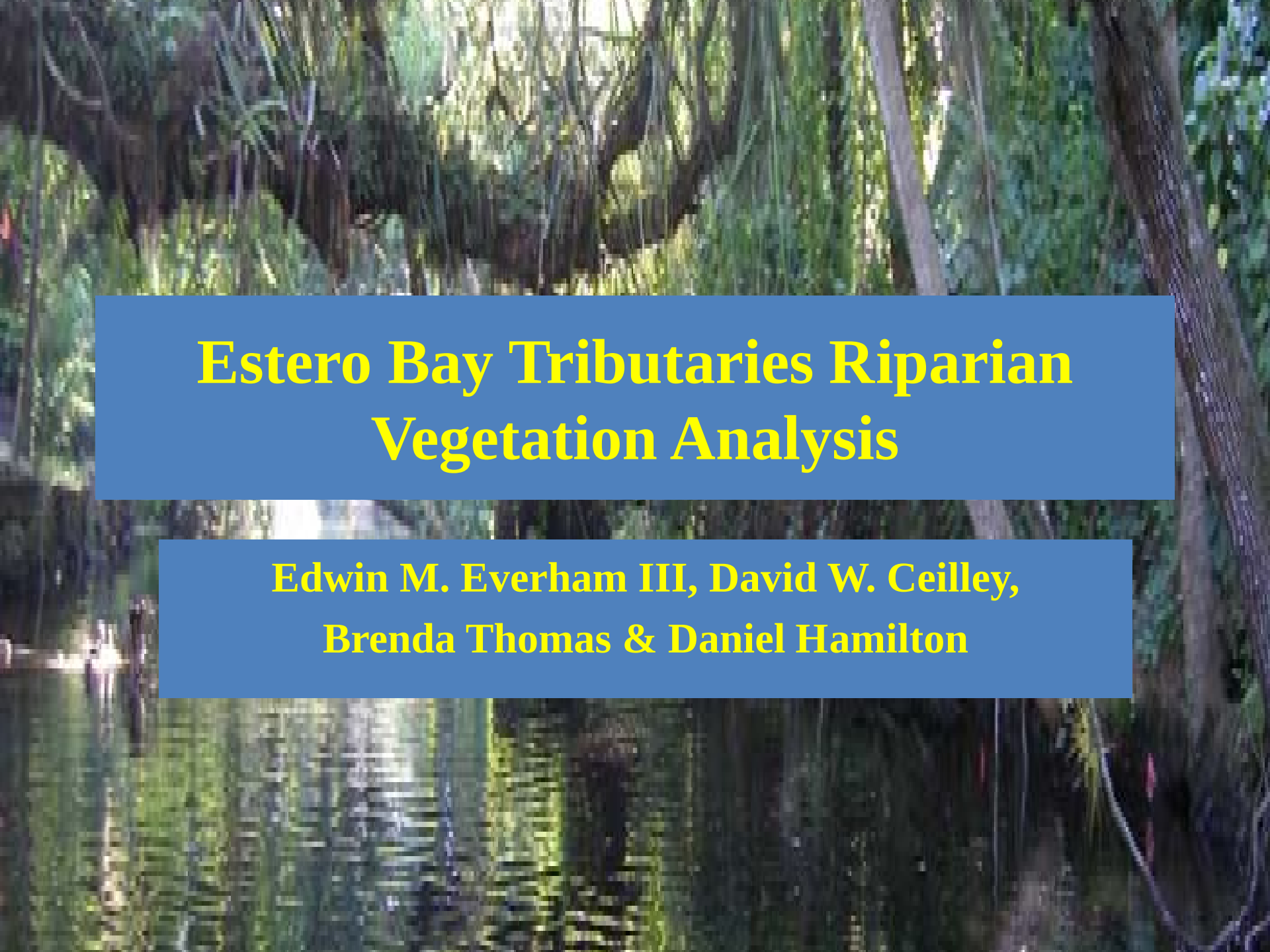


Estero Bay Tributaries Riparian Vegetation Analysis

Edwin M. Everham III, David W. Ceilley,
Brenda Thomas & Daniel Hamilton

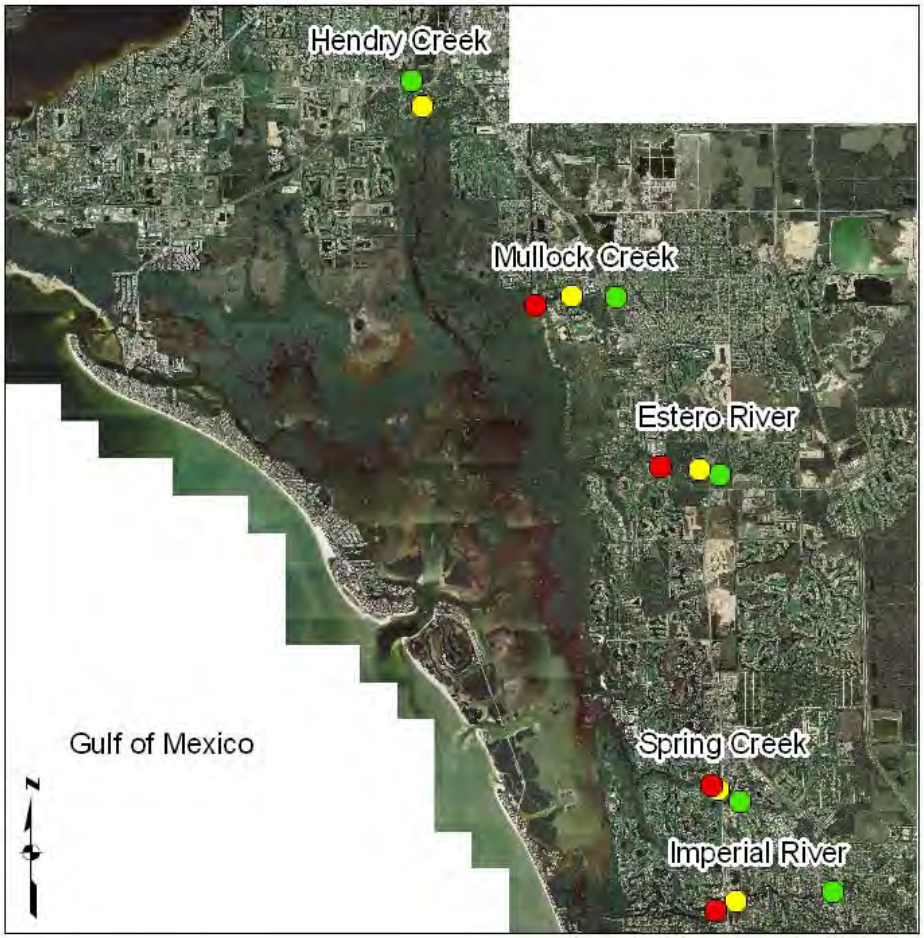
Thanks!

