Caminada-Moreau Headland and Grand Isle-1887 to 1988

CAMINADA-MOREAU HEADLAND AND GRAND ISLE

Morphology

In 1887, several tidal inlets and former distributaries segmented Caminada-Moreau Headland and Grand Isle. Raccoon Pass formed the western boundary and has been open continuously from pre-1887 to present (1887 map). No major changes in morphology had occurred by 1934, except for the barriers fronting Bay Marchand, which were mapped as intertidal features and therefore do not appear on the 1934 map.

Belle Pass, Pass Fourchon, and Bayou Moreau segment the central headland area. Caminada Pass lies between the large, well-developed Caminada spit (locally known as Elmer's Island) to the west and Grand Isle to the east. Grand Isle is a classic drumstick-shaped barrier island with a narrow western end that widens to the east and becomes bulbous on the eastern end. It is the only barrier island in Louisiana commercially and residentially developed (Meyer-Arendt, 1987). Barataria Pass, the deepest tidal inlet along the Louisiana coastline (>40 m in 1989), forms the eastern boundary and is the primay tidal inlet that connects Barataria Bay to the Gulf of Mexico.

By 1956, the land area fronting Lake Champagne was breached as the shoreline retreated (1956 map). Bay Marchand decreased over 70 percent in response to shoreline retreat. Moreover, the downdrift offset west of Belle Pass began to develop. The 1978 shoreline depicts the widening of Bayou Lafourche and Pass Fourchon, while the downdrift offset is more acute (1978 map). Shoreline retreat has reduced Bay Marchand to a small pond and intercepted Bayou Moreau to segment the distributary. By 1988, shoreline retreat had removed large quantities of sediment from the central headland area. This sediment was transported downdrift to Grand Isle but blocked from reaching the Timbalier Islands by the Belle Pass jetties, causing the magnitude of downdrift offset to increase west of Belle Pass. Bay Champagne experienced extensive size reductions, while Bay Marchand is close to complete disappearance. Bayou Moreau now intersects the shoreline in three different locations, and numerous dredge canals dissect the coastal landscape.

Shoreline Movement

Shoreline change was measured at 91 shore-normal transects along the gulf and bay shorelines (transects map; tables 18, 19, 20, 21, and 22). Shoreline change measurements were taken along the gulf shoreline, but bayside measurements were possible only along Caminada spit because no bay shoreline exists to the west.

Caminada-Moreau Headland

The Caminada-Moreau Headland has experienced some of the highest rates of shoreline movement along the Louisiana coastline. Between 1887 and 1934, the average gulfside rate of change was -15.8 m/yr, but this rate gradually decreased to -11.5 m/yr and -9.5 m/yr for the periods 1934 to 1956 and 1956 to 1978, respectively (fig. 27, table 22). The average rate of coastal retreat increased to -13.6 m/yr between 1978 and 1988. The rapid landward movement of the shoreline along the Caminada-Moreau Headland has caused large quantities of sediment to be eroded from this segment. Most of the sediment is transported laterally or offshore, and a smaller percentage has moved landward by overwash processes. In contrast to barrier island shorelines, the Caminada-Moreau Headland consists predominately of cohesive deltaic sediment and a large, sandy beach ridge plain with no back-barrier lagoon or bay, except for a small water body behind Caminada spit. The average rate of bayside movement slowed along Caminada spit from shoreline advance to more stable conditions (fig. 28, table 20).

Grand Isle

Grand Isle is characterized by shoreline retreat and advance along the gulf side, which balances migration directions. The average rate of gulfside change was -0.9 m/yr between 1887 and 1934, with stable or slightly increasing shoreline advance rates of 0.0 m/yr, 2.5 m/yr, and 5.2 m/yr for the periods 1934 to 1956, 1956 to 1978, and 1978 to 1988, respectively (fig. 29, table 22). For 101 years, the gulf shoreline has experienced retreat along its western end while remaining relatively stationary at its midsection and accreting seaward on its eastern end. These trends show that Grand Isle is slowly rotating clockwise around a stable midpoint, a result of net longshore sediment transport that becomes captured by Barataria Pass. The Barataria Pass tidal inlet system is a large sediment sink storing most of its sand as a large ebb-tidal delta. Shoreline advance at the eastern end of Grand Isle is directly related to this ebb-tidal delta (Shamban, 1982). Average bayside rates of change showed slowly increasing rates of shoreline retreat between 1887 and 1988 (fig. 30, table 20). The bay shoreline experienced the greatest erosion to the west and slowly decreased to the east with stable conditions at the eastern end.

Caminada-Moreau Headland and Grand Isle Summary

The average rate of gulfside change between 1887 and 1934 was -10.1 m/yr (table 22). The average rate decreased to -7.2 m/yr between 1934 and 1956 and to -4.9 m/yr between 1956 and 1978. This trend was interrupted when the average gulfside rate increased to -6.5 m/yr between 1978 and 1988 (fig. 31). These rates reveal shoreline retreat of the gulf side except on the eastern end of Grand Isle, which exhibits seaward progradation. The average bayside rate of change for the periods 1887 vs. 1934, 1934 vs. 1956, and 1956 vs. 1978 indicates that only migration direction has changed (fig. 32, table 20). Between 1934 and 1956, average shoreline movement along the bay reversed direction from landward to seaward. The rate of change slowly increased seaward to -3.0 m/yr between 1978 and 1988.

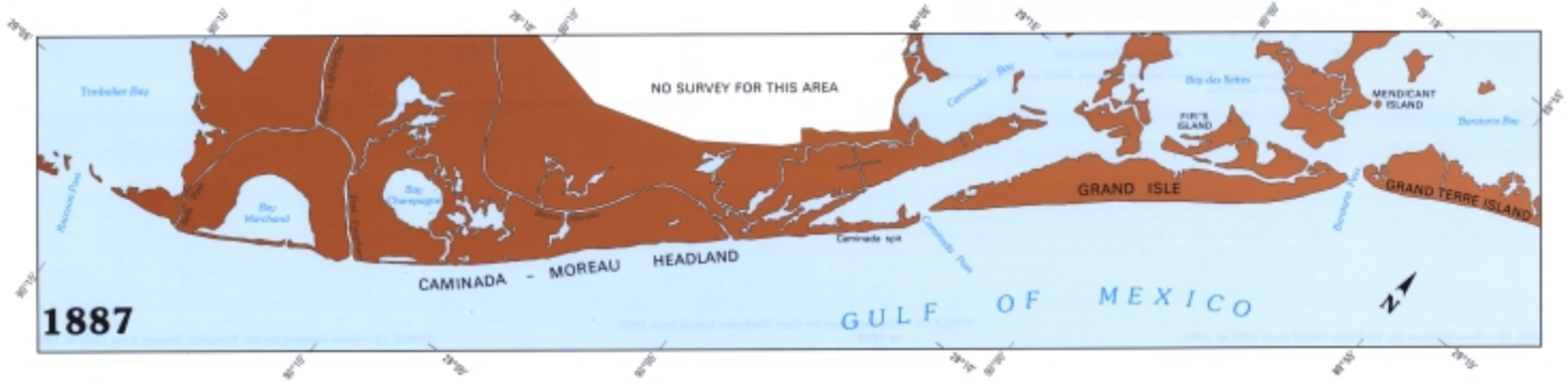
The 1887 vs. 1988 map illustrates land loss and summarizes the cumulative measured changes along the gulf and bay shorelines. The rate of change between 1887 and 1988 along the gulf side of the Caminada-Moreau Headland and Grand Isle ranged from 6.2 to -20 m/yr, with an average change rate of -7.9 m/yr (table 22). The rate of change along the bay between 1887 and 1988 ranged from 7.0 to -13.0 m/yr with an average change rate of 0.1 m/yr (table 20).

