



# ASSET MANAGEMENT FOR URBAN WATERWAYS

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# Functions of Urban Waterways

1. Convey flow from the upstream watershed
2. Convey flow from overbank development via
  - Roadside ditches
  - Agricultural subsurface tile drains
  - Retention pond outfalls
  - Street and subdivision storm drain outfalls
  - Industrial mixed flows
  - Occasionally (although rarely) CSOs
3. Provide floodplain storage



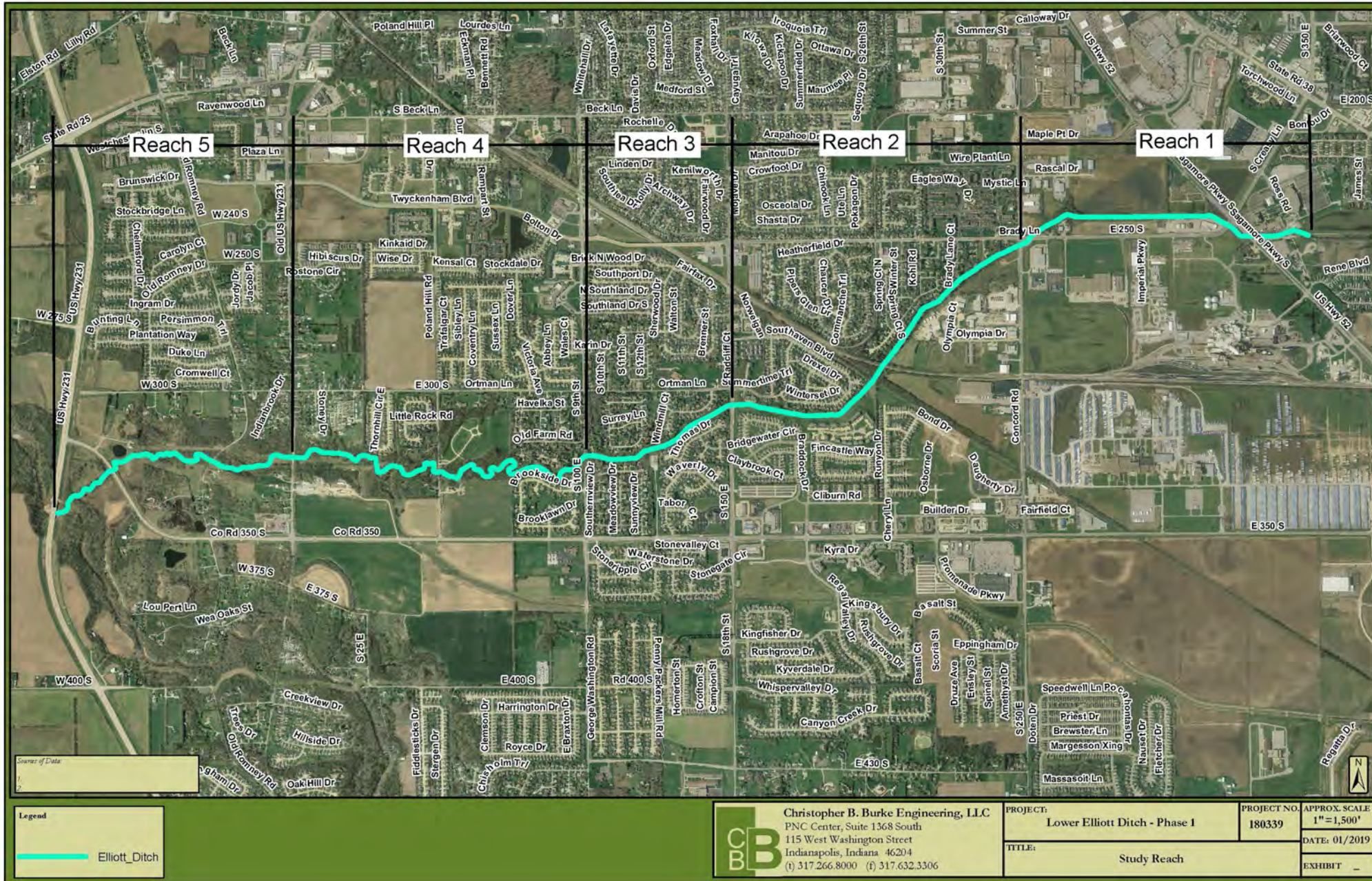


## Poor management and maintenance leads to...

- Structures and lots placed too close to the stream
- Isolated and large-scale bank erosion
- Trash and debris clogging
- Poor water quality
- Overgrowth of invasive species
- Dilapidated bridges and culverts
- Lack of floodplain storage and conveyance
- No riparian buffer left in place