- South Florida Water Management District
- Peter Doering, Ph.D & Tomma Barnes, Ph.D.
- FGCU The Inland Ecology Research Group
- FGCU Coastal Watershed Institute

Objectives

- Investigate riparian vegetation change in response to changing freshwater flow
- Historical analysis of vegetative change
- Establishment of long-term study plots to track future changes
- Attempt to develop vegetative indicators of changes to freshwater flow

Transect Location for Ripairian Vegetational Analysis of Estero Bay



Legend

Estero Bay Transects

- Upstream
- Middle
- Downstream

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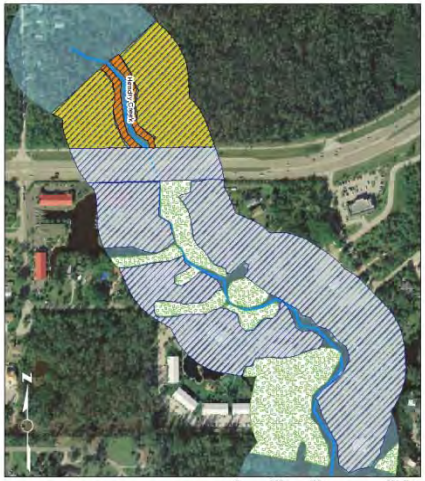
Methods – Historical Analysis

- **Aerial photography from 1966, 1981, and 2002 with ground-truthing of 2002 aerials**
- **GIS mapping of 100-meter boundary on both sides**
- **Identified five broad vegetative communities:**
  - **mangrove**
  - **mixed riparian**
  - **mixed upland**
  - **human landscapes**
  - **agriculture**

Hendry Creek 2002



Legend

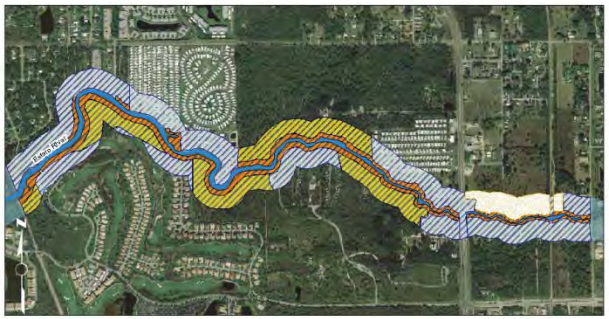
- Human Landscape
- Mangrove
- Mixed Upland
- Mixed Repairian
- Hendry Creek
- Hendry Creek 100 Meter Buffer

Mullock Creek 2002

Legend

- Human Landscape
- Mangrove
- Mixed Upland
- Mixed Repairian
- Mullock Creek
- Mullock Creek 100 Meter Buffer

Estero River 2002



Legend

- Human Landscape
- Mixed Upland
- Mixed Repairian
- Agricultural Field
- Estero River
- Estero River 100 Meter Buffer

Spring Creek 2002

Legend

- Human Landscape
- Mangrove
- Mixed Upland
- Mixed Repairian
- Spring Creek
- Sping Creek 100 Meter Buffer

Imperial River 2002

Legend

- Human Landscape
- Mangrove
- Mixed Upland
- Mixed Repairian
- Imperial River 100 Meter Buffer
- Imperial River

Spring Creek 1966

0 500 1,000 2,000 Feet

Legend

- Mangrove
- Mixed Upland
- Mixed Repairian
- Agricutural Field
- Spring Creek
- Sping Creek 100 Meter Buffer

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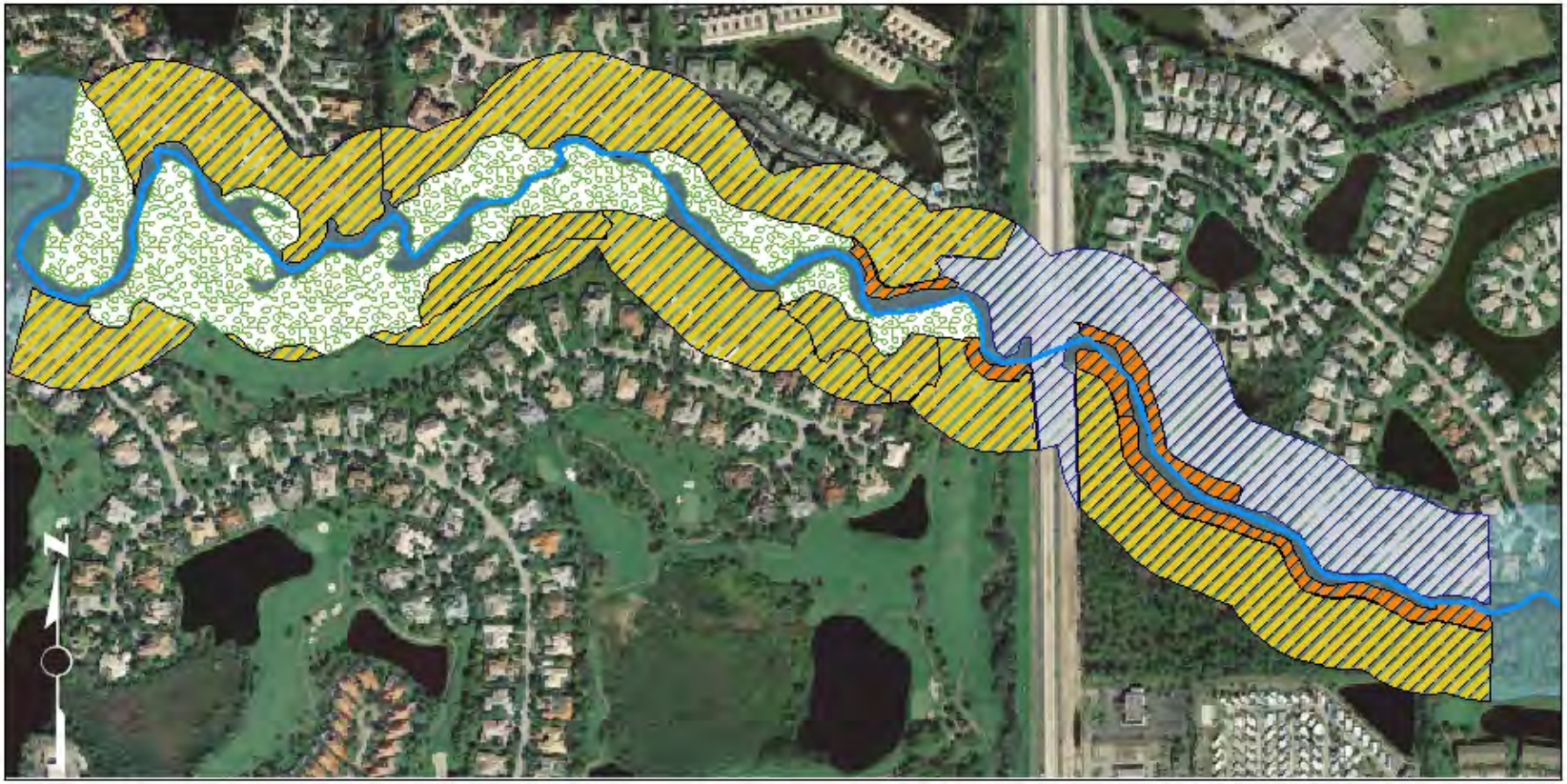
Spring Creek 1981



0 500 1,000 2,000 Feet

Legend

- Human Landscape
- Mangrove
- Mixed Upland
- Mixed Repairian
- Spring Creek
- Sping Creek 100 Meter Buffer

