A Tidal Creek Condition Index Based on Ecological Variables and Rapid Survey Methods, for Southwest Florida

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Sarasota County Environmental Services

Southwest Florida Water Management District
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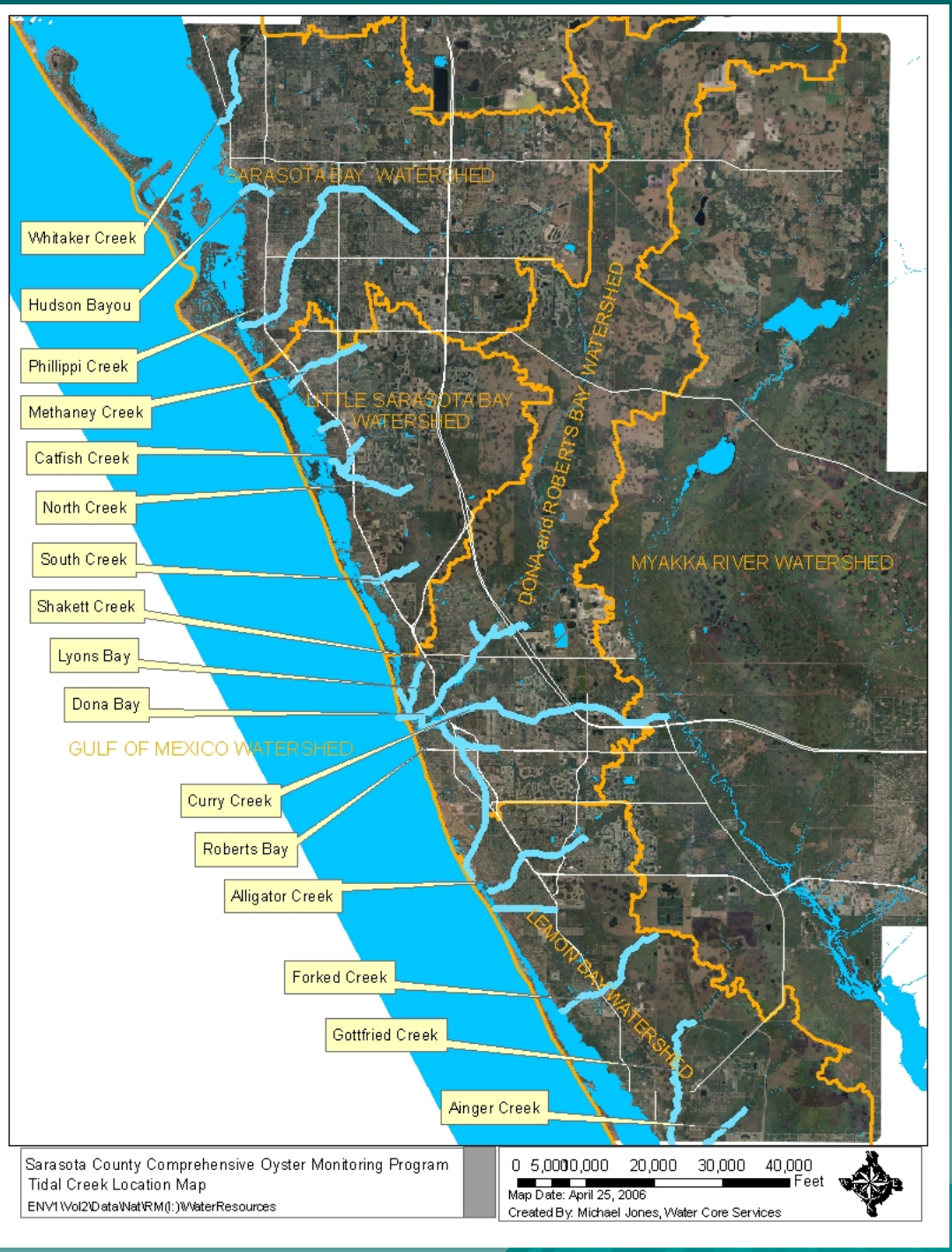
Sarasota County Integrated Water Resource Management Initiative

Multiple Objectives

- *Water supply*
- *Flood control*
- *Natural resources*

TMDL & Watershed Plans

Performance Measures and Report Cards


SARASOTA BAY WATERSHED
LITTLE SARASOTA BAY WATERSHED
DONA and ROBERTS BAY WATERSHED
MYAKKA RIVER WATERSHED
LEMON BAY WATERSHED
GULF OF MEXICO WATERSHED
Whitaker Creek
Hudson Bayou
Phillippi Creek
Methaney Creek
Catfish Creek
North Creek
South Creek
Shakett Creek
Lyons Bay
Dona Bay
Curry Creek
Roberts Bay
Alligator Creek
Forked Creek
Gottfried Creek
Ainger Creek
Sarasota County Comprehensive Oyster Monitoring Program
Tidal Creek Location Map
ENV1\Vol2\Data\Nat\RM(:)\WaterResources
0 5,000 10,000 20,000 30,000 40,000 Feet
Map Date: April 25, 2006
Created By: Michael Jones, Water Core Services

Project History

- **2005: Literature Review & Concept Development**
- **2006: Preliminary Fieldwork and Index Formulation**
- **2007: Major Field Effort and Index Refinement**
- **2008: Spring Surveys in 16 Creeks**
- **2009: 16 Spring Surveys & Monthly Summer Surveys in South Creek**

One Site per Creek

- REPRESENTATIVE
- PROXIMITY TO OTHER DATA SOURCES
- SIZE
- FUTURE AVAILABILITY
- ACCESSIBILITY
- SAFETY
- STREAM SANITATION

Desirable Index Qualities

- Rapid-Survey Methods
- Multiple Levels of Biological Order
- Sufficient Range & Scope of Values
- Relationship to Creek & Watershed Management

Relating Creek Metrics to Stressors and Watershed Influences

BIOLEVEL	METRIC	PROXIMATE STRESSORS	WATERSHED INFLUENCE
Pollution Indicator Species	Filamentous Algae % Cover	Light	Sediments Turbidity Color
		Nutrients	Point and NPS Runoff
		Salinity	Hydrological Alterations

