



EEL RIVER & PLYMOUTH BEACH

by **Howard P. Barnes**

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"Plymouth Beach" is the point of land jutting out from the mainland at Warren Cove just south of Eel River and extending northerly, with a width of only a few hundred feet, for a distance of three miles. It forms a protective barrier for the harbor at Plymouth. Without this natural barrier the short front of the mainland would present a very different picture.

Periodically exposed to severe northerly and northeasterly storms, combined with exceptional high tides, Plymouth Beach has been subjected to extensive damage and erosion. One of these damaging northeasters occurred on April 1st and 2nd, 1958, causing the waves to break over the beach and the stone breakwater in many places. It broke the concrete sea-wall near the public bathhouse at the "Head of the Beach," causing extensive washing away of sand at the parking place, and carrying enough sand into the bed of Eel River to block its flow.

From the highway bridge on Route 3A the Beach is separated from the mainland for a distance of half a mile by the bed of Eel River, until the river empties into the southeasterly part of Plymouth Harbor. The storm of 1958 has revived an old question as to whether any advantage would be gained by cutting a channel across the Beach where it joins the mainland, and leading Eel River directly into Massachusetts Bay at Warren Cove. Bearing on the answer to this question is the history of the Beach and Eel River in years gone by.

SOURCES OF INFORMATION ABOUT PLYMOUTH BEACH

Two books in the library of Pilgrim Hall give pertinent references to the history of Plymouth Beach. One, the *History of the Town of Plymouth from its First Settlement in 1620 to the Year 1832* was written in 1832 by Dr. James Thacher, first Librarian and Cabinet Keeper of the Pilgrim Society. The other source is the *Records of the Town of Plymouth, 1636 to 1705, 1705 to 1743, and 1743 to 1783*, edited by a local committee and printed in 1889, 1892 and 1903. The excerpts herein given are in the original form, preserving the color and atmosphere of the periods when they were written.

PLYMOUTH BEACH ABOUT 1770

In his *History of the Town of Plymouth*, Thacher gives a description of Plymouth Beach "as well remembered by persons now living" at the time he wrote. This is his description

Plymouth Beach commences at Eel River, and extending three miles northerly, is a natural barrier to the wharves against the sweeping surges of the ocean.

Originally, the beach consisted of sand hills and hollows, covered with beach grass, excepting an area of about 80 rods in length, and 30 rods in breadth, which was a thick forest. The inner side of the beach was covered with plum and wild cherry trees, and the swamp with large pitch pine and beech wood, with a large quantity of white grape-vines attached to the trees. In the centre of the hollow, was

a spot about fifty feet square, that was a firm green sward, shaded by four beech trees, from which were suspended numerous vines with clusters of grapes, in their proper season. This was a pleasant resort for gentlemen and ladies, and was much frequented in the summer season...

The point of the beach extended to the spot where the stone pier now (1832) stands, and not far from the point was a house of entertainment for mariners, as the harbor was a famous anchorage, and sometimes near one hundred vessels were seen riding in the Cow Yard. This was the natural state of the beach until about 1770.

Our ancestors were well aware of the importance of the beach as security to the harbor, and we find in 1702 a penalty of five shillings imposed on anyone who shall fell trees or set fires on the beach.

From the Records of the Town of Plymouth

Plymouth August 31 1702

...At this Meeting upon Complaint Made to the town of the great damage likly to accrew the harbour by the cutting down of pine trees at the beach The Inhabitants doe therefor voate that henceforth Noe pine trees shall be felled on sd beach on forfeiture of 5 shillings pr tree to be Recoverable of those yt soe doe & that Noe Man shall set aney fire on sd beach on forfeiture of 5 shillings per time for the towns use.

STORM HAZARDS

Dr. Thacher's descriptions of the destructive storms and tides of the early days give us an understanding of the hazards to which the Beach has always been exposed from these causes.

