ESTABLISHING NATIVE GRASS ON CRITICAL AREA SITES
ACTIVITY REPORT FOR 1999

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Project Stage: A five year project begun in 1997.

Background: A cooperative effort between Eglin Air Force Base, NRCS, Yellow River S&WCD and Florida Three Rivers RC&D. Natural resources personnel at Eglin AFB, in the Panhandle of Florida, wish to reclaim borrow pit areas on the Base. Unreclaimed areas are contributing high sediment loads to rivers and streams. Sedimentation especially threatens the Okaloosa darter, a fish on the endangered species list. Eglin personnel prefer to use species native to Eglin and are especially interested in restoring the longleaf pine/wiregrass habitat. However, the sites to be reclaimed are typically characterized by steep slopes, infertile soils, and high precipitation, causing severe water erosion. Seed and/or plant sources of species native to Eglin are not available commercially. In addition, native species often have poor seed production and seedling vigor. This project contains three separate studies, that research the effectiveness of native species in establishing on and stabilizing critical area sites . Study I tests the adaptability of commercially available native species established as transplants. Study II tests adaptability of three Florida native species established as transplants. Study III tests emergence of Florida native wiregrass and lopsided indiangrass by direct seeding.

Native Grass Transplants – Study I

Objective: To test five species of grasses native to the southeastern US, which are available on the commercial market. Transplants of these species need to be adaptable and able to rapidly establish on critical area sites. Effect of treating the soil with lime, fertilizer and mulch was also studied.

Summary: Transplants of 'Alamo' switchgrass (*Panicum virgatum*), sand cordgrass (*Spartina bakeri*), 'Flageo' marshhay cordgrass (*S. patens*), 'Iuka' and 'Pete' eastern gamagrass (*Tripsacum dactyloides*) were obtained from a commercial grower for this study. Seed of a north Florida ecotype of switchgrass, 'Defuniak Source', (accession no. 9059616) was also provided to the grower by the PMC for growing transplants for this study. The PMC provided tubelings of 'Croom Source' (accession no. 9059450) lopsided indiangrass (*Sorghastrum secundum*), which is not available commercially. Plants were established in replicated plots on treated and untreated soils on 4/28/98. A final evaluation was conducted in December of 1999 for survival and growth characteristics.

Significant Findings: All species except lopsided indiangrass had high survival rates on both untreated (Table 1) and treated plots (Table 2). Overall average species performance on treated and untreated sites is shown in Table 3. Those species with greater than 100% survival were increasing either by seed or by rhizomes. Survival of Defuniak switchgrass is 104% in the untreated section because 10 seedlings were found in one of the plots. Most other untreated Defuniak plots had 100% survival, which was higher than survival on treated plots. This is surprising since Defuniak was originally collected from standing water. It has a shorter, more

compact growth habit than Alamo, but vigor was similar. Both types of switchgrass provided a relatively tall dense canopy. The forage and seed produced by this species is beneficial for wildlife food and cover.

Table 1. Two-year survival and growth characteristics of 5 native grasses transplanted on untreated soils on four critical area sites at Eglin A.F.B. in 1998.

