Fluvial Erosion Impacts on Infrastructure Along Indiana Rivers and Streams

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In June 2008, flooding damaged or destroyed more than 650 sections of road, 60 bridges, and 100 culverts in Indiana.
Distribution of relatively stationary and actively migrating stream reaches of the 42 drainage basins where channel-migration-rate values were documented in Indiana

B. A. Robinson, USGS
Distribution of channel migration rates for 970 meander bends where channel-migration rates were documented in Indiana (B. A. Robinson, U. S. Geological Survey)
The 75th percentile channel-migration rate for the 42 stream reaches where channel-migration-rate values were documented in Indiana (B.A. Robinson, USGS)
Meander-Vulnerable Assets

Transportation Assets
• Bridges
• Roads
• Railroads
• Railroad Bridges

Utility Assets
• Power Lines
• Pipelines
• Dams
• Water-treatment Plants

B. A. Robinson, U.S. Geological Survey

White River near Centerton, Ind.

Google Earth™
Data set includes:

1,128 Assets

- Asset Class
- Latitude
- Longitude
- Stream
- Proximity
- Asset name
- Ownership

B. A. Robinson, U.S. Geological Survey
Buried Pipelines  
(Natural Gas & Oil)

Actively Migrating Streams  
(16)

Migrating Tributaries  
(38 ...not shown)

141 Crossings

B. A. Robinson, U.S. Geological Survey
Eight counties account for 57% of vulnerable assets

Putnam 115
Parke 110
Franklin 97
Hendricks 85
Morgan 68
Shelby 57
Knox 56
Tippecanoe 56

644

B. A. Robinson, U.S. Geological Survey
White River at US 37, near Martinsville, Morgan County, Indiana
Beacon Run at US 40, near Brazil, Putnam County, Indiana

Note rotational slump (yellow arrow)
Whitewater River at Levee Road, near Brookville, Franklin County, Indiana
Lessons from White Lick Creek, Hendricks County, Indiana
White Lick Creek at SR 267, near Plainfield, Indiana
White Lick Creek at SR 267, near Plainfield, Indiana
Quaternary geologic map of Indiana

Gray, H.H. 1989
White Lick Creek at SR 267, near Plainfield, Indiana (39.6550, -86.3843) left bank, yellow arrow indicates SR 267
White Lick Creek at SR 267, near Plainfield, Indiana  (39.6550, -86.3843) left bank, bank sediment stratigraphy
White Lick Creek at SR 267, near Plainfield, Indiana  (39.6550, -86.3843) downstream
White Lick Creek at SR 267, near Plainfield, Indiana  (39.6550, -86.3843) upstream
Managing the Problems
Risk Reduction Strategies

1. Stay Away
   - Erosion & channel migration will continue
   - Limit exposure
   - When possible, move infrastructure out of stream corridor
   - Increase mitigation requirements to discourage development in stream corridor

Refined Corridor Map
Available at:
http://indnr.maps.arcgis.com/apps/webappviewer/index.html?id=43e7b307a0184c7c851b5068941e2e23
Risk Reduction Strategies

2. More Stringent Development Standards
   – Increase detention requirements (Channel protection volume)
   – Promote / require use of LID & green infrastructure stormwater management strategies
   – Institute riparian corridor with use restrictions
Risk Reduction Strategies

3. Improve Planning & Risk Assessment
- Update regulatory flow rates
- Improve / update floodplain models
- Lateral migration monitoring
Risk Reduction Strategies

4. Improve Maintenance & Protect Critical Infrastructure
   – Tree maintenance program
   – Strategic / critical erosion mitigation projects
Bottom Line!
Things to Remember:

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• The recommended strategies:

  ➢ Multi-jurisdictional Coordination
  ➢ Disturbance Avoidance Zones
  ➢ Channel Protection Volume & GI
  ➢ Detailed Geomorphic Assessment
  ➢ Relocating Threatened Assets
  ➢ Monitoring At-risk Structures
  ➢ Protecting In-place Infrastructure
  ➢ Balanced Tree Management Strategies
Riverine Impacts on Transportation Routes “in a Nutshell”

• Several Roads and Bridges in Indiana are Vulnerable to Floods and Stream Movement/Erosion Impacts

• There are ways to Predict, Screen, Monitor, and Prioritize Problem Sites before Potential Service Disruptions Occur

• A Detailed Morphological Stream Assessment is Crucial in Understanding the Overall System, Understanding the underlying System Stressors, and Making the Right Response and Repair Decisions

➢ Early Detection and Mitigation of Problems Saves Time, Money, and Headaches!

An ounce of PREVENTION is worth a pound of CURE.
QUESTIONS?

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