TWO MANGUM TERRACE (DITCH & EMBANKMENT) FEATURES, SWAN ISLAND, KENNEBEC RIVER

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Introduction

Two linear ditch-and-embankment features found in a 35-acre abandoned farm field on Swan Island, Kennebec River, Maine are identified as a rare surviving example of *Mangum Terrace* farming in New England.

Swan Island is located in the Kennebec River between the towns of Richmond and Dresden. The island is owned by the State of Maine and operated as a wildlife management area. The island is 4 miles long by 1/2 mile wide and comprises 1,755 acres of land. The first permanent settlement of the island began in the 1700s. In 1847, the residents successfully petitioned to separate from Dresden and became incorporated as the town of Perkins. During the nineteenth century the island's economy was based upon farming, lumbering, ship building, and commercial ice-cutting operations.

The early twentieth century saw a significant decline in the island's economy and with it a decline in its residential population. By 1918 there were insufficient residents to fill the town's offices and the town was unincorporated and became Perkins Township. In the early 1900s, the state built a bridge over the Kennebec River between Richmond and Dresden just above the island. With the new bridge, ferry service between Richmond-Swan Island-Dresden was discontinued in 1936. With the exception of a few seasonal summer residents, the island was abandoned by the 1940s (Fleming 1966:111-126; MDIFW 2000: 1-6). In 1995, the Island's eight surviving historic buildings and numerous archaeological sites dating from the historic period were placed on the National Register of Historic Places as the Swan Island Historic District.

Findings

The site consists of two separate ditch-and-embankment features. The two features are located in an approximately 35-acre open field.[1] The field was plowed and cultivated with wheat and corn crops until 1936 when the farm was abandoned.[2] The western edge of the field is delineated by a north-south dirt road that runs the length of the island. The north and south sides of the field are delineated by the partial remains of a broken-down stone wall and large-diameter trees which are typically found along the edge of farm fields. The east side of the field is delineated by a series of three man-made farm ponds that drain northward to the Kennebec River. The farm ponds are located in the lowest elevation of the field and water from the field drains down slope (from west to east) to the ponds. On the east side of the farm ponds is another open field.

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[1] 44o 03' 15.13" N 69 o 47' 46.57" W

[2] Information about the field from a recently installed interpretative sign at the site of the Wade House.

[3] The length, width, and distance measurements were taken from aerial photographs using the Google Earth software. The width of the features was spot checked in the field using a tape measure and was consistent with the measurements from the aerial photographs. The elevation data used to calculate the average slope of the features were from Google Earth database which was compiled from USGS and Maine GIS data. The height and depth of the features are based upon field measurements using a tape measure and should be considered rough or approximate measurements.

