GEOL 151 – Source to Sink Field Excursion and Concept sketch

Today will be our last day in the field. We will be tracing water and sediment as they move from the Green Mountains to Lake Champlain. This lab will require you to work together at 5 field sites to rapidly collect data. Once back at UVM, you'll use these data to create a concept sketch that details how channels change and water chemistry changes from the headwaters to outlet of a drainage basin.

At each site, you will need to collect the following data:

1. Average wetted channel width.
2. Average water depth.
3. Average water velocity.
4. What does the channel look like (see Figure 6.10 in Bierman and Montgomery)
5. What is the size of the channel bed material (silt, sand, gravel, boulders, bedrock)?
6. GPS coordinates for the site
7. A 50 ml tube with water sample.

Once back at UVM, you should calculate:

1. The upstream drainage basin area at each site we visited.
2. The discharge in m^3 at each site we visited.

Each person will create their own concept sketch. For the sketch do the following:

1. Use GOOGLE maps/Earth as a base using kmz file loaded onto 151 web site.
2. At each site we sampled and at each site create a caption with the 4 standard concept sketch elements.
3. Using our data, create, add to your sketch, and describe with the 4 standard concept sketch elements your own version of Figure 7.6 in Bierman and Montgomery (make sure to include all four graphs using the field data we collected and the basin area you calculated).
4. WRITE a 250-300 word description of how river channels and the processes shaping them change as you moved down the LONG PROFILE from the headwaters to the outlet of the Winooski River; use this to explain your concept sketch.

All of this is DUE at MIDNIGHT on Wed October s31. Please submit by email to Mae Kate.

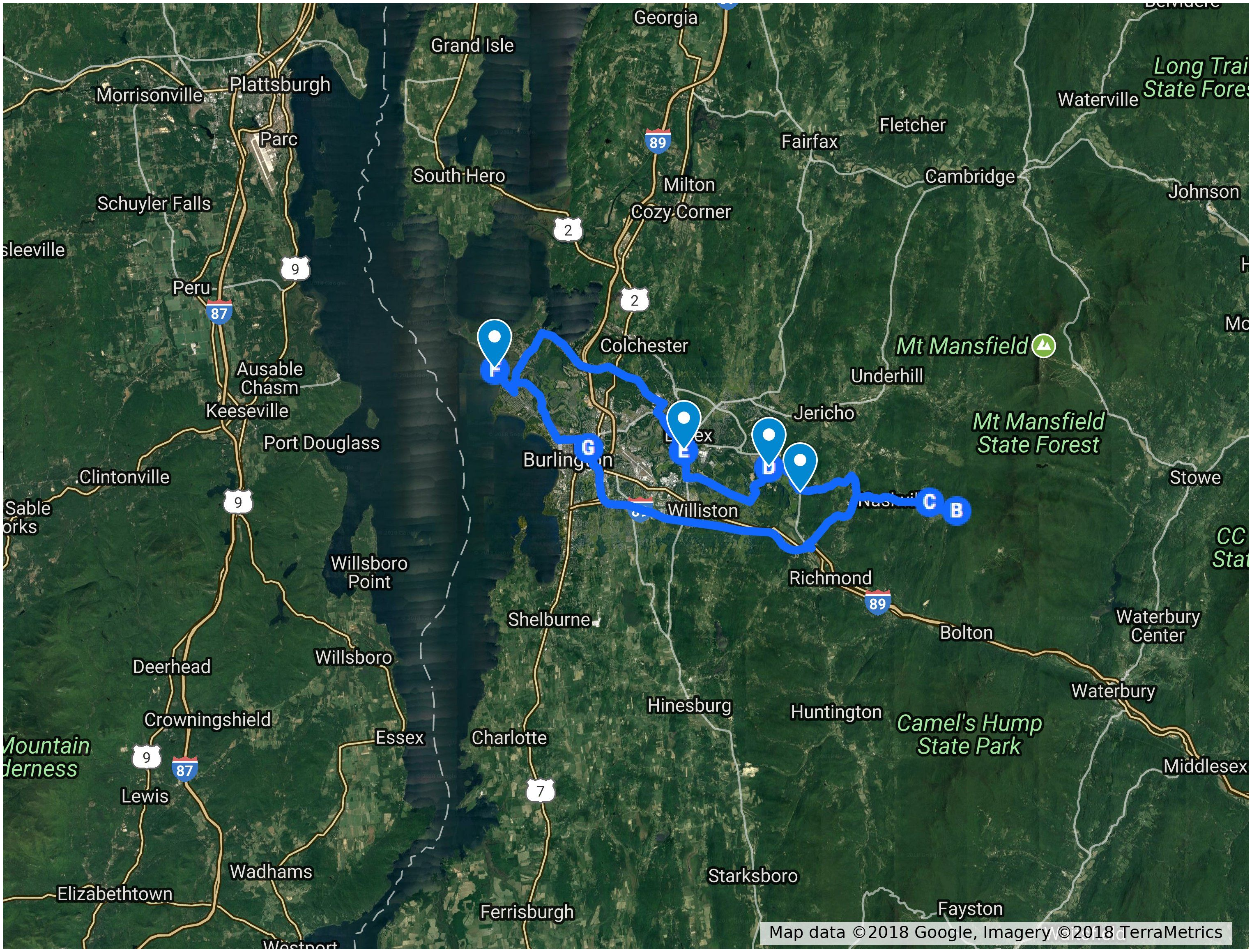
GEAR
Tapes and Weights
Distance meter
Fruit
Test tubes

