

Wildlife Research and Education

Sinton, Texas 78387-1400

John J. Welder
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April 24, 1990

John D. Hunter, Superintendent
Padre Island National Seashore
9405 So. Padre Island Dr.
Corpus Christi, Texas 78418

Dear Mr. Hunter:

In response to your letter concerning the planning team that will be meeting on May 9, 1990, I have called your secretary and set up a meeting for 9:30 AM. In particular, I am concerned about the future of the area of the Seashore where I have permanent vegetation transects, i.e., the area of the Pan Am Road just below the 4-wheel drive sign. This area is of special interest to me and the Seashore because I have had these transects set up since 1972, and have collected data on them at 5-year intervals since that time.

Enclosed is a brief progress report on my work. I have been holding off on publishing this material until I see 'significant' change. In my opinion, this change has not yet occurred, but perhaps is occurring at present. Last year when I was on the island doing a consulting project for the Seashore as a follow-up to the seismographic activity, I felt that the rate of successional change had accelerated. I am scheduled to do another 5-year sampling of the permanent transects in 1992. Perhaps following that sampling, there will have been sufficient change to warrant a publication in a refereed journal.

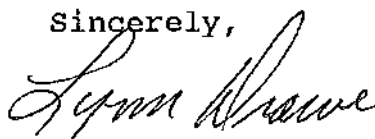
Please understand that this long-term study is at no cost to the Park Service. Dr. Clarence Cottam, deceased Director of the Welder Foundation, was instrumental in getting me involved in this vegetation work. The Welder Wildlife Foundation supported at least two student research projects in the early 1970's following removal of cattle from the Seashore. (Dr. Cottam was a driving force in getting cattle off the Seashore.) These were my graduate students when I was a faculty member at Texas A&I University. When I came to the Welder Foundation as a staff member in 1974, I brought the research project with me and the Foundation has been good enough to support my continued involvement in the study.



John D. Hunter
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I look forward to meeting with you and the team to discuss our mutual interests.

Sincerely,



Lynn Drawe
Assistant Director

Enclosure

D18(1)

April 12, 1990

Progress Report
by
D. Lynn Drawe
Welder Wildlife Foundation
Sinton, Texas

Succession of Vegetation on Padre Island National Seashore

Beginning in September 1971 immediately following the removal of cattle from Padre Island National Seashore, a series of permanently marked vegetation transects was established in the five major plant communities (Rechenthin and Passey 1967) found on the Island. These transects have subsequently been resampled in July and August of 1977, 1983, and 1987. The design of this study calls for resampling at 5-year intervals.

The transects are randomly located in each of the five plant communities (Kattner 1973). Along each of the transects, a 100-foot surveyor's tape is stretched between the two marker posts. At 10-foot intervals along the tape, a 10-point frame is centered perpendicularly to the line. One foilar and one basal hit are recorded for each pin drop. In this manner, 1000 pin drops are recorded for each community.

Preliminary results of this study were reported in Kattner (1973), Drawe and Kattner (1978), and Drawe et al. (1981). Most of the cattle had been removed at least a year prior to the initiation of this study, therefore initial conditions of the vegetation are not known.

Low Coastal Sands Communities - The Low Coastal Sands Communities are the most productive communities on the island in terms of number of species and amount of herbage produced (Kattner 1973; Drawe et al. 1981). During the 15 years of data collection on this study grasses increased slightly in percent cover, grasslike plants held even, forb cover declined, and total cover of live vegetation declined slightly (Table 1). Litter cover declined from 72% to 40%, a rather sizeable decline.

Among the major species of plants in the Low Coastal Sands, the most abundant species initially was gulfdune paspalum (Paspalum monostachyum) which increased after 5 years and then declined (Table 1a). Another abundant species, wooly stemodia (Stemodia tomentosa), declined to zero by 1987. Other abundant forbs also declined considerably from 1971 to 1987.

Coastal Dunes Communities - The Coastal Dunes Communities include primary, lateral, and back dunes. Sampling is distributed 80% in the foredunes and 20% in lateral and back dunes. Grass cover increased initially, then declined after 15 years (Table 2). Forbs increased throughout the study period, showing only slight

TABLE 1. Low Coastal Sand Community - Padre Island National Seashore

Percent Foliar Cover of Grasses, Grasslike plants,
Forbs and Litter for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>GRASSES</u>	<u>GRASSLIKE</u>	<u>FORBS</u>	<u>LIVE VEG.</u>	<u>TOTAL LITTER</u>
1971	13.6	0.2	16.3	30.1	72.4
1977	20.3	1.5	19.5	31.3	72.5
1983	15.0	0.7	16.4	32.1	53.6
1987	15.4	0.2	10.0	25.6	39.8