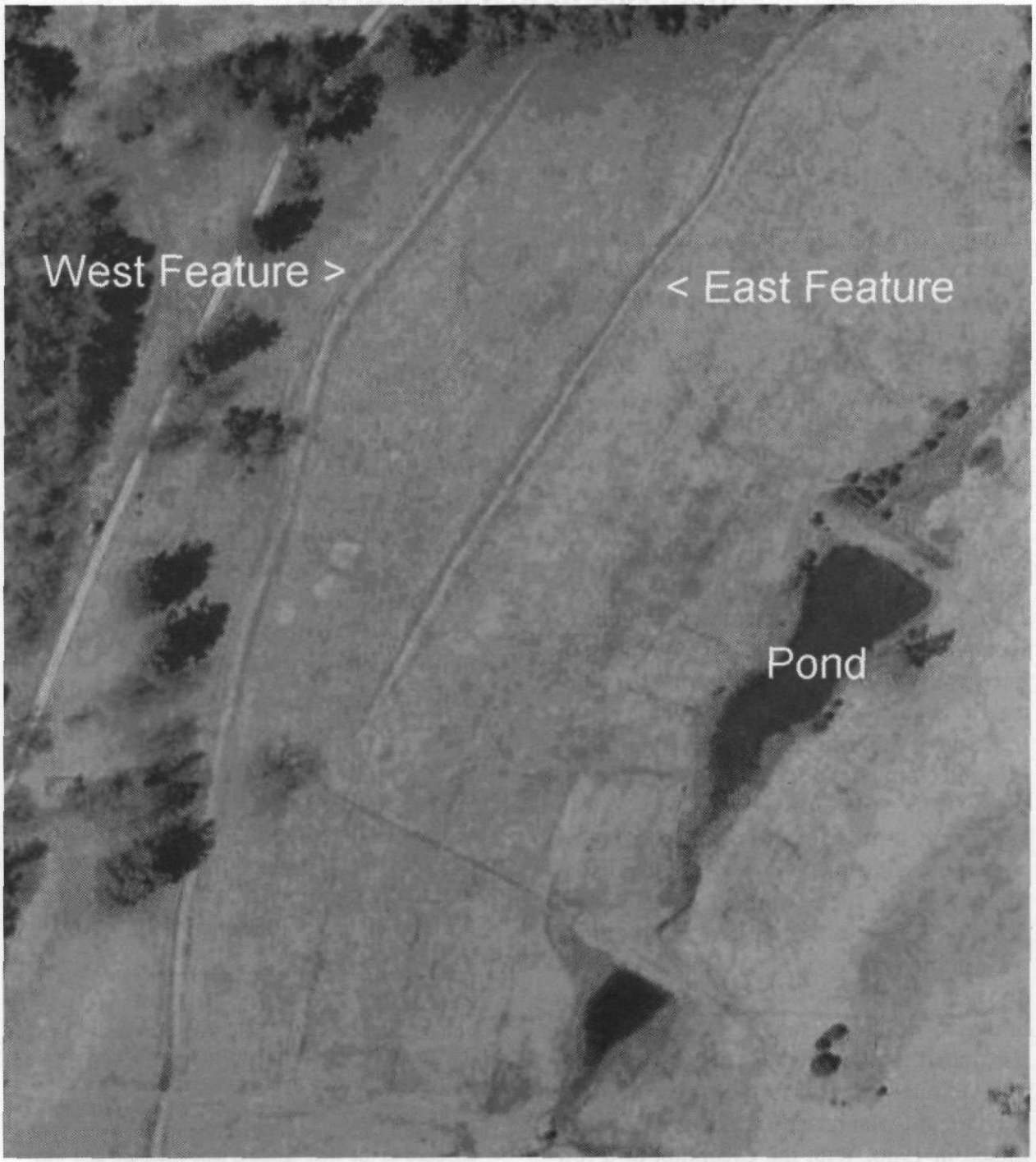

Figure 1. Aerial photo showing the mangum terrace features (Source: MaineGIS/Google Earth).

The west ditch-and-embankment feature is approximately 1,600 ft in length.[3] The ditch is situated on the uphill side of the embankment. The ditch varies from 12 to 16 ft in width and the depth varies from 12 to 24 in. The embankment averages 16 ft in width and the height varies from 24 to 30 in. The southernmost three-quarters of the feature drains southward with an average 9-inch drop in elevation per 100 ft. The north and south ends of the ditch and embankment terminate a few feet short of the edge of the field. Both these ends curve slightly downhill.

The east ditch-and-embankment feature is approximately 800 ft in length. The ditch is situated on the uphill side of the embankment. The ditch varies from 12 to 14 ft in width and the depth is generally less than 16 in. The embankment varies from 14 to 16 ft in width and its height varies from 12 to 24 in. The feature slopes from south to north at an average 12-inch drop in elevation per 100 ft. The north side of the ditch-and-embankment connects to a modern backhoe-dug drainage ditch, which in turn connects to the outflow from the farm ponds. The south side of the feature fades out in the middle of the field.

On the south end, the two features are approximately 190 ft apart. In the middle they are approximately 260 ft apart. At the north side they are approximately 175 ft apart. Both features follow the general contour of the hillside.

