



# **Sediment Transport from Urban, Urbanizing, and Rural Areas in Johnson County, Kansas, 2006-2008**

**Prepared in cooperation with the Johnson County Stormwater Management Program**

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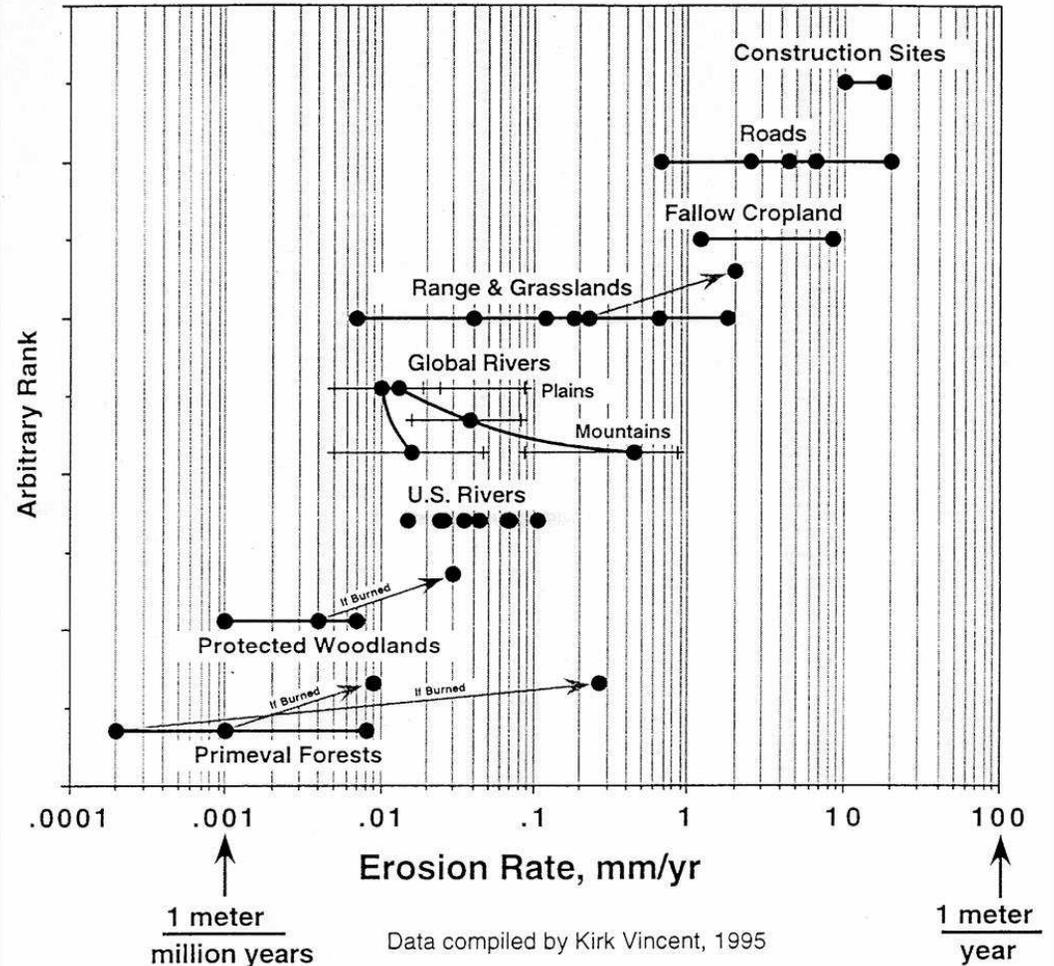
Johnson County  
**Stormwater Management**

# Background

- Increased erosion and sediment transport from construction sites is well documented



Known Global-Range of Denudation Rates



# Background

- Increased erosion and sediment transport from construction sites is well documented
- Sediment deposition and stream-channel erosion complicate relations between urbanization and sediment transport in larger basins



# Objective

**Characterize how urbanization affects suspended-sediment transport across basin scales**

- **Small (5-11 mi<sup>2</sup>) and large (45-65 mi<sup>2</sup>) basins with similar natural features, but varied stages of urbanization were monitored**
- **Turbidity sensors were used as a surrogate for suspended-sediment concentration and were coupled with stage to compute sediment loads across space and time**