Index Components

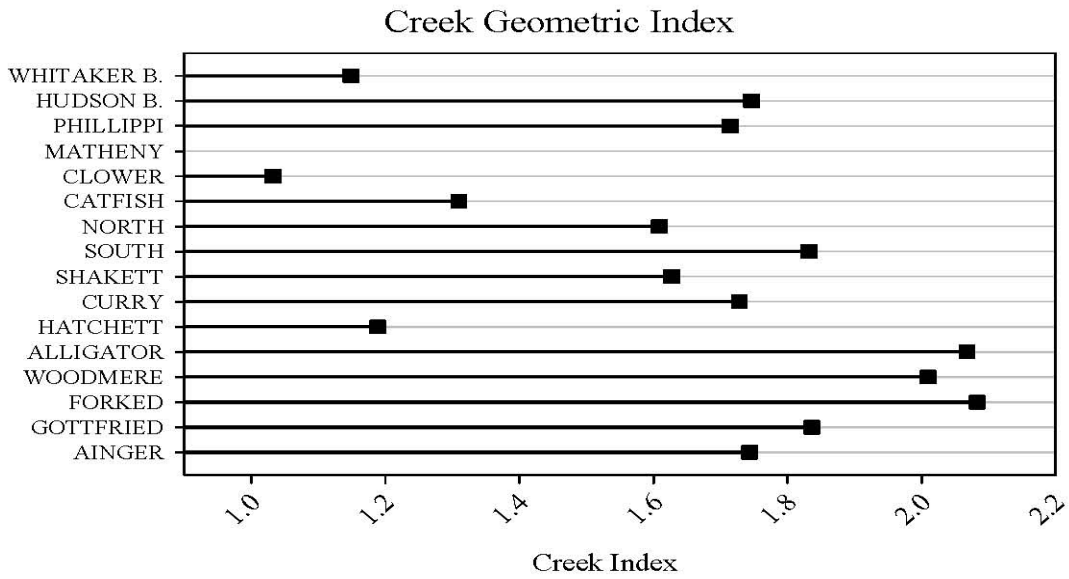
Longevity:	***Tagelus* cohort #**	**Largest oyster**
Valued Indicator Species:	***Tagelus* density**	**% live oyster**
Pelagic/epibenthic Community:	**Dip-Net faunal density (all spp.)**	
Infaunal Community:	**Burrow density**	**Other mollusk density**
Pollution Indicators:	**% Periphyton cover**	**% Filamentous algae cover**

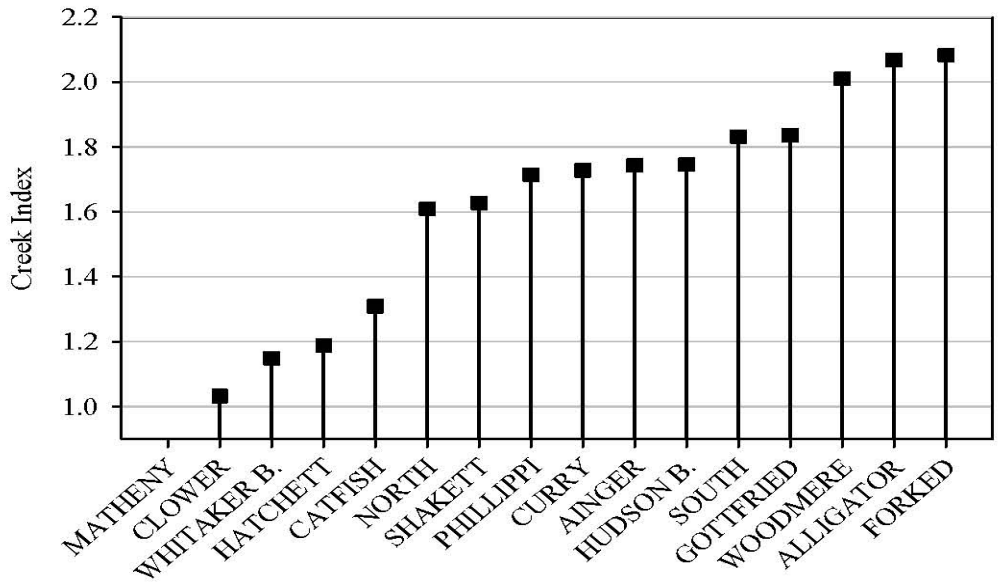
Collecting Bottom Fauna

Sampling Effort

- Oysters sampled intertidally
- Other variables sampled subtidally
- Alternate methods used in polluted creeks

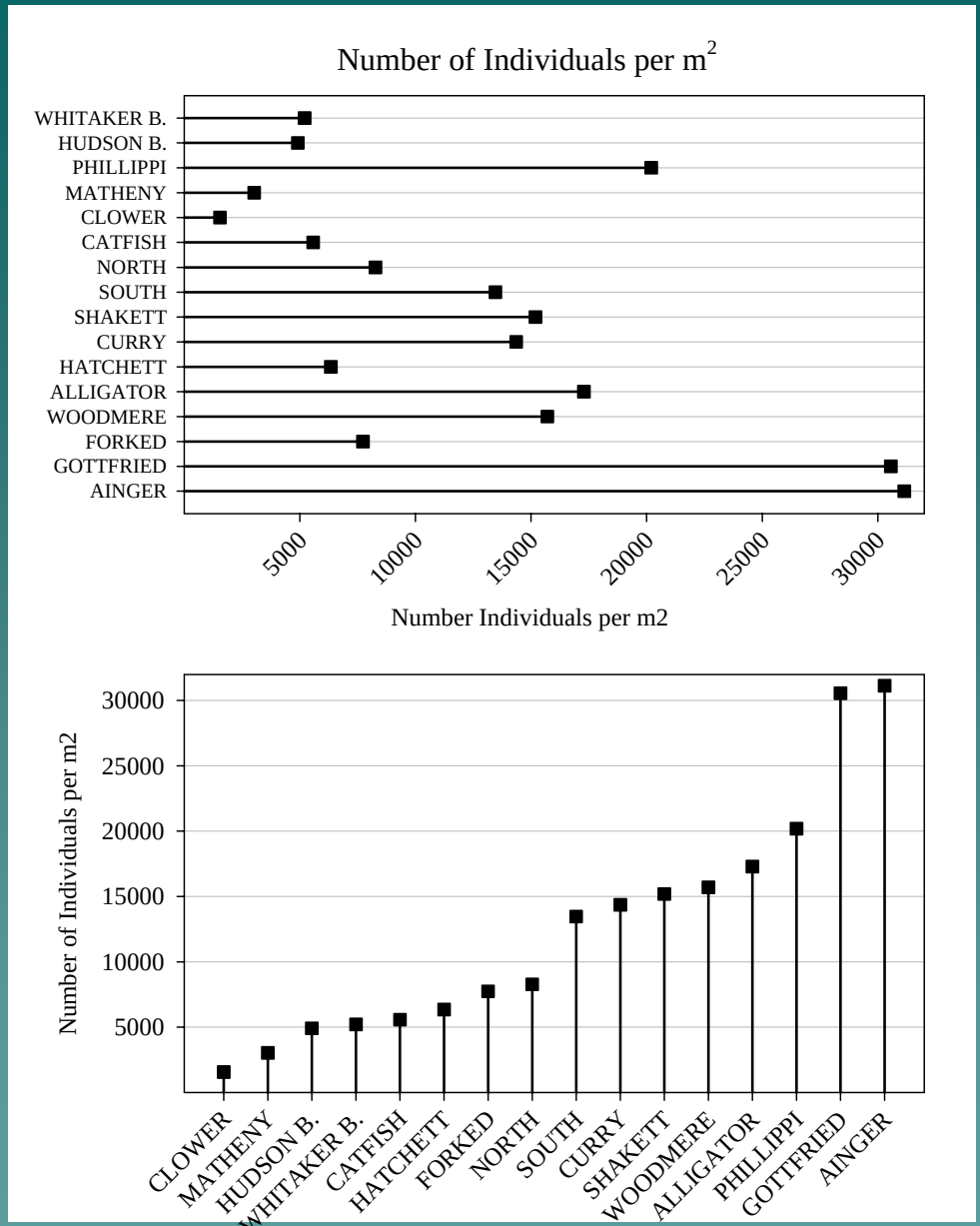
- Sampling is biased to produce highest possible returns per metric

