ASSESSMENT OF FLOOD REMEDIATION WITH MINIMAL HISTORIC HYDROLOGIC DATA: CASE STUDY FOR A SMALL URBAN STREAM

Robert R. Holmes, Jr., PhD, P.E., D.WRE
U.S. Geological Survey Office of Surface Water

Thomas M. Over, PhD, P.E.
U.S. Geological Survey Illinois Water Science Center
Outline

• Problem
• Solution Scheme
• Case Study: Boneyard Creek in Champaign-Urbana, Illinois, USA
• July 9, 2003 flow event
Problem

Given:
• Flooding is identified as a problem
• A remediation project is designed and implemented
• Sparse “pre-” remediation streamflow and precipitation data exist

Determine:
• Impact of remediation on downstream jurisdictions
Problem

Challenges:

• With sparse streamflow and precipitation data, cannot compare actual streamflow peaks and volumes before and after remediation
Solution Scheme

- Remediation project likely designed and permitted with the aid of a computer model
- Collect adequate streamflow and precipitation data after remediation project completed to allow evaluation of the accuracy of the model
- If model matches or overpredicts the observed streamflow, then design model was conservative with design, thus no adverse impact resulted downstream
Case Study: Boneyard Creek in Champaign-Urbana, Illinois, USA

Flooding has been a recurrent problem
Remediation

- City of Champaign engaged a consultant to design remediation to increase flood protection in the “Campustown” section (25-year recurrence interval protection)
- University of Illinois retained the same consultant to design a new channel that would provide 100-year flood protection
- Consultant used U.S. EPA SWMM model for design of the remediation project
Boneyard Creek at USGS Campus Streamgage
Boneyard Creek at Lincoln Avenue
Scheme to Assess the Validity of the SWMM for Boneyard Creek

• Install additional precipitation gages and streamgages
• Collect data until at least 3 storm events with a peak streamflow of 19.7 cms occur
  — SWMM model calibrated by consultant for floods, so only fair to evaluate the model in the flow range the model was calibrated on. 19.7 cms is 5-year flood recurrence
• Utilize the design SWMM model to simulate the streamflow in the Boneyard from these 3 events
• Main point of interest is Lincoln Avenue streamgage
Determining Adverse Impact Downstream

Compare simulated peak with observed peak at Lincoln Avenue

• If Simulated Peak > Observed Peak
  – Conclusion: No adverse impact
• If Simulated Peak < Observed Peak
  – Conclusion: Adverse impact
July 9, 2003 Storm Event

![Graph showing discharge over time with observed and SWMM 4 lines, including a qualifying discharge of 19.7 m³/s.](image-url)
Preliminary Analysis

SWMM model overpredicts the observed peak streamflow for the July 9, 2003 storm event. For this event, the SWMM model was conservative in its simulation of the design. A preliminary finding is that the remediation project has had no adverse impact downstream in Urbana.
Questions?
Brief Examination of the Historic Data

September 2, 1997
844 cfs

July 9, 2003
789 cfs

Photos from Berns, Clancy and Associates (B. Chaille)
Increasing number of floods on BYC
Calibration/Verification Event

Boneyard Creek at Lincoln Avenue at Urbana, IL (July 8-9, 2003)

Discharge (ft³/s)

Time (Minutes)

Observed
SWMM 5
SWMM 4
# Rain-Runoff Depth Analysis of July 2003 Flood Events on Boneyard Creek

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>GES Rain</th>
<th>Average Rain</th>
<th>Observed Discharge</th>
<th>SWMM4 Discharge (GES Rain)</th>
</tr>
</thead>
</table>

**Event "3" (7/9/03, 11:30 - 7/9/03 7:00):**

- Average Discharge: m³/s
- Discharge Volume: m³
- Depth: mm
- Runoff Coefficient: Q/P

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<tr>
<td>Average Discharge</td>
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<td>5.63</td>
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<td>Discharge Volume</td>
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<tr>
<td>Depth</td>
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<td>34.4</td>
<td>10.6</td>
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<td>Runoff Coefficient: Q/P</td>
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<td>0.308</td>
<td>0.444</td>
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**Event "4" (7/9/03 17:00 - 7/10/03 7:00):**

- Average Discharge: m³/s
- Discharge Volume: m³
- Depth: mm
- Runoff Coefficient: Q/P

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<td>Average Discharge</td>
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<td>Depth</td>
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<td>0.344</td>
<td>0.646</td>
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24-hour Rainfall (inches), ending 7:00 7/10/03, Boneyard Creek, Champaign-Urbana, Illinois

Data Source: http://www.sws.uiuc.edu/atmos/boneyard/
24-hour Rainfall (inches) ending 7:00 7/10/03
Champaign-Urbana, Illinois

Source: http://www.sws.uiuc.edu/atmos/boneyard/