Erosion history in the Mad River Valley

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Background

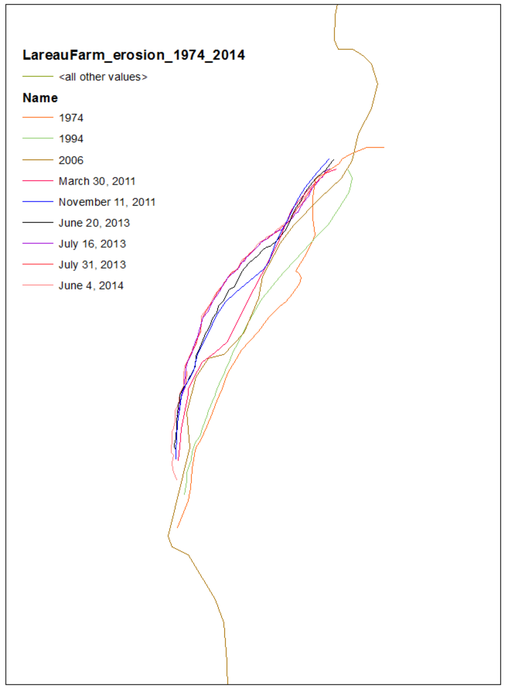
Many streams banks in the Mad River Valley have experienced significant erosion over time. Most of this is due to a small number of large impact events, such as Hurricane Irene. The amount of erosion that occurs due to a large event, however, does not stay consistent from place to place within a watershed.

Lareau Farm, 1994

Source: VCGI

Lareau Farm Timeline

1994	Earliest publically available orthophotos present taken, buffer present along stream bank
1998	Flood causes significant erosion, eliminates part of buffer
2006	Next orthophoto taken
March, 2011	No significant erosion has occurred since last date
November, 2011	Hurricane Irene has eliminated the rest of the buffer, caused largest amount of erosion since 1998
June, 2013	No significant erosion has occurred since last date
July, 2014	Storm causes significant erosion along entire un-buffered stream bank



Lareau Farm, 2008

Source: VCGI

Other Options: LIDAR Measurements and the Potential for Much More Accurate Data

One issue with the approach presented here is that of depth. When comparing orthophotos, only two dimensions are present, leaving room for many accuracy problems to arise. In this project, I have assumed that the height of the stream banks at all locations have remained more or less constant, but with LIDAR data there is no reason to make that assumption. By using LIDAR scans, accurate estimates of the volume of soil lost over a time span can be achieved.

The biggest problem with using LIDAR to accurately estimate erosion is the lack of data so far. Using orthophotos, I was able to compare erosion over the past forty year. LIDAR technology has not existed for 40 years. As time progresses, however, this issue will disappear, and erosion estimates will become much more accurate.

Study Area

Several stream banks in the Mad River Valley were analyzed. All of these streams were relatively small, with the largest one having a full bank width of less than 200 feet.

Methodology

Orthophotos from 1994, 2006, and 2011 available on VCGI were downloaded. Each site's stream bank was digitized in each orthophoto. In addition, an orthophoto from 1974 was used, as well as LIDAR data from 2013 and 2014. These digitized stream banks were then contrasted to see how they changed over time. Major storms were compared to surface area lost at each site for each time span. The changes in width and sinuosity over time were then measured for each stream bank.

Conclusions

Although large storm events are the main cause of erosion in the Mad River Valley, the exact effects of these storms cannot be predicted because stream bank erosion depends heavily on past events and initial conditions. No correlation exists in the width or sinuosity of the measured stream banks after an erosion event and the size of the storm. Advancing technology will allow for more exact measurements and analysis on stream bank erosion.

References

http://vcgi.vermont.gov/
George E. Springston
USGS Geological Survey

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