



Vegetation and Exotic Plant Management

2017 Annual Report for Washita Battlefield NHS

Natural Resource Data Series NPS/WABA/NRDS—2018/1174



ON THE COVER

Washita River during wintertime. NPS Photo.

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The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

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Executive Summary

This report is intended to be used in concert with the Vegetation and Exotic Plant Management Implementation Strategy for Washita Battlefield NHS (Washita Battlefield NHS 2016). The implementation strategy provides an overview of the initial reference conditions and direction and this report provides the results for 2017 as well as an annual update (adaptation) of the direction based on ongoing results. Reference conditions represent a combination of ecological and cultural values of the Washita Battlefield NHS setting. The data used to determine condition of each vegetation unit relative to reference conditions is from the vegetation monitoring surveys conducted by the Southern Plains Network and Southern Plains Fire Group in accordance with Folts-Zettner et al. (2017). The primary management treatments during 2017 were mowing, herbicide, and seeding. Mowing was primary done to control exotic

plants, particularly bromes. Most treatments were effective during the treatment year but long-term results remain to be determined. Of the 8 transects monitored in 5 management units, all transects had >50% cover of expected native grasses for the unit and <25% bare ground. One transect each is in danger of becoming a monoculture and has >15% shrub cover. Four transects had <60% native grass cover, while only two transects had >15% cover of native forbs. Of particular concern, all transects had >10% exotic cover and >5% high-priority exotic plant cover. 2017 management actions continue the battle against exotic plant species and there have been some small victories. It is suspected that the lack of forbs and native grasses are a direct result of both high exotic pressure and long-term drought. A Management Work Plan has been included for 2018.



NPS PHOTO

Grassland area at Washita Battlefield NHS.

1. Introduction and Background

This document is part of a collaborative effort including the Washita Battlefield National Historic Site (WABA), the Southwest Exotic Plant Management Program (SW EPMT), the Southern Plains Fire Group (SPFG), and the Southern Plains Network (SOPN). It is also intended to be used in concert with the Vegetation and Exotic Plant Management Implementation Strategy for Washita Battlefield NHS (Washita Battlefield NHS 2016), where the strategy provides an overview of the initial conditions and direction and this report provides the results for 2017 as well as an annual update (adaptation) of the direction based on ongoing results.

2. Methods

2.1. Spatial Units Used For Vegetation Management

While ecological sites form the primary basis for establishing the expected plant communities, Washita Battlefield NHS was established for its rich historical and cultural heritage. As such we used the spatial units described in the Washita Vegetation Management Plan (Washita Battlefield NHS in prep), which were based on the Cultural Landscape Report – Part 2 (2002) (Figure 2.1-1.).

Vegetation Condition and Management

Overall objectives for vegetation management are presented in the Vegetation and Exotic Plant Management Implementation Strategy Washita Battlefield NHS (2016). Success of a given vegetation objective is determined either by achieving the reference condition(s) (below) identified for a given objective or by a trajectory (trend) leading toward the corresponding reference condition within the specified time frame.

Effectiveness of Treatments

Effectiveness of treatments would typically be determined both qualitatively and quantitatively. However, 2015 was our first season of this approach and before-treatment sampling was not available for most treatments. Thus, qualitative assessments are the primary approach for evaluating treatment effectiveness in 2017.

Condition of Vegetation Units Relative to Reference Conditions

The data used to determine condition of each vegetation unit relative to reference conditions will be from the vegetation monitoring surveys conducted by the Southern Plains Network and Southern Plains Fire Group in accordance with Folts-Zettner et al. (2017). Transect locations for those data are presented below in Figure 2.1-2.

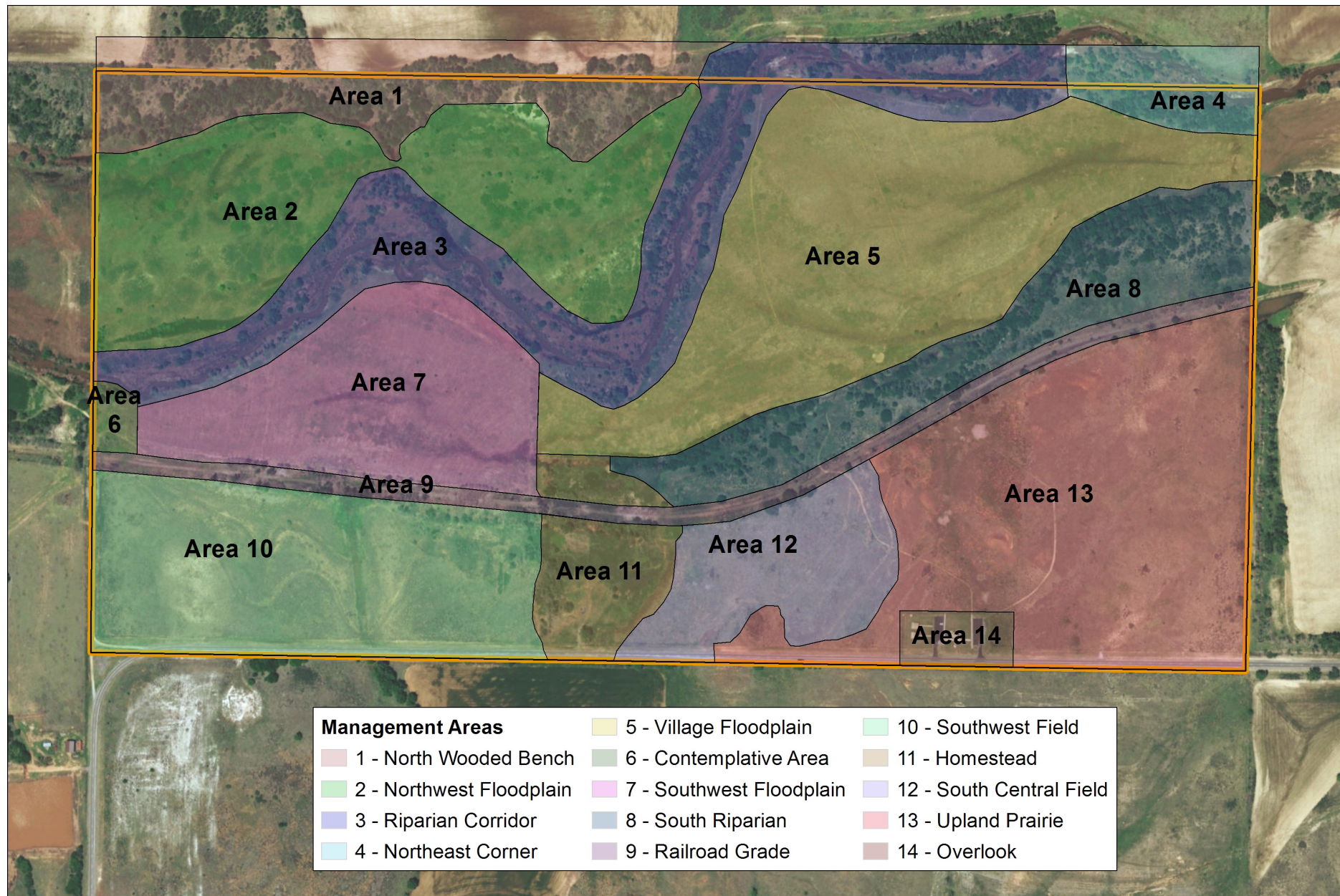


Figure 2.1-1. Spatial units used for the development of a vegetation and exotic plant management strategy at Washita Battlefield NHS.

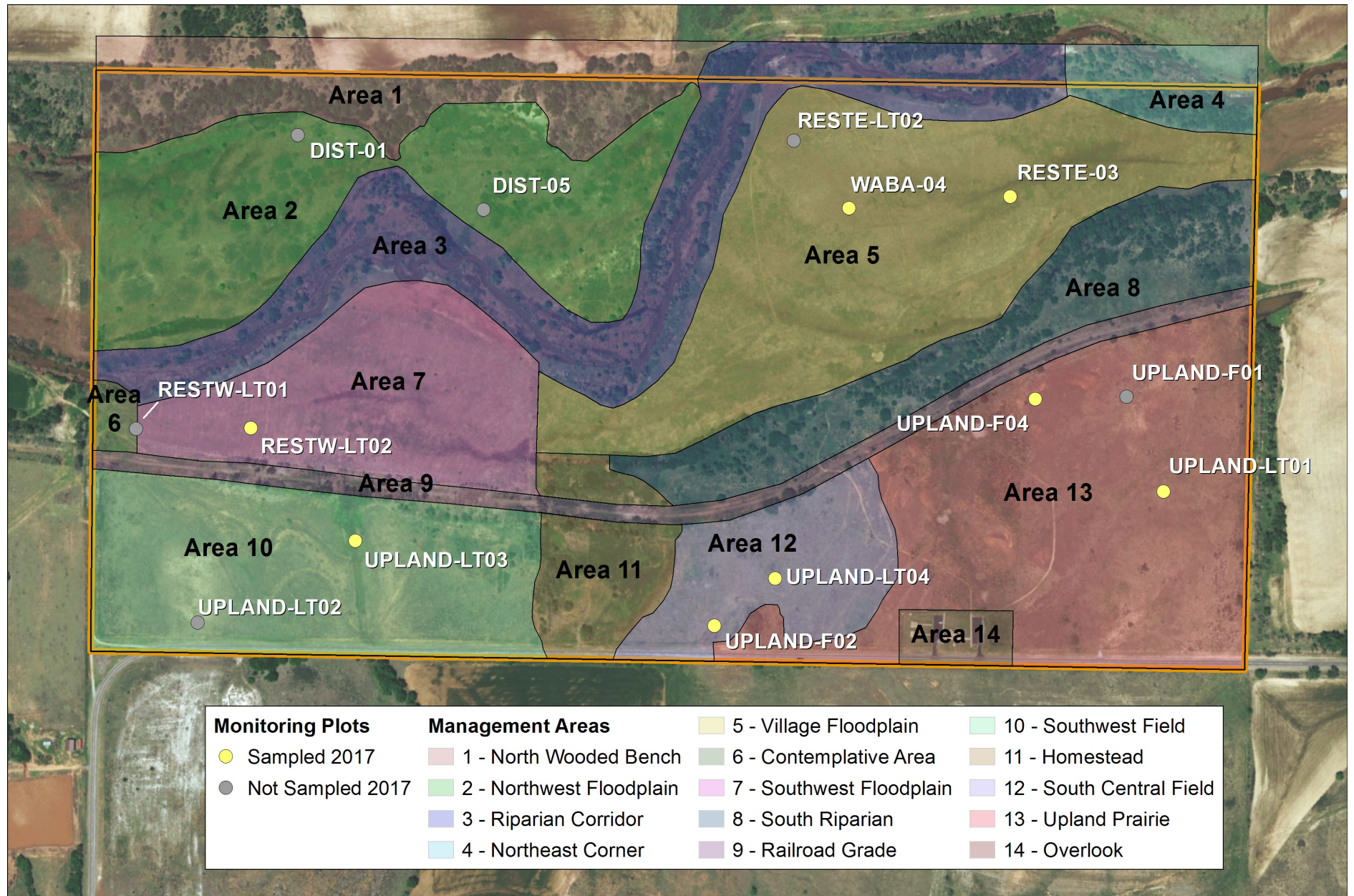


Figure 2.1-2. Grassland plots currently being sampled at Washita Battlefield NHS.

Exotic Plant Occurrence Along High-Risk Vectors

Most exotic plant species become established by gaining a foothold then gradually expanding their invasion zone and seed bank. For this reason, SOPN monitors the early detection of exotic plant occurrence along selected high-risk vectors (i.e., areas along roads, trails, and boundaries) where initial invasion is more likely to occur. This effort entails a sampling scheme that uses a three-year rotating panel design, whereby a subset of the high risk vectors are surveyed each year (a panel) for three years, after which the areas surveyed are repeated. Detailed methods are described in Folts-Zettner et al. (2016), and

the locations of vectors for WABA are shown below in Figure 2.1-3. 2017 exotic monitoring results can be found in Appendix B

Park-wide Rapid Assessment of Exotic Plants

In addition to the monitoring described above, SOPN conducts a rapid assessment of exotic plants every 3 years using a systematic grid covering the entire park (Figure 2.1-4). The rapid assessment examines the occurrence of a subset of higher priority exotic species within a 10 m radius of points on that grid. The presence and density class of each exotic species is recorded at each point in accordance with Folts-Zettner et al. (2016).

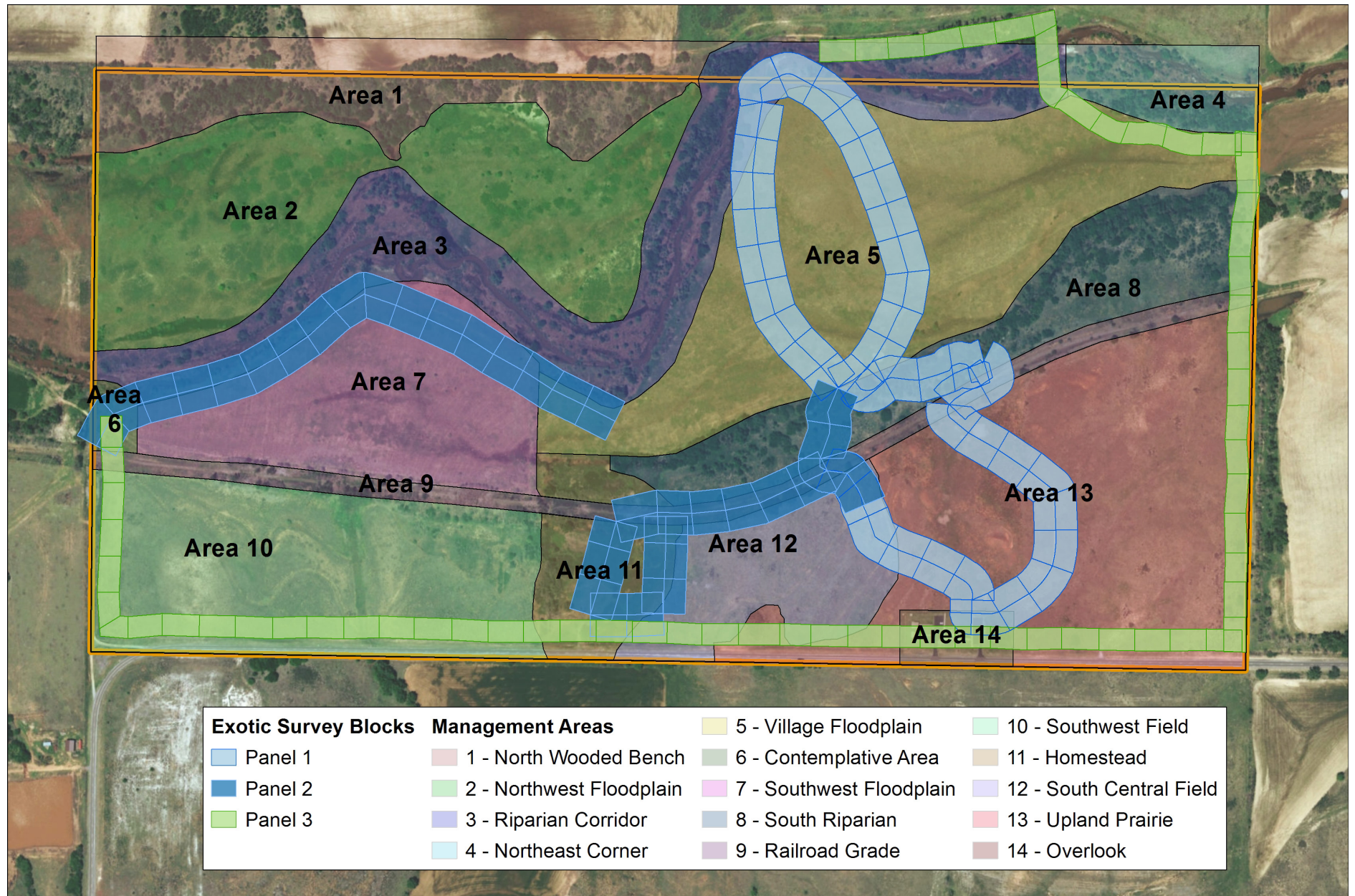


Figure 2.1-3. The high risk vectors sampled at Washita Battlefield NHS on a 3-year rotating basis. Panel 3 was monitored in 2017.