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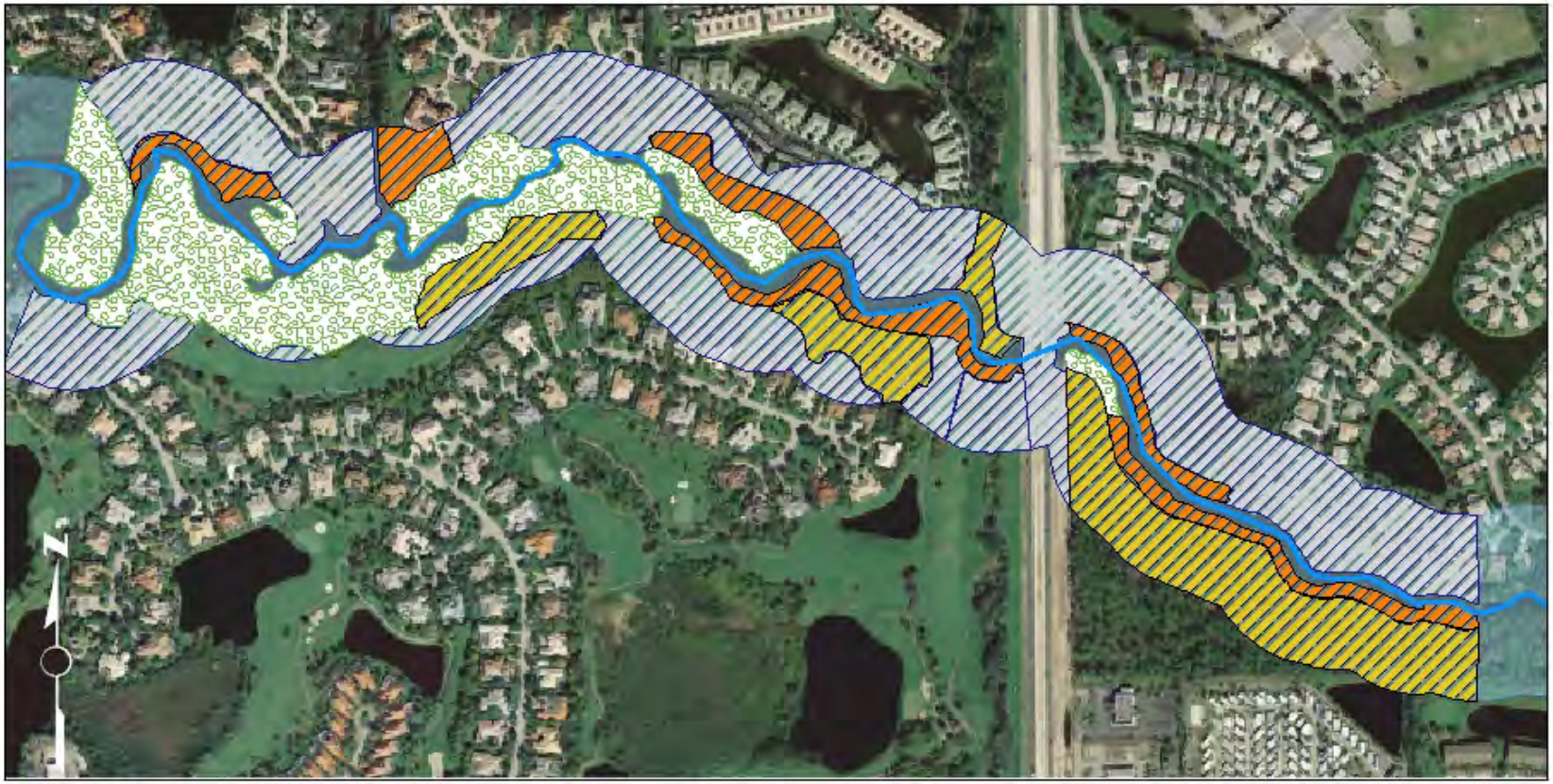
Spring Creek 2002



Legend

- Human Landscape
- Mangrove
- Mixed Upland
- Mixed Repairian
- Spring Creek
- Sping Creek 100 Meter Buffer