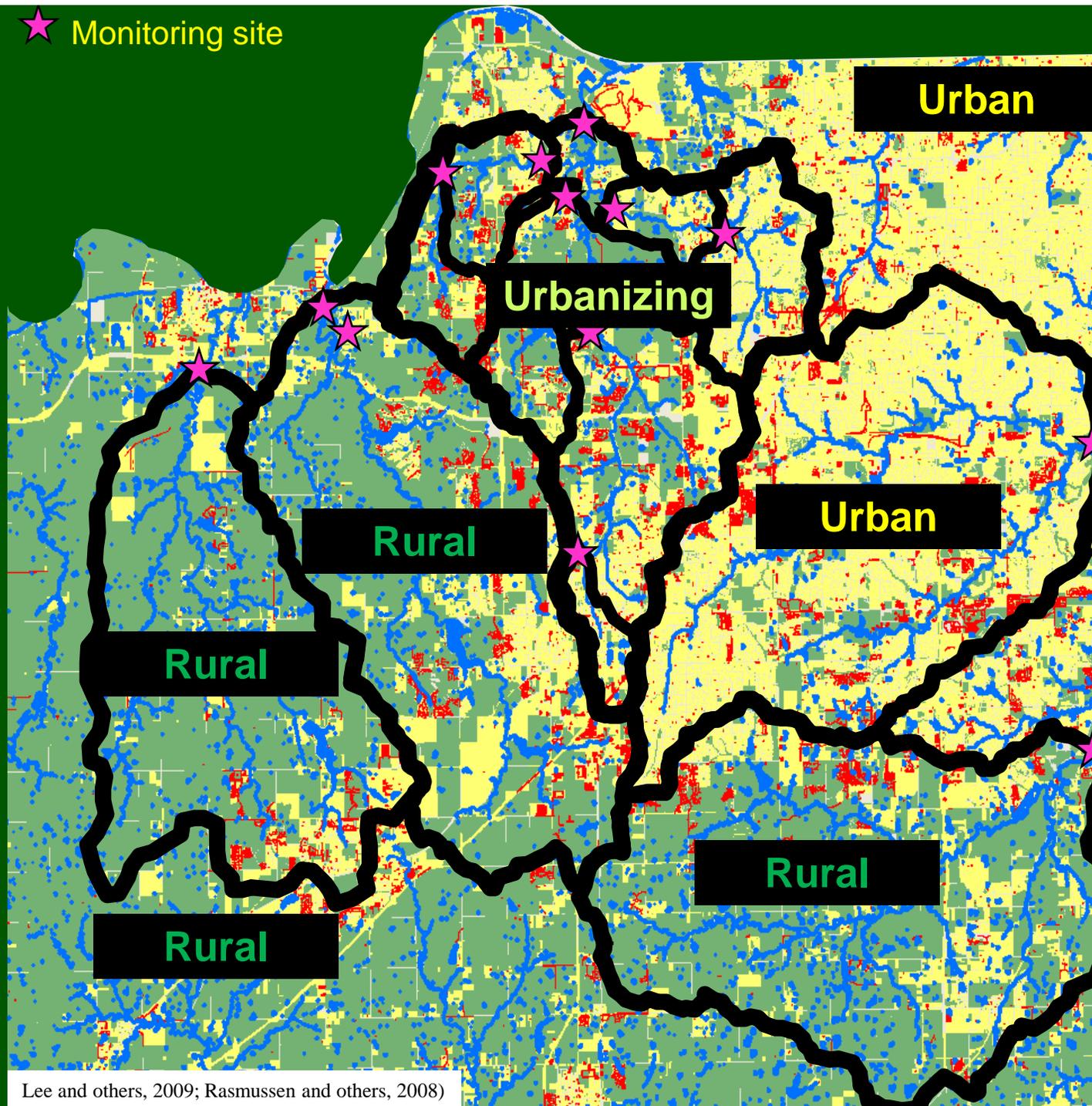
# Continuous turbidity monitoring



# Study area

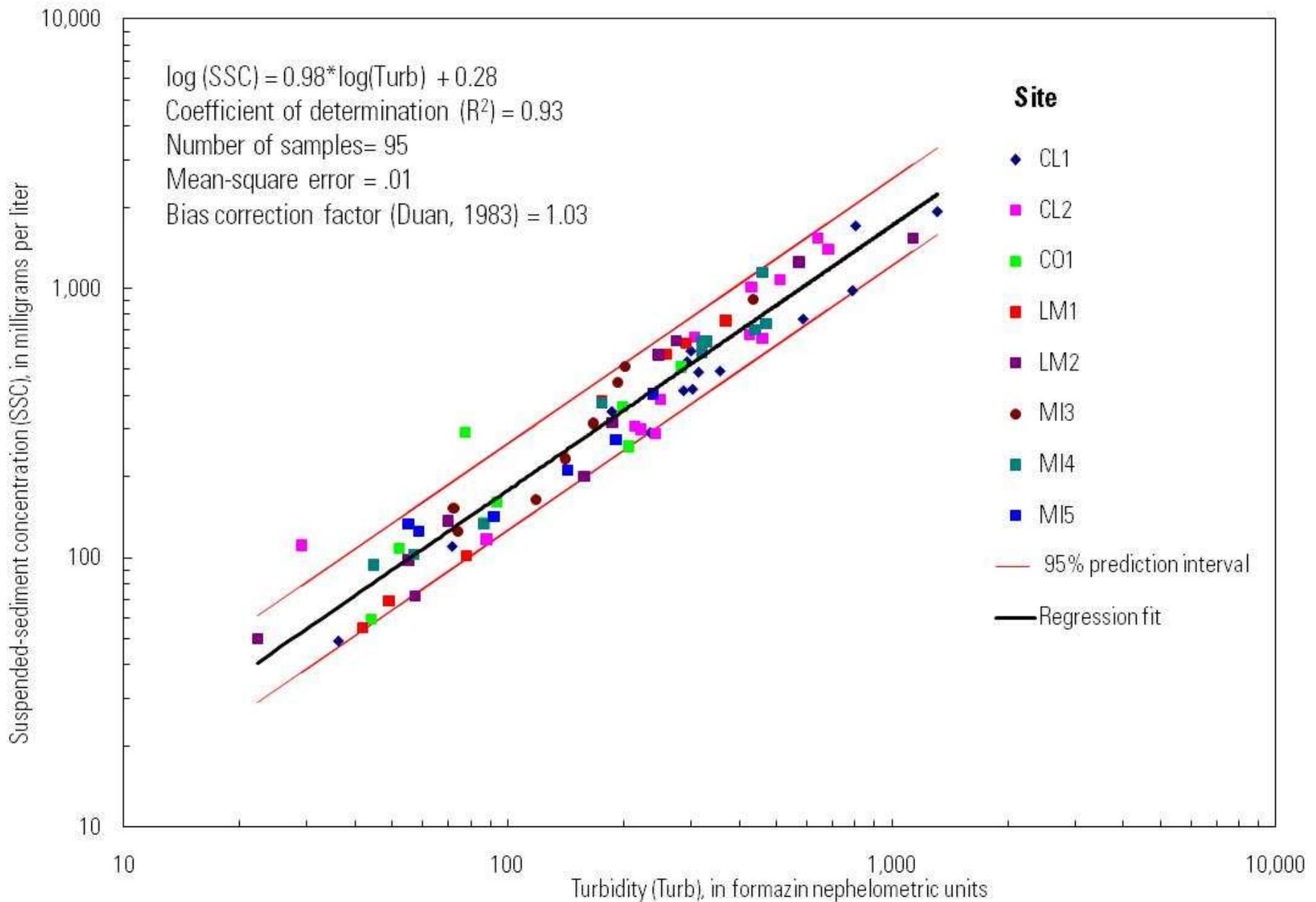
★ Monitoring site

- Range of land-use and watershed sizes