Species	Location	No. Planted	No. Survival	% Survival	Avg Ht (cm)	Avg Wd (cm)	Vigor (1 to 9)*
Alamo	C10E-Blk1	18	17	94	70	20	5
	C10E-Blk2	18	18	100	57	20	5
	C10E-Blk3	18	16	89	100	25	5
	C10E-Blk4	18	18	100	50	25	5
	C9-Blk1	18	18	100	100	30	5
	B32-Blk1	18	22	122	121	36	5
	B32-Blk2	18	18	100	46	17	5
	B35-Blk1	18	15	83	95	12	5
	B35-Blk2	18	18	100	100	20	5
Defuniak	C10E-Blk1	18	18	100	58	14	5
	C10E-Blk2	18	18	100	47	18	4.5
	C10E-Blk3	18	18	100	65	20	5
	C10E-Blk4	18	18	100	36	22	5
	C9-Blk1	18	18	100	70	30	5
	B32-Blk1	18	26	144	145	25	5
	B32-Blk2	18	18	100	90	45	5
	B35-Blk1	18	17	94	75	40	4
	B35-Blk2	18	17	94	75	26	5
Bakeri	C10E-Blk1	18	18	100	90	14	
	C10E-Blk2	18	17	94	100	20	6
	C10E-Blk3	18	16	89	110	20	6
	C10E-Blk4	18	18	100	80	10	6
	C9-Blk1	18	18	100	112	21	5
	B32-Blk1	18	18	100	112	14	6
	B32-Blk2	18	18	100	50	110	6
	B35-Blk1	18	14	78	85	20	5
	B35-Blk2	18	17	94	110	25	5
Flageo	C10E-Blk1	18	20	111	30	25	5
	C10E-Blk2	18	22	122	40	20	6
	C10E-Blk3	18	15	83	40	12	7
	C10E-Blk4	18	18	100	40	15	6
	C9-Blk1	18	18	100	33	20	
	B32-Blk1	18	22	122	30	13	7
	B32-Blk2	18	17	94	33	10	7
	B35-Blk1	18	2	11	30	8	9
	B35-Blk2	18	15	83	22	12	9
Indiangrass	C10E-Blk1	18	17	94	35	35	5
	C10E-Blk2	18	15	83	38	12	6

Species	Location	No. Planted	No. Survival	% Survival	Avg Ht (cm)	Avg Wd (cm)	Vigor (1 to 9)*
	C10E-Blk3	18	16	89	40	25	5
Indiangrass	C10E-Blk4	18	13	72	35	20	6
	C9-Blk1	18	18	100	33	30	5
	B32-Blk1	18	7	39	54	46	6
	B32-Blk2	18	2	11	50	17	9
	B35-Blk1	18	18	100	40	25	5
	B35-Blk2	18	17	94	34	26	7

*1=best, 9=dead

Flageo survival was difficult to determine because many plants had begun to spread by rhizomes. Flageo did best on treated soils. Despite its rhizomatous growth habit, it did not provide a dense ground cover. Nor did Bakeri, which was the tallest species in the study. Its leaves are very thin and wire-like and it has a very open canopy.

Table 2. Two-year survival and growth characteristics of 5 native grasses transplanted on treated soils on four critical area sites at Eglin A.F.B. in 1998.

Species	Location	No. Planted	No. Survival	% Survival	Avg Ht (cm)	Avg Wd (cm)	Vigor (1 to 9)*
Alamo	C10E-Blk1	18	18	100	85	45	5
	C10E-Blk2	18	18	100	98	25	5
	C10E-Blk3	18	18	100	85	22	5
	C10E-Blk4	18	18	100	100	30	5
	C9-Blk1	18	16	89	110	30	5
	B32-Blk1	18	18	100	116	28	5
	B32-Blk2	18	18	100	46	17	5
	B35-Blk1	18	18	100	110	25	5
	B35-Blk2	18	17	94	120	30	5
Defuniak	C10E-Blk1	18	17	94	54	30	5
	C10E-Blk2	18	15	83	90	42	4
	C10E-Blk3	18	18	100	70	35	5
	C10E-Blk4	18	18	100	64	33	5
	C9-Blk1	18	7	39	80	35	5
	B32-Blk1	18	18	100	91	56	5
	B32-Blk2	18	18	100	110	37	5
	B35-Blk1	18	16	89	90	45	5
	B35-Blk2	18	18	100	80	34	4.5
Bakeri	C10E-Blk1	18	18	100	105	28	6
	C10E-Blk2	18	18	100	110	40	5
	C10E-Blk3	18	18	100	116	50	5
	C10E-Blk4	18	18	100	130	27	5
	C9-Blk1	18	18	100	112	50	5
	B32-Blk1	18	11	61	125	25	6
	B32-Blk2	18	17	94	140	35	5
	B35-Blk1	18	18	100	111	45	5