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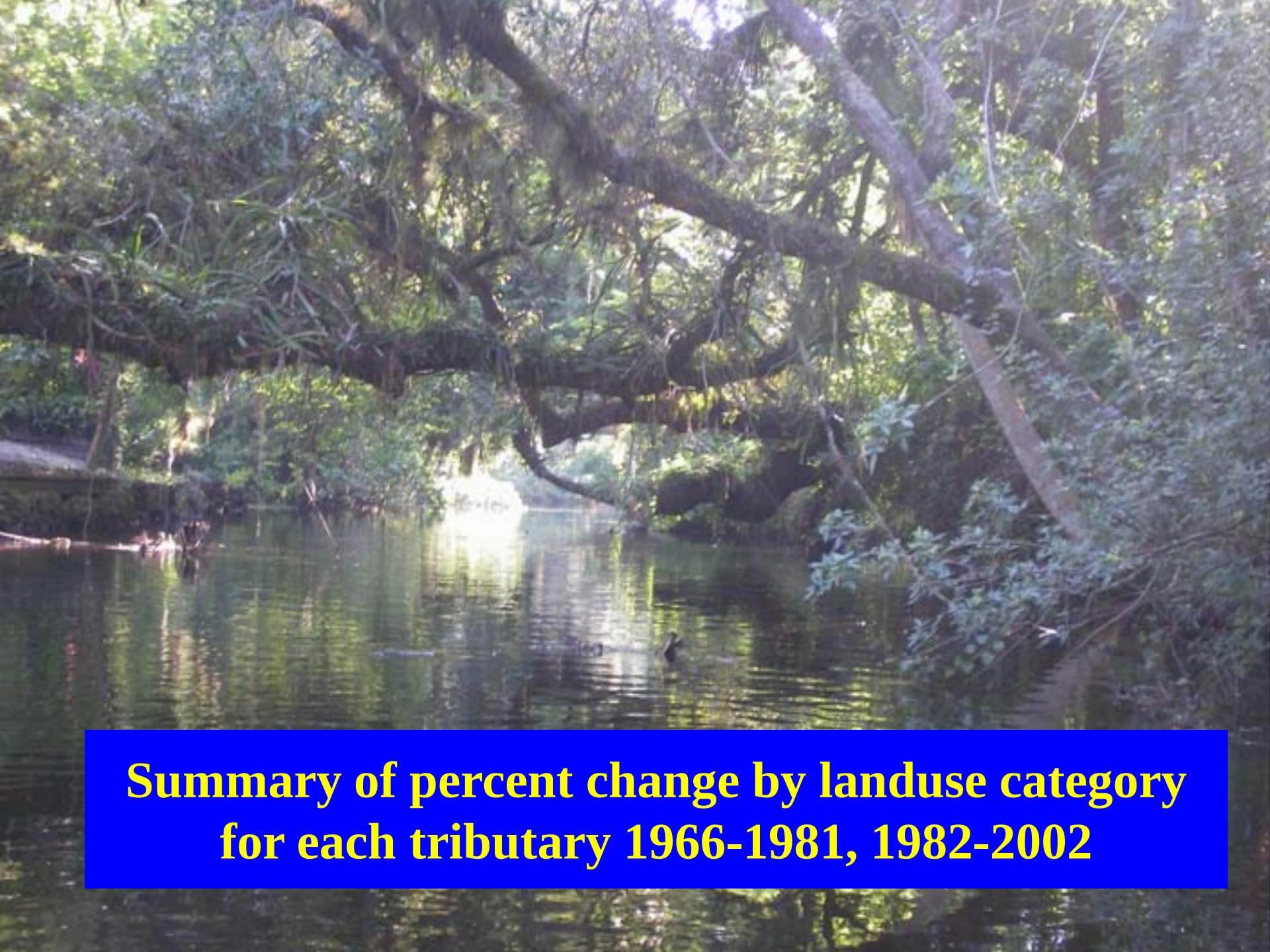
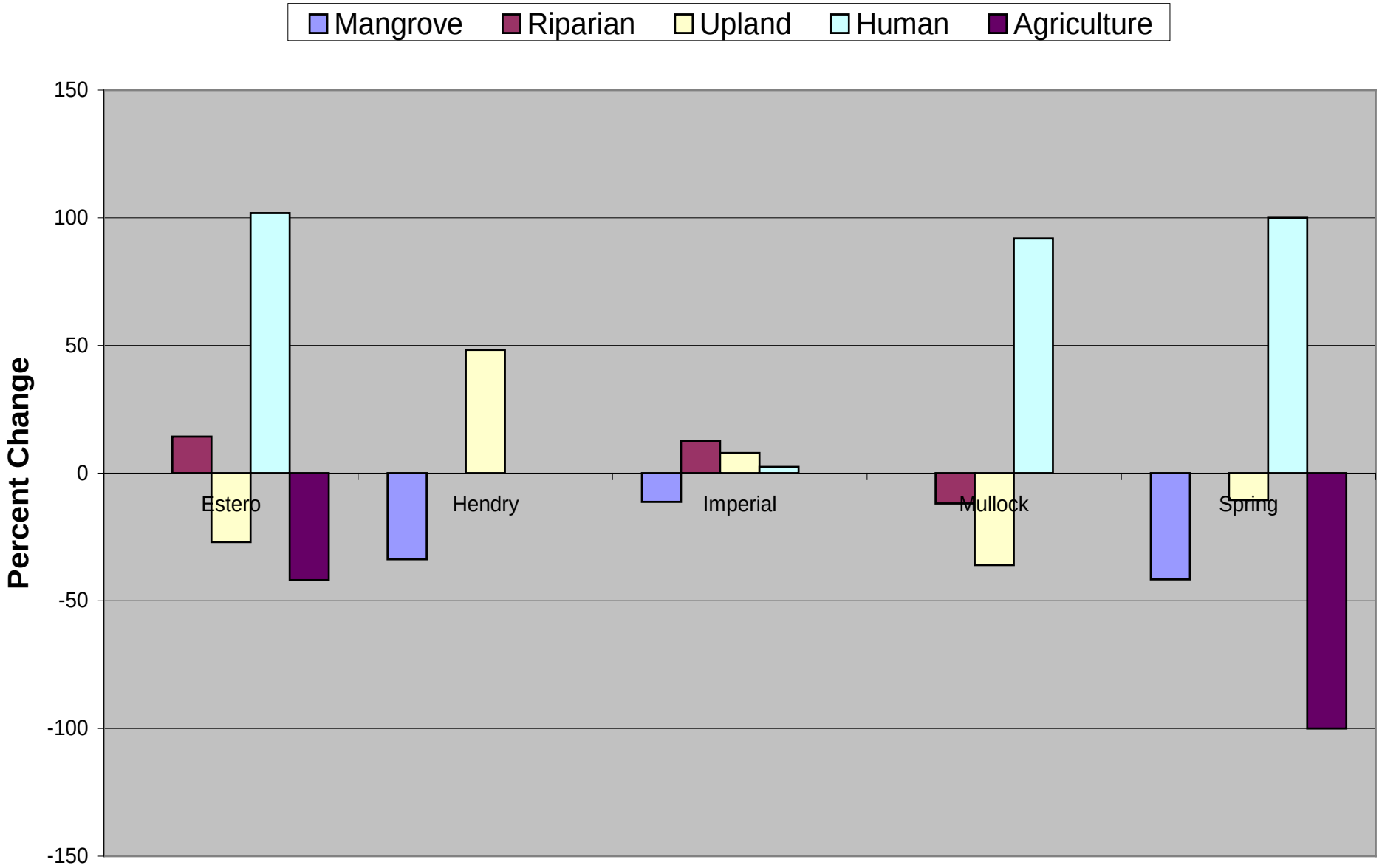
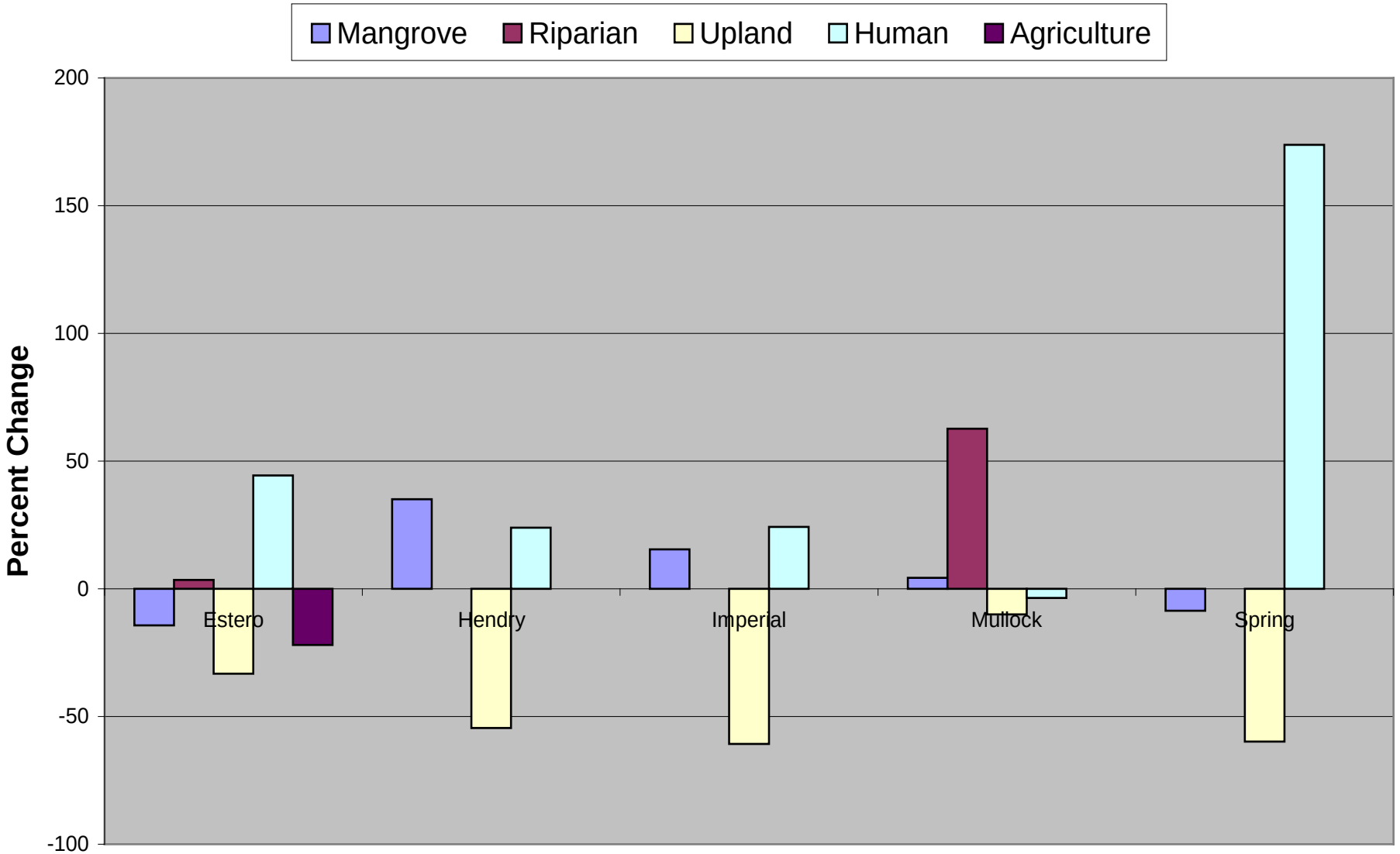