- Similar topography and soils across county
- Urban construction quantified using annual changes in impervious surface

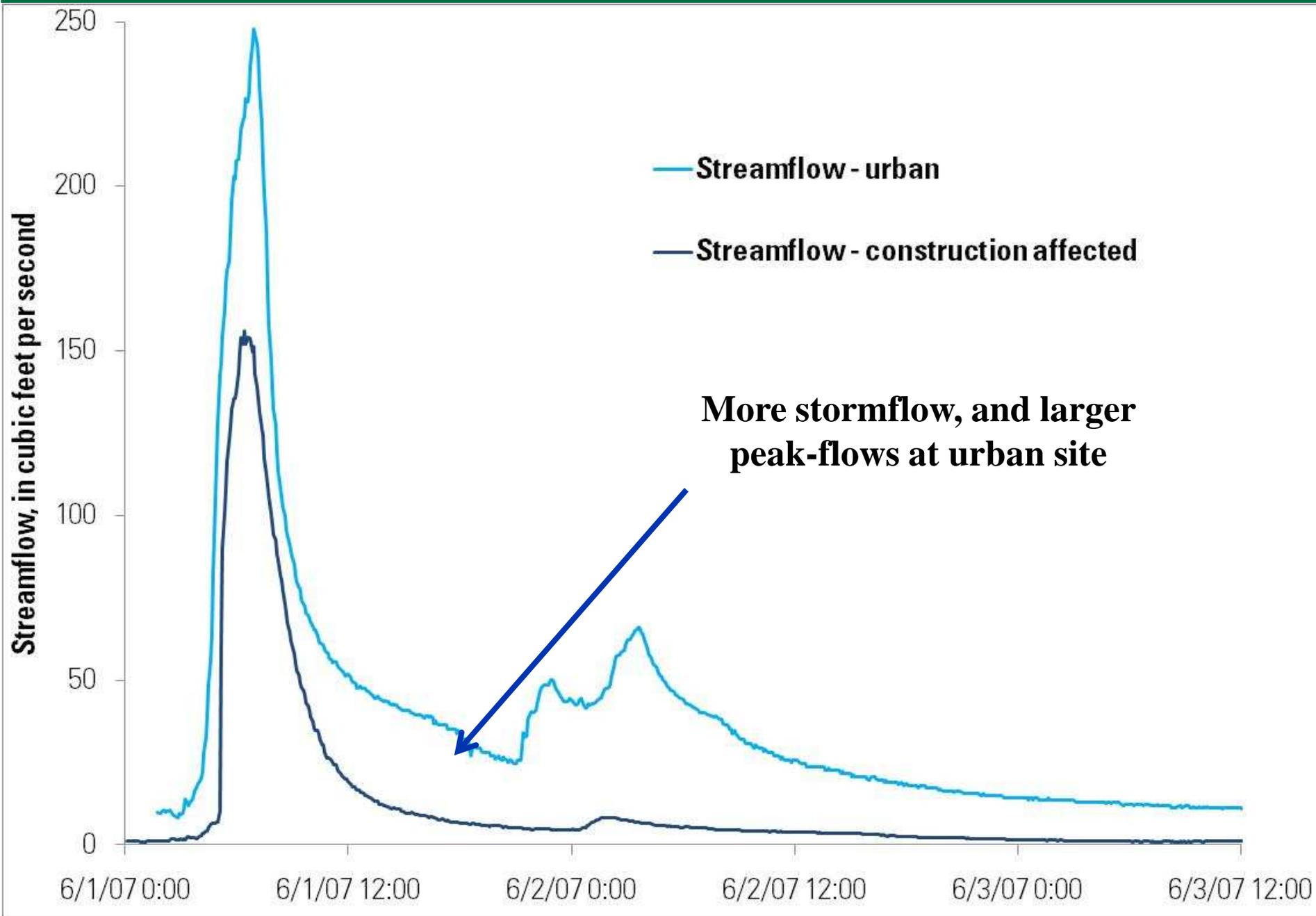


Lee and others, 2009; Rasmussen and others, 2008)

