

Geologic Site of the Month  
April, 2005

***Androscoggin Lake's Outlet Delta System, Maine***



44° 19' 27.86" N, 70° 5' 3.15" W

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## Introduction

Maine has over 5000 lakes and ponds that are at least one acre in size. Many of these water bodies, especially the larger ones, have one or more inlet streams that bring surface water into the lake, and an outlet stream that drains water away from the lake.

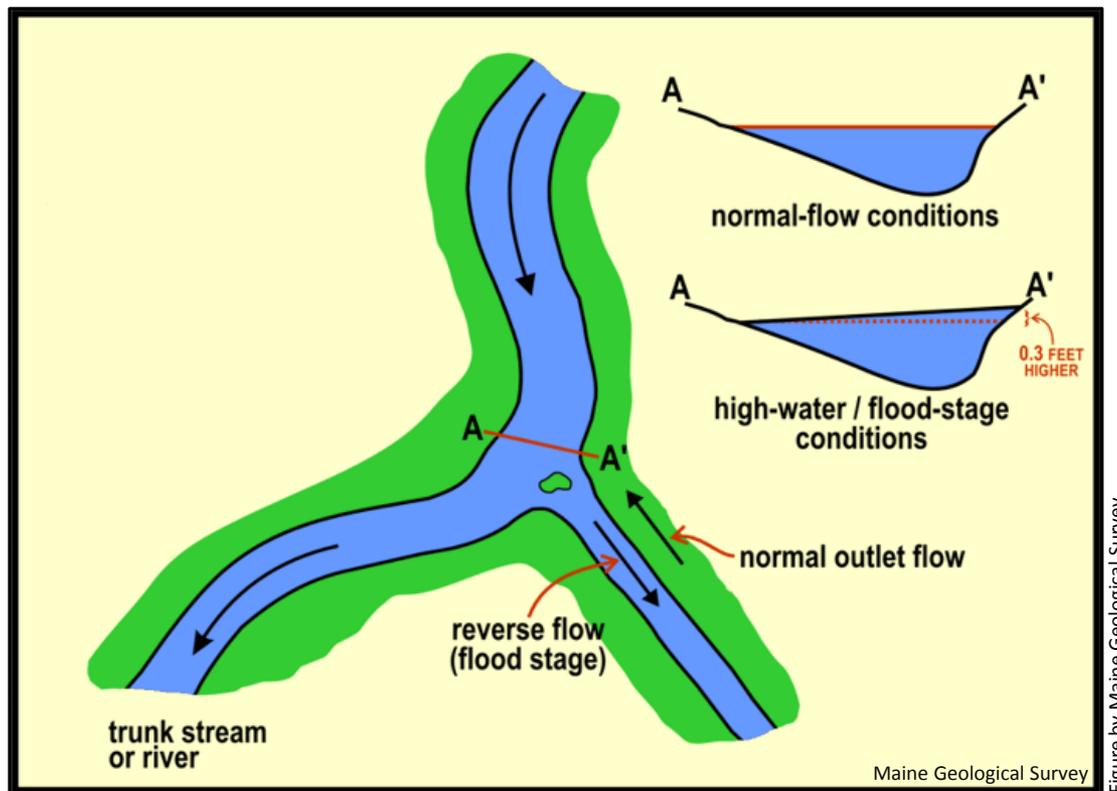
Outlet streams commonly lead to a larger river (trunk stream) farther down the drainage basin, at a lower elevation. Normally an outlet stream always flows away from the lake that it's draining. In rare cases, however, there is very little difference in elevation between the lake, its outlet stream, and the trunk stream. When the major river floods, it may overwhelm the small stream and force it to reverse direction and flow back into the lake. This causes water to pour into the lake at the point which is usually its outlet! During the flood event, fine sandy or muddy sediment is carried into the lake and builds up to form a flat-topped deposit called a "lake-outlet delta."

In most situations where a lake-outlet delta has formed, the outlet stream of the lake joins the trunk river at an acute angle and along the outside of a meander bend (Caldwell, 1989). During flood periods, the water surface tends to "pile up" on the outside of the meander.



### Introduction

This situation favors the movement of water into the outlet and contributes to the reversal in flow (Figure 1). There are also small islands at the mouths of many outlet streams. These likely formed as a result of elevated flow from the lake when flooding of the trunk river subsides and the normal drainage direction is restored.

