Lab 2 – Transect Surveying

Description

The goal of this lab is to introduce you to basic surveying techniques and teach you how to complete channel cross-section and longitudinal profiles. We'll be using a simple autolevel (also called a surveyor's scope or surveyor's level) and stadia rod (also called a leveling rod) to determine the elevation of various points of interest in the channel. Specifically, we'll be focusing on surveying elevations along a chosen transect line in order to create a two-dimensional picture that records stream dimensions and reflects the channel morphology.

All channel surveys are completed with reference to a known point called a benchmark. In some cases, the benchmark is a permanent feature that has been previously surveyed and the elevation is known, such as a USGS benchmark or a CalTrans benchplate. More often, however, there is no known benchmark nearby and you must establish one (see Chpt. 5 of the reading). You can either assign an arbitrary elevation (100.000 m is most common) to your benchmark, or if you have access to equipment that can determine elevation relative to mean sea level with sub-meter accuracy, such as GPS units with external antennas and differential correction capability or high-end altimeters, you can assign a true elevation directly.

The two most common types of transect surveys used to characterize existing channel morphology and document any future changes in stream dimensions are the cross-section profile and the longitudinal profile. Cross-sections lie perpendicular to bankfull flow (across the channel) and quantify the channel shape; longitudinal profiles are surveyed parallel to the main channel (either parallel to the bankfull channel, "channel profile", or parallel to the thalweg, "thalweg profile") and quantify the channel slope. Measuring tapes are strung along the chosen transect line and used to measure the distance between survey points. Each survey point has two dimensions: a 'station' or horizontal distance measurement, and an 'elevation' or vertical measurement. The profile is completed by graphing distance surveyed (measured by the tape) versus elevation surveyed (measured by the stadia rod).

For this lab, we're going to survey the 'Geology dept. creek' located behind the building. Each team will complete two cross-section surveys and a longitudinal survey. Both will require you to use turning points to complete the profiles; refer to Chpt. 5 of the reading for details. For this class, we will always work in the metric system. For surveying, we will use the following levels of accuracy: 0.1m for stationing (horizontal distances read off the tape), 0.005m for elevation and 0.01m for water depth, when applicable.

Readings

Read Chapters 5 – 8 in 'Stream Channel Reference Sites: An Illustrated Guide to Field Technique'. Pay particular attention to Chapter 5, which discusses the basic of how to use the equipment and how to survey.

Instructions

BEFORE you begin, make sure you have all the required equipment:

- Autolevel scope
- Metric stadia rod
- Metric measuring tape
- Survey datasheets
- Field notebook to record comments
- Cross-section pins (rebar, wooden stakes, etc)
- Small hand sledge

1. **Establish a benchmark.** Determine a good location to install a benchmark (rebar, stakes, etc) or select a unique permanent feature that can be easily documented. The benchmark location should be higher than

the bankfull elevation and preferably higher than any high water marks. Also consider how easy it is to see and survey, and how permanent both the location and benchmark itself are. Try to avoid using features such as small trees, tree branches and medium-sized boulders that may move.

a. Describe the benchmark location on each channel morphology survey datasheet.

b. Photograph the benchmark and record the photo number in your field notebook

c. Take a GPS measurement at the benchmark location and record it BOTH in your notebook and in the benchmark description section of the datasheets.

d. Draw the benchmark location on the Field Sketch form.

2. Set up the tripod and scope. Carefully consider where to setup so that you have to do as few turning points as possible. Try to find a location where you can see both cross-sections, including the bank pins, and the entire channel length. Remember that the height of the instrument (eye level of the scope) has to be HIGHER than the points you need to survey, but shouldn't be so high that the rod is unwieldy.

3. **Survey the benchmark to determine height of instrument (HI).**

a. Record the names of the rod person, scope person and notetaker on the datasheet.

b. Hold the stadia rod on top of the benchmark as vertically as possible. Record the measurements on the first line of the datasheet – station is 'BM', backsight is the stadia rod reading, elevation is 100.000m, and height of instrument is: ***HI = ELEV + BS***

4. Survey the cross-section.

a. Using the appropriate datasheet, record the cross-section location, left bank pin and right bank pin descriptions on the datasheet. (Be sure all header and benchmark info is included).

b. Draw the cross-section location on the Field Sketch form.

c. Record the GPS locations of each bank pin on the datasheet.

d. Starting at the LEFT bank pin with 0.0m on the tape, begin surveying. Follow the topography, not a set increment of distance.

e. Record each survey point on the datasheet along with any comments about each survey shot. It's up to the rod person to call out to the notetaker when certain points of interest are surveyed, such as left bankfull, left edge of water, thalweg, etc.

f. Remember to always put 0.0m on the LEFT bank so that your cross-section view is 'looking' downstream.

g. Fully calculate the elevations of all turning points to ensure accuracy:

TP ELEV = HI – FS ***NEW HI = TP ELEV + BS***

5. Survey the thalweg profile.

a. Using the appropriate datasheet, record a description of where station 0.0m is located.

b. Record the GPS locations of the start and end point of the survey on the datasheet.

c. Begin surveying, starting at 0.0m. Follow the topography, but aim for spacing of about 2m.

d. Fully calculate all turning points to ensure accuracy.

6. Survey the second cross-section. Repeat step 4.

7. Close the survey. Always close out the surveys by resurveying the benchmark elevation. This will provide a measure of elevational error. Record the close out shots on the longitudinal survey datasheet AND record the measured error in your field notebook.