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Summary of the New England Beach Nourishment Experience (1935–1996)

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ABSTRACT

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Data from 121 nourished beaches in New England are presented, representing over 170 individual nourishment episodes. The regional-nourishment episode record is less fragmented at the federal level than at the state, local, or private levels. Most nourishment episodes in New England are small (<100,000 cubic yards) and state/locally funded. The total number and volume of nourishment episodes completed annually in the region is declining, and the cumulative volume of nourishment sand in the region has plateaued over time. Total known volume of sand emplaced is 12,550,881 cubic yards with 105 of 173 episodes included in this sum.

ADDITIONAL INDEX WORDS: *Beach replensihment, New England beaches, replenishment cost, beach erosion.*

INTRODUCTION

The traditional concept of beach nourishment is that of a course of action which is taken in response to shoreline erosion. As a "soft stabilization" method, it is often seen as a solution to coastal erosion preferable to both *hard stabilization*, such as seawalls or groins, and *retreat* (*i.e.* the inland relocation of buildings) (PILKEY and CLAYTON, 1989). In the past sixty years, and especially since the 1960's, a large number of beach nourishment episodes have taken place along U.S. coastlines. Each episode has involved variations on the theme of erosion or property damage mitigation; ranging from emergency response to specific storm events, to the desire of communities to enhance local tourism. Consequently, permitting and funding sources for these nourishment episodes have also been varied.

The New England region comprised of Maine, New Hampshire, Massachusetts, Rhode Island and Connecticut, has been ignored in the discussion of the national beach nourishment experience. This is due in part to the relatively fragmented nature of the New England shoreline: many beaches do not occur as long "ribbons of sand", but as small isolated enclaves of sand or gravel situated between rocky headlands. Quite often such beaches are privately held, which usually further removes them from public debate. Nevertheless, there are at least 116 beaches in New England which have been nourished since the 1930's, and about which at least some information is available (Figure 1).

To date, few attempts have been made to analyze the nourishment experience of the New England (PERDIKIS, 1961; SUDAR *et al.*, 1995), in part because it is difficult to conjecture in the absence of available data. Project records of general design parameters such as date, length, volume, cost, and sand sources are poor and often missing. To the degree possible, this paper is intended to close this knowledge gap. The regional nourishment data set compiled and presented herein, may facilitate several investigations: first, it will establish the extent to which beach nourishment has been used as an approach to shoreline erosion, second, it will provide a starting point for inquiries into the cost and durability of nourished beaches, and/or into the role of individual design parameters such as length or sediment source in the success of a nourishment episode (LEONARD *et al.*, 1990); third, such a database will serve as a record of information sources available to coastal zone managers and community planners, and as such could contribute to the formulation of policies involving beach nourishment as a "solution" to coastal erosion (PILKEY and CLAYTON, 1989).

METHODS

As was the case with previous studies of this nature, data on the various beach nourishment episodes of the New England coastline were difficult to obtain. Some data sources conflict significantly with regard to the volume and cost numbers. In addition it seems certain that some nourishment episodes (especially small local and private projects) have been lost and possibly lost forever from all record keeping sources. Thus, we are certain that our data compilation is incomplete and imperfect. Despite these flaws, the record presented herein represents the first and most complete compilation of its kind for the New England region.

The numbers were gathered by a variety of methods. In general, contacts were first formed with officials and contractors at the state and local level in each of the New England states, and follow-up visits were made to relevant city

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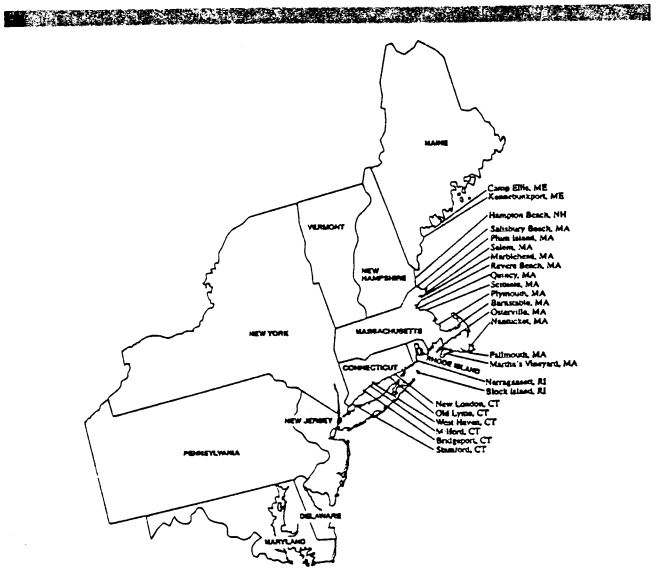

Figure 1. Index map showing the approximate location of 24 nourishment projects (for a complete list see Table 1.

halls, technical libraries, and repositories for state documents. Information on the federal projects was most commonly obtained from U.S. Army Corps of Engineers annual reports, project files and other New England division publications. Where possible, an attempt was made to look at a primary source document for each episode (*e.g.* a contract file for services rendered), and the desired figures (nourishment episode parameters such as locations, dates, volumes, costs, *etc.*) were recorded.