Hurricane of 1635

On the 15th of August, Plymouth was visited by a tremendous storm or hurricane, which is thus described in Morton's *Memorial* (Morton copied the account given by Governor Bradford in his history *Of Plymouth Plantation*):

It began in the morning a little before day, and grew, not by degrees, but came with great violence from the beginning to the great amazement of many : it blew down sundry houses, and uncovered divers others; divers vessels were lost at sea in it, and many more were in extreme danger. It caused the sea to swell in some places to the southward of Plymouth, as it rose to twenty feet right up and down, and made many of the Indians to climb into trees for safety. It threw down all the corn to the ground ... and had the wind continued without shifting, in likelihood it would have drowned some part of the country. It blew down many hundred thousand of trees, turning up the stronger by the roots, and breaking the high pine trees, and such like, in the midst, and the tall young oaks and walnut trees of good bigness were wound as withes by it, - very strange and fearful to behold. It began in the southeast and veered sundry ways, but the greatest force of it as Plymouth was from the former quarter : it continued not in extremity above five or six hours, before the violence of it began to abate; the marks of it will remain this many years in those parts were it was sorest.

Gales of 1723, 1770, 1785

The following is a quotation from Thacher's History of the Town of Plymouth:

1722-3 February... Under this date we meet the following record, made by Elder Faunce, '...a dreadful storm, which raised the tide three or four feet higher than had been known aforetime.' This is the storm of which Cotton Mather gave an account to the Royal Society; it was on the 24th of February. In the year 1770 was a similar tide; and also about 1785, when it was level nearly with the locks of the store doors on wharves, and a quantity of salt and other goods were damaged.

In April following the gale of 1723 this entry appear in the Town Records:

At a Town meeting held at Plymouth Aprill 15th 1723 - voted That Major Lathrop Capt Dyer and James Barnebe be a comitie To Treat With ye owners of ye Beach To prevent Their Cattle going on sd beach which Will Indainger ye ruen of the harbor by ye sea breking over ye beach.

The state of the Beach was still an anxiety to the Town in 1727; further action was taken in 1748, 1749, and 1762. In 1764 comes the first mention of breaches in the Beach, which caused increasing trouble and expense as time went on. The Town Records give evidence of this

1727

At a Town meeting held at Plymouth in the Court House on the 13th of ffebruary 1726/7 Josiah Cotton Esqr chosen Moderator...

Voated that Mr John Murdock Isaac Lathrop Esqr John Watson Esqr & Stephen Churchell be a Committe to treat with the owners of the Beach in order to the preserving of said beach and to endeavor if possible to prevent the Harbours being spoyled and to make report of their doeings thereon the next Town meeting.

1748

At a Town Meeting assembled & held In ye Court House In Plymouth on Monday ye 9th Day of May AD 1748 ...

Then a vote was called to Know if ye Town would now act upon ye affair of Plymouth Beach as mentioned In ye warrant.

Voted in ye affirmative.

And Proceeded viz; whereas many Persons Frequently Drive numbers of Neat Cattle, Horse Kine & sheep to feed upon ye Beach (yt formes Plymouth Harbour) whereby Great damages, hath accrewed, as also, by Persons Takeing stones of sd Beach, great damage has been sustained, by all which ye sd Harbour Lys much Exposed. If not Timely Prevented there is Danger of ye sd Harbours being Ruined. For Remedy whereoff The Town voted That a Petition be prefered to ye Generall Court, for ye Purposes aforesd; and that Thomas Foster Esqr be agent for ye Town to Prefer sd Petition.

1749

At a Town Meeting assembled and held at ye Meeting House In the first Precinct in the Town of Plymouth on Monday ye 25th day of March A Dom: 1749...

Jeremiah Howes Lemuell Morton and Elisha Doten to take ye care of Plymouth Town Beach for ye year Ensuing Agreeable to ye Late Act of ye Province Relateing to ye sd Beach.

1762

At a meeting of the Freeholders and other Inhabitants of the Town of Plymouth, Duly Warned, Assembled and held In the Court House In sd Town on Fryday the 29th day of January A Dom: 1762...

