

Preliminary Flood Plain Delineation Tool

Charles Cannon
GEOG490

Why is this program needed?

- Many flood plain maps are out of date
- Most are hand drawn, difficult to update, and based on old data.

Purpose of this program

- This program is intended to be a framework that can be expanded on so that flood plain maps can be easily updated
- As time goes on more measurements will produce more statistically significant results.
- Future versions will have greater precision through use of LiDAR data

What this version does

1. Reads in a tab delimited text file of stream discharge data
2. Extrapolates the discharge of a 100 year flood event using Pearson Type III regression
3. Uses stream gage elevation datum and user specified ratio of discharge to stream height to estimate stream height
4. Determines inundated areas using DEM

Log Pearson Type III for discharge of a 100 year flood

1. Rank biggest floods of each year on record in descending order by discharge (1 is largest) using QuickSort algorithm.
2. Take the log (base 10) of each discharge
3. Average the discharges and their logs
4. Calculate the recurrence interval $(n+1)/m$, where m = rank for each
5. Compute variance, standard deviation, and skew for the log values
6. Look up k values from frequency table based on skew
7. Solve $10^{(\text{AveLog}Q + k * \text{StandardDeviation})}$ for discharge

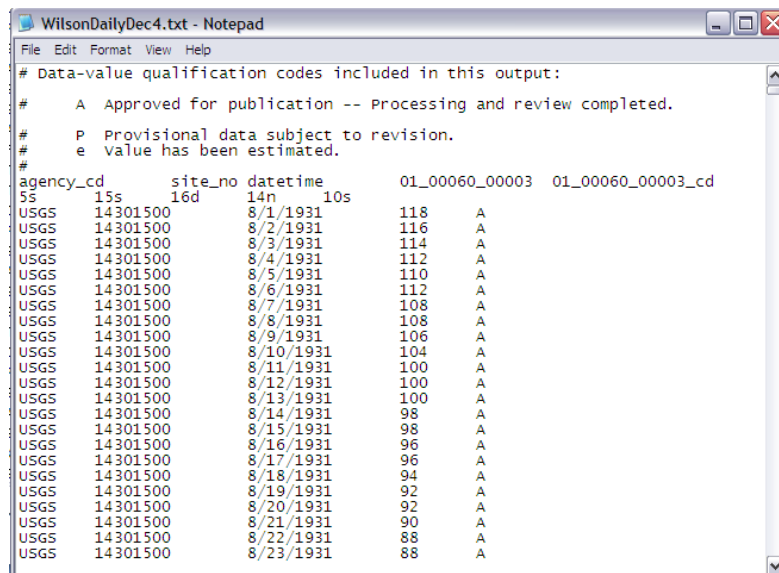
ArcObjects Interfaces Used

- GxDialog is used to allow the user to specify the input textfile using a textfile filter
- Raster and Rasterlayer interfaces are used to point to raster files
- RasterDescriptor and RasterExtractionOp and NumberRemap interfaces are used for a binary classification of pixels by whether they are above or below the estimated flood height.

Required Data

- DEM
- Tab delimited text file of maximum discharge values
- Get from <http://waterdata.usgs.gov/>
- Open in Excel and resave