CATEGORIES OF NOURISHED BEACHES IN NEW ENGLAND

To ensure a comprehensive picture of the New England beach nourishment experience, we attempted to gather data that represented *all* instances in which sand might have been placed on the region's beaches. Thus the term "nourishment" as it is used throughout this paper is intended to encompass more than just those storm protection/erosion control projects which might be termed "designed" or "engineered" beaches. As such, the New England beach nourishment data presented herein falls into several broad funding categories which are listed below:

(1) *Federal: Storm and Erosion.* Congressionally authorized episodes specifically designed to mitigate against damages caused by yearly erosion and storm events. Congress may authorize up to 65% of the total cost for these projects under the Water Resources Development Act PL 99-662 Section 103.

(2) *Federal: Emergency Shore Protection.* Episodes executed after large storms have exposed shorefront property to wind and wave action. These episodes are elligible for complete federal funding under PL 84–99.

(3) *Federal: Navigation.* The Water Resources Development Act of 1976: (PL 94-587) authorizes the disposal of sand dredged from navigation channels and inlets onto adjacent beaches, as long as any additional cost to the federal sponsor is shared 50/50 by local interests.

(4) *Federal: SSSA.* Small Scope Specifically Authorized shore protection projects which were authorized before enactment of the River and Harbors Act of 1962. Natioanlly, the vast majority of such projects are located in New England.

(5) *Federal: Unknown.* Episodes known to have recieved federal funding, but can not be identified as belonging to one of the above classifications.

(6) *State/Local.* Episodes which were sponsored under a state and local government cost sharing agreement.

(7) *Local/Private.* Episodes carried out at the local level by a municipality, local home-owner/business group or other private entity.

(8) *Unknown.* Episodes for which the funding source was not known.

Note that many of the funding categories presented above are common on other U.S. coastlines, while some are uniquely important to the New England region (*e.g.* SSSA). Also, it is common for a beach to have been funded through a variety of sources over its nourished lifetime, thus a given beach may fall into more than one category. For clarity the term *project* is used to encompass all instances of nourishment at a particular location, while the term *episode* is employed to refer to a specific nourishment event on a given beach.

FINDINGS

The beach nourishment episodes identified in this study are presented in Table 1 in geographical order from north to south. Twenty-four key projects are identified on the site map (Figure 1). In all, 173 nourishment episodes have taken place at 121 locations. A total minimum volume of 12,550,000 cubic yards of material was emplaced on New England beaches since 1935. Often, nourishment episodes were mentioned in the literature for which no further data could be found. The data presented in Table 1 is incomplete in several ways. Of the 173 identified beach nourishment episodes, approximate dates are known for 169 episodes (98%), but volume data is known only for 105 episodes (61%), cost data for 61 episodes (35%), and length data for 67 episodes (38%). Efforts continue to fill in known "blanks" in the database, and the authors welcome additions and corrections.

New England's beach nourishment experience differs from other regions of the U.S. in several distinct ways. A notable finding is that the nourishment volume emplaced in New England was greatest in the 1950's, declined during the 1960's and 1970's and has begun to rise again since the 1980's (Figure 2). The region's cumulatve volume trend flattened-out in the 1960's (Figure 3), a trend which contrasts to the rise in cumulative volumes along other U.S. coastlines (VALVERDE and PILKEY, 1997; TREMBANIS and PILKEY, 1997; O'BRIEN *et al*, 1997).

In addition, both the scope and scale of New England's nourishment history are dramatically different from other coastlines examined in this issue. Most of the nourishment episodes are small by U.S. East Coast barrier standards. Of