Rose bushes (*Rosa multiflora*) were observed scattered throughout the field and on the embankments. A line of intermittently spaced bushes was discernible along the length of the east side (down slope) of the west embankment feature. The bushes were less than 2 ft in height due to periodic mowing of the field by the Department of Inland Fisheries and Wildlife.

Discussion

The two linear ditch-and-mounded embankment features were first identified by the author in 2004. The size, length, and design of the two ditches and embankments were unusual and not the typical type of open-ditch drainage used on nineteenth and early twentieth century New England farms. Based upon these unusual characteristics, the author reported the site to the Maine Historic Preservation Commission (MHPC). A review of the Maine Historic Sites Inventory determined that the features had not been previously identified or documented. In June 2007 the author conducted a site walk of the features with Leon Cranmer, historical archaeologist, and Bill Burgress, both from Maine Historic Preservation Commission.

The site walk concluded that the two features were related to agricultural activities on the property, specifically drainage of excess water from the farm field. The subsoil of the island is marine clay, called the Presumpscot Formation, which makes absorption of water difficult and leads to much standing water on the surface. The site walk determined the purpose of the features but was unable to explain the unusual design of the drainage system.

There were two significant and unusual design elements. First, both open ditches were accompanied by a mounded embankment created from the excavated soil removed from the ditches. Nineteenth century open ditches found on farms and along roads in New England generally lack a mounded embankment. The excavated dirt from the ditch was either hauled away or spread out evenly adjacent to the open ditch. An 1860 manual on farm drainage states, "There is a large quantity of earth from an open drain to be disposed of, either by

spreading or hauling away" (French 1860: 101-102). An 1884 farm manual recommends, "Then, with a scraper, carry the earth out, spreading it equally on each side over the outer surface." (Periam 1884: 333) Second, most open ditches were along the edges of the field (with the exception of salt-marsh hay fields) not in the middle of the field where they would potentially interfere with plowing and would also reduce the amount of acreage available for farming (French 1860:102). An intensive search of Cornell University's *The Core Historical Literature of Agriculture* (CHLA) full text database[4] and Google's full-text book database[5] identified an agriculture farming technique, the mangum terrace, which matches these two unusual characteristics.[6]

Figure 3 is reproduced from *Land Drainage and Reclamation* (Ayres and Scoates 1928) and illustrates the basic design of the mangum terrace. It consists of a wide embankment, which is generally referred to in the literature as a *terrace* or *broad terrace*, with a wide shallow ditch on the uphill side of the terrace. The distances between terraces, the width and height of the terraces, and the width and depth of the ditch varied according to the soil type, slope of the field, and other factors. Based upon research from the Texas Agricultural Extension Service, the authors of *Land Drainage and Reclamation* provided a detailed table of measurements for the construction of mangum terraces based upon these various factors. The width of the terrace ranged from 16 to 22 ft and the height ranged from 15 to 24 in. The width of the ditch ranged from 7 to 11 ft, with a depth of 9 in. They recommended a grade with a 7-inch drop per 100 ft for the ditches (Ayres & Scoates 1928:285-287). The ditch and terraces were constructed using either a plow, road scraper, or a V-shaped drag pulled by an oxen or horse team (Hall 1949:105).

The development of the mangum terrace is generally credited to Priestly H. Mangum Sr.[7] He constructed his first broad ditch-and-embankment terraces in 1885 on his farm near Wake Forest, Wake County, North Carolina. The purpose of the method was to reduce soil erosion on hillside fields.[8] The terraces on his farm are described as being, "about 2 feet high and 6 feet broad, with a flat depression about 10 feet wide on the up-slope side. The grade was approximately 8 to 10 inches per 100 feet. Most of the terraces were discharged into wooded areas, but in one field a "canal," or wide ditch, was constructed to carry the discharge from the upper terraces to a stream bottom. Crop rows were often run across the terraces at an oblique angle" (Hall 1949:103). Mangum's terracing system received much interest and attention over the next two decades but much of that interest remained largely confined to the southern Piedmont region. The practice did not receive national attention until 1917 when C. E. Ramser,