Area and Width Change at Grand Isle

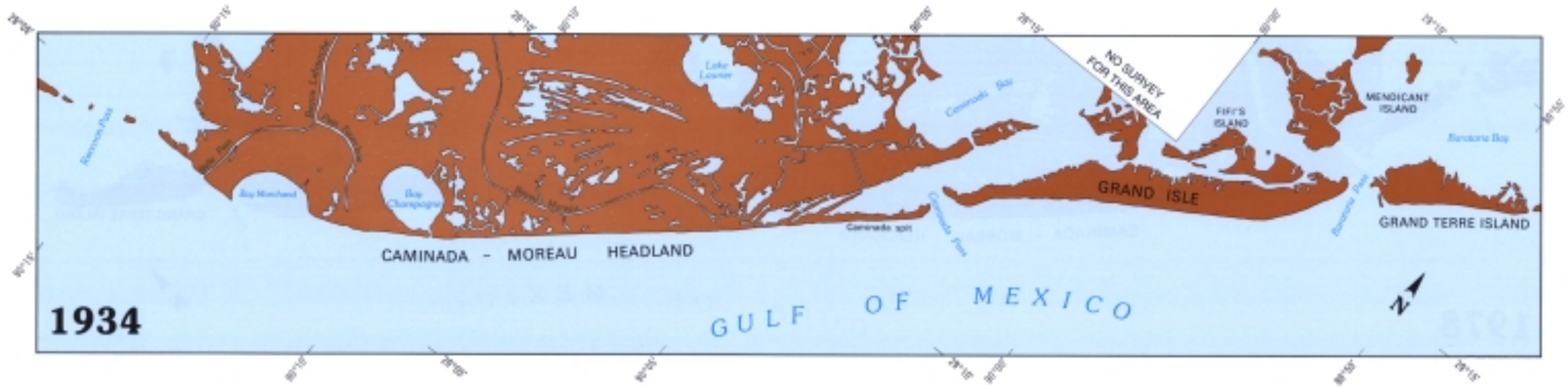
In 1887, Grand Isle ranged from 301 to 1,451 m wide, with an average width of 882 m (table 21). The average rate of land loss between 1887 and 1934 was 2.3 ha/yr (table 23). By 1934, the island had narrowed to an average width of 841 m; widths ranged between 302 and 1,186 m. Between 1934 and 1956, the average rate of area change underwent land loss but slowed slightly to 1.6 ha/yr. Similarly, the average width continued todecrease to 821 m by 1956. Between 1956 and 1978, land loss reversed at an average rate of 1.0 ha/yr, and by 1978, the average width increased to 851 m. Land gain continued at a rate of 1.1 ha/yr between 1978 and 1988 (fig. 33). Numerous coastal engineering activities (beach restoration and replenishment projects) began along Grand Isle in the mid-1950's, and changes in island area and width possibly reflect these human alterations, especially the extensive 1984 dune restoration project conducted by the U.S. Army Corps of Engineers (Adams and others, 1976; Combe and Soileau, 1987).

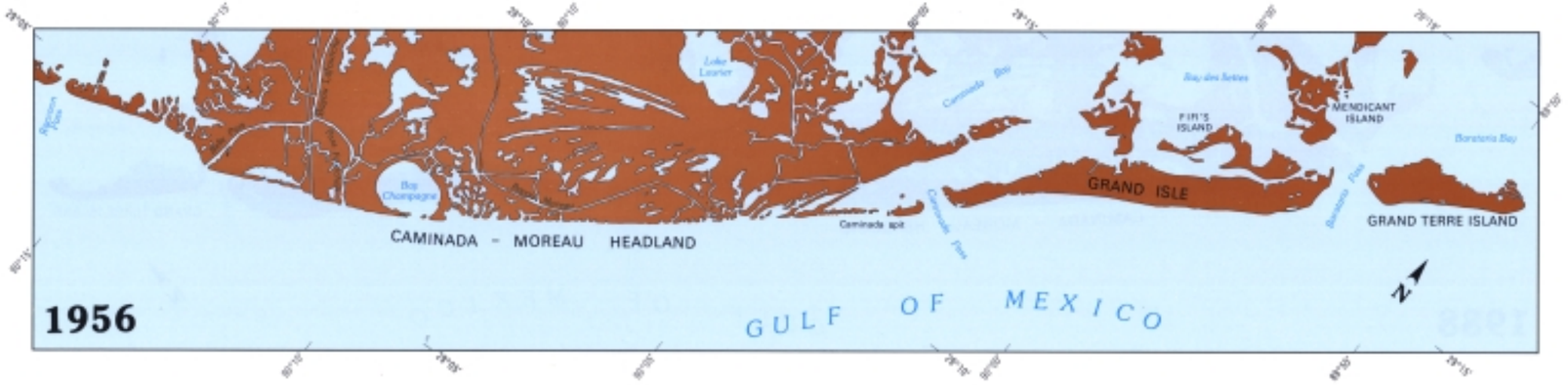
Overall, Grand Isle experienced only a slight decrease in area from 1,059 to 960 ha between 1887 and 1988 (fig. 34). Compared with other barrier islands along the Louisiana coast, the area of Grand Isle has remained relatively stable. For the period 1887 to 1988, the average width of Grand Isle is essentially stable, ranging between 821 and 882 m (fig. 35, table 21). Barrier widths for the Grand Isle area between 1887 and 1988 are shown in figure 36.

