Origin and Sedimentation of Maine Lakes with Emphasis on Lake-Outlet Deltas

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ABSTRACT

Lake basins in Maine were formed primarily by granular disintegration of plutonic rocks and by stream and glacial erosion of metasedimentary rocks. During and immediately following deglaciation, all Maine lakes were the sites of glacial-marine or glacial-lacustrine environments. Meltwater carried glacial sediments to these basins while ice was still present within the watersheds, and subsequently some lake basins developed lake-outlet deltas. Lake-outlet deltas are accumulations of sediment at the normal outlet of a lake, formed during flooding of trunk streams. During some floods, river levels may exceed those of nearby lakes, and water and sediment are carried into the lake, the outlet becoming a temporary lake inlet. Rivers which form lake-outlet deltas head in the Appalachian Mountains of Maine and New Hampshire, where spring floods from snow melt occur each year. Vibra-cores from the Lobster Lake delta, located above the glacial-marine limit, show thick varved sediments overlain by about 4 m of thinly interbedded sand and silt. This sequence has been interpreted as sediments deposited during flow reversals. Cores from the Androscoggin Lake delta contain glacial-marine silts and clays of the Presumpscot Formation, overlain by interbedded flood-derived sands and silts separated by organic-rich silts which represent the deposition between flood events. The morphology of Maine outlet-deltas is dependent upon the relative importance of waves within the lakes vs. the effect of flood waters and sediment supply from the rivers. Like marine deltas, they vary from elongate fluvially dominated systems to deflected, wave dominated types.

PROLOGUE

"At mid-afternoon we embarked on the Penobscot... The river had been raised about two feet by rain... After paddling about two miles, we parted company with the explorers, and turned up Lobster Stream, which comes in on the right, from the southeast. This was six or eight rods wide, and appeared to run nearly parallel with the Penobscot. Joe said it was so called from the small freshwater lobsters found in it. My companion wished to look for signs of moose, and intended, if it proved worth the while, to camp up that way, since the Indian advised it. On account of the rise in the Penobscot, the water ran up this stream quite to the pond of the same name, one or two miles..." 

from Henry David Thoreau, 1864, The Maine Woods

INTRODUCTION

While lakes are present throughout Maine, most occur within two broad belts, one in north-central Maine and the other in the coastal region. Both belts are characterized by the presence of numerous plutonic rock bodies, mostly of Devonian granite. The weathering and erosion of these and other plutons have formed more than 500 lake basins in Maine. About 800 lake
basins were formed by fluvial and glacial erosion of sedimentary rocks, often along major faults. Lakes occupy about 11% of the surface area of plutons and less than 3% of the areas underlain by sedimentary and metasedimentary rocks. A few lake basins were formed by the damming of stream valleys by glacial drift.

Many lakes are connected to the principal rivers of Maine by smaller outlet streams. A few large lakes form the actual headwaters of some large rivers in Maine, including Moosehead Lake that feeds directly into the Kennebec River, Aziscohos Lake that drains into the Androscoggin River, the Pemadumcook Lake system that feeds the West Branch Penobscot River, and Chamberlain Lake that is the direct source of the Allagash River. There are no lakes along the lower reaches of major river systems in Maine, probably because most large rivers appear to flow around plutons rather than through them (Denny, 1982).

In a number of lakes in Maine, deltas are found at what are normally the outlets to these lakes. Outlet delta sedimentation occurs during flood events when the stage of a river exceeds that of the nearby lake, creating a flow reversal in the outlet stream. During these events, the lake outlets become temporary inlets. While most lakes containing outlet deltas are situated in flood plains, the Androscoggin delta is more than 10 km from the Androscoggin River. Outlet deltas are found in lakes along all of the major rivers in Maine, with the most (five) in the Saco River drainage. Outlet delta shape is controlled by the relative importance of riverine versus lacustrine processes.

The first outlet delta reported in Maine was the Androscoggin Lake delta, described by Leavitt and Perkins (1935). Logan (1942) discussed the deltas in Kezar Lake and Androscoggin Lake and first popularized the term "lake-outlet delta." Since then, 12 other deltas have been identified in Maine (Caldwell et al., 1981), and at least two similar deltas have been reported in New Brunswick along the St. John River (Woodrow Thompson, pers. commun., 1986) and along the Magaguadavic River (Ganong, 1896).

