

From ecological desert to native meadow



Above: By December 2014, only 4 months after planting, the meadow effect had really taken hold. The remnant pine rockland is visible in background. Photo: Joyce Maschinski.

An experimental planting of native pineland grasses and herbs transforms a private residence

In August 2014, an experimental planting of native pineland grasses and herbs was carried out by Fairchild Tropical Botanic Garden staff and volunteers on a private residence, under the direction of Dr. Joyce Maschinski. The project had several aims: to evaluate the use of plants grown in flats (12" x 24" x 2" trays) in establishing viable populations of native grasses and herbs; to see how different combinations of species behaved after planting, and lastly to see the effects of clipping, after the plants were established.

The part of the yard selected was located just north of the house and originally was covered by St. Augustine and other lawn grasses. The area was roughly elliptical in shape, measured approximately 70 feet (east-west) and 30 feet (north-south), and was bordered on the east by restored pineland habitat and on

the north and west by turf grass. It was chosen for its exposure to sun, distance from trees, and other logistic factors. The grass and topsoil were removed with a rented Bobcat machine. The western and southern areas had a very superficial soil layer, and were consequently scraped down almost to solid or broken limestone with little residual soil, while the northern and eastern parts had deeper sandy soil, the lower layer of which was retained. In some areas, large pieces of oolite had to be removed. Rocks were raked from the surface to allow maximum area for seeding. Prior to planting, the plot was divided into 1-meter-square sections. Soon after the planting, the borders of the plot were set using small and medium-sized rocks.

Prior to the yard preparation, the trays were sown with multiple combinations of 16 grass and 7 herbaceous pineland

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A step-by-step view of the meadow planting process

1. Raul's yard in summer 2014, prior to planting. The yard was composed of St. Augustine and other turf grasses. Photo: Raul Moas.
2. Raul stands in the area he just cleared. Photo: Joyce Maschinski.
3. Volunteer Erick Revuelta waters flats of grass just prior to planting. Photo: Joyce Maschinski.
4. The meadow on planting day. Photo: Raul Moas.
5. One year after planting, the meadow has filled in nicely. Photo: Raul Moas.
6. Raul discusses the project with another Miami restoration practitioner. Photo: Joyce Maschinski.
7. Raul and Adele Moas in front of their meadow, February 2016. Photo: Joyce Maschinski.

species (see list on page 7). They were greenhouse grown at Fairchild by Devon Powell. A total of 34 trays (with an aggregate of 68 square feet) were planted, divided into identical eastern and western halves. The trays were planted anywhere from 3 to 10 feet from each other, except that, on each side, 3 trays of Meadow Mix #5 and 2 trays of Meadow Mix #1 were planted contiguously. The planting was done over 2 days, and space for the trays was in most cases dug or pick-axed out to a depth of 2-3 inches. Daily watering was done with a portable sprinkler for 2 weeks. Thereafter, 2 sprinklers located in the planting area were left functioning, running for 40 minutes twice weekly throughout the entire study time. No fertilizer or soil amendments were used. For the first few months, weeds that came up in the unplanted areas surrounding the flats were removed manually, but this became more difficult as widespread seeding occurred.

Results

None of the flats experienced significant die-off after planting. Despite being set into poor-quality sandy subsoil or even on top of oolitic rock, within several weeks all the flats appeared to have become established, with noticeable vegetative growth in most. Most of the grass species began flowering soon after being planted. This resulted in the rapid spread of several species, most notably *Digitaria*, *Andropogon*, *Eustachys*, and to a lesser degree, *Schizachyrium*, *Paspalum*, and *Aristida*. In many instances, the tall spikes of the grasses would lean over, or fall onto, adjacent bare ground, dropping seeds well away from the flats, and further seed spread occurred by wind and rain. Within 3 months, 60-70% of the plot had grass cover of at least 1 plant/4 cm², and within 6 months 95% coverage was achieved, with only a fringe along the northeast edge remaining with few seedlings. Within a year, grass coverage had occurred everywhere within the plot. Seed sprouting occurred in highest density where rain collected in puddles, indicating that seeds were washed into these areas, but rate of growth was greatest where more surface soil remained and slowest in areas of almost bare rock. Of the grasses, the “meadow mix” trays, originally sown with multiple combinations of species, were at planting already dominated by *Digitaria*, *Paspalum*, or *Eustachys* species, likely resulting in the absence of several species, such as *Sorghastrum secundum*, *Aristida patula*, *Schizachyrium gracile*, and *Schizachyrium scoparium*. *Muhlenbergia* had not flowered by 1 year’s time, but was well-established within its two original flats. Three Chapman’s goldenrods grew, but no propagation occurred. *Abilgaardia*, a sedge, and *Dicanthelium* spp., planted together as part of the “short leaf” trays, tended to be overgrown by larger species seeding in their vicinity. Though producing seeds, they propagated sparingly, with the offspring also overwhelmed by the larger species. Two silk grasses (*Pityopsis graminifolia*) flowered but have not propagated. *Chaptalia* was seen on at least two trays and propagated sparingly. *Liatis* spp. originally sown



Two months after planting, seedlings germinate in scraped areas where water pooled.
Photo: Joyce Maschinski.

on several trays, was never seen, presumably overgrown on the flats before planting. Seeds of *Tephrosia angustissima* var. *corallicola*, not intentionally planted in the flats, may have come from adjacent plantings in the Fairchild greenhouse. They sprouted next to several flats, and are well established. Several species preexisting in the pineland adjacent to the eastern edge of the plot (*Melanthera*, *Aristida patula*, *Croton linearis*, *Stachytarpheta jamaicensis*, etc.) have sprouted along that side, mixing with the tray grasses.

