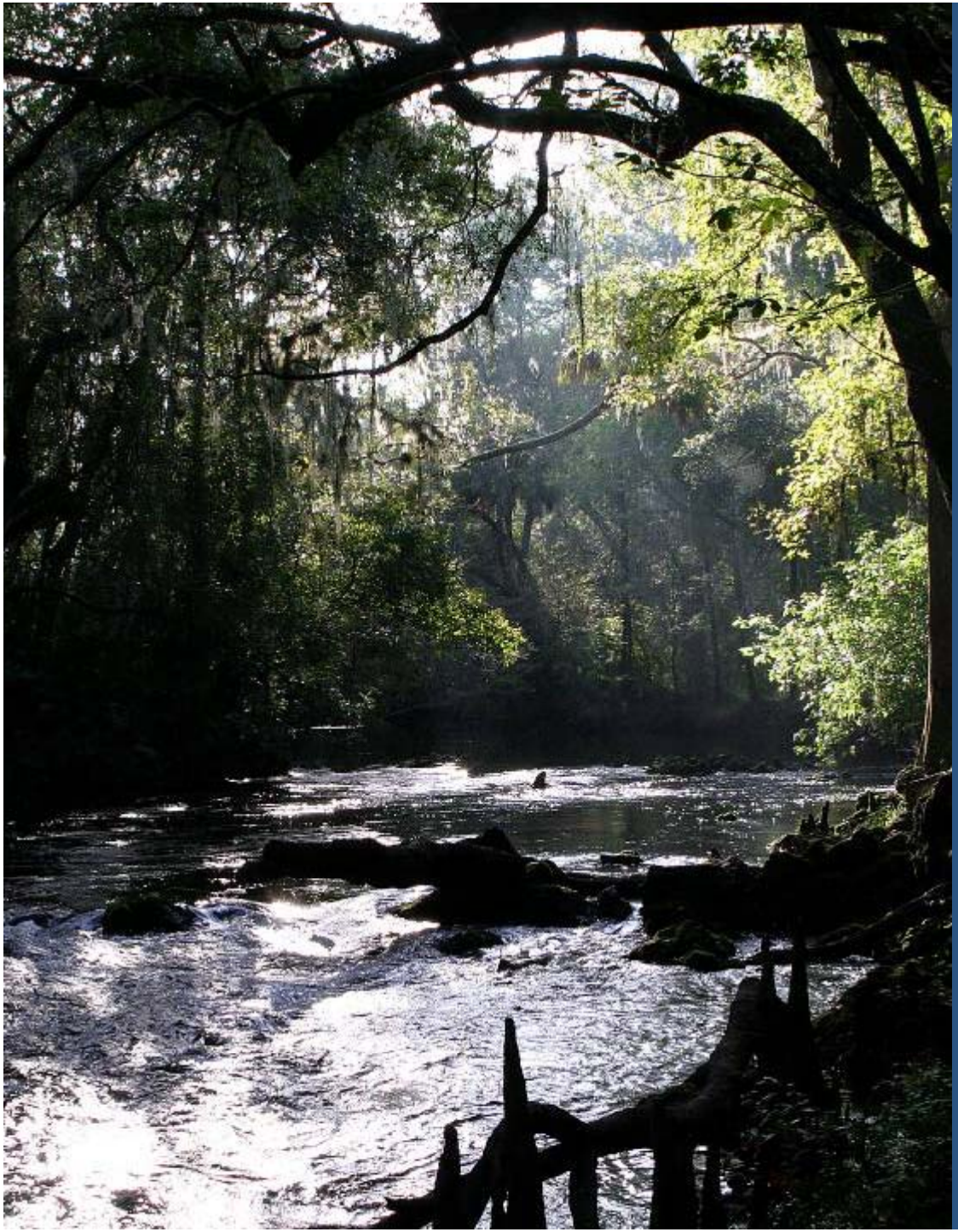
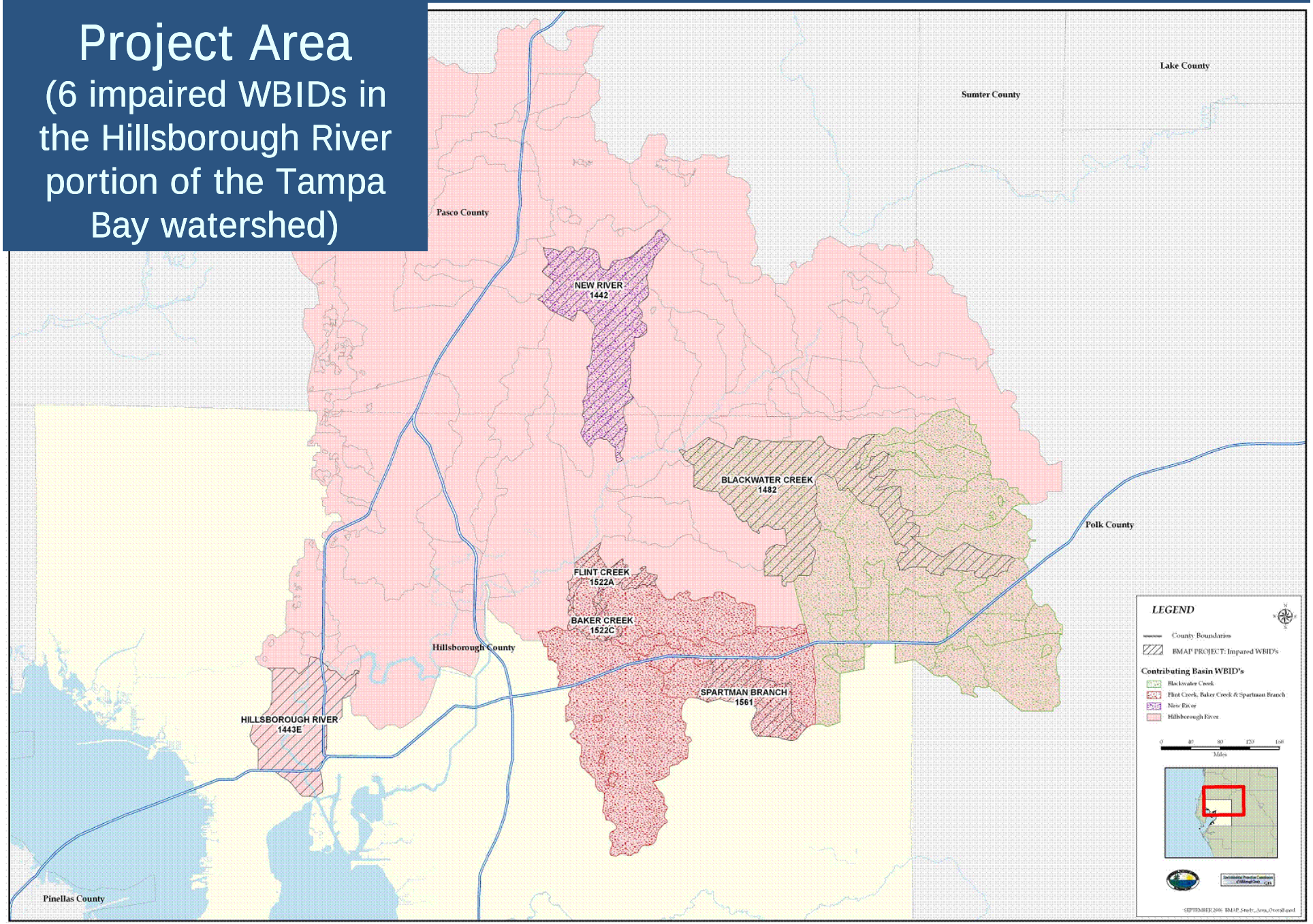


