



Trip Report for Vegetation Monitoring at Palo Alto Battlefield NHP 2019

Project Background and Methods

The Gulf Coast region features landscapes that are, or once were, at the interface of land and water, creating diverse and dynamic habitats for plants. The region's abundant plant life enhances our outdoor experiences, provides vital ecosystem services, and creates food, habitat, and shelter for wildlife. Yet even on protected lands, these unique botanical resources are threatened by human activities and environmental change. Monitoring plant communities is therefore essential to understanding park health and making informed management decisions, so that resources may be enjoyed, unimpaired, by future generations.

Throughout the NPS, plant communities and other key natural resources are tracked and assessed scientifically by 32 Inventory and Monitoring (I&M) networks, through their vital signs monitoring programs. For parks in the Gulf Coast I&M Network, the goals of vegetation monitoring include documenting the status and change in (1) richness of native and non-native species; (2) percent cover and frequency of key species or growth forms like grasses, forbs, shrubs or cacti; and (3) the health of forests. The network follows a peer-reviewed protocol that is largely consistent with other I&M networks in the eastern US, with plot resampling at 3-year intervals.

At Palo Alto Battlefield National Historical Park (NHP), the network initiated monitoring in 2016 by randomly selecting eleven 400-m² (20 m x 20 m) plots within the main park unit. Field methods included finding and marking plots, creating species lists, and estimating percent cover within 1-m² and 10-m² nested frames placed at eight permanent locations along the perimeter of the 400-m² plot. For more details on plot design and field methods, see the protocol narrative, standard operating procedures (SOPs), and related resources in the Supplementary Materials section further below.

2019 Fieldwork Summary and Observations

On 24-27 June, 2019, the first vegetation monitoring event at Palo Alto Battlefield NHP was completed by four network staff. Plots were established by a team of two that installed stakes and marked the plot perimeter (Jeff Bracewell and Billy Finney). A second team followed shortly after to record vegetation data (Jane Carlson, protocol lead, and Fabi Speyrer). Both teams accessed plots by UTV whenever possible. The average sampling duration was 3.5 hours, with a maximum 7 hours in plot Ba 5. Plant identification was completed by Jane Carlson, with assistance from Max Pons (Nature Conservancy) and John Reilley (NRCS plant materials center) during an on-site visit arranged by Rolando Garza, Chief of Resource Management.

Soil moisture conditions changed from dry to saturated during fieldwork, which limited UTV use. On the night of the 24th, 8 cm (3 in) of rain fell in Brownsville, and 32 cm (12.5 in) fell in Harlingen. As a result, the 2 plots in the park's disjunct, eastern section could not be accessed or sampled; they may be added in summer 2022.



Crew members record plant species presence and cover in plot Ba 7, June 2019.

Results from Vegetation Monitoring

The 9 plots at Palo Alto Battlefield NHP were primarily in prairie, which is, broadly, a desired landscape for a park commemorating an 1846 battle fought in an open, grassy expanse. Just 1 plot (Ba 5) was dominated by shrubs, on a historic natural levee. Although grasses were generally dominant in terms of percent ground area covered, the majority of species on each plot's species list were non-grass herbs, i.e., forbs (52%), followed by grasses/sedges (26%), then trees/shrubs (11%), then yuccas/cacti (6%). Figure 1 depicts plot-level species lists by growth form, but excludes vines species because there were so few (0-4). Across all plots, 96 species were recorded, with an average of 29 species per plot (range 12-55). The 2 plots with the highest richness either spanned prairie and shrubland (Ba 5) or were adjacent to a wetland (Ba 8). The lowest richness was in *Spartina spartinae* prairie. Ba 6 also had low richness due to dense invasive Kleberg bluestem (*Dichanthium annulatum*) in an area that once grew Sorghum.

Across all native species recorded, the majority were in only 1 or 2 plots (63%), though a few were documented widely. Among them, Carolina wolfberry (*Lycium carolinianum*) was present in all 9 plots; honey mesquite (*Prosopis glandulosa*), tornillo (*P. reptans*) and borrichia (*Borrichia frutescens*) were in 8 plots; and *Spartina spartinae*, *Malvastrum americanum*, silverleaf nightshade (*Solanum elaeagnifolium*) and prickly pear (*Opuntia engelmannii*) were in 7 plots. Of these, the high frequency of honey mesquite shows continued shrub presence and regeneration in the prairie. Although the current report focuses on species lists, subsequent reports will use percent cover or relative frequency to better represent plot contents.

Data on rare or invasive species has particular value for management. Field crews found no rare, threatened or concern species from federal or Texas lists, but several non-native grasses were present. Kleberg bluestem was in 7 plots; perennial cupgrass (*Eriochloa pseudoacrotirica*) was in 5; Guineagrass (*Urochloa maxima*) was in 3; and buffelgrass (*Pennisetum ciliare*), silky bluestem (*Dichanthium sericeum*) and swollen fingergrass (*Chloris barbata*) were each in 1.

Results from Vegetation Monitoring, continued

Table 1. Plots sampled in 2019, including counts of native and non-native species (all non-natives were grasses). Park communities have not been defined using National Vegetation Classification, so vegetation types are descriptive.