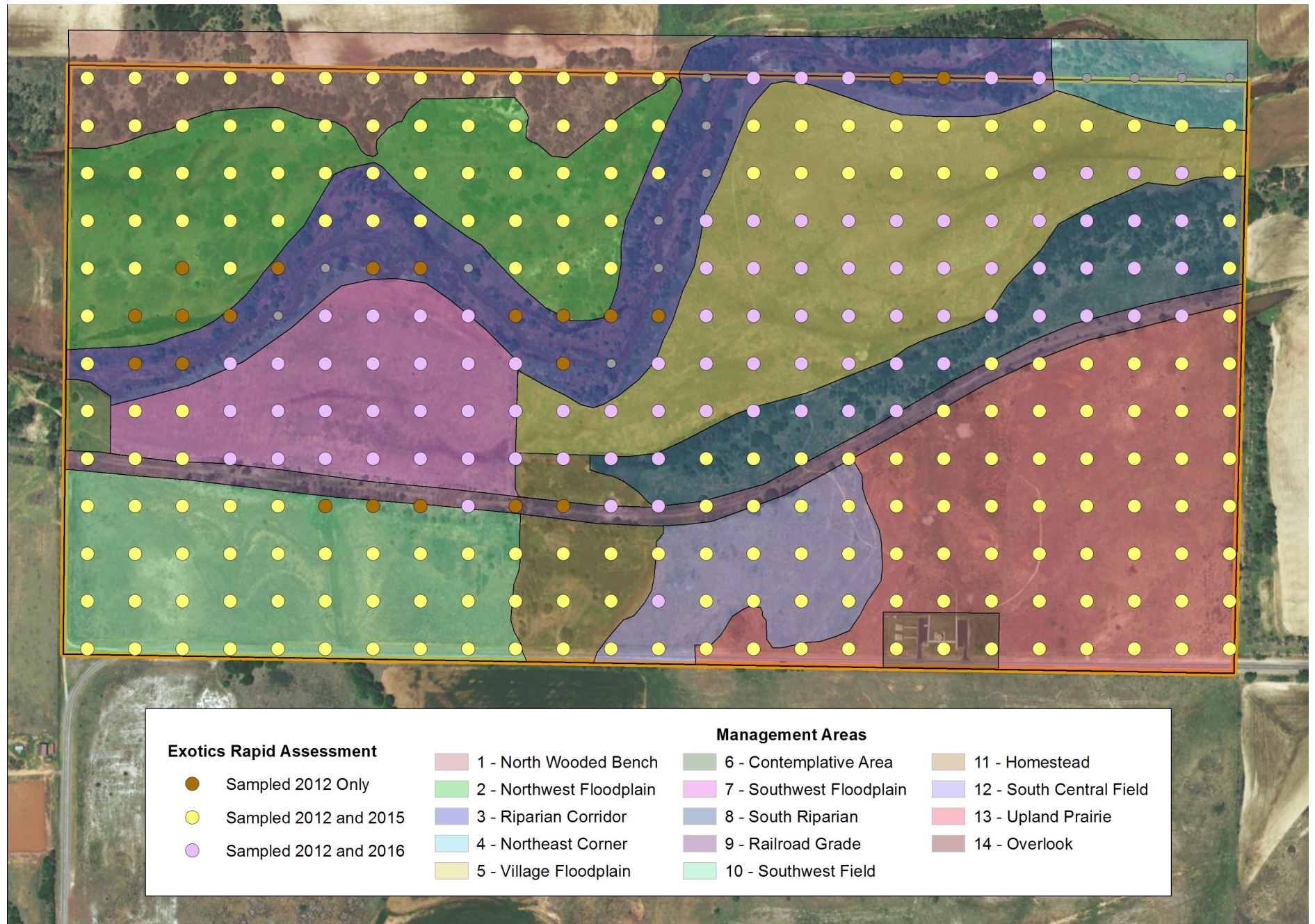


Figure 2.1-4. The park-wide exotic plant rapid assessment grid at Washita Battlefield NHS.

2.2. Reference Conditions For Washita Battlefield NHS

We use the term reference conditions to describe our best estimate of resource conditions that are used as a reference point to evaluate the effectiveness of the vegetation management progress. There have been a myriad of terms and concepts centered on the idea of a resource state that management is trying to achieve. The term “desired condition” is commonly used within NPS as part of the planning process, including those documents undergoing the NEPA process. However, for our purposes, the term desired condition, as it has been used in NPS planning, is too broad and in many cases has uncertainty about very specific resource states that it would be premature to call the desired conditions, particularly in the context of NEPA compliance. Thus, one way to look at how we are using reference conditions here is as a tentative but measurable desired condition.

The reference conditions described below represent a combination of ecological and historical values of the Washita Battlefield Setting NHS setting. They are divided into two categories: (1) Historic Landscape, and (2) Ecological Integrity and Functioning.

Historic Landscape

Overall Goal for the Historic Landscape: To maintain scenic quality and the ability to evoke a sense of place for the historic setting.

For Washita Battlefield, the scenic and historic integrity of the viewshed overlap considerably. From the historic perspective, the reference condition is based on the 1868 landscape, the time of the massacre. The scenic quality of the viewshed is influenced primarily by anthropogenic “stuff”. The historic connection goes beyond the scenic quality and includes the historic connections between landscape, particularly the River corridor, the hills, and the surrounding mid-grass prairie.

Historic Reference Conditions

HL1-Historic Landscape: The historic landscape including vegetation structure and viewshed is consistent with that of the 1868 landscape.

Ecological Integrity and Functioning Landscape Scale Diversity

Overall Goal for Landscape Scale Diversity: The overall goal for landscape diversity at Washita Battlefield NHS is for the landscape to reflect a combination of ecological and historic integrity. This integrity is comprised of two major vegetation zones, upland prairie intersected by riparian habitats, with local variation in the expression of these major types reflected by their local environments such as soils and moisture regimes.

Ecological Reference Conditions

EIF1-Landscape Diversity: The landscape diversity at WABA should generally correspond spatially to the variation expected for the primary ecological sites described above and in NRCS (2014).

EIF2-Native Grass Species Cover: The grasslands at Washita Battlefield NHS should be dominated (>60% cover) by native grass species expected to occur given local site characteristics.

EIF3-Native Grass Species Composition: The grass species at Washita Battlefield NHS should be species expected under the ecological conditions for a given site based on Ecological Site Descriptions, local records and local expertise. Within a given ecological site, >70% of the grass species cover should be native grass species expected to occur at the given local site.

EIF4-Grass Species Monocultures: To avoid monocultures, no individual species should occupy >85% cover within a given ecological site.

EIF5-Grass Species Biodiversity: The native species richness of grasses at Washita Battlefield NHS should be at least 50% of the number of native species reported to occur within a given ecological site.

EIF6-Native Forb Cover: Although grassland sites should be dominated by native grass species, native forbs should occupy > 20% ground cover. It should be noted that the process of restoring native prairies may have an initial temporary stage with < 10%, but there should be an ongoing process of

introducing forbs as vegetation management continues.

EIF7-Forb Species Biodiversity: The native species richness of forbs at Washita Battlefield NHS should be at least 50% of the number of native species reported to occur within a given ecological site.

EIF8-Exotic Species Occurrence: Ideally, there would be 100% native species, but exotic species should be maintained at <10% of the overall cover.

EIF9-Exotic Species Trend: There should generally be a decreasing trend in the proportion of exotic plant species, but at least no net increase in the proportion of exotic to native species. Note: this reference condition will only be reported during periodic synthesis reports.

EIF10- Exotic Species Priority: Less than 5% of the exotic species should be those considered high priority as per the Washita Battlefield NHS Natural Resource Condition Assessment (Struthers et al. 2014)(Table 2.2-1).

Table 2.2-1. Exotic species found within Washita Battlefield NHS that are considered to have the most impact to native habitats throughout the Historic Site based upon combined measures. The logic for this determination can be found in Struthers et al. 2014).

Scientific Name	Common Name
<i>Tamarix ramosissima</i>	Saltcedar
<i>Sorghum halepense</i>	Johnsongrass
<i>Bothriochloa ischaemum</i>	King ranch bluestem
<i>Bromus tectorum</i>	Cheatgrass
<i>Ulmus pumila</i>	Siberian elm
<i>Bromus japonicus</i>	Japanese brome
<i>Convolvulus arvensis</i>	Field bindweed
<i>Melilotus officinalis</i>	Yellow Sweetclover
<i>Cynodon dactylon</i>	Bermudagrass

EIF11-Grassland Functional Groups: To maintain the sense of place of prairie, upland grasslands should be dominated by grasses. Native shrubs and subshrubs (e.g., cacti & succulents) probably add diversity to grassland sites, reflecting ecological site conditions, but should not dominate the sites and typically constitute < 15% of the total cover in grasslands.

EIF12-Riparian Bottomlands Overstory: To maintain the sense of place of the site, with overstory dominated by stands of native cottonwoods within the WABA bottomland ecological sites.

EIF13-Pollinator Habitat: Floral resource abundance and availability is consistent with that expected for the ecological site and sufficient to support healthy populations of native pollinators.

EIF14-MonarchHabitat: The abundance, diversity and densities of native milkweeds are consistent with that expected for the ecological site and sufficient to support healthy populations of monarchs where appropriate.

EIF15-Bare Ground: The Amount and size of bare areas do not exceed that which would expose the site to excessive erosion, be expected for the ecological site, and does not exceed 30%.

EIF16-Erosion: That the presence of rills, gullies, or wind erosion does not exceed that which would naturally be expected for the ecological site and would generally be classified as none to slight.



Figure 3.1-1. Location and type of primary vegetation management actions conducted at Washita Battlefield NHS during 2017.

3. Results

3.1. Management Treatments

The location of the primary vegetation/exotic plant treatments that occurred at Washita Battlefield during 2017 are shown in Figure 3.1-1. Details of the treatments conducted are shown in Table 3.1-1. The primary

management treatments during 2017 were mowing, herbicide and reseeding. Mowing was primary done to control exotic plants, particularly bromes. Chemical treatment was used to control Johnsongrass. Prescribed fire was not used during 2017 at Washita Battlefield.

Table 3.1-1. The primary management actions conducted in each spatial unit at Washita Battlefield NHS during 2017. Also shown are the goals, objectives and effectiveness, either qualitative or quantitative for each management action.

Spatial Unit	Desired Condition with Departures	Management Treatment Used	Description of Treatment	Effectiveness of Treatment	Recommended Change in Management (if any)
1-North Wood	–	No treatment	–	–	–
2-NW Floodplain	To reduce the prevalence of exotic species and to facilitate establishment of native grasses.	Cut stump / Herbicide	Cut and treated stumps of Tamarisk at western boundary	Reduced tamarisk	–
3-Riparian Corridor	–	No treatment	–	–	–
4-NE Corner	–	No treatment	–	–	–
5-Village Floodplain	To reduce the prevalence of exotic species and to facilitate establishment of native grasses.	Herbicide	Sprayed for Siberian elm in Oct	to be determined	–
5-Village Floodplain	To reduce the prevalence of exotic and invasive species and to facilitate establishment of native grasses.	Mechanical	Chain sawed Siberian elm in Oct & eastern red cedar in March	Area cleared of mature Siberian elm and eastern red cedar	–
6-Contemplative	–	No treatment	–	–	–
7-SW Floodplain	–	No treatment	–	–	–
8-South Riparian	To reduce the prevalence of exotic species and to facilitate establishment of native grasses.	Herbicide	Sprayed for Siberian elm in Oct	to be determined	–
8-South Riparian	To reduce the prevalence of exotic and invasive species and to facilitate establishment of native grasses.	Mechanical	Chain sawed Siberian elm in Oct & eastern red cedar in March	Area cleared of mature Siberian elm and eastern red cedar	–
9-Railroad Grade	To reduce the prevalence of exotic and invasive species and to facilitate establishment of native grasses.	Mechanical	Chain sawed Siberian elm in Oct eastern boundary	Area cleared of mature Siberian elm	–
10-SW Field	–	No treatment	–	–	–
11-Homestead	–	No treatment	–	–	–
12-South Central Field	–	No treatment	–	–	–
13-Upland Prairie	–	No treatment	–	–	–
14-Overlook	–	No treatment	–	–	–

Table 3.2-1. Overall summary of reference conditions at Washita Battlefield NHS for 2017. Cells in red with a red X indicate that the transect did not meet the reference condition. Cells in green with a green dot indicate that the transect did meet the reference condition.