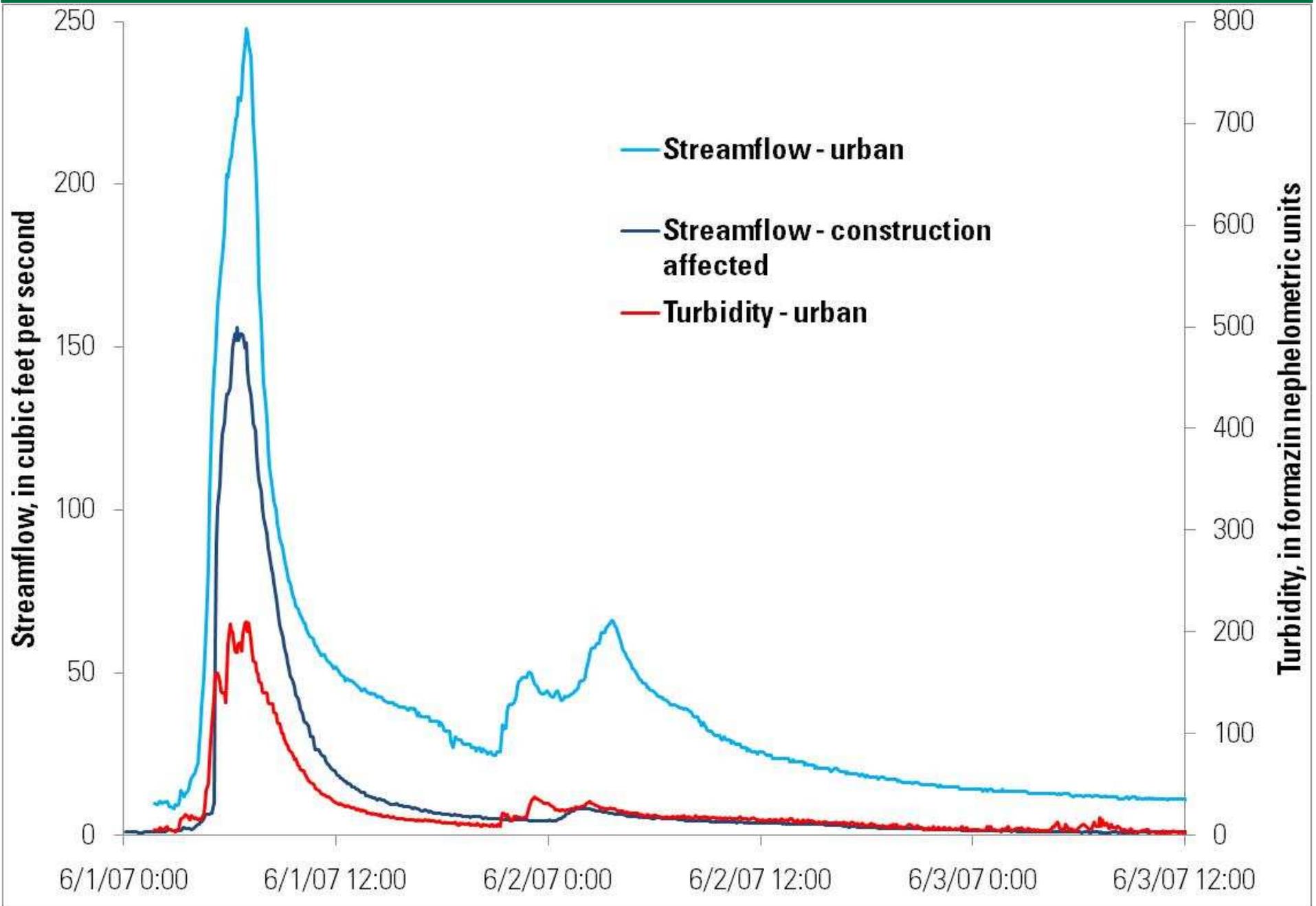
# Turbidity is an effective surrogate for suspended sediment



