



Geologic History and Hydrology of Fern Valley



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BACKGROUND

Fern Valley is a patch of forest in Holmes County, OH belonging to The College of Wooster. The geology of the area consists of a buried valley with a preglacial lacustrine deposit of several tens of feet of lacustrine clays. Around 150 feet of glacial sedimentary deposits overlay the clays. Wilkin Run, the stream running through Fern Valley, is now cutting through these unconsolidated glacial sediments and, in some places, the preglacial lacustrine clays. The purpose of this study was to further our understanding of the geologic history of the area and to examine the hydrologic and climatic regime of the region.

METHODS: GEOLOGIC HISTORY

Data came from the Ohio Department of Natural Resources well logs. Three of these well logs, spanning a distance of 2505 feet (~0.5 mi), were used to make a cross section of Fern Valley. PowerPoint was used to illustrate the cross section.

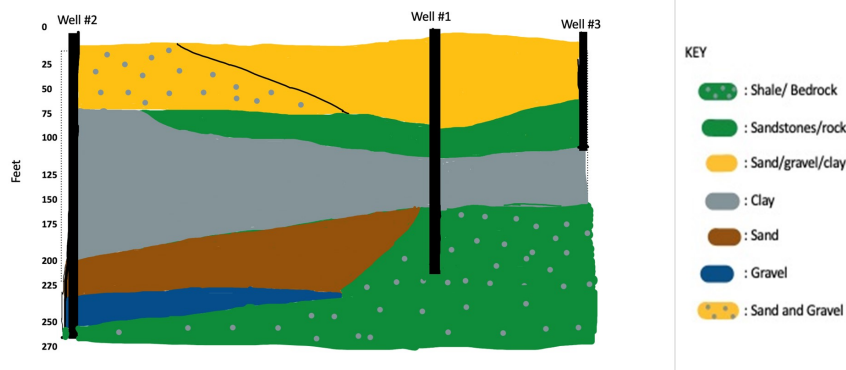
After making the illustration, the layers of sediment were evaluated to create a geologic history of Fern Valley.

METHODS: HYDROLOGY

In 2012, The College of Wooster Geology Department placed a transducer in a well in Wilkin Run to measure the river height. This transducer has been logging river height data every hour since early 2012. This data is used here to examine how stream levels have changed from 2012 to 2020 and to examine storm event hydrographs. The trend in average annual river height for Wilkin Run is then compared to average annual river height for Killbuck Creek, a stream running through Wooster, OH. Both streams are in Northeast Ohio, allowing for a more general evaluation of the changing hydrology and climatology of the region. Precipitation data from 1900-2018 for Wooster, as city in Northeast Ohio, is also analyzed for trends.

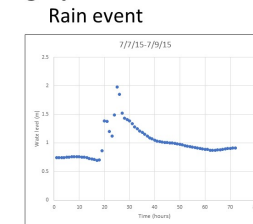
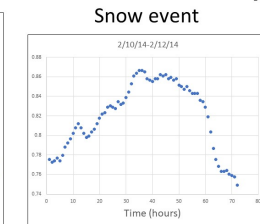
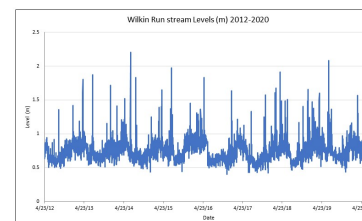
GEOLOGIC HISTORY

Fern Valley is located on the glacial boundary of the last glacial maximum (LGM). The glacier formed a valley in the bedrock and filled it with unconsolidated sediments after it melted. Fern Valley now consists of the original bedrock and lacustrine clays buried by the unconsolidated glacial sediments – sand/gravel/clay.



HYDROLOGY

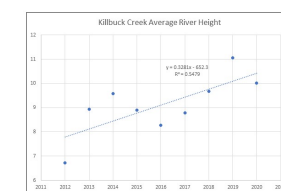
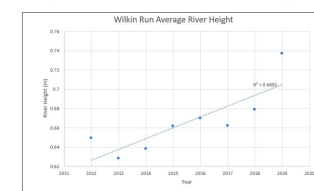
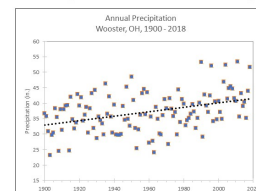
Storm hydrographs



slower peak water level during snow event compared to rain

Regional patterns

The region as a whole is experiencing wetter conditions and higher stream levels:



Additional 7 in. rain per century ($p=0.00001$)

Increasing river height across Northeast OH

DISCUSSION

The well logs indicated a sequence of preglacial, glacial, and post-glacial sediments, which Wilkin Run is now cutting through. The hydrologic data indicates that there is a significant increase in the annual river heights due to increased precipitation in the region. This pattern is consistent with the general climatic trend across the Midwest.

CHALLENGES

The biggest challenges with this project were logistical issues that resulted from the COVID-19 pandemic. We did not have the opportunity to go to Fern Valley to gain a first-hand experience with our field site. In addition, we did not have access to ArcGIS and were therefore also unable to make the LiDAR maps we had planned on making.

REFLECTION

Through this project we learned how to execute investigative research on a geologic site and learned about specific climatic changes to the Midwest, such as that the height of streams are increasing annually in response to wetter conditions. If given the chance to continue this project, we would make updated Digital Elevation Models of Fern Valley using ArcGIS.