Spatial Unit	Transect	Native Grass	Expected Grass	Native Forb	Mono-culture	Exotics	High Priority Exotics	Native Shrub	Bare Ground
5 - Village Floodplain	RESTE-03	X	•	•	•	X	X	X	•
	WABA-04	•	•	•	•	X	X	•	•
7 - Southwest Floodplain	RESTW-LT02	X	•	X	•	X	X	•	•
10 - Southwest Field	UPLAND-LT03	X	•	X	•	X	X	•	•
12 - South Central Field	UPLAND-F02	•	•	X	•	X	X	•	•
	UPLAND-LT04	X	•	X	•	X	X	•	•
13 - Upland Prairie	UPLAND-F04	•	•	X	X	X	X	•	•
	UPLAND-LT01	•	•	X	•	X	X	•	•

3.2. Condition of Vegetation Units Relative to Reference Conditions

Based on our monitoring results, the condition of each spatial unit relative to our reference conditions is shown in figures 3.2-1 to 3.2-17. A summary of the reference conditions is

shown in Table 3.2-1. Measurable reference conditions for the historic landscape, landscape diversity, pollinator habitat and monarch butterfly habitat are still being refined and are not shown in this report. Biodiversity data can be found in Appendix C

Reference Condition EIF2 - Grassland Species Cover

Prairie or grassland habitats by definition are characterized as being dominated by grasses. The native grasses at WABA are also important to stabilize loose soils, protect against flooding and wind erosion, and provide suitable habitat for native fauna. Several sites meet the reference goal and should provide a good resource for recruitment to sites with less ideal circumstances. RESTE-03 has suffered a drastic reduction in native grasses since 2015 (from 50% to 13%). Cheatgrass has become the dominant grass. Native grass in RESTW-LT02 has steadily declined since 2010. UPLAND-LT03 has been dominated by cheatgrass and sedge, while UPLAND-LT04 has consistently hovered around 50% native grass.

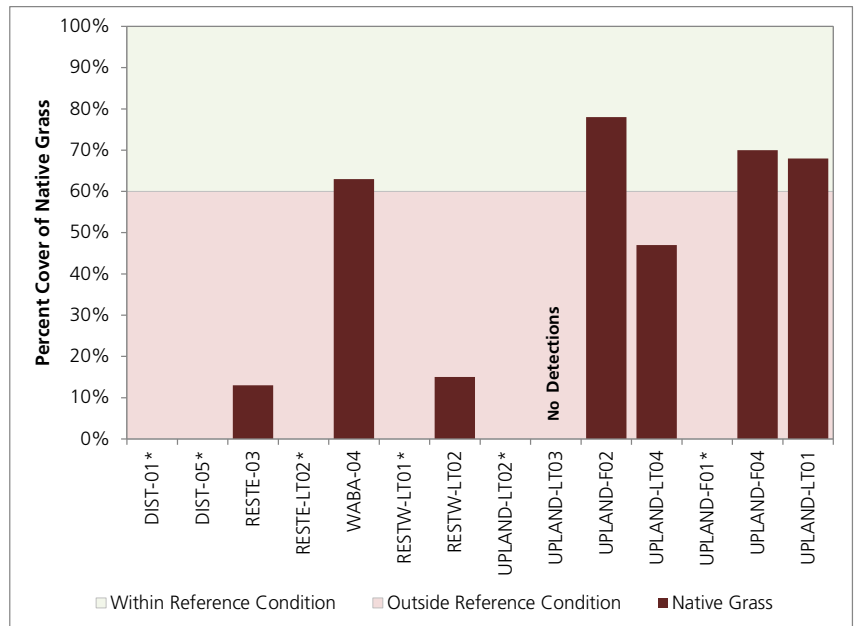


Figure 3.2-1. The percentages cover by native grasses on all of our monitoring plots. Bars within the green portion of the graph are within the reference condition of at least 60% cover by native grasses, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

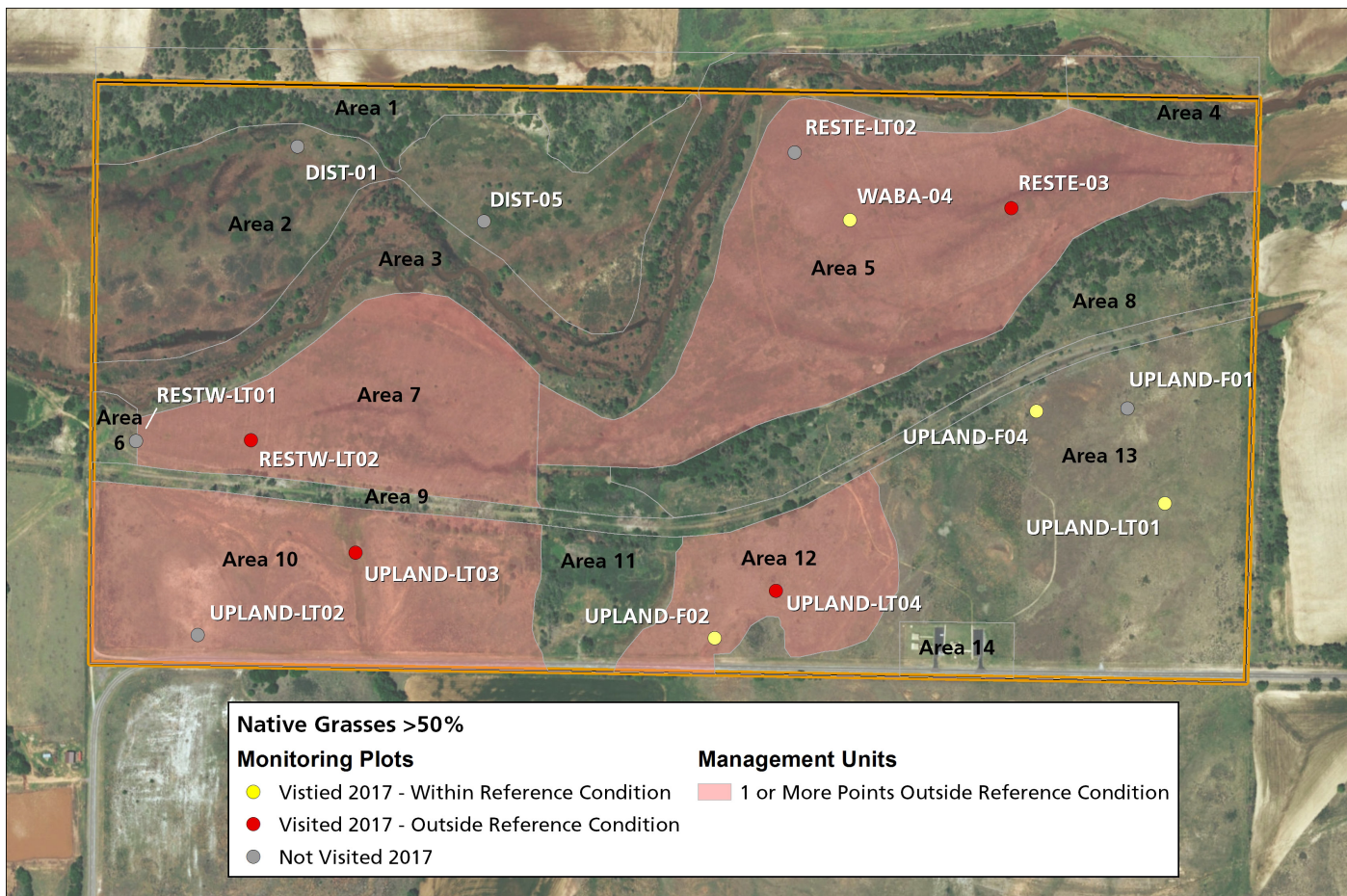


Figure 3.2-2. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

Reference Condition EIF2 - Grassland Species Composition

In addition to cover, we also consider which species are present relative to those expected for the site conditions. A suite of native grasses have been identified that should be present in each fully-realized (climax) plant community, based on Ecological Site Descriptions and local expertise. A variety of native grasses provides an ability to recover quickly from a disturbance and supplies diversity that supports a functioning habitat. All sites are within reference condition and have good grass species diversity (Figure 3.2-3 and 3.2-4), although the abundance of native grasses is less than desired.

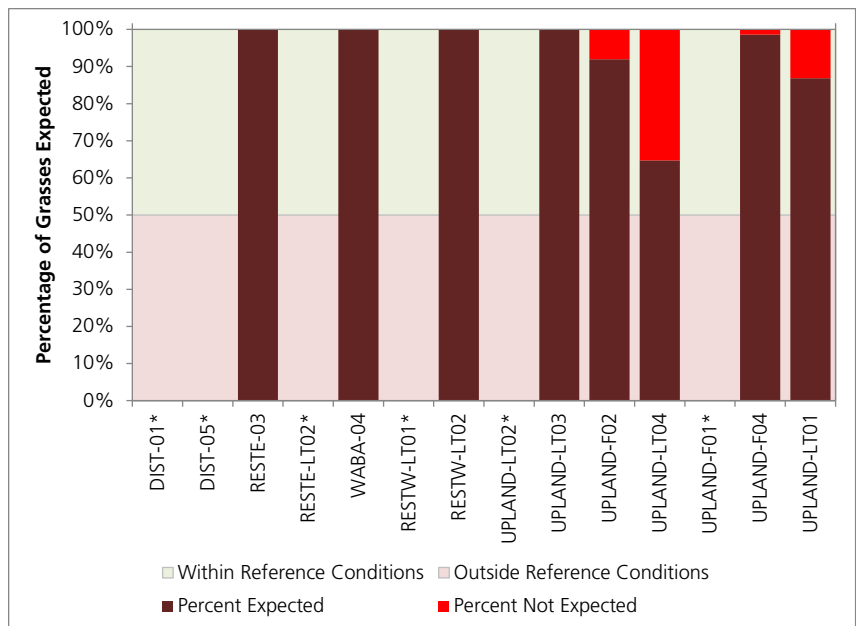


Figure 3.2-3 . The percentage grasses on our monitoring plots that are expected to occur at that site based on ecological site descriptions (NRCS 2011), local expertise, and county records. Bars within the green portion of the graph are within the reference condition of at least 50% cover by native grasses expected to occur at the site, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

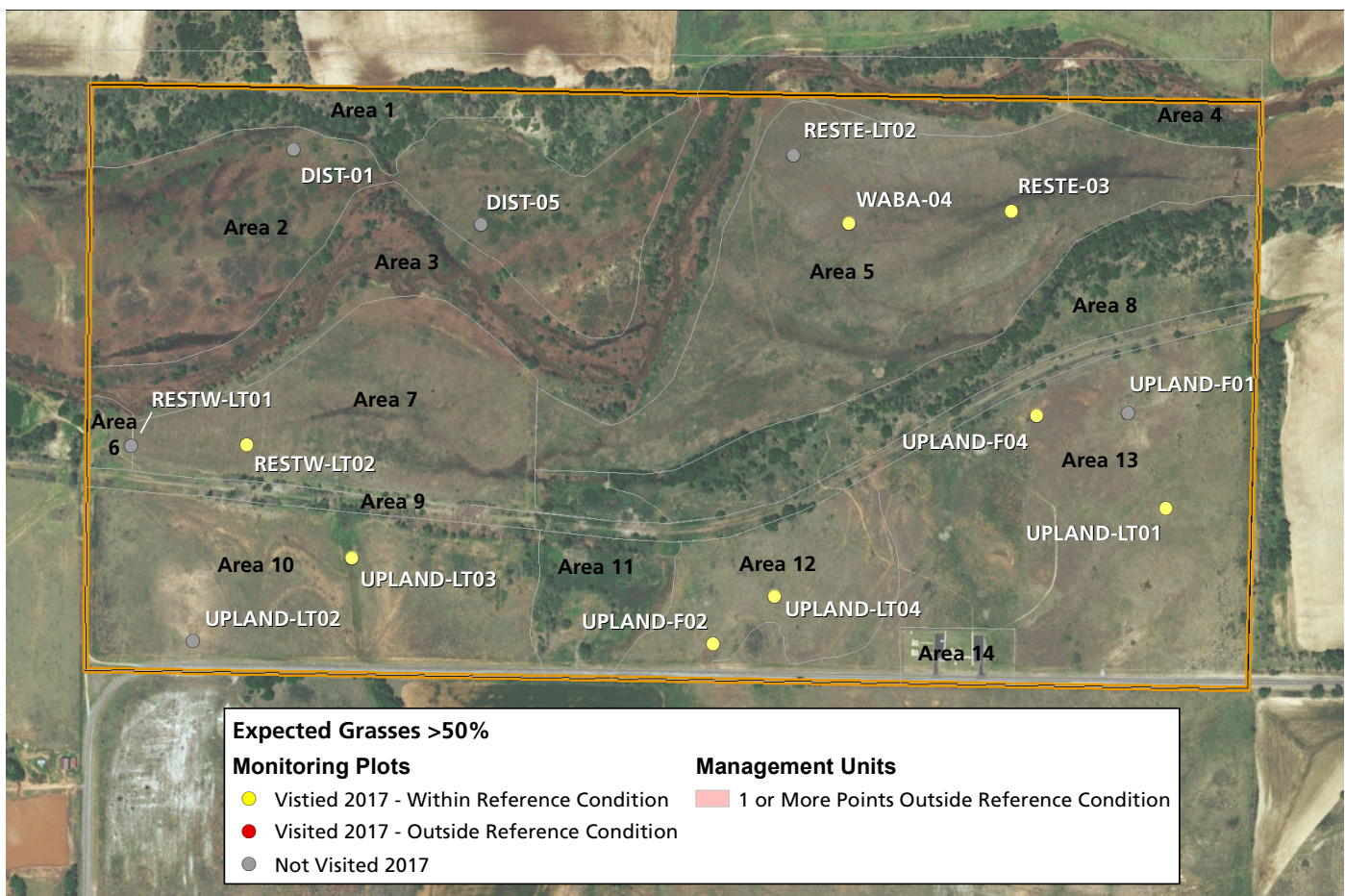


Figure 3.2-4. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

Reference Condition EIF4-Grass

Species Monocultures:

A monoculture occurs when a site is completely dominated by only one grass species. This can result in a lack of diversity, limited habitat, and a vulnerability to disturbance although the degree of concern varies depending on species and site characteristics. UPLAND-F04 has slightly more little bluestem than desired, but this is not a major concern at this time. All other transects monitored in 2017 met this reference condition (Figure 3.2-5 and 3.2-6), most with superior species diversity. Cheatgrass is not considered in this measure because it is an early spring annual exotic.