To our knowledge, the only other lake-outlet delta reported in the literature occurs in Pitt Lake, British Columbia (Ashley, 1978). The flow reversals in Pitt Lake are caused by a combination of tidal currents and river floods. The deposits of lake-outlet deltas are similar to the slack-water deposits described by Kochel and Baker (1982) and Kochel et al. (1982) to the extent that sedimentation occurs in tributaries during flood events in trunk streams.

The purpose of this paper is to discuss the origin of lakes in Maine and the effect that glaciation had on their development. A second focus of the paper is to describe the formation and sedimentary environments of outlet deltas that occur in many of Maine's lakes.

**ORIGIN OF MAINE LAKES**

Many of the lakes in Maine occur in areas underlain by coarse-grained plutonic rock (Fig. 1, Table 1; Caldwell and Hanson, 1987; Hanson and Caldwell, 1983; Hanson and Caldwell, this volume). The basins containing these lakes were formed by granular disintegration of phaneritic plutons. Some of the plutons were weathered to saprolite or rottenstone at some time prior to the last glaciation, probably during the Tertiary (LaSalle et al., 1985; Caldwell et al., 1985a). Glacial and fluvial erosion of these thick soils may also have formed some of the lake basins, while others were due to fluvial and glacial erosion of less resistant sedimentary and metasedimentary rocks. Some of the basins are exceptionally deep; Moosehead Lake, for example, has reported depths of nearly 75 m. The deepest lake in Maine, however, is Sebago Lake with a maximum depth of over 95 m. Hanson and Caldwell (this volume) have shown that the relative weakness of pre-Silurian rocks in northern Maine is related to the multiple episodes of deformation that these rocks have experienced, forming joints in brittle rocks and multiple cleavage planes in pelitic rocks. The erosion of these rocks has generally resulted in the formation of low topography. The central part of Moosehead Lake and parts of Chesuncook Lake, as well as all of Rangeley and Caucomgomoc Lakes, are examples of lakes developed in these regions of older, weaker rock.

Erosion along faults in both sedimentary and igneous rocks has also been responsible for the formation of some of Maine's lake basins. Examples of these include the western portion of Squa Pan Lake in Aroostook County, formed along a fault in the Seboomook Formation; Rainbow and Nemakanta Lakes, which are fault-controlled lakes within the Katahdin pluton (Fig. 2); and Merrymeeting Bay (likely a lake at some lower sea level) which formed within the Norumbega fault zone.

**GLACIAL AND POSTGLACIAL HISTORY OF MAINE LAKES**

Generally, lakes are rare features in unglaciated regions. In glaciated regions such as Maine, the land was locally eroded below the water table, forming natural depressions. Glacial erosion was localized along faults, in areas of weak or weathered rock, or along preglacial valleys. Glacial deposition had the effect of partially filling these basins, and in some cases glaciar...

**TABLE 1. EXAMPLES OF LARGE (25.0 km²) LAKES IN MAINE UNDERLAIN BY PLUTONIC ROCKS. SEE ALSO TABLE 2.**

<table>
<thead>
<tr>
<th>Lake</th>
<th>Pluton</th>
<th>Age of Pluton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sebago</td>
<td>Sebago</td>
<td>Carboniferous</td>
</tr>
<tr>
<td>Mooselookmeguntic</td>
<td>Mooselookmeguntic</td>
<td>Devonian</td>
</tr>
<tr>
<td>Richardson</td>
<td>Mooselookmeguntic</td>
<td>Devonian</td>
</tr>
<tr>
<td>Great Pond</td>
<td>Rome</td>
<td>Devonian</td>
</tr>
<tr>
<td>Pemadumcook</td>
<td>Katahdin</td>
<td>Devonian</td>
</tr>
<tr>
<td>West Grand</td>
<td>Bottle Lake</td>
<td>Devonian</td>
</tr>
<tr>
<td>Chippineticook</td>
<td>Chippineticook</td>
<td>Devonian</td>
</tr>
<tr>
<td>Meddybemps</td>
<td>Meddybemps</td>
<td>Devonian</td>
</tr>
<tr>
<td>Attean and Wood</td>
<td>Attean</td>
<td>Ordovician</td>
</tr>
<tr>
<td>Cupsuptic</td>
<td>Cupsuptic</td>
<td>Ordovician</td>
</tr>
</tbody>
</table>

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drift created lake basins by damming river valleys (Jordan and Caldwell, 1977).

