**Channels and flooding – recurrence intervals and geomorphic effects**

Today we will examine flooding in river channels from two perspectives, the recurrence interval of floods and the geomorphic effects of those floods. We will use the Winooski River as our lab and two on-line resources.

1. The Landscape Change Program and its collection of some of the earliest air photographs of the state of Vermont, a series of images collected by the US Army air corps in just after the 1927 flood.

2. The USGS water information system, a web-based repository of river flow data for the United States accessible from <https://waterdata.usgs.gov/nwis>

**First**, use the lab web page and link there to go to the Landscape Change program web site and view the 67 images of the 1927 flood collected from the air by the Army air corps. Focus on those in the Winooski drainage basin (there are also some from the White River and elsewhere in Vermont). Many of these images have been reshot in 2004 by Jens Hilke in a small plane piloted by former UVM ENVS faculty Ian Worley. Pick an image and its reshot that show significant channel change caused by the flood and compare the 1927 image to the reshot image. Then, go to Google Earth and find the same area and try and recreate the same view. Compare the three images and write a paragraph documenting the effects of the 1927 flood and changes between each time step (1927, 2004, 2020).

**Second**, use the USGS web site (see lab web page for link) to download the *annual maximum flood series (*USGS calls this surface water, peak streamflow*)*. That is, the record of the largest flood in each water year (starts October 1) of the record that starts in 1928 (but captures the November 1927 flood). Also, download the *time series, annual statistics*, which will give you the average flow for each year of the record. Do the following with the data.

A. Use a spreadsheet and calculate the rank and probability of each flood in the annual maximum series using the equation in your book (p. 88, eq. 4.1 and 4.2). Once you have these data, then plot discharge vs probability on the probability graph paper linked to the lab website.

B. Calculate the mean and standard deviation and then the percent standard deviation (SD/mean \*100) of the annual maximum flood and of the annual average streamflow. The percent standard deviation tells us about variability in the data set.

**Third**, prepare your web page. Entitle it “*Channels”.*  On the page include.

1. The three aerial photos (1927, 2004, Google Earth) and your description of channel change over time in one paragraph.

2. A table and probability plot (scanned or photo) showing annual maximum flood probability for the Winooski River at Essex. Write a paragraph comparing the variability (percent standard deviation) of the annual maximum flood series with that of the annual average stream flow and describe how and why they are the same or different from a process point of view. Consider how the 1927 flood plays into these two series and consider how many times larger the discharge is for the annual maximum flood than the annual average flow.