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This paper is a summary of work in progress designed ultimately to treat geological and crustal change in eastern Maine, agricultural practices along the Maine coast, and land speculation downeast in the earliest days of settlement.

A few years ago the authors were asked by the Maine Geological Survey to assist them in dating historical structures under geological stress. This dating augments radioactive isotope work conducted on salt marshes in eastern Maine.[1] By site visits, and through close analysis of the topographical maps and aerial photographs of the area, a number of man-made structures were chosen for dating purposes. Among them are dykes[2] built between 1790 and 1870, primarily in Washington County, in order to control and reclaim salt marsh land.

Dykes were constructed along the New England coast as early as 1739. These dykes, built in the Cohasset River area, deteriorated but were eventually rebuilt in 1792. About nine acres of salt marsh were dyked in two separate efforts. When the dykes were reconstructed they were designed to reclaim an area of nearly one hundred acres.[3] Dyking was also fairly well known in Nova Scotia where French settlers along the Bay of Fundy began to reclaim lands late in the seventeenth century.[4] This shore was well known to Massachusetts colonial troops and traders.

In the Massachusetts area an extensive period of dyking began after the Revolution. Two dykes were built in 1789 and 1795, although neither were in use for long. When the Medford Turnpike was constructed in 1803 an area

of about fifty acres was dyked in conjunction with that road. Others were constructed in the Chelsea area in 1813. In addition salt marshes were dyked in Dartmouth and Westport.[5]

It seems clear that the technology of building dykes to reclaim coastal salt marshes was reasonably well known in Massachusetts. In 1823, the famous agricultural editor Thomas Fessenden published detailed instructions on building dykes, repairing them, their use, and, generally, provided knowledge to anyone who was interested in the subject. Even earlier Samuel Deane gave instructions on dyking in his agricultural dictionary.[6]

The method of transmission of this knowledge to Maine is unknown, but some informed conjectures can be made. Many of the early Addison and Machias, Maine, settlers came from Salem, Newburyport, and Martha's Vineyard in Massachusetts, as well as Scarborough in Maine. Interest in this downeast area originally centered on the possibility of using the marshes as a source of hay for their cattle in winter and probably as a source of income in the Boston market. The earliest settlements in Scarborough were also founded to procure hay.[7]

Speculators and farmers from the north shore of Massachusetts Bay came to Maine looking for these early sources of hay. Their trips were taken prior to any real efforts at settlement. However, activity in the area stimulated creation of a settlement company. Machias town proprietors now began to plan for settlement and to allot lands in this frontier area. By 1769 some land was surveyed and the allotment began. Settlement was sporadic and troubled until after 1785. Still, the value of the salt marshes was well known. Settlers' land rights always included upland or higher salt marsh, as well as lower salt marsh in relatively equal amounts. In fact, at least once, trespass and resurvey of salt marsh lands

resulted in physical conflict and the sheriff was called in to intervene and settle the dispute.[8]

The hay from the marshes was very valuable. Upper salt marsh hay could be fed to cattle in the winter, and it provided a source of nutrients on which cattle might thrive. Lower salt marsh hay produced a coarser hay, called "thatch," which would be used for bedding and rougher purposes and, in emergency, could be fed to cattle.[9] Some hay was also apparently used for fertilizers. A few years after dyking, the salt would be leached from the soil sufficiently to allow the seeding of English hay on upland marshes. Access to the marsh was fairly easy in August and September after regular haying was finished so farmers were prompt to utilize this source. Real estate deeds for the period distinguish between areas producing salt hay, in its various forms, and English hay harvested from upland freshwater meadows.[10]

Dykes were built in Addison in 1792, according to one deed from this area, but the evidence is unclear as to where this dyke was and how long it was in use. Other dykes in the Addison area were constructed by 1795 and a period of reclamation activity ensued. However, this apparently was not an organized effort. More secure materials for dating other sites downeast have been located dating from 1823 to 1835, with the main dykes in Machias being constructed from 1823 to 1826.

Joseph Fenno, originally a resident of Salem, moved part of his mercantile business to the Machias area about 1800. By 1823 he had risen to moderate importance in the area, and he had begun to purchase the original proprietary rights to salt marsh in Machias, Machiasport, and what is now East Machias. His activity in the purchase of land rights and salt marsh was substantial. In the spring of 1824 advertisements appeared in the local press from William Simpson calling to the attention of the public his

intention to dyke a salt marsh in East Machias.[11] Throughout the area a dyking spree apparently ensued, probably following the directions published in the *New England Farmer* the previous year.