Site ID	Number native	Number non-native	Vegetation types	Comments
Ba 1	27	2	Borrichia-dominated prairie with some salt tolerant succulents in historic river meander. Large patches of <i>Spartina spartinae</i>	None
Ba 2	23	3	Borrichia-dominated prairie. No <i>Spartina spartinae</i> . A few salt tolerant succulents	None
Ba 3	24	2	Mixed prairie of native grasses, borrichia, sparse mesquite, and cactus. Patches of <i>Spartina spartinae</i> . Historic Tule lake bed	None
Ba 4	13	0	<i>Spartina spartinae</i> prairie with borrichia	None
Ba 5	51	4	Tamaulipan shrubland in >half and rest a mixed prairie of native grasses, borrichia and sparse mesquite. Patches of <i>Spartina spartinae</i>	Tagged 2 honey mesquites
Ba 6	15	1	Invasive Kleberg bluestem dominated post-agricultural field. No <i>Spartina spartinae</i> . A few mesquite and native shrubs	Mainly bluestem but some scattered native shrubs. Area was flooded when sampled
Ba 7	33	4	Mixed prairie of native grasses, borrichia, sparse mesquite, and cactus. Patches of <i>Spartina spartinae</i> and Kleberg bluestem	None
Ba 8	45	3	Temporary herbaceous wetland in >half, along a historic riverbed that fills after rain. Rest a mixed prairie of native grasses, borrichia, sparse mesquite and other shrubs. Patches of <i>Spartina spartinae</i>	Currently flooded and portions of plot have standing water. Tagged 1 retama (<i>Parkinsonia aculeata</i>) and 2 honey mesquites
Ba 9	12	0	<i>Spartina spartinae</i> prairie with borrichia >half, and the rest borrichia dominated prairie with many salt tolerant succulents in historic river meander	None

List of Supplementary Materials

A supplementary materials document is prepared for each trip report, allowing additional space for data exports, preliminary summaries and informal exploratory analyses. The 2019 Supplementary Materials document includes (1) a table listing all plant species and plot totals; (2) a table of Texas species of greatest conservation need for the county; (3) updates on invasive plant management and fire; (4) maps of landscape features, such as soils, elevation, and land use history; (5) useful references; and (6) select photos of fieldwork and species ID in 2019.

For more information on this monitoring project, visit:

- 1. Vegetation project repository, linking to all online documents and materials: <https://irma.nps.gov/DataStore/Reference/Profile/2247864>
- 2. Protocol narrative for Vegetation monitoring: <https://irma.nps.gov/DataStore/Reference/Profile/2256507>
- 3. Standard Operating Procedures for Vegetation monitoring: <https://irma.nps.gov/DataStore/Reference/Profile/2255905>
- 4. Gulf Coast Network webpage on the Vegetation project: <https://www.nps.gov/im/guln/terrestrial-vegetation.htm>
- 5. Webpages for Palo Alto Battlefield NHP: <https://www.nps.gov/im/guln/paal.htm>; <https://www.nps.gov/paal/index.htm>

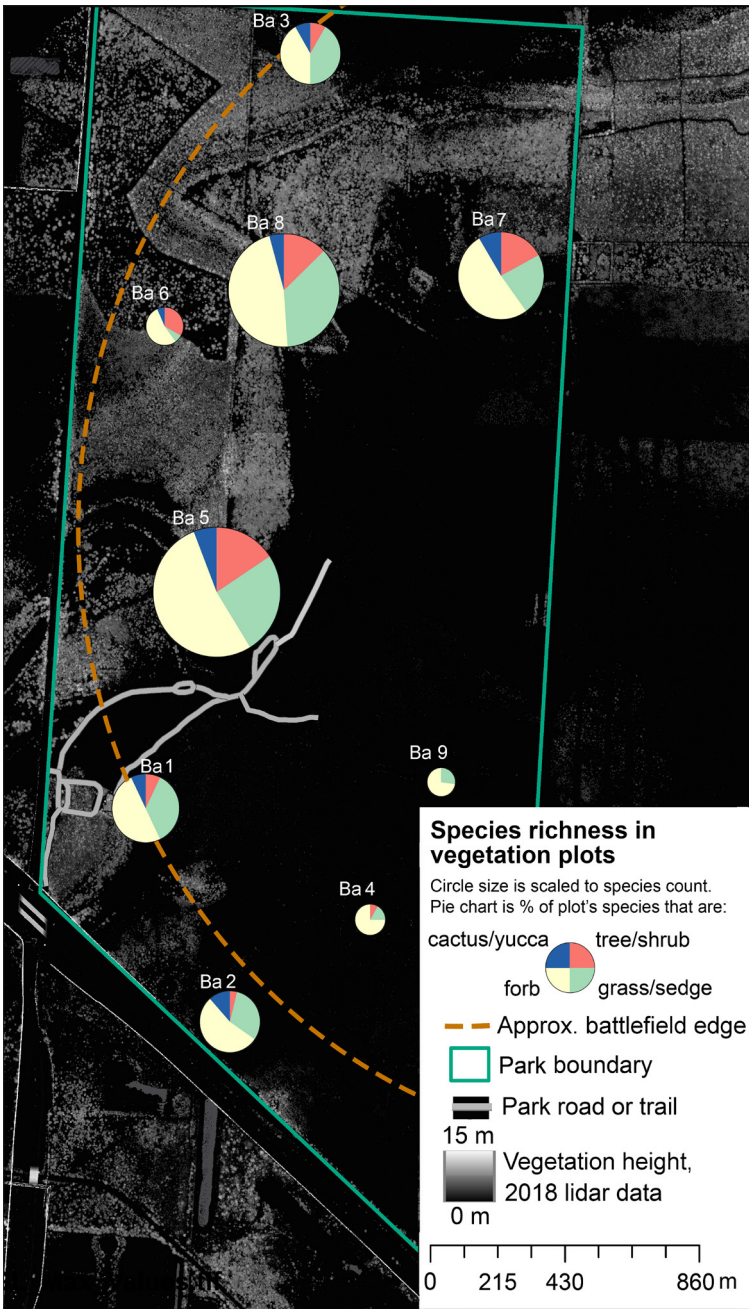


Figure 1. Plots sampled in 2019 (site ID # in white), scaled by species richness and showing % of richness associated with four different plant growth forms.

