Pre/Post Assessment for the Rational Method Module

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COVER LETTER

Cyber Enhanced Data and Modeling Driven Curriculum Modules for Hydrology Education

10-26-2012

Dear Participant:

We are professors in the Departments of Engineering and Technological Entrepreneurship and Innovation Management in the College of Technology and Innovation at Arizona State University.

We are conducting a research study to examine how people learn through online media and data simulations. I am inviting your participation, which will involve your interaction with some online learning modules during your enrollment in this class. These online curricula will be part of a normal class exercise and part of your existing class work. By agreeing to participate in this study, you are allowing us to examine how well you learned using these materials.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty, and your grade will not be affected. You must be 18 years old to participate in this study.

While there is no direct benefit to you, your participation will permit the design and enhancement of future curricular materials that could be used for the instruction of other students. There are no foreseeable risks or discomforts to your participation.

Your responses will be confidential. Your responses will be organized via an anonymous personal identification number (PIN), and your name will not be connected to your responses in any of the analyses or reports. The results of this study may be used in reports, presentations, or publications but your name will not be known or used and results will only be shared in the aggregate form.

If you have any questions concerning the research study, please contact: Dr. Benjamin Ruddell (bruddell@asu.edu; 480-727-5123). If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Return of your class exercises will be considered your consent to participate.

Sincerely,

Dr. Benjamin Ruddell, Arizona State University

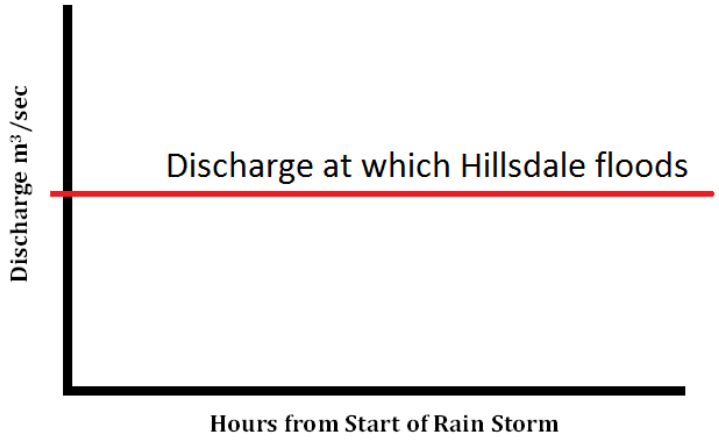
(1) Consider the following:

The City of Hillsdale sits in a forested river valley. Several perennial streams flow in the area. In 2000 Hillsdale was a town of about 250 mi^2. 200mi^2 was open forest, stream and wetland and agriculture. 50mi^2 was residential, commercial and municipal land. Flooding is rare and localized to known low-lying areas and meadows, even during extremely rare rainfall events. In 2012 Hillsdale is a city of 300 mi^2. 100mi^2 is now open forest, stream and wetland and agriculture. 200 mi^2 is residential, commercial and municipal land. The area has undergone development in response to demand for road and parking improvements, additional housing and big box department stores. Recent meteorological conditions have led to heavy rainfall over a three-week span. An extreme '100-year' rainfall event has occurred upstream and a damaging flood peak is predicted by hydrologists to arrive today.

(1a) Compare Hillsdale 2000 with Hillsdale 2012: write a description of the effects of impervious cover and urbanization as the City has expanded.

(1b) Complete a hydrograph analysis on the axes below by doing the following:

- Draw the flood hydrograph for an extreme rainfall event at the Hillsdale stream gage in 2000 before urban development expands; label this curve "H2000".
- Draw the flood hydrograph for an extreme rainfall event at the Hillsdale stream gage in 2012 after urban development expands; label this curve "H2012".



(2) List at least two policies or practices that water managers can pursue to reduce the damage caused by flood events.

1.

2.

(3) What U.S. Federal agency is the primary provider of streamflow and surface water resource data?

(4) What U.S. Federal agency is the primary provider of rainfall and weather data?

(5)What U.S. Federal agency is the primary regulator and provider of flood control services?

(6) Consider the following for your analysis:

You have a job as a risk manager working for Compumarket. You manufacture electronics used for radar applications. Your company is opening a new manufacturing and distribution center in North Dakota in an industrial area, called Eastside, about a mile from Blue River, located in the 100-year floodplain. Eight years ago Compumarket paid for a flood assessment of the area. This prior showed that the agricultural and wetlands regions between Eastside and Blue River stored water year round and reduced peak discharge during flood events, and that the site was unlikely to flood. The area has since developed resulting in a decrease of the agriculture and wetlands and in increased impervious area upstream. Additionally, given that the plant will operate for more than 50 years, it is important to consider that climate change models predict an increase in extreme rainfall events during the life of the plant. Your job as risk manager for investments for Compumarket is to assess and prevent risks of costly disruption or damage to your company's operations. You have a meeting with hydrologic experts scheduled today to discuss the risks of flooding at the site.

(6a) What kind of information are these hydrologists able to provide about the future risk, frequency, severity, or damages of flood events at your location, and what tools and knowledge make it possible to provide this information?

(6b) What questions should you ask in the meeting?

(6c) What might happen to Compumarket if the company does not consider hydrologic risk in its business plans?

(7) Explain the importance of streamflow and rainfall gages for flood management.

(8) What is a mathematical flood model, and why is it important?