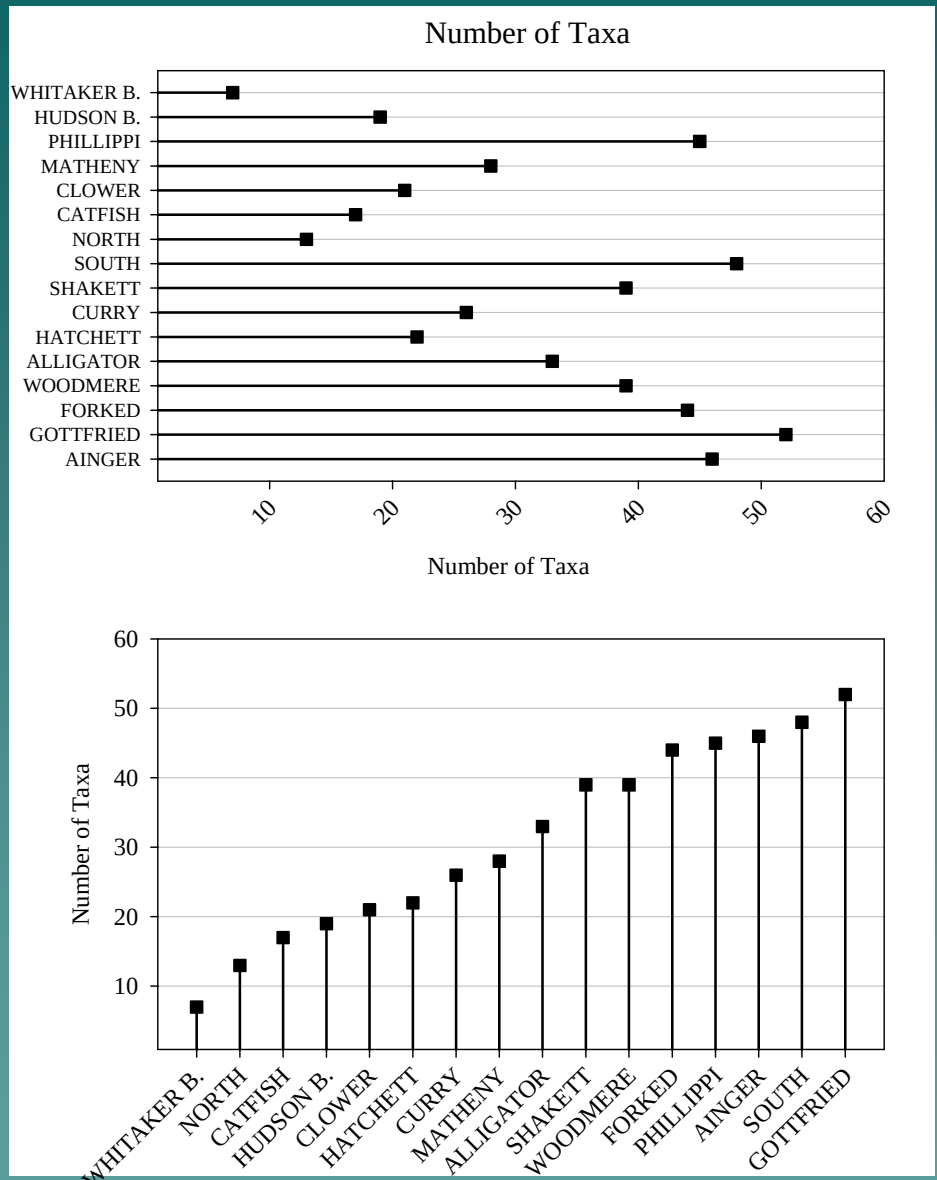

Creek Geometric Index
WHITAKER B.
HUDSON B.
PHILLIPPI
MATHENY
CLOWER
CATFISH
NORTH
SOUTH
SHAKETT
CURRY
HATCHETT
ALLIGATOR
WOODMERE
FORKED
GOTTFRIED
AINGER
1.0
1.2
1.4
1.6
1.8
2.0
2.2
Creek Index


Creek Index
2.2
2.0
1.8
1.6
1.4
1.2
1.0
MATHENY
CLOWER
WHITAKER B.
HATCHETT
CATFISH
NORTH
SHAKETT
PHILLIPPI
CURRY
AINGER
HUDSON B.
SOUTH
GOTTFRIED
WOODMERE
ALLIGATOR
FORKED

Independent Checks on Index Performance

- Benthic Infauna
- Landscape Development Intensity Index
- Age of Watershed Occupation and Use
- Pollutant Model Outputs