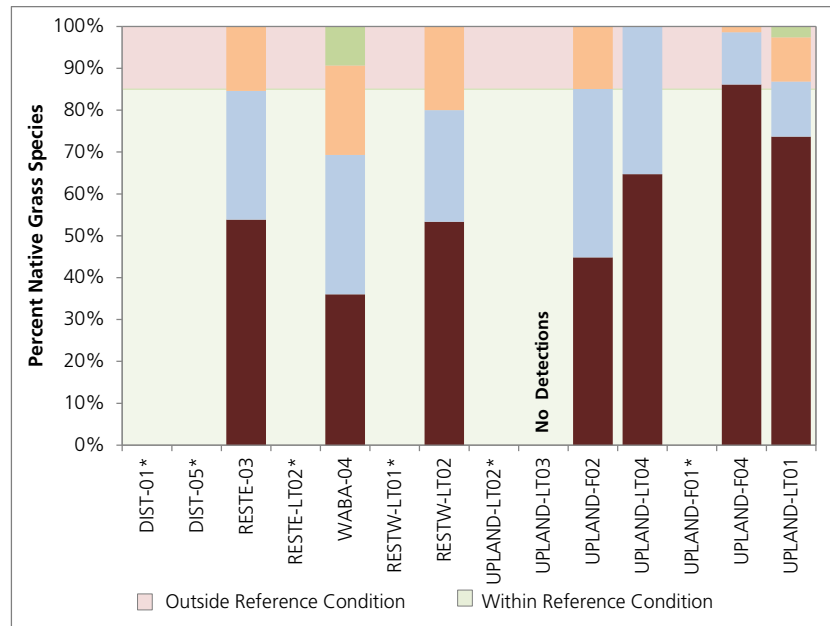


Figure 3.2-5. The percentage individual native grass species on our monitoring plots. Bars within the green portion of the graph are within the reference condition of no individual species having greater than 85% of cover by native grasses, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

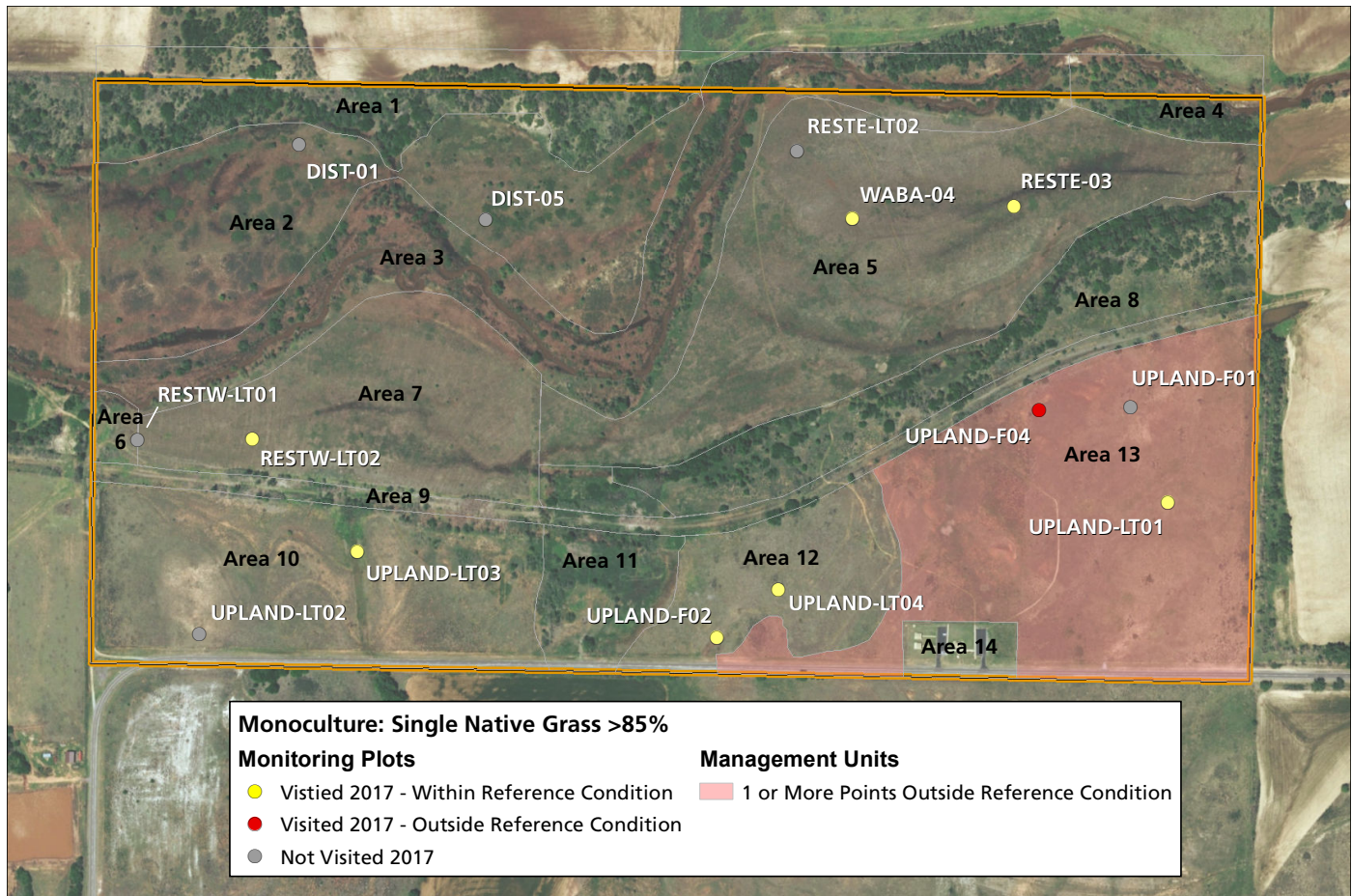


Figure 3.2-6. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

Reference Condition EIF6-Native Forb Cover

Native forbs are critical for healthy, diverse habitats – providing structure, nectar, pollen, seed and browse to the food chain and visual interest to the visitor. As grasslands mature, forbs diminish unless the area experiences periodic natural disturbance. Forb abundance at WABA appears to fluctuate with annual rainfall, experiencing a burst of bloom the year following the end of drought, then slowly dropping off in numbers. UPLAND-F02 and UPLAND-F04 have fewer forbs because native grass cover is high. RESTW-LT02, UPLAND-LT03, and UPLAND-LT04 have a large exotic grass component. A prescribed burn would refresh the grasses, return nutrients to the soil and open up the area by reducing plant litter. Seeding with a mix of annual and perennial forbs after a burn may bring these areas to a better condition, assuming sufficient moisture is present for re-establishment.

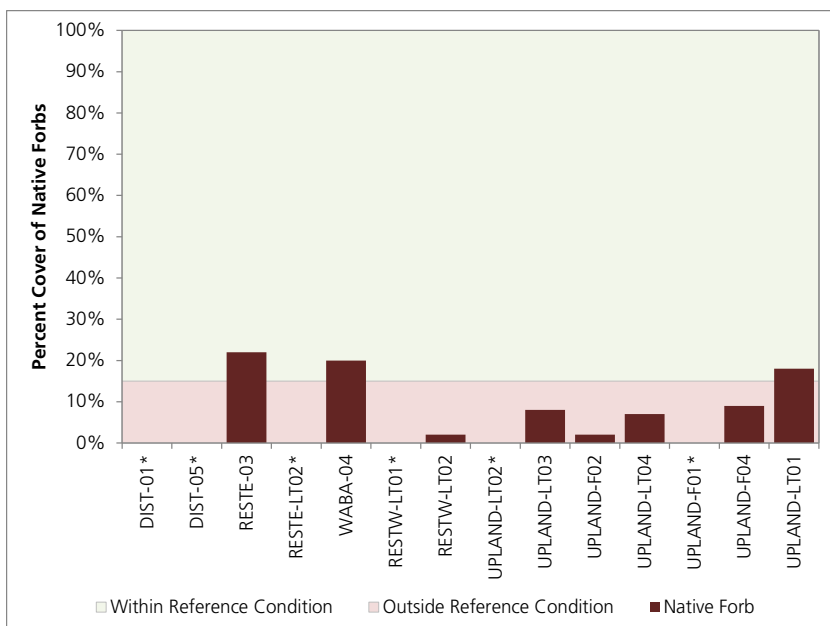


Figure 3.2-7. The percentage cover by native forbs on our monitoring plots. Bars within the green portion of the graph are within the reference condition of having at least 20% cover by native forbs, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

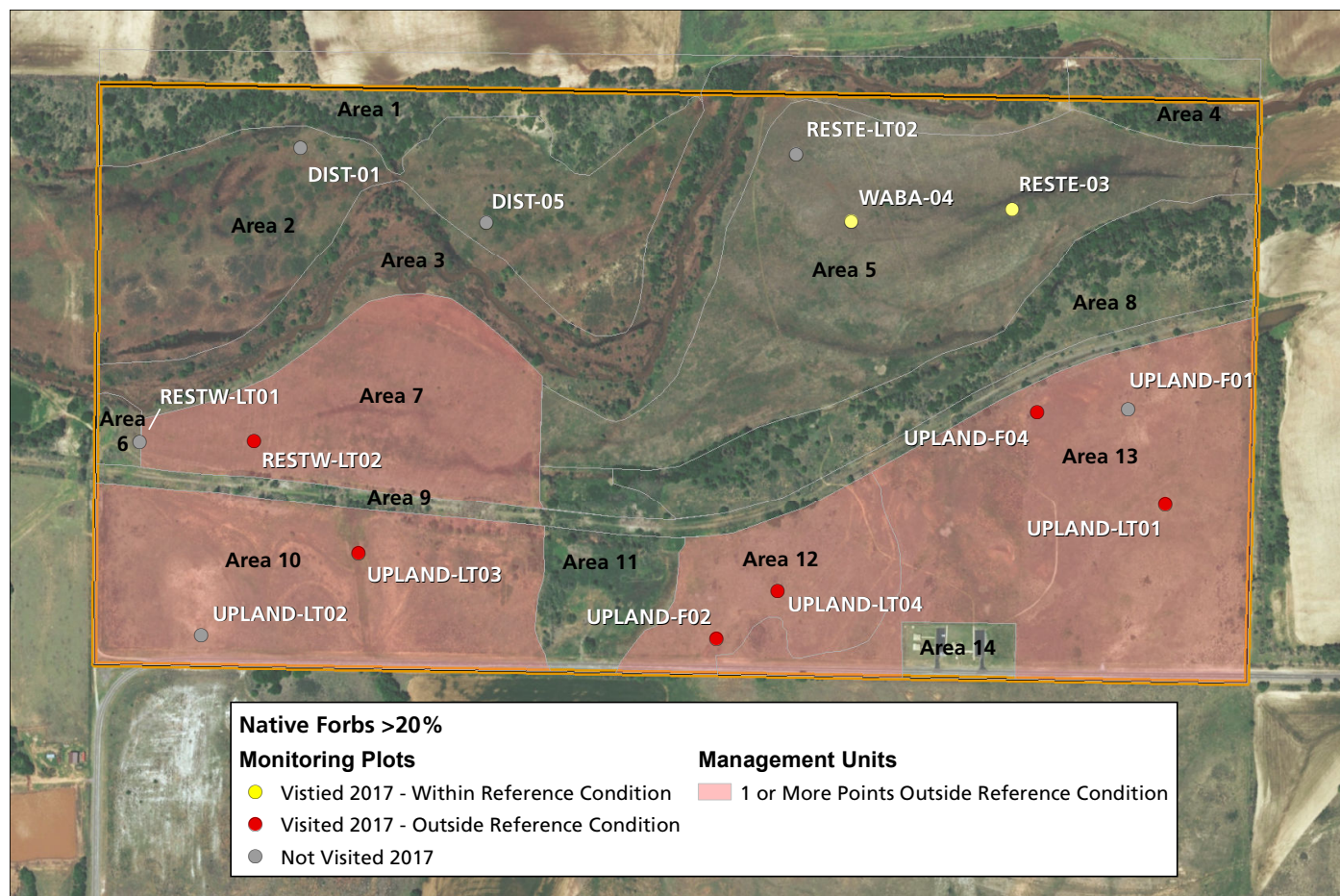


Figure 3.2-8. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

Reference Condition EIF8-Exotic Species Occurrence

Exotic species have become commonplace in the landscape with the potential to alter or replace native plant communities when populations become too abundant. Restoring and maintaining the resilience of natural areas will discourage the presence of exotics. All but one transects monitored in 2017 exhibited high cover of exotic plants, primarily grass species. Of particular concern is the potential for exotic bromes to alter the fire regime in grasslands, resulting in high fire dangers. Other prevalent grasses are Johnson grass and KR bluestem. (Figure 3.2-9 and Figure 3.2-10). Exotic plant control will require multiple techniques (prescribed burns, herbicides, grazing, manual removal) that are carefully timed to produce desired results. Multiple years of consistent treatment will also be necessary.

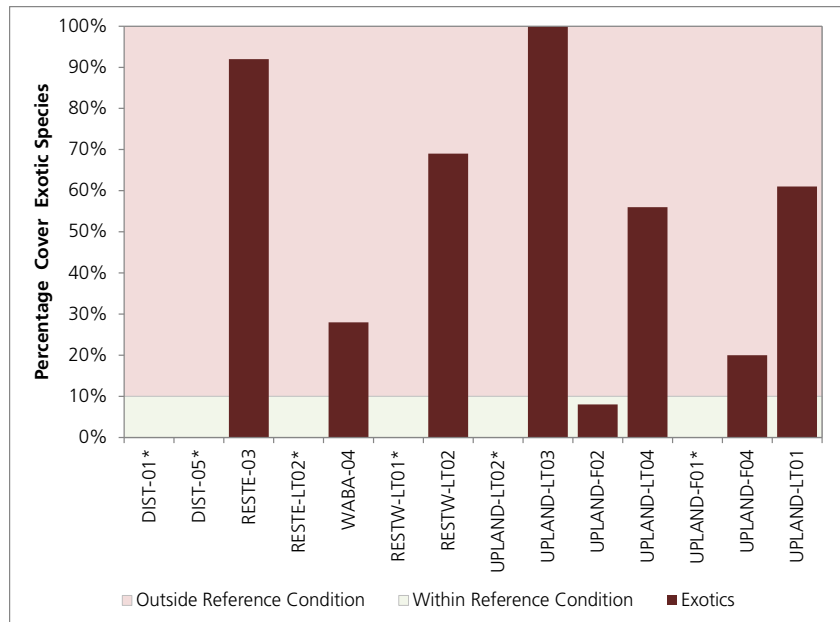


Figure 3.2-9. The percentage cover by exotic species on our monitoring plots. Bars within the green portion of the graph are within the reference condition of having no greater than 10% cover by exotic species, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

