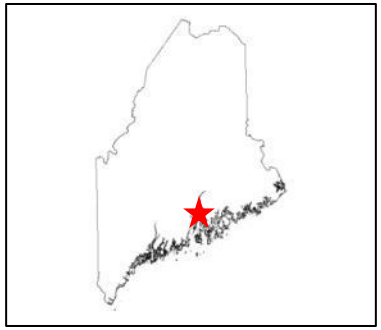
Maine Geologic Facts and Localities

April, 2001

The Eroding Sandy Point Esker, Stockton Springs, Maine



44° 30‘ 20.12“ N, 68° 48‘ 20.33“ W

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Introduction

Eskers are sand and gravel deposits that form inside tunnels within glaciers. They are usually less than 300 m wide and 20 m high, but may extend (with occasional gaps) for more than 100 km. Eskers are usually steep-sided, but often contain multiple ridges. They are usually composed of sediment layers shaped by the ice-tunnel rivers; these layers were often disturbed by movement of the ice during deposition, however. Maine has many eskers, all of which formed during the last Ice Age, which ended between 14,000 and 11,000 years ago.

Sandy Point

The seaward tip of the Sandy Point esker is located in Stockton Springs (Castine and Bucksport 7.5-minute quadrangles), although the esker begins more than 50 km to the north (Figure 1) (Thompson and Borns, 1985). No study has been performed on the sediment comprising the esker, but many pebbles and cobbles of Mt. Kineo rhyolite are visible on the beaches developed from the esker. This suggests a potential source area in Moosehead Lake, 140 km to the northwest, for some of the esker sediment.

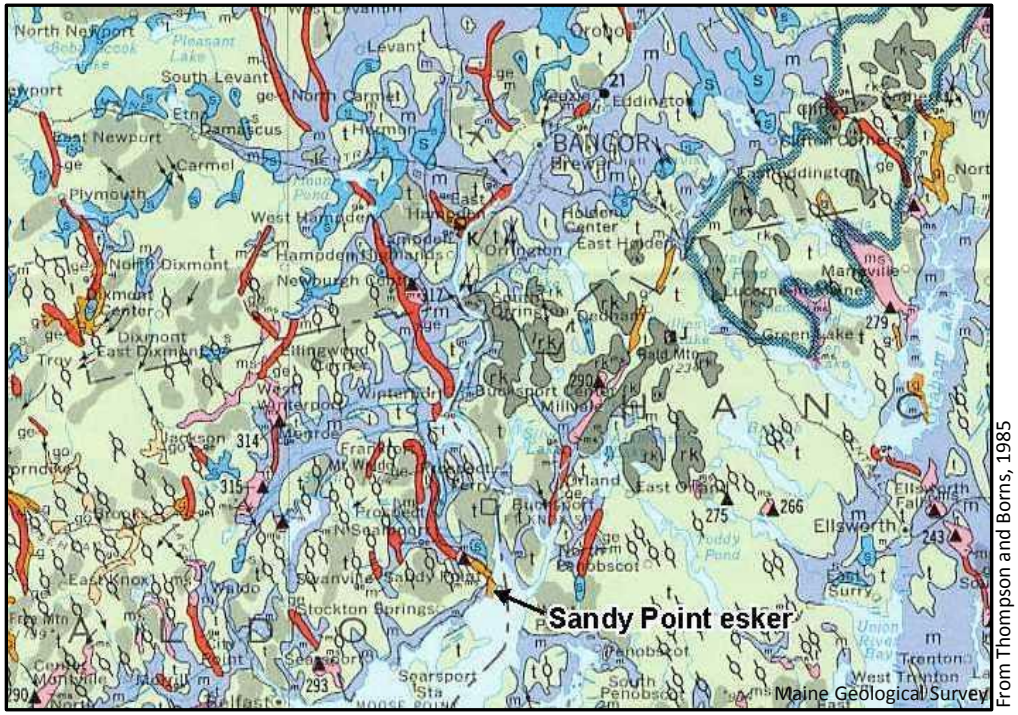

Figure 1. Part of the Surficial geological Map of Maine (Thompson and Borns, 1985). The Sandy Point esker is shown as a red and orange band that winds its way through till (green) and glacial-marine sediment (purple).

Sandy Point

Where it nears the sea, the Sandy Point esker has several separate ridges that are about 150 m in width and 10 m in height (Figure 2). The most seaward tip of the esker faces directly into Penobscot Bay and experiences the force of winter storm waves.