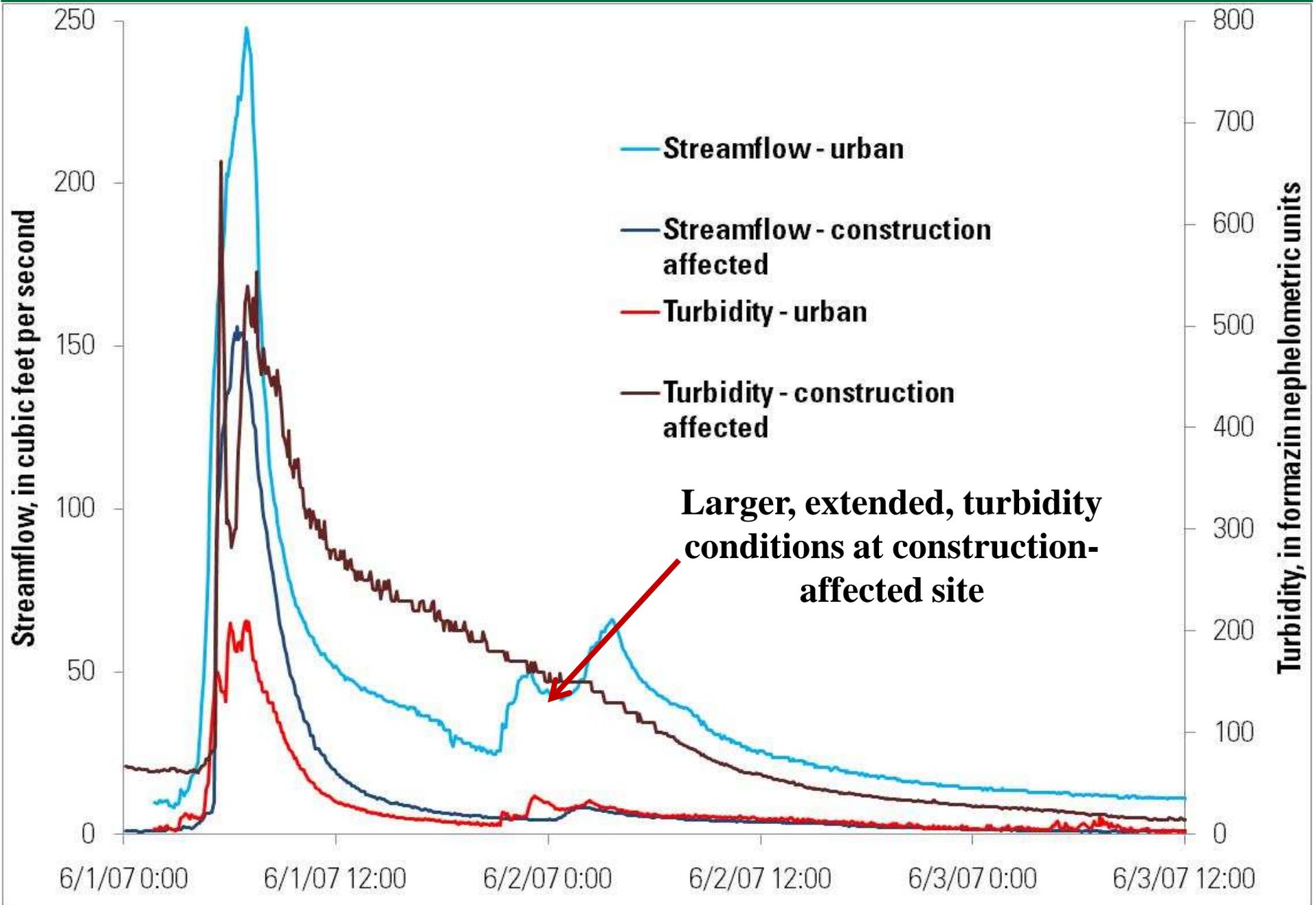
## Stormflow hydrograph at small urban and construction-affected basins



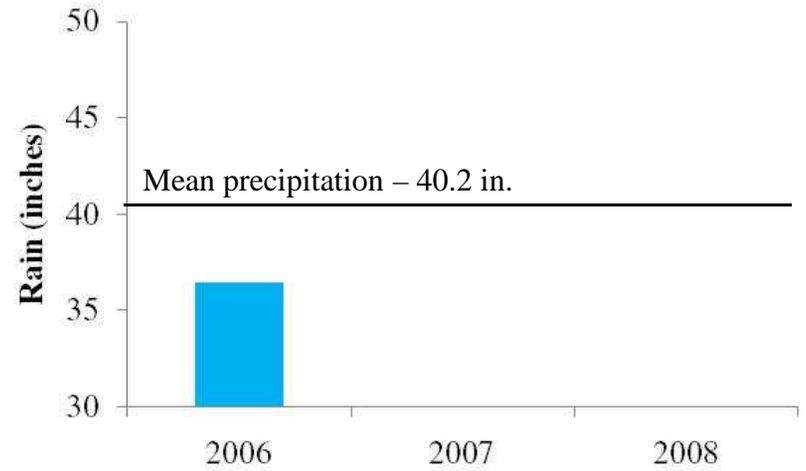
# Sediment transport limited by available supply in urban basin