Summary of percent change by landuse category for each tributary 1966-1981, 1982-2002

A. Habitat Changes 1966-1982



B. Habitat Changes 1982-2002



Historical Analysis

- Development occurred at different times along different tributaries
- Ag lost to residential 66-81
- Upland lost to residential 81-02
- Buffers lost early, protected later (sort of)
- Mangroves did not move (maybe)

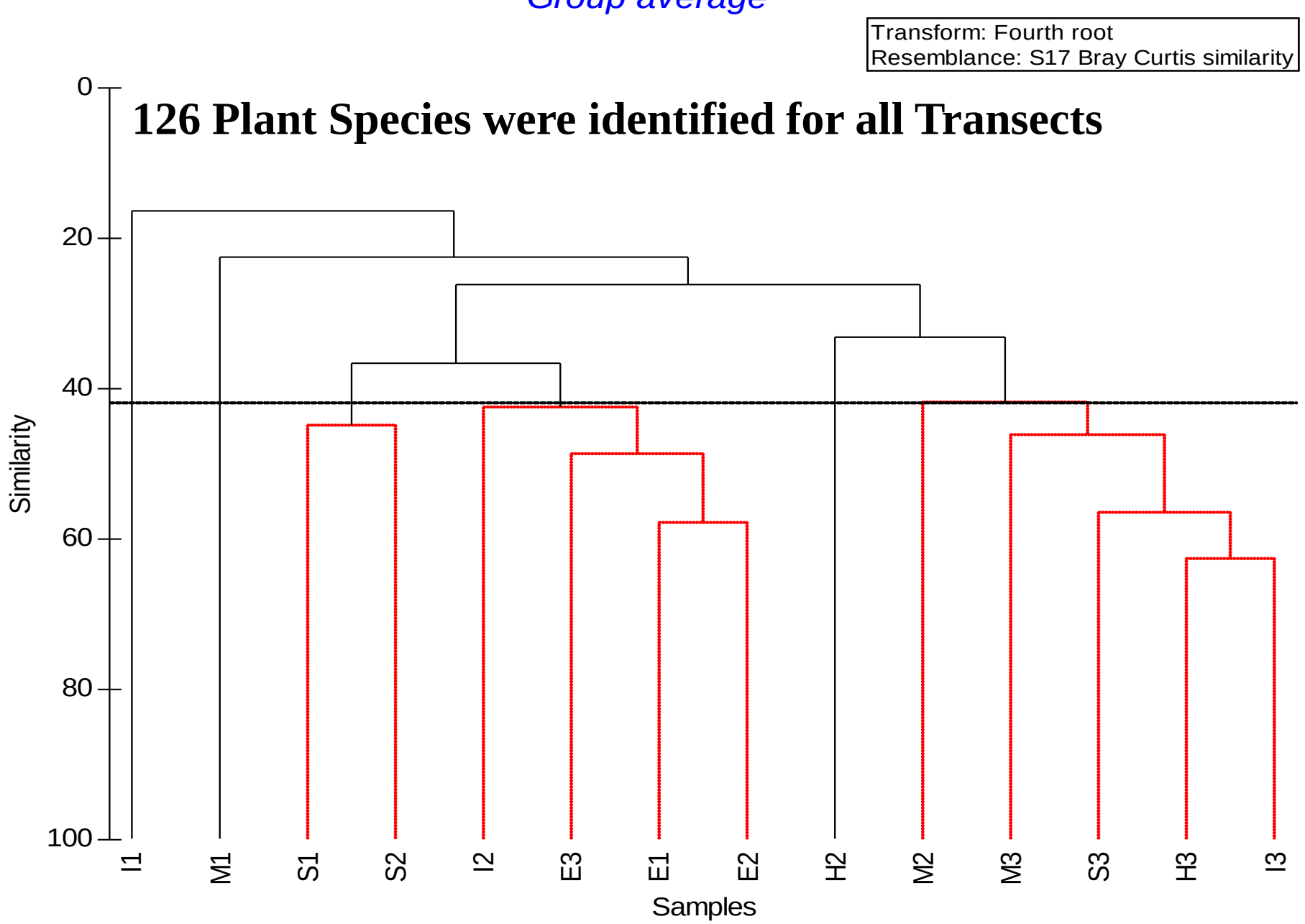
Methods – Transect Establishment

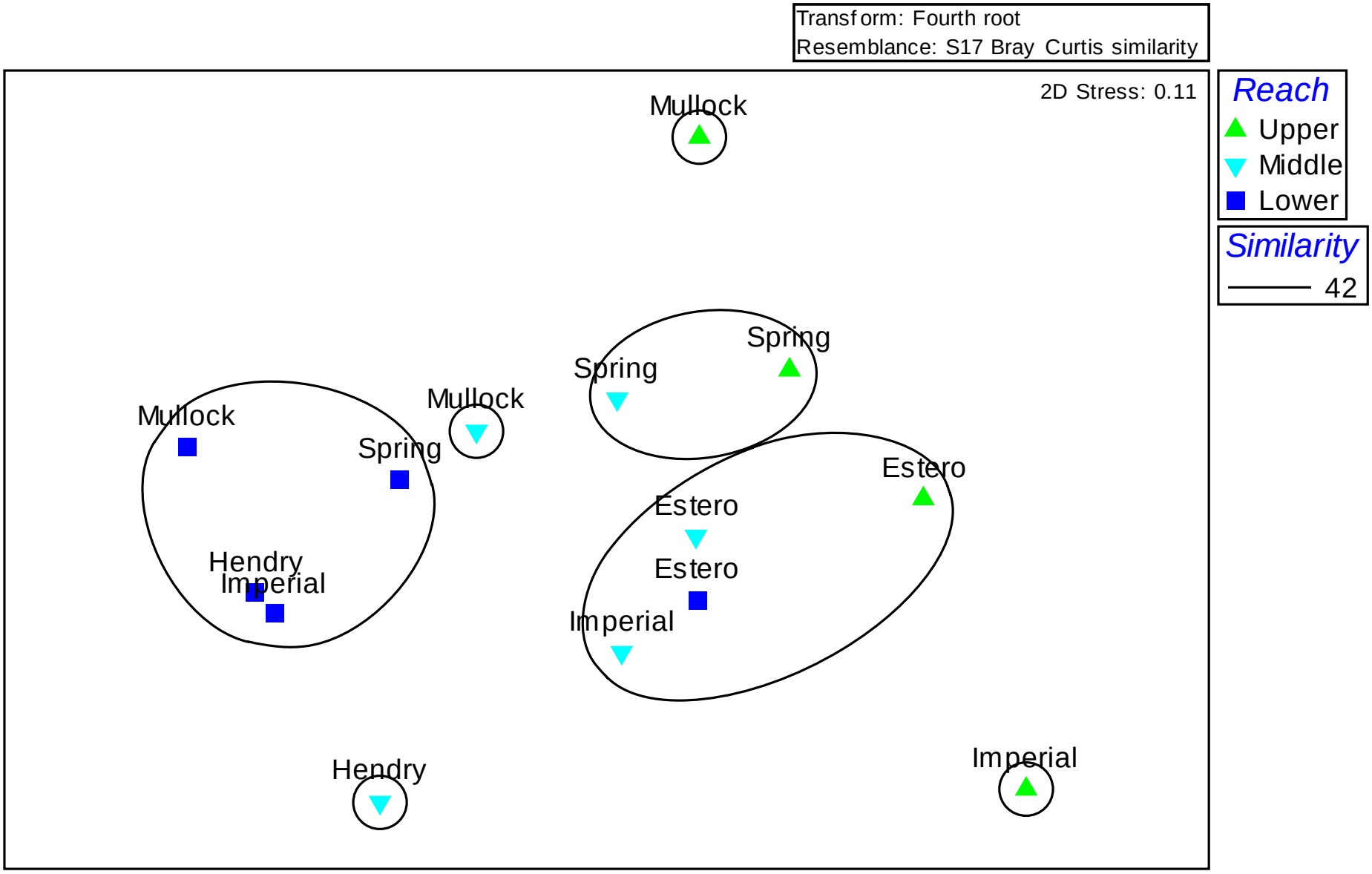
- Three transects were established at each tributary
  - middle transect at estimated transition point between freshwater and estuarine systems (upstream extent of tidal influence)
  - two additional transects were placed approximately 0.5 – 1.0 km above and below this point.
- Each transect is 50 meters long, and 5 m wide to include emergent vegetation.