Number of Individuals per m2
WHITAKER B.
HUDSON B.
PHILLIPPI
MATHENY
CLOWER
CATFISH
NORTH
SOUTH
SHAKETT
CURRY
HATCHETT
ALLIGATOR
WOODMERE
FORKED
GOTTFRIED
AINGER
5000
10000
15000
20000
25000
30000
Number Individuals per m2
Number of Individuals per m2
30000
25000
20000
15000
10000
5000
CLOWER
MATHENY
HUDSON B.
WHITAKER B.
CATFISH
HATCHETT
FORKED
NORTH
SOUTH
CURRY
SHAKETT
WOODMERE
ALLIGATOR
PHILLIPPI
GOTTFRIED
AINGER


Number of Taxa
WHITAKER B.
HUDSON B.
PHILLIPPI
MATHENY
CLOWER
CATFISH
NORTH
SOUTH
SHAKETT
CURRY
HATCHETT
ALLIGATOR
WOODMERE
FORKED
GOTTFRIED
AINGER
10
20
30
40
50
60
Number of Taxa
Number of Taxa
60
50
40
30
20
10
WHITAKER B.
NORTH
CATFISH
HUDSON B.
CLOWER
HATCHETT
CURRY
MATHENY
ALLIGATOR
SHAKETT
WOODMERE
FORKED
PHILLIPPI
AINGER
SOUTH
GOTTFRIED

Pearson Correlations

	Benthic Spp. No.	Benthic Density
Tidal Creek Index	(0.67)**	(0.53)*

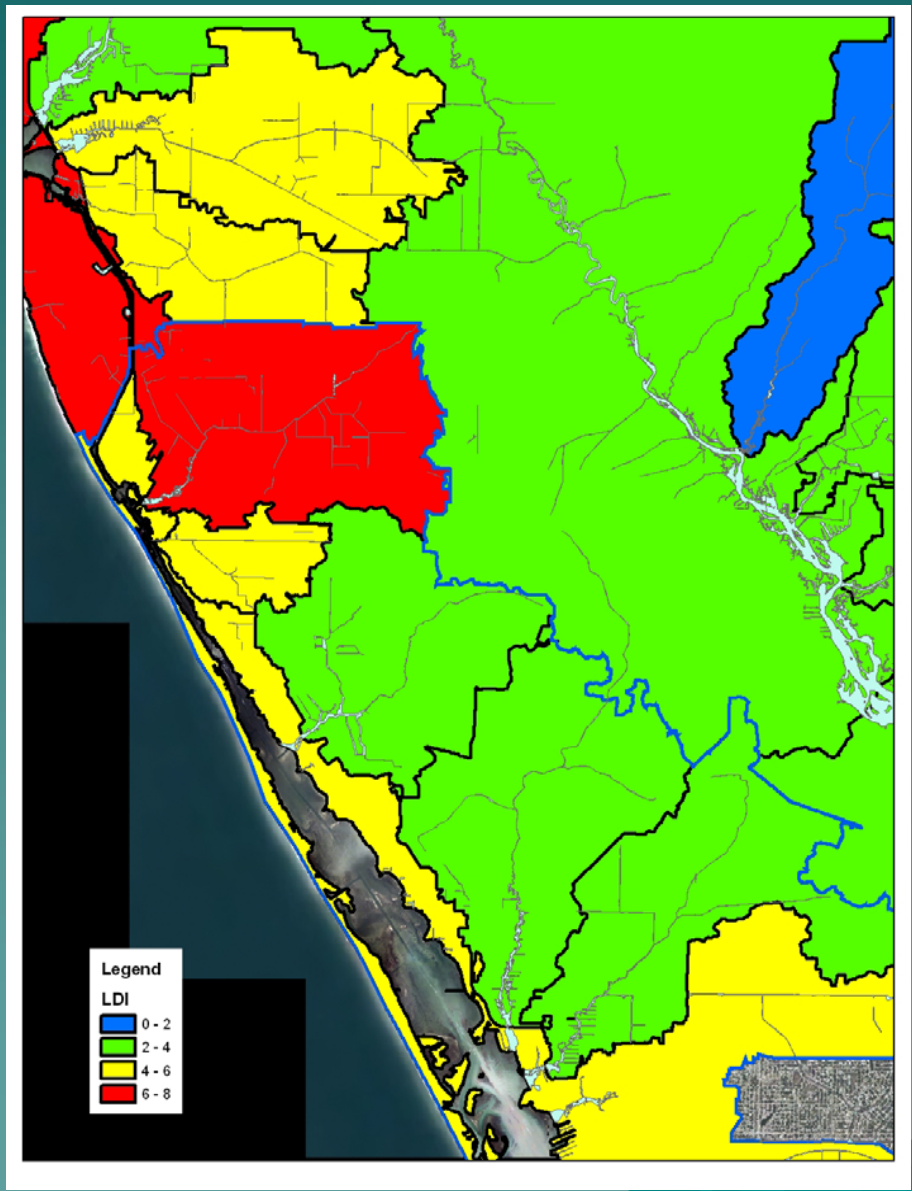
(There is a statistically significant correspondence between the rapid survey method and a proven and commonly used standard.)