Immediately following the retreat of the late Wisconsinan ice sheet from coastal Maine, beginning about 14,000 years ago, the glacially formed lake basins were filled with water (Belknap et al., 1987; Thompson and Borns, 1985). Many of the lake basins were temporarily flooded by the marine submergence and were the sites of deposition of glacial-marine sediments.
Vibracores taken near the outlet delta in Androscoggin Lake contain marine clays and silts of the Presumpscot Formation. These deposits are overlain by sand and silt carried into the lake during late-glacial and postglacial flow reversals.

Thompson and Borns (1985) indicate that only a few lake basins (e.g., Lobster Lake, Brewer and Caldwell 1975; Attean and Wood Ponds, Caldwell and Hanson, 1975) contain mappable glacial lake-bottom deposits (particularly at the scale of their map, 1:500,000), although this does not exclude the possibility that ice-marginal lakes existed in other basins.

Theoretically, all of the modern lake basins above the marine limit contained glacial lakes as soon as the last ice sheet retreated from them, unless they were occupied by ice blocks. Because few coring or seismic studies have been made in Maine lakes, it is not known whether lakes above the marine limit contain varved-clay deposits. In addition, due to the fact that nearly all lakes in Maine are artificially dammed, with water levels raised by one to several tens of meters, it may be possible that some pre-dam exposures of lake-bottom deposits have simply been flooded (Caldwell et al., 1985a).

**EFFECTS OF GLACIAL REBOUND ON DELTA SEDIMENTATION**

The postglacial rebound of Maine has caused the land to be raised upward toward the northwest. Lines of equal crustal rebound (isobases) strike toward the northeast, approximately parallel with the Maine coast (Thompson et al., 1983). Rivers flow across the coastal lowland of Maine more or less down this rebound surface, but with numerous easterly or westerly excursions where their courses are controlled by regional bedrock structure. In their headwaters, these same rivers are largely adjusted to bedrock structure, and thus flow for tens of kilometers in easterly or westerly directions before moving into the coastal lowland (Hanson and Caldwell, this volume). In both regions there are lakes with outlet deltas that occupy positions either north or south of the reaches where rivers roughly parallel a rebound isobase.

Lakes with outlet deltas began to experience flow reversals some time following deglaciation when the modern drainage systems were being established. The initiation of outlet-delta sedimentation was affected by postglacial rebound, particularly where long outlet streams were involved. For example, lakes that lie north of a trunk stream would become higher relative to the river as rebound continued, making flow reversals more difficult. In fact, the only such lakes that continue to experience flow reversals are very close to the trunk stream, such as Lovewell Pond, Kezar Pond, and Kezar Lake. Lakes that lie south of trunk streams occupy a position that has become more favorable for flow reversals as rebound has continued, since rivers have become higher relative to lake elevations. During normal flow conditions, the outlet streams must run northward, against the regional slope of the land. This gives the north-running streams low gradients and makes flow reversal easier. This would suggest that lakes lying south of trunk streams began receiving sediment during reversal events later in geologic history than did those lying to the north. It would also follow that lakes may have existed that received sediment early in postglacial history and then, as rebound raised the lakes too high for reversals to occur, ceased to be sites of outlet sedimentation and delta development. Lakes that lie to the east or west of a trunk stream, and roughly on the same rebound isobase, such as Pushaw Lake and the juncture of Pushaw Stream and the Penobscot River, have not changed in elevation relative to the outlet stream as rebound took place.

**GEOMORPHOLOGY OF LAKE-OUTLET DELTA SYSTEMS**

The one consistent trend in all of the outlet deltas that we have studied is that the outlet streams join the trunk stream at an acute angle on the outside of a meander bend (Fig. 3). The relationship between outlet and trunk stream aids in the diversion of water and sediment from the river to the outlet stream. Kochel and Baker (1982) found the optimum angle between trunk and tributary stream for the formation of slack water deposits to be 90°. In his classic study of river meanders, Friedkin (1945) showed that during bankfull flow conditions there is a higher
HYDROLOGY OF LAKE-OUTLET DELTAS