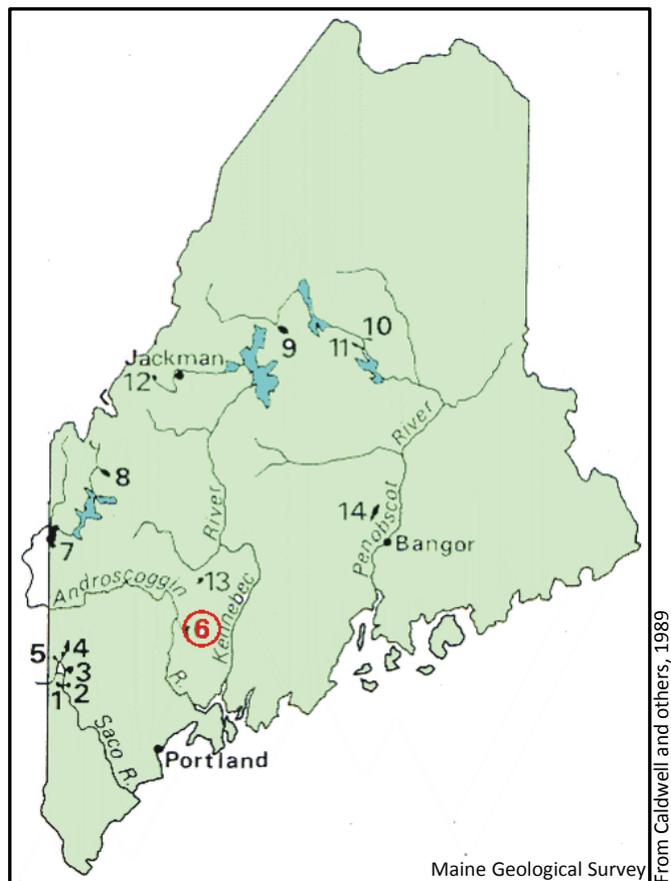


**Figure 1.** Diagram showing the difference in stage at the outside of the meander, relative to the inside of the meander.



### The Outlet Delta on Androscoggin Lake

There are 14 lake-outlets in Maine (Figure 2), and one of the most well developed of these is on Androscoggin Lake in the towns of Leeds and Wayne (Figure 2 and Figure 3).

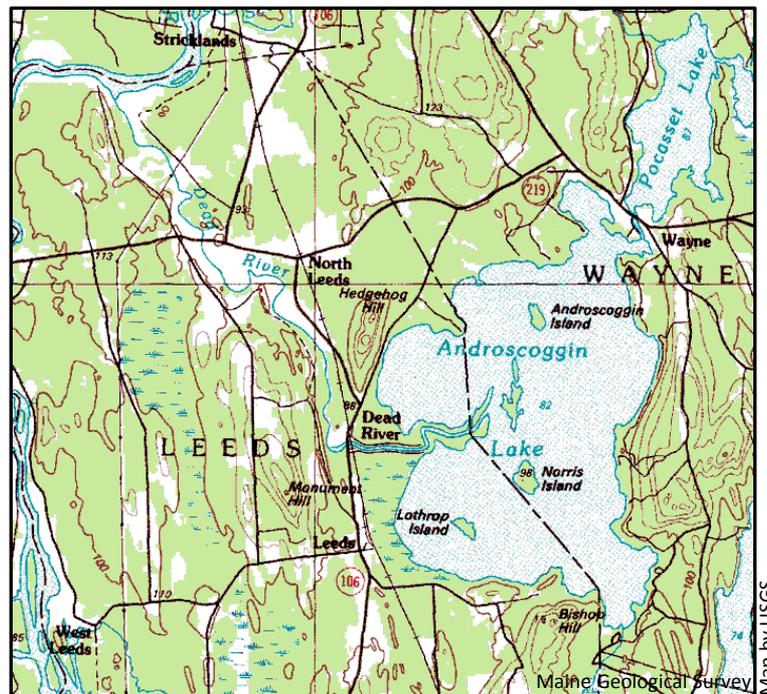


**Figure 2.** Map showing locations of the 14 outlet deltas in Maine. Number 6 is the Androscoggin Lake outlet delta.



### The Outlet Delta on Androscoggin Lake

Androscoggin Lake drains into the sluggish Dead River, which in turn flows north for several miles and empties into the Androscoggin River. At the close of the Ice Age, the Dead River would have had a steeper slope to the north, but postglacial uplift and gentle southward tilting of the earth's crust have reduced the gradient of this stream. Since there is now only a very slight drop in elevation between the lake and the Androscoggin River, flooding of the Androscoggin forces the Dead River to reverse direction and flow back into the lake.