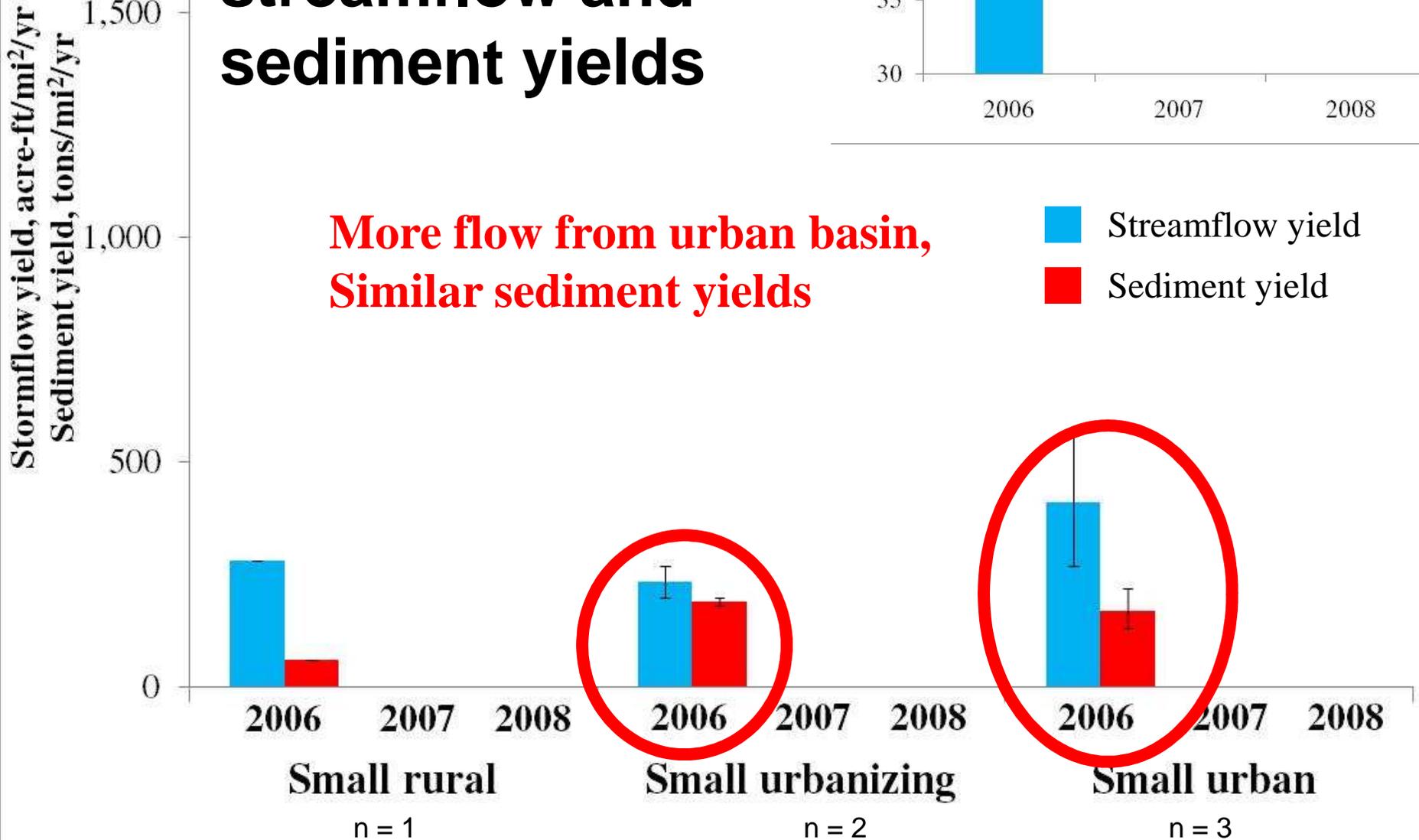
# Typical construction-affected turbidigraph – transport limited



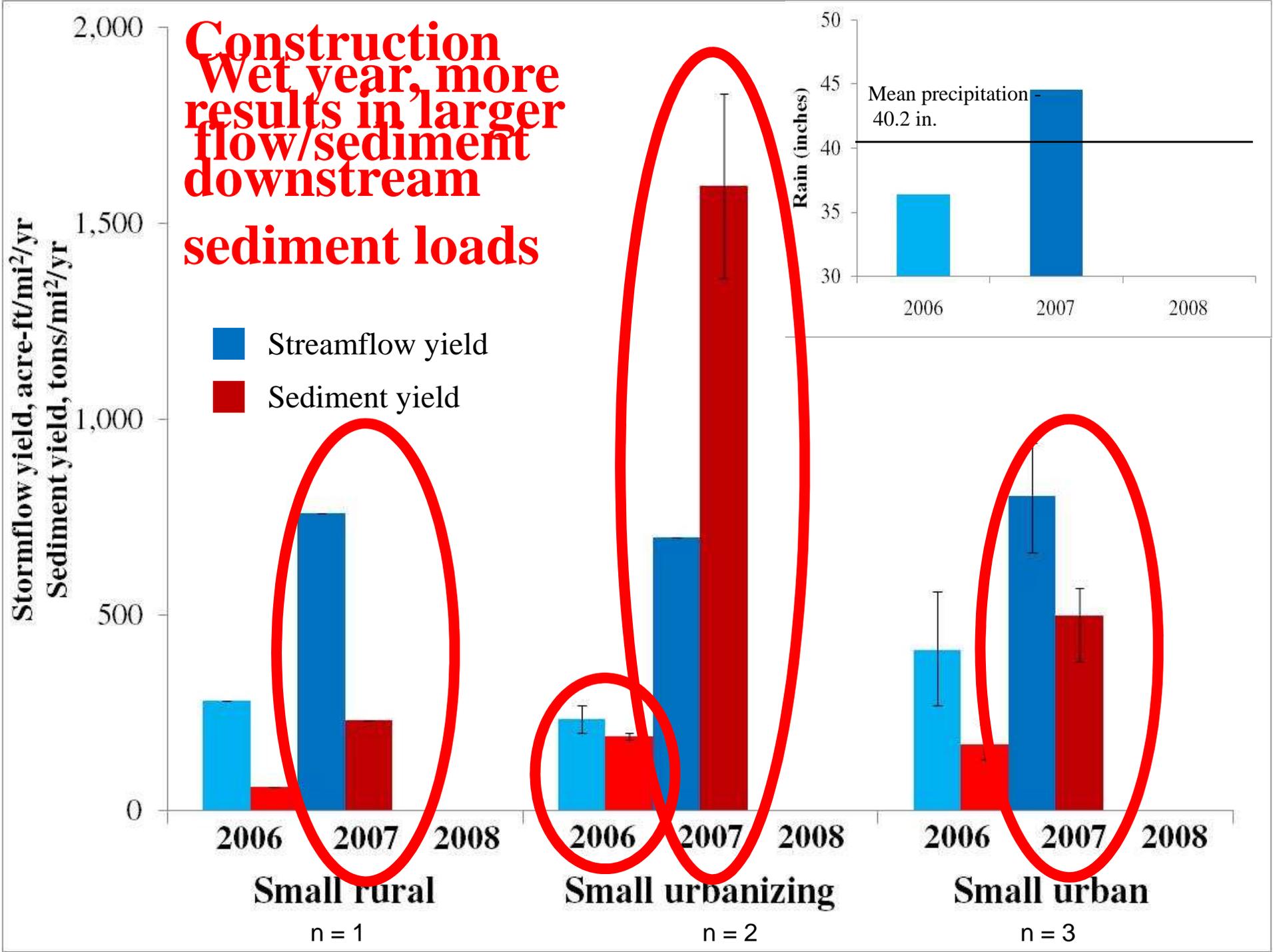
# Relatively dry year, small streamflow and sediment yields