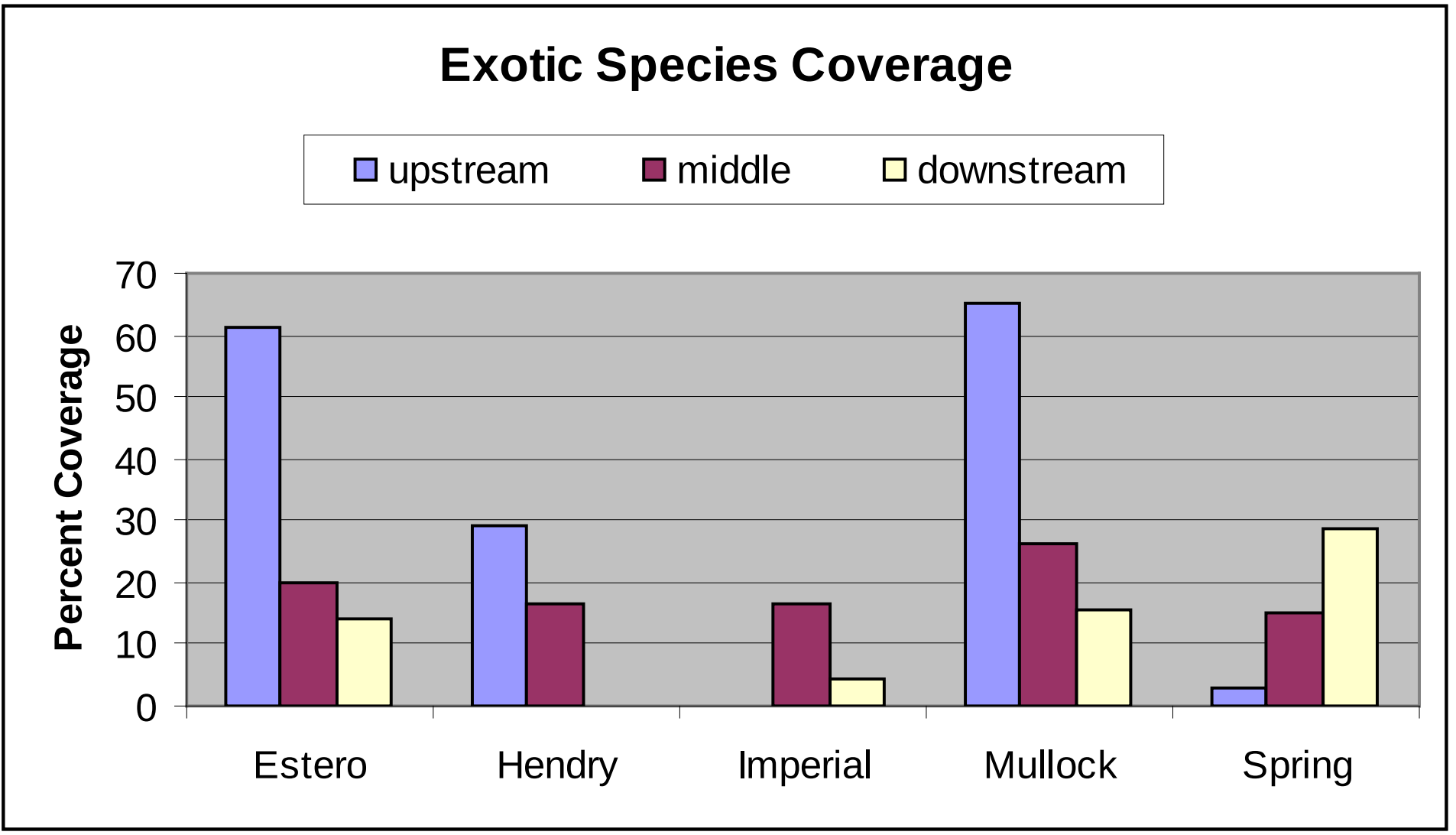
Methods – Field Data Collection

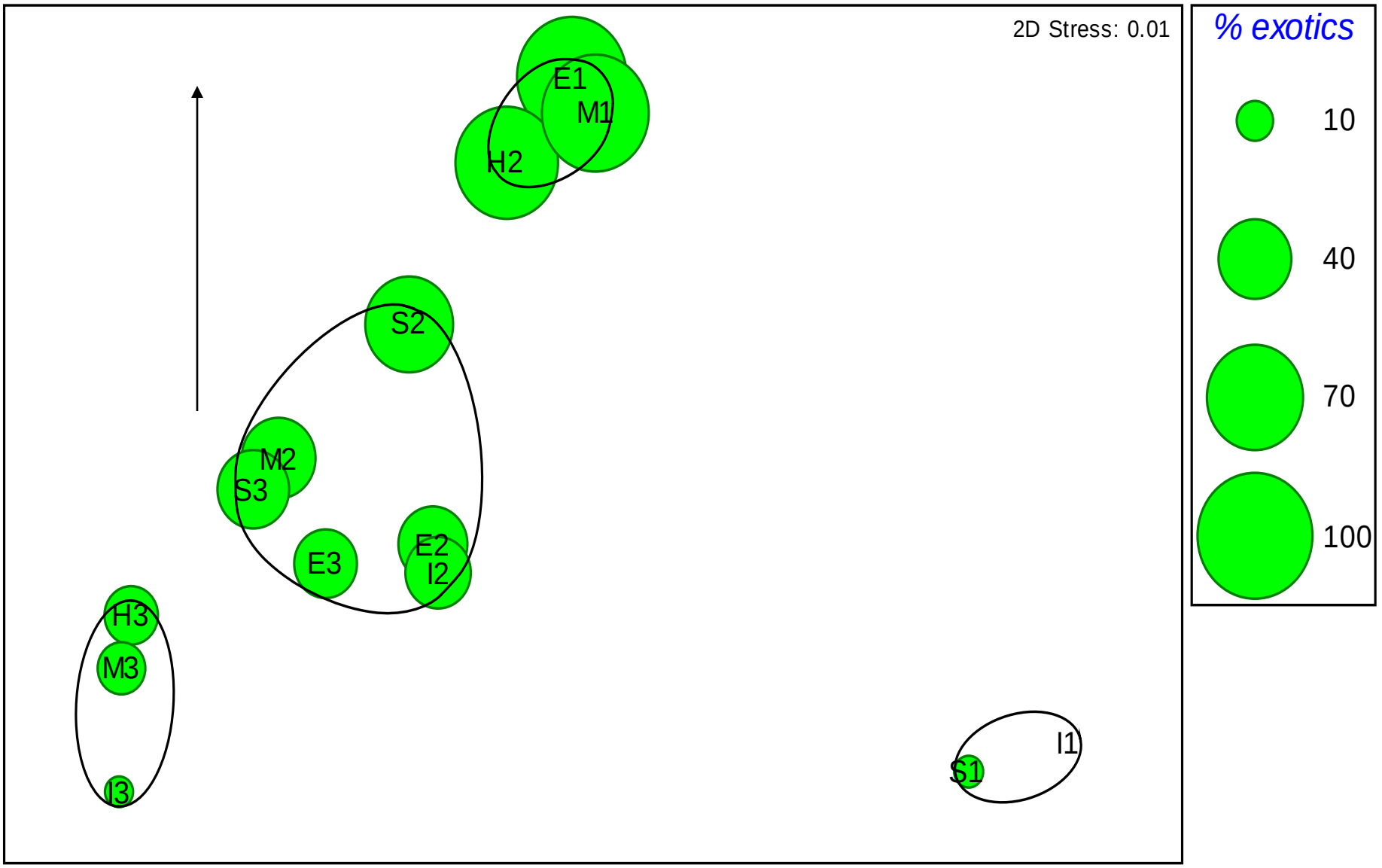
Within each 25 m^2 unit (the 5 m section of the 5 m wide transect), we:

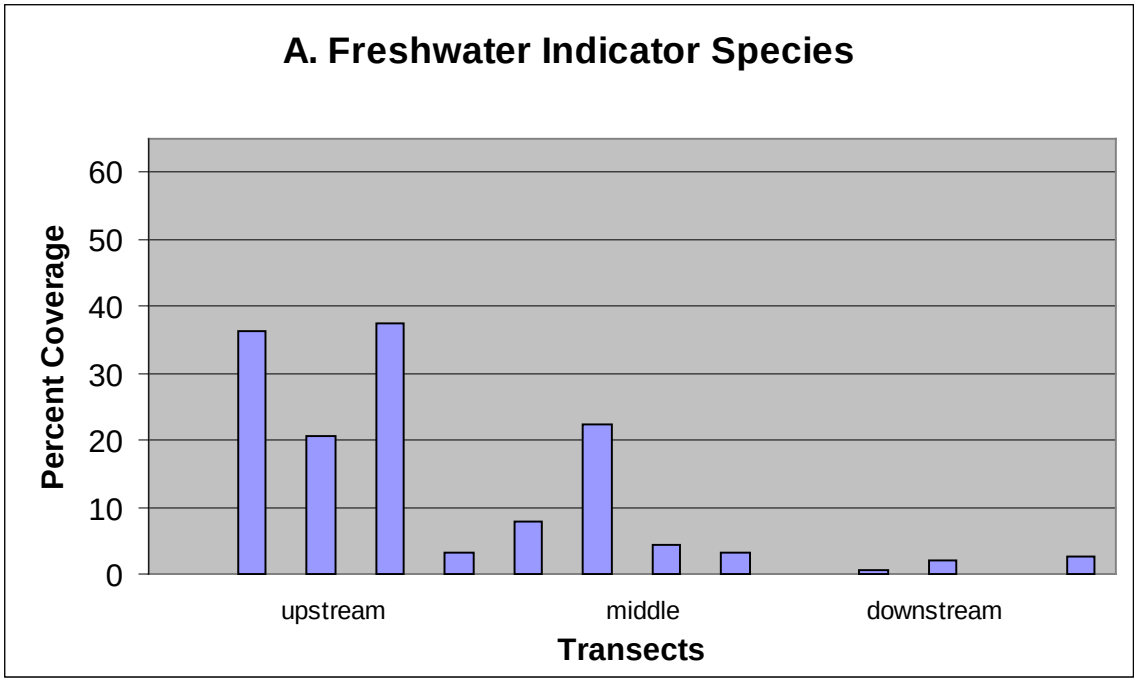
- **estimated percent cover for each species**
- **measured and mapped all woody stems 10 cm or larger in diameter at breast height (dbh)**