# Bank Erosion



# Eroded and Corroded Storm Outfalls





## Debris Clogging and Log Jams



# Low Head Dams and Stream Scouring



# Invasives and Lack of Native Root Structures



# Structures in Disrepair

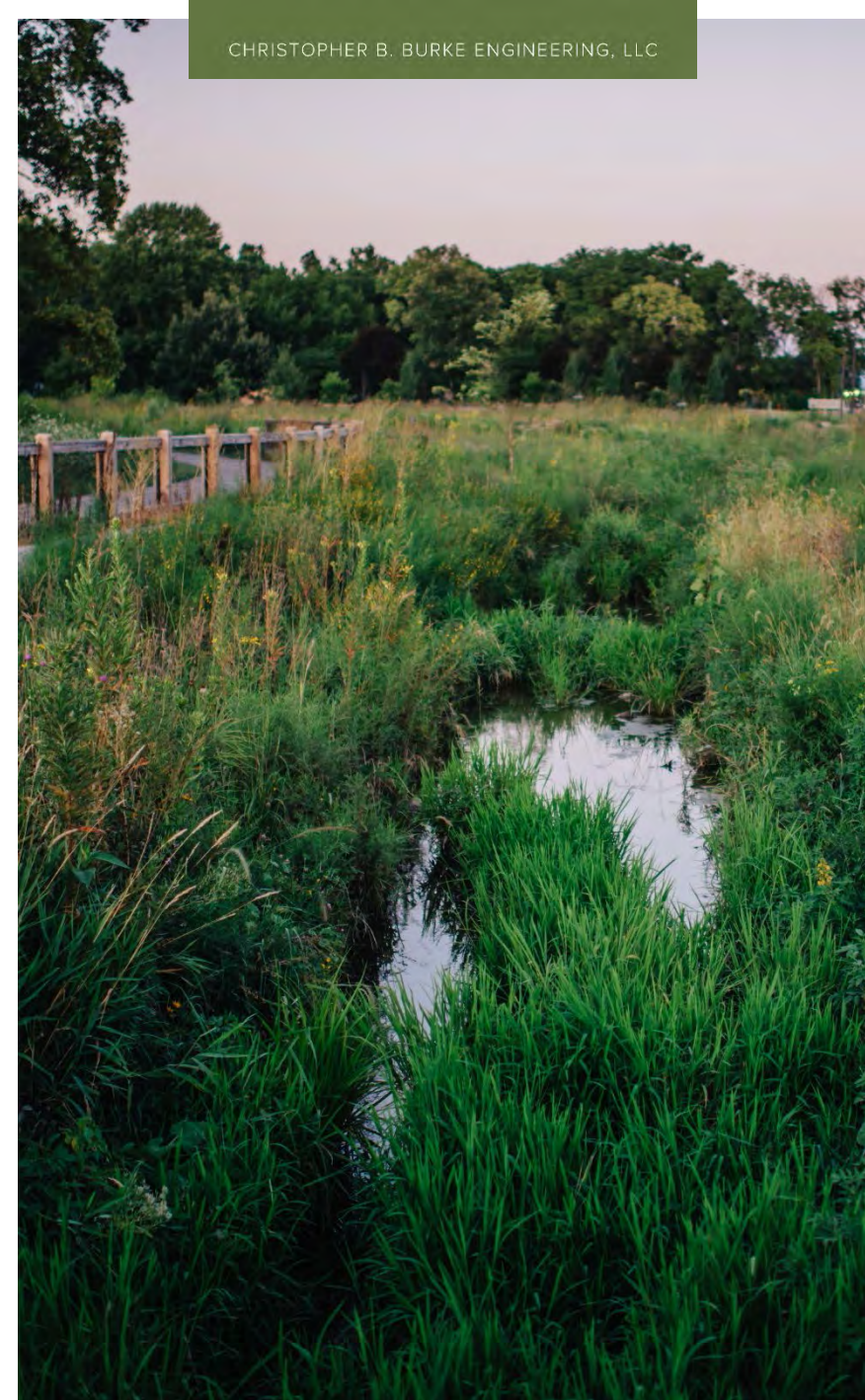