		m/s	*m*	*m*	*NAD 83*		*s (0.8 multiplier for surface measurement)*			
SITE 1	**TYPE**	**velocity**	**avg depth**	**width**	**GPS N**	**GPS E**	**Q**	**NAME of STREAM**		
Site 1										
Site 2										
Site 3										
Site 4										
Site 5										
Site 6										
								Winooski USGS flow measurement		

source to sink trip

Sites to visit

- Delehanty Hall
- Site 1
- site 2
- Site 3
- Site 4
- Site 5
- Site 6



Directions

Directions from Delehanty Hall, Burlington, VT, USA to Delehanty Hall, Burlington, VT, USA

- A Delehanty Hall, Burlington, VT, USA
- B Site 1
- C site 2
- D Site 4
- E Site 5
- F Site 6
- G Delehanty Hall, Burlington, VT, USA

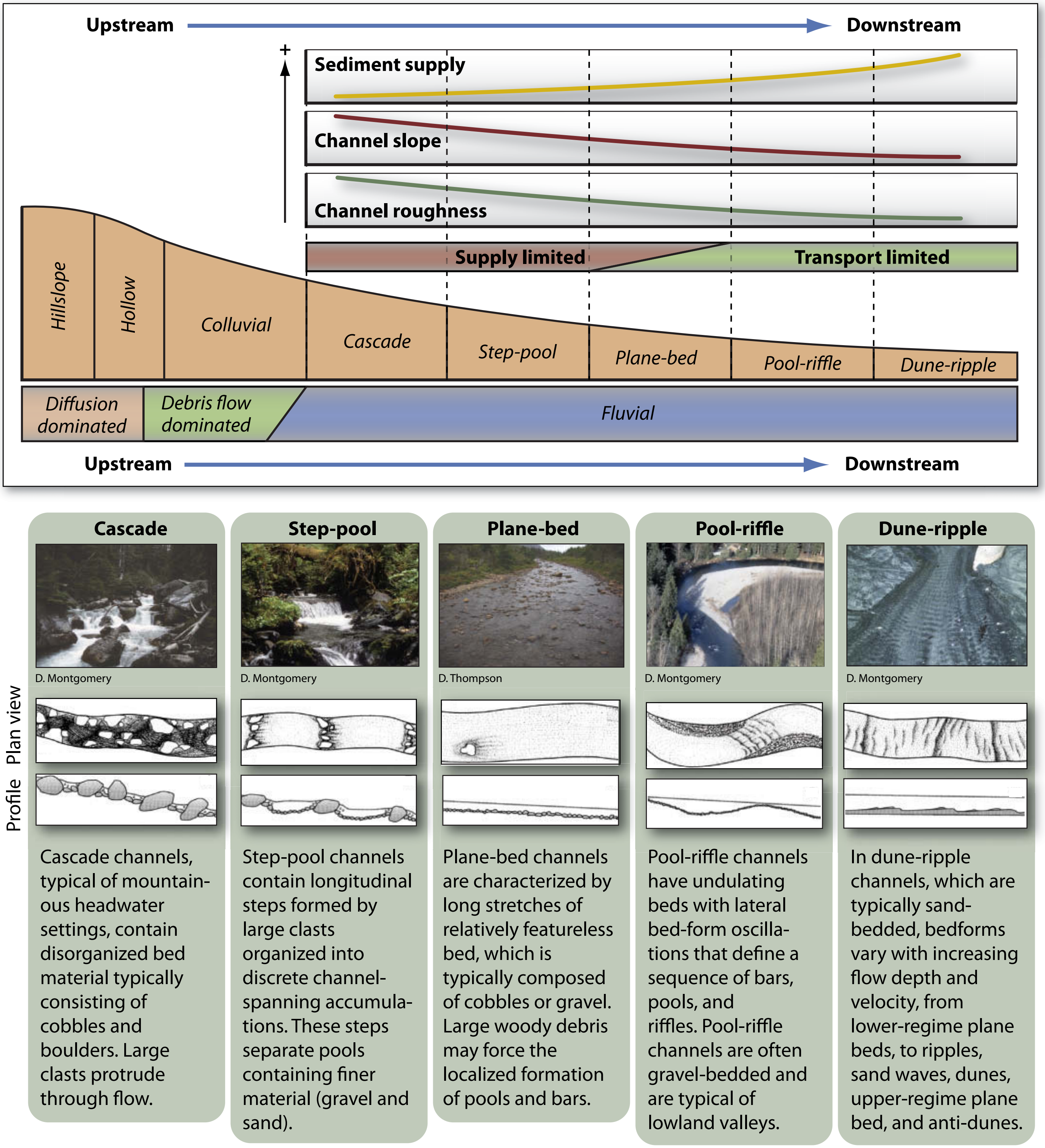
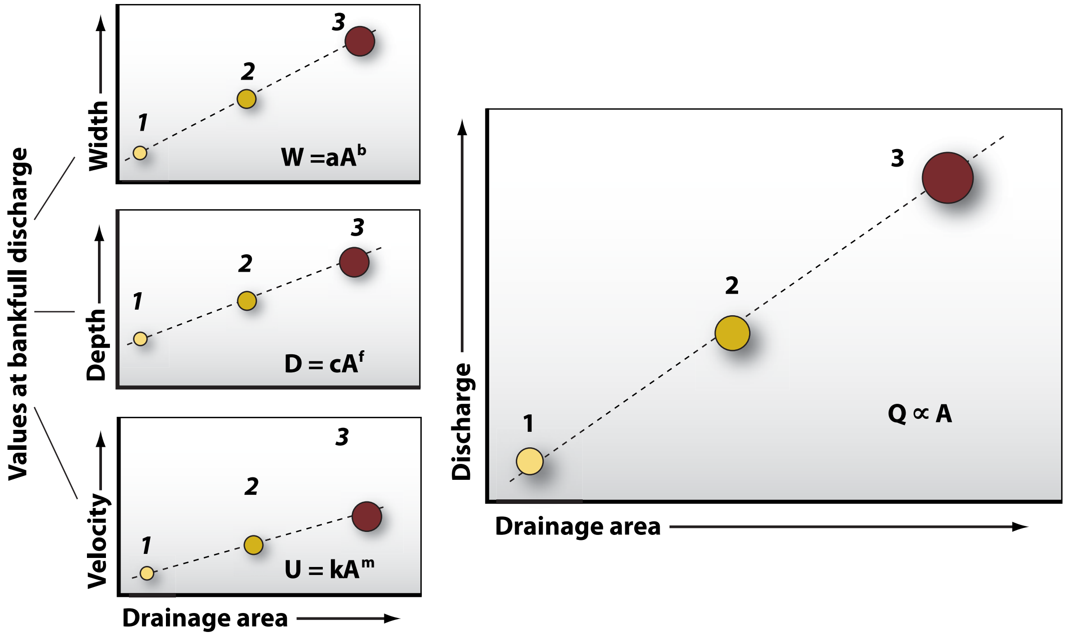