[4] http://chla.library.cornell.edu/c/chla/index.html
[5] http://www.google.com/books
[6] Mangum terraces are also known as *graded broad terraces.*

[7] Arthur Hall argues the ditch and terrace design was the logical outcome from years of experiments with hillside ditching and hillside terracing in the hilly regions of Georgia, South Carolina, and North Carolina between the 1820's and 1880s. Hall further argues that there is evidence that mangum terrace design may have been developed concurrently but independently in several different locations during the 1880s. (Hall, 1949: 101-103)
[8] "The theory of this terrace, which has proven true in years of practice, is that a broad shallow stream of water does not have as great a velocity as a narrower and deeper one, and that by decreasing the velocity more water is taken up by the soil, and less soil and fertilizers are washed away ..." (Elliott, 1919: 333-334).

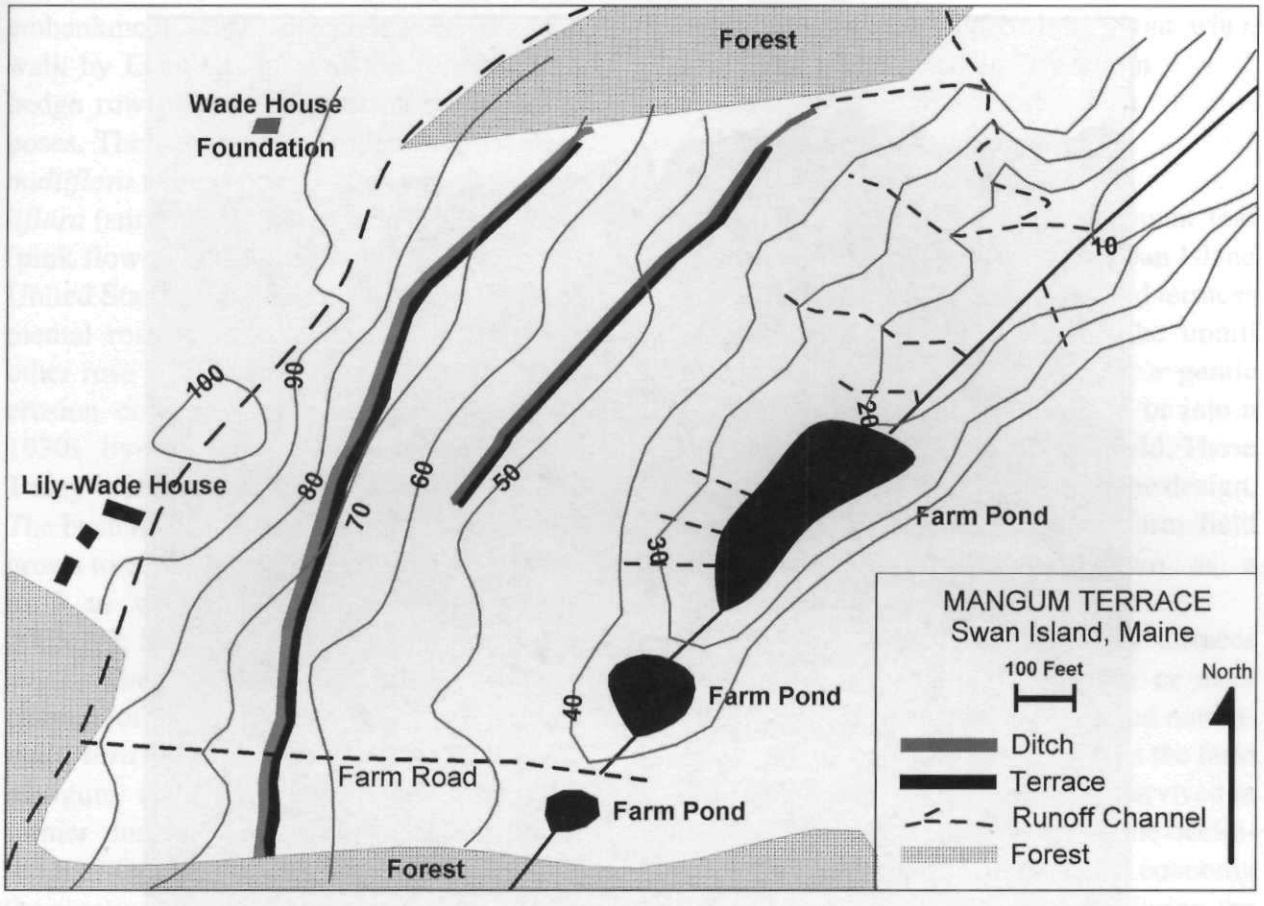

Figure 2. Site map (compiled from USGS map and aerial photos).

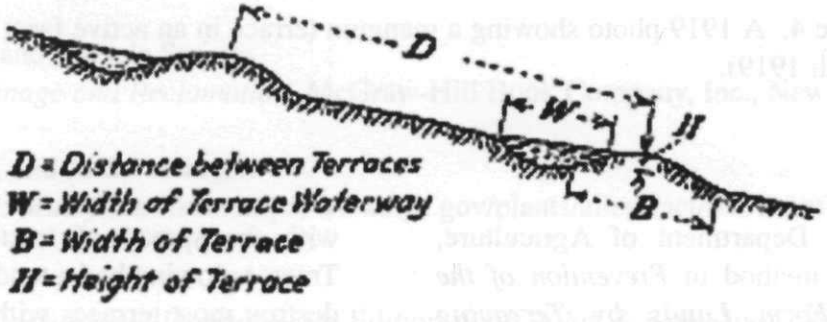

Figure 3. A 1928 illustration showing the basic features of the mangum terrace (Ayres and Scoates 1928).