Species	Location	No. Planted	No. Survival	% Survival	Avg Ht (cm)	Avg Wd (cm)	Vigor (1 to 9)*
	B35-Blk2	18	18	100	100	30	5
Flageo	C10E-Blk1	18	30	167	30	20	5
	C10E-Blk2	18	18	100	40	30	4
	C10E-Blk3	18	30	167	40	30	5
	C10E-Blk4	18	18	100	64	22	6
	C9-Blk1	18	18	100	18	12	5
	B32-Blk1	18	18	100	35	35	6
	B32-Blk2	18	11	61	37	26	6
	B35-Blk1	18	18	100	35	28	4
	B35-Blk2	18	22	122	35	30	4
Indiangrass	C10E-Blk1	18	5	28	76	35	4
	C10E-Blk2	18	10	56	50	25	4
	C10E-Blk3	18	11	61	45	25	6
	C10E-Blk4	18	7	39	45	25	6
	C9-Blk1	18	0	0			
	B32-Blk1	18	3	17	35	22	8
	B32-Blk2	18	5	28	52	27	8
	B35-Blk1	18	17	94	53	28	6
	B35-Blk2	18	8	44	40	25	7

*1=best, 9=dead

Lopsided indiangrass is adapted to native upland nutrient-poor soils, which accounts for the higher survival on untreated soils in this study. Those plants that did survive had good vigor, and some produced seedheads. Other strains of indiangrass more adapted to the soils of Eglin AFB may have had better survival. Eastern gamagrass transplants died out of all plots. The planting sites were most likely too dry for this species.

Table 3. Two-year average percent survival and growth characteristics of 5 native grasses transplanted on treated and untreated soils on critical area sites at Eglin A.F.B. in 1998.

Treatment	Species	Avg. % Survival	Avg. Ht. (cm)	Avg. Wd. (cm)	Vigor (1 to 9)*
Untreated	Alamo	99	82	23	5
	Defuniak	104	73	27	5
	Bakeri	95	94	28	6
	Flageo	92	33	15	6
	Indiangrass	76	40	26	6
Treated	Alamo	98	97	28	5
	Defuniak	90	81	39	5
	Bakeri	95	117	37	5
	Flageo	102	37	26	5
	Indiangrass	41	50	27	6

*1=best, 9=dead

In conclusion, of the five species considered in this study, switchgrass had the greatest potential for use in stabilizing critical areas at Eglin AFB. This held true on soils treated with soil amendments and fertilizer and those that weren't. Both ecotypes in this study had the highest overall survival and provided the most biomass, compared to the two species of cordgrass studied. The drawback of the switchgrass types used in this study is that they have a bunch-type growth habit, and do not tend to spread rapidly. A rhizomatous growth habit would be more beneficial for stabilization of the steep slopes in these borrow pit areas. There are rhizomatous ecotypes of switchgrass growing naturally on Eglin AFB. Although seed production of these native populations is typically very poor, it may be beneficial to develop a strain for critical area stabilization purposes.

Another native species not included in this study has growth characteristics that make it very useful for stabilizing critical area sites. Bitter panicum (*Panicum amarum*) is native to coastal dunes in the southeastern US, and is not normally found inland. However, the cultivar 'Northpa' was planted on one of the sites adjacent to research plots at Eglin AFB. This species has a low dense growth habit and aggressive rhizomes. Being adapted to sterile dune soils, it proved to be highly adapted to the nutrient-poor borrow pit areas and was very successful in colonizing them.

Florida Native Grass Transplants - Study II

Objective: To test the ability of three Florida native upland grasses to colonize critical area sites when established as transplants.

Summary: In December of 1997, seed from wiregrass (*Aristida stricta*) and a rhizomatous form of little bluestem (*Schizachyrium scoparium*) was collected from a site in Eglin AFB that had been burned in April of 1997. Lopsided indiangrass seed was collected from a site in Walton Co. in October of 1996. Transplants of these three species were established by planting seed in 6" deep cone trays in the greenhouse at the PMC. Approximately 2300 wiregrass, 1000 indiangrass and 400 little bluestem seedlings were planted in replicated plots on two critical area sites on 10/28/98 at Eglin. Plants were placed on 1.5' centers. None of the soils had been limed, mulched or fertilized. A one-year evaluation was conducted in December of 1999. Results are shown in Table 4.