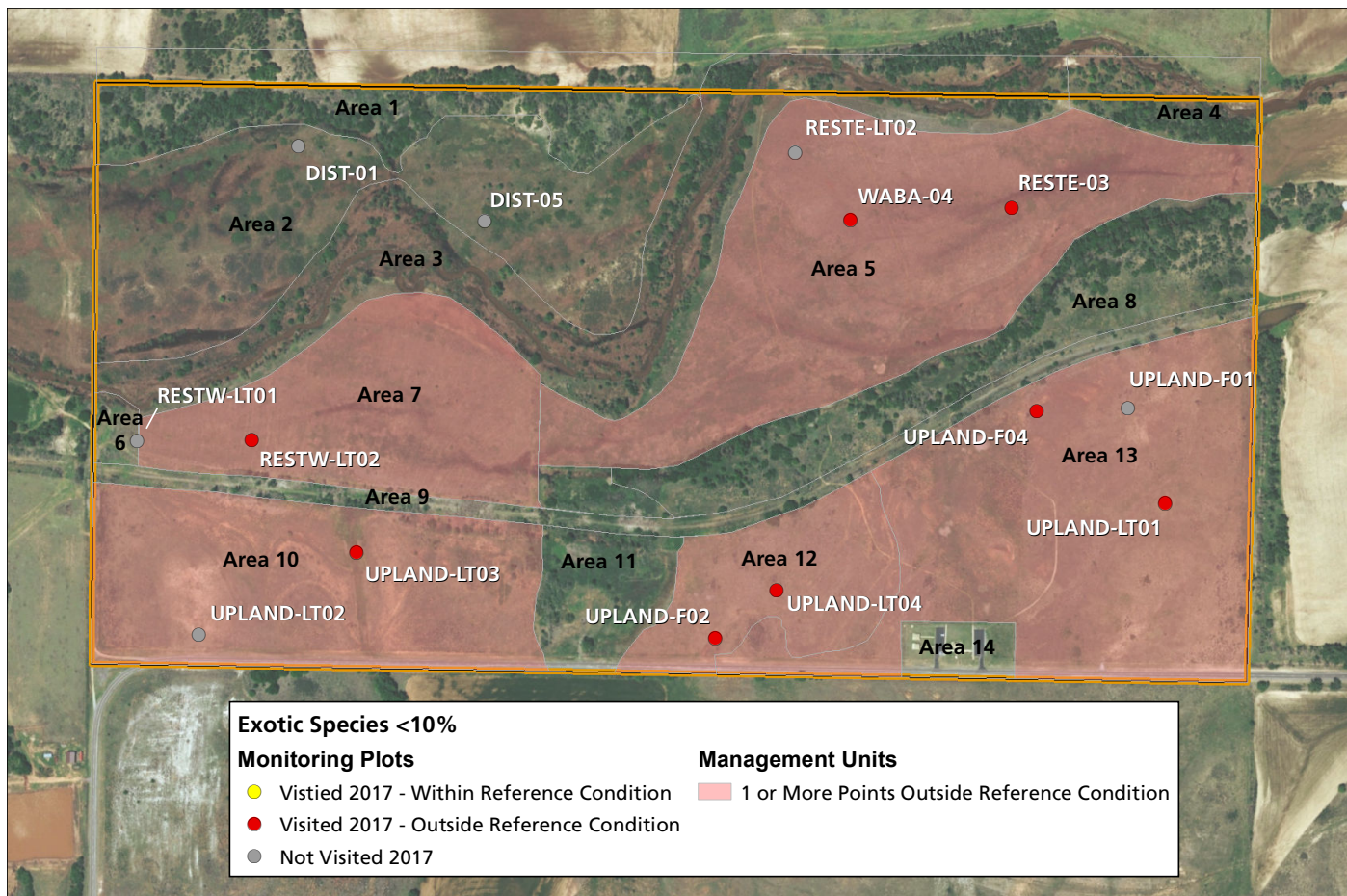


Figure 3.2-10 Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

Reference Condition EIF10- Exotic Species Priority

Some exotic species are very difficult to control while others diminish with various treatments. Eleven exotic species at WABA have been identified as high priority exotics for their ability to alter plant communities combined with their difficulty of control. Most sites at WABA have abundant populations of these types of exotics that are growing throughout the grasslands (Figure 3.2-11 and 3.2-12). The desire to maintain native grasses will require careful exotic control to prevent further degradation.

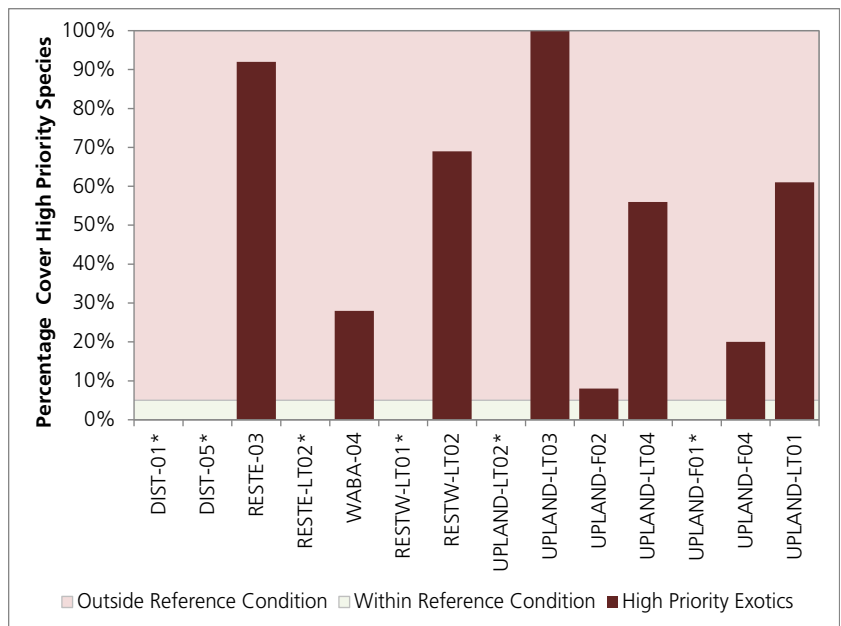


Figure 3.2-11. The percentage of exotic species on each monitoring plots that is considered a high priority species by the park (Struthers et al. 2012). Bars within the green portion of the graph are within the reference condition of having no greater than 5% of the exotic species that are considered high priority, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

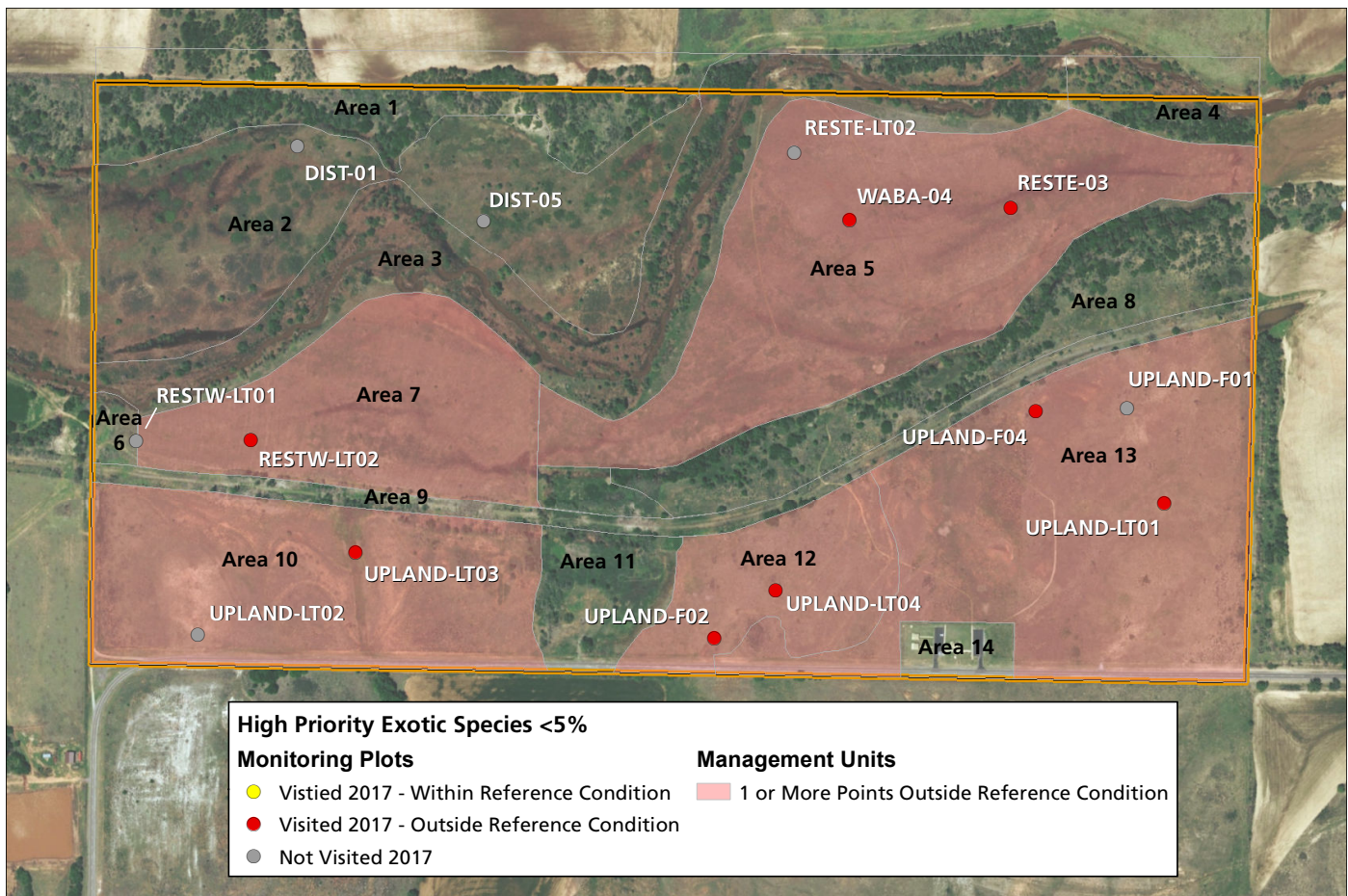


Figure 3.2-12. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

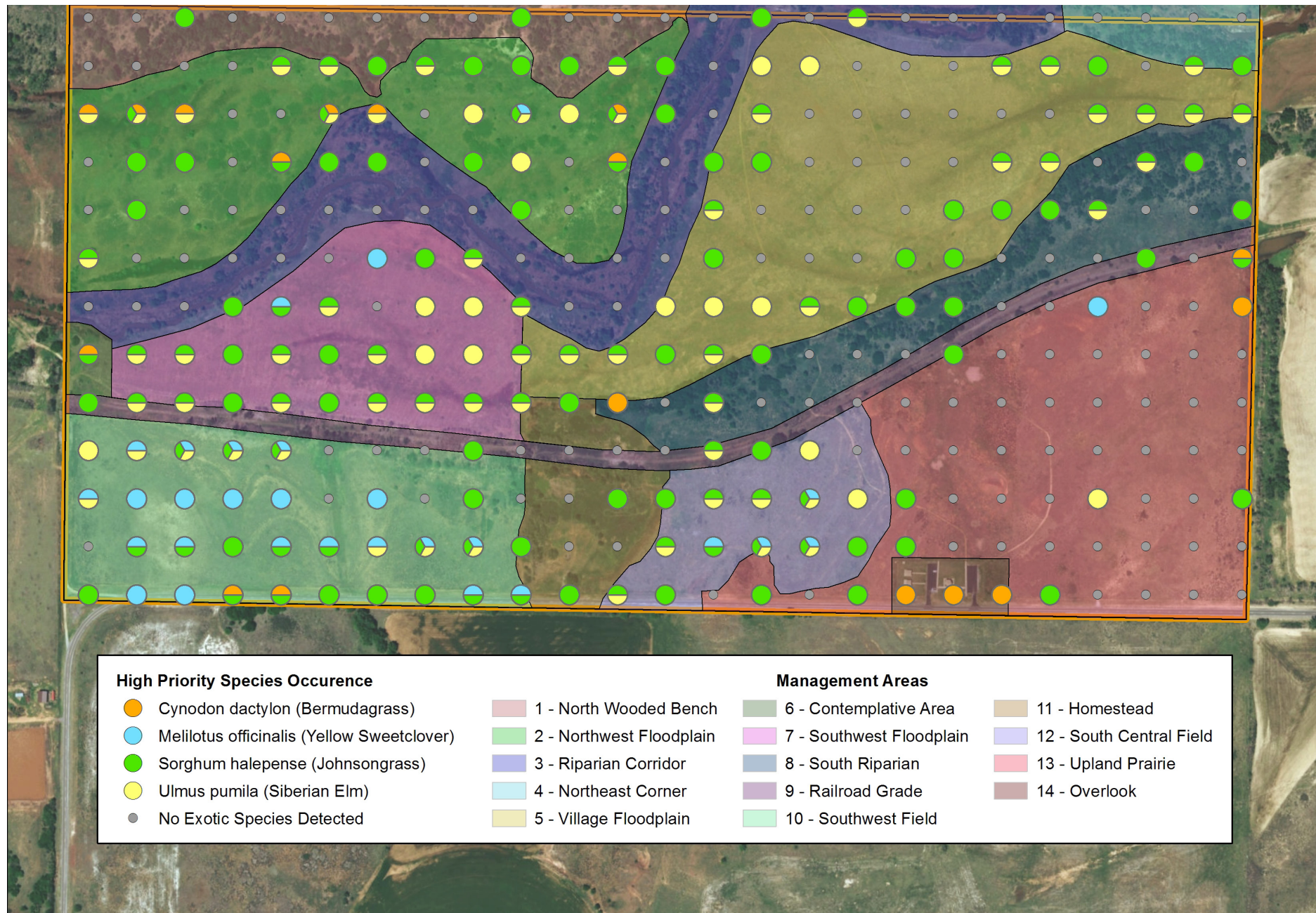


Figure 3.2-13. The distribution of high priority exotic species based on a rapid assessment grid survey conducted in 2015 and 2016. These data are presented to supplement the 2016 monitoring data based on the most recent park-wide survey.

Reference Condition EIF11-Grassland Functional Groups

Shrubs and subshrubs (cactus, yucca) can be an important component of many habitats, offering food and shelter for wildlife and young plants. Too many shrubs, however, can invade and degrade a grassland, causing a change in the plant community. Few to no shrubs/subshrubs were found in transects at WABA (Figure 3.2-14 and 3.2-15). This lack is expected in grasslands, particularly when areas are subjected to frequent burns, so these results cause no concern at this time. RESTE-03 has a mixture of Siberian elm seedlings and skunkbush sumac, a desirable species. Qualitative observations provide evidence of suitable stands of sumac, plum and yucca in areas of the park, although there may be other “missing” shrub species that would be candidates for re-introduction.

