Tools for prioritizing watershed management and the cost-effective use of riparian buffers as water quality BMPs

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Intuitive: change in land uses \(\rightarrow\) change in water quality

- Removal of vegetation
- Plant species homogenization
- Hydrological changes
- Loadings from non-point sources
- Reduced primary productivity
- Food web modifications

USEPA (2000): non-point sources is currently the Nation’s largest source of water quality problems
Reality: changes in land uses and water quality

- Difficult to evaluate and translate into easy understandable information
- Could be different across land uses (time scale, magnitude, scale)
Expectations

[Graph with scatter plot and normal distribution curve]

[Data points on the scatter plot and percentage distribution on the normal curve]
Reality Check

Depth

[Graph showing depth over time with significant spikes at certain points.]

RAIN IN
Flowlink 4 for Windows

CalcFlow 1 (5559865 gal) Rainfall (11.85 in)

[Graph showing rainfall data over time with notable rainfall events highlighted.]
Data

- Non-parametric distributions
- Traditional statistical methods don’t apply
- Cause-effect relationships difficult to identify
- Quantitative studies have been inconclusive
Variability caused by:

- Variable nature of water quality
- Climate variables
- Groundwater influences
- Human activities beyond land use
Benefits

- Tests for associations among variables in tabular form
- Nominal or ordinal measurements scales (i.e. categorically discrete data; quantities that have a natural ordering)
- Simple statistically based method
- Capture relevant processes and patterns
- Allows for scientific judgment
- Present information in an easily understood format
Geographical Data

Land Uses

Water Quality

Water Quality Management Tool
Water Chemistry Parameters

- Conductivity
- Total Dissolved Solids
- Salinity
- pH
- Turbidity
- Diazinon (pesticide)
- Triazine (herbicide)
Words of Caution

- Always ground statistical results to reality
- Because the aggregation of data into categorical data (i.e. low moderate, high) some spatial and temporal resolution is lost
Outputs

- Identified associations between land uses and water quality parameters
- Identified signature water quality parameters for some of the land uses
- Development of thematic maps
  - Reveal areas needing intervention (regulatory, restoration, etc)
  - Help managers in prioritizing watersheds and allocation of funds
There are lies, damned lies and statistics.

by Mark Twain
Stream buffers as BMPs for water quality

319 Grant: Technical Memorandum Adapting the Hickory Creek Watershed Protection Plan for Use in Other Areas of the Lake Lewisville Lake Watershed: Doe Branch and Stewart Creek
## ESAs & Tree Canopy

<table>
<thead>
<tr>
<th></th>
<th>Acreage</th>
<th>Tree Canopy (Ac)</th>
<th>Tree Canopy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>57,110.8</td>
<td>10,652.7</td>
<td>18.7%</td>
</tr>
<tr>
<td>All ESAs</td>
<td>12,005</td>
<td>5,169**</td>
<td>43.1%</td>
</tr>
<tr>
<td>Undeveloped Floodplain</td>
<td>7,594</td>
<td>3,203</td>
<td>42.2%</td>
</tr>
<tr>
<td>Water-related</td>
<td>2,332</td>
<td>1,811</td>
<td>77.7%</td>
</tr>
<tr>
<td>Stream Buffer</td>
<td>4,263</td>
<td>1,596</td>
<td>37.4%</td>
</tr>
<tr>
<td>Inside Floodplain</td>
<td>2,213</td>
<td>1,104</td>
<td>49.9%</td>
</tr>
<tr>
<td>Outside Floodplain</td>
<td>2,049</td>
<td>491</td>
<td>24.0%</td>
</tr>
<tr>
<td>Upland*</td>
<td>2,373</td>
<td>1,476</td>
<td>62.2%</td>
</tr>
</tbody>
</table>

* Approx. 872 ac of trees has been cleared since 2002

** 48.5% of City tree canopy is within areas designated as ESAs
NCTCOG Greenprinting

- A systematic approach for identifying areas that offer the highest conservation benefit for water quality protection and other regional resource priorities (NCTCOG website http://www.nctcog.org/envir/SEEscg/REF/Greenprint.asp)

- NCTCOG, Trust of Public Land, City of Arlington, Upper Trinity Water District
- Lake Lewisville East and Lake Arlington
Thanks!

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- Kenneth Banks, PhD
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References

- Analyzing Water Quality and Land Use Relationships Among Multiple Watershed using Contingency Analysis (Kenneth Banks and David Wachal)