All of the river watersheds that contain known lake-outlet deltas (Fig. 4; Table 2) have their headwaters in the Appalachian Mountains of Maine and New Hampshire where thick winter snow accumulates, and where flow reversals are most common during annual spring thaws. The Saco River heads in the White Mountains of New Hampshire and is at present the only uncontrolled river in Maine that is associated with the formation of outlet deltas. Therefore, the Saco River and its deltas are the most suitable systems for monitoring natural flow reversals. The Lovewell Pond delta was chosen for detailed study because it is the most accessible of the deltas in this system and appears to flood more often than other such deltas along the Saco. Two stage recorders were installed, one in Lovewell Pond, near its delta, and another in the Saco near the outlet channel of Lovewell Pond.
Figure 4. Location map and vertical aerial photographs of lake-outlet deltas. (a) Location of known lake-outlet deltas along major river systems in Maine. Numbers refer to sites of known deltas (see also Table 2). (b) Kezar Pond delta (Fig. 4a, Site 2). (c) Androscoggin Lake delta (Fig. 4a, site 6). (d) Lovewell Pond delta (Fig. 4a, site 1).
Lake-outlet deltas

TABLE 2. LOCATION AND CHARACTERISTICS OF LAKE-OUTLET DELTAS IN MAINE. LAKES THAT ARE UNDERLINED ARE DISCUSSED IN SOME DETAIL IN TEXT. SEE FIGURE 4 FOR LOCATION OF THESE DELTAS.

<table>
<thead>
<tr>
<th>Lake</th>
<th>Outlet Stream</th>
<th>Outlet Length (km)</th>
<th>Trunk Stream</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lovewell Pond</td>
<td>no name</td>
<td>2</td>
<td>Saco River</td>
<td>Fryeburg</td>
</tr>
<tr>
<td>2. Pleasant Pond</td>
<td>no name</td>
<td>1</td>
<td>Saco River</td>
<td>Fryeburg</td>
</tr>
<tr>
<td>3. Kezar Pond</td>
<td>no name</td>
<td>3</td>
<td>Saco River</td>
<td>Fryeburg</td>
</tr>
<tr>
<td>4. Kezar Lake</td>
<td>Kezar Outlet</td>
<td>4</td>
<td>Saco River</td>
<td>Lovell</td>
</tr>
<tr>
<td>5. Charles Pond</td>
<td>Cold River</td>
<td>2</td>
<td>Saco River</td>
<td>Fryeburg</td>
</tr>
<tr>
<td>6. Androscoggin Lake</td>
<td>Dead River</td>
<td>11</td>
<td>Androscoggin River</td>
<td>Wayne and Leeds</td>
</tr>
<tr>
<td>7. Umbagog lake</td>
<td>no name</td>
<td>2</td>
<td>Androscoggin River</td>
<td>Upton</td>
</tr>
<tr>
<td>8. Kennebago Lake</td>
<td>no name</td>
<td>1</td>
<td>Kennebago River</td>
<td>T3 R4 (WBK)</td>
</tr>
<tr>
<td>9. Lobster Lake</td>
<td>Lobster Stream</td>
<td>3</td>
<td>West Branch Penobscot</td>
<td>T3 R14 (WELS)</td>
</tr>
<tr>
<td>10. River Pond</td>
<td>Pockwockamus Dwtr</td>
<td>1</td>
<td>West Branch Penobscot</td>
<td>T2 R9 (WELS)</td>
</tr>
<tr>
<td>11. First Debsconeag Lake</td>
<td>Debsconeag Dwtr</td>
<td>1</td>
<td>West Branch Penobscot</td>
<td>T2 R10 (WELS)</td>
</tr>
<tr>
<td>12. Holeb Pond</td>
<td>Holeb Stream</td>
<td>2</td>
<td>Moose River</td>
<td>Holeb (T6 R1 NBK)</td>
</tr>
<tr>
<td>13. Crowell Pond</td>
<td>McGurdy Stream</td>
<td>3</td>
<td>Sandy River</td>
<td>New Sharon</td>
</tr>
<tr>
<td>14. Pushaw Lake</td>
<td>Pushaw Stream</td>
<td>12</td>
<td>Penobscot River</td>
<td>Hudson</td>
</tr>
</tbody>
</table>