Dyking involved tedious work over long periods of time by teams of three men. Using a special dyking spade equipped with a long, narrow blade, perhaps fourteen inches long and five inches wide, the first person dug a sod of this length and width, and perhaps four inches deep. The sods were dug about ten feet behind the proposed dyke, thus providing both dyking material and a ditch to drain the water. The digger then passed his sod brick to a second person. He, in turn, gave it to a third person who laid the sods in an interlocking fashion much like bricklaying. The dyke was built wider at the bottom and formed, in profile, a crushed, flat-topped pyramid. Every so often in the dyke, perhaps each fifty to one hundred feet, an area was left open for a clapper or flapper valve to be installed. When the tide is in, the valve closes automatically, thus preventing contamination behind the dyke, while when the tide is low, the valve swings free, allowing drainage of the water from the marsh. In most areas the dykes were eight feet wide and six feet high. However, where the stress was greater, dykes were occasionally constructed as much as thirty feet wide, at bottom, and fifteen feet high. Normally roads, often corduroy roads, were constructed on the dykes for access to the hay. Complete drainage of the salt marsh, and the subsequent creation of an area to seed with English hay took from ten to fifteen years. Dykes needed fairly frequent repair, especially after heavy winter storms, or especially high tides.[12] Tax records from the area attest to the increased value of dyked marsh lands.[13]

In the Machias area Fenno and his associates dyked and reclaimed over four hundred acres of salt marsh in this first spurt of activity. In the middle 1860s a second and

much greater effort was begun in Machias. An immense dyke was constructed on the Middle River between Machias and East Machias. This dyke was built with huge loads of earth brought to the site by tramway. By 1874 the upper portion of the land was producing very large crops of English hay, although the process of leaching the areas nearer the water was not as successful. In the 1920s the state erected a road over the dyke (a railway had passed over earlier) and inserted a huge steel flapper valve still in place, although since local dairying disappeared in the 1940s, the hay is no longer harvested.[14] Elsewhere in the area the state has put in place other large steel flapper valves, and in Nova Scotia, on the Tantramar marshes, such valves and dykes are commonplace where public roads are located.

The reclamation of salt marshes continued to interest progressive farmers in Maine. The subject of fencing on the dykes in areas where several owners wished to pasture cattle was discussed.[15] Other areas were dyked, especially in Marshfield, Kennebunk, Old Orchard and elsewhere, as well as in other areas of New England. When the editors of the state's press met in Machias for an excursion, they viewed the dykes and many reported their findings to their readers.[16] Scarborough marshes were always an object of interest for potential dykers and several attempts, none very successful, were begun in that area.[17]

Over and over again the *Maine Farmer* presented articles, queries, and responses with regard to salt marsh reclamation. Usually, however, it was the Nova Scotia marshes that were cited as exemplars for future work.[18]

Dykes in the southern part of Maine tended to go out of use fairly early. The demand for hay increased but cleared land inland supplied that need. Remains of those dykes are noticeable from the road once one is prepared to look for them. Downeast, the dykes remained in good

repair until the 1920s. Even in that decade dykes were constructed and repaired on the Pleasant River in Addison. By World War II, however, farming downeast had nearly disappeared. Dykes were no longer repaired routinely each spring. Hay was still cut, but now for use only in burning the blueberry barrens. By 1946 even this use was over, once low cost petroleum derivatives replaced the salt hay. Today the dykes remain. Whether their usefulness is over is unknown, but their history of providing income for downeast farmers suggests that another day may yet see dyking and reclamation of salt marshes both as a topic in the press and on the land.[19]

NOTES

[1] David C. Smith, Anne E. Bridges, and R. Scott Anderson, "Agricultural Dykes and Salt Marshes: Tools for Study and Dating in Recent Geological Time," *Abstract* in Geological Society of America, Sixteenth Annual Meeting, 1981, p. 121; R. S. Anderson, C. D. Race, H. W. Borns, Jr., and D. C. Smith, "A Rising Sea-Level in Maine, as Determined from Salt Marsh Data," in *ibid.*, p. 177.

[2] Dykes were spelled this way until 1920 when the spelling "dikes" began to be normal. There is a transition period from 1870 to 1920 when "dykes" is normal, but the second spelling is occasionally used. However, "dikes" is found very early as well. We choose to use "dykes" as this was the more normal spelling in the time under discussion.

[3] *New England Farmer*, March 2, 1827, letter from "D."

[4] Graeme Wynn, "Late Eighteenth Century Agriculture on the Bay of Fundy Marshlands," *Acadiensis* 18 (Spring 1979): 80-89; A. H. Clark, *Acadia: The Geography of Early Nova Scotia* (Madison, Wisc,: University of Wisconsin Press, 1968); Howard Trueman, *Early Agriculture in the Maritime Provinces* (Moncton, N.B.: Times Printing Co., 1907).

