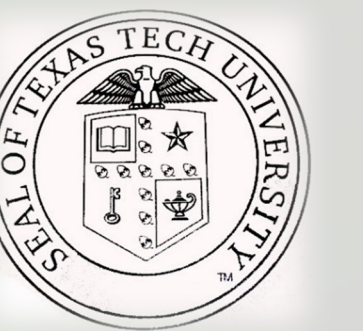


Orchid Conservation in Texas



Kirsten Poff¹, Jason Singhurst², and Jyotsna Sharma¹; ¹Department of Plant and Soil Science, Texas Tech University, Lubbock TX 79409; ²Texas Parks and Wildlife Department, Austin, TX 78744

Introduction

Orchidaceae is one of the largest and most diverse angiosperm families with estimates of 20,000 to 35,000 species occurring on all continents except Antarctica. While this group of plants is quite diverse and nearly ubiquitous, a high percentage of species are rare or threatened with extinction. This may be explained, in part, by the complex mycorrhizal relationships orchids establish at the beginning of their lifecycle. Orchid species are known to have specific niche requirements for establishment and growth, which makes them more susceptible to changes in land use. In some cases, poaching of orchids with high horticultural or ethnobotanical demand also contributes to their decline and extinction in the wild. Approximately 52 species of orchids occur within Texas, 12 of which are listed on the Species of Greatest Conservation Need; and several others are endemic to the state.

Our **OBJECTIVES** were:

1. Field surveys for *Platanthera chapmanii* and *Spiranthes brevilabris* var. *brevilabris*.
2. Document the number of flowering plants of each species, their preferred soil types and the species of peloton forming mycorrhizal fungi within their roots.
3. Propagate plants and test the transplant success of *Platanthera chapmanii* to augment an existing population.



Figure 1. *Platanthera chapmanii* shown with pollinator *Papilio palamedes* (a). Inflorescences of *Spiranthes brevilabris* var. *brevilabris* (b).

Platanthera chapmanii (Chapman's fringed orchid)

This terrestrial species is native to southeastern Texas, parts of southern Georgia and northern Florida. Its occurrence has been recently confirmed in Texas in Hardin, Jefferson, Orange and Tyler counties. Chapman's fringed orchid occurs in mesic to wet pine flatwoods, barrens, and savannas. Plants flower in early August in Texas (Figure 1a).

Spiranthes brevilabris var. *brevilabris* (Common name)

Spiranthes brevilabris var. *brevilabris* (Figure 1b) is one of 13 species of *Spiranthes* native to Texas and is rare throughout its range. This terrestrial species occurs in moist sandy prairies that can occur as pockets of calcareous prairie surrounded by pine forest (Figure 2b). The taxon has been documented in Harris, Walker, Polk, Galveston and San Jacinto counties in eastern Texas, only two other extant sites are known for this species, both occurring in Florida.

