

# **Comparison of Aerial Photographs: 1927 to Today**

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## Introduction:

The 1927 flood occurred on November 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup>. It was a massive flood event, inundating the landscape with nearly nine inches of water over a short period of time (NOAA Website). The already saturated soils were unable to absorb so much rain, and the result was the 1927 flood. The flood affected all of Vermont, but most prominently the Winooski River Basin (NOAA Website). In the days after the flood, the federal government commissioned a flyover of the Winooski, White, Black, and Lamoille Rivers (F. E. Hopkins, 1927). They documented the flood damage with ninety aerial photographs, sixty-eight of which are displayed on the Landscape Change Website. In addition to the aerial photographs, much of the destruction was recorded through photography taken by people on the ground.

The main purpose of this project is to scan, crop, rotate, upload, and then re-shoot the aerial flood photos.

## Methods:

### *Digitization:*

Photos were scanned using a Canon LiDE 30 scanner and a Macintosh Powerbook G4 computer at 600-dpi (dots per inch) resolution so as to maintain the integrity of the original photograph. This is also standard archive resolution. I then used Adobe Photoshop to crop, rotate, and color balance the images. I saved an original TIFF file, and also made a JPEG copy. The JPEG's were uploaded to the Website, as they were considerably smaller than the TIFFs.

### *Mapping the Images:*

One of the most challenging tasks of this project was figuring out a way to visualize the image on a map. Our pilot, Ian Worley, came up with a method that worked extremely well. For each image we took an 8.5 x 11 topographic map (1:24,000 scale) and marked the four corner points of the image, which created a trapezoid on the map showing the area of the historic photograph. The baseline was always the shortest line, the more rectangular the trapezoids were suggest that the historic photo was taken looking downward, and the larger the trapezoid, the higher the plane was. By connecting the two sides of the trapezoid we were able to create a triangle, and the point at which the

two lines intersected was the location of the plane. We determined plane elevation by trial and error, sometimes making more than one circle around a picture area.

#### *Re-Photography:*

Once we had mapped all of the images, we ventured into the airplane. We grouped the pictures by river (excluding Burlington, Colchester, and Winooski which were grouped with the Lamoille river). We re-shot the Winooski river images first (Barre, Middlesex, Montpelier, Richmond, Waterbury, and Williston). On our next flight, we re-photographed the White River images (Bethel, Hartford, Randolph, Royalton, Sharon, Stockbridge). This flight did not prove to be as successful as the first, mainly for meteorological reasons. On our third flight we did the Ludlow images, and re-shot the failed images from the White River. A failed image is a current photo that has completely a different angle of roads, rivers, and other landmarks than the historic photo. On our final flight we did the Lamoille river (Milton and Fairfax), Burlington, Colchester, Winooski and a few Williston images that needed better current photos.

To actually re-take the images from the air, we each (Ian and I, and Jens) had a set of the trapezoid maps, and a copy of the historic photograph. Since many of the historic photographs were similar to each other we only took distinctly different pictures and made notes to shoot one slightly to the left, right, higher or lower. To frame the image we often used landmarks, either man-made or natural, that were in the historic photograph. This included bridges (the most common), roads, buildings (most often churches), and the river itself, though on many occasions the river was an unreliable reference because of the changes that had taken place over the last seventy-five years. We also found that the back seat of the plane was a much better place to take pictures from because in the front seat, the strut often would get in the way.

#### *Pairing the Photos:*

When pairing the historic and current photos, it was important that the current photo not only show the same area as the historic photo but that the prominent features of the photo be at the same angles in both. One of the best indicators of similar angles was ridgelines, as these haven't changes appreciably over the past seventy-five years. Also reliable were bridges and roads, though they weren't always useful, as development has changed them in some places. Once again, we could not always use the river as a frame

of reference because of the change, sometimes extreme, in places. As for correct elevation between the photos we used the sizes of buildings and windows in buildings to match them.

Discussion:

*Comparison of Photos:*

**Fairfax – Lamoille River:**

[www.uvm.edu/perkins/landscape/LS\\_View.php?FileName=LS01421](http://www.uvm.edu/perkins/landscape/LS_View.php?FileName=LS01421)



Little has changed in Fairfax except for the slight expansion of the village, and more development. The road that crosses the river (Route 128) has been made bigger, and the bridge repaired after the flood. There is about the same amount of tree cover, though the fields are now bordered with trees, and there are more trees along the river. The river channel is narrower above the bridge, and similar width below the bridge.

**Burlington – Winooski River:**

[www.uvm.edu/perkins/landscape/LS\\_View.php?FileName=LS01418](http://www.uvm.edu/perkins/landscape/LS_View.php?FileName=LS01418)



Much has changed in this pair. This is also an example of a photo pair in which the elevation and angle are slightly different, we know this because in the historic photo the bridge is slightly larger than in the current photo. It is hard to know whether the flood caused the fork in the river or whether it was there before and has since been abandoned. Most dramatically seen in this picture is the reforestation. The area is almost completely deforested in the historic photo, and almost totally forested in the current image. There is also an island in the in the river now, where there was none in 1927. The land shown in this image has been developed in some areas, although the farm in the 1927 photo is still there today.

**Williston – Winooski River:**

[www.uvm.edu/perkins/landscape/LS\\_View.php?FileName=LS01458](http://www.uvm.edu/perkins/landscape/LS_View.php?FileName=LS01458)



The two most striking changes in this pair of images is ARE the reforestation and the development. The area has been completely taken over by interstate 89. In 1927 the area in this photo was occupied by three farms, a railroad and Route 2. There are now many more houses, a large industrial business, and several roads. While this area has been taken over by people, it has also been taken over by trees. In the 1927 image there are very few trees except for on the slopes in the background. Now the area is almost completely forested except for the large circular piece of land in the upper left of the image. This landmark was the key reference point in pairing these images.

**Sharon – White River:**

[www.uvm.edu/perkins/landscape/LS\\_View.php?FileName=LS01451](http://www.uvm.edu/perkins/landscape/LS_View.php?FileName=LS01451)



Not much change has taken place in Sharon since the 1927 flood. The slopes on either side of the river are more forested than in 1927, and the river is narrower (though the historic photo depicts a flood stage river). A landslide along the river is in the historic photo, and not in the current image. Development has not affected this area at all, the roads are in the same places and there are a few more houses. The most significant changes are more trees and less farming.

#### *Conclusions:*

This project demonstrates remarkable changes that have taken place since the 1927 flood throughout the state of Vermont. In some places, the current image barely resembles the same area in the 1927 photo, whereas in others the landscape seems to have changed very little. In all of the images the river has changed, and in some dramatic changes have taken place. On the whole, most of the photo pairs show reforestation and increase in development, with the building of interstate 89 along river corridors being one of the most important landscape changes.

#### References:

F. E. Hopkins, memo, 15 November 1927, Flood Relief Situation from the point of view of military authorities, 1-I/447, Hoover Papers, Hoover Presidential Library

The Flood of 1927 <<http://www.erh.noaa.gov/btv/html/27flood.shtml>> National Weather Service, Burlington, VT. October 1, 2002.