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### Flooding Along the Lower Delaware River

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### **Problem Definition**

The Delaware River valley has experienced a considerable amount of unexpected flooding this past year, and the Army Corps of Engineers has asked us to help come up with a plan to stop the high water from endangering communities along the lower Delaware River.

Of particular concern is the city of Port Jervis, NY and Matamoras, PA. These two towns are situated at the base of the Catskill Mountains and are in a low valley. To further compound the problem, the Neversink River feeds into the Delaware just South East of Port Jervis.

Back during the ice age, the glaciers gouged out deep troughs in the high plateau of North America. The waters that ran off created streams that over the decades formed present day rivers, lakes and ponds. In the Catskills, a river called the Delaware snakes its way from Delaware County, down past Callicoon and Roscoe, between mountains and dividing New York State and Pennsylvania. The distance is 50 miles by car, by twice that by the river.

It's in these mountains that snow falls and fills reservoirs that supply New York City and the communities in between with fresh drinking water. In a good winter, these mountains can accumulate 10 feet of snow. And when the spring rains begin to melt them and wash the melt down stream, problems occur.

The river snakes on its course down the Delaware Valley and meets the Neversink River 1/4 mile past Port Jervis, NY. During the winter, both rivers ice over, and ice as thick as 3 feet is formed. It's this ice that causes the problem.

Down stream near Sparrowbush, the Delaware emerges from the high mountain walls, and runs into a wide valley. This valley was at one time a large lake. The lake water eroded a passage through the mountains at a place called the Delaware Water Gap, leaving behind the Neversink and Delaware Rivers.

As the cold spring rains and melted snow start their journey down to the ocean, they emerge from the mountain pass and try to move under the iced over river. Usually in the middle of the night, the ice begins to shift and weakens under the pressure and with a deafening roar, gives way. The broken pieces of ice, as big as cars, are pushed downstream to the bend just before the place where the Neversink joins the Delaware. These huge blocks of ice pile up and form a dam, causing the water to back up. Soon, the river level reaches flood stage and begins to overflow its banks at Sparrowbush. The water floods the low lands and the Erie Railroad right of way, and begins to seep into homes and trailers in the west end of town. As the water rises further, it floods the business district and homes in the flood plain of the Delaware in the City of Port Jervis and the Borough of Matamoras, Pa.

### **Problems Encountered:**

Initially, this project was supposed to be a learning experience with Stella and Excel. After the software was installed in October, students worked to develop the Stella model without much success. There were too many variables to consider to make an accurate flood model. Each attempt at modeling ended in failure. Ultimately, the Excel chart was used as the model tool.

### **Evaluation of Results**

All five classes completed Excel charts. The students learned to enter data accurately, and then how to use the Excel chart wizard to produce the results. Students also researched floods and downloaded documents and pictures, which were helpful in increasing their understanding of the subject. Then, most of the students were able to produce a representation of flood activity with the Excel software.

### **Summary of Experience:**

Getting 8<sup>th</sup> grade students to stay after school and work on a project, is like pulling teeth. It is very difficult. After a month of no shows, I moved the project into the classroom and gave project components

as class activities. This worked because students were compelled to complete the work. But after the start, they were interested enough in the project to work independently.

## Curriculum Standards

### Standard 5

*Students develop and use computer-based scheduling and project tracking tools, such as flow charts and graphs.*

- A flow chart was designed and used as a management tool to monitor system performance.