Functions of riparian buffer

- **Vegetation** - corridor of specific width-adjacent to the banks of water bodies

- **Ecological health** - temperature control, nitrogen filtering, bank stabilization

- **BMP** - One of the best BMP for NPS control\(^1\)

- **Establishment** - NRCS-CRP/CREP/EQIP, and EPA- Cost share through 319(h)

\(^1\)(Mayer et al., 2005)
Riparian Buffer: Challenges and Opportunities

**Constraints**
- Financial
- Social
- Physical

**Effectiveness**
- Identify where they are needed most, or where they can perform best

**Disturbances**
- Farming
- Timber logging
- Channelization
- Dredging

**Objective**
- Quantify vegetation composition in riparian buffer
Study Area: L’Anguille River Watershed (LRWS)

- Total Area under row crops (70%)
  - soybean (42.3%),
  - rice (14.9%),
- Forest (21.2%),
- Source of impairment
  - Drainage of the lowland areas - ditching and channelization
  - Silt loads carried into the streams from row crops

Study stream banks to determine sources for sedimentation (Audubon, 2005)

(Source: Center for Advanced Spatial Technologies (CAST), 2006)
How wide should be the buffer..?

**USDA-NRCS guidelines (Act 391 and 393):**

<table>
<thead>
<tr>
<th>Land Slope (%)</th>
<th>Riparian Forest Buffer, ft</th>
<th>Filter Strip minimum widths, ft</th>
<th>Total combined width, ft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cropland</td>
<td>Pastures</td>
<td>Forest</td>
</tr>
<tr>
<td>0-1</td>
<td>35</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>1-3</td>
<td>35</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>3-8</td>
<td>35</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>8-20</td>
<td>35</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>20-40</td>
<td>35</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

Riparian buffers- largest of the minimum combined width

“vegetation (trees and filter strip practices) lying within 45 m (147.5 ft) from the stream bank”
Input Data and Initial Effort

- 2006 natural color imagery
- Stream layer- NHD Plus (ADEQ)
- 2006 LULC Image

- Manually edit stream centerlines to ensure that they match location on natural color imagery
Approx. 360 km (225 miles) of streams data was manually created

Scale used 1:700
Algorithm Development

- Use edited stream centerline and natural color imagery obtained in Spring 2006 to delineate stream banks

- Create buffers from *stream banks*

- Find vegetation composition within the buffers

Leaf-off condition
Searching for the right image

- **Challenge**: Reading entire county 1-m DOQQ and extracting pixel values

- **Solution**: Used 97 Quarter Quads (QQ) sequentially

- **Operation**: Extent of each QQ used for searching image under sample points
Finding Stream Banks

- Identify perpendiculars to the stream
- Extract pixel values along perpendiculars
- Identify stream banks using edge detection concept
Results – Perpendiculars

sampled stream centerline

identified perpendiculars
Results - Stream Boundary Delineation
Error Analysis

How much error can we expect from this method?

Mean error of 2.55 m (RMSE 3.41 m)

Compare with manually delineated streams in GIS

✓ Mean error of 2.55 m (RMSE 3.41 m)
# Results – Vegetation Composition

<table>
<thead>
<tr>
<th></th>
<th>First Creek</th>
<th>Second Creek</th>
<th>Bushy Creek</th>
<th>Larkin Creek</th>
<th>L’Anguille River</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SB</td>
<td>SC</td>
<td>SB</td>
<td>SC</td>
<td>SB</td>
</tr>
<tr>
<td>Urban (%)</td>
<td>1.1</td>
<td>1.2</td>
<td>1.9</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Water (%)</td>
<td>0.7</td>
<td>0.8</td>
<td>1.7</td>
<td>2.0</td>
<td>8.8</td>
</tr>
<tr>
<td>Crops (%)</td>
<td>52.2</td>
<td>47.1</td>
<td>32.3</td>
<td>31.6</td>
<td>46.5</td>
</tr>
<tr>
<td>Forest (%)</td>
<td>45.1</td>
<td>49.7</td>
<td>63.3</td>
<td>64.1</td>
<td>41.5</td>
</tr>
<tr>
<td>Grass (%)</td>
<td>0.7</td>
<td>1.2</td>
<td>0.6</td>
<td>0.5</td>
<td>1.1</td>
</tr>
</tbody>
</table>

- Lower water pixels inventoried
- Higher accuracy of riparian inventory
Summary

✓ Algorithm developed to delineate stream banks: mean error 2.55 m (RMSE 3.41 m)

✓ Riparian inventory shows >32% cropland acreage adjacent to tributaries

✓ Lower water pixels inventoried resulted in higher accuracy of riparian inventory
Acknowledgements

• Deano Traywick

• Center for Advanced Spatial Technology (CAST), Univ. of Arkansas

• Dr. Jackson Cothren, Univ. of Arkansas