During late April and early May of 1986, stage recordings were made of a flood that originated in the White Mountains from warm temperatures and rain (Fig. 5). The stage hydrographs show that the Saco River rose rapidly to the flood peak, followed by a delayed recession, producing a typical asymmetrical flood hydrograph. The hydrograph for Lovewell Pond is more symmetrical, indicating a slower rise and slower recession than exhibited by the river. The greatest difference in stage between the river and pond occurred early during the flood, resulting in maximum current velocities in the outlet stream being directed toward the lake. Similar maximum lakeward velocities also occur in other outlet streams as evidenced by the orientation of fallen trees. In every situation we have studied, it is apparent that trees topple into the water as channel banks are undermined during floods. The root systems remain partially attached and the crowns of the trees become oriented toward the lake.

The hydrographs shown in Figure 5 may be used to better understand the process of formation of the Lovewell Pond outlet delta. Because the transport of sediment is related to the cube or higher power of velocity (Maddock, 1969), the direction of net sediment movement is more a function of current strength than of the duration of flow. Thus, it may be assumed that more sediment is transported toward the lake during the rising limb than is carried back to the river during the falling limb (Fig. 5). The presence of the delta and lakeward-oriented megaripples (length = 3-4 m) in the Lovewell Pond outlet channel (Chormann, 1983) are geomorphic evidence that corroborate this.

In the spring of 1987, we attempted to monitor another reversal event in the Lovewell Pond outlet stream. Unfortunately, the April flood of that year equaled the 75-year record flood, according to preliminary data of the United States Geological Survey, and our equipment was devastated. Our stage recorders were submerged by 3 m of water during the flood (Fig. 6), leaving only a partial record of the flooding event. Because of the close proximity and small elevation difference between the Saco River and Lovewell Pond, once the natural levee of the Saco was overtopped, water entered the lake along several fronts. This caused the lake and river to rise together, with little difference in elevation, during most of the flood. Sediment traps placed on the delta were also lost, thwarting our attempt to relate flood discharge to sedimentation rates.

DELTA SEDIMENTATION

General Stratigraphy

The stratigraphy of the Lobster Lake and Androscoggin Lake deltas has been studied from six vibra-cores and sixteen
kilometers of shallow seismic tracklines taken in Lobster Lake (Caldwell et al., 1985b). These data reveal that a glacial lake had existed near the northwestern end of Lobster Lake, and up to 15 m of lake-bottom silt and clay were deposited in this region. The glacial lake varves are overlain by outlet delta sediments which consist of approximately 4 m of thinly interbedded sand and silt. In each sand and silt couplet (2-5 cm thick) of the deltaic deposit, the coarser sand is thought to represent sediment carried into the lake via the outlet stream during a flood event. The overlying finer silt is believed to be deposited during the slack water conditions that occurred after the lake and the river equilibrated, as well as deposition between flood events. Although a detailed microscopic analysis of these sediment cores has yet to be done, a cursory examination of the cores revealed that the fine-grained sediments are rich in pollen and diatoms. Because the floods which bring sediment to the delta occur most frequently in the late winter and early spring when new pollen are scarce, it is believed that much of this fine sediment is actually deposited during the summer and fall.

Cores from the Androscoggin Lake delta contain a similar deltaic sequence underlain by glacial-marine sediments of the Presumpscot Formation. The top meter of the sediments underlying the delta are distinctly varved, suggesting that the sea had retreated from this area during the final glacial sedimentation in Androscoggin Lake.

Seismic profiles in Lobster Lake taken near the delta front show a well-developed, submerged levee system (Fig. 7), a feature common to many marine and fresh-water deltas. As shown in both seismic records and core data, the deltaic sediments overlie glacial-lake varves.

**Delta Environments**

The morphology of lake-outlet deltas in Maine is highly variable, but generally they contain similar depositional environments. The dominant features of all deltas are a main channel and natural levees that are composed of fine sand and silt. Marsh deposits flank the levees and cover overbank sediments. Distributary channels are not common, but do occur on the delta of Androscoggin Lake (Fig. 4c).