‘Decision Matrix’ update for BMAP WBIDs in the Hillsborough River watershed

Aug. 18, 2011

Project Area

(6 impaired WBIDs in the Hillsborough River portion of the Tampa Bay watershed)



Basin Working Group members

- City of Plant City
- City of Tampa
- City of Temple Terrace
- Hillsborough County
- Pasco County
- Polk County
- Southwest Florida Water Management District
- Florida Department of Agriculture & Consumer Services
- Florida Department of Environmental Protection
- Florida Department of Health
- Florida Department of Transportation
- Tampa Bay Estuary Program

Why is a ‘decision matrix’ tool needed to help with fecal coliform impairments ?

- Florida currently has water quality criteria for fecal coliform bacteria (e.g., no more than 10% of samples may exceed 400 CFU/100 mL)
- Under federal and state law, FDEP is required to develop TMDLs for WBIDs that aren’t meeting these or other water quality criteria
- Coliform bacteria have been used as indicators of potential fecal contamination of water since the late 1800s. (Originally for detecting contamination of water by untreated or minimally-treated sewage.)

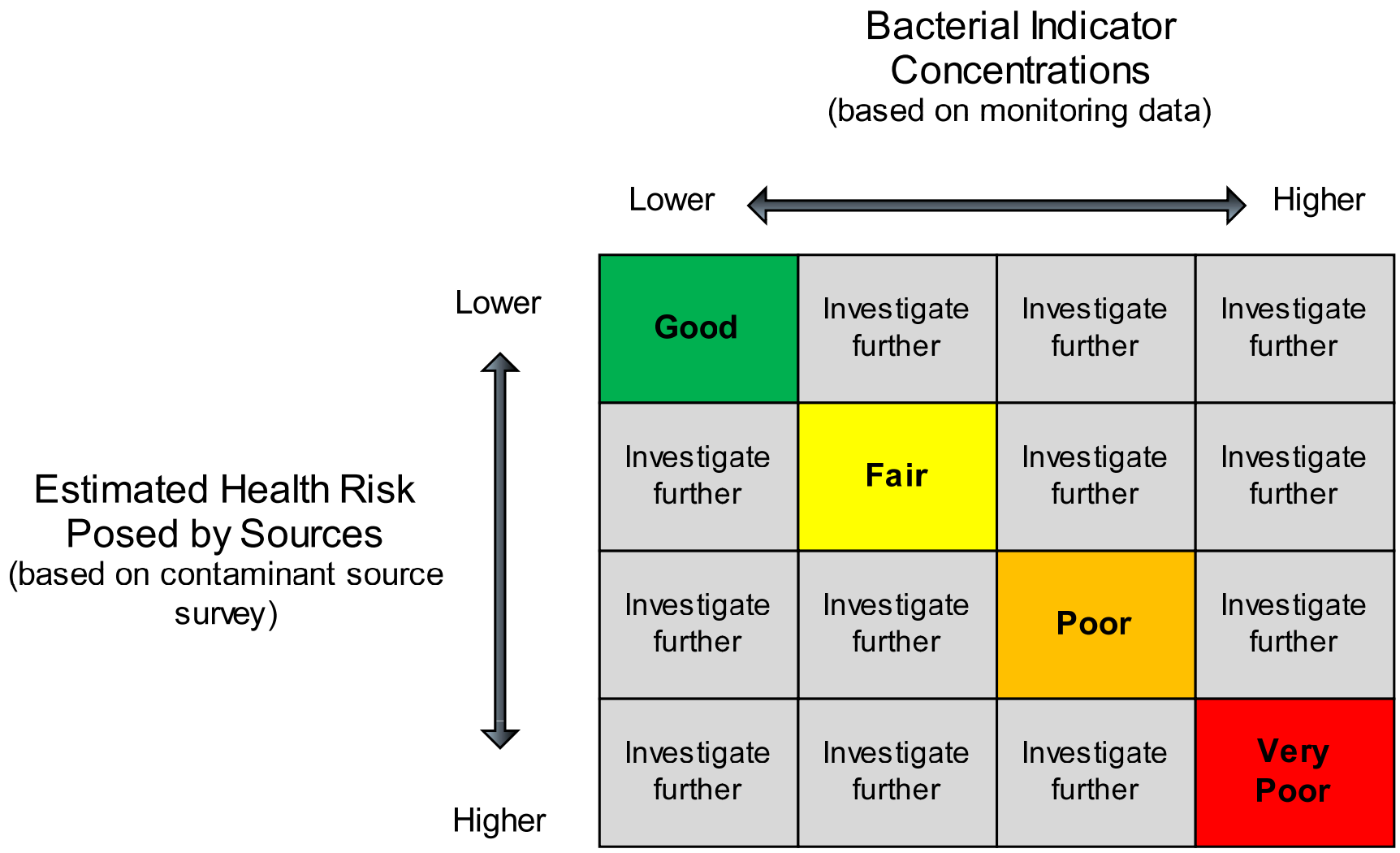
Why is a ‘decision matrix’ tool needed ?