Table 1. *New England Beach Nourishment Episodes (1935–1996).*

#	Beach Location	Date	Funding Type	Volume (cu. yds)	Length (feet)	Cost ($)	Reference
Maine							
1	Pine Point Harbor, Scarborough River	1955	Federal: Navigation				20
2	Pine Point Harbor, Scarborough River	1956	Federal: Navigation	128,099			20
3	Scarborough River Estuary	1975	Federal: Navigation	6,948			18
4	Camp Ellis	1969	Federal: Navigation	87,354			20
5	Camp Ellis	1969	Federal: Navigation	73,130			20
6	Camp Ellis	1970	Federal: Navigation				20
7	Camp Ellis	1978	Federal: Navigation	80,000			20
8	Camp Ellis	1978	Federal: Navigation	50,000			20
9	Camp Ellis	1982	Federal: Navigation	7,300			20
10	Camp Ellis	1992	Federal: Navigation	85,935			20
11	Camp Ellis	1996	Federal: Navigation	90,000		$1,180,000	49
12	Saco River Estuary	1919	Federal: Navigation	78,000			18
13	Saco River Estuary	1969	Federal: Navigation	87,000			18
14	Saco River Estuary	1969	Federal: Navigation	73,000			18
15	Saco River Estuary	1978	Federal: Navigation	80,000			18
16	Saco River Estuary	1978	Federal: Navigation	50,000			18
17	Saco River Estuary	1982	Federal: Navigation	7,300			18
18	Saco River Estuary	1992	Federal: Navigation	13,000			18
19	Saco River Estuary	1992	Federal: Navigation	86,000			18
20	Biddeford Pool	1989	Federal: Navigation	16,000			18
21	Gooches Beach, Kennebunkport		Federal: Navigation				21
22	Gooches Beach, Kennebunkport	1985	Federal: Navigation	26,000			40
23	Wells Harbor	1990	Federal: Navigation	15,000			18
24	Wells Harbor	1991	Federal: Navigation	5,000			18
25	Wells and Drakes Island		Federal: Navigation	10,000			21
26	Perkins Cove	1967	Federal: Navigation	55,000			18
27	Ogonquit Beach	1974					21
28	Woods Island Harbor		Federal: Navigation	12,000			51
New Hampshire							
29	Wallis Sands State Park	1963	Federal: Storm and Erosion	200,000	800	$501,073	34, 48, 47
30	Wallis Sands State Park	1972	Federal: Emergency	10,000		$85,000	37
31	Wallis Sands State Park	1983	Federal: Storm and Erosion			$501,000	52
32	Hampton Beach	1935	State	1,000,000			11
33	Hampton Beach	1955	Federal: Unknown	400,000	5,280	$374,319	30, 34, 20, 19, 9, 13, 48
34	Hampton Beach	1965	Federal: Storm and Erosion	169,000		$272,190	37, 34, 48
35	Hampton Beach	1972	Federal: Emergency	70,000		$420,000	37
36	Hampton Beach		Federal: Unknown	340,000		$1,525,000	47
37	Hampton Beach	1987	Federal: Navigation	21,000			51
Massachusetts							
38	Salisbury Beach, Salisbury	1953	State	100,000	2,300		13
39	Salisbury Beach, Salisbury	1957	Federal: Navigation	36,000	1,500		13
40	Plum Island, Newburyport and Newbury	1987	Federal: Navigation	156,000			51
41	Plum Island, Newburyport and Newbury	1953	Federal: Unknown	56,000	4,000		19, 7
42	Plum Island, Newburyport and Newbury	1973	Federal: Storm and Erosion	43,760	800	$223,757	42, 35
43	Wingersheek Beach, Gloucester	Pre-1961					19