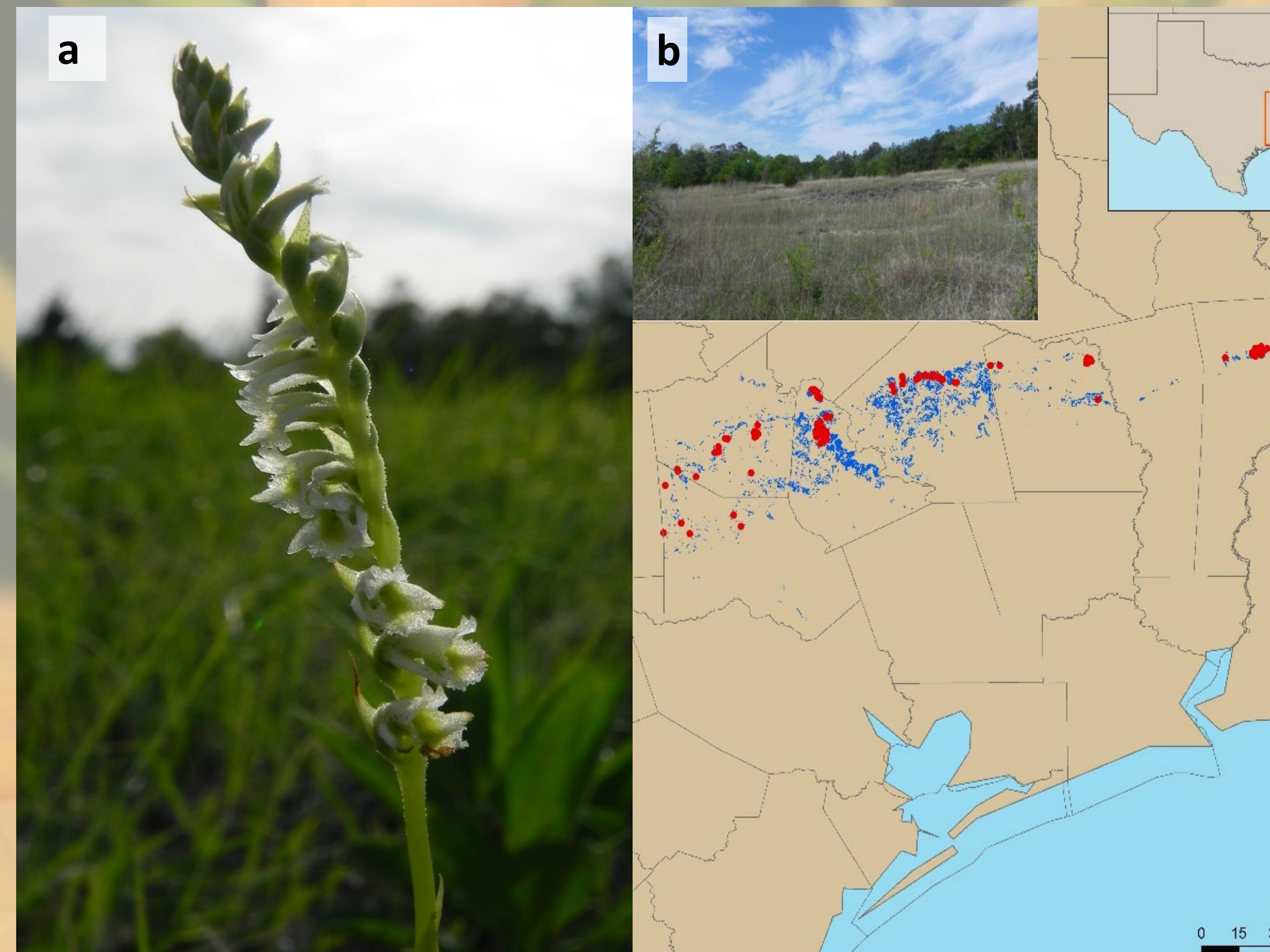


Figure 2. *Spiranthes brevilabris* var. *brevilabris* in flower (a); map showing predicted locations of Fleming Calcareous Prairie (FCP), red data points are known locations and blue shading indicates the predicted areas. The inset shows the FCP habitat (b).

Species	Soil pH	Clay (%)	Silt (%)	Sand (%)	Texture
<i>Platanthera chapmanii</i>	4.8	7.6	32.0	60.4	Sandy Loam
<i>Spiranthes brevilabris</i>	8.0	35.6	24.0	40.4	Clay Loam
<i>Spiranthes brevilabris</i>	7.8	34.0	22.0	44.0	Clay Loam
<i>Spiranthes brevilabris</i>	7.9	34.0	20.0	46.0	Sandy Clay Loam
<i>Spiranthes brevilabris</i>	5.9	20.0	38.0	42.0	Loam

Table 1. Soil analyses from *Platanthera chapmanii* and *Spiranthes brevilabris* var. *brevilabris* showing components and their corresponding textures.

Methods

Objective 1

1. Data from Texas Natural Diversity Database and local conservationists were used to determine possible sites that may host each species.
2. Known and potential sites for both species were surveyed during the flowering season in 2013.
3. A GIS prediction map was developed for Fleming Calcareous Prairie habitat which is a rare plant community and also can host *Spiranthes brevilabris* var. *brevilabris* (Figure 2b).

