Effects of Urbanization on Fish and Macroinvertebrate Communities in the Houston Metropolitan Region

Marty Kelly, Lythia Metzmeier, and Linda Broach
Urban Riparian Symposium
February 15, 2017
Objective

• Compare biological data to physical habitat and watershed data
Objective
Streams in Ecoregion 34
List of Stations

West Bernard Creek (3)  Least Disturbed
West Carancahua Creek (2)  Least Disturbed
West Mustang Creek (3)  Least Disturbed
Austin Bayou (1)  Rural
BCDD # 317 (1)  Rural
Caney Creek (1)  Rural
Cedar Bayou (4)  Rural
Chocolate Bayou (2)  Rural
San Bernard River (2)  Rural
Skull Creek (4)  Rural
Tres Palacios Creek (1)  Rural
Clear Creek (4)  Suburban
Cotton Bayou (3)  Suburban
Cypress Creek (3)  Suburban
Dickinson Bayou (6)  Suburban
Hackberry Gully (3)  Suburban
Armand Bayou (8)  Urban
Greens Bayou (4)  Urban
Halls Bayou (3)  Urban
Sims Bayou (2)  Urban
Big Creek (12)  Big Creek
METHODS FOR COLLECTING BIOLOGICAL DATA

Fish – Seine and Electroshock Fishing

Benthic Macroinvertebrates – D frame kick net

Physical Habitat Measurements
Index of Biological Integrity

Regionalized IBI for Fish Metrics for Ecoregion 34

Total # of Fish Species
Number of Native Cyprinids
Number of Benthic Invertivores
Number of Sunfish
Number of Intolerant Species
Percent of Individuals as Tolerant
Percent of Individuals as Omnivores
Percent of Individuals as Invertivores
Number of Individuals in Sample (ind/seine and ind/min of shock)
Percent of Individuals as Non-Native
Percent of Individuals with Disease or Anomaly.

Rural and Least Disturbed

Dorosoma petenense
Cyprinus carpio
Lythrurus umbratilis
Notropis amnis
Notropis antherinoides
Notropis buchanani
Notropis shumardi
Carpiodes carpio
Minytrema melanops
Moxostoma congestum
Morone chrysops
Elassoma zonatum
Lepomis humilis
Lepomis marginatus
Lepomis symmetricus
Pomoxis annularis
Etheostoma gracile
Etheostoma proeliare
Trinectes maculatus
Urban and Suburban
Anchoa mitchilli
Notropis atrocaudalis
Ameiurus melas
Ictalurus furcatus
Plecostomus spp.
Lucania parva
Poecilia reticulata
Labidesthes sicculus
Lepomis auritus
Aplodinotus grunniens
Cichlasoma cyanoguttatum
Tilapia aurea
Tilapia mossambica
Mugil curema
Avg No. of Species

BC  LDS  RURAL  SUBURBAN  URBAN
Tolerant Fish (w/o Gambusia)
Width of the Riparian Vegetation

![Graph showing the width of riparian vegetation with data points for BC, LDS, RURAL, SUBURBA, and URBAN categories.](image)

- **R.IBI** (y-axis) vs **ripvegwidth** (x-axis)
- Various symbols indicate different categories:
  - BC: Circles
  - LDS: Pluses
  - RURAL: Crosses
  - SUBURBA: Asterisks
  - URBAN: Circles with a dot inside
Road Crossings (density/km²) in Watershed

- BC
- LDS
- RURAL
- SUBURBAN
- URBAN
The objective of the Clean Water Act is to “restore and maintain the chemical, physical, and biological integrity of the Nation's waters”

TCEQ has a statewide Index of Biotic Integrity for benthic macroinvertebrates

Current efforts for regionalizing the B-IBI for macroinvertebrates are ongoing
Richness and Pollution Tolerance

- Taxa Richness
- EPT Richness
- Hilsenhoff Biotic Index
- Intolerant : Tolerant Ratio
- # Non-Insect Taxa
- Hydropsychidae:Trichoptera ratio
Community Structure

- % Chironomidae
- % Dominant Taxon
- % Dominant Functional Group
- % Predators
- % Collector-Gatherers
- % Elmidae
Intolerant Taxa

- EPT Taxa
  - Mayflies
  - Stoneflies
  - Caddisflies
Moderately Tolerant Taxa

- Hydropsychid Caddisflies (net spinners)
- Caenis (mayfly)
- Damselfly larvae
- Dragonfly larvae
- Amphipods
- Crayfish
Tolerant Taxa

- Chironomids
- Leeches
- Oligochaetes
- Lunged Snails
Least Disturbed, Agricultural, and Urban Stream Metric Comparison
# Macroinvertebrate Sample Data

<table>
<thead>
<tr>
<th></th>
<th>LDS</th>
<th>AG</th>
<th>URBAN</th>
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</thead>
<tbody>
<tr>
<td># STATIONS</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>#SAMPLES</td>
<td>15</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Number of Taxa Collected</td>
<td>76</td>
<td>42</td>
<td>38</td>
</tr>
</tbody>
</table>
Intolerant to Tolerant ratio
Total Number of Taxa

The diagram shows a box plot representing the total number of taxa across different types of environments: LDS, AG, and URB. The y-axis indicates the total number of taxa ranging from 10 to 30, while the x-axis represents the different types of environments.
Percent Chironomidae
Benthic IBI Score

![Boxplot showing Benthic IBI scores for different types of environments](image)
So what’s most common in an Urban Stream?
Any Questions?