

RECOMMENDATIONS FOR RECLAMATION OF A
CALICHE ROAD ON PADRE ISLAND NATIONAL
SEASHORE, TEXAS

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A CALICHE ROAD ON PADRE ISLAND
NATIONAL SEASHORE, TEXAS**

FOR:

TEXACO USA

ONSHORE PRODUCING DIVISION

P.O. BOX 8992

CORPUS CHRISTI, TEXAS 78468-8992

CONSULTANT:

TIM E. FULBRIGHT, PH. D.

COLLEGE OF AGRICULTURE AND HOME ECONOMICS

TEXAS A&I UNIVERSITY

KINGSVILLE, TEXAS 78363

WORK PHONE: (512) 595-3711

HOME PHONE: (512) 592-3895

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1.0 ENVIRONMENTAL SETTING

1.1 Location

Padre Island National Seashore lies between the Laguna Madre and the Gulf of Mexico and extends about 110 miles from Corpus Christi Pass on the north to Brazos Santiago Pass on the south (Fig. 1). The reclamation site is located about 7 miles south of the start of the 4-wheel drive zone. The site is near the mudflats of the Laguna Madre in an area known as Boggy Slough.

1.2 Soils

The soils of Padre Island are deep sands that developed on recently-deposited marine and eolian materials. Soil particle size is primarily fine to very fine sand. Soils vary in salt content and in amount of shell and organic matter. Soils on the Island are commonly moderately to severely deficient in nitrogen, phosphorus, and potassium (Drawe et al. 1981). Salinity limits plant growth in salty sands and shoregrass flats. Kattner (1973) reported that fertilization may increase plant production in low coastal sand sites.

1.3 Climate

Padre Island has a subtropical, semiarid climate that is moderated by maritime tropical air from the Gulf of Mexico. The summer months are hot with little daily or weekly variation in temperature. Winters (December to February) are