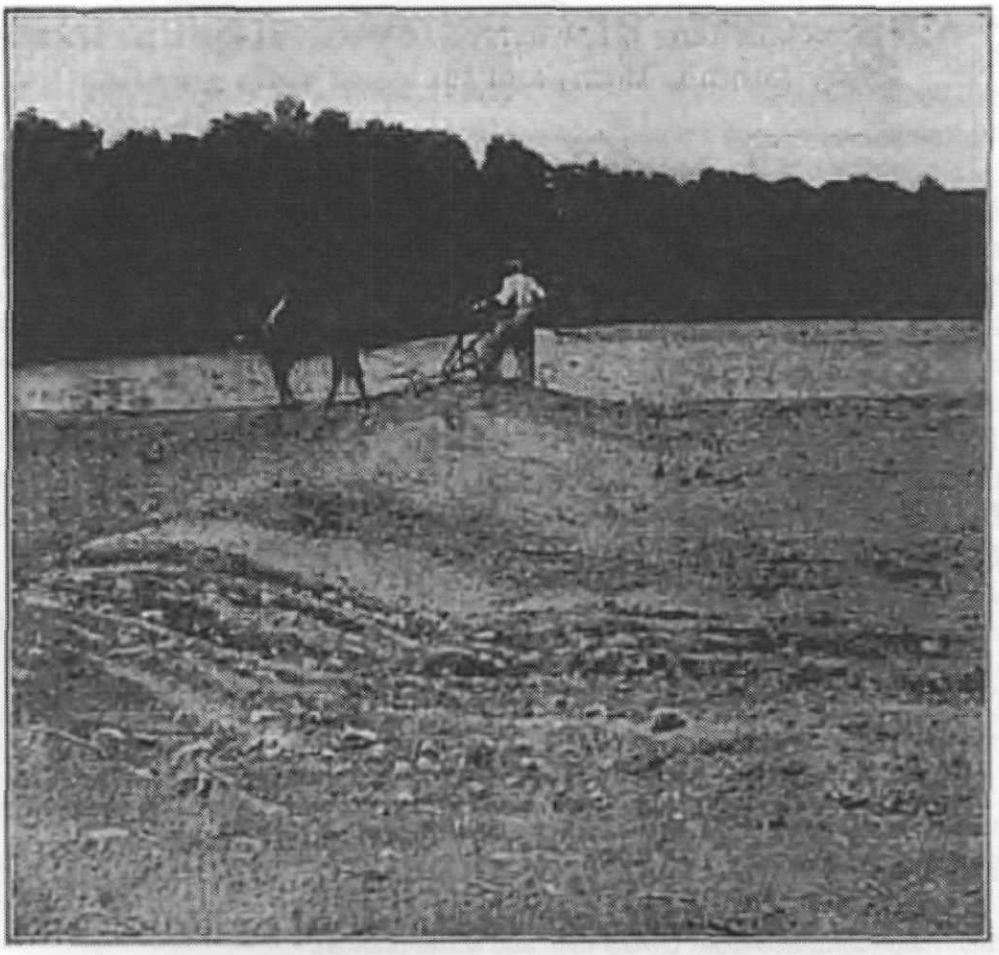

Fig. 138.—The mangum terrace—a great discovery in agriculture. It is a ridge going across the face of a slope so that water will follow it to the edge of the field instead of running down the field and carrying away the soil. While it retards erosion in plowed fields it does not prevent the use of farm machinery, and can itself be easily made with a plow. Ten-degree slope is its limit. (U. S. Dept. Agr.)

Figure 4. A 1919 photo showing a mangum terrace in an active farm field (Smith 1919).

United States Department of Agriculture, published the method in *Prevention of the Erosion of Farm Lands by Terracing* (Bulletin No. 512) (Hall 1949: 104-107). Mangum terraces continued to be used as late as the 1940s, but became largely obsolete with the spread of tractor-based farming. Tractor plowing had a tendency to physically destroy most terraces within 2 to 3 years of being introduced on a farm.

The line of intermittently spaced rose bushes on the down slope (east side) of west

embankment were interpreted on the site walk by Leon Cranmer as the remains of a hedge row planted for erosion control purposes. The rose bush was identified as *Rosa multiflora* which comes in two varieties: *multiflora* (small white flowers) and *cathayensis* (pink flowers). It was first imported into the United States from Japan in 1866 as an ornamental rose and as root stock for grafting other rose species onto. It was first used for erosion control purposes beginning in the 1930s by the Soil Conservation Service. Today it is classified as an invasive species. The bush reaches maturity in 4 to 5 years and grows to a height of 3 to 5 m with a crown 1 to 3 m wide (Bergmann & Swearingen 2005:1-3; Steavenson 1946).

The main question relevant to the discussion of these features is, was the *Rosa multiflora* hedge contemporary with the mangum terrace? Was it planted by the farmer during construction of the mangum terrace? Or, was it planted by the farmer after the creation of the terrace? Or, was it planted by the State of Maine after it acquired the property? Currently, there is insufficient evidence to draw any conclusions about when the hedge was planted and by whom.

Conclusion

The two ditch-and-embankment features found in a 35-acre field on Swan Island are characterized by broad, mounded terraces with a shallow, broad ditch on the uphill slope which directed water down a gentle slope into either a wooded section or into a drainage ditch on the edge of the field. These characteristics are consistent with the design, purpose, and usage of a hillside farm field erosion control technique known as a mangum terrace.

The Swan Island mangum terraces were probably constructed during or after 1917 (the year the technique received national attention), and prior to 1936, when the farm was abandoned. The terraces have survived in a good state of preservation due to the declining early twentieth century local economy and the abandonment of the farm during the 1930s, which effectively prevented the introduction of tractor-based farming techniques.

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