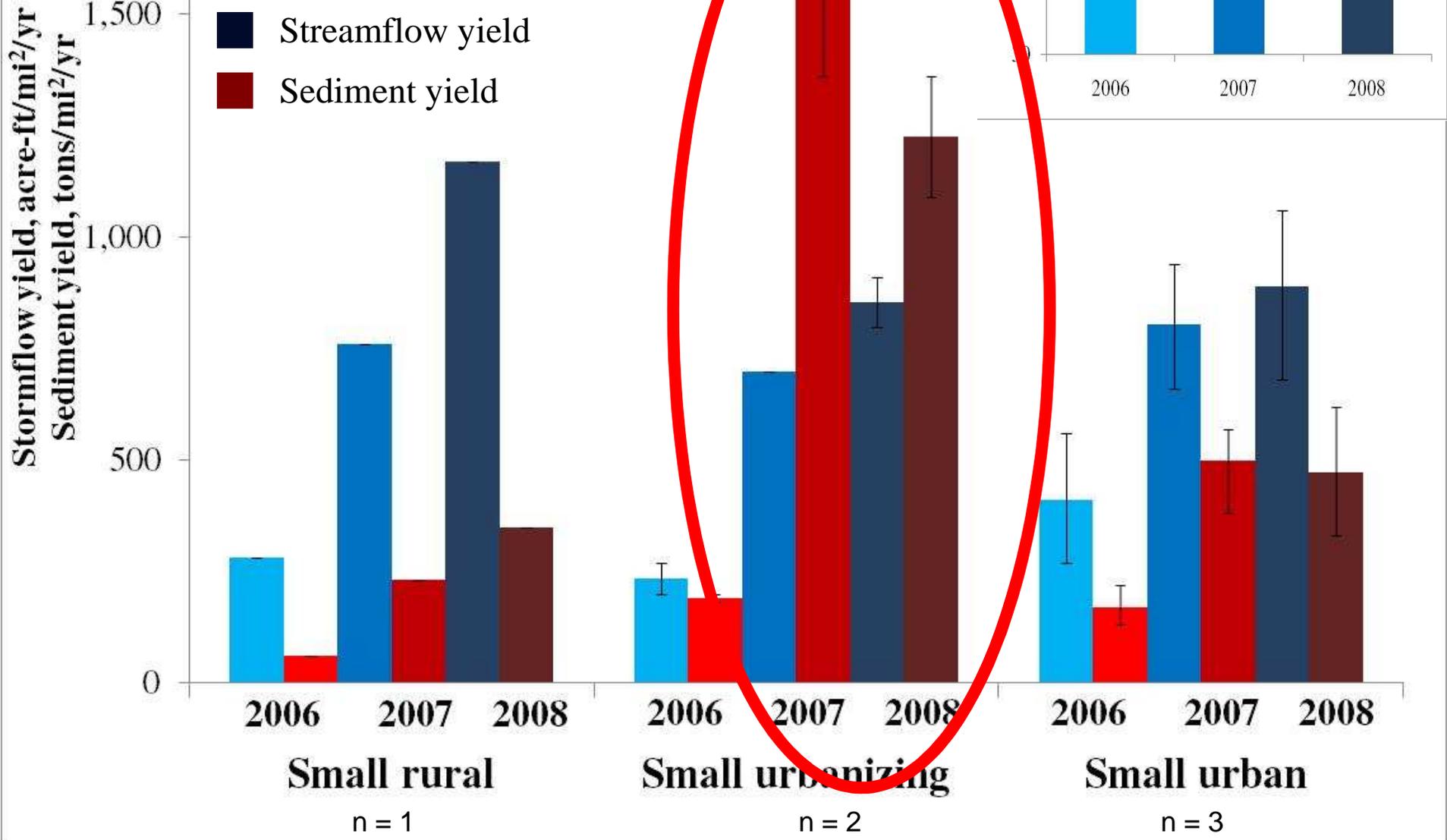
**More flow from urban basin,  
Similar sediment yields**