# Disconnected Floodplains

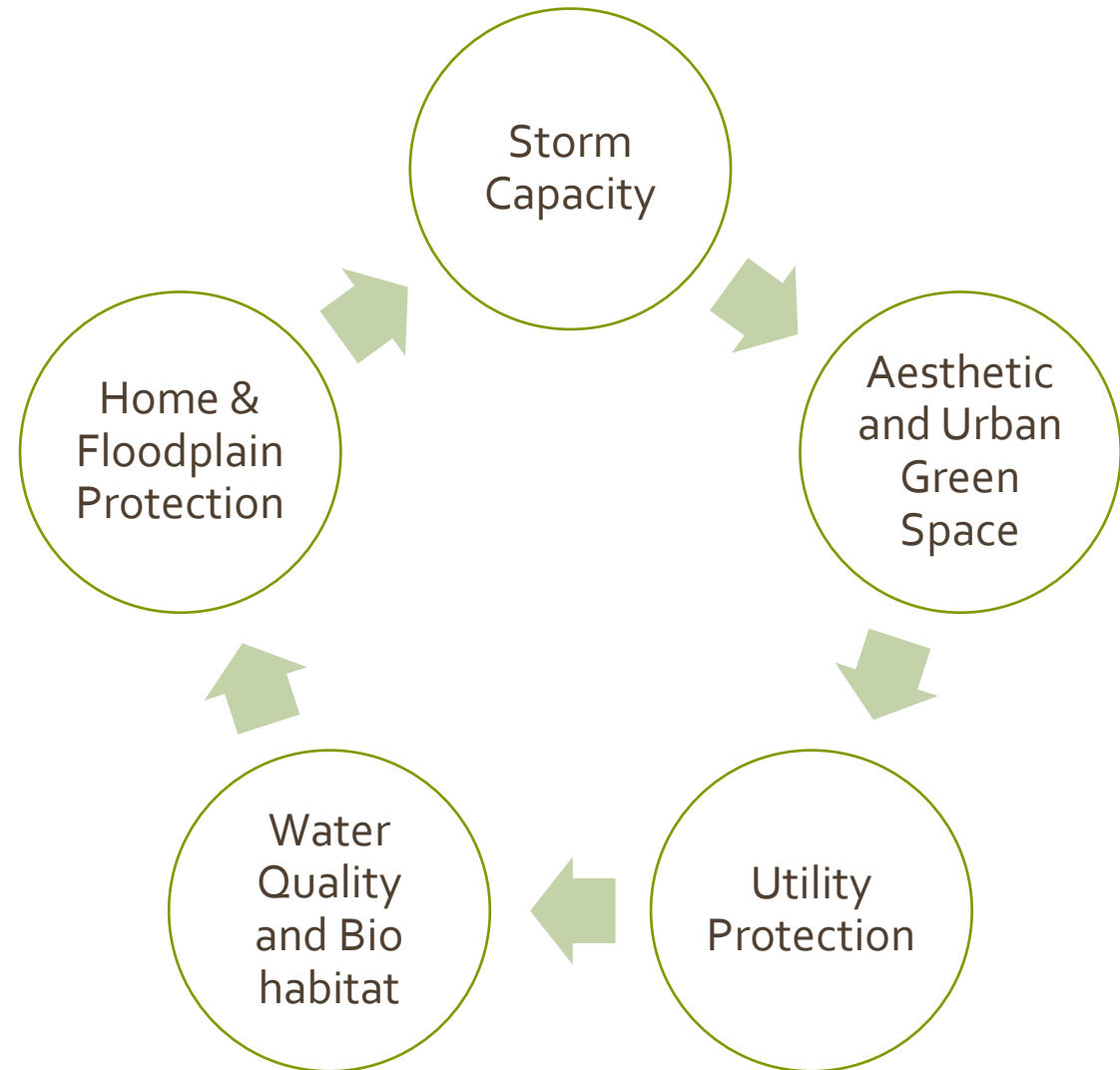


# Stakeholders

- City Engineering
- County Surveyors
- Residential Communities
- County / State / Federal Highway
- Industrial Entities & Commercial Developments
- Colleges & Universities
- River and Watershed Alliances / Education Cooperatives