[5] *New England Farmer*, Jan. 26, Feb. 2, March 2, 1827, all salt marshes and dykes in Massachusetts; *ibid.*, March 25, 1826, quoting the *New Bedford Mercury* on "Reclaimed Marshes."

[6] *New England Farmer,* March 1, 1823, Thomas Fessenden, ed., "On Embankment Dikes, Drains, etc. for the Purposes of Reclaiming Lands from the Seas, Rivers, etc." Also see *American Farmer,* 2: 131, 243, 244; Samuel Deane, *The New England Farmer* (Worcester, Mass.: Isaiah Thomas, 1790), pp. 81, 169-70, 218-19.

[7] George W. Drisko, *Narrative of the Town of Machias,* (Machias, Me.: Press of the Republican, 1904).

[8] Town of Machias, Proprietors' Records, County Commissioners' Archives, Machias, Me.

[9] D. B. Scott, and F. S. Medioli, "Vertical Zonations of Marsh Foraminifera as Accurate Indicators of Former Sea Levels" *Nature,* vol. 272, no. 3653, April 6, 1978, pp. 528-31; W. F. Ganong, "The Vegetation of the Bay of Fundy Salt and Dyked Marshes: An Ecological Study" *Botanical Gazette* 36 (1903): 161-86, 280-302, 349-67, 429-55; Anderson *et al.,* "Rising Sea Level in Maine;" *New England Farmer,* Jan. 21, 28, Feb. 4, 9, March 16, 1831. These last are four responses from different persons to a query on salt marsh uses. The *Oxford Dictionary* definition of the words used in the deeds indicates a direct transfer of technology from the fens area of England. On the peat that was a part of these marshes and contemporary views of its use see *New England Farmer,* May 13, 20, 27, 1825. For haying on the salt marsh dykes see Farm Ledger and Day Book, Samuel Waldo, 1796-1803, for a Thomaston dyked marsh. In Maine Historical Society collections. An important book is Douglas Johnson, *The New England-Acadian Shoreline* (New York: J. Wiley and Sons, Inc., 1925; reprint ed., New York: Hafner Press, 1967), chapters 16, 17, especially.

[10] See forthcoming work by the authors on Joseph Fenno and other land speculators in the 1820-45 time period. As an example see Deed, Joseph Fenno to S. and W. Holway, March 26, 1834, Book 27, pp. 108-10, 206-7, Washington County Register of Deeds, Machias, Me.

[11] *Machias Eastern Star,* April, 1824

[12] Personal observations, oral interviews with Fellows Drisko and Earle H. Preble, June 1, 1979; *Maine Farmer,* Sept. 26, 1874, "The Dyked Marshes of Machias River;" *New England Farmer,* March 1, 1823; *Kennebec Journal,* Dec. 7, 1866, on repairs needed after a bad storm and high tide.

[13] Tax records for the 1840s, East Machias, Maine, in possession of E. Jones, who allowed us to use them. Most of the tax records for both Machias and East Machias were lost in fire. The deeds indicate an increased value greater than other land transfers as well.

[14] *Maine Farmer*, July 23, 1863, Sept. 26, 1874; personal observations; *Portland Price-Current*, June 16, 1866, reporting a meeting of the dyking company; June 10, 1868; and the books of the Middle River Dyking Company, located in Special Collections, Fogler Library, University of Maine at Orono.

[15] *Maine Farmer*, April 10, 1869.

[16] *Maine Farmer*, May 27, 1871; *Portland Price-Current*, Aug. 24, 1867; *Kennebec Journal*, July 27, 1866, are examples of press comment. Also see *Fourteenth Annual Report of the Secretary of the Maine Board of Agriculture, for the Year, 1869* (Augusta, Me.: Sprague, Owen and Nash, 1870).

[17] *Portland Price-Current*, April 20, 1867; *Maine Farmer*, June 15, 1872, J. P. M., "Farming in Maine."

[18] *Maine Farmer*, Feb. 21, 1861, letter from Hopewell, N. B. , asking for information on how to use dyked land he had begun to reclaim. Interestingly enough, his experience was as a boy on the south shore of Massachussetts Bay; Dec. 4, 1862, a letter on Nova Scotia agriculture; October 2, 1862, an editorial, "Reclaiming Salt Marshes"; April 11, 1867, "Diking Marshes"; June 14, 1860, Agricola writing on the Minas Basin and why doesn't Maine do more with its salt marshes.

[19] Oral interviews with Fellows Drisko and Earle H. Preble, Addison, Maine, June 7, 1979; *Maine Farmer*, Aug. 16, 1888, describes haying on fresh meadows, then haying for salt hay with horses wearing "bog shoes" in Waldo County.