</i>	yellow sweetclover	2	0	0	0				
602L	<i>Salsola tragus</i>	prickly Russian thistle					0	2	2	2
602R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	3	0	0	0
602R	<i>Kochia scoparia</i>	kochia					2	2	2	0
602R	<i>Scorzonera laciniata</i>	cutleaf vipergrass					1	1	0	0
602R	<i>Tragopogon dubius</i>	western salsify					1	0	0	0
602R	<i>Verbascum thapsus</i>	common mullein	1	0	0	0				
603L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	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 2011 vs. 2014 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2011				2014			
			D1	D2	D3	D4	D1	D2	D3	D4
603L	<i>Erodium cicutarium</i>	red stem storksbill					2	1	0	0
603L	<i>Kochia scoparia</i>	kochia	2	1	0	0	2	2	0	0
603L	<i>Melilotus officinalis</i>	yellow sweetclover	2	0	0	0				
603L	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0				
603R	<i>Convolvulus arvensis</i>	field bindweed	2	1	0	0	2	2	0	0
603R	<i>Kochia scoparia</i>	kochia	0	1	0	0	2	2	0	0
603R	<i>Melilotus officinalis</i>	yellow sweetclover	1	0	0	0				
603R	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	0
604L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	2	0	0
604L	<i>Erodium cicutarium</i>	red stem storksbill	2	0	0	0	2	0	0	0
604L	<i>Kochia scoparia</i>	kochia	2	1	0	0	2	2	0	0
604L	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	2	2	2	2
604L	<i>Tragopogon dubius</i>	western salsify					1	0	0	0
604R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	2	0	0
604R	<i>Erodium cicutarium</i>	red stem storksbill	2	0	0	0				
604R	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
604R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	1	0	2	2	2	2
605L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	0	0	0
605L	<i>Erodium cicutarium</i>	red stem storksbill	1	0	0	0				
605L	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
605L	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	2	2	2	2
605L	<i>Tragopogon dubius</i>	western salsify					1	0	0	0
605R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	2	0	0
605R	<i>Erodium cicutarium</i>	red stem storksbill	1	0	0	0				
605R	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
605R	<i>Marrubium vulgare</i>	horehound					0	2	1	0
605R	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	0	2	2	2	2
606L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	0	0	0
606L	<i>Erodium cicutarium</i>	red stem storksbill	1	0	0	0				
606L	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	2
606L	<i>Melilotus officinalis</i>	yellow sweetclover					1	0	0	0
606L	<i>Salsola tragus</i>	prickly Russian thistle	1	1	1	0	2	2	2	2
606R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	X	2	0	0	0
606R	<i>Kochia scoparia</i>	kochia	2	2	0	X	2	2	2	2
606R	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	X	2	2	2	2
607L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	0	0	0
607L	<i>Erodium cicutarium</i>	red stem storksbill	1	0	0	0				
607L	<i>Kochia scoparia</i>	kochia	2	0	0	0	2	2	2	2
607L	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
607R	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	0	0	0
607R	<i>Kochia scoparia</i>	kochia					0	2	2	0
607R	<i>Salsola tragus</i>	prickly Russian thistle	1	1	2	0	2	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

Table 7. Comparison of 2011 vs. 2014 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2011				2014			
			D1	D2	D3	D4	D1	D2	D3	D4
608L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	2	0	0
608L	<i>Erodium cicutarium</i>	red stem storksbill					2	0	0	0
608L	<i>Kochia scoparia</i>	kochia	2	0	0	0	2	2	0	0
608L	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	2	2	2	2
608R	<i>Convolvulus arvensis</i>	field bindweed	2	2	2	0	2	0	0	0
608R	<i>Kochia scoparia</i>	kochia	1	2	2	0	2	2	2	2
608R	<i>Rumex crispus</i>	curley dock	1	0	0	0	0	1	1	0
608R	<i>Salsola tragus</i>	prickly Russian thistle	1	2	2	0	2	2	2	2
609L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	0	0	0
609L	<i>Kochia scoparia</i>	kochia					2	2	0	0
609L	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
609R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	0	0	0
609R	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	0	0
