

PHYTOGEOGRAPHIC AND ECOLOGIC RELATIONSHIPS OF THE
FLORA OF BRETON ISLAND, LOUISIANA

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ABSTRACT

The flora of Breton Island, Plaquemines Parish, southeastern Louisiana, 3 miles long by about $\frac{1}{2}$ mile wide, was studied intermittently between 1958 and 1962, the year the island was bisected by a hurricane. The composition of the flora was compared with records published sixty years previously. This salt-spray plant community was composed of 84 species of vascular plants and 3 mosses. Six land forms and their characteristic plant associations were recognized and changes effected during the four year period were noted. The disappearance of ten species abundant sixty years before may be attributed to the effect of salt spray and occasional hurricanes. From the phytogeographic standpoint most species were found to be members of temperate rather than tropical floras, probably due to the severity of the climate militating against the persistence of tropical species. Dispersal agencies are discussed.

INTRODUCTION

Visits to Breton Island offered an unusual opportunity to compare the flora of 1958–1962 with that of sixty years earlier when Lloyd and Tracy (1901) collected plants on Breton and other islands of the Gulf of Mexico. The paucity of publications on Louisiana offshore islands, in a region which the oil industry is rapidly exploiting, accentuates interest in this area.

Breton Island is located about 35 miles

northeast of the Mississippi River at $29^{\circ}28'$ North Latitude. Its central location along the northern border of the Gulf of Mexico makes it both receptive to species capable of migrating from Caribbean sources, and receptive to species arriving by wind, birds, or rafting from the continental coastal plain which extends from Texas to New England. In 1962 the island was divided into two islets, North and South Breton, by a channel about 400 yards wide. The subject of this paper, what is now "South Breton," was formerly three miles long by about one-half mile at its greatest width. It is the most southerly member of a crescent shaped chain of islands known as the Chandeleurs. Judging from maps of the early 18th century, we suspect that Breton Island was not considered geographically one of the Chandeleurs simply because it was probably charted later than the islands to the northeast. At least by 1718, and probably earlier, explorers sailed within a mile or two of Breton (Paullin, 1932).

The substrate of the islands consists almost entirely of broken shells of *Pecten* and *Venus* carried from the adjacent bottoms by offshore wave action (similar to that along the north shore of Yucatan, though in the Chandeleurs there is no longshore drift from a land connection) (Galtsoff, 1954). Year by year Breton Island has been eroding along its eastern and southern shore. Wind and

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wave action had reduced its size from eleven to five miles in length since Lockett's description in 1870 (Russell, 1936). The ultimate fate of the island may be complete inundation as was the case of nearby Battledore Island, the flora of which had been studied by Lloyd and Tracy (1901).

The gulf insular flora of Louisiana was floristically first described by Lloyd and Tracy (1901), Grand Isle later by Brown (1930), the delta vegetation by Penfound and Hathaway (1938) and the Chandeleur flora by Lemaire (1961). Oosting (1954) reviewed the fundamental literature on maritime strand vegetation of the southeastern United States. He pointed out that climax, in its various aspects, is the chief concern of textbooks of plant ecology. He then brought together from the literature what is known of community dynamics and related ecologic processes and conditions on the sand strand, so that they may be correlated more effectively with textbook generalizations. Lloyd and Tracy's collections on Breton Island in 1900 present an opportunity to compare the past flora with that encountered sixty years later and to suggest the dynamism of plant associations. The marine flora of the area has been discussed by Humm and Caylor (1957).

Severe but erratic climatic conditions are characteristic of Breton Island, as apparently of all Gulf and Atlantic strand environments (Oosting, *op. cit.*). The summers are intolerably hot and the winters often penetratingly cold, wet, and windy. The topography of Breton Island is one of continual change. From one visit to the next, shores once dotted with ponds and cut with lagoons are covered over by driving drifts of sand. The north and west ends of the island are particularly vulnerable to wind and wave action, while the entire leeward side, dominated by Black or Honey mangrove (*Avicennia nitida*), is relatively stable. (Nomenclature of this species accords with E. L. Little, *Phytologia* 8:49-57. 1961.) According to Davis (1940, 329-331, pl. 5, fig. 1, and pl. 11, fig. 1) the leeward side was certainly increasing by the continuous reproduction of Black mangrove when he studied the habitat.