• Historic Shorelines•

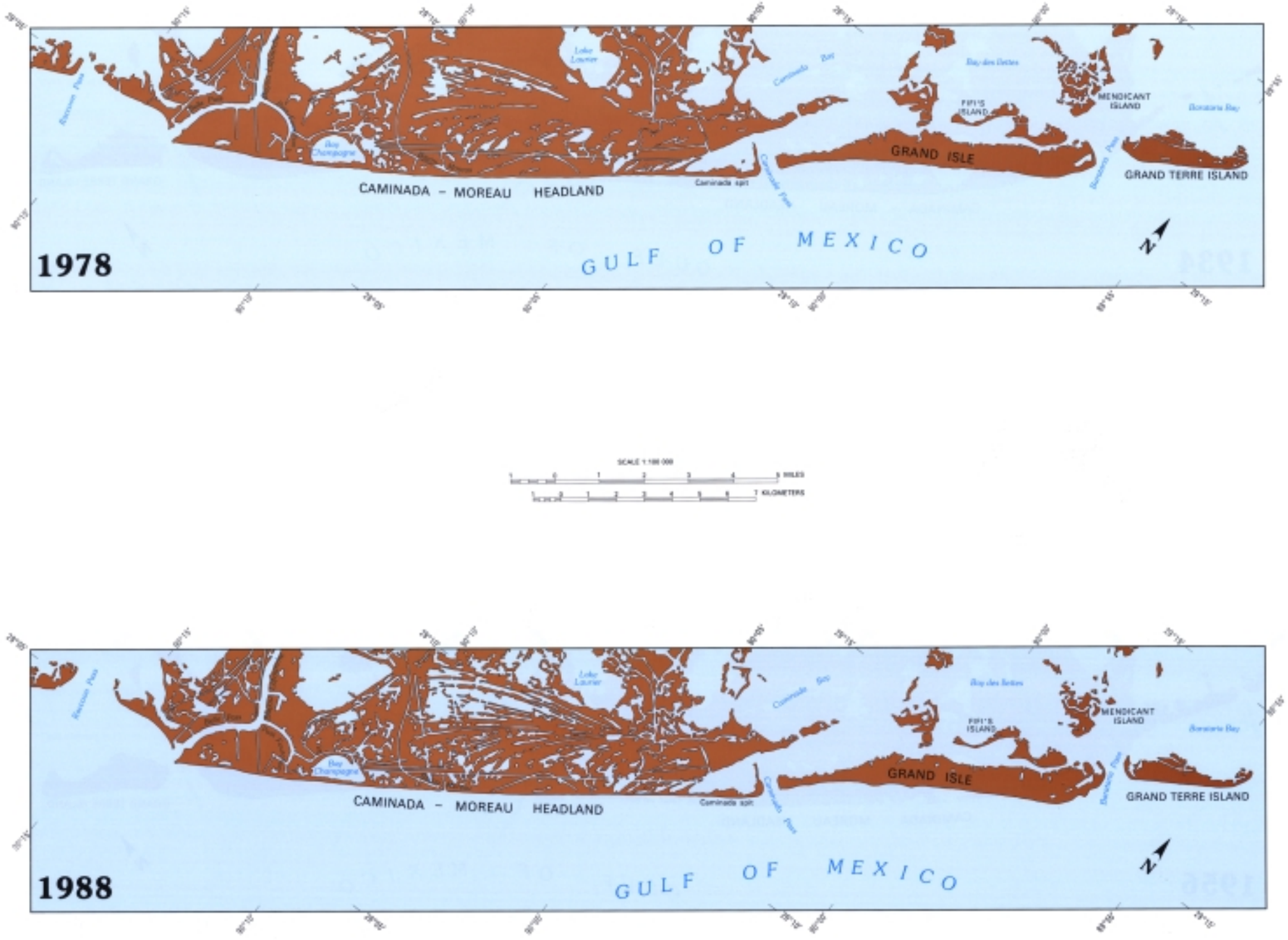


Caminada - Moreau Headland and Grand Isle





Caminada - Moreau Headland and Grand Isle



Caminada - Moreau Headland and Grand Isle

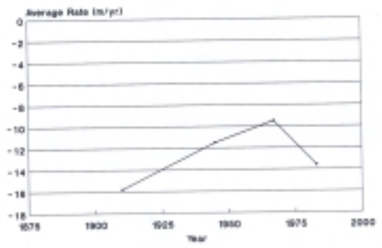


FIGURE 27.—Average gulfside rate of change along the Caminada-Moreau Headland between 1887 and 1988.

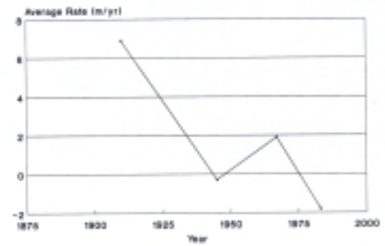


FIGURE 28.—Average bayside rate of change along the Caminada-Moreau Headland between 1887 and 1988.

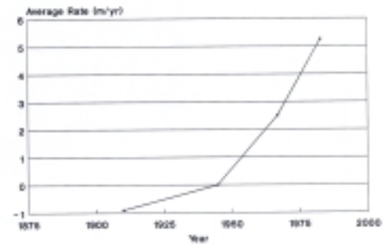


FIGURE 29.—Average gulfside rate of change along Grand Isle between 1887 and 1988.

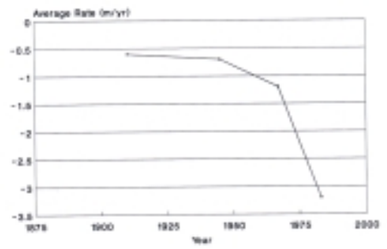


FIGURE 30.—Average bayside rate of change along Grand Isle between 1887 and 1988.

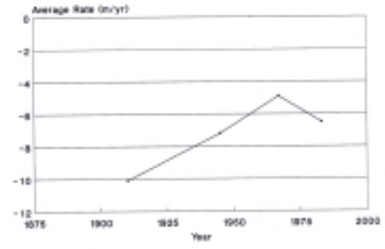


FIGURE 31.—Average gulfside rate of change between 1887 and 1988 for the Caminada-Moreau Headland and Grand Isle shoreline.

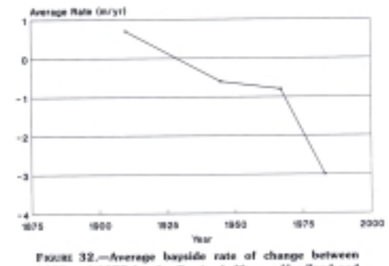


FIGURE 32.—Average bayside rate of change between 1887 and 1988 for the Caminada-Moreau Headland and Grand Isle shoreline.