Objective 2

1. Population size was estimated for both species at each located surveyed.
2. Soil samples were collected for soil texture and pH measurements.
3. Root samples from several individuals of each species were collected for fungal analysis.
4. DNA was extracted from roots to identify the peloton-forming fungi by using the ITS region as a marker (Figure 3a).

Objective 3

1. Seeds collected from a population in Tyler County were germinated asymbiotically in vitro.
2. Following germination, plants were kept in sterile culture for two years, then transplanted into a nursery setting.
3. In 2012, twelve adult plants (Figure 4) were transplanted at the site from where seeds were collected. In 2013, an additional 22 adult plants were transplanted at the same site.
4. The transplanted plots were surveyed in August 2014. Survival success was calculated by evaluating the percentage of plants observed flowering out of the total planted.

Results and Discussion

Objective 1:

- Two new populations of *Platanthera chapmanii* were documented in 2013, one of which was documented in Big Thicket National Preserve and one at another location in Tyler County.
- Four new populations of *Spiranthes brevilabris* var. *brevilabris* were discovered in 2013. Two occur in Sam Houston National Forest in Walker County. The other two new populations are located in San Jacinto County; one of which hosts >1,000 individuals.

Objective 2:

- *Platanthera chapmanii* prefers sandy loam soils.
- *Spiranthes brevilabris* var. *brevilabris* soil preference ranges from loam to clay loam and sandy clay loam (Table 1).
- *Platanthera chapmanii* occurs in acidic soil (pH 4.8), whereas *Spiranthes brevilabris* var. *brevilabris* prefers pH range of 5.9 - 8.0 (Table 1).
- Fungal analysis of root samples indicated the peloton-forming mycorrhizal fungi were of the genus *Tulasnella* for both *Platanthera chapmanii* and *Spiranthes brevilabris* var. *brevilabris*

Objective 3:

- Twenty-six, or 77%, of the 34 transplanted *Platanthera chapmanii* were observed flowering in 2014 (Figure 5). Asymbiotic propagation to later augment populations of *Platanthera chapmanii* is very possible.

