Your Name_____

Canoe Mates_____

_____

Floating the Winooski – River Landforms and Processes In The Field

Winooski River Sinuosity

Introduction:

We will use canoes to float the Winooski River and observe its morphology while discussing the history of the river and the physical processes active today. We will bring GPSs and maps to measure our positions at multiple points along the river and to calculate several physical characteristics of the river. You will be working in groups of three or four today to collect data, however each of you will need to make your own calculations and hand in your own concept sketches.

Gear:

Garmin 12 GPS units, laminated maps, laminated photos, digital cameras, long tape, depth meter or weighted tape, stop watch, range finder.

To hand in: ON MONDAY 9/15/08

- This lab sheet containing all GPS locations and calculations.
- Excel plot of all points used in your sinuosity calculation
- Excel table of all sinuosity points and calculations.
- Concept sketches annotating river processes and landforms along the lower Winooski River.

Directions: MAKE SURE WHO EVER IS IN THE STERN CAN STEER!!

One person in the canoe should collect GPS points at relevant stops as we move down the river, as well as collecting points more frequently for your sinuosity calculations. Use the "MARK" button on the GPS units to collect points. Make sure to name and save each point that you collect. Write down any relevant notes. Be prepared to get your feet wet.

Part 1 – GPS points at the following features and landforms:

During the trip you should keep your eyes open for the following features. We will stop and discuss many of them, but try to spot the others yourselves. Take notes about them so you will be able to discuss them in your sketches.

OBSERVATION OR FEATURE	EASTING	NORTHING	Notes:
evidence for past high water events			
evidence of ice damage to vegetation			
point bar/cut bank pairs			
evidence of human modification of the channel			
evidence for flood plain aggradation resulting from deforestation in the 1800s			
movement of sediment down slope to river			
waste water discharge			
evidence of 1927 flood			
mid-channel island			
floodplain			
terrace			
non-point pollution sources			
agricultural impacts on the river			
stream bank stabilization			

Take some notes for your concept sketches here:

Part 2 – Measuring Discharge (Q) in the field:

During our trip, we will attempt to make flow measurements for the Winooski at two separate locations. When you get back from the field, you will compare your flow measurements from the trip with the actual flow of the Winooski recorded at the USGS gauging station near Essex Junction for this day.

To make measurements of Discharge (Q), you will need several simple pieces of data:

- Width of the channel (m)
- Average Depth of channel (m)
- The time (s) it takes an object to travel a certain distance (m) on the water surface.

	River section 1:	**River Section 2:**
Time of Day (hr)	_____	_____
Channel Width (m)	_____	_____
Average Depth (m)	_____	_____
Surface Distance (m)	_____	_____
Travel Time (s)	_____	_____
Surface Velocity (m/s)	_____	_____

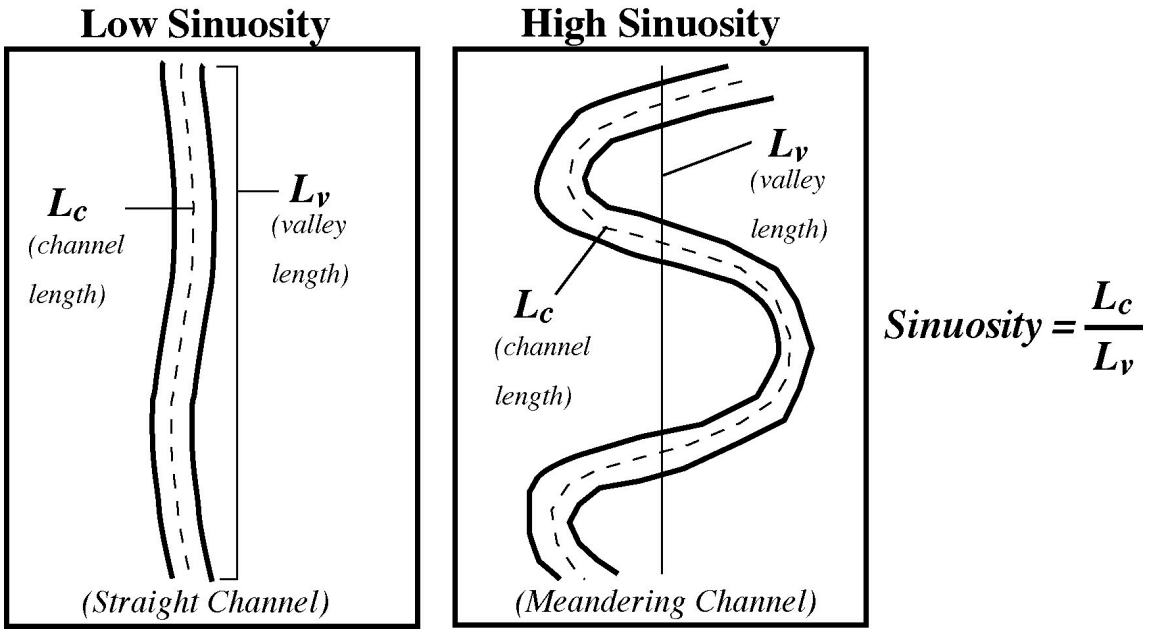
(to get average velocity of the entire water column, multiply Surface Velocity by 0.85)