Animal life on the island was varied and particularly rich in numbers and species of transient birds. Native rice rats, *Oryzomys*

palustris (Harlan), swamp rabbits, *Sylvilagus aquaticus* Bachman, and introduced coypu or nutria, *Myocaster coypus* E. Geoffroy St. Hilaire were the most common mammals. We observed the following birds at their nests: snowy egrets, *Leucophoyx thula* (Molina) and Louisiana herons, *Hydranassa tricolor* (Müller) in the bayberry shrubs, willets, *Catotrophorus semipalmatus* (Gmelin) in the sedge association, clapper rails, *Rallus longirostris* Boddaert on the tops of the primary dunes, black skimmers, *Rynchops nigra* L. and common nighthawks, *Chordeiles minor* (Forster) on the sand flats, boat-tailed grackles, *Cassidix mexicanus* (Gmelin) in the black mangroves and red-winged blackbirds, *Agelaius phoeniceus* (L.) in the grasses bordering the mangrove (Negus, Gould and Chipman, 1961).

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SURVEY AND COLLECTION OF THE FLORA

We traveled to the island several times by sea plane, landed at an islet called "North" Breton, and then motored by 15 foot skiff to "South" Breton or Breton Island proper. A few trips were made entirely by boat. With the skiff we explored the network of waterways among the Black mangroves in the lee of the island. We collected on foot along its length (windward side) and interiorly wherever the Wax myrtle was penetrable.

Donald E. Stone, then a member of the faculty of Tulane University, collected on Breton Island on 29 July 1958, his collection numbers prefixed by "S" (as "S-257") and Ewan (E-) on 4 April 1960. Gould (G-) collected on the following dates: 18 June 1959, 26 March 1959, 4 April 1960, and 13 January 1962. Lemaire's (L-)

collections, to which we make frequent references, were taken 27, 29, 30 October 1959; 15 June, 31 August, and 1 September 1960. Our collections, those of Stone, and a prime set of Lemaire's are deposited in the Tulane University Herbarium.

SURVEY OF SPECIES PRESENT

The following list of 84 species of vascular plants and three mosses were collected

or observed on Breton Island between July, 1958 and January, 1962. The arrangement and nomenclature follows chiefly Small (1933); the grasses, Hitchcock (1950). Monographic studies consulted are noted under remarks. The entry "Lemaire (1961)" under remarks, when no other collector or number is indicated, denotes that Lemaire collected or observed the species but we did not.

LIST OF PLANTS

Genus and Species	Collections	Remarks
Mosses		
<i>Bryum bicolor</i> Dicks.	G-107	det. W. D. Reese
<i>Bryum capillare</i> Hedw.	G-106	det. W. D. Reese
<i>Physcomitrium pyriforme</i> Brid.	G-106	det. W. D. Reese
Cymodoceaceae		
<i>Cymodocea manatorum</i> Aschers.		Lemaire, 1961
<i>Halodule wrightii</i> Aschers.		Lemaire, 1961
Hydrocharitaceae		
<i>Thalassia testudinum</i> Koenig & Sims		Lemaire, 1961
Gramineae		
<i>Andropogon glomeratus</i> (Walt.) B.S.P.		Lemaire, 1961
<i>Chloris petraea</i> Swartz		Lemaire, 1961
<i>Distichlis spicata</i> (L.) Greene		Lemaire, 1961
<i>Eragrostis elliottii</i> S. Wats.	L-1691, 1712	
<i>Eragrostis oxylepis</i> (Torr.) Torr.	L-808, 1732	
<i>Panicum amarulum</i> Hitchc. & Chase		Lemaire, 1961
<i>Panicum portoricense</i> Desv.	L-1720	
<i>Panicum repens</i> L.	S-267	Lemaire, 1961
<i>Paspalum ciliatifolium</i> Michx.		Lemaire, 1961
<i>Setaria geniculata</i> (Lam.) Beauv.	L-1682	
<i>Spartina alterniflora</i> Loisel		Lemaire, 1961
<i>Spartina patens</i> (Ait.) Muhl.	G-53, 21, 58, 72; S-270, 280	Lemaire, 1961, det. J. Swallen
<i>Spartina spartinae</i> (Trin.) Merr.		Lemaire, 1961
<i>Sporobolus virginicus</i> (L.) Kunth	L-803, 636; G-56	
<i>Triplasis purpurea</i> (Walt.) Chapm.	L-807	
<i>Uniola paniculata</i> L.	G-81, 83, 84	
Cyperaceae		
<i>Cyperus filicinus</i> Vahl	G-47, 60; S-258	det. R. K. Godfrey
<i>Cyperus lecontei</i> Torr.		Lemaire, 1961
<i>Cyperus polystachyos</i> Rottb.		Lemaire, 1961
<i>Cyperus retrorsus</i> Chapm.	S-256	det. R. K. Godfrey
<i>Eleocharis albida</i> Torr.	L-634	det. R. Kral
<i>Eleocharis geniculata</i> (L.) R. & S.	G-109	det. R. Kral
<i>Fimbristylis castanea</i> (Michx.) Vahl	L-1687; G-25, 30, 32, 70, 74; S-250, 259, 268	det. R. Kral; Lemaire, 1961