Figure 2. Aerial photograph of Sandy Point esker. Note the Hersey Retreat buildings safely located away from the eroding tip of the feature. The arrow points to an eroding outcrop of fossiliferous glacial-marine sediment. The dashed line marks the base of the former bluff that is now protected by a beach. Numbers 3, 4 and 5 locate Figures 3, 4, and 5.

Eroding Esker

As a result, it is eroding relatively rapidly (estimated at 0.5-1.0 m/yr), and the eroded sand and gravel is forming beaches in front of and along the sides of the esker (Figures 2, 3, 4, 5) (Barnhardt and others, 1998). The beach directly in front of the esker (Figure 3) is very coarse-grained, with boulders scattered above and below the high-tide line. Despite erosion of the bluff sediment, wave and current action is too strong here to permit much of a protective beach to remain. Thus, the bluff face remains devoid of most vegetation.

Figure 3. Eroding southern tip of the Sandy point esker. The bluff is about 10 m high and eroding at an estimated rate of 0.3 m/yr. The bluff is retreating too fast to support vegetation. Seaward of the high-tide line (dashed line), boulders are covered with attached seaweed.

Eroding Esker

On the eastern side, a 50 m wide beach has developed from eroded esker sand (Figure 4). This beach is finer grained than the one in front of the esker, and all the material in it has moved up the Penobscot Estuary by waves and currents. The beach has been leveled for a parking lot and lost any sand dunes it might have once had. This beach has prevented storm waves from reaching the side of the esker for a long time, and large trees cover the formerly eroding bluff face here.

Figure 4. Beach protecting the east side of the Sandy Point esker. Material for the beach has come from erosion of the esker tip. A formerly eroding length of esker is now covered with trees to the right of the car. Note the finer size of beach sediment here than at the tip of the spit.

Eroding Esker

The sides of the esker are draped with glacial-marine muddy sediment. Where exposed (Figures 2, 5), this material contains fossil seashells from ~12,000 years ago (Ives and others, 1967), when the sea covered much of coastal Maine. On the western side of the esker, less sand is available from the eroding esker, and only low, narrow beaches exist (Figure 5). Bluffs of fine-grained glacial-marine sediment are retreating rapidly here, producing mud for intertidal salt marshes and flats, not sand for beaches.

Figure 5. Eroding bluff and small beach on the west side of the esker (see Figure 2 for location). The beach here is too small to afford protection for the bluff, and so it erodes (note fallen trees). Dashed white line marks high-tide line. Bluff material is fine-grained glacial marine sediment, and forms a muddy substrate for salt marsh grasses (arrow).

Eroding Esker

Sand and gravel eroded from the Sandy Point esker is driven by waves and currents up the Penobscot Estuary for several hundred meters. Where the sand beach ends, bluff erosion begins again (Figures 6, 7). Material from this eroded bluff of esker sediment is all driven upstream and forms an extensive beach up to 100 m wide and 400 m long. Though altered for a parking lot, some natural sand dunes remain in the area that was purchased by the Land-for-Maine's-Future Board (Figure 6).

Figure 6. Aerial photo of sand and gravel beach and associated eroding bluff immediately north of Sandy Point. Here too bluff erosion has provided material to form a protective beach. The beach was purchased by the Land-for-Maine's-Future Board and is accessible to the public.

Eroding Esker

Time-series photographs of the eroding bluff that supplies sand for this beach reveal the slow rate of sand production (Figure 7). When photographed in 1998 (Figure 7a), a block of esker sediment was observed on the esker side.

Figure 7a. Eroding bluff north of Sandy Point tip (located in Fig. 6). The relatively slow downslope movement (creep) of a large block of esker material is indicated by the bent trees on the block. As the block creeps down, the trees try to remain vertical and end up bent (May, 1998).

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The bent trunks of the trees on the block indicate that the block is moving downslope slowly by a process called "creep." The trunks bend in an attempt to remain vertical as the block slides down. A photograph of the same site two years later reveals that 1 tree has fallen, and about 0.6 m of sediment has eroded away (Figure 7b).

Figure 7b. May, 2000 view of same site as 7a. Note that one tree has fallen as the block slowly moves downward. The rate of erosion here is around 0.3 m/yr.

Eroding Esker

This small exposure of eroding glacial sediment demonstrates the close connection between bluff erosion and the creation of beaches in Maine (see also Kelley and others, 1989). If the Hersey Retreat (Figure 2) had been built close to the bluff edge a hundred years ago, seawalls to prevent erosion might have been constructed. If that had happened, sand for the adjacent beaches would have remain trapped in the bluff, and no beaches would now exist. Without beaches along the flank of the esker, erosion would have occurred here, and probably necessitated more seawalls along the length of the esker.

References and Additional Information

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