Average Velocity (m/s)	_____	_____
Discharge (m^3/s) (calculated)	_____	_____
Discharge (ft^3/s) (calculated)	_____	_____
Discharge (ft^3/s) (from USGS gauging station for today). http://waterdata.usgs.gov/vt/nwis/uv/?site_no=04290500&agency_cd=USGS	_____	_____

**MAKE SURE TO NOTE THE TIME THAT YOU MADE THESE MEASUREMENTS AND TO COMPARE THEM TO THE USGS REAL-TIME FLOW MEASUREMENT AT THE SAME OF DAY.
**MAKE SURE TO HAND IN ALL CALCULATIONS.

Part 3 – Measuring River Sinuosity:

As we discussed in class, river sinuosity is simply a measure of how "curvy" a reach of a river is. In practice, it is calculated by dividing the "thalweg length" (Thalweg is the deepest part of the channel) by the "as the crow flies" distance between a beginning and an ending point along a channel. You can think of sinuosity as the ratio between the channel length and the valley length.



Sinuosity using the map:

Using a string, trace the shape of the Winooski River from where we put in our canoes to where we pulled them out of the river. Measure the distance using the scale bar on the map. Now stretch the string straight between the two points and again measure the distance.

Sinuosity using GPS points:

Collect at least 15 GPS points as we float down the river trying to collect points in order to catch each major inflection along the channel. In Excel, enter these points then plot them up with the easting measurements along the x-axis and the northing measurements along the y-axis. Using the same strategy described on the next, figure out a way in excel to calculate the cumulative distance between all individual points, and the distance between the first and last point. We will work on this in the computer lab on Friday.

Distance Using the Pythagorean Theorem: If you have a pair of UTM coordinates, you can use the Pythagorean Theorem ($\mathbf{a^2 + b^2 = c^2}$) to calculate the distance between them. Think of measurements of Eastings as the x-axis of a graph, and measurements of Northing as the y-axis of a graph. The difference between Eastings is your "a" and the difference between your Northings is your "b." Now solve for the hypotenuse "c."

Make sure that your GPS units are set to collect data in UTM NAD 83. Calculate the distance between your first two sinuosity points.

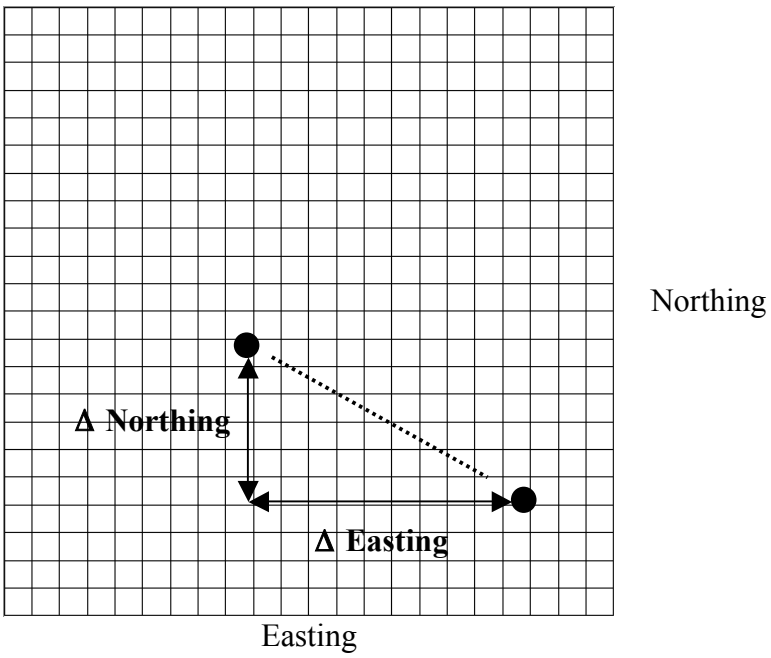
Point 1 = _____E

_____N

Point 2 = _____E

_____N

Plot each point on the graph paper below and calculate the distance between the two points…the hypotenuse. You can use this method to calculate the distance between each pair of points. The sum of all the distances is your total channel length.



Pt #	Easting	Northing
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

	Map Sinuosity	**GPS Sinuosity**
As the crow flies (L_v) distance.	_____(m)	_____(m)
Thalweg distance (L_c) (channel length)	_____(m)	_____(m)
Sinuosity	_____	_____

**HAND IN ALL EXCEL PLOTS, DATA TABLES, AND CALCULATIONS SHEETS

Part 4: Concept Sketches:

- Using the attached maps, produce two concept sketches for the lower Winooski River.