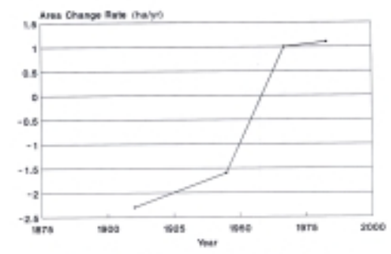
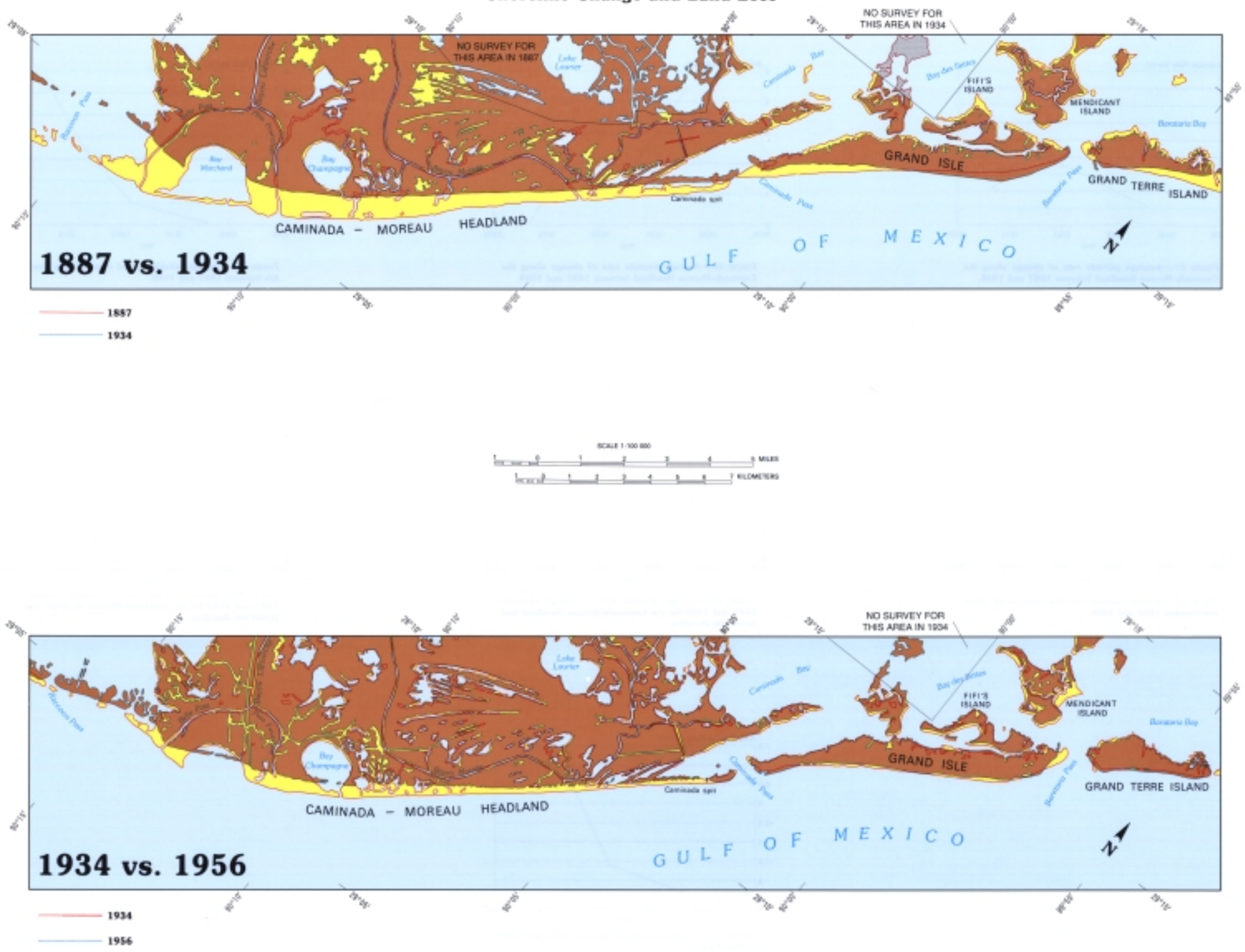


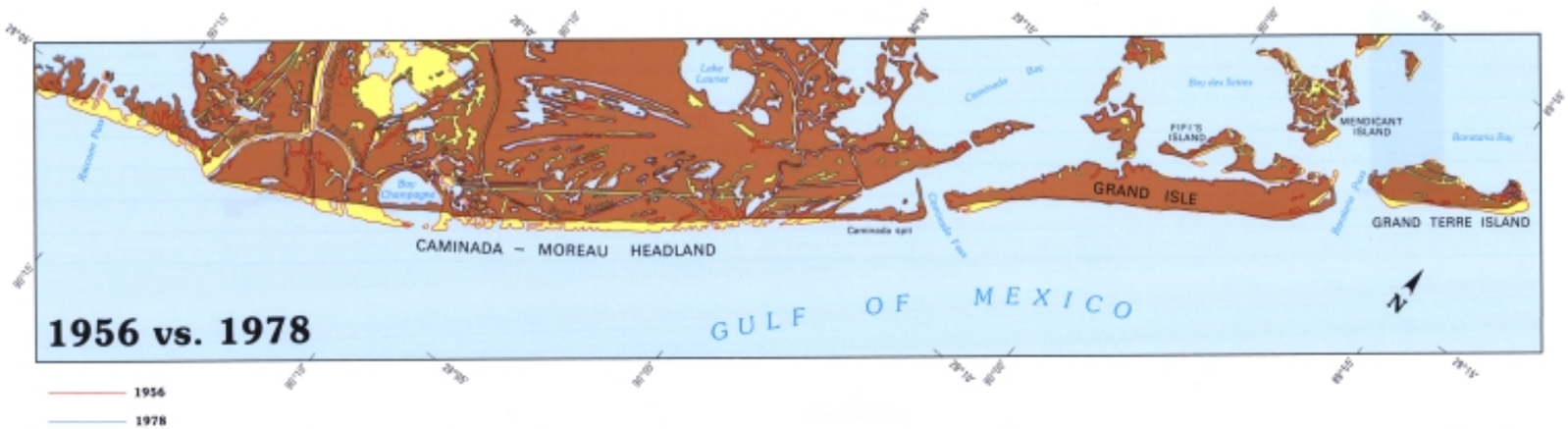
FIGURE 33.—Rate of area change between 1887 and 1988 of Grand Isle.

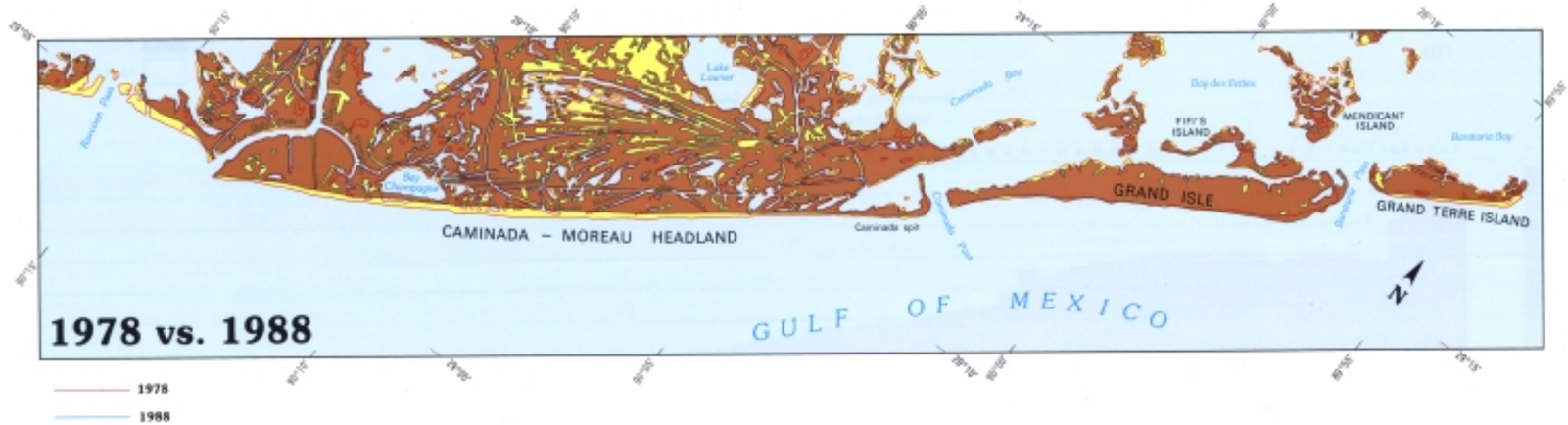
Caminada - Moreau Headland and Grand Isle