TABLE 1a. Low Coastal Sand Community - Padre Island National Seashore

Percent Foliar Cover of Key Speices for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>ERAGROSTIS OXYLEPIS</u>	<u>PASPALUM SETACEUM</u>	<u>PASPALUM MONOSTACHYUM</u>	<u>STEMODIA TOMENTOSA</u>	<u>IVA ANG. AMBROSIA ART., AND PALAFOXIA</u>
1971	1.2	0.4	9.2	7.2	4.0
1977	0.3	0.3	16.3	2.8	2.8
1983	Trace -hit 2 basals	0.2	7.7	0.2	2.1
1987	-0-	-0-	10.2	-0-	0.4

TABLE 2. Coastal Dune Community - Padre Island National Seashore

Percent Foliar Cover of Grasses, Forbs and Litter for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>GRASSES</u>	<u>FORBS</u>	<u>TOTAL LIVE VEG.</u>	<u>LITTER</u>
1971	7.7	19.9	27.6	6.6
1977	20.4	18.6	39.0	36.9
1983	16.8	25.7	42.5	32.1
1987	9.4	23.4	32.8	21.3

TABLE 2a. Coastal Dune Community - Padre Island National Seashore

Percent Foliar Cover of Key Speices of Grass and Forbs for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>UNIOLA PANICULATA</u>	<u>INDIGOFERA MINIATA</u>
1971	7.1	0.6
1977	17.3	3.3
1983	9.8	4.0
1987	4.0	4.2

decline late in the study. Total live vegetation cover was greater at the end of the period. Litter cover increased almost four-fold by the end of the period.

Major species in the Coastal Dunes included sea oats (Uniola paniculata) and little wildindigo (Indigofera miniata). Sea oats first increased, then declined (Table 2a). Wild indigo increased throughout the study.

Salt Marsh Community - The Salt Marsh Community is another community that has an abundance of species and is a heavy herbage producer (Kattner 1973; Drawe et al. 1981). Grass cover declined throughout the study period in this community; whereas, grasslike plants first increased, then declined to near their initial cover (Table 3). Forbs increased initially, then declined. Total live vegetation cover increased initially, then declined to lower than it was at the beginning of the study. Litter cover was higher at the end of the study than at the beginning. The extremely low litter cover at the 1983 sampling is attributed to the fact that the marsh was inundated at sampling.

Among the major species, gulfdune paspalum declined throughout the study, bulrush (Scirpus americanus) increased, then returned to near initial cover, and frogfruit (Phyla nodiflora) increased throughout the study.

Salty Sands Communities - The Salty Sands Communities are the least productive in terms of number of species and herbage production (Kattner 1973; Drawe et al. 1981). Data were not collected in this community in 1971. Grass cover increased, grasslike plants remained about the same, and forbs declined throughout the study (Table 4). Total live vegetation cover declined slightly. Litter cover held steady at first, then declined toward the end of the study.

The major grass species, seashore dropseed (Sporobolus virginicus), increased and the major forb, Polypremum procumbens decreased slightly (Table 4a).

Shoregrass Communities - Shoregrass Communities are relatively simple in terms of number of species present, however are relatively high in terms of herbage production (Kattner 1973; Drawe et al. 1981). Grass cover declined slightly, grasslike plants were not abundant at any time, and forbs remained relatively constant throughout the study (Table 5). Total live vegetation cover first increased, then returned to initial cover by the end of the period. Litter cover increased throughout the study period.

These communities are dominated by one species, shoregrass (Monanthochloe littoralis). Shoregrass cover first increased, then decreased (Table 5a). Bushy sea oxeye (Borrichia frutescens) was the only forb of any abundance, and its cover remained relatively constant throughout the study.

TABLE 3. Salt Marsh Community - Padre Island National Seashore

Percent Foliar Cover of Grasses, Grasslike Plants, Forbs and Litter for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>GRASSES</u>	<u>GRASSLIKE</u>	<u>FORBS</u>	<u>TOTAL LIVE VEG.</u>	<u>LITTER</u>
1971	12.8	15.9	22.6	51.3	37.9
1977	2.5	34.5	31.0	68.0	67.5
1983	3.0	17.6	26.3	46.9	2.6
1987	1.8	15.2	13.0	30.0	49.2

TABLE 3a. Salt Marsh Community - Padre Island National Seashore

Percent Foliar Cover of Key Speices of Grass, Grasslike and Forbs for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>PASPALUM MONOSTACHYUM</u>	<u>SCIRPUS AMERICANUS</u>	<u>PHYLA NODIFLORA</u>
1971	11.1	14.6	5.4
1977	2.0	30.5	9.8
1983	1.6	16.1	8.0
1987	0.8	13.2	11.1

TABLE 4. Salty Sand Community - Padre Island National Seashore

Percent Foliar Cover of Grasses, Grasslike Plants, Forbs and Litter for 1977, 1983, 1987.