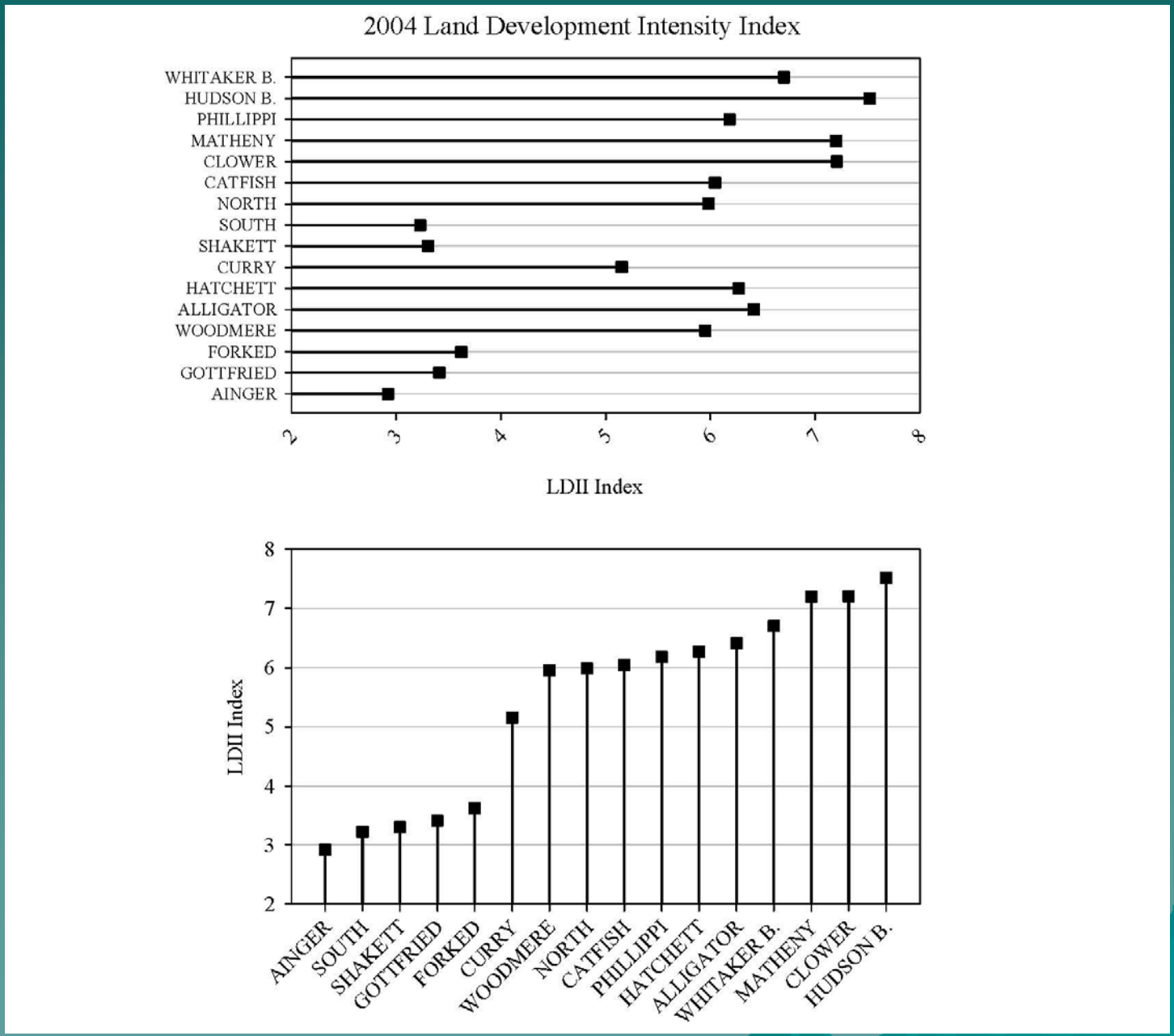
In 2007 the tidal creek condition index and benthic density or diversity data shared:

5 of the 5 highest ranked creeks

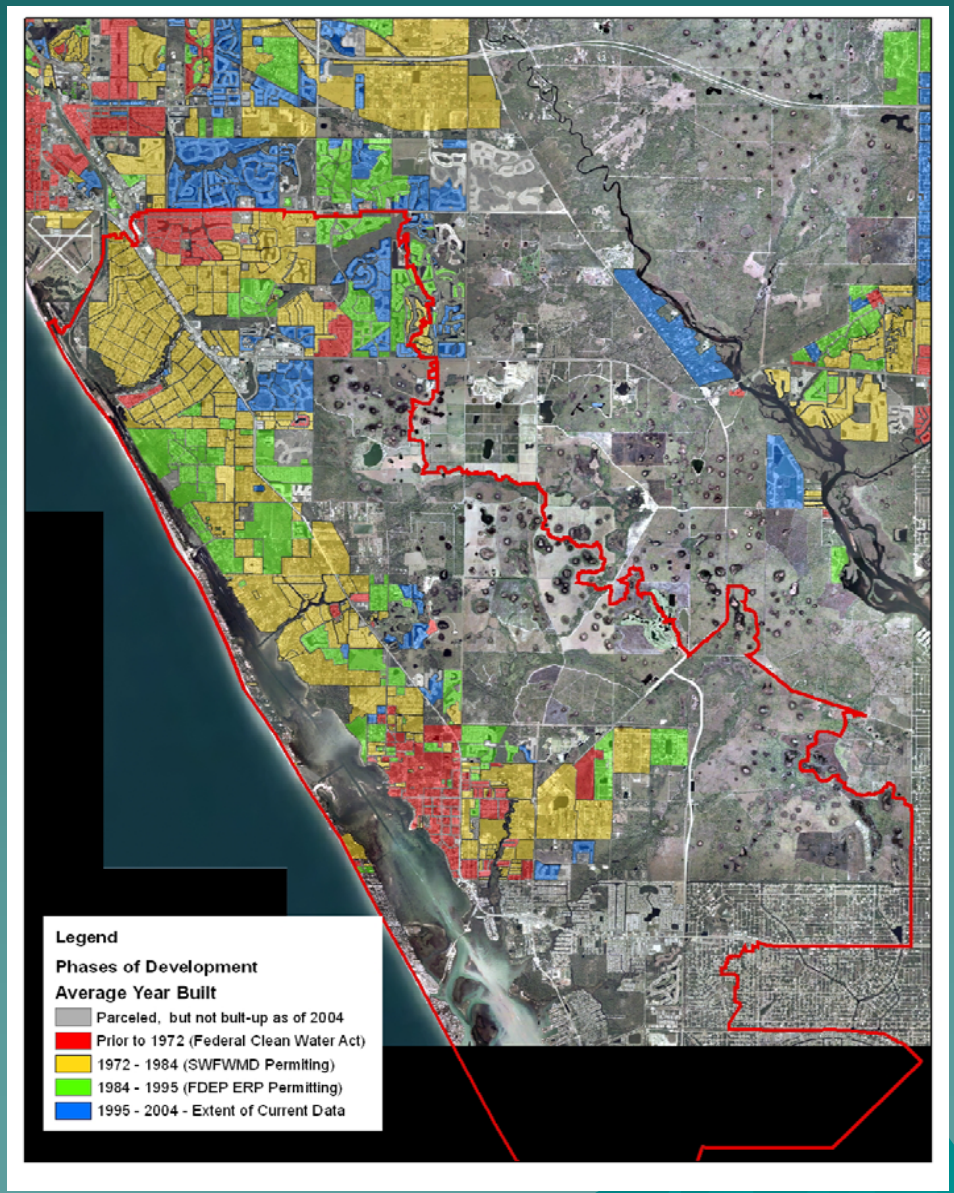
3 (4?) of the 5 lowest ranked creeks

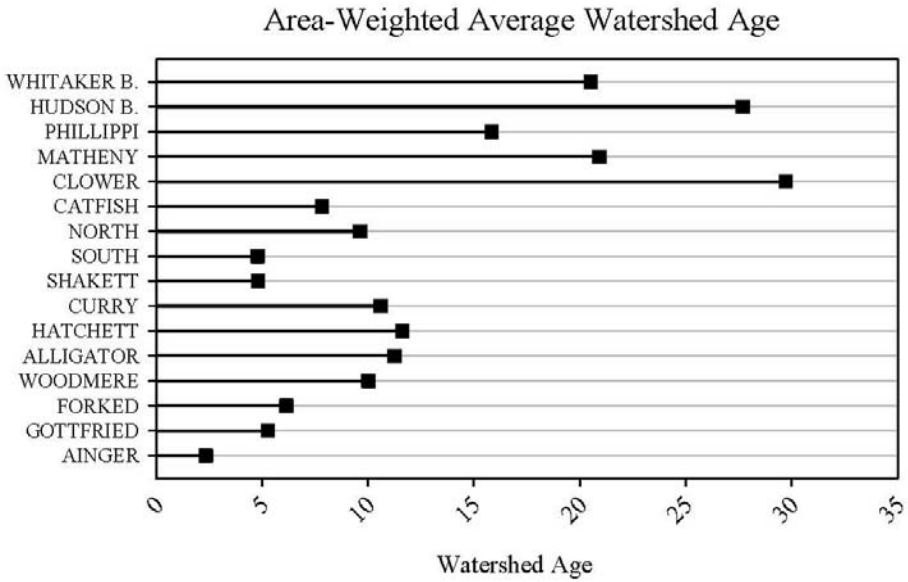
Lemon Bay Watershed Landscape Development Intensity Index
(Courtesy J. Perry, Sarasota County)

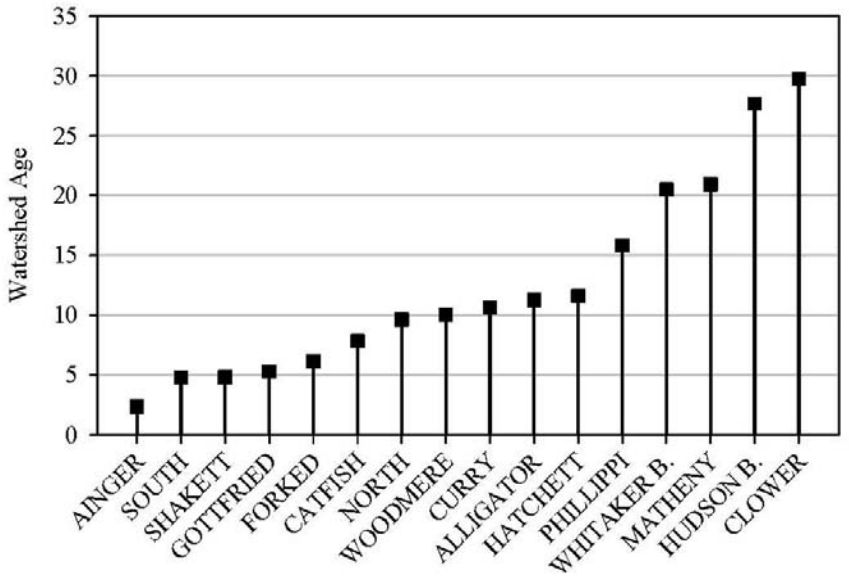



2004 Land Development Intensity Index
WHITAKER B.
HUDSON B.
PHILLIPPI
MATHENY
CLOWER
CATFISH
NORTH
SOUTH
SHAKETT
CURRY
HATCHETT
ALLIGATOR
WOODMERE
FORKED
GOTTFRIED
AINGER
2
3
4
5
6
7
8
LDII Index
LDII Index
2
3
4
5
6
7
8
AINGER
SOUTH
SHAKETT
GOTTFRIED
FORKED
CURRY
WOODMERE
NORTH
CATFISH
PHILLIPPI
HATCHETT
ALLIGATOR
WHITAKER B.
MATHENY
CLOWER
HUDSON B.

Lemon Bay Watershed Average Age of Buildings
(Courtesy J. Perry, Sarasota County)



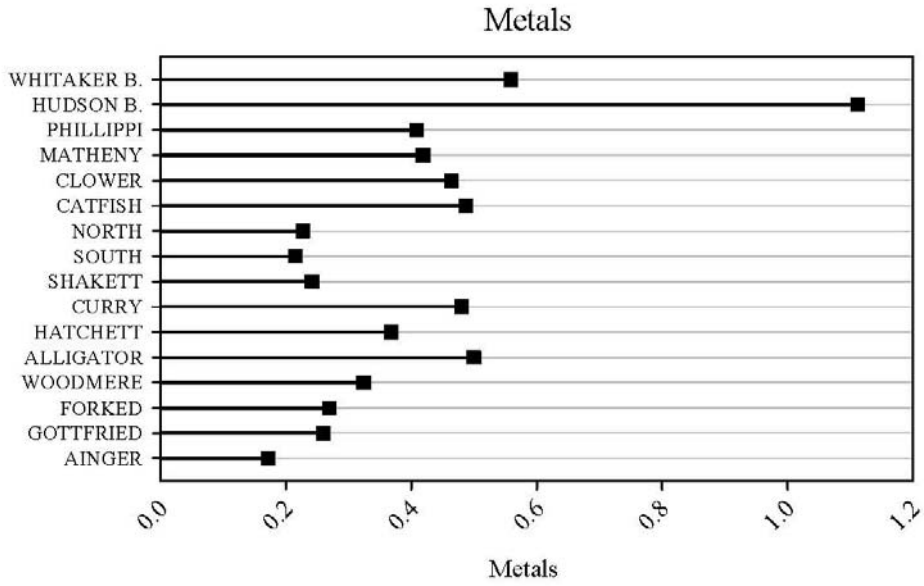

Area-Weighted Average Watershed Age
WHITAKER B.
HUDSON B.
PHILLIPPI
MATHENY
CLOWER
CATFISH
NORTH
SOUTH
SHAKETT
CURRY
HATCHETT
ALLIGATOR
WOODMERE
FORKED
GOTTFRIED
AINGER
0
5
10
15
20
25
30
35
Watershed Age