At sd meeting the Town made Choice of Thomas Foster & Edward Winslow Esqrs To be their Agents, who are Desired and Directed to prefer a Petition to the Great & Generall Court of this Province at their present session, seting forth the Dangerous & Deplorable Scituation of the Beach commonly Called Plymouth Beach which makes the Harbour in sd Town; And the great Danger sd Harbour is in of being Intirely spoiled & Ruined if some Measures be not immediately taken to prevent the same, Praying the sd Courts Interposition aid & Assistance, and that they would Grant them such reliefe as they in their wisdom may think fit.

1764

"In 1764," says Thacher, "a viewing committee of the town reported £20 sufficient for reports of two small breaches near the woods." To quote again from the Town Records:

At a Town Meeting of the Freeholders & other Inhabitants of the Town of Plymouth assembled and Held at the court House in Plymouth on Thursday the 12th Day of July Anno Domini 1764... Then the Town Voted to chuse a Committe of 13 persons To veiw the Beach... This committee to veiw the Beach Called Plimouth Beach & Report what They Think Propper & Nessessary to be Done to secure the sd Beach & Harbour & To Project some Plan or method, that they may think Best for The Town to Do In ye Premises & to make an estimate of the charge & To make Report At the Adjournment of this meeting.

At the meeting adjourned... Wednesday the 18th Day of July Instant Anno Domini 1764. The Report of the Committe chosen to view the Beach & as Above was Read in the Town Meetting & the Town Voted their Acceptance of it. Sd Report Is as followeth, viz.: The subscribers a Comitte as within mentioned, Haveing Viewed the Beach Within mentioned Do Report that we think it proper & Nessessary for securing the sd Beach & the Harbour Depending thereon, that there Be Built a very Good & strong Hedge Immediately Well secured Behind with a Good Backing of Posts & Rails In the two Breaches From Sand Hill to Sand Hill against the Beach woods; & Likewise set a couple of smaller Hedges In the two Low places to the Southward of the Beach woods, & that there Be next Spring Beach Grass Transplanted against the sd Breaches & Low Places, and that they choose some suitable Persons Well acquainted with such Business to Procure The Stuff & Get the Work Done & that We Estimate the Expenche of the same At Twenty Pounds Lawful Money. James Warren, John Finny, [and 6 others] Major Part of the said committee. Then the Town made choise of Capt. John Finney [and 2 others] To Procure the Stuff Needfull & Gett sd work performed & Well Done According to the Best of their Judgments.

Gale of 1778

In December, 1778, there was another great storm, long remembered because of the wreck in Plymouth Harbor of the brig *Arnold*, with the loss of almost all on board. This storm increased the two breaches in the Beach, and the Town was again obliged to take action.

At a Meeting of the Town of Plimouth ... Janry 11th AD 1779 ... Then made Choice of ... a Committe to Repair to the Beach in this Town take Effectual Care that what Meteriall are now there Suteable for repairing the Same be Secured for that purpose, & to take Care in Concert with the standing Committe for takeing Care of the Beach, That no neet Cattle, Sheep or horses be allowed to feed thereon. And to consider & report what the town had best do in the Premises, at the Adjournment.

A few days later

At a Meeting of the town of Plimouth ... Janry 19th, 1779 ... In Pursuace of a Vote of the Town of Plimouth on the 11th Instant the Committe then Chosen have Been & viewed the breaches made in the Town Beach in the late Storm, are of opinion, that as the Season of the year is so verry Boisterous that it is best for the Town to lett the Beach lay as it is untill Some time late in the next Spring & then to Errect two Rows of Hedge fence at Each End of the Beach woods which is about three hundred yards and that their be Stuff procured for the same against that time.

Disastrous Gale of 1784

"In November, 1784," according to Thatcher's account,

a tremendous gale from the east, accompanied by the highest tide ever known, carried away a part of the woods on the east side (of the Beach), and overflowed the valley and swamp, by which all the trees were killed in about three years, except those on the high ground. The same year a committee from the town viewed the breaches, and reported that a wall of eighty feet in length and four feet high,

would be competent to the repairs, with a hedge fence in low places; and that it would require about 1000 tons of stone, and at the cost of £414.