- But, in tropical and sub-tropical areas, fecal coliforms and other bacterial indicators can grow in soils and on vegetation, producing “false-positive” monitoring results
- They can also produce “false-negative” results – some pathogenic viruses and protozoa can survive longer than fecal coliforms in surface waters

How to address these technical limitations?

- Long-term approach (could take 10+ years):
  - Develop better indicators (using other types of bacteria, viruses, etc.) that more accurately reflect human health risks
  - Some new techniques are currently available, but they are costly, technically complex, and not yet standardized
- Short-term approach
  - Until better indicators are developed, use additional types of information (along with fecal coliform counts) to help protect human health and improve water quality
  - This is the purpose of the ‘decision matrix’ approach that is used in the Hillsborough River BMAP process

World Health Organization (2003) "Annapolis protocol" matrix; Conceptual overview



Decision Matrix developed for Hillsborough River BMAP

		MWQA group (based on binomial assessment of frequency of 400 CFU/100 mL fecal coliform exceedances)				
		A (≤ 10%)	B (>10% - 30%)	C (>30% - 50%)	D (>50% - 75%)	E (>75%)
Contaminant source survey (CSS) assessment category (likelihood of fecal contamination posing human health risks)	1. Very Low	A1	B1	C1[a]	D1[a]	E1[a]
	2. Low	A2[b]	B2	C2	D2[a]	E2[a]
	3. Moderate	A3[b]	B3	C3	D3	E3
	4. High	A4[b]	B4[b]	C4	D4	E4
	5. Very High	A5[b]	B5[b]	C5[b]	D5	E5

Hillsborough River CSS assessment categories (based on estimated likelihood that observed sources pose human health risks)

1) **Very Low**: No visual evidence of potential sources of human pathogens; natural environment; no or minimal anthropogenic land uses; wildlife present (any density)

2) **Low:** Low density agricultural and residential sources, including pets, livestock (without direct access to surface waters), or poultry operations; residences on septic systems

3) **Moderate**: Urban stormwater sources (including pet waste) present; well-functioning wastewater infrastructure (both sewer and septic); episodic/low volume sanitary sewer overflows (SSOs) reaching surface waters; moderate-density livestock with little direct access to surface waters; Class A residual and/or septage spreading areas may be present

Hillsborough River CSS assessment categories (based on estimated likelihood that observed sources pose human health risks)

4) **High**: Major stormwater outfalls present; history of failing wastewater infrastructure (central sewer or onsite systems); episodic or chronic/high volume SSOs reaching surface waters; concentrated livestock without direct access to surface waters; residual/septage spreading (Class B)

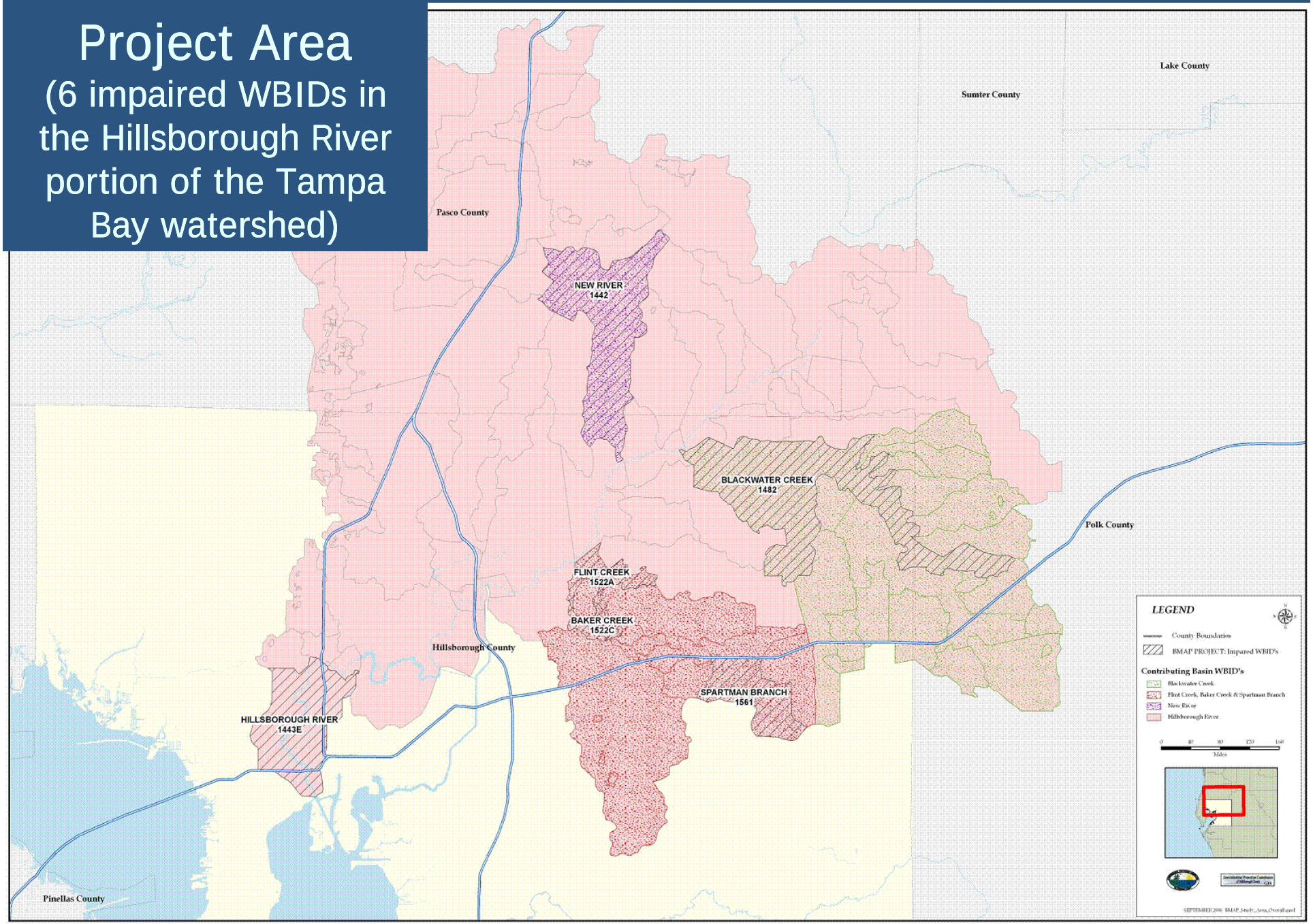
5) **Very High**: Current failing wastewater infrastructure; chronic/high volume SSOs reaching surface waters; concentrated livestock with direct access to surface waters; evidence of direct sewage inputs (e.g., confirmed illicit discharges)