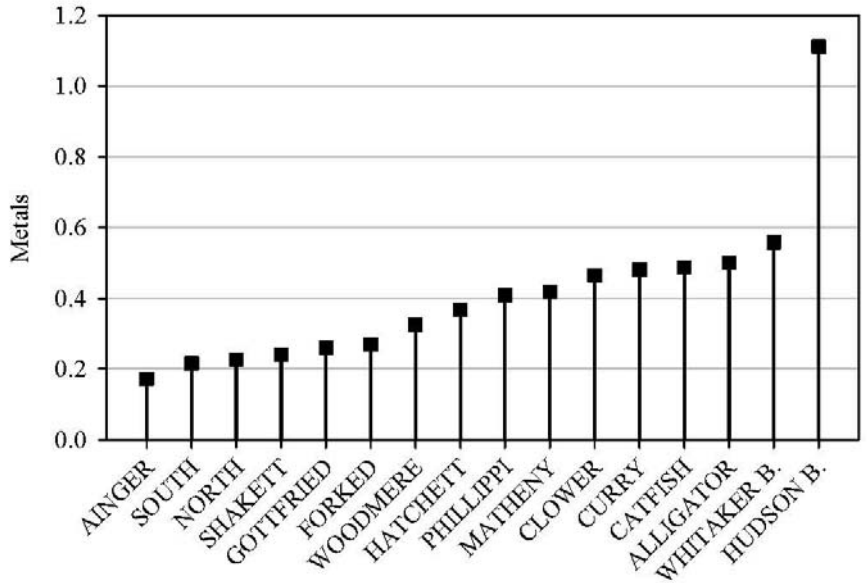

Watershed Age
0
5
10
15
20
25
30
35
AINGER
SOUTH
SHAKETT
GOTTFRIED
FORKED
CATFISH
NORTH
WOODMERE
CURRY
ALLIGATOR
HATCHETT
PHILLIPPI
WHITAKER B.
MATHENY
HUDSON B.
CLOWER

2005 Pollutant Load Model

- 16 pollutants modeled
- Nutrients: TP and TN
- BOD, COD
- Metals: Pb, Zn, Cu, Cd; “Total”
- TSS, TDS
- Oil & Grease

(Pounds per acre per year)


Metals
WHITAKER B.
HUDSON B.
PHILLIPPI
MATHENY
CLOWER
CATFISH
NORTH
SOUTH
SHAKETT
CURRY
HATCHETT
ALLIGATOR
WOODMERE
FORKED
GOTTFRIED
AINGER
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Metals


Metals
1.2
1.0
0.8
0.6
0.4
0.2
0.0
AINGER
SOUTH
NORTH
SHAKETT
GOTTFRIED
FORKED
WOODMERE
HATCHETT
PHILLIPPI
MATHENY
CLOWER
CURRY
CATFISH
ALLIGATOR
WHITAKER B.
HUDSON B.

Pearson Correlations

	Benthic Spp. No.	Benthic Density	Creek Index
Tidal Creek Index	**	*	---
Watershed Age	*	**	ns
Development Index	**	**	ns
Total Metals Load	*	ns	ns

Annual Trends (Spring Data)

	2007	2008	2009
Mean TCI	1.6	1.9	1.9
Highest 4	Forked	South	Curry
	Alligator	Forked	Forked
	Woodmere	Alligator	Alligator
	Gottfried	Phillippi	Phillippi
Lowest 4	Hatchett	North	Woodmere
	Whitaker	Whitaker	Matheny
	Clower	Catfish	Whitaker
	Matheny	Matheny	Clower