609R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	1	2	2	2	2
610L	<i>Convolvulus arvensis</i>	field bindweed					1	2	0	0
610L	No Plant	no plant	0	0	0	0				
610L	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
610L	<i>Tragopogon dubius</i>	western salsify					0	1	0	0
610R	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	0	0	0
610R	<i>Kochia scoparia</i>	kochia	2	2	0	0	2	2	2	0
610R	<i>Salsola tragus</i>	prickly Russian thistle	1	2	0	0	2	2	2	2
611L	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
611L	No Plant	no plant	0	0	0	0				
611L	<i>Salsola tragus</i>	prickly Russian thistle					0	2	2	2
611R	<i>Convolvulus arvensis</i>	field bindweed	1	0	0	0	1	0	0	0
611R	<i>Kochia scoparia</i>	kochia	2	2	0	0	3	2	2	2
611R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
612L	<i>Convolvulus arvensis</i>	field bindweed					2	2	0	0
612L	<i>Kochia scoparia</i>	kochia	0	1	0	0				
612L	<i>Melilotus officinalis</i>	yellow sweetclover					1	0	0	0
612L	<i>Salsola tragus</i>	prickly Russian thistle	0	1	0	0	0	2	2	2
612R	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
612R	<i>Kochia scoparia</i>	kochia	2	2	0	0	3	2	3	2
612R	<i>Salsola tragus</i>	prickly Russian thistle	1	2	2	0	2	2	2	2
613L	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
613L	<i>Kochia scoparia</i>	kochia	1	0	0	0				
613L	<i>Salsola tragus</i>	prickly Russian thistle					0	2	2	2
613R	<i>Kochia scoparia</i>	kochia	2	2	0	0	3	2	2	2
613R	<i>Salsola tragus</i>	prickly Russian thistle	1	2	1	0	3	2	2	2
614L	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
614L	<i>Melilotus officinalis</i>	yellow sweetclover	1	0	0	0				
614L	<i>Salsola tragus</i>	prickly Russian thistle					0	2	2	2
614L	<i>Verbascum thapsus</i>	common mullein	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 2011 vs. 2014 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2011				2014			
			D1	D2	D3	D4	D1	D2	D3	D4
614R	<i>Convolvulus arvensis</i>	field bindweed	0	1	0	0				
614R	<i>Kochia scoparia</i>	kochia	2	2	2	2	3	2	2	2
614R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	2	2	3	2	2	2
615L	<i>Convolvulus arvensis</i>	field bindweed	0	1	1	0	2	2	0	0
615L	<i>Erodium cicutarium</i>	red stem storksbill	1	0	0	0				
615L	<i>Kochia scoparia</i>	kochia	1	2	0	0	2	2	2	2
615L	<i>Melilotus officinalis</i>	white sweetclover					1	0	0	0
615L	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	2	2	2	2
615R	<i>Chenopodium album</i>	common lambsquarters					1	1	1	0
615R	<i>Convolvulus arvensis</i>	field bindweed	1	1	0	0	2	0	0	0
615R	<i>Erodium cicutarium</i>	red stem storksbill	2	0	0	0				
615R	<i>Kochia scoparia</i>	kochia	2	2	2	0	2	2	2	2
615R	<i>Lactuca serriola</i>	prickly lettuce					0	1	0	0
615R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	2	0	2	2	2	2
616L	<i>Salsola tragus</i>	prickly Russian thistle	1	0	1	0	2	2	2	2
616R	<i>Chenopodium album</i>	common lambsquarters					1	1	1	0
616R	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
616R	<i>Kochia scoparia</i>	kochia					2	2	2	2
616R	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	2	2	2	2
617L	<i>Convolvulus arvensis</i>	field bindweed	1	0	0	0	1	0	0	0
617L	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
617R	<i>Chenopodium album</i>	common lambsquarters					2	0	0	0
617R	<i>Kochia scoparia</i>	kochia	2	2	0	0				
617R	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0	2	2	2	2
618L	No Plant	no plant	0	0	0	0				
618L	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
618R	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0	2	2	2	2
650L	<i>Convolvulus arvensis</i>	field bindweed	1	0	0	0				
650L	<i>Kochia scoparia</i>	kochia	2	1	0	0				
650L	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0	2	2	2	2
650R	<i>Chenopodium album</i>	common lambsquarters					2	0	0	0
650R	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	2	2	2	2
651L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
651R	<i>Kochia scoparia</i>	kochia					0	0	0	2
651R	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	2	2	2	2
652L	<i>Kochia scoparia</i>	kochia					2	0	0	0
652L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
652R	<i>Kochia scoparia</i>	kochia					0	0	0	2