Initial application of decision matrix, using information from 2008 MST project

				Human Fecal MST Markers		Ruminant Fecal MST Marker	
Sub-Basin	WBID	Monitoring Location	Classi-fication Matrix Outcome	No. Sampling Dates	% Dates Marker(s) Detected	No. Sampling Dates	% Dates Marker Detected
Lower Hillsborough River	1443E	DHR4A	D5	5	100 %	5	20 %
		HR3	D4	5	80 %	5	20 %
		DHR5	D4	2	50 %	2	0 %
		DHR8	D3	4	50 %	4	0 %
		HR2	C4	3	67 %	3	0 %
		HR4	C4	3	67 %	3	0 %
		DHR7	C3	5	60 %	5	60 %
		DHR6	C3	3	33 %	3	0 %
		HR1 REF	B3	3	100 %	8	0 %
		HR5	B3	5	60 %	5	0 %
		DHR10	A4	1	100 %	1	0 %
Blackwater Creek	1482	BW3	D4	4	75 %	1	0 %
		BW2	D4	3	67 %	3	100 %
		DBW4	A3	1	100 %	1	0 %
		BW5A	A3	2	50 %	2	0 %
		BW1 REF	A2	7	43 %	6	17 %
Baker Creek	1552C	BK2	D3	6	67 %	6	67 %
		BK1	C3	7	57 %	7	29 %
		BK3	C2	2	50 %	2	0 %
		BK4	A4	1	100 %	1	0 %
		BK5	A3	2	100 %	2	0 %
Flint Creek	1552A	FL2	C2	6	50 %	6	0 %
		FL1	C2	5	20 %	5	0 %
		FL3	A3	6	33 %	6	0 %
New River	1442	NR2	C3	7	29 %	7	29 %
		NR1	C2	2	0 %	2	50 %
		NR3	C2	2	0 %	2	50 %
Spartman Branch	1561	SB2	D3	5	20 %	6	0 %
		SB1	D3	6	17 %	6	0 %
		DSB3	C2	2	0 %	2	50 %
		SB3	B2	4	25 %	4	0 %

Project Area

(6 impaired WBIDs in the Hillsborough River portion of the Tampa Bay watershed)



Lower Hillsborough River (WBID 1443E)

"At the WBID scale, the Lower Hillsborough River… appears to be the highest priority for follow-up management action.

This section of the river receives a great deal of recreational use, had a large number of sites falling in CSS category 4 [="*high" risk*]… generated the largest mean CSS rating in the updated surveys… exhibited high frequencies of human MST markers at several monitoring sites… and appears to receive inputs from a number of sources of human fecal contamination…

Sanitary sewer infrastructure, malfunctioning septic systems, homeless residents and stormwater sources appear to be the highest priorities for management action in this WBID."

Blackwater Creek (WBID 1482) and Baker Creek (WBID 1522C)

"The Blackwater Creek (WBID 1482) and Baker Creek (WBID 1522C) WBIDs form a second priority group, with a preponderance of MST monitoring sites falling in CSS categories 3 and 4 [="*moderate" to "high" risk*]... and high frequencies of human and ruminant fecal markers detected at several locations.

The Hillsborough River Reservoir, a Class I waterbody, is located downstream of both WBIDs. In addition, Baker Creek also discharges to Lake Thonotosassa, a highly-eutrophic Class III waterbody that is on the State's surface water improvement and management (SWIM) priority list due to poor water quality.

Primary sources of MST markers in the Blackwater Creek WBID appear to be septic systems, livestock, and discharges of treated effluent from either publicly or privately owned wastewater treatment plants, while malfunctioning septic systems and livestock appear to be the primary sources of markers detected at sites in the Baker Creek WBID ."

Flint Creek (WBID 1522A) and New River (WBID 1442)

"The Flint Creek (WBID 1522A) and New River (WBID 1442) WBIDs form a lower priority group, with most MST monitoring sites classified in CSS group 2 [*="low" risk*]... but with elevated frequencies of human and ruminant fecal markers sporadically detected at some locations.

Both waterbodies discharge to the Class I Hillsborough River Reservoir. Primary sources in the New River WBID appear to be septic systems, livestock and wildlife. Sources in the Flint Creek WBID have not yet been clearly defined but appear to include a mixture of human, agricultural, and wildlife contributions."

Spartman Branch (WBID 1561)

"Among the WBIDs investigated in the MST project, this appears to be the lowest priority for follow-up management action.

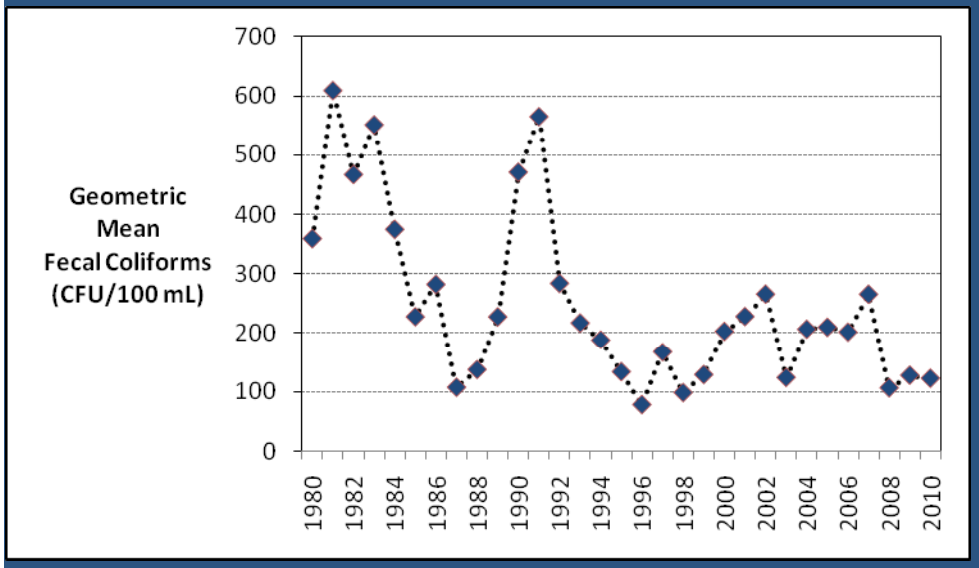
Most of its monitoring stations were classified in CSS group 2 [*='low' risk*] and produced relatively low detection frequencies of MST markers. A mixture of human and wildlife sources are suspected..."