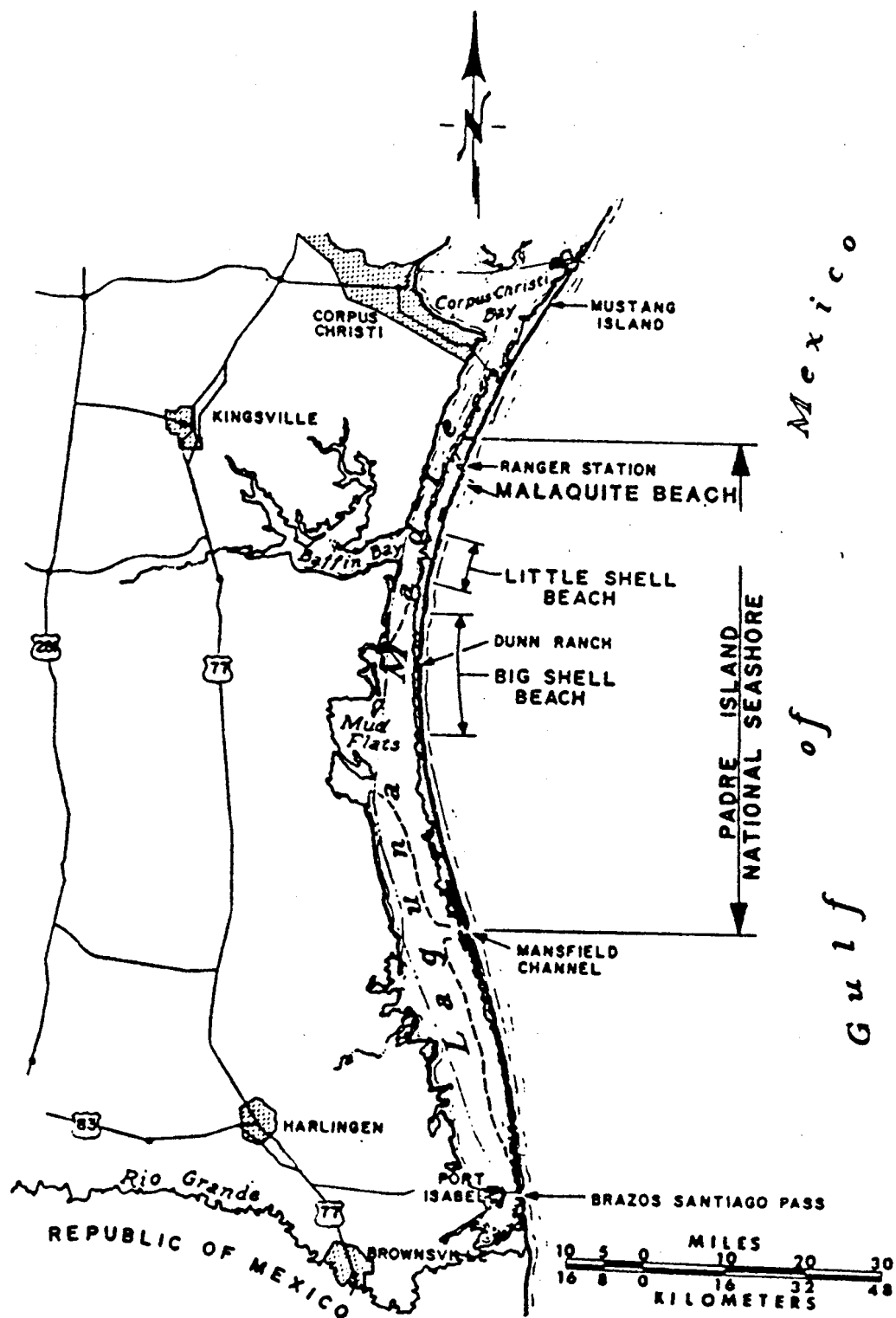


Figure 1. Map of Padre Island, Texas (from Dahl et al. undated).

mild with wider temperature fluctuations than summer. Freezes occur infrequently. Average annual precipitation on the Island ranges from about 30 inches on the northern end to about 26 inches at its southern tip. Excessive precipitation associated with late-summer and fall hurricanes biases the average precipitation upward. The average annual rainfall would be much lower without the hurricanes and would be more indicative of the stress associated with a semiarid climate with frequent drought (Dahl et al. not dated). The variability in precipitation is exemplified by annual rainfall at Corpus Christi which has ranged from 48 inches in 1888 to 5 inches in 1917. Seasonal distribution of precipitation on the Island is irregular, with highest rainfall in the spring and fall months.

Two major wind regimes dominate the Texas coastal zone. Persistent southeasterly winds occur from March to September and north-northeasterly winds occur from October to February. The southeast winds may reach velocities of 30 to 40 miles per hour in the spring. Northerly winds are associated with frontal passages and usually strong with concurrent rainfall.

1.4 Plant Communities of Padre Island National Seashore

Plant communities and plant species composition of north Padre Island have been described by Rechenthin and Passey (1967), Dahl et al. (not dated), and Drawe et al. (1981). Descriptions of south Padre Island vegetation are in Lonard et al. (1978), Lonard and Judd (1980), Judd and Lonard (1985), Judd and Lonard (1987), Lonard and Judd (1989).

The climax vegetation of the Island is a midgrass prairie (Drawe et al. 1981). Rechenthin and Passey (1967) and Drawe et al. (1981) described 5 plant communities on north Padre Island: (1) coastal dunes, (2) low coastal sands, (3) salt marsh, (4) salty sands, and (5) shoregrass flats.

1.4.1 Coastal Dunes

Dominant vegetation of the coastal dunes includes sea oats (Uniola paniculata), gulfdune paspalum (Paspalum monostachyum), thin paspalum (Paspalum setaceum), beach tea (Croton punctatus), beach eveningprimrose (Oenothera drummondii), goatfoot morningglory (Ipomoea pes-caprae var. emarginata), fiddleleaf morningglory (I. stolonifera), and partridgepea (Cassia fasciculata) (Drawe et al. 1981). Bare ground averages 52%.

1.4.2 Low Coastal Sands

Low coastal sand areas consist of deep sands with level to low hummocky topography and occur at elevations to 10 feet above sea level (Rechenthin and Passey 1967). They are often associated or interspersed with dunes or intermixed with shallow depressions of the salt marsh site. Dominant plants include gulfdune paspalum, red lovegrass (Eragrostis secundiflora), fimbry (Fimbristylis castanea), seashore dropseed (Sporobolus virginicus), sea oats, thin paspalum, spikerush (Eleocharis caribaea), and various forbs.