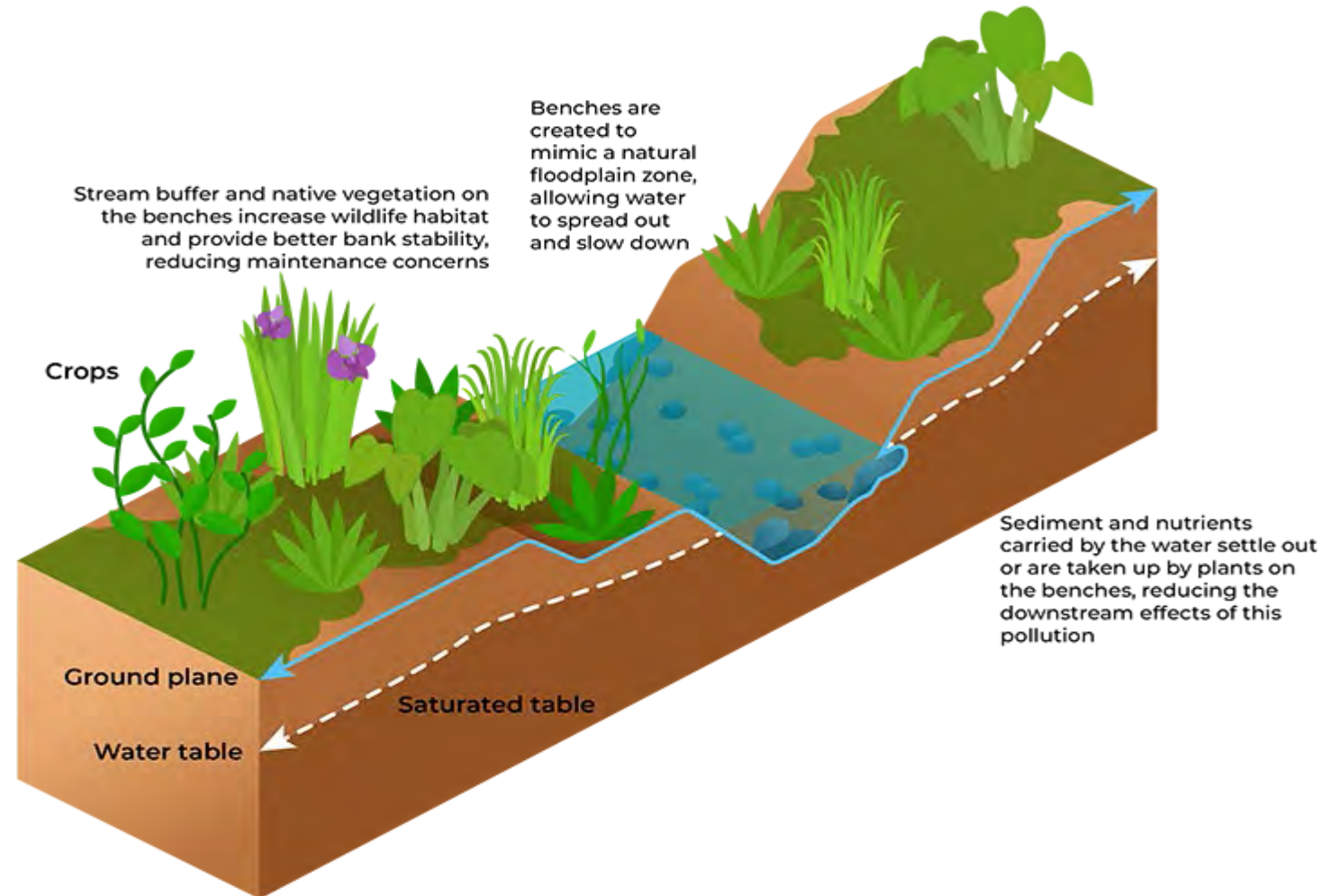


# Project Goals



# Naturalizing Strategies for Manmade Drains and Ditches

## Two-Stage Ditch





# Two-stage Ditch



# Riffle