Table 1. *Continued.*

#	Beach Location	Date	Funding Type	Volume (cu. yds)	Length (feet)	Cost ($)	Reference
44	Singing Beach, Manchester	Pre-1961					19
45	Dane Street Beach, Beverly	Pre-1961					19
46	Palmers Cove, Salem	Pre-1961					19
47	Salem Willows, Salem	Pre-1961					19
48	Forrest Beach Park, Salem	Pre-1961					19
49	Pioneer Village, Salem	Pre-1961					19
50	Collins Cove, Salem	Pre-1961					19
51	Front Street Beach, Marblehead	Pre-1961					19
52	Fisherman's Beach, Swampscott	Pre-1961					19
53	Lynn-Nahant	1954	Federal: Unknown	172,000	2,600		35
54	Revere Beach, Revere	1954	State	522,000		$1,170,000	43, 20, 35
55	Revere Beach, Revere	1992	Federal: Storm and Erosion	768,000	15,840	$6,030,000	48, 43, 1, 47, 52
56	Winthrop Beach, Winthrop	1956	Federal: Unkown			$344,000	48, 46, 52
57	Winthrop Beach, Winthrop	1959	Federal: Unknown	245,000	4,250	$650,000	25, 20, 47
58	Orient Heights Beach, East Boston	Pre-1961					19
59	Pleasure Bay Beach, South Boston	1996	State	10,600			2
60	Germantown Beach, Quincy	Pre-1961					19
61	Quincy Shore Beach (Wollaston Beach), Quincy	1948	State	6,400			5
62	Quincy Shore Beach (Wollaston Beach), Quincy	1959	Federal: Unknown	357,000	8,500	$1,864,320	35, 48, 47, 20, 52
63	Quincy Shore Beach (Wollaston Beach), Quincy	1996	State	44,200			2
64	Nantaskett	1970	Federal: Unknown		6,900		35
65	Wessagussett Beach, Weymouth	1969	Federal: Storm and Erosion	148,000	1,600	$408,000	45, 35
66	Wessagussett Beach, Weymouth	1959	Federal: SSSA		2,600	$381,152	20, 35, 47, 28
67	North Scituate Beach	1967	Federal: SSSA	160,000	2,500	$214,000	41, 35, 47, 20
68	Between First and Second Cliff, Scituate	Pre-1961					19
69	Brant Rock, Marshfield	Pre-1961					19
70	Town Beach, Plymouth	1963	Federal: SSSA		1,300	$17,000	47, 35
71	Plymouth Harbor	1988	Federal: Navigation	40,000			51
72	Town Neck Beach, Sandwich	1966					35
73	Veteran's Memorial Park Beach, Barnstable	Pre-1961					19
74	Kalmus Park Beach, Barnstable	Pre-1961					19
75	Dead Neck, Osterville	1953					3, 19
76	Dead Neck, Osterville	1955		10,000			3, 19
77	Dead Neck, Osterville	1958		9,000			3, 19
78	Dead Neck, Osterville	1968		33,000			3
79	Dead Neck, Osterville	1983		20,000			3
80	Dead Neck, Osterville	1985		106,000	2,400		3
81	Chase Garden Beach, Yarmouth	Pre-1961					19
82	Englewood Beach, Yarmouth	Pre-1961					19
83	South Yarmouth Beach, Yarmouth	Pre-1961					19
84	West Dennis Beach, Dennis	Pre-1961					19
85	East and West of Parker's River, Dennis	Pre-1961					19
86	Chatham Harbor	1986	Federal: Navigation	117,000			51
87	East of Herring River, Harwich	Pre-1961					19
88	Red River Beach, Harwich	Pre-1961					19
89	Loop Beach, Cotuit	Pre-1961					19
90	Falmouth Heights, Falmouth	Pre-1961					19

Table 1. *Continued.*

#	Beach Location	Date	Funding Type	Volume (cu. yds)	Length (feet)	Cost ($)	Reference
91	Maganset Beach, Falmouth	Pre-1961					19
92	Wild Harbor, Falmouth	Pre-1961					19
93	Cuttyhunk Harbor	1987	Federal: Navigation	9,000			51
94	Monument Beach, Bourne	Pre-1961					19
95	Pocasset Beach, Bourne	Pre-1961					19
96	Buttermilk Bay, Wareham	Pre-1961					19
97	Hamilton Beach, Wareham	Pre-1961					19
98	Little Harbor, Warham	Pre-1961					19
99	Long Beach, Wareham	Pre-1961					19
100	Parkwood Beach, Wareham	Pre-1961					19
101	Pinehurst Beach, Wareham	Pre-1961					19
102	Onset Bay, Warham	Pre-1961					19
103	Swift Beach, Wareham	Pre-1961					19
104	Silver Shell Beach, Marion	Pre-1961					19
105	Water Street Beach, Mattapoisett	Pre-1961					19
106	Pope Beach, Fairhaven	Pre-1961					19
107	Oak Bluffs, Martha's Vineyard	1973	Federal: Storm and Erosion	98,090	1,200	$471,917	35, 21
108	East Beach, Clark Point, New Bedford	1956	Local	12,600			14
109	East Beach, Clark Point, New Bedford	1959	Local	77,000			14
110	East Beach, Clark Point, New Bedford	1959	Local	10,666			14
111	West Beach, Clark Point, New Bedford	1959	Local	21,331			14
112	West Beach, Clark Point, New Bedford	1980	Federal: Storm and Erosion	53,306	1,600	$456,161	35, 32
113	East & West Beaches, Clark Point, New Bedford	1958		106,000			14
114	Horseneck Beach, Westport	Pre-1961					19
115	Children's Beach, Nantucket	Pre-1961					19
116	Nantucket Harbor	1988	Federal: Navigation	40,000			51
117	Green Harbor	1987	Federal: Navigation	36,000			51
118	Sesuit Harbor	1988	Federal: Navigation	27,000			51
	Rhode Island						
119	Oakland Beach, Warwick	1981	Federal: Storm and Erosion	35,000		$740,375	33, 36
120	Sandy Point, Narrangansett	1996	Federal: Navigation	60,000		$444,444	50, 23
121	Sand Hill Cove, Point Judith	1955	Federal: SSSA		5,280	$122,143	36, 20, 47
122	Block Island Harbor	1987	Federal: Navigation	16,000			51
123	Misquamicut Beach	1959	Federal: SSSA	80,000	3,250	$48,000	20, 47, 36, 38, 19, 39
124	The Misquamicut Club	1992	Private	25,000	4,800		27
125	Napatree Beach, Westerly	Pre-1961					19
126	Town Beach, Westerly	1988	Local	90	100		24
127	Town Beach, Westerly	1989	Local	1,000	400		25
128	Town Beach, Westerly	1990	Local		400		26
129	Town Beach, Westerly	1993	Local				28
	Connecticut						
130	Eastern Point Beach, Groton	Pre-1961					19
131	Esker Point Park, Groton	1969	State/Local	7,403		$132,853	29
132	Neptune Park, New London	1964	State/Local	63,000	800	$134,400	29
133	Ocean Beach, New London	Pre-1961					19
134	Seaside Regional Center, Waterford	1967	State	15,615		$118,593	29