FIGURE 6.10 Downstream Trends in Mountain Stream Channel Types and Characteristics. Schematic illustration of typical downstream trends in sediment supply, channel slope, channel roughness, and channel types on a longitudinal profile from ridge crest to basin outlet. The particular sequence of channel types along any given river system will reflect both local and systematic downstream trends in channel slope.

flow energy; flow tumbles over obstructions. The largest clasts may move only every few decades; smaller clasts are rapidly transported during more frequent flows. Cascade reaches are steep (between 8 and 20 degrees), have large bed-material grain sizes, and have relatively shallow flow depths. Sediment transport in cascade channels tends to be supply limited because the transport capacity generally exceeds the sediment supply.



In humid-temperate regions, rivers and streams typically gain water over their length; thus, **discharge** increases downstream (with increasing basin area) and so do channel width, depth, and the average downstream velocity of water moving through the channel at any particular flow condition. Usually, comparisons are made at bankfull flow. Coefficients (a, c, and k) are determined empirically. Because basin area and discharge are positively related, basin area (which is easily measured) is used as a proxy for discharge when predicting downstream trends in width, depth, and downstream velocity, with typical values of $b = 0.3$ to 0.5, $f = 0.3$ to 0.4, and $m = 0.1$ to 0.2.

FIGURE 7.6 Downstream Changes in Channel Geometry. Downstream hydraulic geometry relationships quantify the observation that in humid-temperate drainage basins, channel width, depth, and water velocity all increase with basin area for a specified river level, such as bankfull.

Such correlation between basin area and geomorphically important channel characteristics means that by amalgamating hydraulic geometry data for multiple stations along a drainage, one can predict channel characteristics downstream at specific, geomorphically meaningful discharges, such as bankfull, as a function of basin area. Equations of the same form as at-a-station relationships (see Chapter 6, eq. 6.4) are used for downstream (basin area) relationships. When downstream relationships are plotted, the exponents represent the downstream rate of change in width, depth, and cross-sectional area with increasing basin area.

Finding that flow velocity generally increases downstream comes as a surprise to many people accustomed to thinking that the rushing, turbulent waters of mountain streams flow faster than the apparently calm water of large lowland rivers. However, the roughness of mountain streams and their shallow depth together lead to energy dissipation that more than makes up for their steeper slopes. Deep, wide lowland rivers flowing through relatively smooth channels have little friction along the bed and banks, allowing the water to move quickly despite the low slope (see Chapter 6).

Uplands to Lowlands

Drainage basins encompass a continuum of elevation, climate, and biota from their headwaters in the uplands to their outlets downslope. In large drainage basins, such as the Amazon, this continuum extends from frigid, lofty mountain peaks to sweltering tropical lowlands. Moving down the main stem river in a drainage basin, one can make predictions about changes in the dominant geomorphic process and form, changes indicative of slope, temperature, and weathering intensity [Figure 7.7]. In general, upland areas are sediment sources and lowland areas are sediment sinks.