Northeastern

Department of Civil and Environmental Engineering

Waterway Transitions and Restoration at Bridges

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12pm-1pm
458 Richards Hall

Abstract

Across the U.S., stream restoration activities are in progress to rehabilitate streams degraded by urbanization, road construction, prior modifications, such as channel straightening, and other land use changes. Stream and river management projects are implemented to improve water quality, stream function, aquatic habitat, and aesthetics, and provide mitigation for road construction. Adding to the challenge of restoring or rehabilitating streams is the fact that road crossings frequently intersect streams that are to be rehabilitated. Bridge design and maintenance are focused on conveying water, sediment, and debris beneath bridges at high flows. In contrast to stream restoration projects, lower bankfull flows, are rarely considered in design and maintenance of bridges, since safety and functioning of the bridge is based on much higher flows, such as the 50- or 100-year floods. The primary cause of bridge failure in the United States is scour and channel instability around the bridge foundations; thus, attention to safety and liability issues are primary in bridge engineering. Road crossings can have a significant influence on local hydraulics and sediment transport, resulting in an altered flow pattern that can cause backwater, increased erosion, debris and sediment deposition, and channel instability. Thus, managing rivers and streams that include one or more road crossings requires some knowledge of the flow hydraulics over a range of flows in order to create a smooth, stable transition through the bridge opening. This presentation will focus on assessing and creating stable transitions at bridges that align with stream restoration goals.

Bio

Dr. Johnson is a Professor of Civil Engineering and the Head of Civil and Environmental Engineering Department at the Pennsylvania State University. She conducts research in the areas of bridge scour, stream restoration, reliability analyses, and river mechanics. She received her B.S. from the New Mexico State University in 1981 and her PhD from the University of Maryland in 1990. In 1992, Dr. Johnson won the National Science Foundation Young Investigator award and in 1995, she won the National Science Foundation Presidential Faculty Fellow award. She has also won several other awards, including several teaching awards, a faculty mentoring award, and the ASCE-EWRI Outstanding Woman of the Year award. She is a Fellow of EWRI (Environmental and Water Resources Institute of ASCE). She has published numerous papers in peer-reviewed journals on bridge scour, stream restoration, uncertainty in hydraulics, bridge scour, and stream restoration, and the probability of bridge failure due to scour. She has recently published journal articles on incorporating road crossings in stream restoration projects, improving the urban stream restoration effort, and the physiographic characteristics of bridge-stream intersections. Her research has recently included the development of a stream stability assessment method for use at bridge-stream intersections for the Federal Highway Administration, the design of vanes and weirs for protecting bridge foundations, laboratory and computer experiments to assess the use of in-stream structures to reduce maintenance of bridge openings, vulnerability analyses for streams and bridge crossings, and development of probabilistic bridge scour factors for bridge design. In addition, she recently published a paper on the professional liabilities of practitioners in the stream restoration field.

Peggy Johnson, PhD

Department of Civil and Environmental Engineering

PENNSYLVANIA STATE UNIVERSITY

Education

- **PhD, Civil & Environmental Engineering, *UNIVERSITY OF MARYLAND***
- **MS, Civil Engineering, *UNIVERSITY OF MARYLAND***
- **B.S., Geological Sciences, *NEW MEXICO STATE UNIVERSITY***

Research Interests

- **Bridge scour**
- **Stream stability assessment**
- **River hydraulics & mechanics**
- **Uncertainty & risk in civil engineering**
- **Probabilistic modeling**

Selected Service, Honars, Awards

- **ASCE-EWRI Outstanding Woman of the Year Award**
- **Fellow, EWRI.**
- **NSF Young Investigator Award, 1995**