652R	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
653L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
653R	<i>Kochia scoparia</i>	kochia					0	0	0	2
653R	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
654L	<i>Convolvulus arvensis</i>	field bindweed					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 2011 vs. 2014 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2011				2014			
			D1	D2	D3	D4	D1	D2	D3	D4
654L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
654R	<i>Convolvulus arvensis</i>	field bindweed					1	0	0	0
654R	<i>Kochia scoparia</i>	kochia					0	0	0	2
654R	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
655L	<i>Convolvulus arvensis</i>	field bindweed	0	1	0	0	2	0	0	0
655L	<i>Euphorbia davidii</i>	davids spurge					1	0	0	0
655L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
655R	<i>Convolvulus arvensis</i>	field bindweed					2	2	0	0
655R	<i>No Plant</i>	no plant	0	0	0	0				
655R	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
656L	<i>Convolvulus arvensis</i>	field bindweed	1	2	0	0	2	0	0	0
656L	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0	2	2	2	2
656R	<i>Convolvulus arvensis</i>	field bindweed	0	1	0	0				
656R	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
657L	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0				
657L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
657R	<i>Convolvulus arvensis</i>	field bindweed	1	1	0	0	1	0	0	0
657R	<i>Salsola tragus</i>	prickly Russian thistle	2	1	0	0	2	2	2	2
658L	<i>Convolvulus arvensis</i>	field bindweed					2	0	0	0
658L	<i>Salsola tragus</i>	prickly Russian thistle	2	1	1	0	2	2	2	2
658R	<i>Convolvulus arvensis</i>	field bindweed	1	0	0	0	1	0	0	0
658R	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
659L	<i>Kochia scoparia</i>	kochia	1	0	0	0				
659L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	1	1	0	0
659R	<i>Convolvulus arvensis</i>	field bindweed					1	0	0	0
659R	<i>No Plant</i>	no plant	0	0	0	0				
659R	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
660L	<i>Salsola tragus</i>	prickly Russian thistle	2	0	0	0	2	2	2	2
660R	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	0
661L	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
661R	<i>No Plant</i>	no plant	0	0	0	0				
661R	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
662L	<i>Salsola tragus</i>	prickly Russian thistle	1	1	0	0	2	2	2	2
662R	<i>No Plant</i>	no plant	0	0	0	0				
662R	<i>Salsola tragus</i>	prickly Russian thistle					2	2	2	2
663L	<i>Convolvulus arvensis</i>	field bindweed	2	2	0	0	2	0	0	0
663L	<i>Kochia scoparia</i>	kochia					2	0	0	0
663L	<i>Lactuca serriola</i>	prickly lettuce					1	0	0	0
663L	<i>Melilotus officinalis</i>	white sweetclover					1	0	0	0
663L	<i>Melilotus officinalis</i>	yellow sweetclover	1	2	0	0				
663L	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
663R	<i>Amaranthus retroflexus</i>	redroot pigweed					2	2	2	2
663R	<i>Chenopodium album</i>	common lambsquarters					1	1	1	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 2011 vs. 2014 detections for each individual Vector Block, detailing the given Density Code for each Distance Class (continued).

Block	Scientific Name	Common Name	2011				2014			
			D1	D2	D3	D4	D1	D2	D3	D4
663R	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	2	2	2
663R	<i>Eragrostis barrelieri</i>	mediterranean lovegrass					2	0	0	0
663R	<i>Erodium cicutarium</i>	red stem storksbill					2	2	0	0
663R	<i>Kochia scoparia</i>	kochia	1	0	0	0	2	2	2	2
663R	<i>Salsola tragus</i>	prickly Russian thistle	2	2	0	0	2	2	2	2
663R	<i>Tribulus terrestris</i>	puncturevine					1	1	0	0
664L	<i>Convolvulus arvensis</i>	field bindweed	2	0	0	0	2	0	0	0
664L	<i>Salsola tragus</i>	prickly Russian thistle	1	0	0	0	2	2	2	2
664R	<i>Bromus catharticus</i>	rescue grass					2	2	0	0
664R	<i>Convolvulus arvensis</i>	field bindweed	2	2	2	0	2	2	2	2
664R	<i>Kochia scoparia</i>	kochia					2	2	2	2
664R	<i>Salsola tragus</i>	prickly Russian thistle					2	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

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..

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