

Influence of Invasive Species on Afforestation Growth, Survival, and Composition



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INTRODUCTION

Managers with natural resource agencies often have a ‘plant and walk away’ mentality, assuming large-scale afforestation actions meant to restore wildlife habitat can proceed without much input and management. However, competition from vegetation may result in longer rotations for seedlings to produce viable resources for wildlife. Conversely, native vegetation may have a protective effect while exotic vegetation may induce a competing effect.

In addition, disturbance by non-native fauna may reduce growth and survival of seedlings. On the other hand, disturbance from non-native fauna may enhance survival and growth of seedlings by mimicking beneficial disturbance performed by farming equipment in agricultural operations.

Large-scale afforestation operations are used to rehabilitate lands historically converted from bottomland hardwood forest to agricultural operations. Depending on the site conditions of the area to be rehabilitated, these operations can range from apt to fail or may not need planting at all as volunteer vegetation may naturally regenerate a site.

This study will investigate how competition from native flora and invasive species (Chinese tallow [*Triadica sebifera*] and trifoliolate orange [*Poncirus trifoliata*]) impact the survival, growth, and stand composition of an afforestation site during the first 6—8 years post-planting. This study will also assess whether herbicidal control of competing flora is beneficial to the growth of desirable hardwood species. In addition, this study will examine the effects of herbivory and disturbance from feral hogs (*Sus scrofa*) on survival and mortality of seedlings and overall stand composition over eight years. Lastly, this study will take into account the survival of woody volunteer vegetation and its role in stand diversity and composition.



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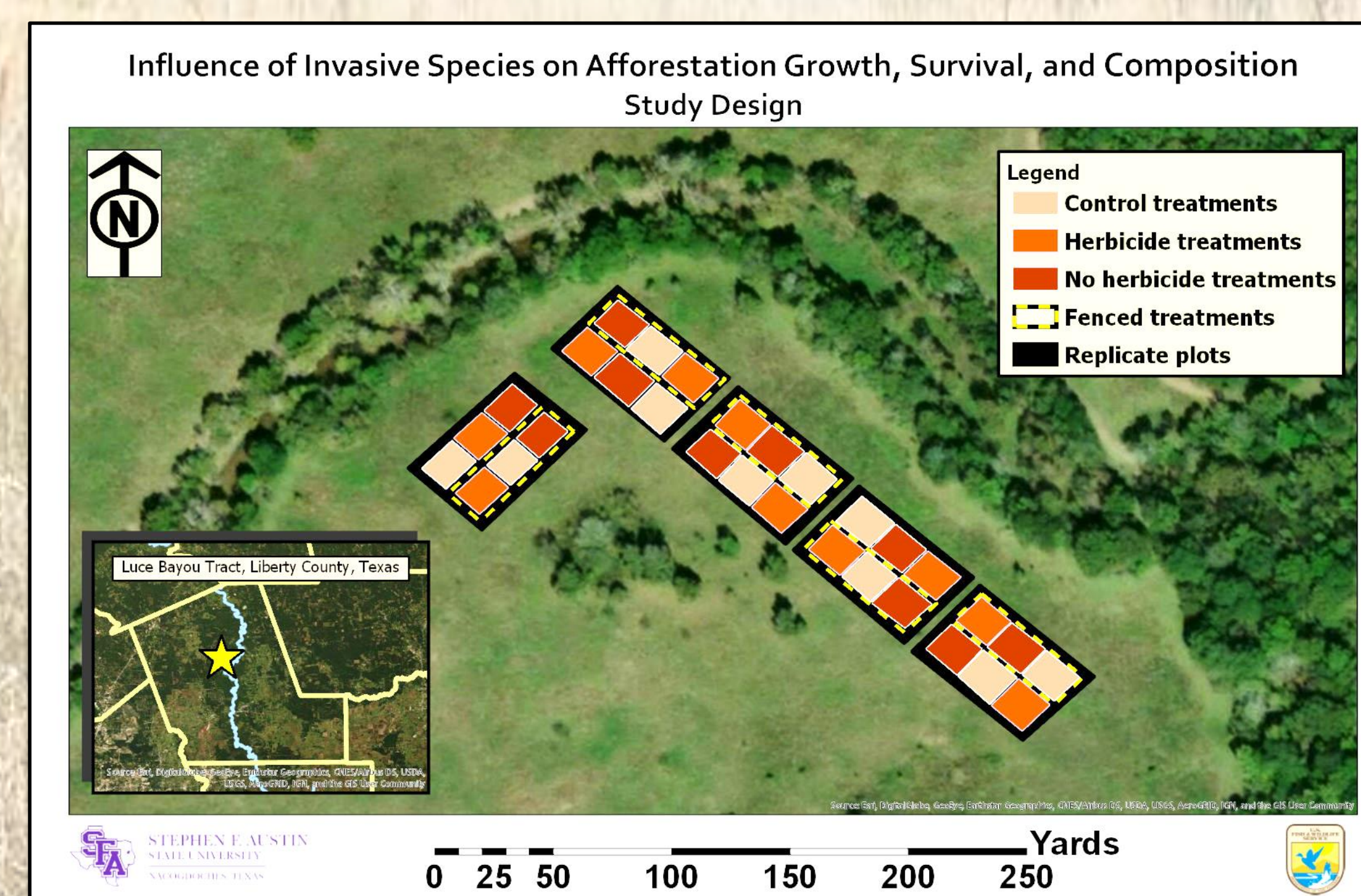
Goals and Objectives