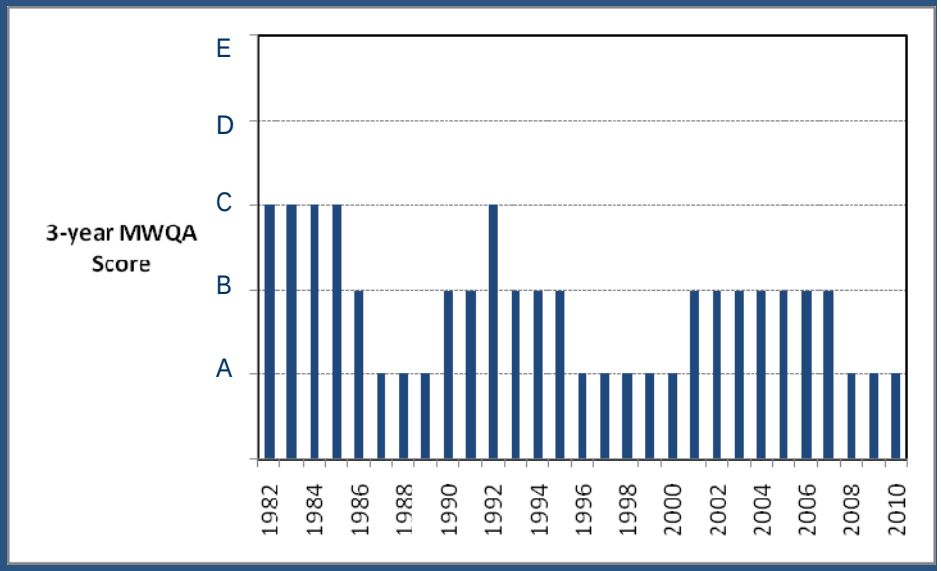
Updated water quality data

- Fecal Coliform data updated through 2010
- Based on long-term EPC stations only (no follow-up data available from MST stations)
- CSS information has not been updated for these WBIDs

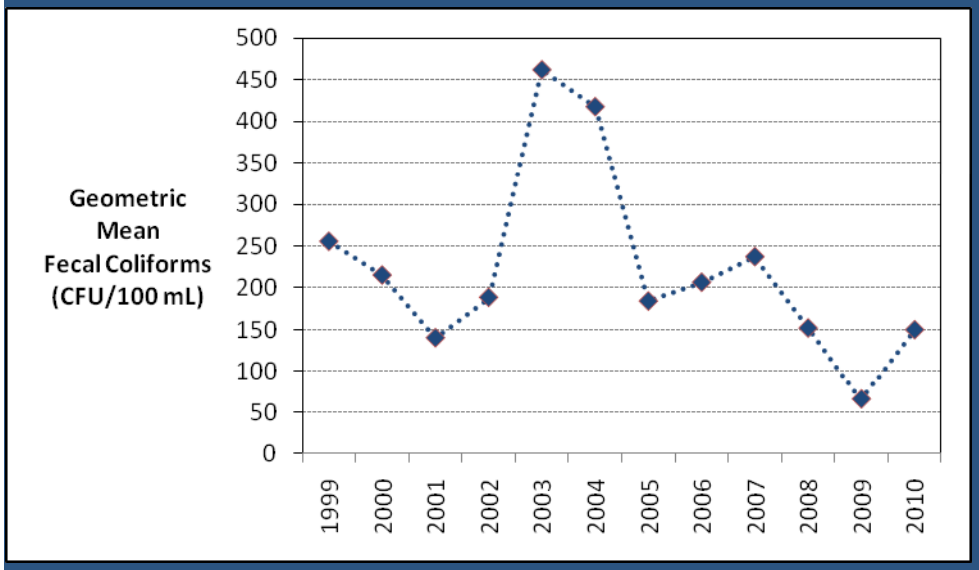
	WBID 1482 Blackwater Creek		WBID 1522C Baker Creek	WBID 1522B L. Thonotosassa		WBID 1522A Flint Creek	WBID 1443E Lower Hillsborough River		
Year	EPC STA 143	EPC STA 108[1]	EPC STA 107	EPC STA 135[2]	EPC STA 118[2]	EPC STA 148	EPC STA 105	EPC STA 152	EPC STA 137
1980									
1981									
1982		A	C	A	A		C		C
1983		B	C	A	B		C		C
1984		A	C	A	A		C		D
1985		A	C	A	A		C		C
1986		A	B	A	A		B		B
1987		A	B	A	A		A		B
1988		A	B	A	A		A		B
1989		A	B	A	A		A		B
1990	C	B	C	A	B		B		B
1991	C	B	D	A	B	D	B		B
1992	C	B	D	A	B	C	B		B
1993	C	B	D	A	B	C	B		B
1994	B	B	C	A	A	B	B		B
1995	B	B	B	A	A	B	B		C
1996	B	B	B	A	B	B	B		C
1997	A	A	A	A	B	B	A		B
1998	A	A	A	A	B	B	B		B
1999	A	A	A	A	A	B	A		A
2000	B	A	A	A	A	B	A		B
2001	B	A	A	A	A	B	B	B	B
2002	B	A	B	A	A	A	B	B	B
2003	B	A	B	A	A	A	B	B	C
2004	B	B	C	A	A	B	B	B	B
2005	A	A	C	A	A	B	B	B	B
2006	A	A	C	A	A	B	B	B	B
2007	A	A	B	A	A	B	B	B	B
2008	A	A	B	A	A	B	A	B	B
2009	A	A	B	A	A	B	A	A	A
2010	A	A	B	A	A	B	A	A	A