Changes in the Course of Eel River

Thacher continues:

The committee also recommended the digging a canal to turn the course of Eel river, that it may empty into the channel within side of the beach as formerly: the river having been diverted from its natural course by some proprietors of meadows for their benefit, about 1750. It was the decided opinion of Mr. John Peck, a skillful marine architect, about the year 1779, that for the safety of the harbor a canal to turn the river back to its natural channel was indispensable necessary. The judgment of such a man ought to have received immediate attention.

Condition of the Beach 1803-1832

"But in the year 1803," to continue Thacher's account,

a committee of the town examined the ground and estimated the expense of a canal at a sum from \$600 to \$800. The town did not adopt this measure, and such were the extraordinary inroads of the sea, that in 1805 and 1806, the beach was in such ruinous condition that the tide swept over it and boats actually crossed at the breaches; nor was it long before a channel was worn in one of the breaches nine feet deep, and vessels loaded with stone passed through. A promiscuous wall of stone was now erected, but was soon entirely demolished by the surges of the sea, as if composed of pumpkin shells.

A reviewing committee now reported that a sea wall of two thousand feet, requiring thirty thousand tons of stone, costing \$45,000 was found necessary. The town petitioned our legislature from time to time for assistance in repairing the beach. In 1785 a grant was obtained of £500, conditional, that the town would raise and apply a like sum; but, from inability, this was not complied with. In 1806, a township of land in the state of Maine was granted on condition that the town raised and applied \$5000 in two years, which was accepted, and the township of land was sold for \$9500. In 1812, a lottery to raise \$16,000 was granted by the general court, which sum as eventually realized and applied as designed. Since that time another township of land has been granted for the same purpose. A sum amounting to more than \$40,000 has been expended for repairs since the year 1806, without any assistance from the general government. But in the year 1824, the town preferred a petition to congress for assistance, and the general government assumed to itself the future repairs, and in 1824 and 1825 made a grant of \$43,566. In 1824, the repairs were conducted by Lieutenant Chase, of the Engineer department... The next year the repairs were prosecuted under the supervision of Colonel Totten, of the corps of engineers, assisted by the collector of the port. The method adopted for the repairs, is, by triangular frames of timber filled in with stones, around and over which the sand gathers and forms a new brest. In other places large bodies of brush are laid, which have produced the desired effect, accumulating sand into cliffs and helping the growth of beach grass. The frames employed are of three sizes, a part fourteen feet base, twelve feet rafters; twelve feet base, ten feet rafters; ten feet base, seven feet rafters. These frames are morticed and tenoned together, and placed in a line vertically on the surface of the beach, and filled with stones. The largest size contains five tons, and the smallest three tons. The whole quantity of stones used from 1824 to 1831 is 14,997 tons.

Eel River Restored to its Natural Course

As an indirect aid to the security of the beach, a canal half a mile in length and fifteen feet wide was cut by the town in the year 1814, for the purpose of conducting Eel River to its native outlet within side of the beach, which has been found to be of very essential advantage. This outlet will require annual vigilance, and it is confided to posterity as a work of great importance to the preservation of

the harbor. The repairs of this beach which have so long engaged attention are now considered as complete, and with care and a little ANNUAL EXPENSE, WILL PROBABLY CONTINUE AS A MOUND OF DEFENSE FOR AGES.

These repairs have not proved to be "a mound of defense for ages," as Dr. Thacher hoped. Major easterly storms, with high tides, have continued nipping at the barrier of Plymouth Beach. In *Pilgrim Memorials and Guide to Plymouth*, written in 1860 by William S. Russell, some thirty more years of the history of Plymouth Beach are added, with stress on the

Gale of 1851

The severe storm in April, 1851, combined with the high course of tides occurring at the same time, occasioned considerable injury near the southerly part of the beach. We cannot but trust that government, following in the track of former days, will not suffer this indispensable barrier against the ocean to disappear for want of that care it requires to save our harbor from inundation.