1.4.3 Shoregrass Flats

Shoregrass flats are dominated by shoregrass (Monathochloe littoralis) and beach carpet (Philoxerus vermicularis) (Drawe et al. 1981).

1.4.4 Salt Marsh

Salt marshes are poorly drained shallow depressions at elevations at or slightly below sea level (Rechenthin and Passey 1967). Major species of the salt marsh community include gulfdune paspalum, seashore saltgrass (Distichlis spicata), seashore dropseed (Sporobolus virginicus), bulrush (Scirpus americanus), and frogfruit (Phyla nodiflora) (Rechenthin and Passey 1967, Drawe 1990).

1.4.5 Salty Sands

The salty sands are low-lying flats adjacent to and inland from the sand dunes along the western side of the Island (Rechenthin and Passey 1967). Seashore dropseed and Polypremum procumbens are the major species (Drawe 1990).

1.5 Possible Impacts of Road Removal

The reclamation site is a strip of caliche road about 3,960 feet long and 16 feet wide. The low coastal sand, shoregrass flats, and salt marsh communities occur

interspersed along the road. The coastal dune community occurs along the east end of the road for about 300 feet.

Removal of the caliche will bare the substrate underlying the caliche road, which appears to be sand. Compaction, salinity, and leaching from the caliche may result in a difficult surface for establishing vegetation.

2.0 RECLAMATION PROCEDURES

Removal of the caliche road is estimated to be completed by early July. Hot, dry conditions in July and August normally make establishing vegetation difficult. If caliche removal is completed in July, I suggest site be fertilized with 250 pounds/acre granular 18-18-5, disced, and then mulched to inhibit soil blowing. Native grass hay, wheat straw, feedlot wastes, and other well-anchored vegetation materials are the best mulch materials and the least expensive for erosion control (Armbrust 1977), although they are not a panacea for sand fixation (Dahl, not dated). I recommend mulching with native grass hay obtained from the Island, which is available from Green Surroundings Hardware-Garden Center on north Padre Island (Table 1, page 18). Representatives from Texaco and the National Seashore should be present at the time the hay is harvested to ensure that (1) vegetation similar to the reclamation site is harvested and (2) no exotic species such as bermudagrass (Cynodon dactylon) are present.

Vegetation may establish from seeds present in the mulch. Personnel at the Green Surroundings Hardware-Garden Center on Padre Island stated that they have successfully revegetated areas on north Padre Island with the mulch. I am skeptical of such reports

until I see proof. In early September 1991, the potential of the mulch to produce seedlings should be evaluated. This evaluation should be based on (1) the density and canopy cover of seedlings, (2) the amount of mulch remaining on the surface, and (3) the condition of mulch remaining on the soil surface. Based on this evaluation, a decision should be made regarding the extent of transplanting or direct seeding necessary to achieve the National Seashore requirement of 30% cover of live vegetation. A decision should also be made regarding the need to add additional mulch. If wind action has removed a significant amount of the mulch from the soil surface an additional mulch application may be necessary to prevent soil erosion during the winter.

Planting may be done directly into the mulched soil surface whether transplanting or direct seeding is used. Spring planting is generally more successful than fall planting because a longer period is available for plants to become established before the onset of cool weather. Chances of successful fall planting would be greatest if sufficient rainfall to moisten the soil profile occurred in early September. Planting, whether vegetative or by seed should be done after rains when the soil is moist.

2.1 Transplanting

2.1.1 Advantages and Disadvantages

Transplanting is the most expensive of the 2 alternatives. However, transplanting vegetative materials (seedlings, cuttings, roots, rhizomes, etc.) has the greatest probability of success, based on my search of the literature

on vegetation restoration in coastal environments. Transplanting is preferable over seeding for fall planting because the plants will be easier to establish before cool weather. There is a much wider variety of plant species available for transplanting than for direct seeding in coastal habitats.

2.1.2 Timing and Methods

Transplanting should be done when the soil profile is moist during late March to early May or as soon as adequate soil moisture is available in September. Dahl (not dated) found that spacing plants 2 feet apart when revegetating sand dunes on north Padre Island proved optimum with more dense plantings providing no additional benefit.

