



## Trip Report for Vegetation Monitoring at San Antonio Missions 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 San Antonio Missions National Historical Park (NHP), the network initiated monitoring in 2016 by randomly selecting ten 400-m<sup>2</sup> (20 m x 20 m) plots: 5 were in San Antonio units and 5 were at Rancho de las Cabras, near Floresville. Field methods included finding and marking plots, creating species lists, and estimating percent cover within 1-m<sup>2</sup> and 10-m<sup>2</sup> nested frames placed at eight permanent locations along the perimeter of the 400-m<sup>2</sup> 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

The first round of vegetation monitoring at San Antonio Missions NHP was completed over three park visits in 2019: 11-14 March, 13-18 May, and 3-6 June. On the March visit, plots were established and marked by the network field crew (Jane Carlson and Fabiane Speyrer), with assistance from resource manager Greg Mitchell. On the May and June visits, 4 plots and 6 plots were sampled by the network crew. The average sampling time was 7 hours (max of 11 hours in Ra 4 and Mi 2). The botanist was network ecologist Jane Carlson, with post-field ID support primarily from Jason Singhurst of Texas Parks & Wildlife.

### Results from Vegetation Monitoring

The 10 plots in San Antonio Missions NHP covered the spectrum from intact native to heavily impacted plant communities (Table 1), consistent with the park's long and varied land-use history. Rancho plots were mainly blackbrush shrubland with grassland patches, and San Antonio plots were mainly regrown (ruderal) forest or woodland. Most San Antonio plots had a understory dominated by invasive hedge parsley



Recording plant species presence and cover in plot Mi 02, May 2019.

(*Torilis arvensis*) and an overstory of young sugarberry trees (*Celtis laevigata*), older honey mesquite (*Prosopis glandulosa*) or a mix of both, reflecting the area's intensive land-clearing for agriculture (ending in the 1980s), as well as hydrological alteration of the San Antonio river system. Most Rancho plots, in contrast, had rich shrubland communities of up to 17 co-occurring shrub species with few apparent human impacts, in spite the unit's grazing history that ended in 1995. The only exception was species-poor Ra 2, which was in an area maintained as improved pasture through 1995 and was still treeless by 2004. Although shrubs and trees dominated plots in percent ground area covered, they contributed only 15% of species richness for both units combined. Non-graminoid herbs, or forbs, contributed 60% of richness, followed by grasses/sedges (14%), vines (9%) then cacti/yuccas (2%). Figure 1 has plot-level percentages by growth form, but excludes cacti/yuccas because there were so few (0-5 per plot).

Across all plots, a total of 211 species were recorded, although 14 were non-reproductive forbs or grasses that could not be identified to genus or species. Across the San Antonio plots, the total richness was 119, with 46 species per plot on average (range 34-63). Richness at the Rancho unit was much higher, at 172 species and a per-plot average of 83 (range 44-106). The most commonly encountered species, found in 9 or 10 plots, were straggler daisy (*Calyptracarpus vialis*), yellow oxalis (*Oxalis dillenii*), Texas persimmon (*Diospyros texana*), honey mesquite (*Prosopis glandulosa*), spiny hackberry (*Celtis pallida*), sugarberry (*Celtis laevigata*) and cucumberweed (*Parietaria pensylvanica*).

Data on rare or invasive species have particular value for management. During monitoring, the crew found one vulnerable species (*Houstonia parviflora*), but no rare, threatened or concern species from federal or Texas lists. In contrast, several non-native species were widespread. Hedge parsley was in 8 plots, Japanese brome (*Bromus arvensis*) and Guinea grass (*Urochloa maxima*) were in 5, and rescuegrass (*Bromus catharticus*) was in 3. The remaining 6 invasive species were in 1 or 2 plots only. Relevant lists are in the Supplementary Materials document.

Results from Vegetation Monitoring, continued

Table 1. Plots sampled in 2019, including counts of native and non-native species. Not all communities were defined using National Vegetation Classification (i.e., CEGs from Cogan 2007), so vegetation types include descriptions.