• Shoreline Change and Land Loss •

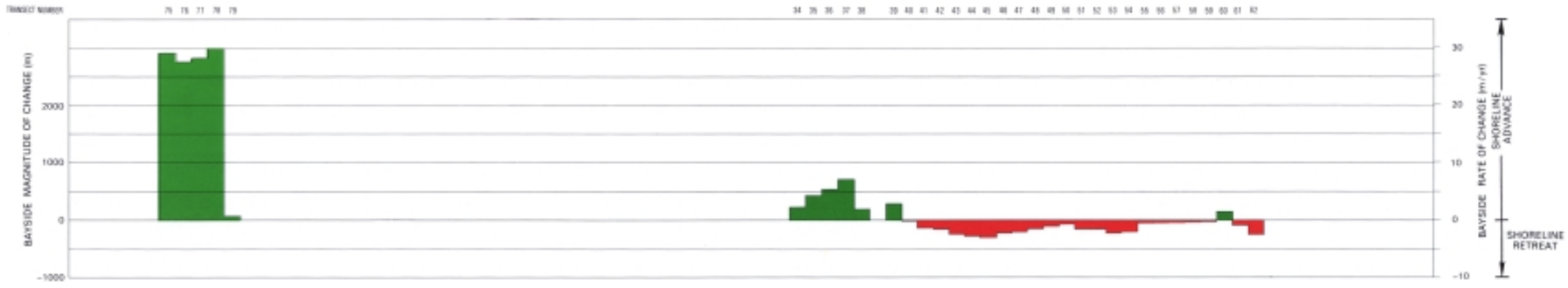


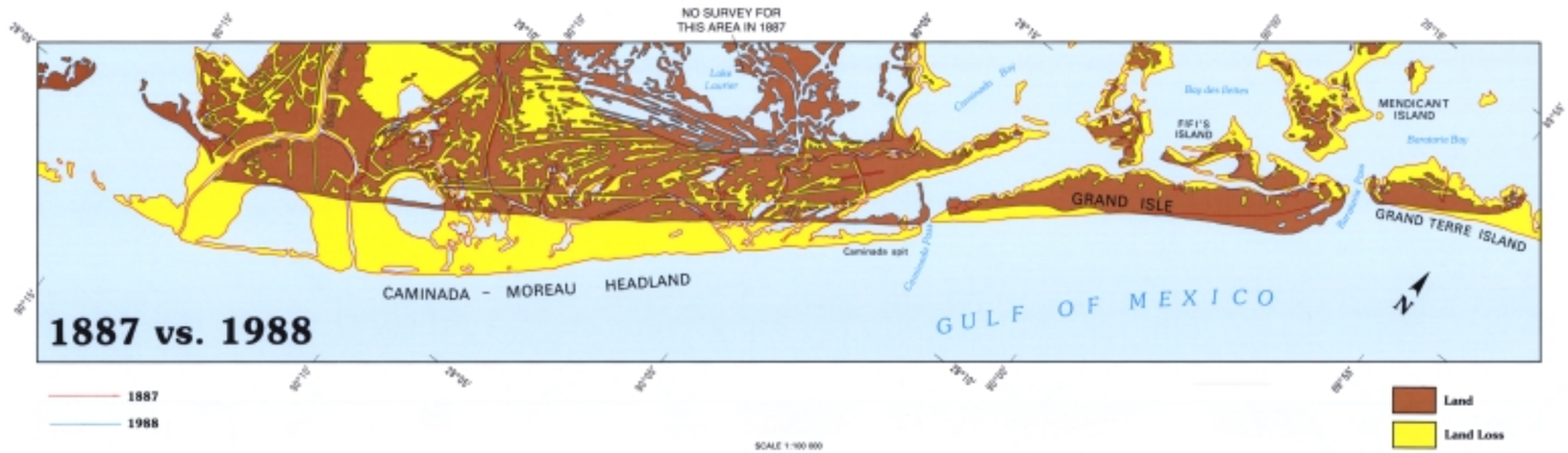
Caminada - Moreau Headland and Grand Isle

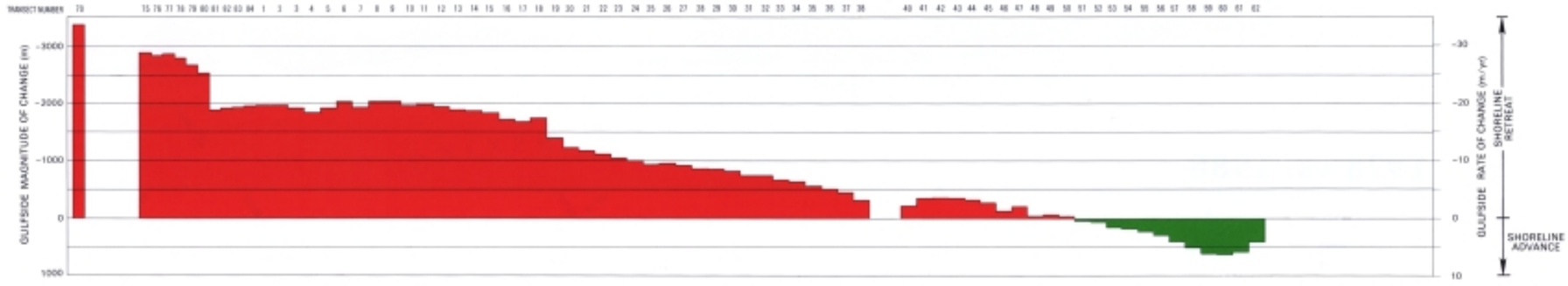




Caminada - Moreau Headland and Grand Isle







Caminada - Moreau Headland and Grand Isle

TABLE 18.—*Caminada-Moreau headland and Grand Isle bayside magnitude of change (meters)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Transect coordinate		90° 12' 00"	45'	30'	15'	90° 11' 00"	45'	30'	15'	90° 10' 00"	45'	30'	15'	90° 09' 00"	45'	30'	15'	90° 08' 00"	45'	30'	15'	90° 07' 00"	45'	30'	15'	90° 06' 00"	45'	30'	15'	90° 05' 00"	45'	30'	15'	90° 04' 00"	45'	30'	15'	90° 03' 00"	45'	30'	15'	90° 02' 00"	45'	30'
Y	1887 - 1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
σ	1934 - 1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
a	1956 - 1978	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
r	1978 - 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
s	1887 - 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Transect #		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Transect coordinate		15'	90° 01' 00"	45'	30'	15'	90° 00' 00"	45'	30'	15'	89° 59' 00"	45'	30'	15'	89° 58' 00"	45'	30'	15'	89° 57' 00"	45'
Y	1887 - 1934	-134	-228	-48	-123	-79	-9	-79	-127	-54	-93	-24	-19	12	-11	-11	3	1	-8	-170
σ	1934 - 1956	-91	93	-10	28	-4	24	24	20	-74	-167	-28	14	-18	32	16	22	174	-29	-107
a	1956 - 1978	-17	-8	-25	-5	-15	5	-14	-68	-18	14	-148	-17	-21	-14	-39	-30	-23	-35	14
r	1978 - 1988	-92	-112	-130	-98	-48	-118	-10	-8	-7	-38	-8	-13	2	-8	8	6	-5	-32	24
s	1887 - 1988	-274	-287	-211	-194	-142	-97	-59	-145	-153	-214	-205	-35	-23	-21	-29	-5	147	-86	-238

Caminada-Moreau headland bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	1927	333.4	83.7	420	288	6
1934 - 1956	-33	-8.3	8.2	3	-20	4
1956 - 1978	176	42.5	85.1	169	-9	4
1978 - 1988	-66	-17.6	14.5	4	-37	5
1887 - 1988	2046	413.2	193.3	767	185	5