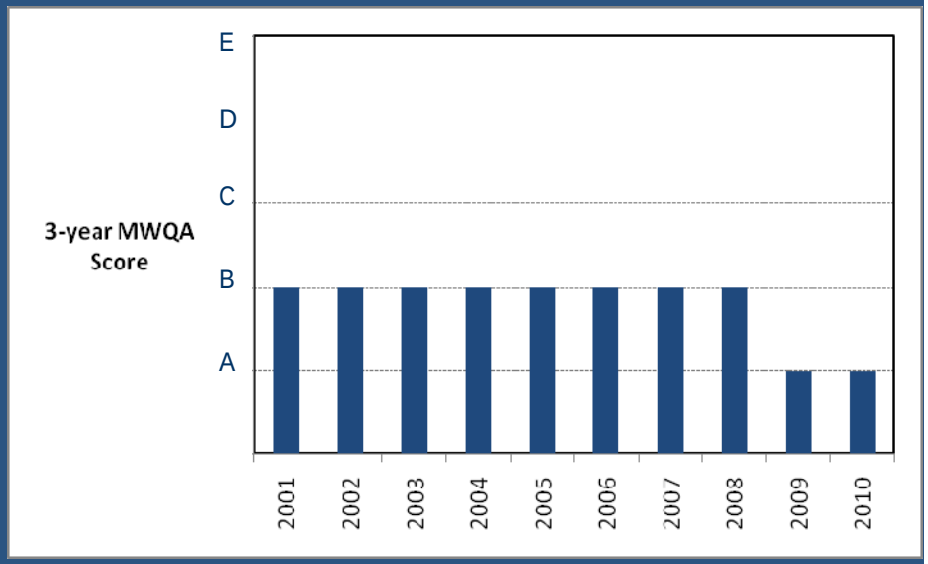
WBID 1443E
EPC Sta. 105
LHR at Rowlett Park Dr



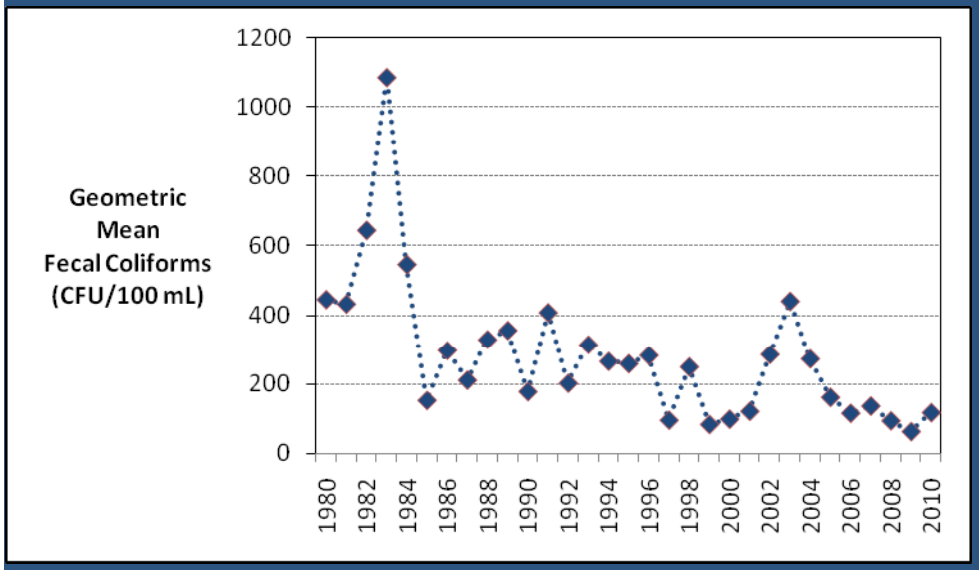


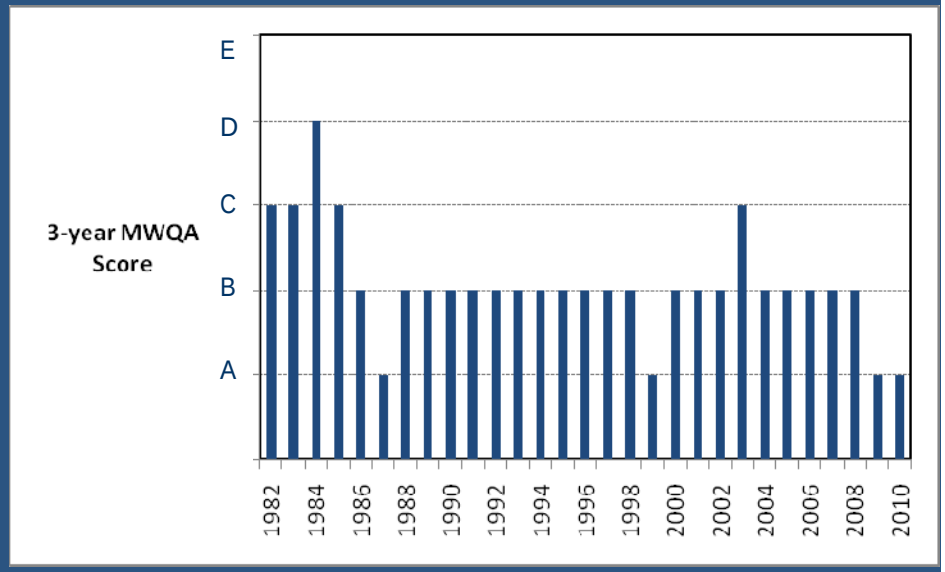
WBID 1443E
EPC Sta. 152
LHR at Sligh Ave (=BMAP HR4)