- **recorded canopy density, and**
- **measured the vertical structure of the vegetation.**

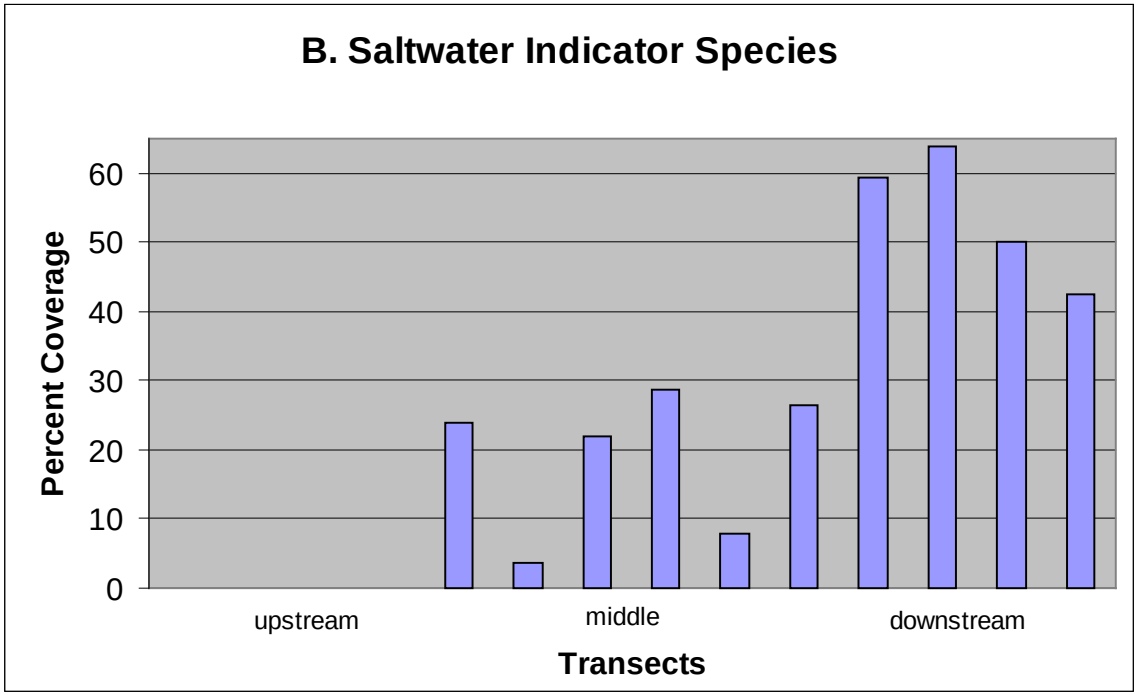

Group average
Transform: Fourth root
Resemblance: S17 Bray Curtis similarity
126 Plant Species were identified for all Transects
Similarity
0
20
40
60
80
100
I1
M1
S1
S2
I2
E3
E1
E2
H2
M2
M3
S3
H3
I3
Samples