Grand Isle bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-732	-30.5	128.8	690	-229	24
1934 - 1956	-350	-14.6	74.2	174	-190	24
1956 - 1978	-657	-27.4	49.8	94	-145	24
1978 - 1988	-771	-32.1	48.2	55	-130	24
1887 - 1988	-2660	-104.2	130.0	553	-287	24

Caminada-Moreau headland and Grand Isle bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	886	30.9	183.6	480	-229	29
1934 - 1956	-379	-13.4	68.8	174	-190	28
1956 - 1978	-467	-17.4	81.3	183	-145	28
1978 - 1988	-859	-29.6	42.8	55	-130	29
1887 - 1988	-434	-15.0	242.1	797	-287	29

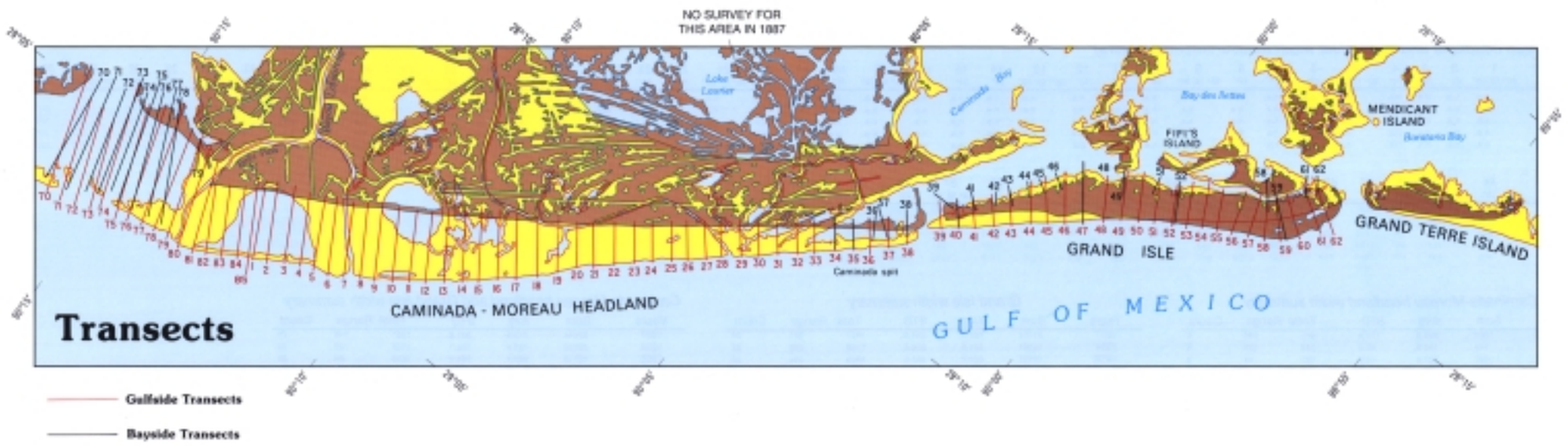


TABLE 19.—*Caminada-Moreau headland and Grand Isle gulfside magnitude of change (meters)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Transect coordinate		90° 12' 00"	45'	30'	15'	90° 11' 00"	45'	30'	15'	90° 10' 00"	45'	30'	15'	90° 09' 00"	45'	30'	15'	90° 08' 00"	45'	30'	15'	90° 07' 00"	45'	30'	15'	90° 06' 00"	45'	30'	15'	90° 05' 00"	45'	30'	15'	90° 04' 00"	45'	30'	15'	90° 03' 00"	45'	30'	15'	90° 02' 00"	45'	30'
Y	1887 - 1934	-2119	-2128	-1966	-1203	-1314	-1047	-812	-928	-936	-889	-896	-881	-878	-848	-838	-816	-806	-748	-859	-538	-529	-496	-433	-423	-368	-465	-368	-352	-379	-413	-396	-451	-433	-423	-438	-396	-378	-269	-862	-287	-283	-410	-396
σ	1934 - 1956	380	340	209	-334	-441	-521	-561	-495	-444	-423	-497	-418	-727	-548	-582	-373	-367	-332	-287	-276	-240	-201	-167	-155	-292	-245	-228	-176	-366	-393	-128	-94	-68	-111	-67	-62	-62	0	n.a.	169	165	137	39
a	1956 - 1978	-138	-117	-164	-170	-349	-339	-365	-444	-452	-471	-436	-526	-194	-254	-157	-272	-249	-234	-257	-215	-212	-253	-260	-253	-122	-164	-167	-212	-77	-30	-169	-133	-98	-28	38	15	40	2	n.a.	-99	-195	-81	43
r	1978 - 1988	-62	-87	-82	-130	-103	-114	-132	-167	-168	-186	-161	-129	-151	-215	-239	-254	-253	-426	-213	-180	-189	-167	-164	-159	-138	-144	-122	-117	-79	-61	-52	-52	-50	-63	-52	-28	-28	-26	n.a.	11	31	-2	-12
s	1887 - 1988	-1909	-1962	-1913	-1837	-1806	-2031	-1930	-2028	-2020	-1968	-1982	-1908	-1887	-1863	-1837	-1717	-1678	-1734	-1396	-1218	-1172	-1111	-1034	-1001	-909	-959	-921	-890	-841	-814	-741	-743	-664	-625	-543	-493	-428	-396	n.a.	-206	-335	-341	-329

Transect #		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Transect coordinate		15'	90° 01' 00"	45'	30'	15'	90° 00' 00"	45'	30'	15'	89° 59' 00"	45'	30'	15'	89° 58' 00"	45'	30'	15'	89° 57' 00"	45'
Y	1887 - 1934	-329	-304	-270	-247	-158	-67	-12	55	99	152	169	212	253	321	328	287	229	182	91
σ	1934 - 1956	-22	-57	-62	1	-34	-29	33	39	-21	-95	-91	-51	-93	-61	-9	-6	61	-19	-108
a	1956 - 1978	33	70	84	63	79	46	-4	-9	-6	2	-16	-1	7	60	74	169	138	332	479
r	1978 - 1988	3	49	141	2	77	-9	-18	-29	20	43	42	76	117	88	113	148	197	137	52
s	1887 - 1988	-306	-242	-117	-179	-20	-48	1	56	69	158	164	237	294	410	518	810	824	564	418

Caminada-Moreau headland gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-25071	-744.0	450.4	-280	-2128	38
1934 - 1956	-9618	-259.1	234.2	380	-727	38
1956 - 1978	-7905	-208.0	142.2	46	-529	38
1978 - 1988	-5178	-138.3	77.6	-28	-429	38
1887 - 1988	-50972	-1341.6	869.4	-296	-2028	38

Grand Isle gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-1058	-44.0	275.7	326	-882	24
1934 - 1956	9	0.0	78.5	199	-159	23
1956 - 1978	1288	56.0	152.5	476	-196	23
1978 - 1988	1187	51.6	58.7	187	-25	23
1887 - 1988	2944	68.9	317.3	624	-341	23

Caminada-Moreau headland and Grand Isle gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-26929	-479.0	520.2	326	-2128	62
1934 - 1956	-9618	-157.7	226.8	380	-727	61
1956 - 1978	-6618	-108.5	188.7	476	-529	61
1978 - 1988	-3991	-65.4	113.1	187	-429	61
1887 - 1988	-46479	-321.8	544.0	624	-2128	61

See page 46 for explanation of numbers.

Caminada - Moreau Headland and Grand Isle

TABLE 20.—*Caminada-Moreau headland and Grand Isle bayside rate of change (meters per year)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Transect coordinate		90° 12' 00"	45"	30"	15"	90° 11' 00"	45"	30"	15"	90° 10' 00"	45"	30"	15"	90° 09' 00"	45"	30"	15"	90° 08' 00"	45"	30"	15"	90° 07' 00"	45"	30"	15"	90° 06' 00"	45"	30"	15"	90° 05' 00"	45"	30"	15"	90° 04' 00"	45"	30"	15"	90° 03' 00"	45"	30"	15"	90° 02' 00"	45"	30"
Y	1887 – 1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
e	1934 – 1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
a	1956 – 1978	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
r	1978 – 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
S	1887 – 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Transect #		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Transect coordinate		15"	90° 01' 00"	45"	30"	15"	90° 00' 00"	45"	30"	15"	89° 59' 00"	45"	30"	15"	89° 58' 00"	45"	30"	15"	89° 57' 00"	45"
Y	1887 – 1934	-2.9	-4.9	+1.0	-2.6	+1.7	-0.2	+1.7	-2.7	+5.1	-0.7	-0.5	-0.4	5.3	-0.2	-0.2	0.1	8	-0.2	-2.8
e	1934 – 1956	-1.4	2.9	-0.8	1.3	-0.2	1.1	1.8	3.2	-3.4	-7.1	-1.3	0.6	-0.7	0.8	0.7	1.0	7.9	-0.9	-4.9
a	1956 – 1978	-0.8	-0.6	-1.2	-0.2	-0.6	0.1	-0.8	-2.8	-0.8	0.6	-8.0	-0.8	-1.9	-0.8	-1.6	-1.4	-1.6	-1.4	0.6
r	1978 – 1988	-8.2	-11.2	-19.6	-8.5	-4.6	-11.5	-1.8	-6.8	-8.7	-3.8	-3.6	-1.3	5.2	-6.8	0.6	6	-0.6	-3.2	2.4
S	1887 – 1988	-2.7	-2.6	-2.1	-1.9	-1.4	-1.0	-0.8	-1.4	-1.6	-2.1	-2.0	-0.3	-0.2	-0.2	-0.3	6	1.6	-0.9	-2.4

Caminada-Moreau headland bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 – 1934	34.6	8.9	1.8	8.8	4.4	5
1934 – 1956	-1.1	-0.3	0.4	0.2	-0.9	4
1956 – 1978	7.7	1.9	0.6	7.8	-0.4	4
1978 – 1988	-8.6	-1.6	1.4	0.4	-3.7	6
1887 – 1988	20.6	4.1	1.9	7.8	1.9	5

Grand Isle bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 – 1934	-15.8	-0.6	2.7	10.4	-4.9	24
1934 – 1956	-15.9	-0.7	3.4	7.9	-8.8	24
1956 – 1978	-29.9	-1.2	1.9	2.8	-6.8	24
1978 – 1988	-77.1	-3.2	6.6	0.3	-13.3	24
1887 – 1988	-24.8	-1.0	1.3	2.8	-2.8	24

Caminada-Moreau headland and Grand Isle bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 – 1934	18.8	8.7	3.8	10.4	-4.9	29
1934 – 1956	-17.0	-0.8	3.1	7.9	-8.8	25
1956 – 1978	-22.1	-0.8	2.3	7.8	-6.8	28
1978 – 1988	-68.9	-3.0	6.3	0.3	-13.3	29
1887 – 1988	-4.3	-0.1	2.4	7.8	-13.3	29

TABLE 21.—*Caminada-Moreau headland and Grand Isle width measurements (meters)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Transect coordinate		90° 12' 00"	45"	30"	15"	90° 11' 00"	45"	30"	15"	90° 10' 00"	45"	30"	15"	90° 09' 00"	45"	30"	15"	90° 08' 00"	45"	30"	15"	90° 07' 00"	45"	30"	15"	90° 06' 00"	45"	30"	15"	90° 05' 00"	45"	30"	15"	90° 04' 00"	45"	30"	15"	90° 03' 00"	45"	30"	15"	90° 02' 00"	45"	30"
Y	1887	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
e	1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
a	1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
r	1978	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
S	1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Transect #		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Transect coordinate		15"	90° 01' 00"	45"	30"	15"	90° 00' 00"	45"	30"	15"	89° 59' 00"	45"	30"	15"	89° 58' 00"	45"	30"	15"	89° 57' 00"	45"
Y	1887	1080	1171	1333	1491	1160	1301	1244	1011	880	1008	936	826	888	842	903	850	838	771	888
e	1934	550	724	980	1068	841	1168	1149	1013	982	1139	1165	1021	1125	956	878	843	842	890	772
a	1956	545	859	911	1118	900	1094	1223	1039	929	933	1045	983	1011	901	892	850	810	828	491
r	1978	540	701	967	1178	967	1166	1204	953	911	849	880	984	1001	951	826	962	1024	1115	938
S	1988	626	843	971	1088	986	1141	1172	917	926	896	926	1027	1116	1038	1060	1145	1168	1209	982

Caminada-Moreau headland width summary

Years	Sum	Avg	STD	Total	Range	Count
1887	1284	232.8	111.4	481	148	5
1934	974	194.8	49.8	248	122	5
1956	637	127.4	44.9	193	64	5
1978	1060	213.6	85.7	568	119	5
1988	831	160.2	80.4	314	69	5

Grand Isle width summary

Years	Sum	Avg	STD	Total	Range	Count
1887	21177	882.4	294.5	1481	991	24
1934	19851	841.3	276.6	1186	992	23
1956	19661	829.9	252.6	1233	916	23
1978	19578	851.1	264.1	1294	979	23
1988	20071	872.7	316.1	1299	938	23

Caminada-Moreau headland and Grand Isle width summary

Years	Sum	Avg	STD	Total	Range	Count
1887	22441	773.8	381.2	1481	148	29
1934	20825	726.8	353.1	1186	122	28
1956	19816	687.1	301.1	1233	64	28
1978	20648	737.3	336.8	1294	119	28
1988	20872	745.4	387.5	1461	69	28