An appropriate of \$1000 made and expended by the town, and also one by the United States of \$5000 have, in some measure, repaired the injury sustained; but a further sum of \$50,000 would probably be required to insure permanent security.

By the late 1800s, the Beach had developed as a summer recreation area, with some fifteen or more cottages, a large three-story pavilion offering rooms and serving meals, a landing wharf, and regular steamer service from Plymouth during the summer. It was a delightful place for a day's vacation, basking in the sun on the clean, white sand and enjoying the outside bathing on the shallow, sandy shore.

Gale of 1898

Then, on November 26th and 27th, 1898, came the worst storm on record in Plymouth, known in New England as the "Steamer Portland Storm." Let us refer to an "on-the-spot" report given in the *Old Colony Memorial* of December 3, 1898. The storm began about 8 P.M. on Saturday night with fine snow which, by daylight on Sunday, had developed into damp, blinding snow with an eighty-mile per hour gale. Full tide was at 10:30 A.M., covering Water Street with two to three feet of water. The storm abated by late evening. A fleet of vessels in the Cow Yard parted or slipped their cables, and either sank or were washed ashore. Heavy surf rolled across the Beach for over a mile, undermining the cottages, which were tumbled into the harbor by the fierce gale. To quote :

At Plymouth Beach the destruction was complete, over a mile of the sand ridge being cut down to a low bar. Every cottage was wrecked, all but one of the seventeen being swept away, and the Columbus Pavilion being represented by a small part of the original structure. The sand filled Eel River full inside the beach, and the surf cut a new passage for the stream straight out to sea... The Warren Avenue and River Street bridges were ruined.

The entire Beach was washed inland from opposite the Franklin House (at Manter's Point), a distance of twenty feet, filling the bed of Eel River seven feet above its old level ... and wreckage reaches as far upstream as "Hayden's Mills," there being acres of it, while the road bed is covered with sand two feet deep.

Three weeks later, the *Old Colony Memorial* reports that Major Harwood, of the United States Engineers in charge of government works in this district, visited the scene.

He found the former protection to our harbor in very bad condition, about 9000 feet of its length having been overwhelmed by the terrible surf of November 27, and the government barriers completely destroyed ... From \$50,000 to \$60,000 is needed to put the Beach in proper defensive

condition... We understand that Major Harwood is of the opinion that Eel River should again be restored to its channel inside the Beach.

The Federal Government, in 1899, stepped into the picture and assumed the responsibility for protecting the Beach by a rip-rap dike, and for restoring Eel River to its natural course within the Beach.

It is fitting to close this history with part of the record of the U.S. Army Engineer Division, New England, kindly furnished me by Captain Walter H. Johnson. The present stone dike begins north of the Beach Club, about 1200 feet northeast of the northern end of the Plymouth Town Beach seawall, and extends for about 12,000 feet to the high dunes near the outer extreme of the spit. This dike is covered with dunes in some locations. No details are available for the several types of timber cribs used in earlier days, and filled with brush and stone, or stone alone, as the storm of 1898 washed away all traces of them.

Since 1898, the stone mound dike has been consistently used. This dike is five feet wide at the top, and is built eighteen feet above mean low water, or eight and four-tenths feet above mean high water. The rock is placed on the easterly, or bay, side, with a slope of one foot vertical to two feet horizontal, and on the harbor, or westerly, side with a slope of one to one. Congress has delegated to the Corps of Engineers the responsibility of maintaining this dike for the proper functioning of navigation in Plymouth Harbor, and it is paid for by Federal funds.

That this struggle of man against wave and wind has been an endless one, is borne out by the record of the Corps of Engineers of work done on Plymouth Beach.