Table 1. *Continued.*

#	Beach Location	Date	Funding Type	Volume (cu. yds)	Length (feet)	Cost ($)	Reference
135	Point O'Woods, Old Lyme	1965	State/Local	24,000	950	$118,193	29
136	White Sands Beach, Old Lyme	1957	State/Local	51,000	1,360	$72,713	19, 15, 29
137	White Sands Beach, Old Lyme	1967	State	37,000		$65,028	29
138	Hawk's Nest Beach, Old Lyme	Pre-1961					19
139	Chalker Beach, Old Saybrook	1961	State/Local	9,700	1,600	$99,432	29
140	Clinton Town Beach, Clinton	1964	State/Local	21,000		$44,827	29
141	Hamonasset Park, Madison	1955	Federal: SSSA	380,000		$489,549	20, 47, 29
142	Guilford Point Beach, Guilford	1959	State/Local	13,000	400	$78,000	20, 47, 29, 46
143	Jacob's Beach, Guilford	Pre-1961					19
144	Branford Point Park, Branford	1963	State/Local	11,000	300	$27,356	29
145	West Silver Sands, East Haven	1958	State/Local	170,000	2,550	$237,142	29, 19, 10
146	Prospect Beach, West Haven	1957	Federal: Unknown	443,000	6,470	$358,507	19, 29, 48, 20, 47
147	Prospect Beach, West Haven	1973	State/Local	25,000		$166,000	29
148	Prospect Beach, West Haven	since 1987	Federal: Storm and Erosion			$2,268,000	47
149	Sea Bluff Beach, West Haven	since 1987	Federal: Storm and Erosion			$450,000	47
150	Savin Rock, West Haven	Pre-1961					19
151	Laurel Beach, Milford	1965	State/Local	70,000	2,800	$182,092	29
152	Woodmont Shore, Milford	1959	Federal: SSSA	256,000	4,300	$165,517	19, 29, 47, 20
153	Woodmont Shore, Milford	1964	State/Local	63,000		$124,000	29
154	Woodmont Shore, Milford	since 1987	Federal: Storm and Erosion			$1,184,000	47
155	Gulf Beach, Milford	1957	Federal: SSSA	55,000	1,235	$63,909	29, 19, 47, 20, 36
156	Gulf Beach, Milford	1966	State	15,000	800	$22,650	29
157	Silver to Cedar Beaches, Milford	1955	Federal: SSSA		8,500	$333,255	20, 47, 29
158	Silver Medows End and Myrtle Beaches, Milford	1960	State/Local	223,000	5,280	$301,507	29
159	Long Beach, Stratford	1966	State/Local	600,000		$415,062	29
160	Short Beach, Stratford	1955	Federal: Navigation		3,500		20, 47, 29
161	Seaside Park, Bridgeport	1957	Federal: Unknown	691,000	8,800	$479,920	29, 19, 8, 47, 48, 20
162	Pleasure Beach, Bridgeport	Pre-1961					19
163	Fairfield Beach, Fairfield	1959	State/Local	140,000	4,400	$240,807	29
164	Southport Beach, Fairfield	1958	Federal: SSSA	22,000	700	$52,894	20, 47, 29, 36, 19
165	Sasco Hill Beach, Fairfield	1958	Federal: SSSA	20,000	900	$71,276	20, 47, 29
166	West Fairfield Beach, Fairfield	1964	State/Local	165,000	5,600	$365,368	29
167	Burial Hill Beach, Westport	1957	Federal: SSSA	17,000	500	$17,430	20, 47, 29, 36
168	Sherwood Island State Park, Westport	1957	Federal: Unknown	1,070,000	6,000	$767,832	19, 2, 20, 29, 36
169	Sherwood Island State Park, Westport	1983	Federal: Storm and Erosion	113,054	600	$2,076,160	48, 47, 44, 36
170	Compo Beach Westport	1957	Federal: SSSA	260,000	2,600	$253,633	20, 47, 29, 36
171	Calf Pasture Beach Park, Norwalk	1958	Federal: SSSA	94,000	2,200	$176,565	20, 47, 29, 36
172	Cove Island, Stamford	1958	Federal: SSSA	61,000	1,300	$145,000	20, 47, 29, 36
173	Cummings Park, Stamford	1960	Federal: SSSA	45,000	1,000	$87,948	20, 47, 29, 36