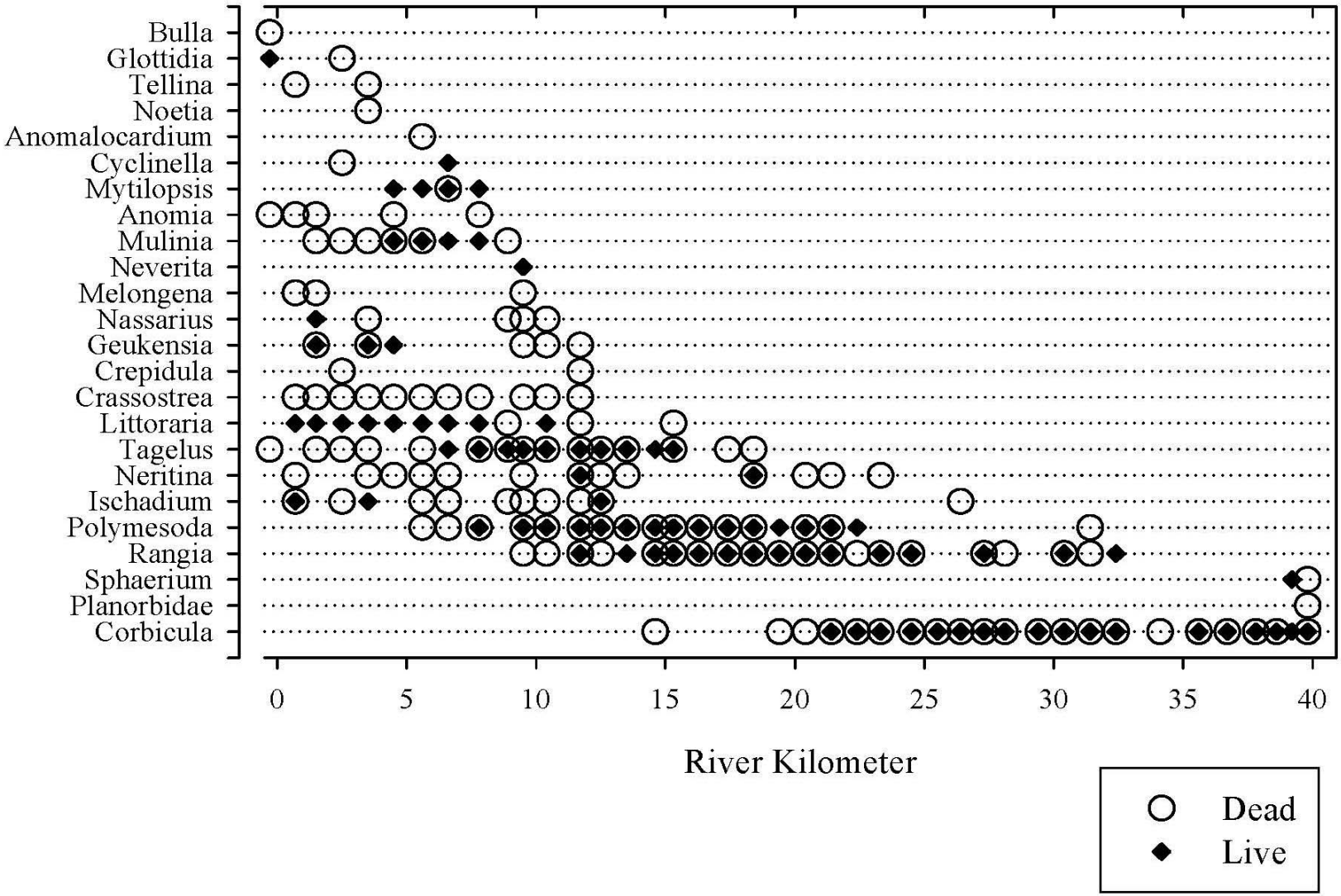
Monthly Trends in South Creek

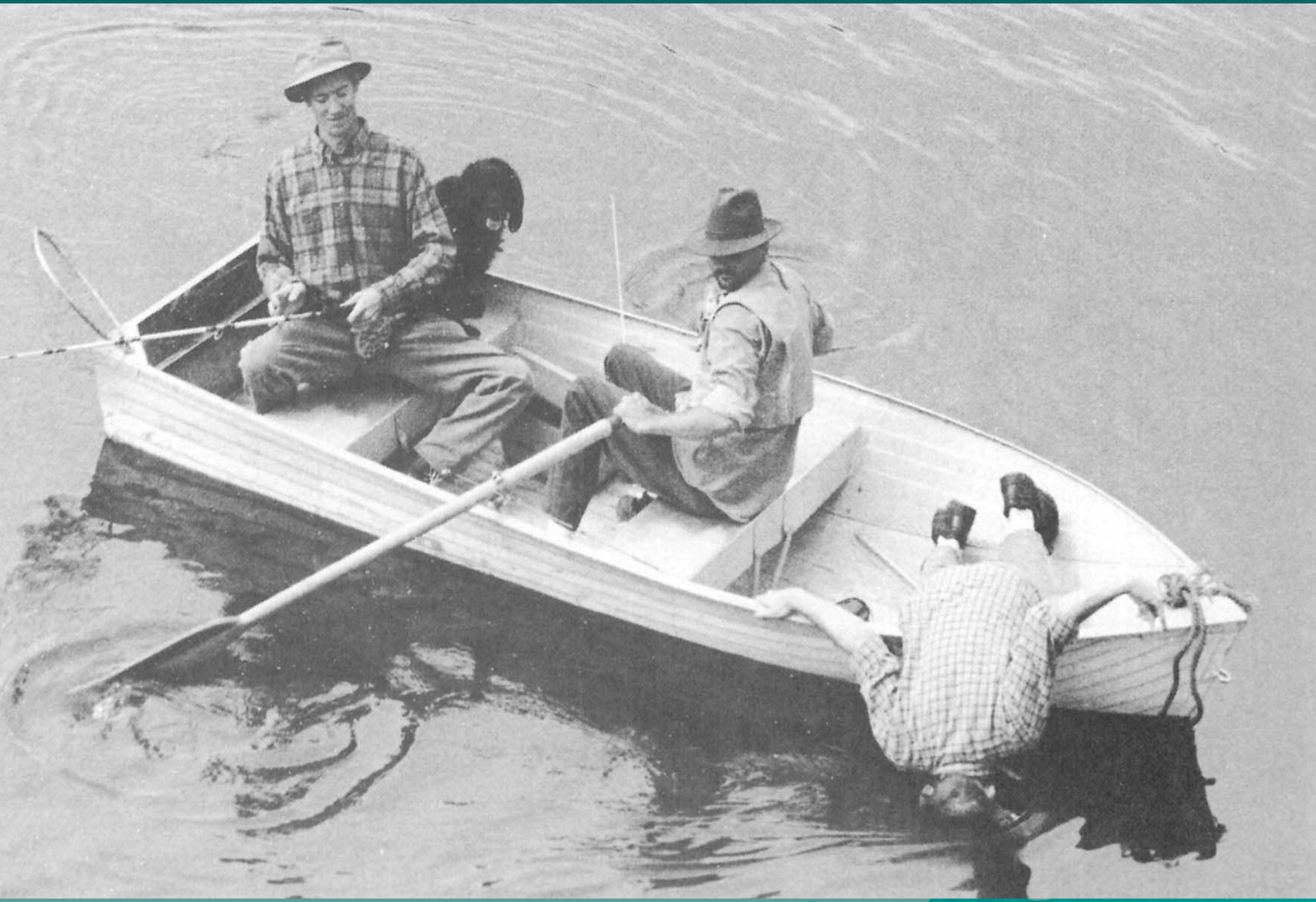
	2009 Creek Index
April	2.06
June	2.05
July	2.28
August	2.49
September	next week

Can the TCI be used in the Myakka River?

AS IS– Depends on oysters; but only between the Charlotte County line and Myakkahatchee Creek

WITH CHANGES-- Maybe, from US 41 to Rambler's Rest; would need work; could not compare to lower river or to coastal creeks


Bulla
Glottidia
Tellina
Noetia
Anomalocardium
Cyclinella
Mytilopsis
Anomia
Mulinia
Neverita
Melongena
Nassarius
Geukensia
Crepidula
Crassostrea
Littoraria
Tagelus
Neritina
Ischadium
Polymesoda
Rangia
Sphaerium
Planorbidae
Corbicula
0
5
10
15
20
25
30
35
40
River Kilometer
Dead
Live



Acknowledgments

- Southwest Florida Water Management District – Manny Lopez
- Sarasota County – Jon Perry, Mike Jones
- Sarasota Bay Estuary Program – Gary Raulerson
- Florida Department of Environmental Protection – Russ Frydenborg, Ellen McCarron, Steve Wolfe, Lori Wolfe
- Mote Marine Laboratory – Anamari Boyes, Emily Hall, Janet Gannon, Rusty Holmes, Lucas Jennings, Jay Leverone, Dennis Medved, Brad Robbins, Jay Sprinkel, Susan Stover