Sediment transported to the delta front is deposited as a subaqueous, lobate platform. If the lake is large and has a properly oriented fetch, platform sediment may be reworked by wave action. One such example is Lovewell Pond, the longest fetch of which is oriented into the prevailing winds. Twenty-knot winds across the lake produce wave heights of 45 to 50 cm which have sufficient energy to rework sand on the delta platform. This sand is transported onshore, forming beach ridges at the delta mouth (Figs. 8a, 9b). In Maine outlet deltas, these beach ridges may be paired or unpaired and are perpendicular to highly oblique to the orientation of the main channel. Commonly, the ends of the beach ridges are lengthened by spit growth. In the Lovewell Pond delta there are at least three sets of tree-covered beach ridges, each representing a period of sedimentation and reworking (Fig. 8a).

**Delta Shapes**

The general shapes of Maine’s outlet deltas correspond well to Scott’s classification published in Fisher et al. (1969, p. 82). Because Scott relates delta morphology to fluvial versus marine conditions and because he defines marine processes as wave action and longshore transport, his scheme works well in lake environments. When depositional processes of the river are the major influence on the delta, an elongate form like that of the Mississippi bird-foot delta results. The Androscoggin Lake (Fig. 4c) and Kezar Pond (Fig. 9a) deltas are examples of this type of delta morphology. The Androscoggin Lake delta has prograded 3 km into the lake and merged with a line of till-covered bedrock islands which protect the delta from wave attack.

The shape of the Lobster Lake delta (Figs. 8b and 9c) reflects a delta that is dominated by wave processes. Lobster Stream, the lake outlet, parallels the shore for about 0.6 km before connecting to the lake. The stream is separated from the lake by a vegetated spit that has formed in response to longshore transport of sand.
Lake-outlet deltas

Figure 7. (a) Sedimentary features of the Lobster Lake delta recorded in seismic profile. Note submerged levees. (b) The seismic profile interpreted by Daniel Belknap, University of Maine, Orono.
from the west side of the lake. Periodically, the spit is breached during large floods, but soon the channel is deflected again by spit accretion. This repetitive process has produced a delta surface that is dominated by a series of beach ridges separated by channel fill deposits. The morphology of the Lobster Lake delta is comparable to the Senegal River delta described by Wright and Coleman (1973).

The shape of the Lovewell Pond delta is a product of both fluvial and lacustrine processes (Figs. 8a and 9b). The delta is elongate and has prograded far into the lake; its front is highly modified by wave attack. Sand transport by wave action has produced several paired beach ridges that flank the main channel. The Ebro River delta (Wright and Coleman, 1973) along the Spanish Mediterranean coast is probably the closest marine example of this type.

**Delta Size**

The size of the exposed portions of lake-outlet deltas is related to a number of factors, the most significant of which appears to be lake depth. Other things being equal, shallow lakes have larger deltas than deep lakes, due to the smaller quantity of sediment necessary to cause progradation. This situation is exhibited well by the contrasting conditions of Androscoggin and Lobster Lakes (Figs. 4c and 8b). Because Androscoggin Lake has a relatively shallow nearshore and is no more than 6 m deep, its delta has built approximately 3 km into the lake. The much deeper Lobster Lake, which reaches 24 m within 1 km of the lake shore, contains a delta that has caused only .5 km of shoreline progradation. However, this delta does appear to be thicker than shallow lake deltas and its subaqueous extent can be defined some 2 km offshore. Other factors which favor the formation of large deltas include large trunk stream drainage area, high frequency of floods, high sediment yield in trunk stream watershed, and favorable juncture angle between outlet stream and trunk stream.

**SUMMARY**

A large number of the lakes in Maine occur in areas underlain by plutonic rocks. Fewer lakes lie in regions of sedimentary and metasedimentary rocks. In all of Maine, rock weathering and faulting locally weakened the rocks and promoted the formation of lake basins by glacial excavation. Below the limit of marine submergence, many lake basins were briefly filled with sea water, while above this limit, many lakes were filled with glacial meltwater.

In fourteen lakes in Maine, deltas have been identified at what are normally the outlets to these lakes. Sedimentation at these deltas is related to flooding in trunk streams, which produces flood stages higher than the lake levels. Under these conditions, sediment is transported to the outlet delta. The shapes of these deltas is determined by the relative importance of riverine processes (sediment transport to the delta) versus lacustrine processes (wave reworking and longshore transport of sediment).

**ACKNOWLEDGMENTS**

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Allan Saiz and Christopher Baldwin (Department of Geology, Boston University) aided in the installation of the stage recorders in the Saco River and Lovewell Pond and Saiz...
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