Map 1: This map shows the reach of river we floated down in canoes. Examples of what should be included on this concept sketch include the following:

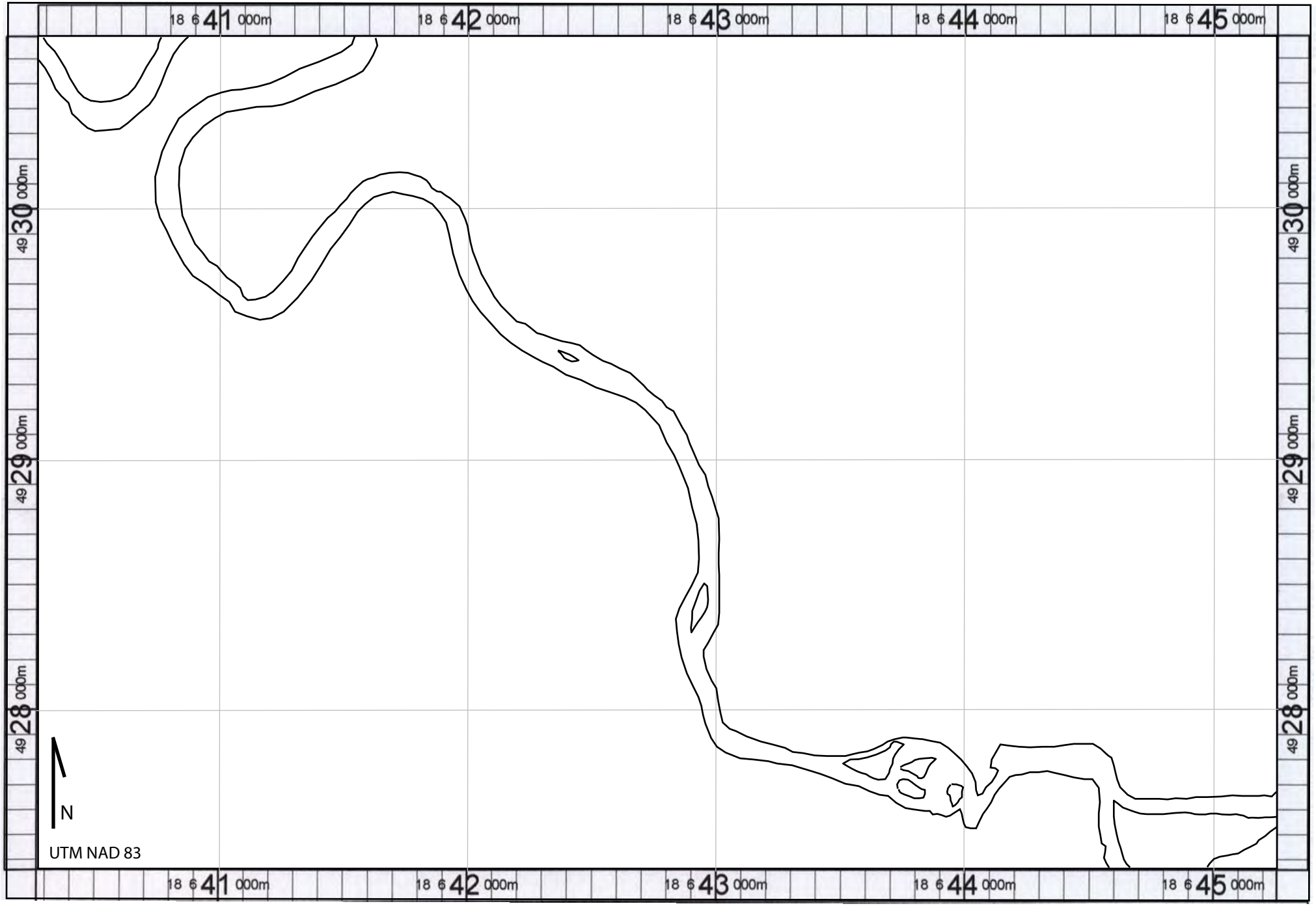
- Locations of all GPS points collected,
- Sinuosity along this channel reach,
- The location and discussion of the features and concepts listed in Part 1,
- Any other examples of fluvial process and form you took note of on our float trip,
- Any other relevant concepts discussed in the readings, Monday's lecture, or your own personal knowledge and experience.

Map 2: This map shows the section of the Winooski River from where we pulled out our canoes, and the river outlet into Lake Champlain. Although we did not float this reach of the river, there are wonderful examples of fluvial process and form displayed on this map. Using the **laminated orthophoto** we used during the float trip, make a second concept sketch based upon features you can pick out purely in map form. An online version of this map can be found in the **Maps and Orthophotos Link from our Webpage.** The easiest way to get there is from:
http://www.uvm.edu/~pbierman/classes/morph/index.html

Your concept sketch should include concepts from the readings and lecture such as:

- Evidence of active meander migration,
- Evidence of past channel position, (for this one, don't just look at the river channel and water bodies, look to the floodplain and hillslopes for landforms that are suggestive of river channel form and process),
- A discussion of how the sinuosities between this reach of river and the one on map 1 differ,
- Anything else you notice and find important.

Winooski River - Map 1 (use for concept sketch)



Winooski River - Map 2 (use for concept sketch)