Commelinaceae

- Commelina erecta* var. *angustifolia* Lemaire, 1961
(Michx.) Fern.

Juncaceae

- Juncus megacephalus* M. A. Curtis S-257; L-637
Juncus roemerianus Scheele Lemaire, 1961

Liliaceae

- Smilax auriculata* Walt. G-112
Yucca gloriosa L. E-19888

Myricaceae

- Myrica cerifera* L. G-5; S-282; E-19880,
19881, 19886

Urticaceae

- Parietaria floridana* Nutt. Lemaire, 1961

Polygonaceae

- Rumex persicarioides* L. S-274

Chenopodiaceae

- Salicornia virginica* L. E-19889; G-37; S-276

Phytolaccaceae

- Phytolacca americana* L. Lemaire, 1961

Batidaceae

- Batis maritima* L. G-20, 75; S-277;
E-19890

Cruciferae

- Cakile edentula* (Bigel.) Hook. G-2, 3, 16, 100; S-261
Lepidium virginicum L. G-45, 71, 104, 112; cf. Hitchcock, 1936
S-252, 278, 279;
E-19877

Rosaceae

- Rubus trivialis* Michx. G-6, 102; E-19876 Lemaire, 1961

Leguminosae

- Daubentonia drummondii* Rydb. G-76; S-283; L-1701
Strophostyles belvola (L.) Ell.

Euphorbiaceae

- Chamaesyce ammanioides* (H.B.K.) L-1693 det. J. Ewan
Small
Chamaesyce ingallsii Small L-1692 Lemaire, 1961
Chamaesyce polygonifolia (L.) Small L-1708 det. J. Ewan
Chamaesyce supina (Raf.) Moldenke L-1694
Croton punctatus Jacq. G-26, 59, 91; det. M. C. Johnston
S-264; E-19883

Malvaceae

- Hibiscus lasiocarpus* Dav. Lemaire, 1961
Kosteletzkya virginica var.
altheaefolia Chapm. L-1685

Cactaceae

- Opuntia stricta* Haw. E-S.n.; G-6, 115 det. L. Benson

Onagraceae

- Oenothera humifusa* Nutt. G-108, 103, 110;
S-255, 262; L-959;
E-19884

- Umbelliferae
Hydrocotyle bonariensis Lam. E-19887; G-35; Lemaire, 1961
 S-265, 253
Ptilimnium capillaceum (Michx.) Raf. G-52, 46; S-263, 251
- Plumbaginaceae
Limonium carolinianum (Walt.) Britt. G-66 det. J. L. Luteyn
Limonium carolinianum var. *angustatum* Blake G-112 det. J. L. Luteyn
Limonium nasbii Small L-355 det. J. L. Luteyn
- Gentianaceae
Sabatia arenicola Greenm. S-254; L-641, 1017; cf. Wilbur, 1955
 G-50
Sabatia stellaris Pursh E-17896; G-39, 55 cf. Wilbur, 1955
- Asclepiadaceae
Cynanchum palustre (Pursh) Hel. L-1684
- Convolvulaceae
Ipomoea pes-caprae (L.) Sweet Lemaire, 1961
Ipomoea stolonifera (Cyrill.) Poir. G-27 Lemaire, 1961
- Boraginaceae
Heliotropium curassavicum L. L-640; G-33; S-275
- Verbenaceae
Lippia nodiflora (L.) Michx. E-19885
- Avicenniaceae
Avicennia nitida Jacq. G-14; S-273; E-19891
- Labiatae
Teucrium canadense L. G-43 cf. McClintock & Epling, 1946
- Scrophulariaceae
Agalinis maritima var. *grandiflora* (Benth.) Pennell G-18; L-635, 798
Bacopa monnieri (L.) Pennell G-13, 38; S-266 cf. Pennell, 1935
Linaria canadensis var. *texana* (Scheele) Pennell G-113; L-962
- Cucurbitaceae
Melothria pendula L. L-1703
- Compositae
Anthemis cotula L. Lemaire, 1961
Aster tenuifolius L. L-1709
Baccharis balimifolia L. G-4; L-354; S-271, 281; E-19882
Borrichia frutescens (L.) DC. G-17, 111; S-269, 271a; 271b
Conyza canadensis (L.) Cronq. L-1700
Eclipta alba (L.) Hassk. L-1702
Erechtites hieracifolia (L.) Raf. G-86, 85, 105; L-1704
Eupatorium serotinum Michx. E-19879
Iva frutescens L. Lemaire, 1961
Mikania scandens (L.) Willd. E-19892; L-1714
Pluchea campborata (L.) DC. L-1706
Pluchea foetida (L.) DC. L-1707
Pluchea purpurascens (Sw.) DC. L-1705

ANALYSIS OF VEGETATION

The methods employed in describing the vegetation of Breton Island are based on the general premise that the entire flora is a salt spray community (cf. Wells, 1939) and that the various associations of plants are primarily due to varying salt tolerance of different species. Correlation of tolerance to salt by individual plants and their subsequent zonation with the intensity of air borne spray is well substantiated (cf. reviews by Oosting, 1954 and Boyce, 1954).

The intimate relationship of species composition is best treated in conjunction with the land form of a strand flora. Our topographic classification is adapted from Martin (1959).

The six zones of vegetation were distinguished from a mere scattering of beach plants dominated by *Cakile* to the dense bay shore tangle of Black mangrove. Species in each association are listed and the abundance of each with regard to its particular association:

- * rare
- ** infrequent
- *** frequent (indicating scattered presence)
- **** common (indicating presence over most of the island)
- ***** abundant

Six land forms were characterized by specific plant associations.

1. The outer beach was most vulnerable to very high tides; of all the terrains it supported the least vegetation.

Cakile association

<i>Batis maritima</i>	***
<i>Cakile edentula</i>	****
<i>Heliotropium curassavicum</i>	**
<i>Hydrocotyle bonariensis</i>	***

2. The inner beach has been inundated annually during hurricanes or high winds. On the eastern half of the island where there is full exposure to the prevailing southeast wind, no inner beach exists. (Fig. 1)

Sedge association

<i>Baccharis halimifolia</i>	***
<i>Bacopa monnieri</i>	**
<i>Borrichia frutescens</i>	***
<i>Croton punctatus</i>	***

<i>Cyperus filicinus</i>	***
<i>Distichlis spicata</i>	***
<i>Eleocharis geniculata</i>	***
<i>Fimbristylis castanea</i>	*****
<i>Heliotropium curassavicum</i>	**
<i>Hydrocotyle bonariensis</i>	****
<i>Juncus megacephalus</i>	**
<i>Lepidium virginicum</i>	***
<i>Limonium carolinianum</i>	*
<i>Linaria canadensis</i>	**
<i>Myrica cerifera</i>	***
<i>Oenothera humifusa</i>	***
<i>Ptilimnium capillaceum</i>	***
<i>Rumex persicarioides</i>	*
<i>Sabatia arenicola</i>	***
<i>Sabatia stellaris</i>	****
<i>Spartina patens</i>	*****
<i>Uiola paniculata</i>	**

3. Foredune. The primary dune is highest along the eastern half of the island and becomes gradually lower toward the west end until it is absent. The outer beach comes progressively closer to the primary dune (Fig. 1) toward the narrow strip at the north end where the *Myrica* covered dune yields to constant wave action.

Croton association

<i>Croton punctatus</i>	*****
<i>Hydrocotyle bonariensis</i>	**
<i>Ipomoea angustifolia</i>	***
<i>Lepidium virginicum</i>	***

4. Backdune.

Wax myrtle association

<i>Baccharis halimifolia</i>	****
<i>Myrica cerifera</i>	*****
<i>Opuntia stricta</i>	***
<i>Teucrium canadense</i>	**

5. A secondary dune exists as a high land formation on the eastern half of the island. It covers about three acres. The presence of very old and large storm-washed boles suggests that severe hurricanes have repeatedly inundated the island.

Opuntia-Yucca association

<i>Bryum bicolor</i>	*
<i>Bryum capillare</i>	*
<i>Erechtites hieracifolia</i>	**
<i>Opuntia stricta</i>	*****
<i>Physocomitrium pyriforme</i>	*



Figure 1. Vegetation of outer beach, eastern half of Breton Island, January, 1962. *Myrica*, on left, appearing dark; *Croton*, clothing the primary dune, gray and withered appearance due to recent freeze; *Opuntia*, foreground, being covered by drift. No inner beach present.

<i>Rubus trivialis</i>	***
<i>Smilax auriculata</i>	*
<i>Yucca gloriosa</i>	****

6. The leeward shore. The only terrain where the overlay of the substrate is not composed entirely of sand. The death and decay of Black mangrove has contributed to the accumulation of soft black muck.

Black mangrove association	
<i>Avicennia nitida</i>	*****
<i>Batis maritima</i>	****
<i>Borrichia frutescens</i>	***
<i>Salicornia virginica</i>	****

DISCUSSION

The report of Lloyd and Tracy (1901) provides data for the comparison of floras after an interval of sixty years. The following species were abundant in 1900 and still held their dominance with two exceptions:

Avicennia nitida
Batis maritima

Borrichia frutescens
Fimbristylis castanea
Mikania scandens (rare in 1958-62)
Myrica cerifera
Opuntia
Sabatia stellaris
Salicornia sp.
Uniola paniculata
 (infrequent in 1958-62)
Yucca gloriosa

The following species were rare or absent in 1900 and were common, 1958-1962.

Croton punctatus
Danbentonia drummondii
Hydrocotyle bonariensis

The following species (in the nomenclature of Lloyd and Tracy) were abundant in 1900 but were absent, 1958-62.

Asclepias amplexicaulis Michx.
Bradburya virginiana (L.) Kuntze
Catbartolinum floridanum (Planch.) Small
Chaetochloa magna (Griseb.) Scribn.
Cassia (*Chamaecrista*) sp.



Figure 2. Clearing within *Myrica* stand, same location as Figure 1, *Opuntia* colony flanked by *Croton*. Some *Opuntia* clumps four meters across and nearly 2 meters high.

Dondia linearis (Ell.) Heller
Gnaphalium purpureum L.
Ilex vomitoria Ait.
Iva imbricata Walt.
Physalis angustifolia Walt.

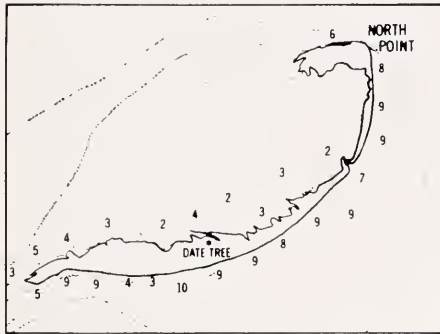
The disappearance of the last three species listed is not easily explained. The sedge association and to a lesser extent the *Croton* association are the most unstable zones on the island. All of the species of the inner beach and primary dune (now common; now absent) are characteristic of these two associations. Vulnerability to salt spray is the obvious explanation for this instability. Several other changes in the Breton Island flora may be noticed by a comparison of our observations with those made by Lloyd and Tracy in 1900. Lloyd and Tracy pointed out that the dominance of *Panicum amarulum* on the upper beaches of the Gulf islands (including Breton) was comparable to the dominance of the "sand-binding grass" *Uniola paniculata* on the Florida dunes (Webber, 1898) and on the Ocracoke Island, North Carolina strand (Kearney, 1900). On

Breton Island, *Panicum amarulum* was now replaced by *Fimbristylis castanea* and *Spartina patens*. *Uniola paniculata* remained only as a small colony, less than a half acre, in a blow-out of the primary dune at the approximate center of the island. In 1900 it was abundant, but on our visits was now infrequent. This is noteworthy because Wells (1939) rates *Uniola paniculata* as even more salt spray tolerant than either *Myrica cerifera* or *Ilex vomitoria*. The decline here is probably due to the growth of the dune and the consequent cutting off of some of the salt spray.