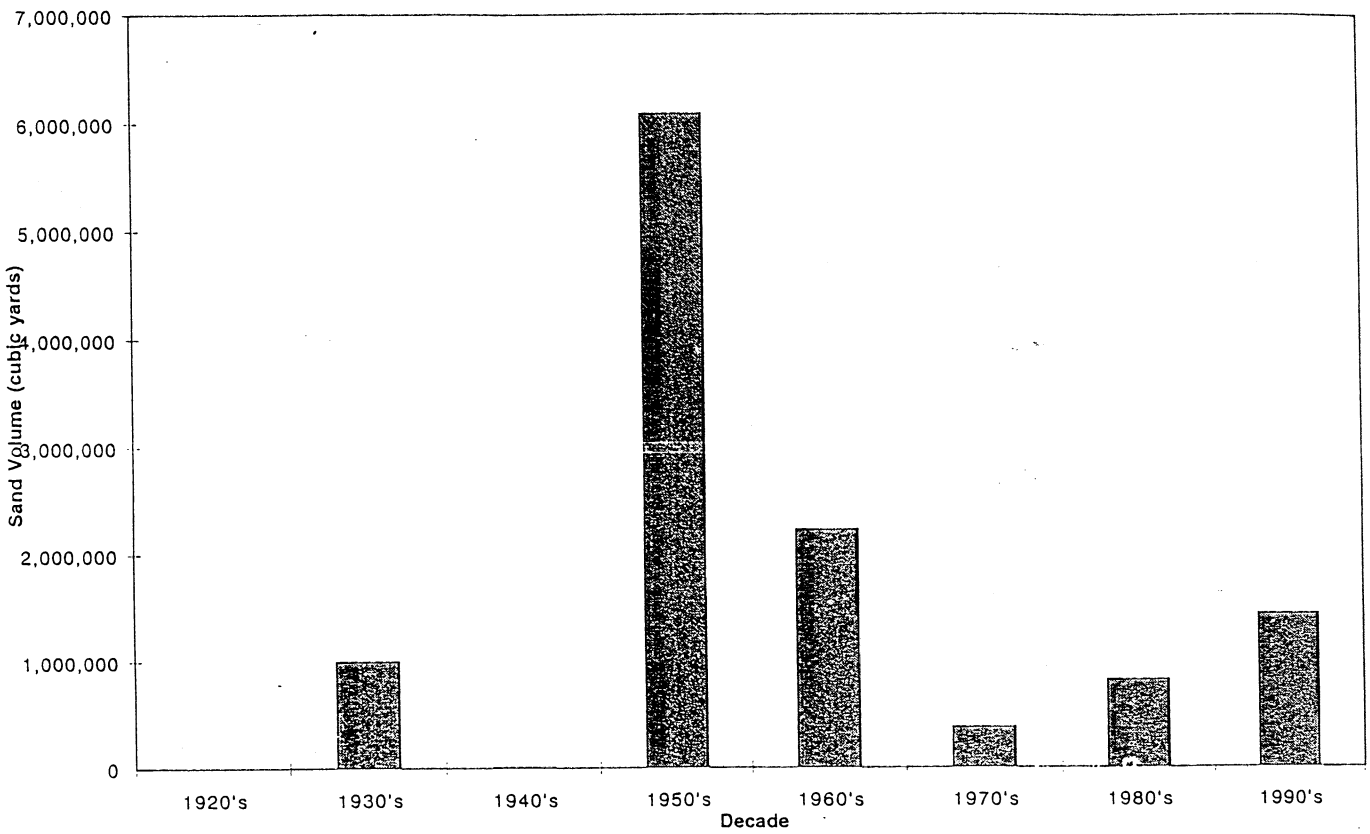

Figure 2. Total volume of nourishment sand placed on New England beaches per decade.

episodes whose nourishment volume is known, 71% are smaller than 100,000 cubic yards, and another 23% are between 100,000 and 500,000 cubic yards. To emphasize this point, consider that the total known volume of sand used for nourishment in New England (≈ 12 million cubic yards) is the same as the total volume of sand that has been used on a 10 mile stretch of Miami Beach, FL (VALVERDE and PILKEY, 1997).