**Construction  
Wet year, more  
results in larger  
flow/sediment  
downstream  
sediment loads**

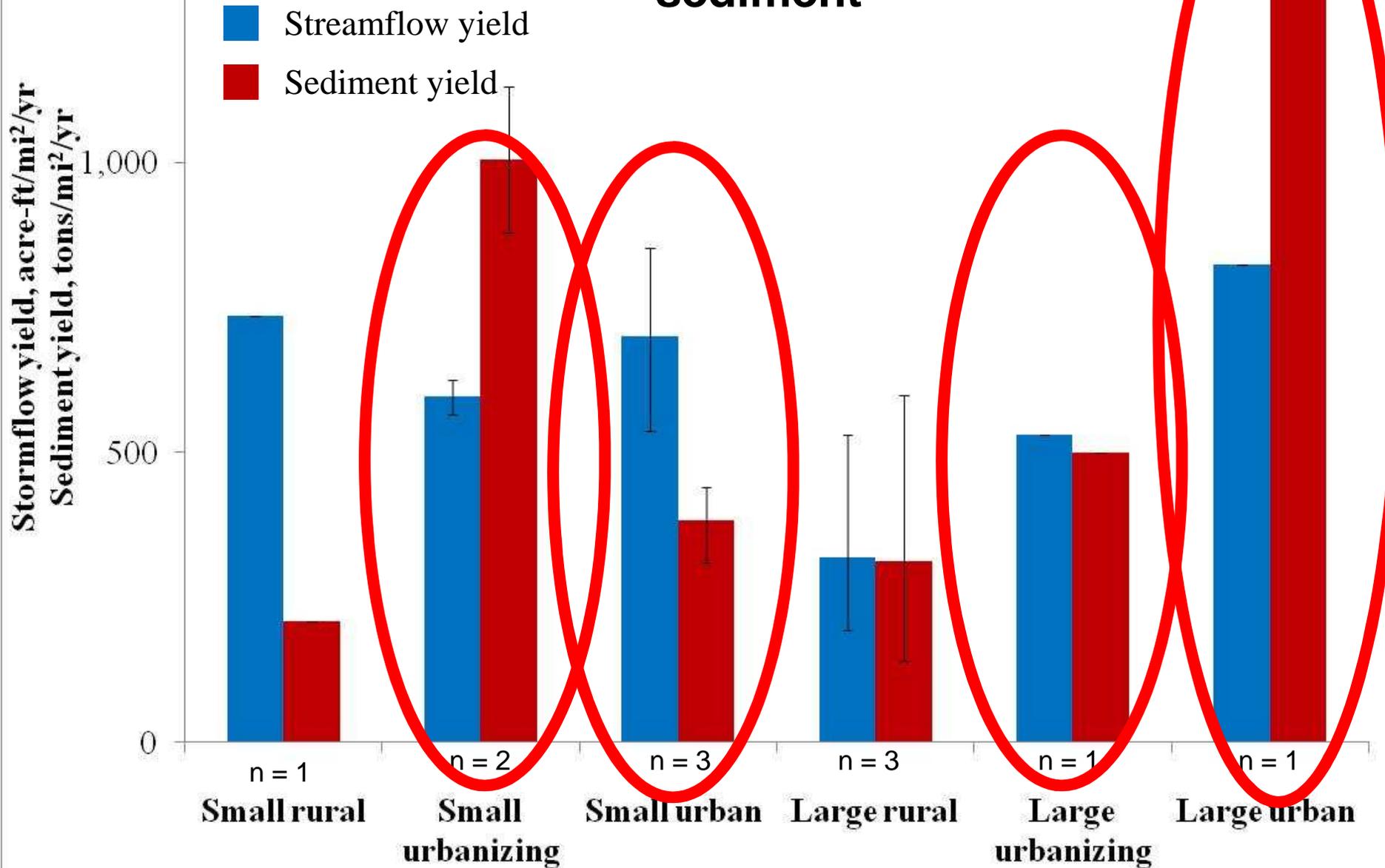


**2<sup>nd</sup> wet year, less sediment at urbanizing sites**



# Annual mean from 2006-2008

## Large urban basin transports most flow and sediment



# General conclusions

- Construction activity was a substantial source of suspended-sediment in small (5-11 mi<sup>2</sup>) basins
  - Despite improved management practice and dilution from intermediate basin
  - Sediment concentrations at construction-affected sites were larger among both stormflow and low-flow conditions
- Among larger (45-65 mi<sup>2</sup>) basins, the oldest urban basin had 2-10 times larger sediment yields than urbanizing or rural basins
  - Sediment deposition, resuspension, and channel erosion have more influence on sediment transport

# Report/Contact Info

Report available online

<http://pubs.usgs.gov/sir/2009/5001>

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