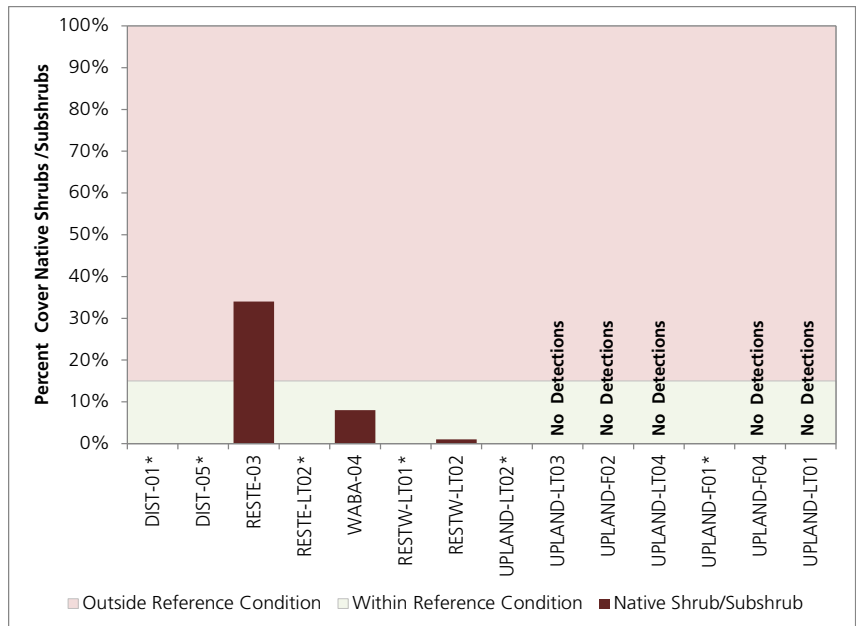


Figure 3.2-14. The percentage of cover by native shrubs on each monitoring plot. Bars within the green portion of the graph are within the reference condition of having no greater than 15% shrub cover, whereas bars in the red portion are outside the reference condition. Plots marked with an “*” were not sampled during 2017, but are part of our overall sample in other years.

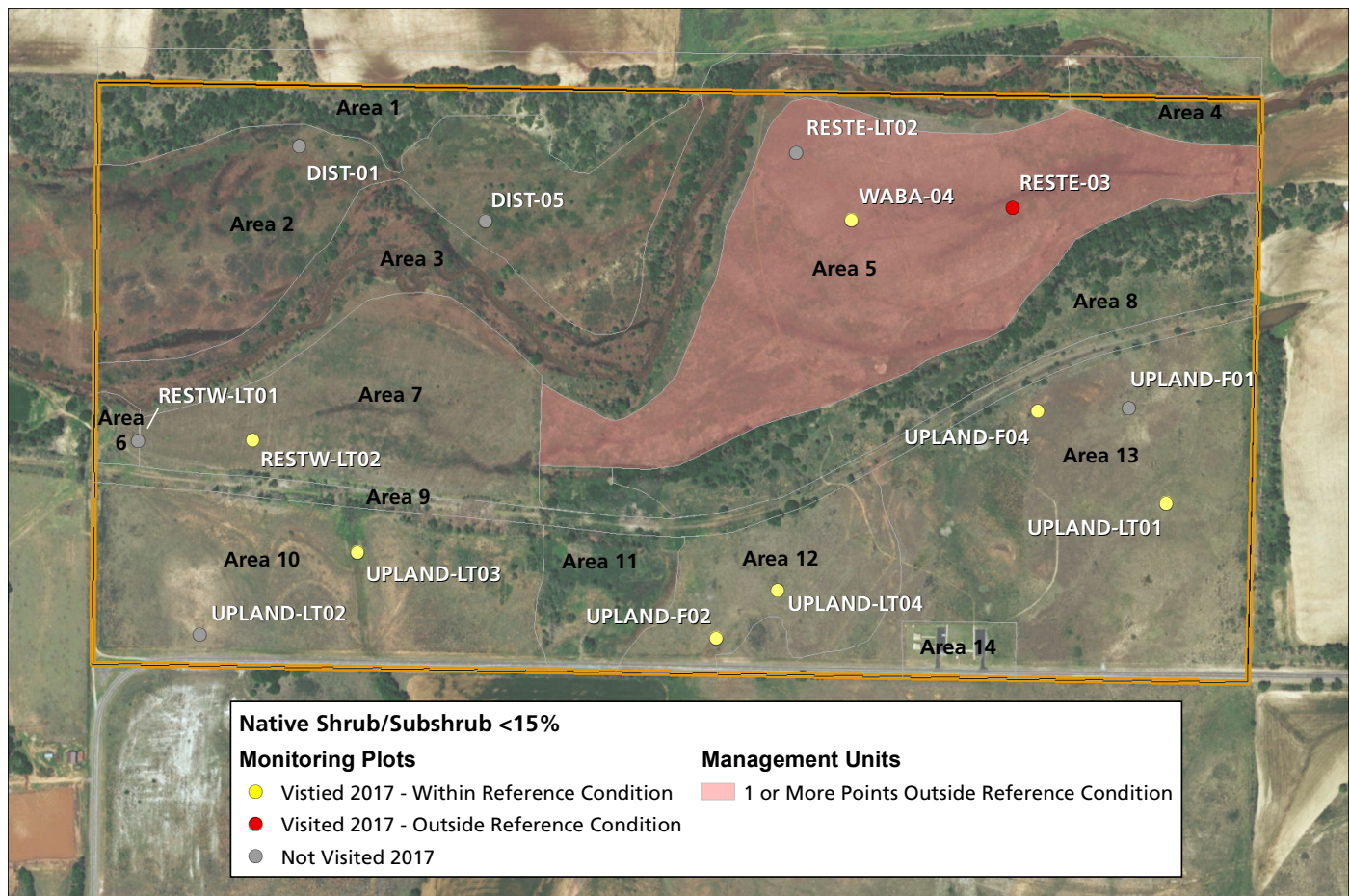


Figure 3.2-15. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

Reference Condition EIF15-Bare Ground

The presence of bare ground is necessary for recruitment of new plants, shelter for small mammals and insects, and proper water infiltration. Too much bare, unprotected ground invites erosion (wind or water) and exotic invasion to degrade a plant community. All transects monitored in 2017 at WABA have little to no bare ground and likely indicates an abundance of decadent grasses and litter (Figure 3.216 and 3.2-17). Prescribed burns will be necessary to open up the sites, refresh the grasses and return nutrients to the soil. However, consistent exotic control efforts will be necessary to prevent increased invasion.

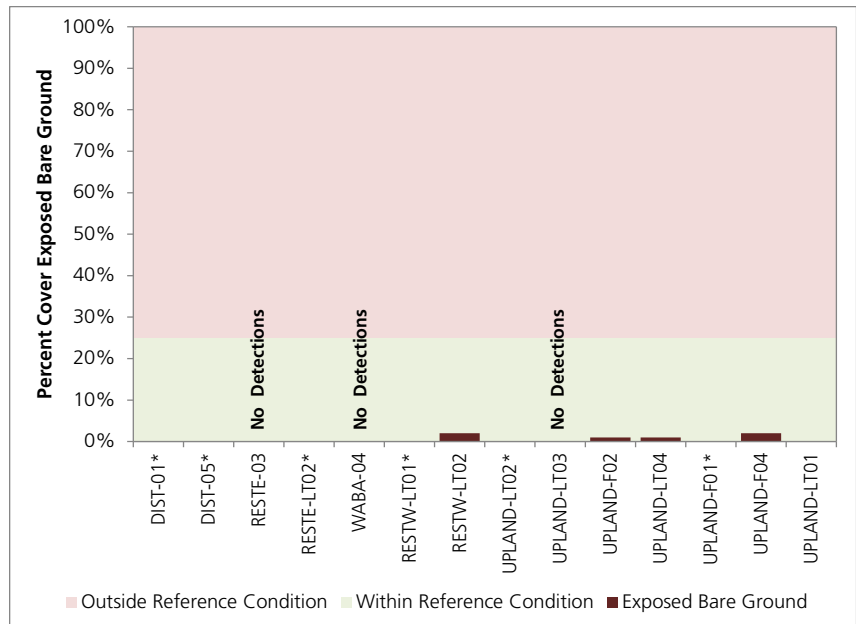


Figure 3.2-16. The percentage of cover by bare ground on each monitoring plot. Bars within the green portion of the graph are within the reference condition of having no greater than 30% bare ground cover, whereas bars in the red portion are outside the reference condition. Plots marked with an "*" were not sampled during 2017, but are part of our overall sample in other years.

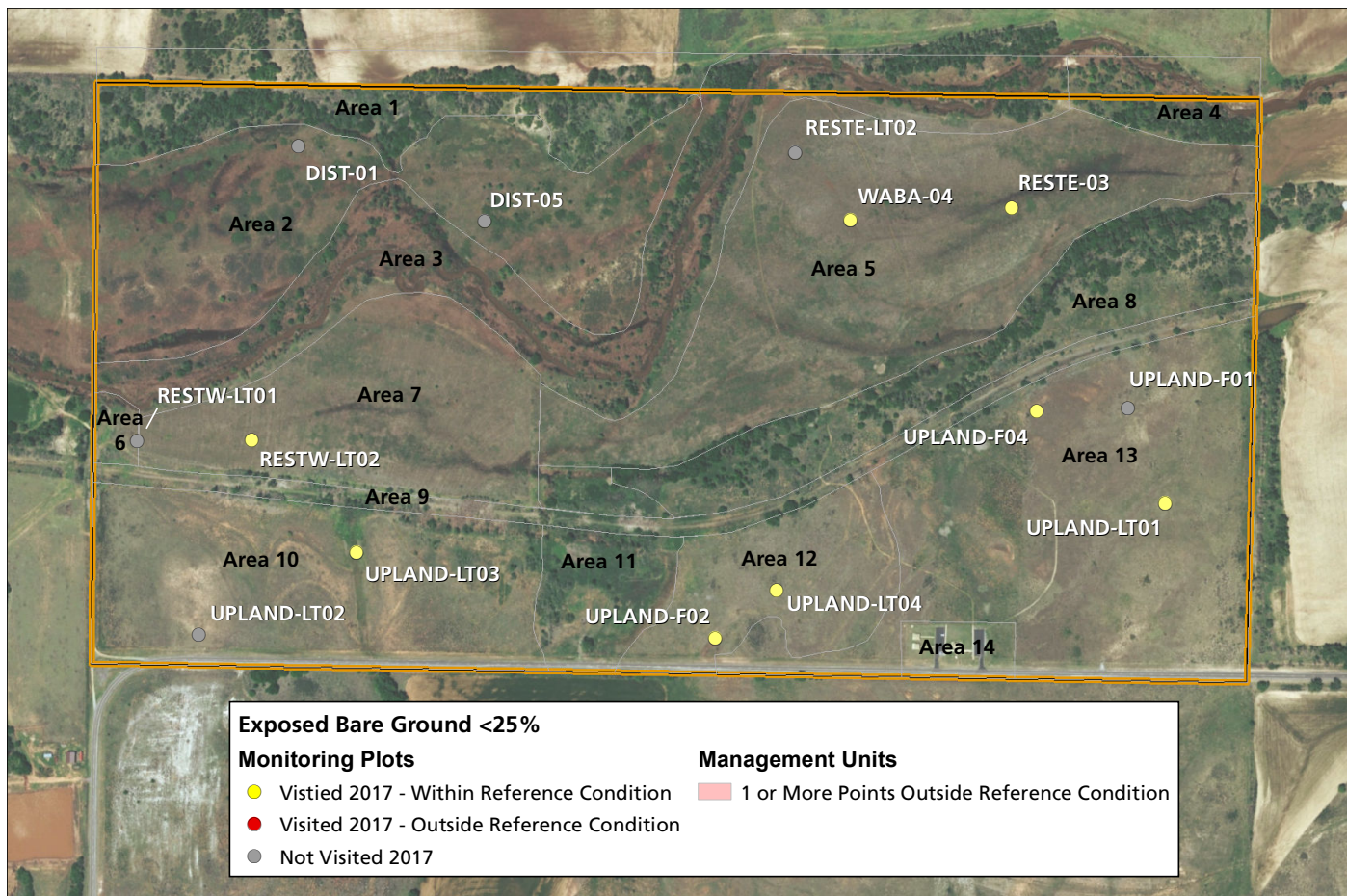


Figure 3.2-17. Monitoring plots shown in relation to vegetation management units. Units shaded in red have one or more plots that are outside the reference condition. The individual plots outside the reference condition are shown in red.

4. Discussion And Adaptation

The problem of exotic plants as a whole at WABA is not surprising. There are a number of problematic exotic species at the park although most are found in defined patches. This is not the case when it comes to the exotic bromes; they have spread throughout the park. Bromes exhibit cyclical abundance but are ever present in the interstices of the native bunchgrasses. Strategies have been developed to combat these grasses but await the approval of compliance before being implemented.

It is suspected that the lack of forbs and native grasses are a direct result of both high exotic pressure and long-term drought. Most native plant species at WABA have some level of drought resistance and will survive on

morning dew and light rains. However, the presence of exotic bromes in the spring do inhibit seedling establishment by intercepting moisture and limiting light. Allelopathy, the chemical inhibition of one plant by another, is found in other brome species and could be an invasion strategy used by cheatgrass and Japanese brome.

Johnsongrass and KR bluestem are also difficult grasses to control. The herbicide Outrider® is proving effective against Johnsongrass when application is carefully timed and repeated. At WABA, little bluestem and other grasses rapidly fill the space once Johnsongrass is removed. KR bluestem is very difficult to control. At this time, the only known effective treatment is hot summer fire, which is not an optimal time in the Southern Plains for prescribed fire. Team members continue to look at options for control.