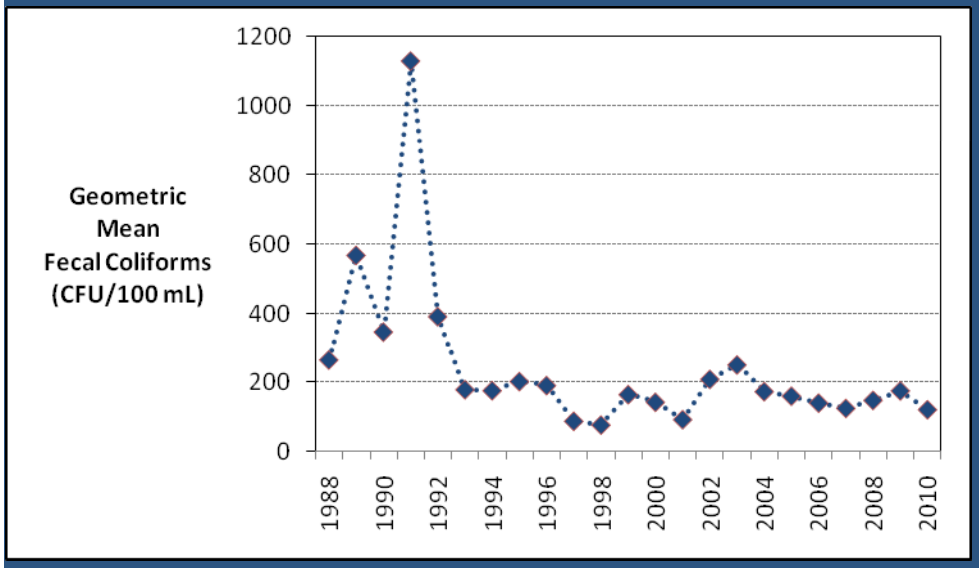


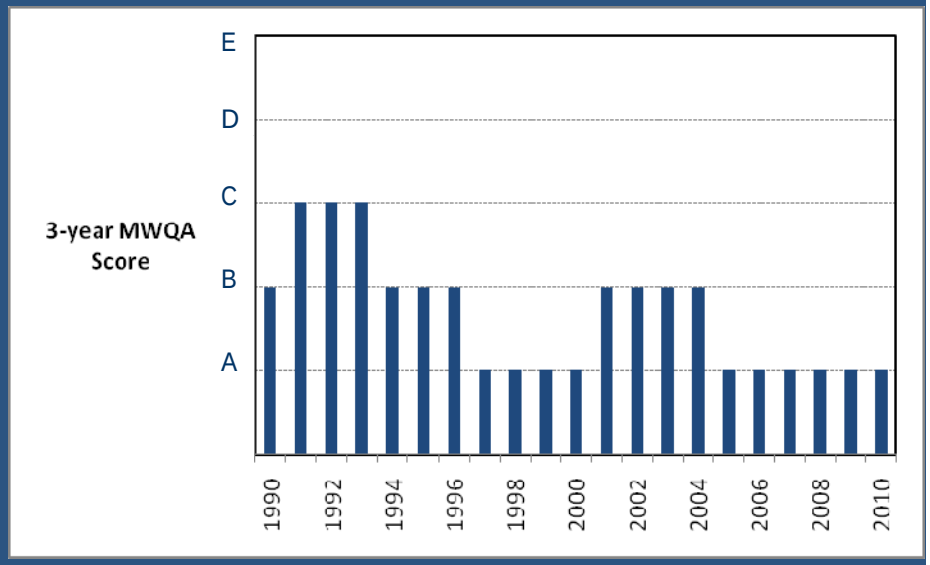
WBID 1443E
EPC Sta. 137
LHR at Columbus Drive



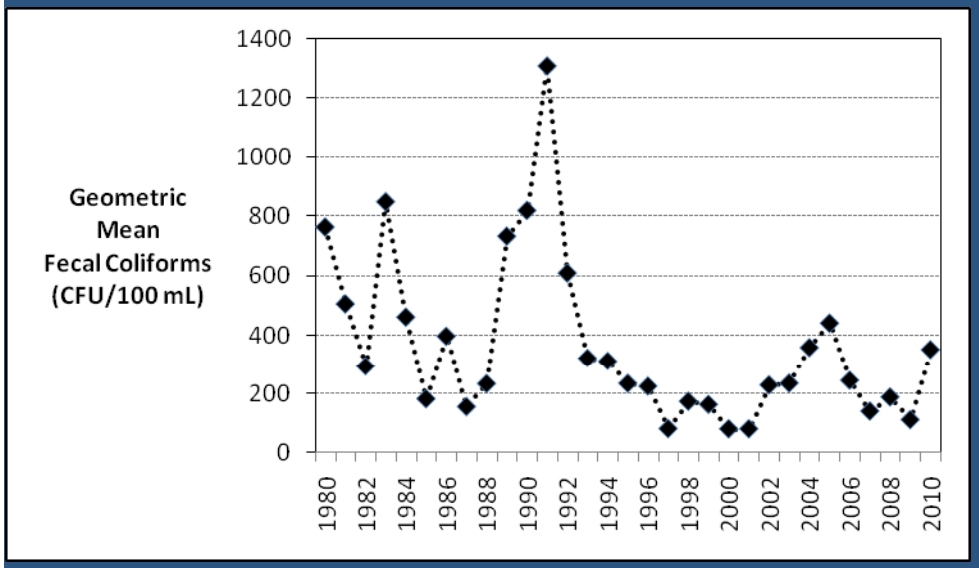


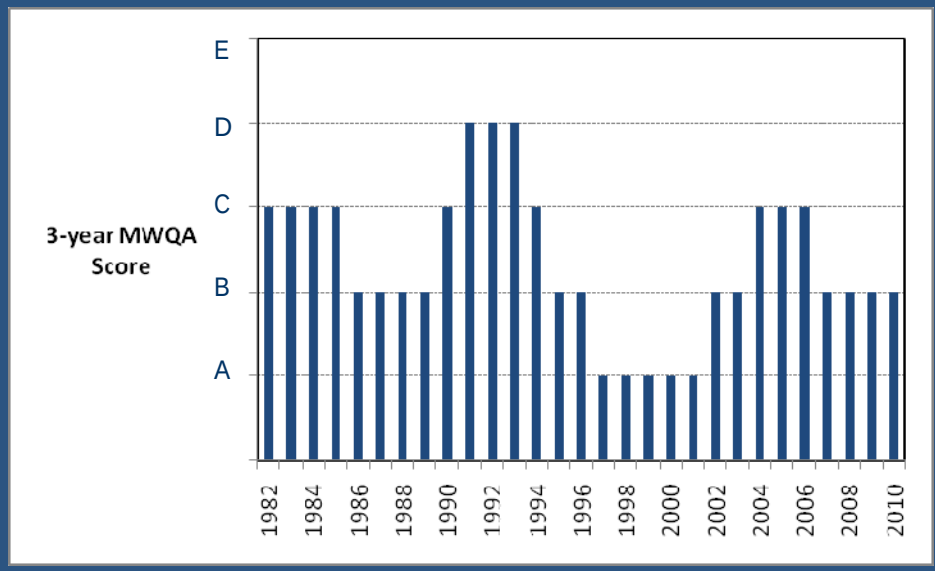
WBID 1482
EPC Sta. 143
Blackwater Creek at SR 39 (=BMAP DBW1)