<u>YEAR</u>	<u>GRASSES</u>	<u>GRASSLIKE</u>	<u>FORBS</u>	<u>TOTAL LIVE VEG.</u>	<u>LITTER</u>
1972	---- ¹	----	----	----	----
1977	2.0	1.3	23.0	26.3	4.5
1983	11.0	0.1	9.5	20.6	4.5
1987	18.0	1.4	3.8	23.2	0.6

¹Data not collected in 1972

TABLE 4a. Salty Sand Community - Padre Island National Seashore

Percent Foliar Cover of Key Speices of Grass and Forbs for 1977, 1983, 1987.

<u>YEAR</u>	<u>SPOROBOLUS VIRGINICUS</u>	<u>POLYPREMUM PROCUMBENS</u>
1977	----	----
1983	8.9	2.9
1987	13.6	1.0

TABLE 5. Shoregrass Community - Padre Island National Seashore

Percent Foliar Cover of Grasses, Grasslike Plants, Forbs and Litter for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>GRASSES</u>	<u>GRASSLIKE</u>	<u>FORBS</u>	<u>TOTAL LIVE VEG.</u>	<u>LITTER</u>
1971	52.3	----	----	52.3	0.3
1977	57.8	1.8	5.8	65.4	2.3
1983	50.9	----	5.2	56.1	5.0
1987	44.4	0.4	6.6	51.4	5.2

TABLE 5a. Shoregrass Community - Padre Island National Seashore

Percent Foliar Cover of Key Speices of Grass and Forbs for 1971, 1977, 1983, 1987.

<u>YEAR</u>	<u>MONATHOCHLOE LITTORALIS</u>	<u>BORRICHIA FRUTESCENS</u>
1971	51.3	----
1977	56.5	0.8
1983	48.7	1.8
1987	41.0	1.0

DISCUSSION

It had been expected that with the removal of cattle from the Seashore, the succession of vegetation would progress rather rapidly toward climax. Initial surveys indicated that the stage of succession was relatively low (Rechenstien and Passey 1967) and in 1971 our sampling indicated a low stage. However, after 15 years the expected trend toward climax had not occurred. There was an initial increase in production (Kattner 1973) and a buildup of litter, then a subsequent stagnation of the existing vegetation. As evidenced by Tables 1-5, species composition changed very little, except for an actual reduction of some of the original grasses. Litter cover was already relatively high by our first sampling in 1971 in the Low Coastal Sands and actually declined in that community. In most other communities, litter built up over the study period. Although production data are not being collected, observations are that productivity of the communities has declined because of the litter buildup and stagnation of the vegetation. Kattner (1973) found that burning increased subsequent productivity of Low Coastal Sands communities.

The findings of McAtee (1975) and McFarland (1973) can be used to partially explain the slow recovery rate of the vegetation of the Seashore. McAtee (1975) reported that the environment of the Seashore is very harsh. Even though the area receives " of rainfall per year, it is a physiological desert because of high evapo-transpiration rates, poor soil moisture relations, and high salinities of both the prevailing winds and the soils. McFarland (1973) showed that the soils of the Seashore are highly infertile, low in organic matter, and low in moisture holding capacity. In a situation where soils are inherently infertile, if most of the available nutrients are tied up in decaying vegetative matter (litter) then these nutrients are not available for plant growth (McFarland 1973). Evidence of the response of these infertile soils to the addition of fertility has been reported by Kattner (1973). This is not a recommendation to artificially fertilize the Seashore, merely evidence that with low fertility, plant successional changes may be slowed.

Literature Cited

Drawe, D. L. and K. R. Kattner. 1978. Effect of burning and mowing on vegetation of Padre Island. *Southwestern Nat.* 23:273-278.

Drawe, D. L., K. R. Kattner, W. H. McFarland, and D. D. Neher. 1981. Vegetation and soil properties of five habitat types on north Padre Island. *TX. J. Sci.* 33:145-157.

Kattner, K. R. 1973. Secondary successional vegetation on Padre Island National Seashore. M. S. Thesis. Texas A & I Univ., Kingsville. 71 p.

McAtee, J. W. 1975. Human impact on the vegetation and

microclimate on the beach and foredunes of Padre Island National Seashore. M. S. Thesis. Texas A & I Univ., Kingsville. 96 p.

McAtee, J. W., and D. L. Drawe. 1980. Human impact on beach and foredune vegetation of north Padre Island, Texas. Environ. Manage. 4:527-538.

McAtee, J. W. and D. L. Drawe. 1981. Human impact on beach and foredune microclimate of north Padre Island, Texas. Environ. Manage. 5:121-134.

McFarland, W. H. 1973. Soil properties of four range sites on Padre Island National Seashore. M. S. Thesis. Texas A & I Univ., Kingsville. 82 p.

Rechenthin, C. A. and H. Passey. 1967. The vegetation of Padre Island National Seashore. Project Rpt., USDA, SCS, Temple, TX. 17p. (mimeo, with photos)