**Figure 3.** Portion of the Lewiston 1:100000-scale topographic map showing the Dead River and the outlet delta on Androscoggin Lake.



### The Outlet Delta on Androscoggin Lake

Lakes containing outlet deltas often lie within the flood plain of the nearby trunk river. However, the Androscoggin Lake outlet delta is situated nearly 7 miles from the Androscoggin River (Figure 4). In terms of distance from the trunk stream, the Androscoggin Lake outlet delta is second only to the Pushaw Lake outlet delta which is located approximately 7.5 miles from the Penobscot River.

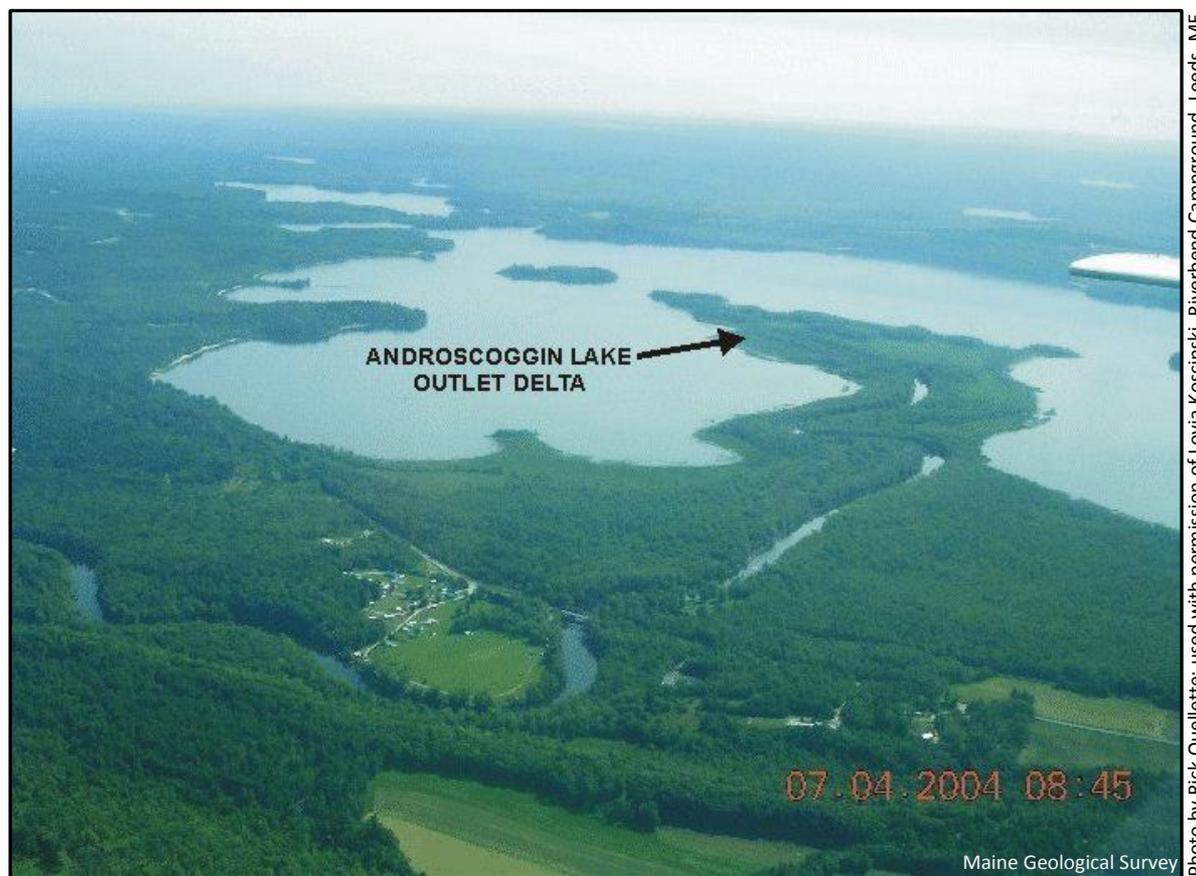


**Figure 4.** Portions of the North Turner and Wayne 7.5' USGS topographic maps showing Androscoggin Lake's outlet delta.



### The Outlet Delta on Androscoggin Lake

The Androscoggin Lake outlet delta is very large, extending a distance of nearly two miles out into the lake (Figure 5).



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Photo by Rick Ouellette; used with permission of Lovia Koscinski, Riverbend Campground, Leeds, ME

**Figure 5.** Aerial photo of Androscoggin Lake's outlet delta looking easterly (Riverbend Campground in the foreground)



### The Outlet Delta on Androscoggin Lake

The shapes of Maine's lake-outlet deltas are influenced by the combination of fluvial action by the contributing streams and wave action on the lake. Where wave action predominates, the delta usually runs along the lakeshore, with the stream separated from the lake by a narrow spit. In contrast, where river action predominates, the delta is allowed to grow out into the lake for a considerable distance. The Androscoggin Lake delta belongs to the latter type and is analogous in this respect to the Mississippi River's "bird-foot delta" (Figure 6).



Photos by David F. Silver, ME Department of Environmental Protection



**Figure 6.** Two aerial views of the Androscoggin Lake outlet delta looking northeasterly (village of Wayne in the background). Note the prominent meander in the right hand photograph.



### The Outlet Delta on Androscoggin Lake

It is believed that the length of the Androscoggin Lake delta has resulted from the frequency of flood events in combination with the shallow nearshore conditions (Androscoggin Lake has a maximum depth of 38 feet, but is typically less than 20 feet deep).



Photos by David F. Silver, ME Department of Environmental Protection

**Figure 7.** Aerial view of the Androscoggin Lake outlet delta looking northeasterly (village of Wayne in the background). Note the presence of the distributary channel which has resulted in the formation of an island (left of center).



The Outlet Delta on Androscoggin Lake

Also, the till-covered bedrock islands at the delta terminus protect it against erosion by waves (Figure 8).



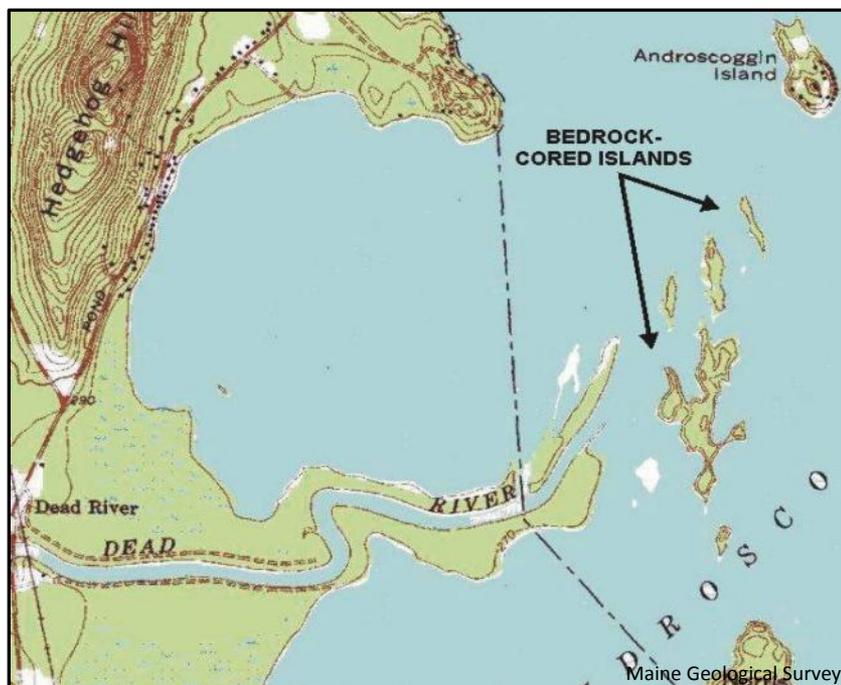
Photos by David F. Silver, ME Department of Environmental Protection



**Figure 8.** Aerial view of the Androscoggin Lake outlet delta looking westerly (Left) and southerly (Right) toward the protective bedrock cored islands.

### The Outlet Delta on Androscoggin Lake

In the last 40 years, the delta has expanded to connect with most of the islands shown on the 1966 topographic map of the Wayne quadrangle (Figure 9).



**Figure 9.** Portion of the 7.5' USGS topographic map showing the outlet delta and the bedrock-cored islands in 1966, and an aerial view of the present Androscoggin Lake outlet delta. Note Androscoggin island.

References and Additional Information

Caldwell, D. W., FitzGerald, D. M., and Fenster, M. S., 1989, Origin and sedimentation of Maine lakes with emphasis on lake-outlet deltas, in Tucker, R. D., and Marvinney, R. G. (editors), Studies in Maine geology; Volume 5 - Quaternary geology: Maine Geological survey, p. 97-108.

