Geography 586

Term Project Proposal - Final

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Topic -

In June of 2008, historic flooding occurred in Cedar Rapids, IA. Much of the central part of the city was flooded beyond the 500 year flood plain. The Cedar River has natural sharp bend to the river to the south of downtown. On the east side of the river are some small bluffs which limit open land which can be flooded adjacent to the river. In 1972, Landfill #1(known locally as Mt Trashmore) was opened on the west side of river.

Hypothesis -

The narrow channel of the Cedar River between the bluffs and the landfill created a dam effect which caused the height (stage) of the 2008 flood to be worse than if the landfill was not there.

Data (Source)-

Nominal surface (area) of the river. (USGS quad)*
Flood surface (area) of the river. (FEMA)*
Hourly stage and flow data from the USGS gauge station in Cedar Rapids (USGS)*
One foot contours within the basin #
Volume estimates of the 'basin' #
Flow estimates at narrowest point of the river #
A basin model to show amount of fill during the flood. @

*This data has been obtained.
I plan to create two datasets: from a current USGS quad (obtained) and a pre-1972 USGS quad. A Nov 19 trip to Iowa DNR GIS library is scheduled to acquire the pre-1972 quad.
@ 3D Analyst will be used. A ESRI Virtual Campus keycode obtained to get up to speed on the tools needed for the project.

Process-

1. Create two 'one foot' contour layers from USGS quads.
    - Use equal intervals between 10' lines shown on the maps.
    - Use centerline of the river as base elevation (700') and extrapolate the river volume.
2. Calculate the basin volume at one foot elevations above the base elevation (700') for each dataset.
3. Estimate outflows for the two datasets based on the width of the channel at the south end of the project area.
4. Develop a basin model with actual flow data to achieve actual stage.
5. Apply the model with the estimated flow data without the landfill.
6. Use results to show what effect the location of landfill had on the stage of the 2008 flood in Cedar Rapids.
7. Use the model with flow data from other river events to see if it works in multiple situations.

This would show the robustness of the model and could be used to establish a confidence interval. More flow data would need to be gathered for the other events!

Intended Outputs -

A calculation of the size of the basin for each dataset will show the amount of displacement created by the landfill. A calculation of the difference in the width of river at the southern end of the project area (outflow). Both of these will require obtaining a pre-1972 USGS quad and using 3D analyst.

The most important output is a model which will return an elevation stage given an amount of flow and the time interval. Achieving this is a very necessary a part of the project in order to test the hypothesis. A greater level of detail in model would be better but even a daily calculation would be sufficient for generated a basic model. The goal is to create an hourly model.

If time allows, other river events can be researched and applied to the model to see if the model returns the proper stage.

If all the above can be achieved, the ultimate goal is loading a file into ArcMap with the model calculations. Then with some hopefully simple programming a visual simulation of the flood could be shown. But this is not required!