1826-1834

Construction of stone wall and planting of beach grass

1835

Construction of 900 feet of stone wall, 1500 feet of brush fence and planting of beach grass (\$50,000 spent 1824 to 1835)

1836-1839

Repairs to existing wall and construction of stone fill timber crib wall, \$2500

1840-1841

Minor repairs

1853-1854

Closed 2400 feet of breaches caused by the severe storm of April 1851, using triangular timber cribs filled with stone

1866

Replaced 1300 feet of stone filled timber cribs

1868

Constructed 200 feet stone filled cribs

1872

Constructed 200 feet brush bulkhead, 250 feet of stone jetties, added more stone, etc.

1873

Constructed 3000 feet brush and stone jetties, etc.

1874

Constructed 3100 feet brush groins and more timber cribs

1875-1882

Stone bulkhead on outer end extended

1883

Extended 830 feet stone bulkhead, etc.

1886

Extensive repairs to bulkhead at south end

1888

Constructed 370 feet of timber plank bulkhead

1892

1300 feet bulkhead repairs

1899-1905

November 1898 storm destroyed all protective works, lowered level of the Beach, and blocked the outlet of Eel River. 12,000 plus or minus feet of new type stone dike placed, at cost of \$72,000

1910-1911

Additional 616 feet stone dike for a total length of 12,459 feet

1912

1300 feet of dike repaired

1936

8000 feet of dike repaired

1957-1958

Still at it, repairing stone dike

The concrete sea-wall and the rip-rap at the Town Beach property at the "Head of the Beach" is a project, not of the Federal Government, but of the State, with some participation by the Town.

And so it goes. From 1620 to 1958 we have had many destructive and erosive storms. Will the stone dike protective barrier, adopted since 1898, with constant attention, be the answer? Who can tell? The struggle of man continues, and will continue forever, against the destructive forces which seek to wear away the defensive barrier to Plymouth Harbor.

PLYMOUTH BEACH: Protective Barrier of Plymouth Harbor

by Edward Chase

Pilgrim Society Note, Series One, Number 22, 1972

These current notes are a continuation of Pilgrim Society Note No. 8, dated August 1958, prepared by Howard P. Barnes. The reason for bringing up to date the Howard Barnes report, only fourteen

years later, is that around 1970 extensive construction was completed by both the State and Federal governments, far exceeding in scope and cost the combined total of all works done prior to 1970.

State Seawall

In the fall of 1969, the State constructed at a cost of \$106,000 a concrete seawall 1050 feet long running northerly from the end of the 1958 wall to the Federal stone dike at the Manters Point footbridge over Eel River. The elevation of the top of this seawall is twenty feet above mean low water. On the bay side of this wall and five feet below its top, a stone apron was built extending fifteen feet towards the ocean. The County of Plymouth and the Town of Plymouth contributed a total of half the cost of the seawall.

Stone Groins

As part of the contract for construction of the seawall, two stone groins were built making a total of five stone groins between the southerly end of the Town-owned property and Manters Point. These five groins are each 180 feet long, perpendicular to the seawall, and are spaced 460 feet apart. The function of a groin is to build or maintain a protective beach by trapping littoral drift (mostly sand) or to retard the erosion of an existing beach.

Town Purchase at Southerly End of Beach

In 1962 and 1962, the Town bought from private owners about 1000 feet of waterfront running from the end of the 1958 wall northerly to Manters Point. The average width of this strip of land is 200 feet running between the center line of Eel River and the mean high water line of Plymouth Bay.

Direction of Plymouth Beach

Although we speak of going northerly and southerly along the Beach, Plymouth Beach points like an arrow in the direction of North thirty degrees West (true meridian).

Federal Construction

In 1970-1971, the U.S. Army Corps of Engineers made a major contribution to Plymouth Beach at a cost of \$724,000. The work consisted of three parts : (1) rebuilding the stone dike and installing stone aprons on both sides, (2) building a new stone jetty at the northerly end of the Beach, and (3) building an adjustable groin. This work was grouped by the Corps of Engineers under the title "Rehabilitation of Long Beach Dike," with plans and specifications dated April 17, 1970.