To observe the potential impact of invasive species (flora and fauna) in survival, growth, and composition of afforested sites in a bottomland hardwood forests.

- 1: Determine the effect of invasive feral hogs on survival of afforested species and recruitment of volunteer vegetation.
- 2: Determine if herbicidal application is silviculturally effective for controlling invasive Chinese tallow and trifoliolate orange.
- 3: Determine if afforestation efforts and invasive species control treatments affected stand structure and composition.

METHODS AND MATERIALS

The study site is a fallow pasture within the floodplain of the Luce Bayou Tract of Trinity River National Wildlife Refuge. Timber was harvested from the site between 1972—1988. It was farmed or mowed annually. The study area was prepared by shearing vegetation with a small dozer. Before planting, five replicate plots (144 ft X 96 ft) were placed approximately 60 ft from the edge of Gillen Bayou.



This split-split plot design was selected to study the interactions between feral hog disturbance and use of herbicide on seedlings growth, seedling survival, and stand composition. Within each split plot of fenced or unfenced treatment, three treatments (48 ft X 48 ft; control treatment, herbicide treatment, no herbicide treatment) were randomly placed. Two treatments (herbicide treatment, no herbicide treatment) were planted with 25 seedlings while the control treatments were left unplanted.



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Seedlings were hand-planted operationally by a single planter on a 10 ft X 10 ft spacing consisting of 5 rows of 5 seedlings; each row consisted of seedlings of only one species. Species were: Nuttall Oak (*Quercus texana*), water oak (*Q. nigra*), willow oak (*Q. phellos*), swamp chestnut oak (*Q. michauxii*), and overcup oak (*Q. lyrata*).

Seedling survival, height and diameter – Survival and condition of seedlings categorically characterized. Healthy seedlings which disappeared or were found uprooted were recorded as a sign of hog disturbance. Seedling height (inches) was assessed in November using a height pole. Seedling groundline diameter (inches) was assessed using dial calipers.

Fauna disturbance control (Split-plot factor) – To study the effects of feral hogs, within each whole plot, two split plots (144 ft X 48 ft) were delineated for fenced/unfenced treatment. Hog panels (16 ft X 34 inch panels) were used for exclusion fencing and were placed prior to planting. Fencing is expected to 1) prevent disturbance to soil from hog activity; and 2) alteration of the seed bed from hogs consuming or introducing seeds.



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Flora competition control treatments (Split-split plot) – The herbicide treatment was glyphosate herbicide (Roundup Custom® at 1.5% [v/v] in water) to control herbaceous vegetation and an application of triclopyr herbicide (Garlon® 4 Ultra at 20% [v/v] in oil) to control woody vegetation. Seedlings within the herbicidal treatment plot were covered with a 13-gallon trashcan when vegetation around the seedlings was treated with herbicide.

Vegetation mapping – Post-planting in June, woody vegetation was mapped by walking the entirety of the plots, documenting presence and locations of trees and shrubs in each treatment. Herbaceous vegetation was measured using percentages with Daubenmire squares. This will be used to observe changes in density of volunteer woody native and invasive vegetation in stand composition within and among treatments.

Statistical Analysis – ANOVA will be used to analyze effects of individual treatments and interactions of treatments seedlings growth, seedling survival, and stand composition as the stand progresses over the next eight years.