http://en.wikipedia.org/wiki/John_Heinz_National_Wildlife_Refuge_at_Tinicum#/media/File:TinicumNWR.jpg

Reconstructing Historic Streams and Wetlands of Philadelphia

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Abstract

The hydrologic landscape of Philadelphia underwent significant changes in the nineteenth century. Wetlands and stream channels were often buried or extensively modified for use in industry. At one point the city was crisscrossed by at least forty streams, along with the two major rivers, the Delaware and Schuylkill. Today, only twenty-two streams remain. As part of its sustainability plan, the city seeks to reduce stormwater runoff in a number of ways, including the creation of new public green spaces and wetlands, the restoration of waterways, and the creation of new public green spaces and corridors. Successful restoration of an ecosystem requires multiple lines of evidence to ascertain reference conditions. To this end, we sought to reconstruct the nineteenth century streams and wetlands in Philadelphia, a period beset by rapid transformation of the city. This time period pre-dates aerial photography of the city, and thus one source of evidence useful in this task is found in the herbarium data from the Academy of Natural Sciences in Philadelphia. This study was completed by georeferencing herbarium records of wetland-obligate plants using Google Earth, utilizing the maximum extent calculators to create buffers of uncertainty, and, in collaboration with other historical archives and maps, was then able to pinpoint specific locations that were once high-quality wetlands in the city. Georeferencing the historical wetlands with present-day imagery can provide planners, city managers, and interested citizens a better understanding of what sites might be well suited for wetland reconstruction.

Study Questions:

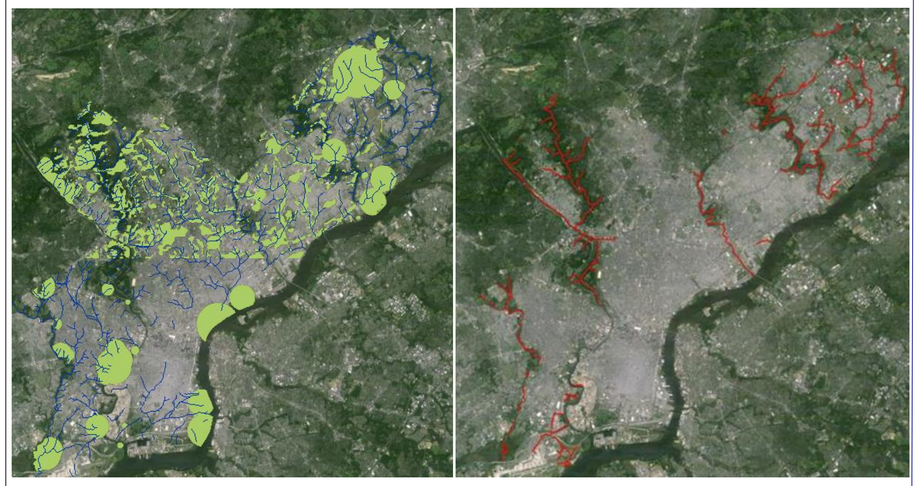
What is the historic distribution of streams and wetlands in Philadelphia?

Adam Levine, Philadelphia Water Department.
http://www.phillyh2o.org/backpages/Maps/A_HistoricStreams.jpg

History Of Study Area:

According to the archives, Philadelphia County, Pennsylvania had over forty streams before the city enclosed the fresh water system into the sewers. The project was originally done for health reasons and the city thought this was the best way to prevent illness. The city now only has twenty-two of the original streams remaining. Philadelphia is aware of the expensive cost it would be to reverse the system and has begun seeking other alternatives to alleviate the issue with their Greenworks Philadelphia plan. This study is the first of its kind in Philadelphia and serves as valuable information to the city officials. The map to the left shows over forty historic streams in Philadelphia before the landscape was altered.

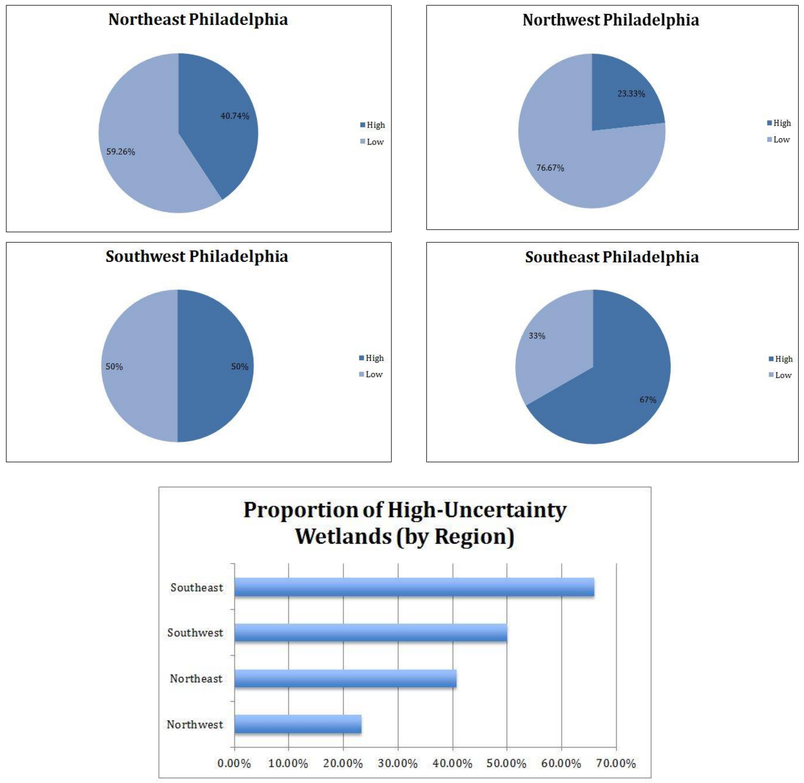
Historic Streams and Wetlands vs Present Day:



Methods:

- Archived herbarium data was georeferenced in *Google Earth*
- Coordinate points and maximum extent of uncertainty from each record using the point-radius method in the MaNIS georeferencing calculator
- Buffer uncertainty points in meters
- Clip uncertainty points to Philadelphia County
- Clip out highland areas using contour lines and georeferencing historical maps
- Import USGS possible and probable fill hidden stream valleys illustrating historic geologic alterations in the area
- Convert raster to polygon and join to wetlands layer
- Kernel density statistics were calculated to show the density of uncertainty variance and probability density between the four geographic regions of the city

Results:



Conclusions:

- Historic streams and wetlands are represented in almost every geographic area of the map except for directly in the center of the city.
- Historical high quality wetlands are most represented in two different areas
  - Northwest section along the eastern banks of the Schuylkill River
  - Northeast section
- USGS data shows the terrain in the Northeast and Northwest has been altered.
- Kernel density analysis showed greater uncertainty in the Southeast and Southwest regions of the city.
- Highest uncertainty was in the Southeast with the least uncertainty being represented in the Northwest region.

Further Study:

- More herbarium data records for Philadelphia should be georeferenced.
- Planners should also focus their attention on smaller sections of the city rather than the city in its entirety.
- Uniformed method to minimize error, both human and digital, to reproduce the high quality wetlands of Philadelphia.