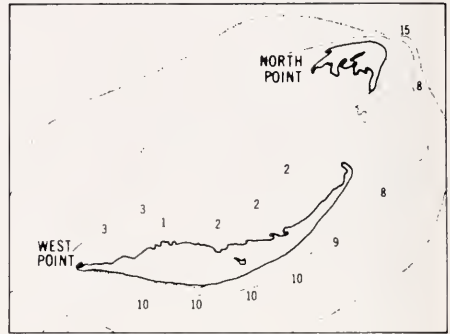
In 1900, *Ipomoea pes-caprae* and *I. stolonifera* formed a "network covering the soil" on the upper beach of Breton Island. Lloyd and Tracy noted that usually these two species were scarce on the Gulf islands, but that Breton was an exception. They attribute the usual condition to the "pre-eminently tropical" ecological requirements of these species. Sixty years later *Ipomoea pes-caprae* was rare on Breton Island but *I. stolonifera* was frequent.

Throughout the period of our study the

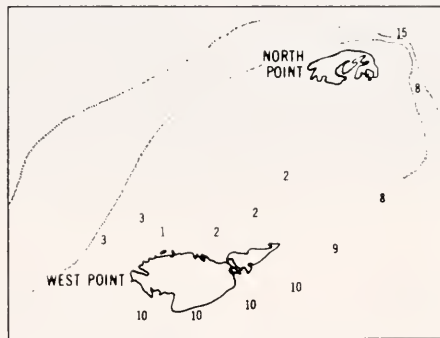
BRETON ISLAND



1899



1969



1970

Figure 3. The gradual disappearance of Breton Island as shown by comparison of extracts from United States Coast and Geodetic Survey charts. Fine dotted lines indicate sand shoals probably a part of a much larger land mass in the distant past.

so-called "low stature dunes" of the upper beach (Lloyd and Tracy, 1900) were covered with *Croton punctatus* and *Myrica cerifera*. In 1900 these dunes were "clothed with a thicket of *Ilex vomitoria* and *Myrica gale* [cerifera]."

Lemaire's collections further document the changing nature of the Breton flora since 1900 and the seasonal differences it displays. Lemaire collected or observed 47 species of plants which we failed to record; he did not record seven we found. He scored 25 as rare or infrequent, ten as infrequent and five as common. Lemaire collected during late summer and fall; our collections, in the spring and early summer. That most of his 47 species were transitory and not due to

differences in collecting experience is partially supported by Boyce (1954). During three summers on Cape Fear, North Carolina, Boyce noted fourteen transitory species which do not ordinarily reproduce in the salt spray community. Five genera are the same as those collected by Lemaire (in three cases* the species are identical): *Conyza canadensis**; *Phytolacca americana**; *Andropogon glomeratus**; *Aster walteri*; and *Sporobolus poiretii*.

During the span of four and a half years over which we visited Breton Island, several changes occurred in the apparent abundance of two common species. For approximately two years, 1958 to 1960, *Daubentonia* shrubs, 8 to 10 feet high, were a prominent feature,

and during early summer, a brilliant yellow spectacle, between the upper and lower beach. In 1960, following several hurricanes, they virtually disappeared. In January, 1962, *Daubentonia* were again common, about 50 yards inland from their former location, along the primary dune and among the dense stand of *Myrica*. They were also dispersed among *Baccharis* shrubs on the upper beach in sedge association. *Fimbristylis* and *Spartina* were still abundant.

Opuntia was always present (1958-1962), in abundance on the secondary dune and sparingly present in the lee of the primary dune in the sheltered clearings of *Myrica*. A few plants grew at the west end and along the border of the secondary dune. Some grew alongside of, and even in the brackish

water of, the mangrove swamp. In the primary dune sites, from 1958 to 1960, the *Opuntia* clumps were very small, 6 inches to 1 foot, and spread only a few feet. In January, 1962, despite several hurricanes during 1961 and the coldest winter of the century, *Opuntia* had flourished in the clearings among the *Myrica* (Fig. 2) and spread even below the foredune (Fig. 1) and had grown as high as 5 feet tall with a 12 foot spread.

An attempt to equate floral and topographic zonation with the categories used by Vogl (1966, modified from Purer 1942) is only partially adequate because the entire island is obviously vulnerable to massive inundation during hurricanes. The following list may be close equivalents.

Breton Island

Outer beach
Inner beach
Foredune
Secondary dune
Leeside shore

Vogl's Classification

Middle littoral zone
Upper littoral zone
Maritime zone (not inundated)
Maritime zone (not inundated)
Maritime zone (not inundated)

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