| Site ID | Native spp. | Non-native spp. | Vegetation types                                                                                                                                                         | Soil type                             | Historical physiographic class; land use from available imagery                                                    |
|---------|-------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Mi 1    | 43          | 4               | Riparian forest of pecan - sugarberry and extensive poison ivy (CEGL002087)                                                                                              | Loire clay loam, occasionally flooded | Riparian forest; intact forest in 1953                                                                             |
| Mi 2    | 60          | 3               | Upland ruderal shrubland of sweet acacia - sugarberry - spiny hackberry (CEGL007793) and small open patches of grasses and forbs                                         | Atco loam on slopes                   | Upland scrub; open field in 1953; recovering shrubland in 1996                                                     |
| Mi 3    | 42          | 3               | Lowland ruderal forest of sugarberry with honey mesquite (no CEG)                                                                                                        | Atco loam on slopes                   | Riparian/upland forest; open field in 1953; recovering forest in 1996                                              |
| Mi 4    | 31          | 3               | Lowland ruderal forest of sugarberry with honey mesquite (no CEG) and cedar elm - sugarberry - possum-haw virginia wild rye (CEGL008468)                                 | Loire clay loam, occasionally flooded | Riparian forest; open field in 1953; recovering forest in 1996                                                     |
| Mi 5    | 37          | 3               | Upland ruderal woodland of honey mesquite - spiny hackberry (CEGL007787)                                                                                                 | Loire clay loam, occasionally flooded | Riparian forest; open field in 1953; recovering forest in 1996                                                     |
| Ra 1    | 80          | 5               | Upland shrubland of blackbrush acacia (CEGL003874), upland ruderal woodland of honey mesquite - spiny hackberry (CEGL007787) and small open patches of grasses and forbs | Colibro sandy clay loam on slope      | Upland scrub; intact in 1931 and 1996                                                                              |
| Ra 2    | 40          | 4               | Upland ruderal woodland of honey mesquite - spiny hackberry (CEGL007787)                                                                                                 | Buchel clay, occasionally flooded     | Upland scrub; intact in 1931, improved pasture through 1995, still trees by 2004, recovering sparse shrubs in 2008 |
| Ra 3    | 87          | 3               | Upland shrubland of blackbrush acacia (CEGL003874) and small open patches of grasses and forbs                                                                           | Colibro sandy clay loam on slope      | Mid-slope to upland scrub; intact in 1931 and 1996                                                                 |
| Ra 4    | 98          | 8               | Upland shrubland of blackbrush acacia (CEGL003874), ruderal woodland of honey mesquite - spiny hackberry (CEGL007787) and a large open patch of grasses and forbs        | Colibro sandy clay loam on slope      | Mid-slope to upland scrub; intact in 1931 and 1996                                                                 |
| Ra 5    | 86          | 2               | Upland shrubland of blackbrush acacia (CEGL003874) and a large open patch of grasses and forbs                                                                           | Colibro sandy clay loam on slope      | Upland scrub; intact in 1931 and 1996                                                                              |

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 park; (3) updates on invasive plant management and fire; (4) maps of landscape features, such as elevation and land 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 San Antonio Missions NHP: <https://www.nps.gov/im/guln/saan.htm>; <https://www.nps.gov/saan/index.htm>

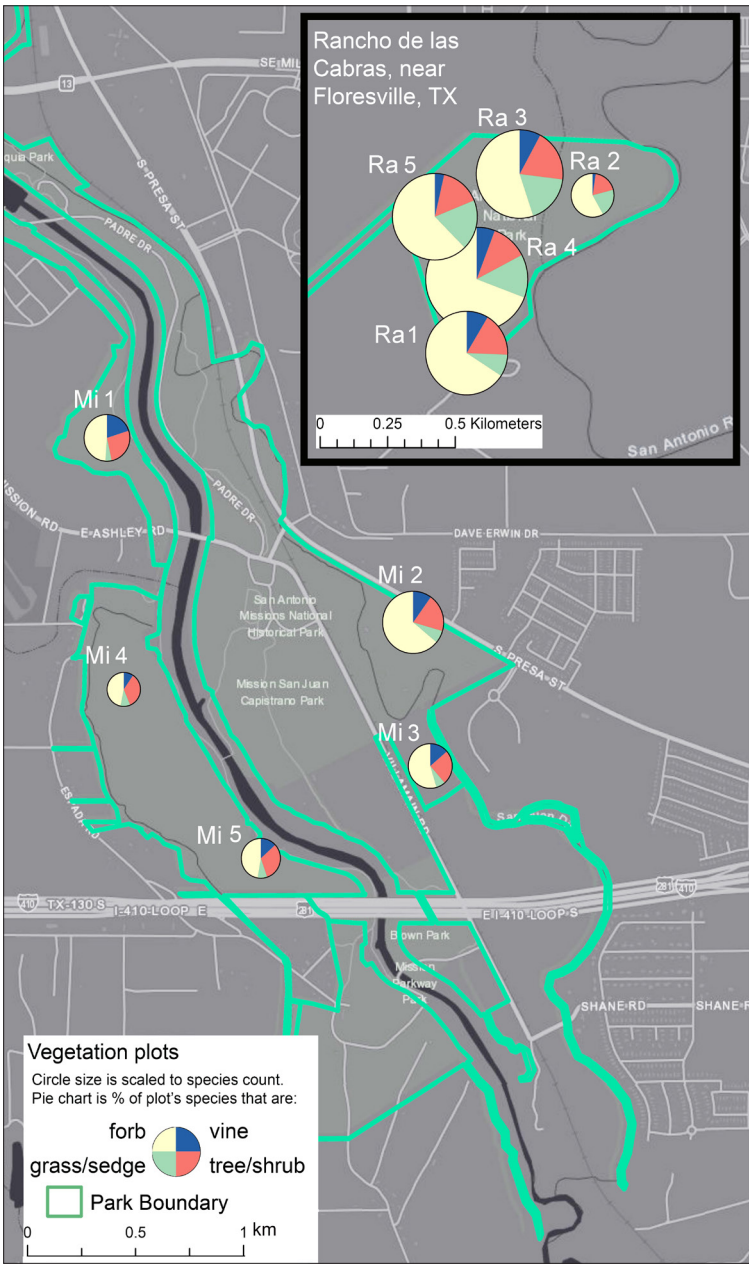


Figure 1. Plots sampled in 2019 (site ID # in white), scaled by species richness and showing % of richness associated with four different plant growth forms.