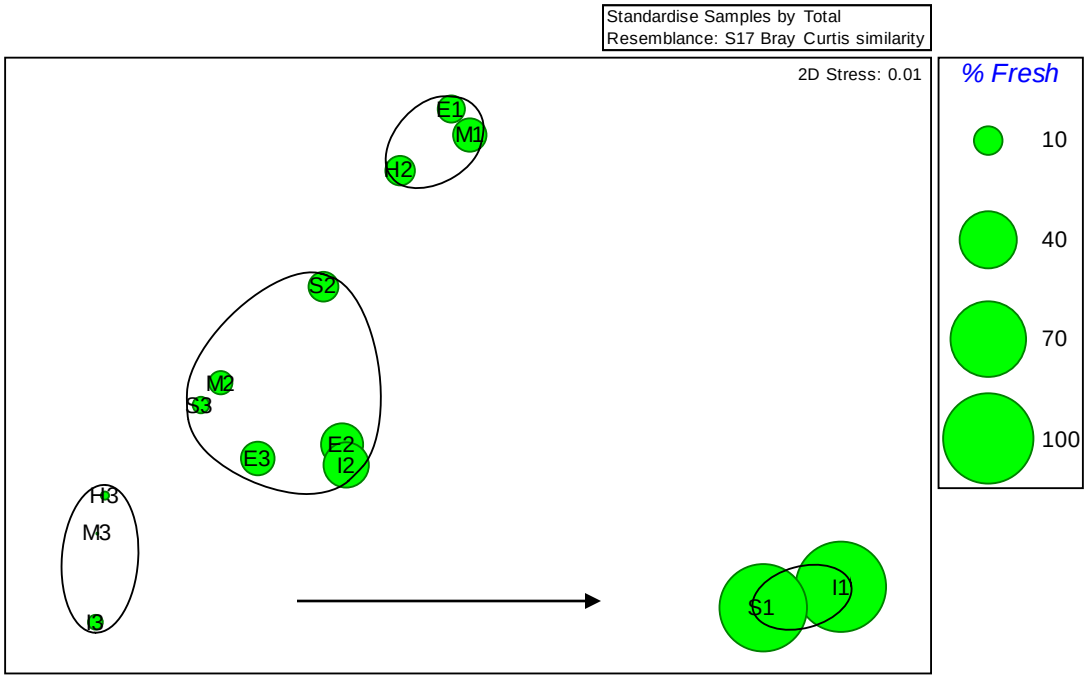

Transform: Fourth root
Resemblance: S17 Bray Curtis similarity
2D Stress: 0.11
Reach
Upper
Middle
Lower
Similarity
42
Mullock
Spring
Spring
Mullock
Mullock
Spring
Estero
Estero
Estero
Hendry
Imperial
Imperial
Hendry
Imperial

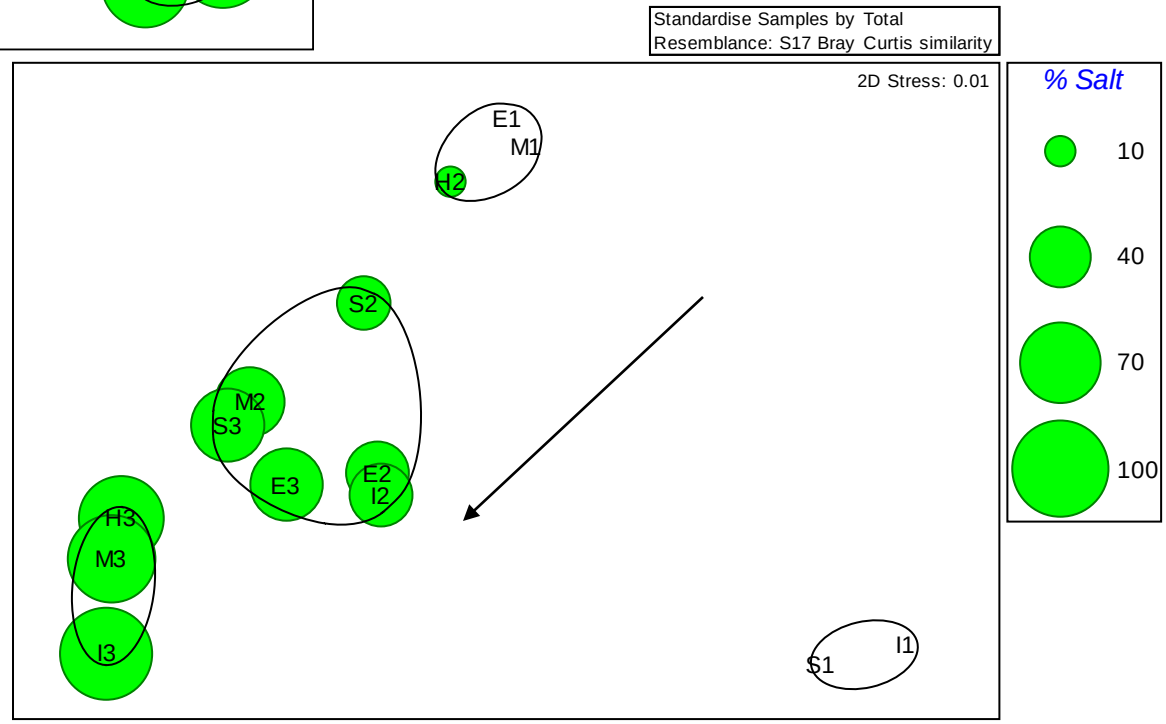

Exotic Species Coverage
upstream
middle
downstream
Percent Coverage
70
60
50
40
30
20
10
0
Estero
Hendry
Imperial
Mullock
Spring


Standardise Samples by Total
Resemblance: S17 Bray Curtis similarity
2D Stress: 0.01
% exotics
10
40
70
100
E1
M1
H2
S2
M2
S3
E3
E2
I2
H3
M3
I3
I1
S1


A. Freshwater Indicator Species
Percent Coverage
60
50
40
30
20
10
0
upstream
middle
downstream
Transects


B. Saltwater Indicator Species
Percent Coverage
60
50
40
30
20
10
0
upstream
middle
downstream
Transects


Standardise Samples by Total
Resemblance: S17 Bray Curtis similarity
2D Stress: 0.01
% Fresh
10
40
70
100
E1
M1
H2
S2
M2
S3
E3
E2
I2
H3
M3
I3
I1
S1


Standardise Samples by Total
Resemblance: S17 Bray Curtis similarity
2D Stress: 0.01
% Salt
10
40
70
100
E1
M1
H2
S2
M2
S3
E3
E2
I2
H3
M3
I3
I1
S1

Conclusions

- Riparian vegetation changes reflect land use patterns in Estero Bay watershed. < native uplands, < agriculture and > human landscape along shorelines.
- Riparian buffers may be inadequate to preserve ecological integrity of tributaries.

- We identified groups of plant species that are sensitive freshwater flow regimes and human disturbance.
- Riparian vegetation serve as indicators of freshwater flow patterns and may help establish minimum flows and levels (MFLs)