Field Trip 1: A Walking Tour of the Chippewa River near the University of Wisconsin Eau Claire

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### Table of Contents:

<table>
<thead>
<tr>
<th>Section</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Stop 1: Point Bar</td>
<td>2</td>
</tr>
<tr>
<td>Stop 2: Little Niagara behind McIntyre Library</td>
<td>4</td>
</tr>
<tr>
<td>Stop 3: Pump Station</td>
<td>7</td>
</tr>
<tr>
<td>Stop 4: Rock Slide</td>
<td>9</td>
</tr>
<tr>
<td>Stop 5: River Bed</td>
<td>11</td>
</tr>
<tr>
<td>Stop 6: Alluvial Fan at Hendrickson Hill</td>
<td>13</td>
</tr>
<tr>
<td>Stop 7: Hendrickson Hill</td>
<td>16</td>
</tr>
<tr>
<td>Stop 8: Little Niagara Falls</td>
<td>18</td>
</tr>
<tr>
<td>Stop 9: Cut Bank</td>
<td>21</td>
</tr>
<tr>
<td>Summary</td>
<td>22</td>
</tr>
<tr>
<td>Bibliography</td>
<td>22</td>
</tr>
</tbody>
</table>
Introduction:

On September 12th and 20th, 2007, the University of Wisconsin – Eau Claire Geomorphology class took field trips to parts of the Chippewa River in Eau Claire, Wisconsin. There were a total of nine stops, one on the 12th and eight more on the 20th. The weather on both days was nice with temperatures ranging from the mid-60s to low 70s. Only a slight breeze was present on both days. Each day began slightly cloudy but as the day progressed, each became sunnier and warmer. Our first stop was on a point bar of the Chippewa River across the river from the main campus. This was for many people in the class their first time in the field taking field observations. The second stop, first on the 20th, was behind McIntyre Library on the Little Niagara River. As we walked down stream we observed the many flood precautions that the university had installed as well as some stream morphology. Our third stop was at a pump station on the Little Niagara which was also installed for flood control. From this stop we continued into Putnam Park and took a look at a rock slide that forced the university to rebuild the trail at stop four. Stop five was on a portion of the Chippewa River normally under water. However, the river was at a low enough that we were able to walk out onto the sandstone bed of the river. We continued down river until we came to stop six at a culvert pipe installed to help divert rainwater from upper campus. Stop seven was on Hendrickson Hill which showed further manmade improvements to more efficiently handle runoff rainwater from upper campus. Coming back out through Putnam Park we stopped at Little Niagara Falls, a nick point created by the Little Niagara River flowing along the bedrock into the Chippewa River. Our last stop was on the cut bank side of the Chippewa River across from stop one. This stop looked at the improvements that the University had made on this side of the river to prevent damage to utilities (Figure 1). The purpose of this field trip was to further our understandings of fluvial processes as well as the civil engineering involved in dealing with these processes.
Figure 1 – An aerial photograph of the field trip area with the location of stops

From Google Earth

**Stop 1:** Point Bar  
**Date:** 9/13/2007  
**Time:** 15:48  
**Latitude:** N 44°48.0’  
**Longitude:** W 91°30.0’  
**Elevation:** 236 m  
**Temperature:** 65.8°F  
**Dew Point:** 70%  
**Wind Velocity:** 1.1 m/s

Our first stop was on a point bar of the Chippewa River. The day had a light breeze and is cloudy but by the time we left this stop the clouds had began to clear up. A point bar is the side of a river where sediment deposition is greater than sediment erosion located on the inside of a meander bend (Ritter et al., 2002). This happens because the water on the inside of a curve is slower, therefore dropping its sedimentary load, on this side of the river as compared to the opposite side, where the flow is faster. The brownish discoloration on the bridge
pillars nearby showed evidence that the river’s base flow is at least 1.5 meters below normal which makes sense seeing as rainfall has been below normal (Figure 2). The diameter of rocks found on the point bar max out at around 5 cm (Figure 3). These rocks were left here by past flooding events. Short vegetation covers approximately 20% of the ground.

Figure 2 - Showing how low the Chippewa River was on our field trip.

Figure 3 – Sizes of rocks on the point bar
The vegetation on the point bar is mostly grasses and small flowering plants which reach a maximum or 0.7 meters high (averaging about 0.3 meters). Further inland large bushes and small trees (30 m from the river bank) can be seen growing (Figure 4).