5. Literature Cited

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Appendix A: 2018 Tentative Workplan

Spatial Unit	Desired Condition with Departures	Management Treatment Used	Description of Treatment	Effectiveness of Treatment	Recommended Change in Management (if any)
1-N. Wooded Bench	Improve conditions for native trees	Herbicide	Spray musk thistle in May	–	–
	Improve conditions for native trees	Manual	Pull musk thistle in May	–	–
	To maintain the historic landscape	Mow	Mow perimeter 4x year for fire break	–	–
2-NW Floodplain	To maintain the historic landscape	Mow	Along perimeter for fire break	–	Future options include prescribed burn, mastication and grazing
3-Riparian Corridor	–	–	No treatment	–	–
4-Northeast corner	To maintain the historic landscape	Mow	Mow perimeter 4x year for fire break and fence repair	–	–
5-Village Floodplain	Improve conditions for growth of desired native grasses	Herbicide	Spray to control Johnsongrass in May and other exotics from construction	–	Trail construction to begin summer 2018
6-Contemplative	Improve conditions for growth of desired native grasses	Mow	Mow multiple times to control exotics	–	Possible construction area in 2018
7-SW Floodplain	Improve conditions for growth of desired native grasses	Herbicide	Spray to control Johnsongrass in May	–	Grazing a future option
8-South Riparian	Reduce populations of high priority exotic plants	Herbicide	Spray to control Johnsongrass in May and other exotics from construction	–	Fall and spring construction
9-Railroad Grade	Improve conditions for growth of desired native grasses	Herbicide	Spray in May to control Johnsongrass	–	–
10-SW Field	Improve conditions for growth of desired native grasses	Herbicide	Spray in April to control Siberian elm	–	Grazing a future option
11-Homestead	Improve conditions for growth of desired native grasses	Mow	Mow 2+ times in summer to control tall kochia and Russian thistle	–	Grazing a future option
	Improve conditions for growth of desired native grasses	Seed	Seed or transplant native grasses and forbs in fall	–	–
12-South Central Field	Improve conditions for growth of desired native grasses	Herbicide	Spray to control Johnsongrass in May	–	Trail construction beginning summer 2018
	Improve conditions for growth of desired native grasses	Seed	Seed native grasses West side of Custer's Knoll in spring & fall	–	–
13-Upland Prairie	Improve conditions for growth of desired native grasses	Mow	Mow eastern side of unit for cheatgrass, Bermudagrass and fire break	–	Grazing a future option
	Improve conditions for growth of desired native grasses	Seed	Drill Seeding of native grasses and forbs in fall	–	–
14-Overlook	–	–	No treatment due to construction	–	Construction zone in 2018

Appendix B: Exotics Field Summary

Presented is summary data from 2017 exotics monitoring. The first table contains a list of the exotic species detected and the overall number of blocks in which they were found. The second and third tables provides a similar breakdown by transect monitored. The block map depicts the individual blocks monitored(summary presented in the report). These maps can be used with corresponding detailed data found on IRMA (<https://irma.nps.gov/DataStore/>).

Start Date: 5/30/2017 End Date: 6/1/2017

Total Blocks Surveyed: 68

Approx. Length Surveyed (m): 3400

Field Crew: Jonathin Horsley
Kaitlin O'Brien

Vectors Surveyed: BOUNDARY

Transects Surveyed: WABA_EX_301 total # blocks = 68

Species Found Along All Vectors and Transects

Scientific Name	Common Name	Primary Growth Habit	Duration	Total Blocks
<i>Bothriochloa ischaemum</i>	kr bluestem	Graminoid	Perennial	6
<i>Bromus catharticus</i>	rescue grass	Graminoid	Annual	9
<i>Bromus japonicus</i>	japanese brome	Graminoid	Annual	43
<i>Bromus tectorum</i>	cheatgrass	Graminoid	Annual	47
<i>Chenopodium album</i>	common lambsquarters	Forb/Herb	Annual	13
<i>Convolvulus arvensis</i>	field bindweed	Vine	Perennial	1
<i>Cynodon dactylon</i>	bermudagrass	Graminoid	Perennial	5
<i>Erodium cicutarium</i>	red stem storksbill	Forb/Herb	Annual	4
<i>Kochia scoparia</i>	kochia	Forb/Herb	Annual	27
<i>Lamium amplexicaule</i>	henbit	Forb/Herb	Annual	2
<i>Melilotus officinalis</i>	yellow sweetclover	Forb/Herb	Perennial	16
<i>Onopordum acanthium</i>	scotch thistle	Forb/Herb	Biennial	2
<i>Salsola kali</i>	prickly russian thistle	Forb/Herb	Annual	1
<i>Salsola tragus</i>	prickly russian thistle	Forb/Herb	Annual	11
<i>Sorghum halepense</i>	johnsongrass	Graminoid	Perennial	30
<i>Taraxacum officinale</i>	dandelion	Forb/Herb	Perennial	3
<i>Tragopogon dubius</i>	western salsify	Forb/Herb	Annual	6
<i>Tribulus terrestris</i>	puncturevine	Forb/Herb	Annual	1
<i>Ulmus pumila</i>	siberian elm	Tree	Perennial	21

Species Found Along Vectors and Transects (only transects with exotics are listed):

Vector: BOUNDARY
 Transect: WABA_EX_301

Scientific Name	Common Name	# of Blocks With Species
<i>Bothriochloa ischaemum</i>	kr bluestem	6
<i>Bromus catharticus</i>	rescue grass	9
<i>Bromus japonicus</i>	japanese brome	43
<i>Bromus tectorum</i>	cheatgrass	47
<i>Chenopodium album</i>	common lambsquarters	13
<i>Convolvulus arvensis</i>	field bindweed	1
<i>Cynodon dactylon</i>	bermudagrass	5
<i>Erodium cicutarium</i>	red stem storksbill	4
<i>Kochia scoparia</i>	kochia	27
<i>Lamium amplexicaule</i>	henbit	2
<i>Melilotus officinalis</i>	yellow sweetclover	16
<i>Onopordum acanthium</i>	scotch thistle	2
<i>Salsola kali</i>	prickly russian thistle	1
<i>Salsola tragus</i>	prickly russian thistle	11
<i>Sorghum halepense</i>	johnsongrass	30
<i>Taraxacum officinale</i>	dandelion	3
<i>Tragopogon dubius</i>	western salsify	6
<i>Tribulus terrestris</i>	puncturevine	1
<i>Ulmus pumila</i>	siberian elm	21

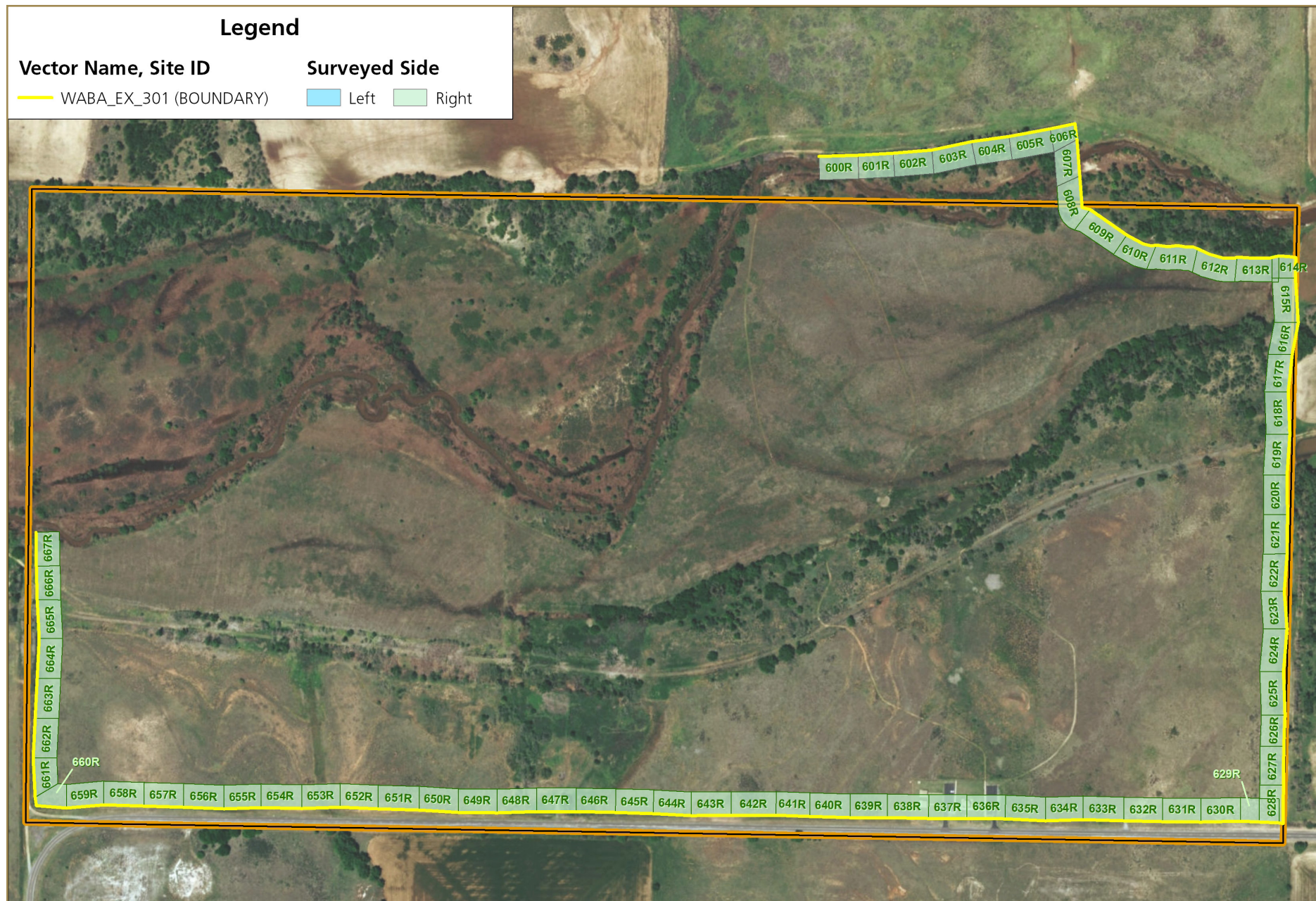


Figure B-1. Exotic monitoring transects visited at Washita Battlefield NHS during 2017.

Appendix C: Biodiversity (Rapid Assessment Average Cover)

Community biodiversity is measured in 10 random satellite plots within 100-meters of the transect (Location Name). The cover class (listed at bottom) for that plant in each plot (Cover Sum) is presented, along with the average cover for the community (Average Cover). Points Detected provides the number of plots (N=10) in which each species was detected.

Location Name	Species Code	Scientific Name	Common Name	Cover Sum	Points Detected (N=10)	Average Cover
RESTE-03	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	4	4	1
RESTE-03	BROJAP	<i>Bromus japonicus</i>	japanese brome	36	10	3.6
RESTE-03	CHEPRA	<i>Chenopodium pratericola</i>	desert goosefoot	1	1	1
RESTE-03	CIRVUL	<i>Cirsium vulgare</i>	bull thistle	1	1	1
RESTE-03	CONCAN	<i>Conyza canadensis</i>	canada horseweed	13	10	1.3
RESTE-03	DESILL1	<i>Desmanthus illinoensis</i>	illinois bundleflower	9	8	1.13
RESTE-03	DESPIN	<i>Descurainia pinnata</i>	western tansymustard	1	1	1
RESTE-03	EUSEXA	<i>Eustoma exaltatum</i>	showy prairie gentian	1	1	1
RESTE-03	GRIPAP	<i>Grindelia papposa</i>	wax gumweed	1	1	1
RESTE-03	HELANN	<i>Helianthus annuus</i>	common sunflower	4	4	1
RESTE-03	MONCIT	<i>Monarda citriodora</i>	lemon beebalm	2	2	1
RESTE-03	PANVIR	<i>Panicum virgatum</i>	switchgrass	2	2	1
RESTE-03	PASSMI	<i>Pascopyrum smithii</i>	western wheatgrass	6	5	1.2
RESTE-03	QUILOB	<i>Quincula lobata</i>	purple groundcherry	4	4	1
RESTE-03	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	11	5	2.2
RESTE-03	SOLCAN	<i>Solidago canadensis</i>	canada goldenrod	6	4	1.5
RESTE-03	SOLELA	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	1	1	1
RESTE-03	SORHAL	<i>Sorghum halepense</i>	johnsongrass	2	2	1
RESTE-03	SORNUT	<i>Sorghastrum nutans</i>	indiangrass	7	6	1.17
RESTE-03	ULMRUB	<i>Ulmus rubra</i>	slippery elm	3	3	1
RESTW-LT02	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	1	1	1
RESTW-LT02	BOTISC	<i>Bothriochloa ischaemum</i>	kr bluestem	1	1	1
RESTW-LT02	BOUCUR	<i>Bouteloua curtipendula</i>	sideoats grama	7	3	2.33
RESTW-LT02	BROTEC	<i>Bromus tectorum</i>	cheatgrass	10	7	1.43
RESTW-LT02	CIRUND	<i>Cirsium undulatum</i>	wavyleaf thistle	1	1	1
RESTW-LT02	CONCAN	<i>Conyza canadensis</i>	canada horseweed	4	4	1
RESTW-LT02	DESILL1	<i>Desmanthus illinoensis</i>	illinois bundleflower	2	2	1
RESTW-LT02	HELMAX	<i>Helianthus maximiliani</i>	maximillian's sunflower	4	2	2
RESTW-LT02	OXASTR	<i>Oxalis stricta</i>	sheep sorrel	1	1	1
RESTW-LT02	PANVIR	<i>Panicum virgatum</i>	switchgrass	6	4	1.5
RESTW-LT02	PHYLON	<i>Physalis longifolia</i>	longleaf groundcherry	1	1	1
RESTW-LT02	SAPSAP	<i>Sapindus saponaria</i>	western soapberry	5	2	2.5
RESTW-LT02	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	15	7	2.14
RESTW-LT02	SOLCAN	<i>Solidago canadensis</i>	canada goldenrod	5	4	1.25
RESTW-LT02	SOLGIG	<i>Solidago gigantea</i>	giant goldenrod	1	1	1
RESTW-LT02	SOLNEM	<i>Solidago nemoralis</i>	gray goldenrod	1	1	1
RESTW-LT02	SORHAL	<i>Sorghum halepense</i>	johnsongrass	12	4	3
RESTW-LT02	SORNUT	<i>Sorghastrum nutans</i>	indiangrass	8	4	2
RESTW-LT02	SPEINE	<i>Spermolepis inermis</i>	red river scaleseed	2	2	1

Cover Classes: 1=1-10% Cover, 2=11-20% Cover, 3=21-30% Cover, 4=31-60% Cover, 5=61-100% Cover