The transplanting operation can be done by hand or it can be mechanized. Almost 16,000 total plant units will be needed to revegetate the 16 X 3,960 foot reclamation site. According to Mr. Otto Bundy (Horticultural Systems, Inc., Parrish, Florida) a crew of 5 persons can plant about 7,500 containerized vegetative plant units per day. Thus, a minimum of 3 days will be needed to plant the site. Dahl (not dated) used a tractor-mounted 2-row tobacco transplanter to plant a 50 foot by 3,280 foot area on Padre Island. Collecting, preparing, and planting transplants 2 feet apart required 150 to 300 man-hours. Extrapolating Dahl's results, it appears time requirements for transplanting by hand and mechanical transplanting are similar.

2.1.3 Plant Materials

Plant materials for transplanting can be harvested by hand from native stands on Padre Island or materials can be obtained from commercial sources. Problems with obtaining plants from native stands on Padre Island are (1) adequate root tissue must be harvested to avoid transplant shock, (2) the difficulty of finding a source of materials, (3) a large number of man-hours will be required to harvest, handle, and process the materials, and (4) someone with formal training in plant propagation and identification will be needed.

Many of the plant species native to the reclamation site are available from commercial sources in the form of containerized vegetative plant units. Gulfdune paspalum, thin paspalum, and seacoast bluestem are important species that are not commercially available. However, seeds of these species could easily be harvested by hand on the island and given to a commercial grower to grow vegetative materials for transplanting.

I suggest the following planting scheme: on the eastern 300 feet of the reclamation site plant a mixture of bitter panicum (Panicum amarum), thin paspalum, seacoast bluestem (Schizachyrium scoparium), gulfdune paspalum, and seashore paspalum (salt jointgrass) (Paspalum vaginatum). Species for planting on the remainder of the site include gulfdune paspalum, thin paspalum, marshhay cordgrass (Spartina patens), seashore dropseed, and saltgrass. The amount of each species planted should vary according to the

natural abundance of each species adjacent to the road. Composition and relative proportions of plant species along the road should be determined and a planting scheme designed before vegetative plant materials are ordered. Bitter panicum, seashore paspalum, marshhay cordgrass, seashore dropseed, and saltgrass can be obtained commercially. Seeds of gulfdune paspalum, thin paspalum, and seacoast bluestem will have to be harvested by hand and grown by a commercial grower for transplanting.

2.2 Direct Seeding

2.2.1 Advantages and Disadvantages

The advantage of direct seeding is that it is less expensive and more rapid than transplanting. The major disadvantages are (1) the probability of successful establishment is lower than with transplanting, (2) certain species, such as bitter panicum and saltgrass, can not be planted by seed, and (3) marshhay cordgrass, partridgepea (Cassia fasciculata), and rosering gaillardia (Gaillardia pulchella) are the only species present in the area that are commercially available as seed.

2.2.2 Timing and Methods

Seeding should be done when the soil profile is moist during late March to early May or as soon as adequate soil moisture for seed

germination and emergence is available in September. Planting directly into the native hay mulch can be done with a Tye Right-of-Way Special drill. Using a Tye drill will reduce disturbance to the mulch and reduce damage to plants that may have become established in the road. The reclamation site can be seeded in less than half a day.

2.2.3 Plant Materials

Partridgepea and seaots should be planted in the eastern 300 feet of the reclamation site. Marshhay cordgrass and rosering gaillardia should be planted in the remaining portions of the site.

3.0 DOCUMENTATION OF PLANT ESTABLISHMENT

I recommend conducting periodic (2-month intervals) evaluation of live plant canopy cover to document the degree of success of plant establishment for a minimum of 1 growing season after planting (until November 1992). Estimation of total canopy cover can be done using point-frame analysis or the Daubenmire quadrat method (Bonham 1989).

4.0 RECOMMENDATIONS

I recommend the following steps for restoration of the road site:

1. June - August 1991: Collect gulfdune paspalum and thin paspalum seeds to produce vegetative material for restoration plantings.
2. July 1991: Apply fertilizer, disc the site, and then apply a native hay mulch.

3. **Early September 1991:** Evaluate the potential of mulch to produce seedlings and determine the amount of mulch remaining on the soil surface. Apply additional mulch if needed to protect the soil surface.
4. **September - October 1991:** Collect seacoast bluestem seeds to produce vegetative material for restoration plantings. Determine the composition of the vegetation along the road and the relative abundance of major species, develop a planting scheme, order plant materials for transplanting, and arrange for production of gulfdune paspalum and thin paspalum seedlings for transplanting in late March - early May.
5. **Late March - early May 1992:** Transplant seacoast bluestem, gulfdune paspalum, thin paspalum, and commercially available plant materials. Fertilizer (150 pounds/acre granular 18-18-5) should be broadcast by hand during planting to enhance plant establishment.
6. **May - November 1992.** Estimate canopy cover of live vegetation using the point-frame or Daubenmire quadrat method in July, September, and November to document success of plantings.