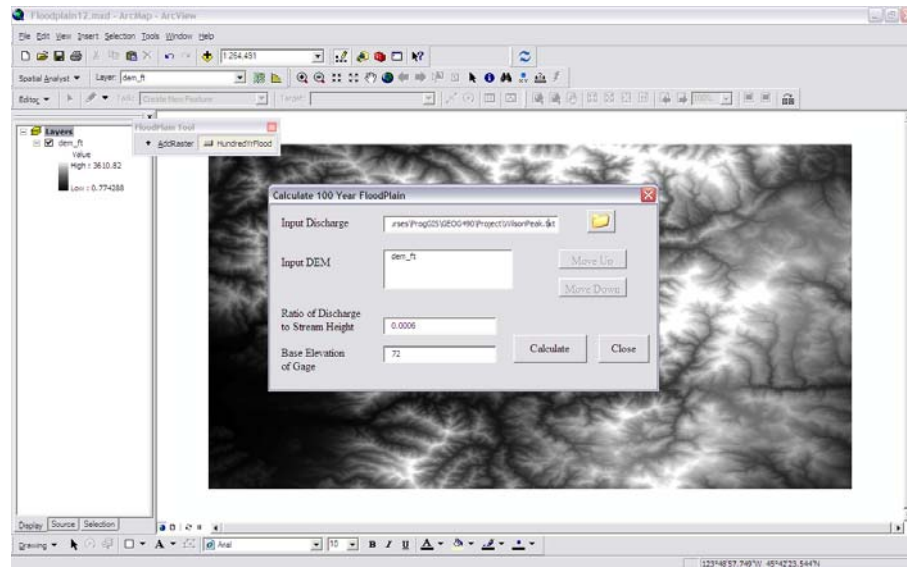
Example of text file



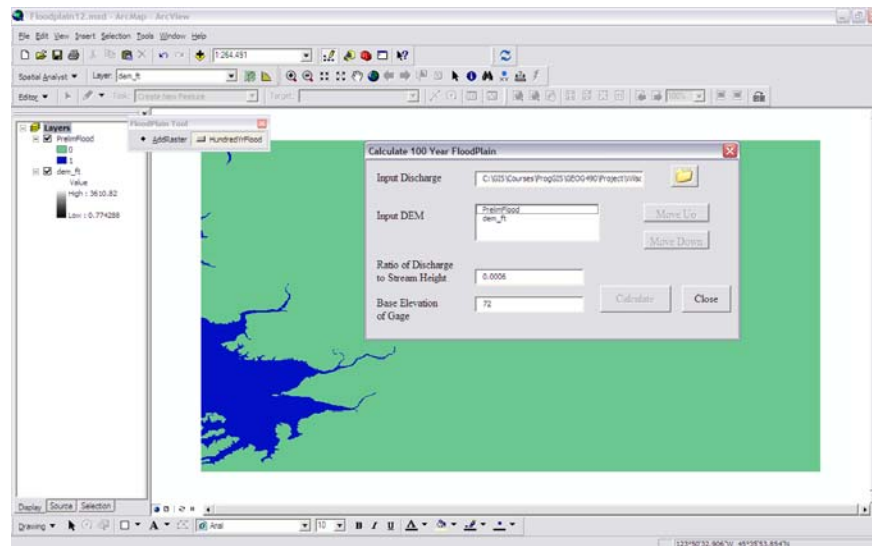
The screenshot shows a Notepad window titled "WilsonDailyDec4.txt - Notepad". The text inside is a tab-delimited file containing USGS discharge data. It includes a header section with data-value qualification codes and a main data table with columns for agency_cd, site_no, datetime, and two numerical columns.

```
File Edit Format View Help
# Data-value qualification codes included in this output:
#   A   Approved for publication -- Processing and review completed.
#   P   Provisional data subject to revision.
#   e   Value has been estimated.
#
agency_cd    site_no    datetime    01_00060_00003    01_00060_00003_cd
5s          15s       16d         14n          10s
USGS 14301500 8/1/1931    118          A
USGS 14301500 8/2/1931    116          A
USGS 14301500 8/3/1931    114          A
USGS 14301500 8/4/1931    112          A
USGS 14301500 8/5/1931    110          A
USGS 14301500 8/6/1931    112          A
USGS 14301500 8/7/1931    108          A
USGS 14301500 8/8/1931    108          A
USGS 14301500 8/9/1931    106          A
USGS 14301500 8/10/1931   104          A
USGS 14301500 8/11/1931   100          A
USGS 14301500 8/12/1931   100          A
USGS 14301500 8/13/1931   100          A
USGS 14301500 8/14/1931   98           A
USGS 14301500 8/15/1931   98           A
USGS 14301500 8/16/1931   96           A
USGS 14301500 8/17/1931   96           A
USGS 14301500 8/18/1931   94           A
USGS 14301500 8/19/1931   92           A
USGS 14301500 8/20/1931   92           A
USGS 14301500 8/21/1931   90           A
USGS 14301500 8/22/1931   88           A
USGS 14301500 8/23/1931   88           A
```

Tell program what data to use...



Output



Future Versions

- Will calculate the watershed from the DEM and the location of the stream gage to use as a mask
- Will calculate area based on the DEM only
- Will not require the user to enter anything other than the paths to the DEM, Shapefile (stream gage location), and the textfile
- Possibly incorporate stream networking

References Used

- Chang, Kang-Tsung, 2008, *Programming ArcObjects with VBA, A Task-Oriented Approach*: Second Edition, CRC Press, 2008
- Burke, Robert, 2003, *Getting to Know ArcObjects*: ESRI Press, 2003
- Geoffrey Duh
- USGS
 - <http://waterdata.usgs.gov/nwis/sw>
- ESRI Developers Network
 - <http://edn.esri.com/>
- ESRI Support Center
 - <http://support.esri.com>
- OSU Streamflow Tutorial
 - <http://water.oregonstate.edu/streamflow/analysis/floodfreq/>