Figure 4 – Diagram of vegetation zones on the point bar

**Stop 2: Little Niagara behind McIntyre Library**

Date: 9/20/2007  
Time: 13:13  
Latitude: N 44°48.8’  
Longitude: W 91°30.1’  
Elevation: 264 m  
Temperature: 68°F  
Dew Point: 59%  
Wind Velocity: 0.6 m/s

Our second stop was on the Little Niagara Creek (LN) right behind McIntyre Library. The day was a cloudy with a light northerly breeze. LN was “babbling” slowly along. LN ranged from 1 to 2 meters wide at this point (Figure 5). The stream has moved over the years and appears to play an important role draining the nearby swamps (Figure 6). The vegetation along the creek looks to be natural within 2 m as opposed to the manicured lawn on the outside of the natural area.
To the north of LN McIntyre Library sits on pillars to protect the library against flooding (Figure 7). McIntyre library is designed to withstand a large flood so that its base is anchored to the bedrock so the library does not become buoyant and float away. LN was slightly high resulting from rain in past 2 days. The bottom of the creek is mostly sand with a few small pebbles. There is also some organic matter, such as leaves and sticks, at the bottom. A fallen tree showed what happens when the water is forced to slow.
On one side of the tree fall, the fast-moving creek bottom is mostly sands while on the other side, which was forced to slow because of the tree, there are smaller particles that were dropped by the low velocity of the creek on that side (Figure 8). Slight meanders appear in this small stream creating various small cut banks, or a point of maximum erosion along a meander (Ritter et al., 2002). Along the stream a culvert adds to the flow, draining nearby parking lots and small swamps. Duckweed can be seen floating on top of the water.
Stop 3: Pump Station

Date: 9/20/2007
Time: 13:50
Latitude: N 44°47.9’
Longitude: W 91°30.2’
Elevation: 250 m
Temperature: 70.4°
Dew Point: 55%
Wind Velocity: 0.4 m/s

Stop number three took a look at the pump station along LN. (The trees slope toward Putnam Hall.) Rocks placed along bank of the LN to keep the banks from eroding away any further (Figure 9). The pumping station itself is used to control flooding. LN, as we’ve mentioned before, plays a key role in draining nearby swamps as well at the impermeable parking lots that cover campus.

Figure 9 – The large rock on the side slope and the smaller rocks in the river were added to help slow down the river and prevent further erosion.
Two large pipes 2 meters in diameter handle the normal flow (outlets) (Figure 10.1). The pumping station is used to control flow, slow erosion, and prevent flooding. In the event that the Chippewa River was to flood and “back-flood” into LN, the gates would close the 2 pipes cutting off the inflow from the Chippewa (Figure 10.2). Pumping/dRAINing the LN would begin diverting the flow through an alternate route.

![Figures 10.1 and 10.2 – On the left the two pipes that can be closed in the event of a bank-flood and on the right these two dealies are used to pump water somewhere else.](image)

Downstream from the pumping station the Little Niagara continues its journey to the Chippewa River. The creek is now down cutting into bedrock (Figure 11).

![Figure 11 – Little Niagara is now down cutting into bedrock.](image)
<table>
<thead>
<tr>
<th>Stop 4:</th>
<th>Rock Slide</th>
</tr>
</thead>
<tbody>
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<tr>
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</tr>
<tr>
<td>Latitude:</td>
<td>N 44°48.0’</td>
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<td>Wind Velocity:</td>
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</tr>
</tbody>
</table>

Our next stop was on a trail in Putnam Park that had recently (within the last three years) been remade following a rock fall. The walking trail went along the side of a hill with the river 10-15 meters below. The remodeling of this area was quite evident (Figure 12). The uphill side a retaining wall slants inward to the slope of the hill, helping to fight soil creep, a gradual movement of material down a slope, due to gravitational force, nearly imperceptible to the eye (Ritter et al., 2002).
The new retaining wall leaned back into the hill in an effort to counteract the soil-creep as well. The old wall shows evidence of soil-creep, noticeably jutting out from its original position (Figure 13). A large variety of trees, shrubs, and grasses also helped to hold the soil in place.

These slopes are particularly interesting because the vegetation can give evidence of this soil creep phenomenon. Trees attempting to grow straight up begin to show a curve as soil creep attempts to skew their growth to point downhill rather than vertically straight up (Figure 14).
Stop five took a look at the sandstone bedrock that had been exposed because the Chippewa River is so low. The river was about 100 meters wide, but since the water levels were down we were able to examine the older sand deposits (Figure 15). The bedrock exposed is old sandstone dipping in a general NW-SW direction (Figure 16). These rocks at one point were sand dunes that over the course of millions of years had been cemented into the sandstone that we can see today, the dipping seen in the rocks shows ancient fluvial processes at work. Large mounds, also known as sand dunes or levees, can be seen, deposited by the eddy coming across the river from the faster moving cut-bank side (Figure 17).