I do not recommend direct seeding because of the low probability of success and lack of seed availability.

Services available for designing and conducting plant transplanting on the site range from purchasing plants from a commercial supplier and hiring a local crew to do the planting to hiring a consulting firm to conduct the entire operation. I have provided a xeroxed list of companies that may provide these services. I strongly recommend Horticultural Systems, Inc. (Table 1, page 18).

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Table 1. Recommended sources of plant materials for reclamation on Padre Island National Seashore.

Plant Materials	Source
Native hay for mulching	Green Surroundings Hardware-Garden Center Corpus Christi, Texas Telephone: (512) 949-7442
Vegetative plant materials and seeds	Horticultural Systems, Inc. Golf Course Road P.O. Box 70 Parrish, Florida 34219 Telephone: (800) 771-4114 Fax: (813) 776-2410 Contact: Otto S. Bundy, Vice President

6.0 CURRICULUM VITA: Timothy Edward Fulbright

PERSONAL:

Address: College of Agriculture and Home Economics
Campus Box 156
Texas A&I University
Kingsville, Texas 78363

Telephone: Work (512) 595-3711
Home (512) 592-3895

Age: 37

Birth date: September 24, 1953

PRESENT POSITION:

Associate Professor of Range Management, College of Agriculture and Home Economics, Texas A&I University, Kingsville, Texas 78363.

EDUCATION:

Doctor of Philosophy in Range Science: Department of Range Science, Colorado State University, Fort Collins, Colorado. May, 1981.

Master of Science in Wildlife Biology: Department of Biology, Abilene Christian University, Abilene, Texas. May, 1978.

Bachelor of Science in Biology: Department of Biology, Abilene Christian University, Abilene, Texas. May, 1976.

MEMBERSHIPS IN PROFESSIONAL SOCIETIES:

Society for Range Management

The Wildlife Society

Texas Chapter of the Wildlife Society

PROFESSIONAL ACTIVITIES:

A. Editorships.

- 1. February 1989-now. Associate Editor, Journal of Range Management.**
- 2. 1986-now. Editorial board, Texas Journal of Agriculture and Natural Resources.**

B. 1988, 1989 Chairman, South Texas Plant Materials Center Annual Plant Technical Committee Meeting. 1982-present Member, USDA, SCS South Texas Plant Materials Center Technical Committee.

RESEARCH AND WORK EXPERIENCE:

A. Presently teach the following courses: Range Plants, RWM 328; Range Analysis and Evaluation, RWM 329; Rangeland Watershed Ecology, RWM 331; Principles of Range Management, RWM 423; Range Ecosystems, RWM 429; Range Autecology, RWM 535; Range Synecology, RWM 586.

B. Consulting.

- 1. June 30-July 1, 1983. Assisted in Vocational Agriculture Teachers Range Judging and Plant Identification Workshop, Welder Wildlife Refuge, Sinton, TX.**

2. March 3-5, 1989. Consulting on establishment of food plots for white-tailed deer on the Jaime Garza Diego Ranch, Coahuila, Mexico.
3. January 1990-present. Preparation of an annotated bibliography on the effects of range management practices on wildlife for the Texas Parks and Wildlife Department, Austin, Texas (with Dr. Ed Kozicky).
4. Consulted with Frost Bank on environmental impact of dredge disposal on the Kenedy Ranch, June-October, 1990.
5. Consulted with the Highway Division of the Office of the Attorney General of Texas on grazing capacity of a tract of land involved in condemnation proceedings, October-December, 1990.
6. Conducted an analysis of vegetation on the El Coyote Ranch and estimated cost of vegetation restoration following seismograph survey for Maxim Engineers, Houston, Texas, April-June 1991.
7. Consulted with Texaco Oil Company on revegetation of oil pad and road sites on Padre Island National Seashore, May 1991.
8. Conducted a survey of poisonous plants on rangeland for Hoechst-Celanese Corporation during June 1991.

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