TABLE 22.—*Caminada-Moreau headland and Grand Isle gulfside rate of change (meters per year)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Transect coordinate		90° 12' 00"	45"	30"	15"	90° 11' 00"	45"	30"	15"	90° 10' 00"	45"	30"	15"	90° 09' 00"	45"	30"	15"	90° 08' 00"	45"	30"	15"	90° 07' 00"	45"	30"	15"	90° 06' 00"	45"	30"	15"	90° 05' 00"	45"	30"	15"	90° 04' 00"	45"	30"	15"	90° 03' 00"	45"	30"	15"	90° 02' 00"	45"	30"
Y	1887 – 1934	-45.1	-40.3	-29.7	-25.6	-21.6	-22.3	-19.4	-19.8	-19.9	-19.8	-19.1	-18.3	-17.3	-18.0	-18.2	-17.4	-17.1	-18.8	-14.0	-11.4	-11.2	-10.4	-9.2	-9.0	-8.2	-8.6	-8.2	-7.0	-8.1	-8.7	-8.4	-9.8	-9.2	-8.0	-8.3	-8.8	-8.8	-8.8	-14.8	-8.7	-8.1	-8.8	-8.8
e	1934 – 1956	-15.0	-17.5	-9.1	-15.2	-20.8	-23.7	-22.8	-22.8	-23.2	-19.2	-22.8	-19.8	-22.8	-24.8	-20.8	-17.0	-18.7	-15.1	-13.0	-12.6	-11.6	-9.1	-8.8	-7.8	-13.3	-11.2	-10.4	-8.0	-13.8	-13.3	-5.7	-4.3	-3.8	-8.0	-6.8	-3.7	-2.8	0	n.a.	7.7	7.0	6.2	1.8
a	1956 – 1978	-8.3	-8.3	-7.8	-7.7	-10.8	-10.6	-17.8	-20.2	-20.8	-21.4	-19.8	-24.8	-6.8	-11.5	-7.8	-12.4	-11.9	-10.6	-10.8	-9.7	-9.6	-11.5	-11.4	-12.8	-5.8	-7.5	-8.5	-9.6	-9.5	-1.4	-7.7	-6.8	-4.4	-1.9	1.8	5.7	1.8	6.2	n.a.	-4.5	-8.9	-2.8	1.8
r	1978 – 1988	-6.2	-9.7	-9.2	-13.8	-10.2	-11.4	-13.2	-15.7	-16.8	-19.6	-15.1	-12.8	-15.1	-21.5	-25.3	-26.4	-26.3	-42.6	-21.3	-19.6	-16.7	-18.4	-15.9	-13.8	-14.4	-12.6	-11.7	-7.9	-8.1	-8.2	-8.2	-8.6	-8.5	-5.2	-2.8	-2.8	-2.8	n.a.	1.1	3.1	-0.2	-1.2
S	1887 – 1988	-19.5	-18.4	-15.8	-16.2	-15.6	-25.0	-19.1	-29.0	-29.0	-19.6	-19.6	-19.2	-18.7	-18.4	-18.2	-17.0	-18.6	-17.2	-13.8	-12.1	-11.6	-11.3	-10.2	-9.8	-9.3	-8.8	-8.1	-6.8	-8.3	-8.1	-7.3	-7.3	-6.8	-6.2	-6.4	-4.9	-4.2	-2.8	n.a.	-2.0	-3.2	-3.4	-3.3

Transect #		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Transect coordinate		15"	90° 01' 00"	45"	30"	15"	90° 00' 00"	45"	30"	15"	89° 59' 00"	45"	30"	15"	89° 58' 00"	45"	30"	15"	89° 57' 00"	45"
Y	1887 – 1934	-6.8	-6.8	-5.7	-5.3	-3.9	-1.4	-0.3	1.2	1.9	3.2	4.1	4.5	5.4	6.8	8.9	8.1	4.9	3.5	1.9
e	1934 – 1956	-1.3	-2.8	-2.4	0	-1.5	-6.9	1.8	1.8	-1.3	-1.8	-1.4	-2.3	-4.2	-2.8	-6.1	-6.2	4.1	-8.8	-7.2
a	1956 – 1978	1.5	3.2	2.9	3.3	3.4	2.1	-0.2	-0.4	-6.3	0.1	-6.8	9	0.3	3.3	3.6	5.6	6.2	18.1	21.8
r	1978 – 1988	8.3	4.8	14.1	0.2	7.7	-6.8	-1.8	-2.8	3.0	4.0	4.2	7.6	11.7	8.8	11.3	14.0	18.7	12.7	1.5
S	1887 – 1988	-3.0	-2.4	-1.2	-1.8	-0.2	-6.5	9	0.8	0.6	1.8	1.9	2.3	2.8	4.1	5.0	6.1	6.2	5.6	4.1

Caminada-Moreau headland gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 – 1934	-621.8	-18.8	6.8	-6.8	-48.3	36
1934 – 1956	-437.2	-11.8	10.8	17.3	-33.0	36
1956 – 1978	-399.3	-9.5	6.3	1.8	-24.0	36
1978 – 1988	-517.8	-13.6	7.8	-2.8	-42.0	36
1887 – 1988	-594.7	-15.3	5.8	-2.9	-29.0	36

Grand Isle gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 – 1934	-22.6	-0.9	3.9	6.8	-14.5	24
1934 – 1956	8.0	0.6	3.5	7.7	-7.2	23
1956 – 1978	56.6	2.5	6.6	21.8	-4.9	23
1978 – 1988	116.7	5.0	5.7	16.7	-2.8	23
1887 – 1988	29.2	0.9	3.1	6.2	-3.4	23

Caminada-Moreau headland and Grand Isle gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 – 1934	-604.8	-16.1	11.1	6.9	-48.3	60
1934 – 1956	-437.2	-7.2	10.5	17.3	-33.0	61
1956 – 1978	-380.7	-4.9	8.6	21.8	-24.0	61
1978 – 1988	-389.1	-6.9	11.5	16.7	-42.0	61
1887 – 1988	-494.4	-7.9	8.4	6.2	-60.8	61

See page 46 for explanation of numbers.

Caminada - Moreau Headland and Grand Isle

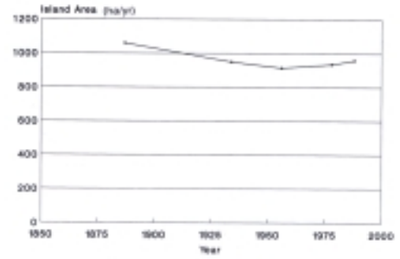


FIGURE 34.—Area changes between 1887 and 1988 of Grand Isle.

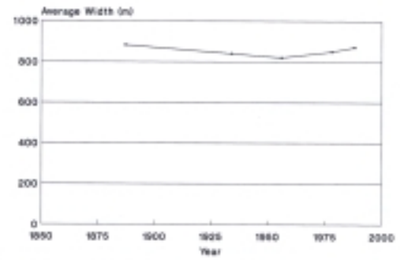


FIGURE 35.—Average barrier width of Grand Isle between 1887 and 1988.

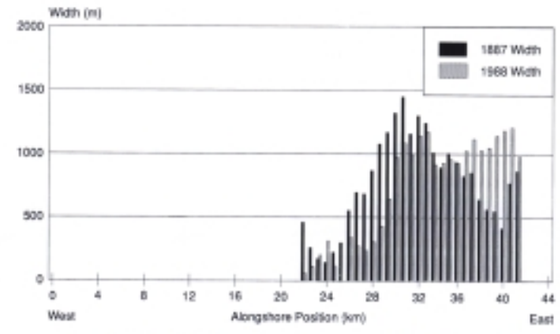


FIGURE 36.—Comparison of barrier widths for 1887 and 1988 for the Caminada-Moreau Headland and Grand Isle shoreline.

TABLE 23.—*Area changes for Grand Isle from 1887 to 1988*

Date	Area (ha)	Change (ha)	% Change	Rate (ha/yr)	Projected Date of Disappearance
1887	1,059				
1934	950	-109	-10%	-2.3	2347
1934	950				
1956	915	-35	-4%	-1.6	2528
1956	915				
1978	936	21	2%	1.0	N.A.
1978	936				
1988	960	24	3%	1.1	N.A.
1887	1,059				
1988	960	-99	-9%	-1.0	2948