Figure 15 – A view across the river only made possible by the extremely low river level.
Figure 16 – Dipping angle of sandstone bedrock

Figure 17 – A look at one of the natural levees created by the river
Stop six took a look at a culvert that the university built to deal with the large amounts of water that must be drained from upper campus. The culvert is a large metal monstrosity with large boulders cemented to its sides to prevent erosion (Figure 18). The pipe also drains the hill. In the summer of 2006, heavy rainstorms resulted in a large amount of erosion.

Figure 18 – Culvert pipe with large rocks cemented to it.
The boulders were cemented in place and were supposed to be there to prevent erosion, the large amount of water that still on occasion flowed down the hill have started to erode behind the rocks that were supposed to prevent damage to the culvert pipe (Figure 19). At the end of the culvert pipe is a deeper pool where water is constantly flowing. An alluvial fan is being formed by the large amount of rainwater as it comes out the culvert on its way to the Chippewa River (Figure 20).

*Figure 19 – Erosion cutting into the rocks flanking the culvert pipe.*

*Figure 20 – Alluvial fan created by water running out of the culvert pipe.*
The water rushing out of the culvert pipe has also exposed a very interesting deposition pattern. The water has gouged open one of the natural levees showing its inner stratigraphy. The further down into the levee you look, the larger the deposited materials (Figure 21).

Figure 21 - Waters from the culvert pipe exposed the inner stratigraphy of one of the levees. (Harry giving the view a thumbs up)
Our next stop was on Hendrickson Hill. Taking a short walk up the hill we were able to see many of the measures the city had taking in order to control erosion (Figure 22). Chancellors Hall, located on the University of Wisconsin-Eau Claire, is built at the top of the hill. The university was afraid that if the hill washed out further, the structural integrity of Chancellors Hall and the parking lot would be compromised. Thousands of dollars was spent building the culvert pipe and storm drain system to deal with the large amount of rainwater from on top of the hill.

Figure 22 – The class walking up Hendrickson Hill
Overflow pipes in a small holding pond have been constructed in order to accommodate large amounts of water (Figure 23). The trees around the trail further up used to parallel the trail all the way down the hill but because of the erosion problems these trees were cut down to allow for construction.

Extra soils and silts were added to the sandy landscape to allow the heavy machinery that was used to build the culvert and drainage pipes to come back up the hill. Sands on the outskirts of the trail reflect the flooding of previous years.

*Figure 23 – Picture of small holding ponds that keep rainwater overflows.*
Our eighth stop was at Little Niagara Fall, also known as “lover’s rock”. This area is a prime example of a nick point, which is a process lowering the base level of a stream (Ritter et al., 2002). The point stands about 3 meters above the Chippewa and the little Niagara drains out into the Chippewa here (Figure 24). Due to the low river level, we were able to walk all the way around the bedrock outcropping, something that is usually impossible (Figure 25).
Also, small “pot-holes” can be found here. A “pot-hole” is a hole that is bored or drilled into a rock (bedrock) by a small pebble. The pebble gets caught in a circular current (or eddy) and it wears a hole into the rock (Figure 26). Not only were we able to see a pothole in its beginning stages but we were also able to see an old pothole measuring at least a meter deep (Figure 27).
Figure 26 – Diagram showing how potholes are formed.

Figure 27 – This is an old pothole at least a meter deep. Note the golf ball for scale.
Our ninth stop looked at the recent improvements that the University had made to the cut bank of the river in order to slow down erosion. The university cleared the bank of trees and installed anchors that are said to hold the bank together better. A nice railing, having a very nice rust color said to be the exact color the university was looking, was installed. The side of the slope is mostly large rocks with grasses matted to the rocks to prevent further erosion (Figure 28). The slope is approximately 45°.
Summary:

On two consecutive thursdays, the 13th and 20th of September, 2007, a University of Wisconsin – Eau Claire geomorphology class went into the field to study fluvial processes as well as how civil engineers deal with the problems associated with these processes. We went to a total of nine stops each addressing a different fluvial process and/or engineering problem. The processes that we encountered on our journey included: stream migration (point bars and cut banks), rock falls, soil-creep, deposition, erosion, alluvial fan formation, nick points and pot-hole formation. The amount of time and money that the University and City of Eau Claire has put into combating these processes is amazing; water is definitely a very destructive force. Our field trip expanded upon our knowledge of fluvial features and gave us hands-on experiences in the world of fluvial geomorphology.

Bibliography: