Pat Dryer
Half Moon Lake: A True Oxbow Lake?
Geography 364
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Abstract

Half Moon Lake appears to be an oxbow lake but after further investigation into the formation it is evident that Half Moon is not a true oxbow lake. Existing terrace remnants (or other landforms) indicate that the river channel was sculpted and changed many times before the actual avulsion occurred to form the lake. It is believed that a series of downcutting and lateral erosion shaped the current landscape. Some evidence of formation is still visible on the current landscape while other formations, such as terraces, have been completely destroyed over the years due to flood plain evolution. By looking at topographic maps and digital elevation models it is possible to infer a sequence of events that led to the formation of Half Moon Lake.
**Half Moon Lake: A True Oxbow Lake?**

**Introduction**

Half Moon Lake is located in Eau Claire County, Wisconsin and the formation of this lake is not clearly known. At first glance Half Moon Lake appears to be a typical oxbow lake. Further investigation into the formation of Half Moon reveals that Half Moon is not a simple oxbow lake. There were many different processes that formed the lake over the years. I believe that Half Moon Lake is a result of many episodes of aggradation, downcutting, and lateral erosion.

**Methods**

- Investigate terrace locations and heights along the Chippewa River using aerial photography and digital elevation models.
- Travel to known terraces around the area and on Half Moon Lake to study shape, location, and proximity to other terraces.
- Interpret results from field work, topographic maps, and aerial photography to formulate hypothesis of the formation of Half Moon Lake.

**Results**

There are seven visible terraces in Figure 1 that can be observed along the Chippewa River that are associated with the formation of Half Moon Lake. The many terraces have different elevations, Table 1, and some are relatively intact while others are almost non existent due to lateral migration.
Figure 1 - There are seven distinct terraces around Half Moon Lake on the Chippewa River. The lowest six terraces would have evolved after the last glacial advance—Wisconsinan glaciation. The upper most terrace, T-7, is known as the Wissota Terrace and is composed of glacial outwash.

<table>
<thead>
<tr>
<th>Terrace</th>
<th>Approximate Elevation (feet above sea level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>770</td>
</tr>
<tr>
<td>T-2</td>
<td>780</td>
</tr>
<tr>
<td>T-3</td>
<td>790</td>
</tr>
<tr>
<td>T-4</td>
<td>800</td>
</tr>
<tr>
<td>T-5</td>
<td>810</td>
</tr>
<tr>
<td>T-6</td>
<td>830</td>
</tr>
<tr>
<td>T-7</td>
<td>860</td>
</tr>
</tbody>
</table>
Table 1- Elevations of the terraces created by the Chippewa River.

Discussion

To understand how Half Moon Lake was formed one must first have background knowledge of the sediments in the area. During the Wisconsinan glaciation ice extended to about 40 miles north of the Eau Claire area. Then an abrupt climate change occurred causing the glaciers to retreat. This glacial retreat provided massive amounts of sediment to the Chippewa River resulting in the whole watershed to aggrade into the surrounding watersheds.

After the glaciers retreated the sediment load to the Chippewa River would have been greatly reduced, giving the Chippewa River excess power. A river with excess power downcuts and therefore the Wissota terrace was formed. The Wissota terrace could be classified as a depositional terrace. Depositional terraces are created when streams incise into sediment that was laid down during times of excess sediment. The Wissota terrace is visible in Figure 1 as T-7. The elevation of this terrace is about 860 ft above sea level (a.s.l.). After times of downcutting the river would have meandered across the flood plain. This downcutting continued for sometime and eventually caused the stream to become graded. It is possible that the river migrated laterally to where the current location of the east and west arms of Half Moon Lake is currently located. When the river would have encountered bedrock, from downcutting, the river may have incised down during times of high flow. The projected path of this hypothesis is visible in Figure 2.

Due to a change in base level, possibly from a climate change, the Chippewa River could have gained more power and caused the river to further incise. The path of the river may have
changed laterally but stayed flowing through the arms of Half Moon Lake forming a rock cut terrace in the sandstone. This terrace is visible with the location of the label “T-7” in Figure 1.

**Figure 2**- Possible path of the Chippewa River. This sketch illustrates how the river started to incise into the bedrock on the east and west arms of Half Moon Lake. This is not an exact location of the river but an estimate of what may have happened. This drawing illustrates how the river, at the T-6 level, split and flowed around an island, which is presently Carson Park. The river may have split when it encountered a more resistant portion of bedrock. This sequence of events would have created T-6.

Over the next period the river may have become graded and continued to migrate laterally through out its flood plain. During this lateral migration the Half Moon meander would have formed, visible in Figure 3.

A stream always strives to be at a graded state. During this time the river at the north end of the Half Moon meander would have started to migrate westward. This westward migration is
visible in Figure 3. This lateral migration would have formed T-5, the highest point in Carson Park, at 810 ft a.s.l.

A base level change once again would have given the river more power and the river not only continued to widen its flood plain but also continues to migrate on the north end of Half Moon Lake, visible in Figure 4. The bedrock restricted the river from moving further westward, and the river began to downcut again, forming T-4 at an elevation of 800 ft a.s.l. (Fig. 5). There are remnants of T-3 near the court house in downtown Eau Claire. T-3 is located at about 790 ft a.s.l. (Fig 6).

Figure 3- Possible location of the Chippewa River following the incised bedrock channel in Half Moon Lake. The Chippewa River would be further down cutting into the bedrock increasing the size of the rock cut terrace. This sequence of events would have created T-5.
The Chippewa River was following the Half Moon meander and eroding laterally across the floodplain in other areas where the bedrock doesn’t prohibit migration, visible in Figure 7. A decrease in sediment load or climate change could have given the river excess power causing more erosion and downcutting to occur. This erosion could have caused an avulsion to occur, creating the present day Half Moon Lake (Fig. 8.) Over time the river would have continued eroding latterly, removing evidence of previous terraces and cutting new paths through the glacial outwash. The last terrace, T-1, is located along Owen Park in downtown Eau Claire and was formed from the river laterally migrating and downcutting at the same time. T-1 is visible in figure 1.

Figure 4. - The river continues to migrate laterally and starts forming T-5 on present day Carson Park.
Figure 5.- The formation of the terraces on the north end of Half Moon Lake were created during this time period. The distinct shape of Half Moon Lake is present as well as indications that an avulsion could occur due to lateral erosion causing the formation of an oxbow lake.

Figure 6. Terraces are still forming along Half Moon Lake as well as lateral migration along the flood plain.
**Figure 7** - Lateral migration of the Chippewa River. This lateral migration would have widened the flood plain as well as destroyed previously formed terraces.

**Figure 8** - The present path of the Chippewa River. The river has taken many different paths carving the landscape that is familiar to us at the present time.
Conclusion

The formation of Half Moon Lake is a very complicated series of events. The exact series is not known at the current time but evidence of the past is present in the modern landscape. There are seven visible terraces indicating that major events happened during this time causing a change in stream power and sediment load.

By investigation of terrace heights and relative positions one is able to infer the possible sequences that could have created Half Moon Lake. The best way to make these inferences is to look at topographic maps as well as digital elevation models to help determine terrace heights and locations.