The distribution of funding sources for New England nourishment episodes also differs from that of other coastlines. Of the total number of episodes identified, 47% represent nourishment episodes which were funded in part through federal dollars. The remaining 53% of episodes were presumably funded without federal participation (*i.e.* at the state/local/private level). We assume that the New England federal project record is fairly complete as presented herein. This greater proportion of state/locally/privately funded projects reflects the fact that a large number of New England projects are too small or too private to justify federal involvement.

If one considers nourishment volume, rather than nourishment episodes, as distributed among funding categories, a different picture of federal involvement emerges from that presented above (Figure 4). Of the approximately 12 million cubic yards of total known nourishment volume, 8,712,276 cu. yards or 69% was funded, in part, by federal dollars. We believe that this represents a fairly accurate picture of the volume of federally funded sand, (67 episodes of 81 represented in total). Thus, though fewer in number, the federally funded nourishment projects of the New England region account for a majority of all the sand emplaced over the years. Non-federal projects, though more numerous, tend to be small in size and thus account for approximately one third of the total volume. In addition, the 3,838,515 cu. yards (31%) attributed to state/local/private and other sources is considered to be a poor representation of the total volume of non-federally funded nourishment sand, (38 episodes of 92 represented). We feel that the state/local/private volume share is larger than indicated in Figure 4, as a result of poor record keeping for state, local, and private nourishments.

Of the federal projects within this study, 29 are currently authorized by Congress and are active federal projects (USACE 1994). There are also many federal projects whose volumes are included in this record but which are no longer authorized by Congress. It should be noted that these remaining federal projects include the largest and most expensive projects in the region. Currently authorized projects account for 54% of the total known volume of nourishment sand.

In general, the number of nourishment episodes executed per year in New England has declined since the 1960's. This decline in episode numbers does not appear to have been accompanied by an increase in the volumes or lengths of remaining episodes, a finding which is in contrast to that which