Location Name	Species Code	Scientific Name	Common Name	Cover Sum	Points Detected (N=10)	Average Cover
RESTW-LT02	SYMERI	<i>Symphyotrichum ericoides</i>	white heath aster	3	3	1
RESTW-LT02	ULMPUM	<i>Ulmus pumila</i>	siberian elm	7	7	1
RESTW-LT02	VITACE	<i>Vitis acerifolia</i>	mapleleaf grape	1	1	1
UPLAND-F02	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	5	5	1
UPLAND-F02	ARTDRA	<i>Artemisia dracunculus</i>	false tarragon	5	5	1
UPLAND-F02	BOUCUR	<i>Bouteloua curtipendula</i>	sideoats grama	4	2	2
UPLAND-F02	BROJAP	<i>Bromus japonicus</i>	japanese brome	2	1	2
UPLAND-F02	BROTEC	<i>Bromus tectorum</i>	cheatgrass	6	4	1.5
UPLAND-F02	CHEALB	<i>Chenopodium album</i>	common lambsquarters	1	1	1
UPLAND-F02	CONCAN	<i>Conyza canadensis</i>	canada horseweed	7	7	1
UPLAND-F02	CUCFOE	<i>Cucurbita foetidissima</i>	buffalo gourd	1	1	1
UPLAND-F02	DALPUR	<i>Dalea purpurea</i>	purple prairie clover	2	2	1
UPLAND-F02	DESCAN	<i>Desmodium canescens</i>	hoary tickclover	1	1	1
UPLAND-F02	DESPIN	<i>Descurainia pinnata</i>	western tansymustard	3	3	1
UPLAND-F02	HELANN	<i>Helianthus annuus</i>	common sunflower	2	2	1
UPLAND-F02	MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	5	5	1
UPLAND-F02	NASLEU	<i>Nassella leucotricha</i>	texas wintergrass	1	1	1
UPLAND-F02	OENSUF1	<i>Oenothera suffrutescens</i>	scarlet guara	3	3	1
UPLAND-F02	PANVIR	<i>Panicum virgatum</i>	switchgrass	8	5	1.6
UPLAND-F02	PASSMI	<i>Pascopyrum smithii</i>	western wheatgrass	1	1	1
UPLAND-F02	PLAPAT	<i>Plantago patagonica</i>	woolly plantain	3	3	1
UPLAND-F02	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	23	7	3.29
UPLAND-F02	SILANT	<i>Silene antirrhina</i>	sleepy catchfly	2	2	1
UPLAND-F02	SOLELA	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	2	2	1
UPLAND-F02	SORNUT	<i>Sorghastrum nutans</i>	indiangrass	9	6	1.5
UPLAND-F02	SYMERI	<i>Symphyotrichum ericoides</i>	white heath aster	2	2	1
UPLAND-F02	ULMPUM	<i>Ulmus pumila</i>	siberian elm	2	2	1
UPLAND-F04	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	5	5	1
UPLAND-F04	ARTLUD	<i>Artemisia ludoviciana</i>	louisiana sagewort	1	1	1
UPLAND-F04	BOUCUR	<i>Bouteloua curtipendula</i>	sideoats grama	3	3	1
UPLAND-F04	CASPUR	<i>Castilleja purpurea</i>	citron paintbrush	1	1	1
UPLAND-F04	CHAERI	<i>Chaetopappa ericoides</i>	baby white aster	1	1	1
UPLAND-F04	CIRUND	<i>Cirsium undulatum</i>	wavyleaf thistle	4	3	1.33
UPLAND-F04	CONCAN	<i>Conyza canadensis</i>	canada horseweed	2	2	1
UPLAND-F04	CROTEX	<i>Croton texensis</i>	texas croton	3	3	1
UPLAND-F04	DALPUR	<i>Dalea purpurea</i>	purple prairie clover	7	7	1
UPLAND-F04	DESCAN	<i>Desmodium canescens</i>	hoary tickclover	3	3	1
UPLAND-F04	DICOLI	<i>Dichanthelium oligosanthos</i>	heller's panicgrass	1	1	1
UPLAND-F04	GAIPUL	<i>Gaillardia pulchella</i>	indian blanket	1	1	1
UPLAND-F04	HETVIL	<i>Heterotheca villosa</i>	hairy false goldenaster	5	4	1.25
UPLAND-F04	LEPPAN	<i>Leptochloa panicea</i>	mucronate sprangletop	1	1	1
UPLAND-F04	MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	1	1	1
UPLAND-F04	MONCLI	<i>Monarda clinopodioides</i>	basil beebalm	4	4	1
UPLAND-F04	PLAPAT	<i>Plantago patagonica</i>	woolly plantain	7	7	1
UPLAND-F04	PLARHO	<i>Plantago rhodosperma</i>	red-seed plantain	2	2	1

Cover Classes: 1=1-10% Cover, 2=11-20% Cover, 3=21-30% Cover, 4=31-60% Cover, 5=61-100% Cover

Location Name	Species Code	Scientific Name	Common Name	Cover Sum	Points Detected (N=10)	Average Cover
UPLAND-F04	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	44	10	4.4
UPLAND-F04	SISCAM	<i>Sisyrinchium campestre</i>	prairie blue-eyed grass	1	1	1
UPLAND-F04	SYMERI	<i>Symphyotrichum ericoides</i>	white heath aster	9	7	1.29
UPLAND-F04	SYMFAL	<i>Symphyotrichum falcatum</i>	white prairie aster	2	2	1
UPLAND-F04	THEMEG	<i>Thelesperma megapotamicum</i>	hopi tea greenthread	2	2	1
UPLAND-F04	ULMRUB	<i>Ulmus rubra</i>	slippery elm	1	1	1
UPLAND-F04	YUCGLA	<i>Yucca glauca</i>	soft soapweed yucca	1	1	1
UPLAND-LT01	AF	N/A	annual forb	5	5	1
UPLAND-LT01	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	8	8	1
UPLAND-LT01	ARIDRA	<i>Arisaema dracontium</i>	green dragon	1	1	1
UPLAND-LT01	ARTDRA	<i>Artemisia dracunculus</i>	false tarragon	1	1	1
UPLAND-LT01	BROTEC	<i>Bromus tectorum</i>	cheatgrass	12	8	1.5
UPLAND-LT01	CONCAN	<i>Conyza canadensis</i>	canada horseweed	5	5	1
UPLAND-LT01	CROTEX	<i>Croton texensis</i>	texas croton	4	4	1
UPLAND-LT01	CYPODO	<i>Cyperus odoratus</i>	fragrant flatsedge	2	2	1
UPLAND-LT01	DESCAN	<i>Desmodium canescens</i>	hoary tickclover	7	7	1
UPLAND-LT01	DICOLI	<i>Dichanthelium oligosanthos</i>	heller's panicgrass	4	4	1
UPLAND-LT01	ERIBEL	<i>Erigeron bellidiastrum</i>	western fleabane	1	1	1
UPLAND-LT01	GAIPUL	<i>Gaillardia pulchella</i>	indian blanket	2	2	1
UPLAND-LT01	LEPDEN	<i>Lepidium densiflorum</i>	common pepperweed	3	3	1
UPLAND-LT01	LINPRA	<i>Linum pratense</i>	meadow flax	1	1	1
UPLAND-LT01	MONCLI	<i>Monarda clinopodioides</i>	basil beebalm	2	2	1
UPLAND-LT01	OXASTR	<i>Oxalis stricta</i>	sheep sorrel	1	1	1
UPLAND-LT01	PLAPAT	<i>Plantago patagonica</i>	woolly plantain	11	10	1.1
UPLAND-LT01	POAARI	<i>Poa arida</i>	plains bluegrass	1	1	1
UPLAND-LT01	PRUANG	<i>Prunus angustifolia</i>	chickasaw plum	5	1	5
UPLAND-LT01	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	33	10	3.3
UPLAND-LT01	SOLELA	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	1	1	1
UPLAND-LT01	TRABET	<i>Tragia betonicifolia</i>	betonyleaf noseburn	2	2	1
UPLAND-LT03	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	1	1	1
UPLAND-LT03	AMBTRI	<i>Ambrosia trifida</i>	giant ragweed	1	1	1
UPLAND-LT03	ARTDRA	<i>Artemisia dracunculus</i>	false tarragon	3	2	1.5
UPLAND-LT03	BROTEC	<i>Bromus tectorum</i>	cheatgrass	12	3	4
UPLAND-LT03	CIRUND	<i>Cirsium undulatum</i>	wavyleaf thistle	2	2	1
UPLAND-LT03	CONCAN	<i>Conyza canadensis</i>	canada horseweed	3	3	1
UPLAND-LT03	DALPUR	<i>Dalea purpurea</i>	purple prairie clover	4	4	1
UPLAND-LT03	DESILL1	<i>Desmanthus illinoensis</i>	illinois bundleflower	6	6	1
UPLAND-LT03	HELANN	<i>Helianthus annuus</i>	common sunflower	3	3	1
UPLAND-LT03	MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	11	8	1.38
UPLAND-LT03	MONCIT	<i>Monarda citriodora</i>	lemon beebalm	2	2	1
UPLAND-LT03	PASSMI	<i>Pascopyrum smithii</i>	western wheatgrass	1	1	1
UPLAND-LT03	PHYLON	<i>Physalis longifolia</i>	longleaf groundcherry	1	1	1
UPLAND-LT03	QUILOB	<i>Quincula lobata</i>	purple groundcherry	2	2	1
UPLAND-LT03	SAPSAP	<i>Sapindus saponaria</i>	western soapberry	1	1	1
UPLAND-LT03	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	23	8	2.88

Cover Classes: 1=1-10% Cover, 2=11-20% Cover, 3=21-30% Cover, 4=31-60% Cover, 5=61-100% Cover

Location Name	Species Code	Scientific Name	Common Name	Cover Sum	Points Detected (N=10)	Average Cover
UPLAND-LT03	SOLELA	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	6	6	1
UPLAND-LT03	SOLGIG	<i>Solidago gigantea</i>	giant goldenrod	1	1	1
UPLAND-LT03	SORNUT	<i>Sorghastrum nutans</i>	indiangrass	3	2	1.5
UPLAND-LT03	SPEINE	<i>Spermolepis inermis</i>	red river scaleseed	1	1	1
UPLAND-LT03	SYMERI	<i>Symphotrichum ericoides</i>	white heath aster	2	2	1
UPLAND-LT04	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	7	7	1
UPLAND-LT04	ARTDRA	<i>Artemisia dracunculus</i>	false tarragon	13	8	1.63
UPLAND-LT04	BOUCUR	<i>Bouteloua curtipendula</i>	sideoats grama	1	1	1
UPLAND-LT04	BROTEC	<i>Bromus tectorum</i>	cheatgrass	7	5	1.4
UPLAND-LT04	CHEALB	<i>Chenopodium album</i>	common lambsquarters	2	2	1
UPLAND-LT04	CHEPRA	<i>Chenopodium pratericola</i>	desert goosefoot	1	1	1
UPLAND-LT04	COMUMB	<i>Comandra umbellata</i>	bastard toadflax	3	3	1
UPLAND-LT04	CONCAN	<i>Conyza canadensis</i>	canada horseweed	2	2	1
UPLAND-LT04	CUCFOE	<i>Cucurbita foetidissima</i>	buffalo gourd	1	1	1
UPLAND-LT04	DESPIN	<i>Descurainia pinnata</i>	western tansymustard	2	2	1
UPLAND-LT04	DESSOP	<i>Descurainia sophia</i>	flixweed	1	1	1
UPLAND-LT04	EUPGLY	<i>Euphorbia glyptosperma</i>	rib-seed sandmat	1	1	1
UPLAND-LT04	EUTGYM	<i>Euthamia gymnospermoides</i>	texas goldentop	1	1	1
UPLAND-LT04	HELANN	<i>Helianthus annuus</i>	common sunflower	2	2	1
UPLAND-LT04	HELPET	<i>Helianthus petiolaris</i>	prairie sunflower	1	1	1
UPLAND-LT04	KOCSCO	<i>Kochia scoparia</i>	kochia	1	1	1
UPLAND-LT04	MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover	4	4	1
UPLAND-LT04	PANVIR	<i>Panicum virgatum</i>	switchgrass	7	5	1.4
UPLAND-LT04	PASSMI	<i>Pascopyrum smithii</i>	western wheatgrass	11	5	2.2
UPLAND-LT04	PLAPAT	<i>Plantago patagonica</i>	woolly plantain	1	1	1
UPLAND-LT04	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	27	9	3
UPLAND-LT04	SOLELA	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	2	2	1
UPLAND-LT04	SORNUT	<i>Sorghastrum nutans</i>	indiangrass	1	1	1
UPLAND-LT04	SPOCRY	<i>Sporobolus cryptandrus</i>	sand dropseed	3	2	1.5
UPLAND-LT04	SYMERI	<i>Symphotrichum ericoides</i>	white heath aster	1	1	1
UPLAND-LT04	ULMPUM	<i>Ulmus pumila</i>	siberian elm	3	3	1
WABA-04	AMBPSI	<i>Ambrosia psilostachya</i>	western ragweed	1	1	1
WABA-04	BOUCUR	<i>Bouteloua curtipendula</i>	sideoats grama	2	2	1
WABA-04	BROTEC	<i>Bromus tectorum</i>	cheatgrass	24	9	2.67
WABA-04	CHEALB	<i>Chenopodium album</i>	common lambsquarters	1	1	1
WABA-04	CHEPRA	<i>Chenopodium pratericola</i>	desert goosefoot	1	1	1
WABA-04	CONCAN	<i>Conyza canadensis</i>	canada horseweed	9	8	1.13
WABA-04	CROTEX	<i>Croton texensis</i>	texas croton	1	1	1
WABA-04	DESILL1	<i>Desmanthus illinoensis</i>	illinois bundleflower	6	6	1
WABA-04	DESPIN	<i>Descurainia pinnata</i>	western tansymustard	3	3	1
WABA-04	GRIPAP	<i>Grindelia papposa</i>	wax gumweed	2	2	1
WABA-04	LITCAR	<i>Lithospermum carolinense</i>	hairy puccoon	1	1	1
WABA-04	MONCIT	<i>Monarda citriodora</i>	lemon beebalm	3	2	1.5
WABA-04	PANVIR	<i>Panicum virgatum</i>	switchgrass	9	5	1.8
WABA-04	PASSMI	<i>Pascopyrum smithii</i>	western wheatgrass	8	5	1.6

Cover Classes: 1=1-10% Cover, 2=11-20% Cover, 3=21-30% Cover, 4=31-60% Cover, 5=61-100% Cover

Location Name	Species Code	Scientific Name	Common Name	Cover Sum	Points Detected (N=10)	Average Cover
WABA-04	PHYSA	<i>Physalis</i>	groundcherry	1	1	1
WABA-04	PLPAT	<i>Plantago patagonica</i>	woolly plantain	2	2	1
WABA-04	SCHSCO	<i>Schizachyrium scoparium</i>	little bluestem	10	5	2
WABA-04	SOLCAN	<i>Solidago canadensis</i>	canada goldenrod	8	3	2.67
WABA-04	SOLELA	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	4	4	1
WABA-04	SORHAL	<i>Sorghum halepense</i>	johnsongrass	3	3	1
WABA-04	SORNUT	<i>Sorghastrum nutans</i>	indiangrass	4	3	1.33
WABA-04	SYMERI	<i>Symphotrichum ericoides</i>	white heath aster	1	1	1
WABA-04	ULMPUM	<i>Ulmus pumila</i>	siberian elm	1	1	1

Cover Classes: 1=1-10% Cover, 2=11-20% Cover, 3=21-30% Cover, 4=31-60% Cover, 5=61-100% Cover

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

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National Park Service
U.S. Department of the Interior



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