Rebuilding Stone Dike

The rebuilt stone dike extends from Manters Point northerly about one mile. The top of the dike is five feet wide and eighteen feet above mean low water. The slopes are two to one on the bay side and one to one on the harbor side. On the bay side, a continuous stone apron has been placed from the dike at elevation ten feet above mean low water extending forty feet easterly towards the ocean. On the harbor side, a continuous stone mat has been placed from the dike at elevation fifteen feet above mean low water extending twenty-five feet westerly towards the harbor. The stone mat on the westerly side absorbs the force of the waves which break over the top of the dike in a severe storm and which formerly washed out the ground in back of the dike.

New Stone Jetty

A new stone jetty was built at the extreme northerly end of Plymouth Beach (Long Beach) about 800 feet long and extending in a general northeasterly direction. The top of the jetty is eight feet wide and runs from elevation eighteen feet above mean low water to elevation twelve at the northeast end.

Adjustable Groin

The adjustable groin is 315 feet long, perpendicular to the Beach on the bay side and abreast of the last group of three cottages (most northerly cottages on the Beach). The groin consists of thirty-seven

prestressed concrete piles spaced eight feet nine inches apart. Between the concrete piles are inserted creosoted timber stop-logs. By adding more stop-logs in the future, the height of the groin can be adjusted to a maximum elevation of thirteen and one half feet above mean low water. The site of this groin was picked to build up the narrowest portion of the protective barrier called Plymouth Beach. If this experimental groin is successful in building up the protective beach, the Corps of Engineers plans to construct ten additional similar groins spaced about 1000 feet apart going southerly.

Storm of February 19, 1972

The new State and Federal construction received a severe testing on February 19, 1972, when a tremendous northeaster with high-course tides hit Plymouth Beach. The concrete seawall came through the ordeal unscathed as did the stone dike. The only damage to be observed was to the stone mat in back of the dike. The waves breaking over the top of the dike dislodged about one per cent of the cover stones (each stone weighing 500 to 1000 pounds) of the stone mat on the harbor side.

Inner Breakwater

Although not a part of Plymouth Beach, note should be made of the fact that an inner stone breakwater was constructed by the Corps of Engineers in 1969-1970. This breakwater is about 3500 feet long and makes an arc in Plymouth Harbor around the Town Wharf, the State Pier, and a new anchorage basin eight feet deep. The cost of this breakwater and anchorage basin was \$2,325,000 with the State and Town each contributing ten per cent.

Ownership of Plymouth Beach

Plymouth Beach is 16,000 feet long. The Town of Plymouth owns eighty-one per cent of the Beach. The other nineteen per cent is owned by twenty-four separate owners. On these twenty-four parcels there are nineteen cottages at the present time.

Bird Sanctuary

The most northerly 3000 feet of Plymouth Beach, which is owned by the Town, has been protected and maintained as a tern colony by the Massachusetts Audubon Society. The Society has been ably assisted by the Plymouth Conservation Commission. In 1971, the Conservation Commission enclosed the tern colony with about 7000 feet of snow-fence and planted beach grass to help stabilize the dunes.

Motor Vehicles

In addition to action by wind and wave, Plymouth Beach is also being perceptibly worn away by motor vehicles. The main cart-path or roadway along Plymouth Beach has always been on the westerly or harbor side. However, about halfway along the Beach there is a cut through the sand dunes. Most of the vehicles in the summertime take this cut and churn their way northerly up the Beach on the easterly or bay side. About half a mile northerly from the cut through the dunes, the vehicles (4 -wheel drives) come upon the new adjustable groin which might be thought to be the end of the line. But the stop-logs have been removed from three panels of the groin and the vehicles pass right through the groin. The vehicles are also able to navigate around the inboard end of the groin.

From the early eighteenth century when, as noted by Howard Barnes, the townspeople attempted to prevent cattle herders from ruining Plymouth Beach, to the late twentieth century when motorized cowboys are endangering the Beach, history shows that man, as usual, is his own worst enemy.