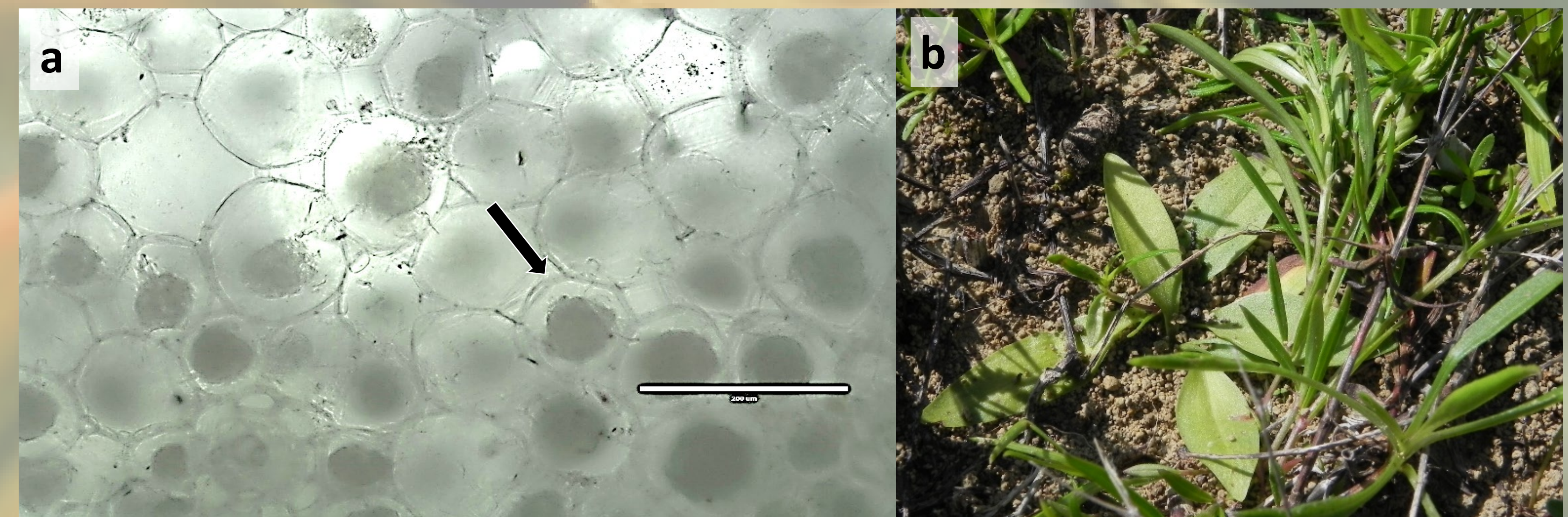


Figure 3. Pelotons within the root cells of *Platanthera chapmanii* (a), and nonflowering *Spiranthes brevilabris* var. *brevilabris* (b).



Figure 4. Plants of *Platanthera chapmanii* 1 year after transplanting were observed as reproductive plants (a) and lab-raised plants packed in sphagnum moss (b).

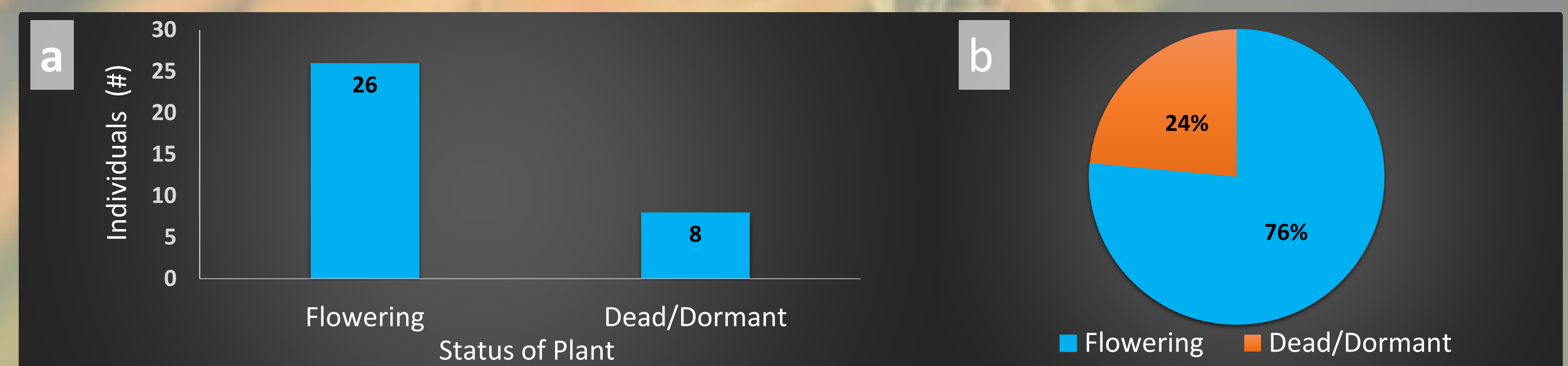


Figure 5. Number of *Platanthera chapmanii* transplanted plants observed flowering or considered dormant/dead in 2014 (a), and the same data shown as percentages of all *Platanthera chapmanii* plants transplanted across 2012 and 2013 that were observed flowering or considered dormant or dead in 2014 (b).

Acknowledgements

We thank Matt Richards (The Atlanta Botanical Garden), Pauline Singleton (Watson Native Plant Preserve) and Joe Liggio. We appreciate the assistance from Weyerhaeuser, Tom Philipps (USFWS), George Russell, Native Prairies Association of Texas, Big Thicket National Preserve, and many private landowners for allowing access to their lands. Financial support from the Horned Lizard License Plate Program (Texas Parks & Wildlife Department) is gratefully acknowledged.