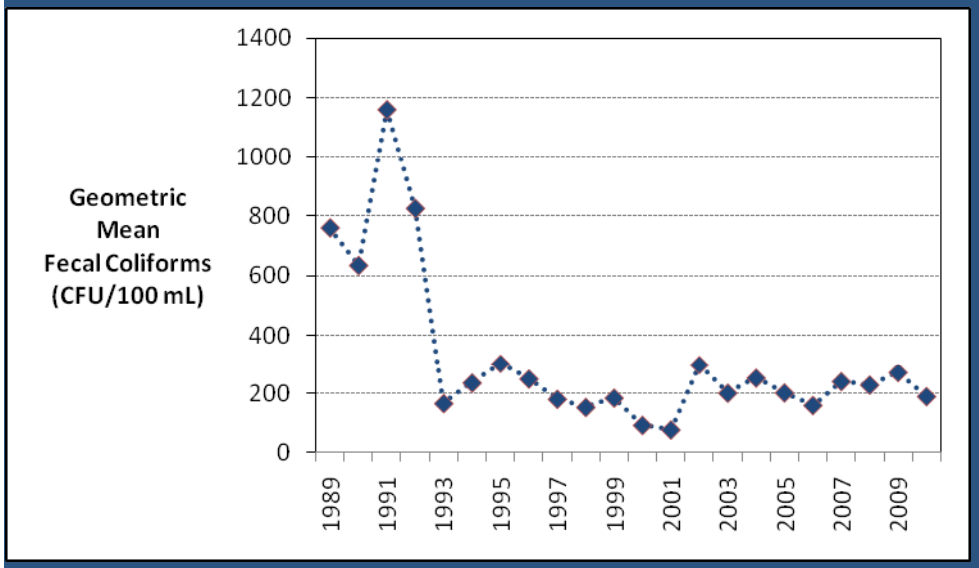


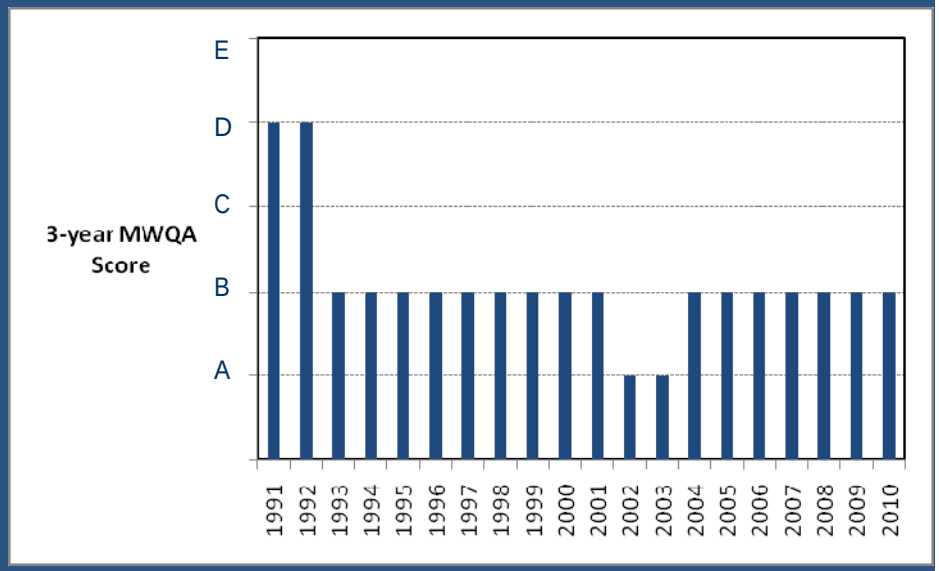
WBID 1522C
EPC Sta. 107
Baker Creek at Thonotosassa Road (=BMAP BK1)





WBID 1522A
EPC Sta. 148
Flint Creek at US 301 (=BMAP FL1)





	WBID 1482 Blackwater Creek		WBID 1522C Baker Creek	WBID 1522B L. Thonotosassa		WBID 1522A Flint Creek	WBID 1443E Lower Hillsborough River		
Year	EPC STA 143	EPC STA 108[1]	EPC STA 107	EPC STA 135[2]	EPC STA 118[2]	EPC STA 148	EPC STA 105	EPC STA 152	EPC STA 137
1980									
1981									
1982		A	C	A	A		C		C
1983		B	C	A	B		C		C
1984		A	C	A	A		C		D
1985		A	C	A	A		C		C
1986		A	B	A	A		B		B
1987		A	B	A	A		A		B
1988		A	B	A	A		A		B
1989		A	B	A	A		A		B
1990	C	B	C	A	B		B		B
1991	C	B	D	A	B	D	B		B
1992	C	B	D	A	B	C	B		B
1993	C	B	D	A	B	C	B		B
1994	B	B	C	A	A	B	B		B
1995	B	B	B	A	A	B	B		C
1996	B	B	B	A	B	B	B		C
1997	A	A	A	A	B	B	A		B
1998	A	A	A	A	B	B	B		B
1999	A	A	A	A	A	B	A		A
2000	B	A	A	A	A	B	A		B
2001	B	A	A	A	A	B	B	B	B
2002	B	A	B	A	A	A	B	B	B
2003	B	A	B	A	A	A	B	B	C
2004	B	B	C	A	A	B	B	B	B
2005	A	A	C	A	A	B	B	B	B
2006	A	A	C	A	A	B	B	B	B
2007	A	A	B	A	A	B	B	B	B
2008	A	A	B	A	A	B	A	B	B
2009	A	A	B	A	A	B	A	A	A
2010	A	A	B	A	A	B	A	A	A

Thanks…
Questions ?

Gerold Morrison
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Some additional reading...

- National Research Council (NRC). 2004. Indicators for waterborne pathogens. National Academy Press, Washington, DC
- Rose, J.B., and others. 2001. Healthy beaches Tampa Bay: Microbiological monitoring of water quality conditions and public health impacts. Tampa Bay Estuary Program Technical Report #03-01. TBEP. St. Petersburg, FL
- U.S. Environmental Protection Agency (U.S. EPA). 2007. Report of the experts scientific workshop on critical research needs for the development of new or revised recreational water criteria. EPA 823-R-07-006. Washington, DC
- World Health Organization (WHO). 2003. Guidelines for Safe Recreational Water Environments. Volume 1. Coastal and Fresh Waters. WHO, Geneva, Switzerland

- Project reports are posted on the FDEP ftp site: ftp://ftp.dep.state.fl.us/pub/water/BMAP/