Table 4. One-year survival and performance of three Florida native grasses planted as transplants on two Eglin critical area sites.

Site	Species	% Survival	Plant Ht. (cm)	Canopy Wd. (cm)	Vigor (1 to 9)*
Site 1	Wiregrass	83	21	14	5
	Bluestem	62	14	13	4
	Indiangrass	33	12	13	7
Site 2	Wiregrass	92	18	10	5
	Bluestem	74	12	10	4
	Indiangrass	37	16	13	7

*1=best, 9=dead

Wiregrass had the greatest survival on both sites and plants had fairly good vigor. The bluestem had fair survival and many plants were vigorous enough to produce seedheads. Only one third of the Walton Co. ecotype of indiangrass plants survived, and vigor was poor. Not unexpectedly, all of these native grasses have been slow to establish. Fortunately, weed competition is almost non existent. The wiregrass and bluestem plants may benefit from annual applications of fertilizer. Evaluations are to be conducted for another two years.

Florida Native Grass Direct Seeding Trial – Study III

Objective: To test the ability of two Florida native upland grasses to colonize critical area sites when established by direct seeding during different seasons of the year.

Summary: Wiregrass collected from Eglin in 1997 and indiangrass collected from Ft. Cooper in 1997 (accession no. 9059727) were direct seeded on 5' x 5' plots at four sites. Trials were located on both treated and untreated soils. Seeding rate for wiregrass and indiangrass was 80 and 20 pure live seed/ft^2 respectively. Seedings were done by hand broadcasting seed on four dates, 4/28/98, 6/24/98, 10/28/98 and 1/7/99. Plots were raked before and after seeding. Evaluations were conducted in December of 1999. Results are shown in Tables 5 and 6.

Significant Findings: Lopsided indiangrass emerged from all seeding dates, but greatest emergence occurred from the fall and winter seedings on both soil types. Indiangrass seedling densities had decreased on the spring and summer planted plots from original counts. Droughty conditions during 1999 were the most likely cause. Seedlings on plots treated with lime, fertilizer and mulch appeared taller and more vigorous than untreated plots.

Wiregrass only emerged from the fall and winter plots. The reason for this is uncertain, however, similar results have been found in studies in central Florida. Since weed competition on the Eglin plots was minimal, higher moisture in the fall and early winter may have encouraged seed germination. Plots will be monitored for one to two more years to determine how well both species become established on these critical area sites.

Table 5. Average plant density and growth characteristics of lopsided indiangrass and wiregrass direct seeded on untreated critical area sites on Eglin AFB. Evaluations conducted in December of 1999.

Species	Planting Season	Density Plants/ft^2	Plant Ht. (cm)	Plant Wd. (cm)	Vigor (1 to 9)*
Indiangrass	Spring	1	14	9	8
	Summer	1	30	12	6
	Fall	5	7	2	7
	Winter	9	6	1	8
Wiregrass	Spring	0			
	Summer	0			
	Fall	2	4	1	7
	Winter	11	6	1	6

*1=best, 9=dead

Table 6. Average plant density and growth characteristics of lopsided indiangrass and wiregrass direct seeded on treated critical area sites on Eglin AFB. Evaluations conducted in December of 1999.

Species	Planting Season	Density Plants/ft^2	Plant Ht. (cm)	Plant Wd. (cm)	Vigor (1 to 9)*
Indiangrass	Spring	3	23	11	5
	Summer	7	21	9	7
	Fall	10	11	2	7
	Winter	6	8	1	7
Wiregrass	Spring	0			
	Summer	0			
	Fall	1	8	2	8
	Winter	5	9	1	7

*1=best, 9=dead