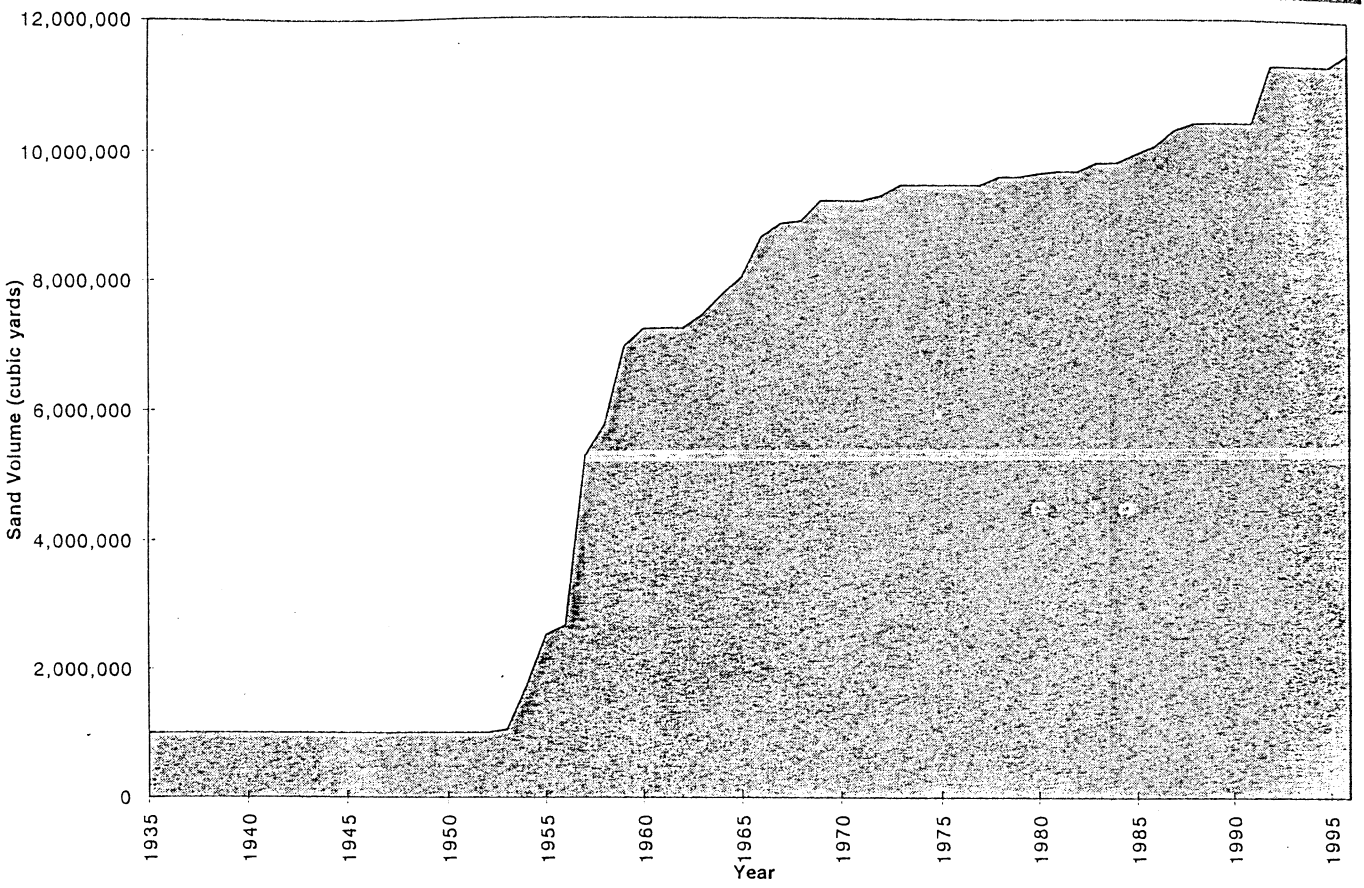

Figure 3. Cumulative New England nourishment volume over time (1935–1996).

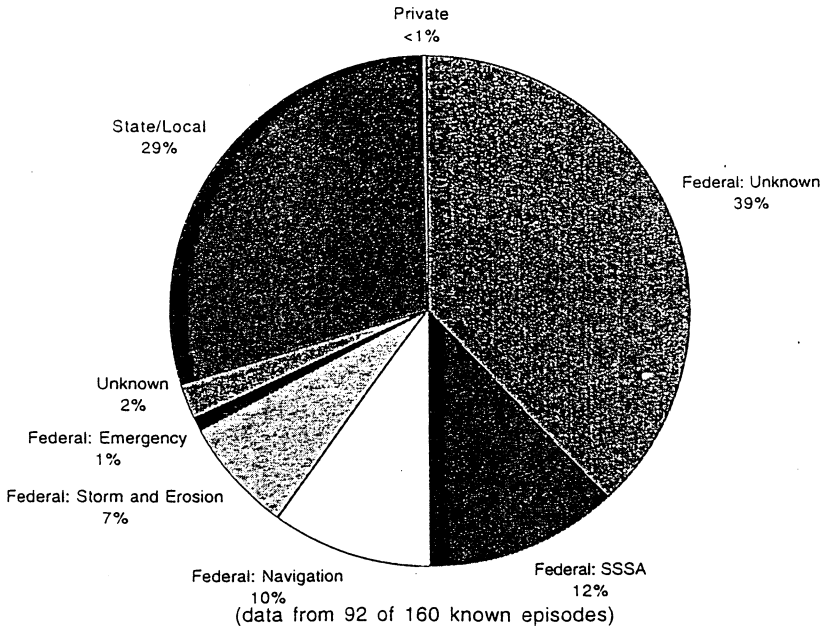

Figure 4. Funding sources of New England nourishment episodes expressed as a percent of total sand volume (1935–1996).

has been observed on the U.S. East and Gulf coast barriers, (VALVERDE and PILKEY, 1997; TREMBANIS and PILKEY, 1997).

Other interesting points in the New England Nourishment record include the following: most of the New England nourishment episodes have occurred in Massachusetts (51%) and Connecticut (28%). The largest New England nourishments (1,000,000+ cubic yards), have been in Connecticut (Sherwood Island State Park), and New Hampshire (Hampton Beach). The most expensive nourishment ($6,000,000+) was the Boston Metropolitan District Commission's Revere Beach project in Massachusetts.

CONCLUDING REMARKS

In general, New England beach nourishment episodes are small and state/locally funded. The largest and most expensive projects in the region are all federally funded. Reconstruction of the regional nourishment record is most difficult for projects funded at the state, local, and private levels. This has lead to a significant underestimation of the proportion of non-federally funded nourishment sand in the regional record presented herein. The trend across the region is that the total number and volume of episodes is declining, and the cumulative nourishment volume for the region has remained nearly constant over time. This finding contrasts to the steady to exponential rise in cumulative nourishment volumes on other U.S. coastlines, (TREMBANIS and PILKEY, 1997; VALVERDE and PILKEY, 1997; O'BRIEN *et al.*, 1997).

FURTHER INFORMATION

In order to facilitate greater use of this database for research purposes, our records may be obtained either by contacting the authors directly or by accessing our web-site at http://www.geo.duke.psds.htm. The authors welcvome the submission of corrections and/or additions to the database.

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