Clipping

Six months after the initial planting, the western half of the plot was hand-trimmed to 6-8 inches in height, while the eastern half remained uncut. After 8-10 weeks, the grasses had returned to pre-trim height and the appearance of the 2 halves was similar. No discernible change in population or dieback occurred among the cut grasses.

Current Status

As of this writing, a nearly solid ground cover of 12 native pineland grass species, with a few non-grass herbs, is established on an area of 2,100 square feet. A trail running north-south, near the eastern edge, probably started by local animals and

List and contents of flats

- **Schizachyrium mix:** (2 flats)
Schizachyrium sanguineum
Schizachyrium gracile
Schizachyrium scoparium
- **Short leaf mix:** (2 flats)
Abilgaardia ovata
Dicanthelium aciculare
Dicanthelium commutatum
- **Fast-spreading mix:** (2 flats)
Eustachys petraea
Eustachys glauca
Paspalum blodgettii
Paspalum caespitosum
- **Andropogon mix:** (2 flats)
Andropogon longiberbis
Andropogon ternarius,
Andropogon virginicus var. *glaucus*
- *Andropogon longiberbis:* (2 flats)
- **Muhly:** *Mulhenbergia* (2 flats)
- **Meadow Mix #1:** (6 flats)
Andropogon longiberbis
Andropogon virginicus var. *glaucus*
Aristida patula
Aristida purpurascens
Chaptalia albicans
Digitaria filiformis var. *filiformis*
Eustachys glauca
Eustachys petraea
Liatis gracilis
Liatis tenuifolia
Liatis gracilis forma *alba*
Paspalum blodgettii
Paspalum caespitosum
Pityopsis graminifolia
Schizachyrium gracile
Schizachyrium scoparium
Solidago odora var. *chapmanii*
Sorghastrum secundum
- **Meadow Mix #2:** (2 flats)
Andropogon spp.
Aristida purpurascens
Chaptalia albicans
Eustachys glauca
Liatis gracilis
Paspalum caespitosum
Pityopsis graminifolia
Schizachyrium gracile
Solidago odora var. *chapmanii*
Sorghastrum secundum
- **Meadow Mix #3:** (2 flats)
Aristida purpurascens
Chaptalia albicans
Digitaria filiformis var. *filiformis*
Liatis tenuifolia
Paspalum blodgettii
Paspalum caespitosum
Pityopsis graminifolia
Schizachyrium scoparium
Solidago odora var. *chapmanii*
- **Meadow Mix #4:** (2 flats)
Andropogon longiberbis
Andropogon virginicus var. *glaucus*
Eustachys glauca
Liatis gracilis
Liatis gracilis forma *alba*
Paspalum blodgettii
Paspalum caespitosum
Pityopsis graminifolia
Schizachyrium gracile
Sorghastrum secundum
- **Meadow Mix #5:** (10 flats)
Andropogon spp.
Andropogon longiberbis
Andropogon virginicus var. *glaucus*
Eustachys glauca
Liatis gracilis
Paspalum caespitosum
Schizachyrium gracile
Sorghastrum secundum

reinforced by people working in the yard, is the only area barren of native species. The overall health of the grassland appears good. One of the planted species, the annual clump grass *Digitaria filiformis* is also one of the best propagators. Its large dead clumps result in a straw-like ground cover which prevents further sprouting, and the largest ones have had to be removed manually. Weed sprouting and intrusion have varied throughout the plot, with the northeastern edge most affected, not unexpectedly as this was the last area to seed. Within the plot, *Alysicarpus vaginalis* (a non-native with deep taproot), *Phyla nodiflora* (frog fruit, a native with creeping stems), *Spermacoce*, and 2 species of weedy spurge have been the most common weeds, while along the edges, intrusion and direct seeding from a *Richardia* sp. (non-native), *Phyla*, and lawn grass has also occurred. There has been no regular weeding done for the past 6 months, but modest work, perhaps 1

hour every 2 weeks, would probably be enough to keep the area largely free of weeds. The major challenge has been weeding within the plot without disturbing the grasses. In retrospect, placement of flat rocks at intervals to serve as steppingstones would have helped this but would also have reduced the area available for seeding.

An abundance of animal life has been attracted to the planting. Dragonflies, bees, wasps, flies, hemipterans, butterflies, skippers, and 3 types of grasshoppers have been observed feeding on the plants or each other. Racers and scarlet snakes have been seen in the planting or its borders.

Summary

- Rapid propagation of multiple pineland grasses may be possible over fairly large areas, using the technique of pre-grown flats described above. In this experiment, 64 square feet of flats was able to fill 2,100 square feet of land with grass cover within 6 months. If planting is done in summer, just prior to flowering/seed set, with at least 2-3 months of rainy season remaining, and the weed-containing topsoil can be stripped off leaving bare rock or seed-free subsoil, it may be possible to re-establish viable grassland on larger tracts of land.
- While several factors facilitated propagation, the enhanced seed production from having many individual plants in each flat and the imminent flowering of the grasses at time of planting were probably the most important. Other factors included long seed stalks, the windborne nature of several of the grasses, and regular watering.
- Tall, rapid-growing grasses will overgrow less robust grass and herb species when grown in trays and likewise may overwhelm smaller species even in nutrient-poor substrates.
- In smaller projects, flats allow establishment of a number of species in a compact space, which can then serve as a seed source for adjacent areas.
- Please note that the routine watering used in this project did not mimic the dry season water stress seen in pinelands, nor did the soil preparation duplicate the rock surface of natural pine rockland habitat.

About the Author

Raul Moas and his wife, Adele, have been interested in pineland plants since moving into their current home, which had small remnants of the original pineland understorey, in 1992. Restoration has taken place over approximately one-fourth of the property since then. The property currently is part of the Miami-Dade County Environmentally Endangered Lands (EEL) Covenant Program.

Acknowledgments

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